Executive Summary

The North Carolina Department of Transportation Rail Division (NCDOT) and the Virginia Department of Rail and Public Transportation (VDRPT) in conjunction with the Federal Railroad Administration (FRA) and the Federal Highway Administration (FHWA) propose the implementation of high speed rail (HSR) passenger service within the Southeast High Speed Rail Corridor (SEHSR) from Washington DC to Charlotte, North Carolina.

The US Department of Transportation (USDOT) designated the SEHSR corridor in 1992. The designation identified Washington, DC; Richmond, VA; Raleigh, NC; and Charlotte, NC as the major urban areas to be connected. The SEHSR corridor has since been extended to include South Carolina, Georgia, Florida, and would connect the Northeast Corridor (NEC), the southeast, and the gulf coast. The fully extended corridor is illustrated in Figure ES-1.

Nationally, the USDOT is seeking to develop an economically efficient, environmentally sound, and globally competitive nationwide intermodal transportation network. USDOT is developing a nationwide high speed rail network as one component of the nationwide intermodal transportation network, and the SEHSR corridor is part of that effort. The purpose for the development of the SEHSR is to offer a competitive transportation mode which would divert travelers from air and auto travel within the overall travel corridor, lessening the congestion in the corridor, improving modal balance and overall system efficiency, with a minimum of environmental impact.

The system is needed because of the rapid economic and population growth in Virginia and North Carolina and the associated congestion this growth places 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 decreases safety and reliability on the existing network, while increasing energy consumption and travel times. Ridership models estimate that over one million passengers per year could be diverted to rail from air and highway travel in the SEHSR corridor by 2015.

The Environmental Impact Statement and Key Findings

For the SEHSR corridor, USDOT and the states have chosen to develop a Tier I Environmental Impact Statement (Tier I EIS) pursuant to the National Environmental Policy Act. This is a "program level" document that reviews the project at the corridor level, rather than at a detailed level. Based on feasibility studies, this Tier I EIS examines the incremental development of high speed passenger service along existing rail rights of way, using fossil fuel locomotives with a maximum authorized speed of 110 mph.

This document examines nine (9) Study Area Alternatives as build solutions, and one No-Build approach. The Study Area Alternatives are six-mile wide corridors centered on existing rail rights of way that connect the four major urban areas of the SEHSR corridor. For a combined graphic of all Study Area Alternatives see Exhibit ES-2. For ease of analysis, the Study Area Alternatives were broken into segments, which are shown in Exhibit ES-3. The individual Study Area Alternatives are shown in Exhibit ES-4. These alternatives were developed based on feasibility studies conducted by both states since 1992. The No-Build alternative (base case) consists of the existing transportation network (air, auto, bus, and rail) within the overall travel corridor and existing and committed improvements related to those modes.

All Study Area Alternatives were reviewed for:
-potential impacts (corridor level) to both the human and natural environment (including transportation impacts such as diversions from other modes, induced travel, and public safety),
-compatibility with approved or adopted transportation and land use plans and programs,
-engineering constraints and conceptual costs to construct, and
-operational characteristics (ridership/revenue projections, commercial feasibility, travel times).

A set of basic assumptions that apply to all Study Area Alternatives include:

- Transportation service 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.

- 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 places certain technological requirements and operational limitations on the high-speed trainsets and other technology choices.

- The Southeast High Speed Rail service is proposed to consist of four round trips per day between Charlotte and Washington, DC. It would also provide four additional round trips between Raleigh and Charlotte.

- The operational model developed for this analysis assumed a maximum speed of 110 mph in the corridor, with an average speed of 85 to 90 mph. Based on this operational model, estimated end-to-end travel time for this high speed rail service would range from six hours to seven and one-half hours, depending upon which of the nine study area alternatives is used. The number of daily trips and the average speeds account for shared trackage operations.

- Station stops have not yet been determined. It was assumed that the SEHSR would serve all stations where Amtrak currently provides service, however every train would not stop at all stations.
- The introduction of higher speeds onto existing rail lines would require modifications to the existing signal and control systems. The spacing of signals would be increased to accommodate the longest braking distance of any train operating on the route. This would likely be a 110 mph passenger train. Also, when any operations exceed 79 mph, signal indications are required to be displayed in the locomotive cab or use Automatic train stop or automatic train control.

- At-grade highway crossings are permitted for 110 mph. However, FRA guidance states that pubic and private crossings where train speeds are between 90 and 110 mph should be equipped with special crossing protection devices, grade separated, or closed.

- The overall safety of the existing rail system would be improved by the implementation of a high speed rail system, which would upgrade not only the track, crossings and rolling stock, but also the stations and associated facilities.

Table ES-1 gives the geographical context for each Study Area Alternative; Table ES-2 gives a summary of operation/engineering characteristics; and Table ES -3 gives a summary of human/natural environmental information on each Study Area Alternative. The alternatives have been labeled A through J, with “I” omitted to avoid confusion or misreading.

Exhibit ES-1
Federally Designated High Speed Rail Corridors

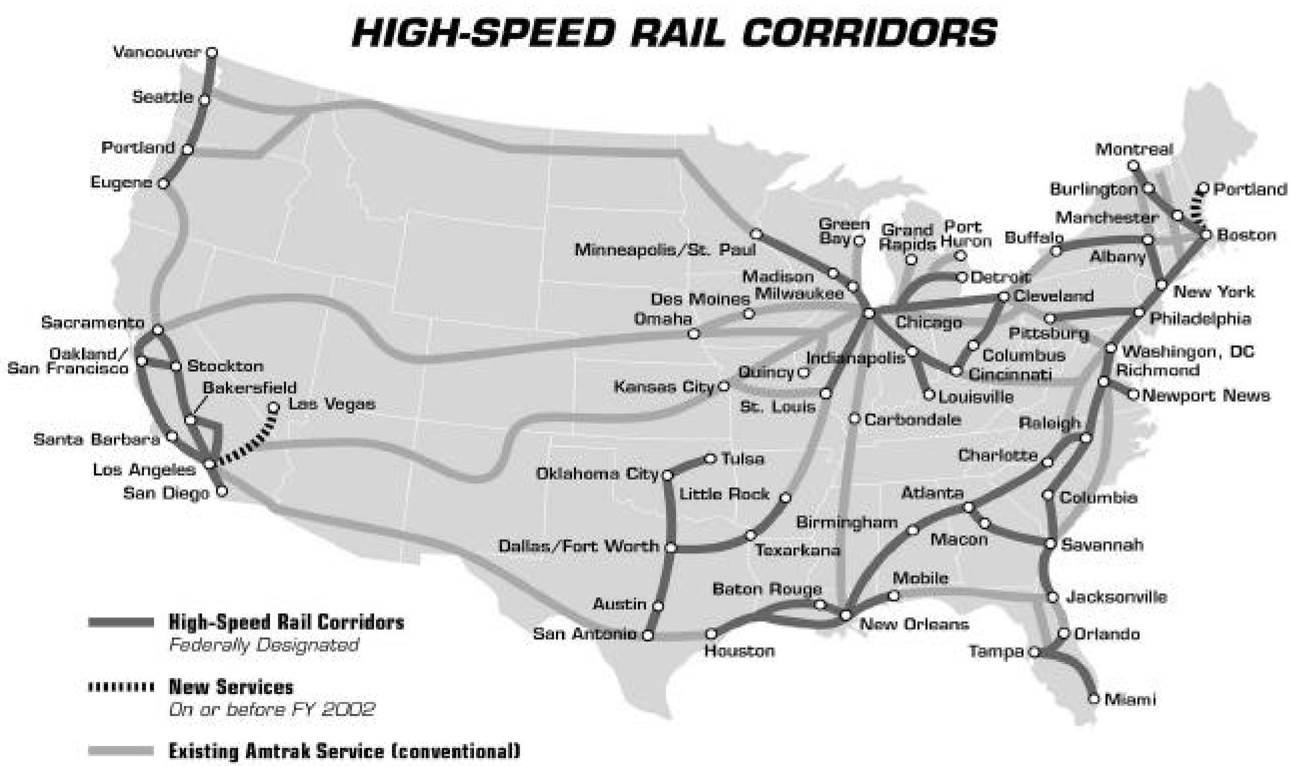
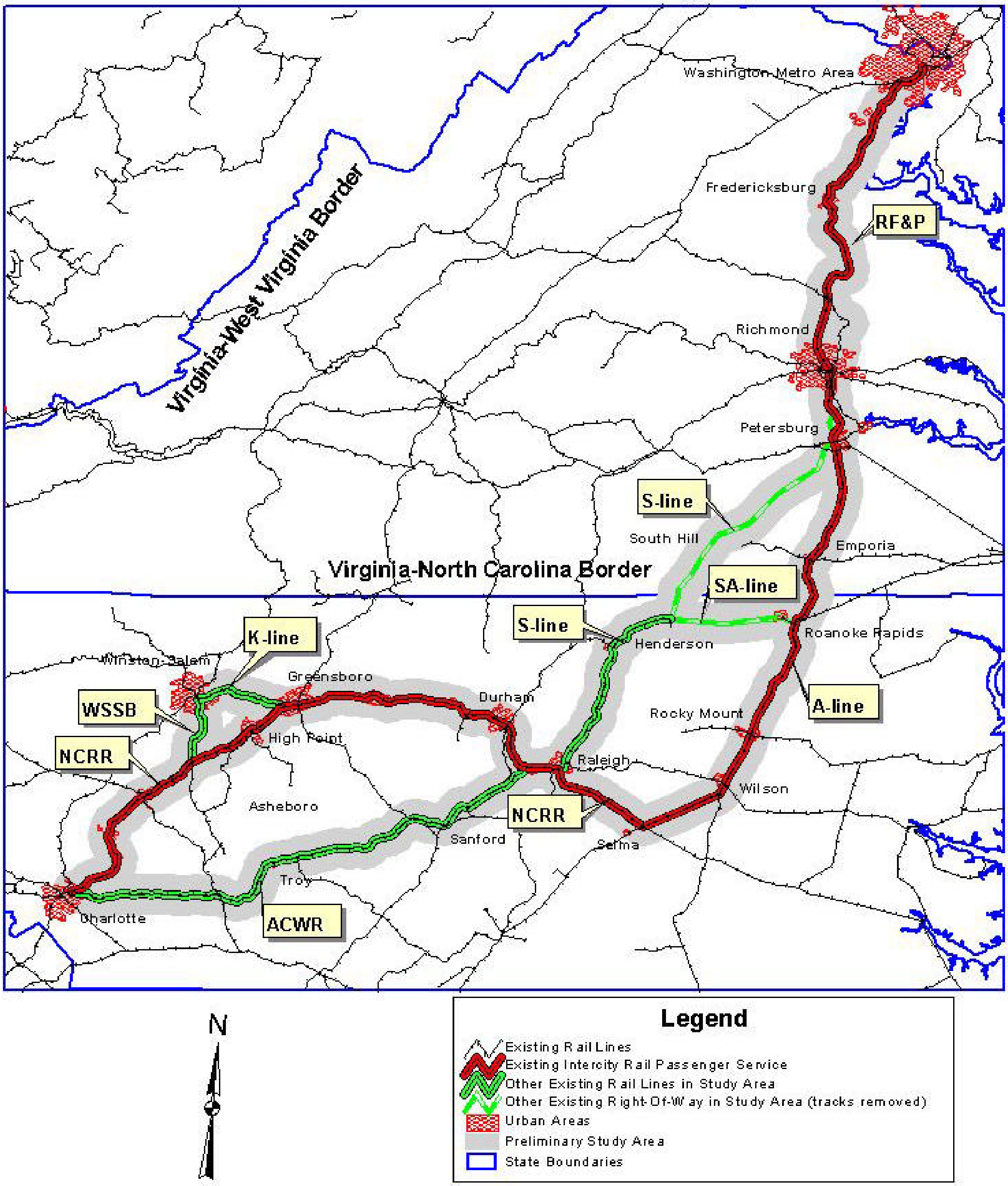


Exhibit ES-2

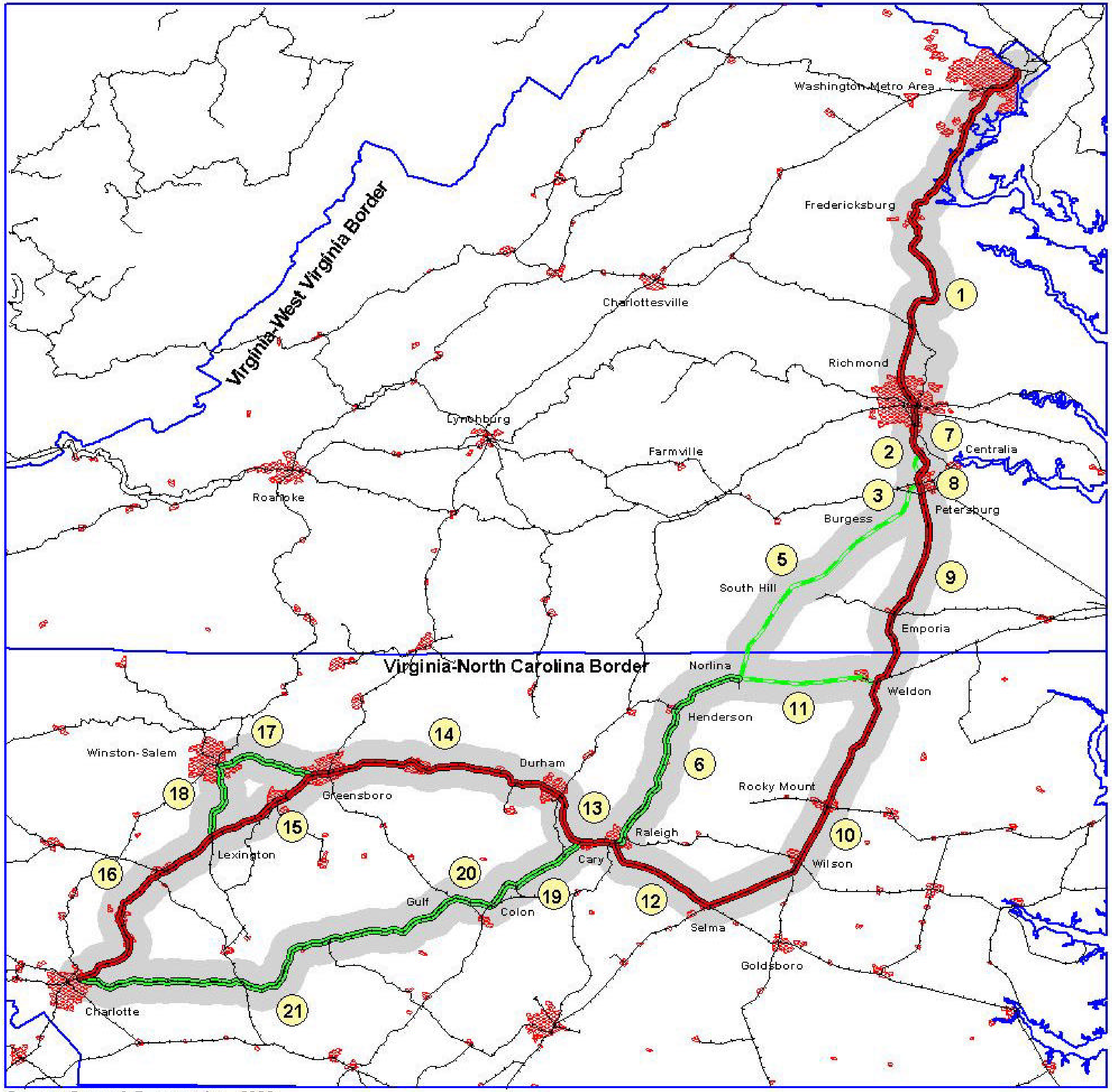
Southeast High Speed Rail: Tier 1 EIS Alternative Study Areas



Source: United States Department of Transportation, 1997, prepared by Carter & Burgess, 1999

Exhibit ES-3

Segment Description - SEHSR



Source: Carter & Burgess, Inc., 2000

1. Former RF&P and S-line - Washington, DC to Centralia, VA (common to all 9 alternatives).
2. S-line (pre-1969) - Centralia, VA to Ettrick Station, VA (includes a portion of the A-line from north of Centralia to north of Chester and from approximately South Dunlop to Ettrick Station)
3. S-line (pre-1969) - Ettrick Station, VA to Burgess, VA (includes a portion of the A-line from Ettrick Station to the Appomattox River)
4. S-line Burgess Connector - may be included for study later if appropriate
5. S-line - Burgess, VA to Norlina, NC
6. S-line - Norlina, NC to Raleigh (Boylan "Wye"), NC
7. A-line - Centralia, VA to Ettrick Station, VA
8. A-line - Ettrick Station, VA to Collier (Yard), VA
9. A-line - Collier (Yard), VA to Weldon, NC
10. A-line - Weldon, NC to Selma, NC
11. SA-line - Weldon, NC to Norlina, NC
12. NCRR - Selma, NC to Raleigh (Boylan "Wye"), NC
13. NCRR - Raleigh (Boylan "Wye"), NC to Cary (Fetner), NC
14. NCRR - Cary (Fetner), NC to Greensboro (Pomona), NC
15. NCRR - Greensboro (Pomona), NC to Lexington, NC
16. NCRR - Lexington, NC to Charlotte, NC
17. K-line - Greensboro (Pomona), NC to Winston-Salem, NC
18. WSSB - Winston-Salem, NC to Lexington, NC
19. S-line - Cary (Fetner), NC to Colon, NC
20. NC Line & CF Line - Colon, NC to Gulf, NC
21. ACWR - Gulf, NC to Charlotte, NC

Legend

- Existing Rail Lines
- Existing Intercity Rail Passenger Service
- Other Existing Rail Lines Under Consideration
- Other Existing Right-Of-Way in Study Area (tracks removed)
- Preliminary Study Areas
- Urban Areas
- State Boundaries
- Segment Numbers

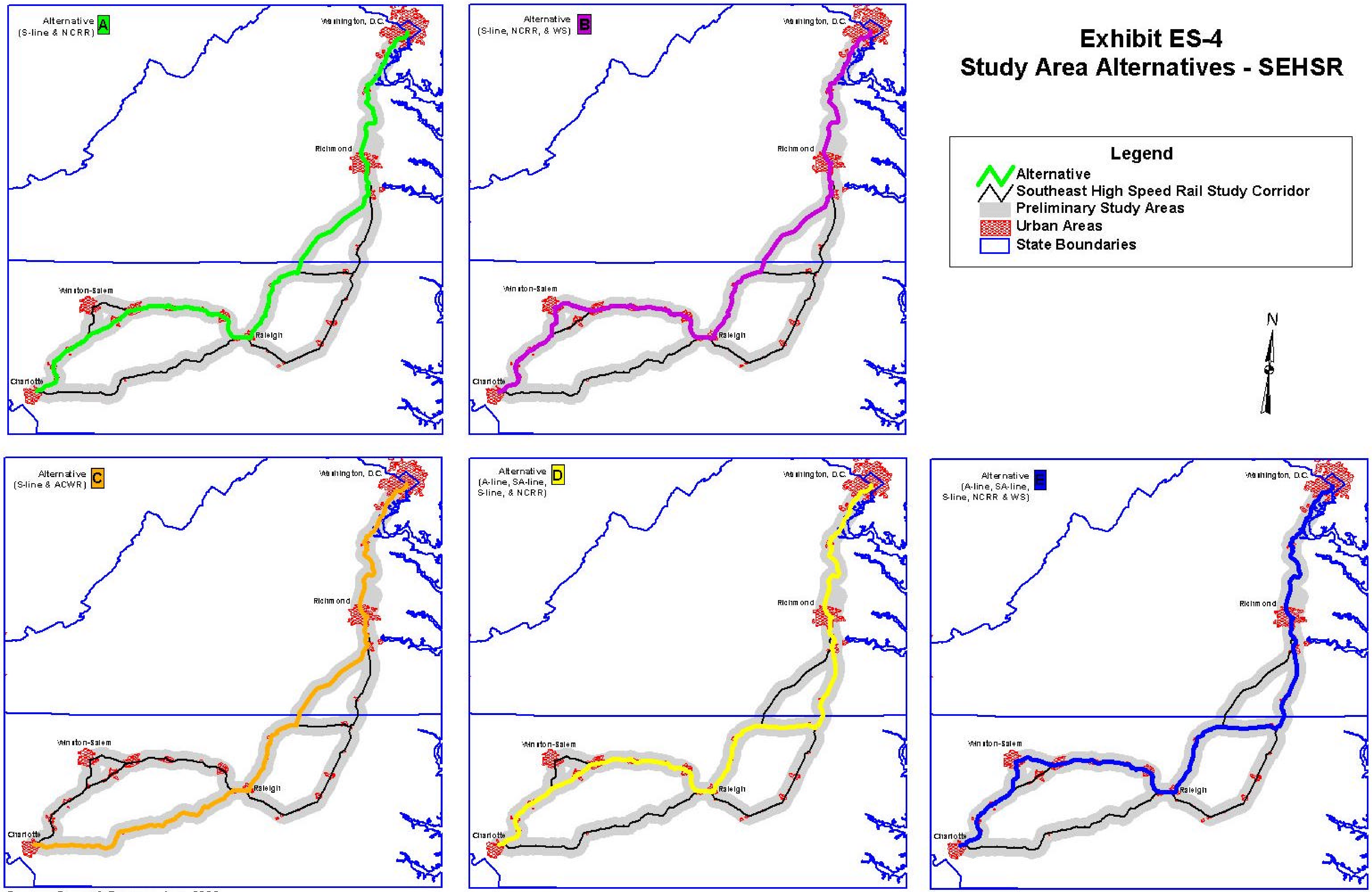
*Segment 1 - The RF&P and S-line are common to all Alternatives

*Segment 4 - (S-line Burgess Connector) May be included in future studies if appropriate

*ACWR includes short segments of the S-line, NS-line and CF-line (Cary to Gulf)

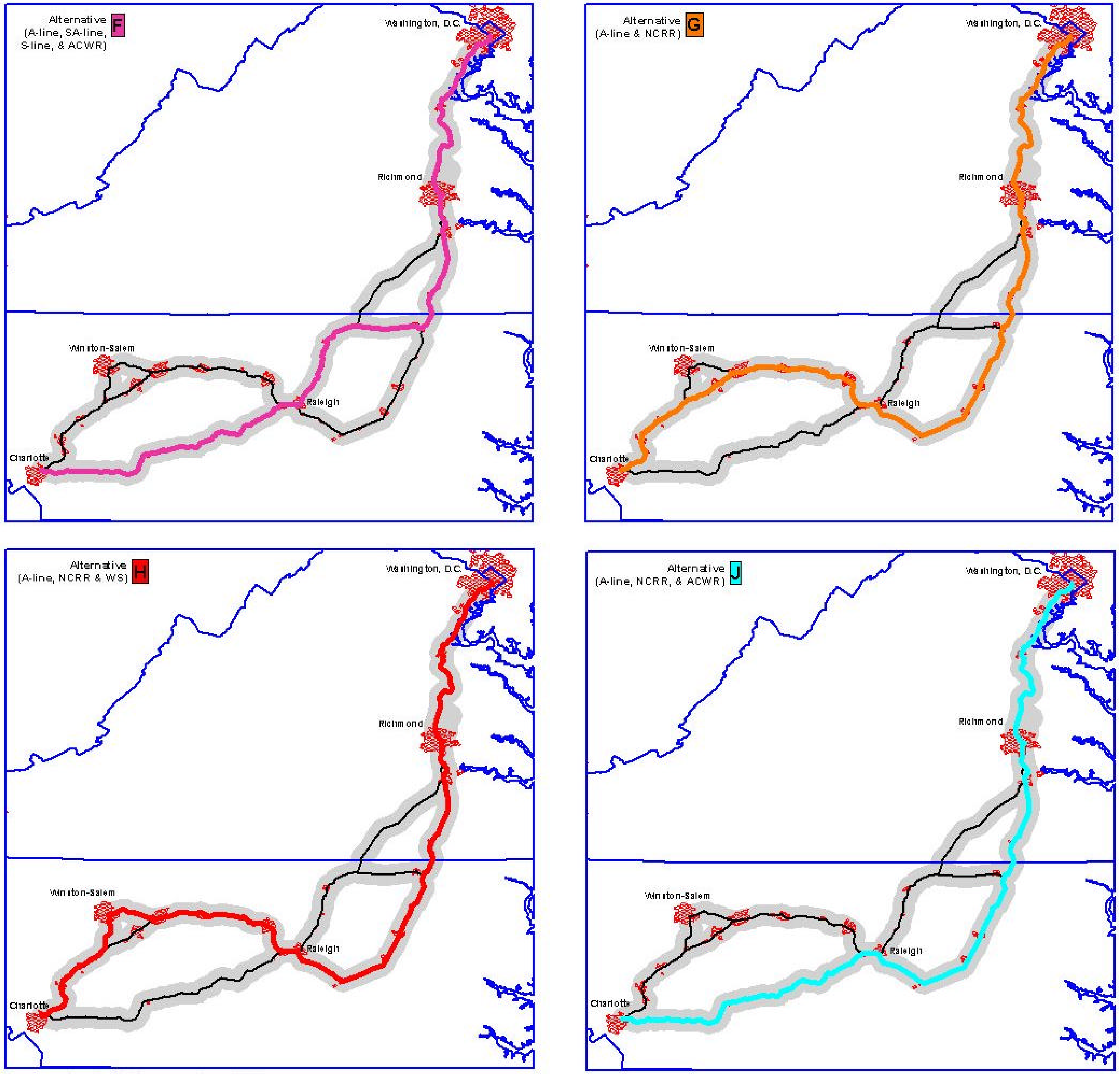
N

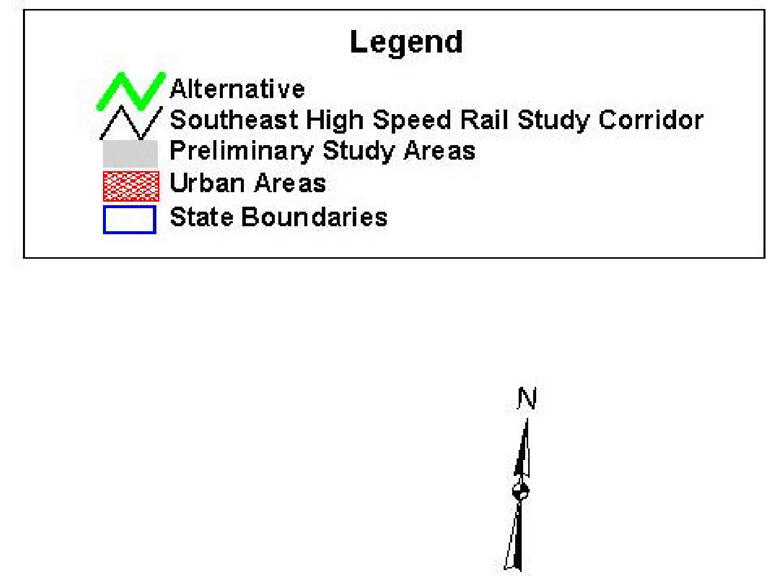
Exhibit ES-4
Study Area Alternatives - SEHSR



Source: Carter & Burgess, Inc., 2000

Exhibit ES-4 (Continued)
Study Area Alternatives - SEHSR





Source: Carter & Burgess, Inc., 2000

Table ES-1
Study Area Alternatives: Geographic Characteristics

	A	B	C	D	E	F	G	H	J
Rail Lines	Old RF&P NCRR S-line	Old RF&P S-line NCRR K-line WSSB	Old RF&P S-line NS Line CF Line ACWR	Old RF&P A-line SA-line S-line NCRR	Old RF&P A-line SA-line S-line NCRR K-line WSSB	Old RF&P A-line SA-line S-line NS Line CF Line ACWR	Old RF&P A-line NCRR	Old RF&P A-line NCRR K-line WSSB	Old RF&P A-line NCRR NS Line CF Line ACWR
Segments	1, 2, 3, 5, 6, 13, 14, 15 and 16	1, 2, 3, 5, 6, 13, 14, 16, 17 and 18	1, 2, 3, 5, 6, 13, 19, 20 and 21	1, 6, 7, 8, 9, 11, 13, 14, 15 and 16	1, 6, 7, 8, 9, 11, 13, 14, 16, 17 and 18	1, 6, 7, 8, 9, 11, 13, 19, 20 and 21	1, 7, 8, 9, 10, 12, 13, 14, 15 and 16	1, 7, 8, 9, 10, 12, 13, 14, 16, 17 and 18	1, 7, 8, 9, 10, 12, 13, 19, 20 and 21
Communities Served: **Virginia**	Alexandria Woodbridge Fredericksburg Ashland Richmond Centralia Petersburg Burgess La Crosse	Alexandria Woodbridge Fredericksburg Ashland Richmond Centralia Petersburg Burgess La Crosse	Alexandria Woodbridge Fredericksburg Ashland Richmond Burgess La Crosse	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia
Communities Served: **North Carolina**	*Norlina* *Henderson* *Raleigh* Cary *Durham* *Burlington* *Greensboro* High Point Lexington Salisbury Charlotte	*Norlina* *Henderson* *Raleigh* Cary Durham Burlington Greensboro Winston-Salem Lexington Salisbury Charlotte	*Norlina* Henderson Raleigh Apex *New Hill* *Moncure* Colon Gulf Robbins Star Troy Norwood Oakboro Aquadale Midland Charlotte	Weldon Norlina Raleigh Cary Durham Hillsborough Burlington Greensboro High Point Lexington Salisbury Concord/ Kannapolis Charlotte	Weldon Norlina Raleigh Cary Durham Hillsborough Burlington Greensboro Kernersville Winston-Salem Lexington Salisbury Charlotte	Weldon Norlina Raleigh Apex *New Hill* Moncure Colon Gulf Robbins Star Troy Norwood Oakboro Aquadale Midland Charlotte	Weldon Rocky Mount Wilson Selma Clayton Garner Raleigh Cary Durham Hillsborough Burlington Greensboro High Point Lexington Salisbury Concord/ Kannapolis Charlotte	Weldon Rocky Mount Wilson Selma Clayton Garner Raleigh Cary Durham Hillsborough Burlington Greensboro Kernersville Winston-Salem Lexington Salisbury Charlotte	Weldon Rocky Mount Wilson Selma Clayton Garner Raleigh Apex *New Hill* Moncure Colon Gulf Robbins Star Troy Norwood Oakboro Aquadale Midland Charlotte

Source: Carter & Burgess, Inc, KPMG Ridership and Revenue Projections, September 2000; Compiled by the Resource Group, May 2001

Table ES-2
Operational and Physical Characteristics Summary Information for Study Area Alternatives

Summary Information	A	B	C	D	E	F	G	H	J
Length (route miles)	448	463	428	468	483	448	481	496	461
Average Total Travel Time (Washington, DC to Charlotte, NC)	6.23 hrs.	6.90 hrs.	6.20 hrs.	6.55 hrs.	7.23 hrs.	6.53 hrs.	6.75 hrs.	7.43 hrs.	6.73 hrs.
Annual Ridership in 2025	1,790,600	1,756,700	1,400,900	1,700,700	1,660,600	1,333,300	1,669,700	1,625,000	1,312,000
Net operating income or (loss) in year 2025	$26,340,000	$21,270,000	$13,160,000	$18,980,000	$18,120,000	$1,830,000	$20,060,000	$13,570,000	$4,090,000
Net operating income or (loss) in year 2025	$26,340,000	$21,270,000	$13,160,000	$18,980,000	$18,120,000	$1,830,000	$20,060,000	$13,570,000	$4,090,000
Net Energy Reduction Fuel (gal/yr)	10,015,119	9,724,939	6,679,376	9,924,448	9,557,693	6,564,192	10,433,752	9,993,470	6,910,545
Conceptual Capital Cost* (In Billions of dollars)	$2.611	$2.720	$2.515	$2.711	$2.820	$2.615	$2.848	$2.957	$2.752
Areas of Engineering Complexity (high)**	18	23	25	20	25	27	19	24	26
Potential right of way needs (in acres)	678	731	930	620	674	872	545	598	797
Fuel consumption (gal./trip)	403	432.3	383.5	421.2	450.5	401.7	434.2	463.5	414.7
At grade crossings	1,053	1,172	918	1,134	1,254	1,100	1,115	1,235	963

*All monies are in year 2000 dollars. Costs do not include equipment or station improvements.
** The complexity of the engineering required to design or construct the proposed project was based upon conceptual engineering assuming use of the existing railroad rights of way. An area was considered high if it involved considerable changes to the existing right of way or if physical constraints offered major challenges to developing acceptable engineering solutions.
Source: Carter & Burgess, Inc.; KPMG Ridership and Revenue Report September 2000: and William Gallagher and Associates.

Table ES-3
Summary of Potential Human/Natural Impacts and Benefits of the Study Area Alternatives

Environmental Information	Buffer width for review	A	B	C	D	E	F	G	H	J
Water Supply Watersheds	6 mi.	27	33	19	28	35	21	27	34	21
Major Rivers (potential crossings)	n/a	29	28	29	31	30	33	29	28	31
Wetlands (NWI & hydric soils)	300 ft.	117.3	115.8	117.0	124.0	122.5	123.7	190.7	189.2	190.4
FEMA 100-year Floodplain crossings	n/a	83	76	44	89	82	50	97	90	58
Mineral Resources (Mines)	.5 mi	36	37	40	37	38	41	33	34	37
Hazardous Materials Sites	6 mi.	1,708	1,728	1,426	1,720	1,740	1,448	1,176	1,780	1,488
Air Quality-Net reduction in NOx emissions (lbs/yr)	n/a	554,889	530,895	279, 065	547,392	517,065	269,540	589,505	553,099	298,179
Annual 2025 Trip Diversions	n/a									
-From auto to rail		865,349	841,840	595,092	858,004	828,290	585,761	899,266	863,596	613,822
-From air to rail		320,061	311,365	220,103	242,001	233,620	165,215	171,289	164,494	116,918
Noise &Vibration Category 3 sensitive receptors	300 ft.	333	342	259	371	371	287	369	372	284
Prime farmland (acres)	6 mi.	37,219	39,360	26,523	45,137	46,992	34,308	57,346	59,134	46,670
Protected Species- # Of known populations identified	6 mi.	33	35	45	44	46	56	43	49	51
National Rivers Inventory	6 mi.	11	11	13	10	11	13	12	13	14
Estimated Relocations										
-Residential dwellings (each)	n/a	365	371	220	405	411	260	301	307	156
-Business (square footage)	n/a	65,145	110,920	57,374	62,191	107,966	54,420	70,344	116,119	62,573
Historic Sites										
-National Register Sites	1500 ft.	61	61	32	32	61	32	48	48	19
-Study List Sites	1500 ft.	317	317	273	387	387	343	390	390	346
Parks	500 ft.	14	15	11	14	15	11	15	16	12
Gamelands/Public lands (ac.)	500 ft.	5.7	5.7	14	5.7	15.7	15.3	5.7	5.7	15.3
Areas of Environmental. Complexity (high)*	n/a	6	8	4	5	7	3	7	9	5

*Refers to the level of difficulty required to avoid or minimize environmental impacts in a certain area. High areas of complexity are those that would require creative avoidance and minimization techniques and add to the overall construction effort and would require public and agency coordination and involvement.

Source: Carter & Burgess, Inc. 2001, compiled the Resource Group May 2001

After the Tier I EIS is completed and public hearings are held, it is anticipated that a recommended study area report will be prepared for approval by the Secretaries of Transportation for Virginia and North Carolina. The report would document the Study Area Alternatives to be carried forward for further study in the final environmental impact statement and in the record of decision.

If the record of decision documents a Build Alternative as the preferred course of action, a program would be developed identifying the proposed actions necessary to implement the Southeast High Speed Rail program in the recommended Study Area Alternative(s). The anticipated type of environmental documentation needed for each action, or group of actions would be determined, and a phased program of project development would be established based on availability of resources and on the priorities of the states of Virginia and North Carolina.

The VDRPT and the NCDOT Rail Division would then proceed with the Tier II project development, which would involve further refinements within the recommended Study Area Alternative(s) including the identification of specific alignments, station locations, detailed environmental analysis, detailed engineering analysis, and more accurate capital cost estimates. A schedule for the development of the Tier II documentation efforts would be developed and initiated. During the Tier II efforts, detailed agency coordination would take place including the securing of permits following the appropriate environmental documentation.

TABLE OF CONTENTS

Chapter 4.0 Environmental Consequences

.List of Tables

List of Figures

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 Purpose

The purpose of this proposed high speed rail program is to provide a competitive transportation choice to travelers within the Washington, DC to Charlotte, NC travel corridor. Implementation of improved rail passenger service could:

- divert trips from air and highway within the travel corridor, thus reducing congestion;
- result in a more balanced use of the corridor's transportation infrastructure;
- increase the safety and effectiveness of the transportation system within the travel corridor; and
- serve both long-distance business and leisure travelers between and beyond Virginia and North Carolina, including Amtrak's Northeast Corridor.[1]

This environmental document analyzes potential rail passenger service within a 500-mile travel corridor. The Southeast High Speed Rail (SEHSR) Study Area Alternatives have been selected based on public input, existence of existing rail facilities, and engineering/environmental feasibility.

1.2 Project Description and Approach

The proposed SEHSR project involves the development, implementation, and operation of high speed rail service in the approximately 500-mile travel corridor from Washington, DC, through Richmond, VA and Raleigh, NC, to Charlotte, NC. For the purpose of this environmental document, nine SEHSR Study Area Alternatives (each approximately six-miles wide, centered around existing rail rights-of-way) were selected for review. In addition to these Study Area Alternatives (Build Alternatives), a No Build Alternative is also considered. This No Build Alternative provides a baseline for analysis in this environmental document.

Figure 1.1 shows the combined study areas for the SEHSR.

The North Carolina Department of Transportation Rail Division (NCDOT) and the Virginia Department of Rail and Public Transportation Division (VDRPT) with their federal partners, the Federal Railroad Administration (FRA) and the Federal Highway Administration (FHWA) determined that the SEHSR program should be analyzed using the Incremental High Speed Rail (HSR) approach with fossil fuel train sets.[2] This decision was based on the findings of earlier feasibility studies.[3]

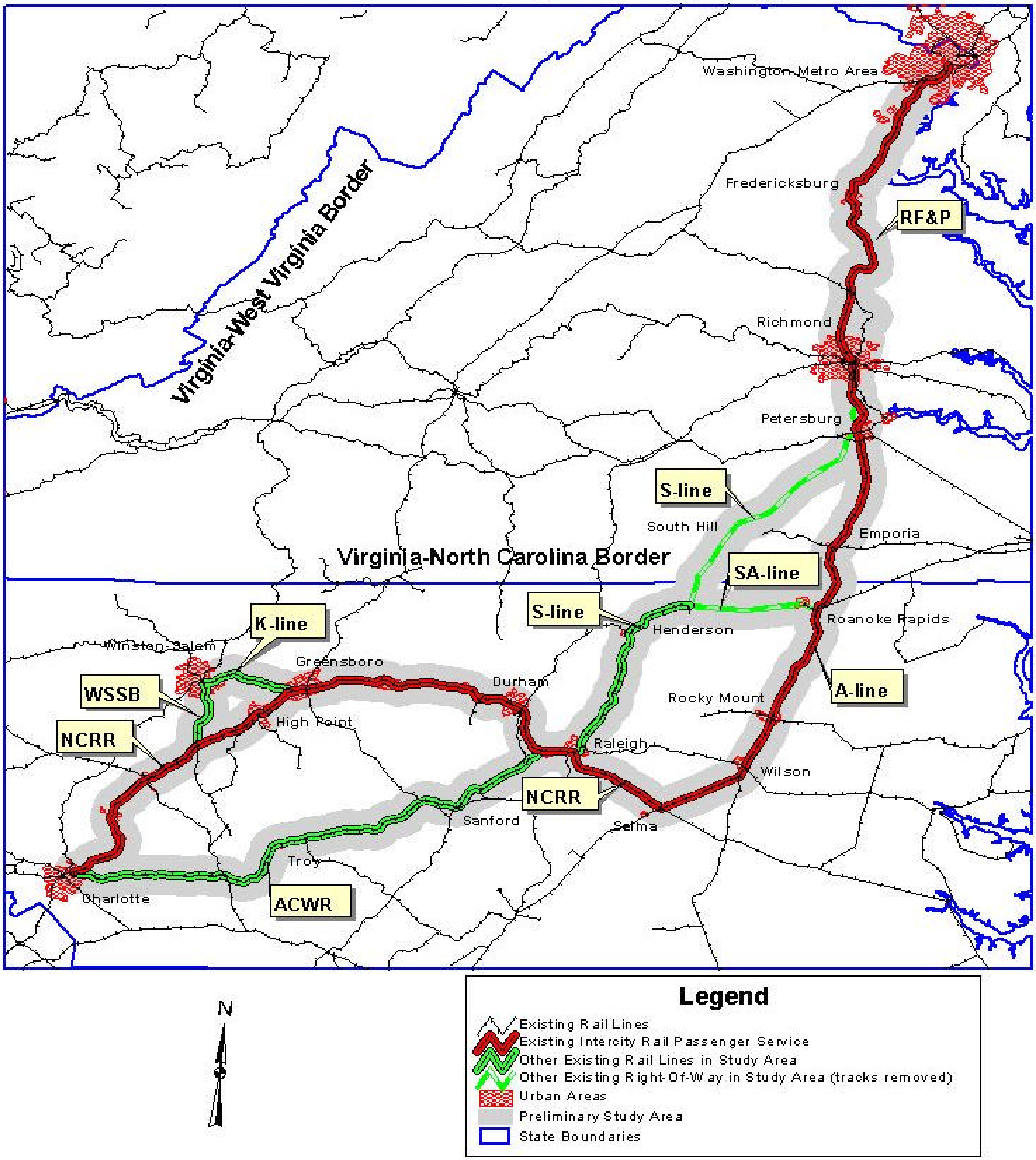
This proposed approach minimizes impacts to both the human and natural environments by utilizing the existing rail infrastructure and rail rights-of-way. By using existing infrastructure, the initial capital investment required by the system is also reduced.

---

[1] The Northeast Corridor main route extends from Washington, DC to Boston with extensions planned beyond Boston.
[2] High Speed Ground Transportation for America, US DOT- Federal Railroad Administration, September,1997.
[3] Feasibility Study Summary & Implementation Plan, NCDOT- Rail Division, April, 1999.

Figure 1.1

Southeast High Speed Rail: Tier 1 EIS Study Areas (Gray)



Source: United States Department of Transportation, 1997, prepared by Carter & Burgess, 1999

Although the rail facilities already exist in most locations, the Incremental HSR approach would require improvements at various locations within the travel corridor. These improvements would accommodate higher passenger train speeds, and increase the capacity of the infrastructure to handle additional passenger and freight rail traffic. This approach would utilize fossil fuel train sets capable of speeds up to 110 mph.[4]

Pursuant to the National Environmental Policy Act (NEPA), if a proposed project is being implemented by a federal agency, requires a federal permit, or has federal funding, a series of environmental analyses must be performed to identify probable environmental and community impacts and potential mitigation. Since the SEHSR project could potentially be funded with federal funds and may require federal permits, this Environmental Impact Statement (EIS) process is being performed.

Due to the nature of this proposed project, including:

- the length of the corridor (almost 500 miles),
- the number of existing rail rights-of-way, and
- the early planning level of the project concept,
- The NCDOT, VDRPT and federal partners chose a Tiered EIS as the appropriate process for environmental documentation.[5]

This Tiered approach allows for a first document (Tier I) that is general in nature, thus providing an overview of the travel corridor and Study Area Alternatives. Following this document could be a second level of documents (Tier II) that are very detailed in the level of analysis. Detailed Tier II documents would be completed as appropriate for the proposed actions.

The Tier I (program level) document addresses the following questions:

- What is the purpose of the Southeast High Speed Rail Corridor program?
- Why do we need it?
- What are the potential regional impacts of such a system?
- What is the best general location for the system (i.e. what general route); and
- How does high speed rail compare with other travel options within the corridor?

Environmental analyses for each SEHSR Study Area Alternative were performed based on readily available data. Because this is a program level document, specific "build" actions will not be taken as a result of this environmental documentation.[6]

Following this Tier I EIS, a determination will be made by the transportation departments of Virginia and North Carolina whether to move forward to implement a high speed rail program through both states. If the decision is made to move forward, the states will work together to develop a final rail plan that is consistent with the Tier I EIS Record of Decision. This final plan will identify the specific actions needed to fully implement high speed rail in North Carolina and Virginia.

---

[4] High Speed Ground Transportation (HSGT) has been defined by the United States Department of Transportation (USDOT) as ground transportation service that is time competitive with air and automobile travel on a door-to-door basis, in the range of 100 to 500 miles. Source: *High Speed Ground Transportation for America*, US DOT- Federal Railroad Administration, September, 1997.
[5] As described in 23CFR 771.111[g] and CEQ regulations 1502.20 & 1508.28
[6] Unless those actions have independent utility and require no further environmental documentation.

Following development of the final rail plan, the appropriate Tier II environmental studies (project level) would be performed for those specific actions. A decision on the type of Tier II environmental documentation to be prepared would also be made at that time. The Tier II studies could include any of the following of three types of environmental documents based upon the proposed action:

- Categorical Exclusions (CEs) for actions that do not individually or cumulatively have a significant environmental effect.
- Environmental Assessments (EAs) for actions in which the significance of the environmental impact is not clearly established. EAs can lead to the development of EIS documents or a Finding of No Significant Impact (FONSI)
- Environmental Impact Statements (EISs) for projects where it is known that the action will have significant environmental effect.

USDOT (FHWA and FRA) environmental regulations and procedures [23CFR 771.117 (c and d) and 45 FR 40854 (1980 revised May 26, 1999)] list potential actions that meet the criteria for CE documentation. These actions would include activities that do not involve or directly lead to construction such as planning and technical studies and engineering to define elements of a proposed action or alternatives. Other types of actions, which could be a part of the next phase of developing HSR, and which meet the criteria for CE's by FHWA/FRA include:

- installation of fencing, signs, signals, pavement markings, small passenger shelters, traffic signals, and railroad warning devices where no substantial land acquisition or traffic disruption would occur;
- construction of bicycle or pedestrian lanes, paths or facilities;
- bus and rail car rehabilitation;
- the purchase of vehicles that can be accommodated by existing facilities or new facilities, which are themselves cleared by a CE;
- track and railbed maintenance and improvements when carried out within existing right-of-way; maintenance of existing railroad equipment, track and bridge structures, electrification, communication, signaling, security facilities, stations, maintenance of way and other existing railroad-related facilities;
- minor rail line additions including construction of side tracks, passing tracks, crossovers, short connections between existing lines, new tracks within existing rail yards that are consistent with existing zoning and do not involve a significant amount of right-of-way;
- acquisition of existing railroad equipment, track and bridge structures, electrification, communication, signaling, security facilities, stations, maintenance of way and other existing railroad-related facilities or the right to use such facilities for the purpose of conducting operations at or similar to present or previous levels of operation; and
- improvements to existing facilities to service, inspect, or maintain rail passenger equipment, including the expansion of existing buildings, the construction of new buildings and outdoor facilities, and the reconfiguration of yard tracks.

Actions potentially included in the next phase of HSR development, which meet the criteria for CE documentation and require FHWA approval include:

- bridge rehabilitation, reconstruction or replacement or the construction of grade separation to replace existing at-grade railroad crossings;
- approvals for disposal of excess right-of-way or for joint use of right-of-way, where the proposed use does not have significant adverse impacts;
- rehabilitation or reconstruction of existing rail and bus buildings and ancillary facilities where only minor amounts of additional land are required or where there is no substantial increase in the number of users; and

- the construction of rail storage facilities in areas used predominately for industrial or transportation purposes and there are no conflicts with existing zoning or significant noise impacts to the surrounding community.

The Tier II studies would be detailed in nature, as appropriate to the action, and would continue the public involvement effort already begun in this first Tier. These detailed environmental analyses will assess the environmental impacts of each action and identify ways to avoid, minimize and mitigate impacts. The state transportation departments and Federal Agencies would use the Tier II studies to determine the exact location and magnitude of each action, such as number of tracks, types of structures, station location and configuration, routing within existing right of way, bypasses, etc. As Tier II documents are completed, the permitting process (as appropriate) would be initiated and completed, and the construction process could proceed.

1.3 Background and Legislative History

The proposed Southeast High Speed Rail (SEHSR) project is part of a plan by USDOT and Amtrak to develop a nationwide high speed rail network, as illustrated in Figure 1.2.

Authorization for a program of national high speed rail corridors was included in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA-PL102-240, Section 1036) and continued in the Transportation Equity Act for the 21st Century (PL 105-178, Section 7201). ISTEA stated,

"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."

The high speed rail corridor program was established by ISTEA as one component of this intermodal system.

In 1992, the USDOT designated the SEHSR Corridor one of five original national high speed rail corridors.[7] Further extensions to the corridor added connections south into South Carolina, Georgia, and Florida.[8] The fully extended SEHSR Corridor is illustrated in Figure 1.2**.**

The SEHSR Corridor would connect with the Northeast Corridor (NEC) in Washington, DC northward to New York, Boston, and beyond. The union of these two high speed corridors provides potential for the greatest trip lengths within the Amtrak system, and thus the greatest potential revenues.

Since the initial corridor designation, FRA and FHWA have worked with both states to facilitate development of rail transportation options. FRA has performed numerous studies in cooperation with the rail programs of both states. In early 1998, FRA, FHWA, NCDOT and VDRPT entered into a joint Memorandum of Understanding (MOU) to coordinate and document each agency's respective roles and responsibilities in developing environmental documentation of the rail programs of both states. This cooperation has greatly benefited both Virginia and North Carolina.

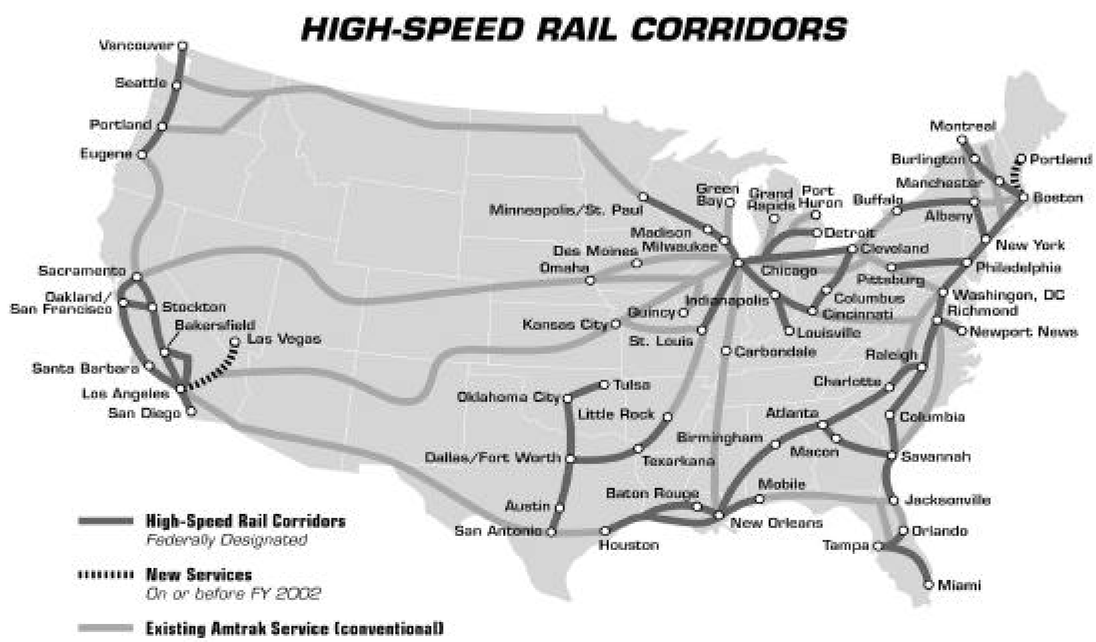
---

[7] The designated corridor extended from Washington, DC to Charlotte, NC via Richmond, VA and Raleigh, NC.

[8] This designation allowed for federal monies to be spent on improvements to the existing rail system in order to achieve high speed rail service. The USDOT designated an extension of the SEHSR from Richmond to Hampton Roads in 1996. In 1998, the USDOT extended the corridor into South Carolina, Georgia, and Florida. Further extensions in 2000 added corridor connections in Georgia and Florida.

The SEHSR program is identified for funding in the FY 2000-2006 NCDOT Transportation Improvement Program (TIP) and in the Virginia Department of Transportation (VDOT) FY 2000-2005 Six-Year Improvement Program. Both Virginia and North Carolina have conducted specific studies to plan for high speed rail. In addition, both Virginia and North Carolina are undertaking improvements along some of the routes under study to address existing conventional passenger and freight rail needs.

Figure 1.2
Designated High Speed Rail Corridors



Initiatives by the Commonwealth of Virginia

Since designation of the SEHSR Corridor in 1992, Virginia has been conducting planning studies for high speed rail while working to enhance conventional freight and passenger rail operations.

In 1992, the Preliminary Engineering Feasibility Study for Additional High Speed Track between Washington, DC and Richmond was prepared for VDRPT. In 1995, VDRPT, building on the work of this earlier study, prepared the Washington, D. C. to Richmond, Virginia Passenger Rail Study. The study evaluated future demand, revenues, needed improvements, and cost projections for alleviating congestion and implementing high speed rail between Washington, DC and Richmond, Virginia.

Virginia is working with the Virginia Railway Express (VRE), CSX Transportation (CSXT), Norfolk Southern Railroad (NS), Amtrak, and FRA to implement a multi-year capital improvement program to increase capacity and alleviate congestion on the busy Washington, DC to Richmond freight and passenger rail corridor. The improvements will also reduce rail travel times for the 100-mile trip. More than $770 million in needed capital improvements have been identified. Approximately $380 million of the total will be state funds programmed for the projects, with other contributions coming from program partners. In 2000, the Virginia General Assembly earmarked $67 million for this program of infrastructure improvements and equipment purchases that will enhance freight and passenger operations between Richmond and Washington, DC. In addition, the Virginia General Assembly earmarked $10 million for VRE-related capital improvements along the corridor, $75 million for Metrorail expansion in Northern Virginia and $9.3 million to begin work on rail service to Southwest Virginia that will connect in Richmond.

In 1999, the FRA submitted a report to Congress entitled "Potential Improvements to the Washington – Richmond Corridor ". This report, which expanded upon earlier studies, specified, on a preliminary basis, the infrastructure improvements that would enable the Washington, DC – Richmond Corridor to reliably accommodate the mix and volume of higher speed intercity passenger, commuter, and freight services projected for the year 2015.

VDRPT coordinated a Signal System Study of the existing rail activity between Washington, DC and Charlotte, North Carolina in conjunction with CSXT, Norfolk Southern, VRE, Amtrak and FRA. This study was funded by FRA and completed in 2000. The study recommended improvements needed (in both states) to implement a state-of-the-art train communication system capable of supporting operating speeds up to 110 mph, and compatible with all locomotives.

In 2000, Virginia received $750,000 from FRA to upgrade 21 highway-rail grade crossings, including two pedestrian grade separations in the Washington, DC to Richmond corridor. The improvements include the installation of constant warning time devices that will give motorists consistent advance warning times regardless of train speed.

Virginia and the City of Richmond are currently in the process of restoring the historic Main Street Station in downtown Richmond. Upon restoration of the station, Amtrak has plans to add the station to its passenger rail schedule in an effort to attract more riders. The Main Street Station will become a multi-modal facility that serves intercity bus, local transit, taxis, and airport limousines. The service will include four to six passenger trains daily. The final phase for the project is expected to be complete in mid-2005. The last phase includes increasing passenger train service to approximately 17 trains per day and adding an inter-city bus terminal. Main Street Station can serve all study area alternatives under analysis in this document.

Initiatives by the State of North Carolina

Since the designation of the Southeast High Speed Rail (SEHSR) Corridor in 1992, North Carolina has undertaken several high speed rail studies. North Carolina's ongoing rail efforts have focused primarily on enhancing passenger rail service by making infrastructure improvements to enhance reliability, reduce travel times, improve safety, and improve station facilities.

In the mid-1990's, North Carolina began to examine ways to achieve high speed rail service in the state. In September 1995, Governor Jim Hunt appointed the Transit 2001 Commission to provide recommendations for improving public transportation in the 21st century. The Transit 2001 Report included a master plan for statewide rail and transit improvements, including implementation of the SEHSR program. As a result of the Commission's recommendations, Governor Hunt set a goal of reducing rail travel time between Raleigh and Charlotte to two hours. Passenger train service between Raleigh and Charlotte (174 miles) currently takes approximately three hours and forty-five minutes.

North Carolina received funding under Section 1036 of ISTEA from FRA to conduct master planning for high speed passenger rail service from Charlotte to Richmond via Raleigh. These studies culminated in the Southeast High Speed Corridor Feasibility Study Summary, finalized in 1999, which included an environmental screening, engineering analyses, operational analyses and evaluations of the SEHSR corridor. Several of the studies and concepts evaluated in that report have been brought forward and updated for this analysis.

In 1990, a study was conducted for NCDOT to determine infrastructure improvements needed between Rocky Mount, Selma, Raleigh and Charlotte. Lease negotiations between Norfolk Southern (the rail line's freight operator) and the North Carolina Railroad (the state-owned company that owns the right-of-way from Charlotte through Greensboro, Raleigh, and Selma to Morehead City) prevented action from taking place at that time. A Congestion Mitigation Study for Proposed Passenger Service Improvements was prepared for NCDOT in 1999 that further studied the capital improvements necessary to reduce congestion and delays along the Raleigh to Charlotte corridor, while also providing capacity for future business growth by Norfolk Southern. Based on these studies, NCDOT, Norfolk Southern and the North Carolina Railroad have developed a $400 million multi-year program of infrastructure improvements that will help alleviate freight and passenger delays on this heavily used corridor.[9] These improvements will also reduce passenger train running times between Raleigh and Charlotte from three hours and 45 minutes to approximately three hours. FRA with Amtrak and NCDOT are prepared to initiate the first series of these improvements that totals approximately $50 million and will take place over the next two to three years.

Through Traffic Separation Studies, NCDOT has evaluated 39 highway-rail crossings along the North Carolina Railroad (NCRR) corridor between 36th Street in Charlotte and Liberty Street in China Grove, as well as several in Salisbury and Greensboro. Additional studies are underway in Wake Forest and Clayton and a study is being conducted for Rocky Mount. Nineteen crossing closures and other improvements have been implemented statewide under the program since 1995, as a direct result of these Traffic Separation Studies, with more programmed in coming years. The NCDOT has received significant federal funding for its "Sealed Corridor" program, which upgrades heavily used highway-rail crossings with improvements such as four-quadrant gates and median barriers. Total federal funding committed to the NCDOT Sealed Corridor program for crossing safety improvements was over $9 million.[10]

As part of the NCDOT Rail Improvement Program, the department is involved in restoration work on historic passenger stations in Salisbury, Wilson, Rocky Mount, Selma, High Point, and Greensboro. Station improvements are also planned for Kannapolis and Burlington. In addition, major multimodal transportation centers are currently planned for Charlotte, Greensboro, Durham, and Raleigh. These passenger stations and intermodal centers may someday serve the SEHSR Corridor, depending on the selected route for the system.

---

[9] Examples of improvements include signalization, curve work, interlocking improvements, and addition of track. Other capital investments include the purchase of new equipment.
[10] Through year 2000.

1.4 Need for the Proposed Project

Growth

As population and travel demand grow, intercity transportation by air and auto increasingly suffer from congestion and time delays, particularly in metropolitan areas, at and around airports, and during weekend, holiday and bad weather periods.[11] This decline in the level of service and the quality of the travel experience adversely affects the intercity traveler, other transportation system users, carriers and the general public.

Population and economic growth rates in Virginia and North Carolina have been tremendous over the past several decades and are projected to remain high over the next few decades. This growth has burdened both states' airport and highway networks, which are experiencing capacity problems that are projected to worsen, despite planned improvements. Trends such as migration from rural to urban areas and aging populations in both states put additional and unique burdens on the transportation network. The economic development of a region is greatly influenced by the efficiency of its transportation system. If Virginia and North Carolina's transportation systems do not provide options for reliable and convenient movement of goods and people, the region's economy may suffer.

Since 1960, the population of Virginia has increased 76% and the population of North Carolina has increased 71%, while the U.S. population increased by slightly less than 54%. Between 1990 and 1999, Virginia's population grew by 11.0% and North Carolina's population grew by 15.4%, while the U.S.'s population increased by 10.8%. Following the national trend, North Carolina and Virginia are projected to experience significant increases in the over-65 population in the coming decades. In 1999, residents 65 or older comprised 12% of North Carolina's population. By the year 2025, this figure is projected to increase by 123% to over 2.0 million, or 21% of North Carolina's population. In 1999, residents who were 65 or older comprised 11% of Virginia's population. By the year 2025, this figure is projected to increase by 104% to over 1.5 million, or 19% of Virginia's population. This increase in the over-65 population is significant because of the increased mobility within this age group. Nationally, between 1969 and 1990, there was a 46% increase in trip making for people over 65. No formal, final data from the year 2000 Census was available at time this document was printed. Year 2000 Census data would be used in the development of the FEIS and Tier II documents.

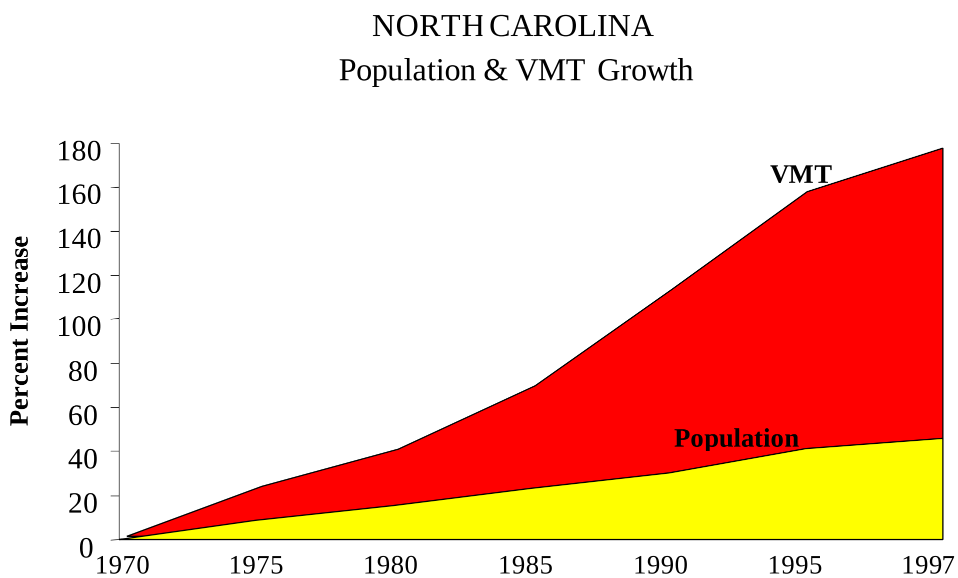
Congestion

Population growth and economic development have led to increasing traffic congestion on interstates and major highways in North Carolina and Virginia, Figure 1.3. The majority of intercity automobile travel in the Washington, DC to Charlotte, NC corridor is accommodated on Interstates 95 and 85. A typical auto trip from Charlotte to Washington, DC along this route takes approximately seven hours during non-peak hours. Daily traffic volumes regularly exceed the design capacity of both I-85 and I-95 through the corridor, causing delays and safety concerns. Average highway speeds, particularly during rush hour, are declining while concerns about air quality are rising. Virginia and North Carolina are in the process of planning or constructing the expansion of many of the interstate highways that traverse the travel corridor to provide additional capacity. Experience has shown that traffic volumes quickly reach or exceed the capacity of highway improvements. The exponentially increasing cost and potential environmental impacts of continual roadway expansion and improvements make it less desirable, and in some cases nearly impossible, to implement further improvements. New

[11] *High Speed Ground Transportation for America* , US DOT- Federal Railroad Administration, September,1997.

roadway alternative routes typically meet with the same obstacles as new rail construction and often face a high level of community opposition.

Figure 1.3



Source: NCDOT, 2000.

The demand for air travel is rapidly increasing nationwide and in the travel corridor. Over the past two decades, the expansion of air traffic has far outpaced the growth in airport capacity. Between 1980 and 1996, domestic enplanements increased from 275 million to 538 million.

Airport congestion has resulted in delays. In June 2000, delays in the air traffic control system nationwide (registered when flights are delayed 15 minutes or longer) totaled 48,448 hours for the month, out of 14.2 million flights. This is an increase of 16.5 percent from June 1999 according to the Federal Aviation Administration (FAA). Projections show that by 2003, the major east coast airports linking the northeast and southeast, including Washington National, Washington-Dulles, Richmond, Raleigh-Durham, Piedmont-Triad and Charlotte-Douglas airports, are each estimated to generate 20,000 annual hours of flight delays. FAA considers these "delay problem" locations. These delays significantly increase airline-operating costs and have related environmental effects such as noise and emissions from aircraft. Delays also affect passengers and commerce due to missed hours at work, meetings, and business opportunities. Time sensitive business and leisure travelers increasingly spend more time waiting for delayed flights than actually traveling to their destinations. Airport delays are largely caused by weather, but over 25% of all delays are caused by the air traffic control system's inability to handle the volume of traffic.[12] FAA has identified and recommended actions to prevent the projected growth in delays, including the development of High Speed Ground

[12] FAA annual 12-year forecast, March 2000.

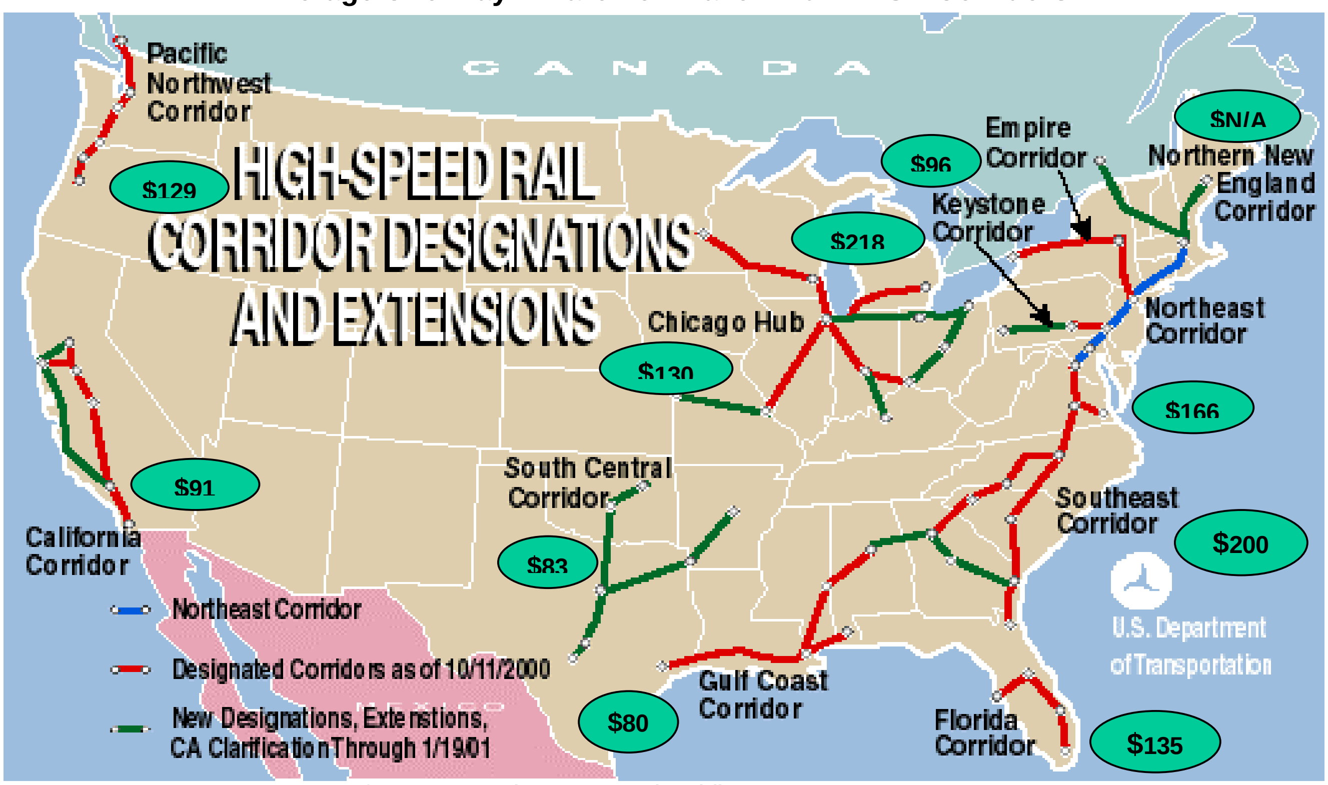
Transportation (HSGT) as a potential means of relieving pressure on the short haul air traffic through the diversion of air trips of 500 miles or less.[13] Existing airline prices along identified high speed corridors were examined using the U.S. Department of Transportation (DOT) quarterly consumer report on domestic airline fares, covering the fourth quarter of 2000. The special feature section of the report provides information on fare premiums for the airport in the 83 cities, which summarizes fare data by city, and demonstrates the impact of low-fare service and hub domination on fare levels. This data was used to develop Figure 1.4, which illustrates airfare prices for each HSR corridor.

Travel Time

Travel time and service reliability are key factors that impact the traveling public's choice of transportation mode. Currently, conventional passenger rail travel times are not competitive with travel by airplane or auto within the SEHSR Corridor.

Nationwide Amtrak on-time performance remained below 80 percent throughout the 1990's. North Carolina and Virginia have experienced far heavier delays. Nationwide, the percentage of trains arriving on-time (defined as within ten minutes of scheduled arrival time) was 79 percent in 1999. That same year, Carolinian trains arrived more than ten minutes behind schedule 43.8 percent to 58.1 percent of the time. The Piedmont trains arrived more than ten minutes behind schedule 22.2 percent to 40.8 percent of the time in 1999. These travel delays are due to the increasing volumes of both passenger and freight service within the corridor.

Figure 1.4
Average One Way Airfare For Travel Within HSR Corridors



Source: U.S. Department of Transportation, Domestic Airline Fares Consumer Report, June 2001.

[13] USDOT, Federal Railroad Administration. High Speed Ground Transportation for America, September 1997.

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 corridor, while other segments will continue to operate at slow speeds and experience delays. While these improvements would help travelers between these cities, it does not provide a seamless linkage between the proposed SEHSR Corridor and the Northeast Corridor to form a comprehensive eastern passenger rail system. For the Washington, DC to Charlotte, NC traveler, these limited trip improvements make rail transportation more attractive but still less attractive than automobile and air travel. Thus these initial improvements do not significantly enhance the passenger transportation network in the Washington, DC to Charlotte, NC corridor.

Without meaningful reductions in travel time and improvements to equipment, rail passenger service competitiveness will not increase, and travelers will not divert in significant numbers from other modes. 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.

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 of 418,000, to 498,000 in 2015 and to 543,000 in 2025 or slightly more than one percent per year.

The proposed SEHSR program addresses the existing rail passenger service problems by improving travel times and increasing capacity, while providing a safer and more efficient mode of travel as compared with the private motor vehicle. It could serve as a more attractive alternative to automobile, air and bus intercity travel between Washington, DC and Charlotte. The Washington, D.C. to Richmond, Virginia Passenger Rail Study found that if travel times between Washington and Richmond could be reduced to 90 minutes, ridership in the I-95 corridor would triple by 2015. The proposed SEHSR service would reduce travel time from Washington, DC to Charlotte from the current ten hours to an estimated six to seven and one half hours. The proposed SEHSR service is anticipated to impact the travel corridor by diverting trips from auto and air, and by producing some induced travel (additional trips that individuals would not otherwise make), thus improving overall mobility within the travel corridor.

Typical diversion rates on the proposed SEHSR service are shown below in Table 1.1.

Table 1.1
Typical Diversion Rates as modeled (annual rates)

Alternative	1999 Ridership	2015 Ridership				2025 Ridership			
		Total Ridership	Additional Ridership			Total Ridership	Additional Ridership		
			Induced	Diverted			Induced	Diverted	
				Auto	Air			Auto	Air
No Build	417,600	497,600				542,800			
Build	NA	Up to 1,584,100*	Up to 52,950*	Up to 779,500*	Up to 278,700*	Up to 1,790,600*	Up to 60,700*	Up to 899,300*	Up to 320,100*

*Note: Ridership and diversion vary by Study Area Alternative
Source: KPMG model forecast data, October 2000

These diversion numbers illustrate the proposed SEHSR program's role in the creation of a balanced transportation system. The table shows that the proposed service could divert over 1,000,000 passenger trips from air and auto by 2015.[14]

Implementation of this new service could also enhance capacity of the predominant modes of air and auto travel. The Southeast Rail Corridor and the Northeast Rail Corridor link major east coast cities. By linking cities and communities in the Southeast and Northeast where highway and airline travel volumes are the greatest, the proposed SEHSR service would help to ease the congestion of the present transportation facilities and balance the transportation system that exists within the corridor. The development of a true multi-modal transportation system could provide benefits to the traveling public and the economy, since each transportation mode offers certain travel advantages and disadvantages. In addition, the proposed SEHSR service could also facilitate system linkages, increasing destinations that could be reached by conventional rail service, and the other modes, through a direct connection with the high speed rail 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 service would serve as the spine to these added routes, allowing conventional rail service passengers to connect to the proposed SEHSR 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 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; and in North Carolina; Greensboro-High Point-Winston-Salem (the Triad), Raleigh-Durham-Chapel Hill (the Triangle), and Charlotte. The Metrorail in Washington, DC and Northern Virginia would connect to the SEHSR service at Union Station and Alexandria. The Virginia Railway Express in Northern Virginia currently provides daily commuter rail service from Manassas, Virginia and Fredericksburg, Virginia to Washington, DC and would connect to the SEHSR in Fredericksburg and 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 service.

Air Quality

A number of counties within the SEHSR Corridor are presently experiencing air quality impacts from mobile source emissions. The seriousness of these impacts will continue to increase as new standards come into effect and as traffic volumes increase. There is a need to reduce transportation related mobile emissions. The movement of passengers by high speed rail offers significantly less pollution per passenger mile traveled as compared to auto travel.

Diverting some of the traveling public from automobiles to the train will aid in reducing emissions through the corridor. Transportation funding is currently tied to air quality, therefore providing an alternative that is time competitive with the automobile and produces significantly less pollution may facilitate the overall development of the transportation system.

[14] Diversion rates have proven much higher than this in urbanized sections of the country that offer competitive rail services, such as the Philadelphia-Washington, DC corridor where 23% of passenger trips are carried by rail. Source: Statement of Ross B. Capon, Executive Director, National Association of Railway Passengers, before the Subcommittee of Transportation of the Committee on Appropriations, U.S. Senate, April 10, 1997.

Safety

For the SEHSR service 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. Nationally, passenger rail is one of the safest ways to travel. Railroad safety in the U.S. has steadily improved over the past several decades, despite increases in both rail traffic and highway traffic crossing rail lines at-grade.

According to the U.S. Bureau of Transportation Statistics, in 1998 there were 41, 471 highway fatalities, 621 aviation fatalities, and 1,008 railroad-related fatalities. Of the 1,008 railroad-related fatalities, which represents both freight and passenger operations, only four rail passenger fatalities occurred. In its 30-year history, Amtrak has had only 100 fatalities, while moving over 600 million passengers.

The majority of rail-related fatalities (more than nine out of ten during 1998) occur as a result of highway-rail collisions or trespasser accidents. Between 1989 and 1998, total annual highway-rail collisions dropped from 6,525 to 3,508; related fatalities dropped from 833 to 431; and related injuries dropped from 2,868 to 1,303. Over the same time period, total annual highway-rail collisions in North Carolina dropped from 188 to 109; related fatalities dropped from 22 to 15; and related injuries dropped from 85 to 48. North Carolina was ranked 11th in the nation for highway-rail grade crossing incidents in 1998.[15] In 1998, Virginia had 51 highway-rail grade crossing collisions, resulting in two fatalities and 15 injuries. Nationally, Virginia was ranked 22nd for highway-rail grade crossing incidents.[16] Trespasser accidents have remained fairly steady both nationally and at the state level. In 1998, there were 536 trespasser fatalities nationwide, 19 in North Carolina and 10 in Virginia.

The VDRPT, in cooperation with VDOT has been making special efforts to improve crossing safety. Efforts by Virginia include the construction of highway and pedestrian bridges over rail lines. In addition, Virginia has been expanding the use of protection devices at private crossings. Virginia has participated in the testing of active physical barriers to prevent motorists from violating the highway-grade crossing warning devices. Virginia is installing constant warning time protection devices within the corridor between Richmond, VA and Washington, DC.

In the Transportation Efficiency Act for the 21st Century (TEA-21), the United States Congress established funding specifically intended to improve highway-rail crossings and accommodate high speed rail. Section 1103 (c) of the TEA-21 provides funds for the High Speed Rail Crossing Improvement Program. The purpose of this program is to reduce or eliminate the hazards at highway-rail grade crossings in designated high speed rail corridors. Work eligible for funding includes:

- Installation or improvement of warning devices;
- Improvement of track circuitry which activates warning devices;
- Improvements such as crossing surfaces, improved sight distances, crossing illumination;
- Closure of crossings with or without attendant highway relocations;
- Grade separation construction or reconstruction; and
- Combining crossing warning systems with advanced train control and/or intelligent highway traffic control systems.

[15] Source: Federal Railroad Administration.
[16] Source: Federal Railroad Administration.

The NCDOT has been working since the early 1990's 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, Greensboro, and Charlotte by using traffic control devices to separate all vehicular and rail traffic. CSXT is also involved in a segment of the corridor between Raleigh and Cary. The use of specific devices and technology for particular crossings is based on factors such as intersection geometrics, road width and other local conditions, and is evaluated on a case-by-case basis. Gates with extended arms, median barriers, and four-quadrant gates are examples of devices used. At the Sugar Creek Road crossing in Charlotte, North Carolina, 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.

The safety improvements discussed above 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.

The FRA has developed the following safety guideline to address safety concerns at highway crossings along high speed rail corridors:[17]

Public and private crossings where train speeds are between 90 and 110 mph should be equipped with special crossing protection devices, grade separated, or closed.

In addition, Virginia and North Carolina participate in the Federal Railroad Administration's safety inspection program. The program involves state and federal inspectors working together to inspect the condition of the rail infrastructure. Inspection elements covered by the program include equipment, signal systems, track and operating practices. The FRA has established Track Safety Standards that are based on train speeds. The standards specify nine classes of track, with the class of track determined by the maximum speed of trains on that track segment, ranging from 10 mph to a maximum of 200 mph. Higher track classifications require correspondingly higher safety standards.

Energy Efficiency

Increasing the transportation modal balance could also result in less energy use and a corresponding decrease in pollution within the SESHR Corridor. Intercity rail is 45 percent more energy-efficient than domestic commercial airline service and 76 percent more energy-efficient than general aviation.[18] Even greater improvements are gained over highway travel, resulting in net benefits to the human environment along the corridor. New high speed equipment, used in other corridors around the country, has demonstrated reductions in noise and vibration as compared to conventional train sets.

Summary

---

[17] This guideline applies to the SEHSR program. The allowable speed at any given location is also influenced by design characteristics such as track conditions, track geometry, terrain, right-of-way restrictions, type of train equipment, and adjacent land use. The condition of rail infrastructure is critical for rail because rail operates on a fixed guide way. Typical infrastructure defects include settled or soft roadbeds, track geometry defects, rail and joint bar defects, and signal failures.

[18] *Transportation Energy Data Book, Edition 16* , Oak Ridge National Laboratory, July 1996.
(note: these numbers reflect Amtrak equipment in use in 1994, both fossil fuel and electric, and represent btu's/passenger mile as compared with air travel)

The SEHSR program could help address these needs by:

- 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.

2.0 ALTERNATIVES

The purpose of this document is to examine the effects of the proposed Southeast High Speed Rail (SEHSR) program on various environmental resources throughout the overall travel corridor. In order to perform this environmental review, a conceptual service plan and conceptual study area (route) alternatives were developed. As such, this Chapter provides a general discussion of NCDOT and VDPRT's approach to developing the SEHSR program. The remainder of this Chapter presents a discussion of the development and identification of Study Area Alternatives (Build Alternatives) and the No Build Alternative.

The development of the proposed Southeast High Speed Rail Corridor program under review in this environmental document entailed the analysis and development of both physical and operational elements of a rail passenger service plan. In general, the steps involved in developing the SEHSR program for this analysis, included:

- Identification of the implementation approach for program development.
- Identification of the appropriate vehicle technology for the proposed service.
- Development of a conceptual service operations plan, in conjunction with the identification of conceptual service corridors.

This chapter provides an overview of these processes as well as a detailed discussion of alternatives that were developed for review in this environmental document.

2.1 Implementation Options

The Federal Railroad Administration (FRA) report, *High-Speed Ground Transportation for America* (September 1997) examines three implementation options for the development of high speed rail (HSR) improvements: Magnetic Levitation, new location high speed rail, and incremental rail improvements. The incremental approach was chosen for this SEHSR program. The following discussion provides information that guided this decision by the NCDOT and the VDRPT.

Magnetic Levitation Implementation Option

Magnetic Levitation (Maglev) is an advanced transportation technology in which magnetic forces lift, propel, and guide a vehicle over a special purpose guideway. The FRA's Maglev Deployment program is focusing on the development of a demonstration project in the United States. The agency is evaluating two potential projects, the first is a 35-mile plus section of the Northeast Corridor between Baltimore and Washington, DC and the second is a 45-mile route linking the Pittsburgh Airport to the City of Pittsburgh and its eastern suburbs.

The Baltimore to Washington, DC project is conceived as the initial stage of a high speed Maglev system that would serve the entire northeast and southeast corridors between Boston and Charlotte, NC. Based on information from The Baltimore-Washington Maglev Project, distributed by the Mass Transit Administration of the Maryland Department of Transportation (October 2000), the project design and construction costs are estimated at $3.3 to 3.6 Billion dollars (inflated to mid year of construction).

The Maglev system was considered as an option for this project by VDOT, VDRPT, NCDOT and the federal agencies of FRA and FHWA. However, the estimated implementation cost of $39 million per route mile, combined with its higher speed capabilities, places Maglev beyond the assumed parameters of the proposed SEHSR service.[1] A projected 2040 completion date for this expansion of the Maglev service into the Northeast and Southeast corridors does little to satisfy the current and projected (20 year) demand within the SEHSR corridor. In addition, the current demand for this type of service (in the SEHSR travel corridor) cannot justify the extremely high costs. The high costs, lack of currently operating systems, and character of the proprietary guideway, make its implementation an unlikely solution to the transportation problems in the Southeast Corridor. Therefore, this implementation option was eliminated from further consideration by the participating agencies. An FRA study indicates that Maglev would be the most expensive choice for a high speed rail passenger system.

All New High Speed Rail (HSR) Implementation Option

The new high-speed rail implementation option represents an advanced steel-wheel-on-steel-rail passenger system on almost completely new right-of-way. Through a combination of electrification and other advanced components, greatly modified alignments, and state-of-the-art vehicles, new location HSR can attain maximum practical operating speeds on the order of 185 to 200 mph. At these higher speeds, trains must be completely grade-separated, meaning there are no at-grade crossings with roads or other types of transportation; the tracks are fenced to prevent intrusion; and the trains must run on new, dedicated alignments that are very straight. High speed trains also must have sophisticated, modern signaling and automated train controls. The California high speed train study is currently looking at this type of system as an alternative.

Trains operating at these high speeds cannot share track or guideway with conventional rail operations, including the current generation of passenger equipment operated by Amtrak and regional rail authorities, as well as the freight equipment currently operated by the freight railroads. Where new high speed and conventional rail operations must share a right-of-way operations are limited to lower speeds.

FRA rules require new high speed and conventional rail equipment, to withstand certain impact loads in the event of a collision. Because impact resistant standards for rail equipment is the US are different than in Europe or Japan, high speed trains used in Europe or Japan may not be useable in the US, and new equipment designs may be needed. Due to these factors, new location HSR makes little use of existing rail right of way and infrastructure, and thus must support the higher costs as well as the increased environmental impacts and mitigation requirements associated with all new infrastructure projects. Like highways on new right of way, this option would likely encounter strong community opposition in some areas.

The high costs and longer implementation horizon of this alternative led VDOT, VDRPT, NCDOT and the federal agencies to dismiss it as a near term solution to the transportation problems in the Southeast Corridor. It will not be considered further during this analysis.

Incremental Implementation Option

The incremental approach constitutes upgraded intercity rail passenger service using existing railroad rights of way to the greatest extent possible. Currently, most of these rail lines are owned by freight railroad companies and have active freight traffic. Two fundamental approaches can be used to accomplish effective incremental upgrades.[2]

[1] Cost estimates developed as part of the Pittsburgh MagLev Demonstration project.
[2] Based on service goals of time savings, net revenue, and life-cycle costs.

- Improve the infrastructure (including, for example, track and structures) to allow for higher speeds.
- Improve the fleet of locomotives and cars to provide better acceleration, to achieve higher maximum speeds, and to alleviate the need to slow for curves.

Both state departments of transportation preferred this option for the proposed SEHSR program because:

- it makes maximum use of existing facilities;
- it is the least expensive of the high speed implementation options (allowing more readily attainable funding levels);
- it facilitates the air quality goals of both states;
- it minimizes overall environmental impacts; and,
- it provides relatively high benefits in comparison with the investment required.

Past studies completed in the Northwest and Northeast rail corridors show that incremental improvements within existing rail systems provide the least overall environmental impacts and the highest commercial feasibility, both of which are necessary for a successful transportation system. Because the use of existing rights of way is less disruptive to existing communities, community support is generally strengthened.

2.2 Technology Options

Several basic train technology alternatives are available for the incremental implementation of the proposed Southeast High Speed Rail service. A range of potentially available technologies that fit within the basic SEHSR assumptions will be examined.

A basic assumption of the incremental approach to HSR is that transportation service would be provided on standard gauge railroad tracks capable of also supporting North American standard heavy-haul freight trains as well as the high speed passenger trains. Based on the findings of earlier feasibility studies, the proposed maximum operating speed of the high speed passenger service would be 110 mph.[3] The earlier studies showed that with fossil fuel engines, speed increases above the 110 mph did not generate significant improvements in ridership and revenues, but they did significantly increase costs because of the more stringent regulations necessary above that speed. While some segments of the SEHSR service may be operated on tracks dedicated to high-speed, much of the route will involve incremental improvements to tracks owned by commercial freight lines operating at conventional speeds. Shared tracks place certain technological requirements and limitations on high speed trains.

Train Technology Options

For the most part, the type of fuel used to power a vehicle is the predominant consideration when selecting a vehicle. Modern railways obtain energy to operate trains in two basic ways, fossil fuel and electric power. Each technology has its qualities and limitations.

Fossil fuel is the most commonly used method in North America. Petroleum fuel is carried on-board the train, converting its chemical energy to electrical energy with a generator. This electric energy is then utilized by electric traction motors for movement. For high speed passenger applications, both diesel engines and gas-turbine engines may be used. Both of these engine types burn commercially available grades of petroleum fuel.

[3] Feasibility Study Summary & Implementation Plan, NCDOT- Rail Division, April, 1999.

The second method involves the generation of electrical energy at a stationary power plant that is delivered to the train through a series of transmission lines and sliding contacts. The train converts the electrical energy to mechanical energy with electric traction motors. Modern electric traction technology allows the use of commercially available 60Hz electrical power. While common elsewhere in the world, electrified railroads are rare in America. The foremost examples are between South Bend, IN and Chicago, IL and between Washington, DC and Boston, MA.

Current diesel, gas-turbine or electric technologies will meet or exceed the performance requirements of the proposed SEHSR service. Electric traction has the capability of greatly exceeding the currently assumed requirements through much faster acceleration and deceleration.

Electric trains

With high-power and high-torque, electric traction is the only wheel/rail railroad technology with performance characteristics needed for very high-speed (150 mph and higher) operations. The French TGV, German ICE, Spanish AVE, and Amtrak's new Acela Express are electric powered. Electric trains have excellent acceleration characteristics, are quiet, and since power comes from fixed-location generating plants, local emissions are low.

Electric railways require high initial capital investment. Additional infrastructure includes overhead wires with supporting structures, known as a catenary, to deliver electric power to the train. Sub-stations, located at about 30 mile intervals, are required to condition the commercially purchased power. Additional expense would be incurred for signal systems that are compatible with electrified railways. Overhead clearance requirements are greater to accommodate the catenary equipment. Many existing overhead structures would need to be raised or replaced. The existence of high-voltage overhead wires at highway grade crossings would also be a safety concern. There have also been public concerns in some locations over the potential visual impacts of an electrified wire system.

Electric railways have performance capabilities significantly beyond the requirements of the proposed SEHSR service. When very high speed and high acceleration rates are required, the cost of electric traction can be justified. These costs can be from 2 to 3 million per mile based upon the cost of the Northeast Corridor electrification. The cost for electrification will vary based upon the construction conditions. Given the initial costs of an electrified system (both monetary and environmental) relative to the ridership/revenue projections for the SEHSR corridor over the next 25 years, the VDRPT and NCDOT have determined that an electrified system is not warranted at this time.

Fossil-Fuel Diesel Trains

For high speed passenger service, heavyweight passenger locomotives such as the EMD models F59PHI, can achieve 110 mph at the limits of their performance range.[4] These locomotives are adaptations of American type freight locomotives and meet existing Federal Railroad Administration safety requirements. When coupled to passenger car types used in Amtrak's fleet, such as Horizon Fleet and Amfleet series cars, the resulting train would meet speed and safety requirements with minimum adaptation.

[4] EMD – Electro-Motive Division of General Motors Corporation

British Rail introduced modern lightweight diesel-powered high speed trains in 1976. This technology was facilitated by the development of lightweight (approximately 13,000 pounds), high speed (2,000 rpm) diesel engines rated at 2,000 horsepower (hp) and higher. These trains used two locomotives, one at each end of the string of passenger cars, in a configuration known as ‘push-pull.’ The Amtrak Acela Express train, although electric-powered, is configured in ‘push-pull’.[5]

Another approach to high speed, diesel powered trains is the Diesel Multiple Unit or DMU. In general, the DMU uses several, smaller diesel engines distributed throughout the trainset. The engines are mounted under the passenger car floors. Separate locomotives are not used. Recent versions of this technology are in commercial services exceeding 100 mph (for example, the Adtranz IC3 Flexliners used in Israel). However this vehicle is not safety rule compliant (FRA requires greater car strength to resist crushing from side or end impacts) and no near term plans are underway to bring it into Tier II compliance.

Many non-U.S. trains, including current commercial versions of the lightweight diesel powered options, are not fully compliant with FRA safety requirements (49 CFR Part 238) and no near term plans are underway to bring it into Tier II compliance. This means that they cannot be operated in mixed traffic with heavier freight or passenger trains, and thus would not allow the use of the existing infrastructure. This does not imply that the manufacturers could not meet the requirements if an order for equipment was pending. However, if the regulatory compliance results in significant weight gain, the performance advantages of lightweight design would be diminished.

Diesel engines offer good fuel efficiency in all speed ranges. Diesel engines also offer reasonable acceleration due to their favorable torque characteristics. Lighter weight designs would have significant acceleration advantages. Diesel powered locomotives are emission regulated by the EPA.[6] DMU’s appear to be exempt from the emission rules.

Fossil Fuel Gas-Turbine Trains

These trains utilize a gas-turbine engine, also known as a turboshaft engine, similar to engines used in modern helicopters. Amtrak currently operates an example of this technology on the New York to Albany route. The FRA is currently funding the development of a turbine-powered version of the Amtrak Acela Express Power Unit.

Turbines offer good fuel economy at high power output but are not as efficient at lower power settings. The torque characteristics of turbine engines do not offer as high acceleration as a comparably rated diesel. Turbine powered trains perform best with long distances between stations and on a track with minimum speed restrictions. The FRA has invested in research of gyroscopic battery technology (fly wheel), which if applied to a turbine-powered train, would compensate for acceleration deficiencies. Up until now, acceptance and utilization of turbine-powered trains throughout the world has not been widespread.

[5] Operating between Washington and Boston

[6] All passenger locomotives produced after 2006 must meet EPA Tier 2 locomotive emission limits: (grams/bhp-hr) HC2 – 0.30, CO – 1.5, NOx – 5.5, PM – 0.20. The regulation permits some alternative compliance. The final rule, located in 40 CFR Parts 85, 89 and 92, should be consulted for exact requirements.

Technology Comparisons

Both gas-turbine and diesel technologies are capable and proven for the proposed SEHSR 110 mph maximum operating speed. Gas-turbine trains would perform best with longer distances between stops and with track improvements that permit steady cruise speeds. Diesel power would provide better acceleration for shorter station spacing and track configurations with frequent speed restrictions. The diesel locomotives must meet the Railroad Noise Emission Compliance Regulation (49 CFR 210). Gas-turbine powered locomotives are specifically exempted from this regulation (49 CFR 210.3(b)(5)).

If operation plans were such that fossil–fueled high speed locomotives used in the proposed SEHSR service were to continue on the Northeast Corridor to New York, these locomotives would likely be required to be equipped as dual power locomotives. Dual power allows fossil fueled locomotives with electric transmissions (diesel-electric or turbine-electric) to shut down their engine generators and power their electric traction motors from a fixed electrical contact. Combustion fumes from locomotives are not allowed in the tunnels in and out of New York's Pennsylvania Station. This practice may be subject to change in the future based on potential safety improvements to these tunnels. Typically, trains entering the electrified Northeast Corridor at Washington, DC, bound for New York, have their fossil-fueled locomotives removed and electric locomotives attached to the train.

Provision of dual power on SEHSR locomotives would have cost implications. More fossil fueled locomotives would be required to provide service over a longer distance and additional costs would be incurred as a result of the equipment that would be needed. No are no anticipated environmental implications in the Southeast corridor.

Both gas-turbine and diesel-powered trains would meet the performance characteristics required by the basic assumptions of the proposed SEHSR service and be considered acceptable alternatives.

Safety and Regulatory Issues

The Federal Railroad Administration (FRA) has stringent regulations regarding passenger train safety issues. Most high speed trains operating in other parts of the world do not meet current FRA safety regulations. Most passenger railcars manufactured for use by Amtrak meet the safety requirements for 110 mph operations.[7] Before final selection of train equipment is made, compliance with FRA safety regulations will need to be achieved.

At-grade highway crossings are permitted for 110 mph operations without special requirements. However, prudence would dictate that safety provisions at highway crossings exceed the minimum required because of the high speeds and presence of passengers. Where possible, highway grade crossings should be eliminated through closure or grade-separation. Where not practical, a 'Sealed Corridor' program could serve as a model for highway crossing safety improvements. This program upgrades heavily used highway-rail crossings with improvements such as four-quadrant gates and median barriers

The introduction of higher speeds onto existing rail lines would require modifications to the existing signal system. The spacing of signals would be increased to accommodate the longest braking distance of any train operating on the route. This would likely be the 110 mph passenger train. Also, when any operations exceed 79 mph, signal indications are required to

[7] Amtrak's Talgo trains in the Pacific Northwest operate under a regulatory waiver and are not yet considered fully compliant with the regulations.

be displayed in the locomotive cab.[8] All locomotives on the route, including lower speed freight locomotives, would require this in-cab display capability.

2.3 Southeast High Speed Rail Program Operations

For the purposes of this environmental document, general service characteristics were developed for the proposed Southeast High Speed Rail (SEHSR) program. The states chose to model fossil fuel powered trains for use along the SEHSR corridor. The use of fossil fuel engines fits well with the incremental approach, allowing improved equipment to be used early in the implementation of the system under existing conditions. For the proposed SEHSR system, several different types of fossil fuel equipment would be evaluated, including cars with tilt suspension technology. This suspension can "lean" while traversing curves, maintaining safety and passenger comfort. Cars with this technology assure passenger comfort at a higher speed, thereby allowing the use of the existing right-of-way for most of the corridor, with fewer modifications. The SEHSR service connects directly with the existing high speed Northeast Corridor at Washington where tilt technology is currently in operation. Marketing considerations strongly suggest that operation plans consider seamless linkage in Washington, DC.

The operational model used assumed a maximum speed of 110 mph in the corridor, with an average speed of 85 to 90 mph. Based on this analysis, estimated end-to-end travel time for the SEHSR service is six hours to seven and one-half hours. Proposed service will consist of four round trips per day between Washington, DC and Charlotte, NC, and four additional round trips between Raleigh, NC and Charlotte, NC. Station stops have not yet been determined. It was assumed that the SEHSR would serve all stations where Amtrak currently provides service, however every train would not stop at all stations.

This service operation model is merely conceptual for the purposes of this Tier I analysis and is common among all Study Area Alternatives (Build Alternatives). As the SEHSR program moves forward, in depth operational modeling would be undertaken.

2.4 Build Alternatives (Study Area Alternatives)

Extensive feasibility studies have been completed since 1992 considering alternatives between the major cities of the SEHSR corridor. The general locations that make up the SEHSR Build Alternatives (Study Areas) are based upon these feasibility studies. Over 1,000 miles -- stretching from Washington, DC to Charlotte, NC -- are being examined for the location of the proposed corridor (that would provide SEHSR service).

The SEHSR program could be developed and implemented on an existing rail line, or on segments of existing rail lines in conjunction with areas of new track. As such, general Study Area Alternatives that combine various rail (or potential rail) segments were developed for analysis in this environmental document. All Build Alternatives assume an incremental approach (upgrading existing infrastructure as much as possible) utilizing fossil fuel locomotives.

Given the nature of this environmental analysis, the goal for alternative development was to identify general locations that could feasibly accommodate the proposed SEHSR program. As such, nine, six-mile wide Study Area Alternatives (centered on existing rail rights-of-way), located between Washington, DC and Charlotte, NC (passing through Richmond, VA and

[8] Automatic train stop or automatic train control may be used in lieu of cab signals.

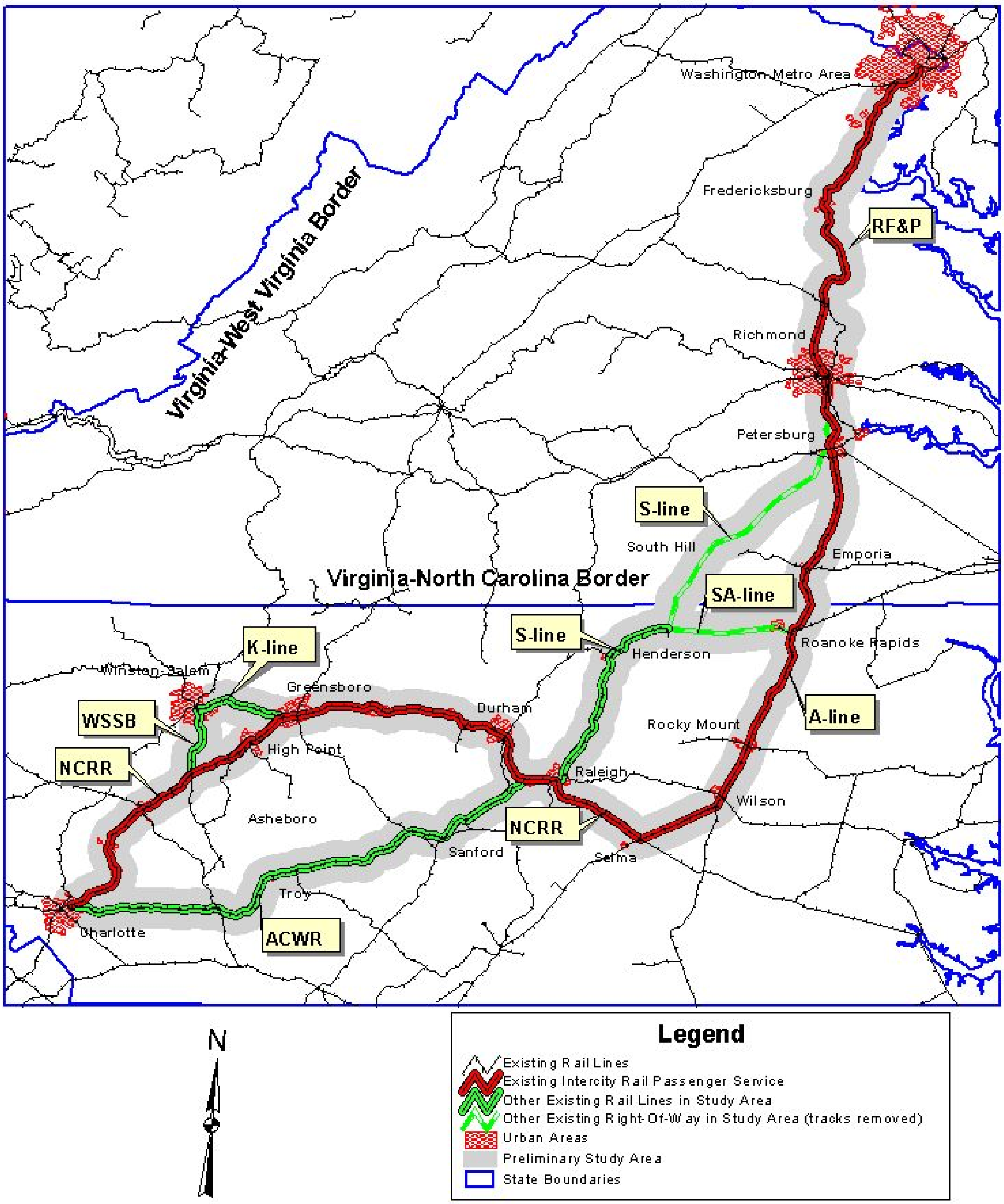
Raleigh, NC) were developed. The Study Area Alternatives consist of different combinations of study segments containing the following railroad lines:

- RF&P (Richmond Fredericksburg and Potomac), between Washington, DC & Richmond;
- CSXT-S-line (the former Seaboard Air Line, including certain segments that were abandoned prior to 1969) between Richmond and Raleigh;
- CSXT-A-line (former Atlantic Coast Line);
- CSXT SA-line (former Seaboard Air Line) and the NCRR (North Carolina Railroad), between Raleigh and Charlotte;
- the NCRR between Raleigh and Charlotte;
- Winston-Salem Southbound (WSSB);
- the former Southern Railroad K-line;
- CSXT S-line between Raleigh and Colon;
- NS-line (Norfolk Southern);
- Norfolk Southern (NS) CF-line; and
- ACWR (Aberdeen Carolina and Western Railway) between Gulf and Charlotte.

Figure 2.1 presents the general location of these rail lines.

Figure 2.1

**Southeast High Speed Rail:
Tier 1 EIS Alternative Study Areas**



Source: United States Department of Transportation, 1997, prepared by Carter & Burgess, 1999

2.4.1 Description of Study Segments

As discussed earlier in this Chapter, existing (or abandoned) rail lines were used as the centerlines for development of study segments. Based on the rail lines and their locations, 21 study segments were identified, as illustrated in Figure 2.2. The 21 segments used for development of the Study Area Alternatives include the following:

1. **Former RF&P and S-line** – Washington, DC to Centralia, VA (common to all 9 alternatives).
2. **S-line** (pre-1969) - Centralia, VA to Ettrick Station, VA (includes a portion of the A-line from north of Centralia to north of Chester and from approximately South Dunlop to Ettrick Station)
3. **S-line** (pre-1969) - Ettrick Station, VA to Burgess, VA (includes a portion of the A-line from Ettrick Station to the Appomattox River)
4. **S-line Burgess Connector** - may be included for study later if appropriate
5. **S-line** – Burgess, VA to Norlina, NC
6. **S-line** - Norlina, NC to Raleigh (Boylan "Wye"), NC
7. **A-line** - Centralia, VA to Ettrick Station, VA
8. **A-line** - Ettrick Station, VA to Collier (Yard), VA
9. **A-line** - Collier (Yard), VA to Weldon, NC
10. **A-line** - Weldon, NC to Selma, NC
11. **SA-line** - Weldon, NC to Norlina, NC
12. **NCRR** - Selma, NC to Raleigh (Boylan "Wye"), NC
13. **NCRR** - Raleigh (Boylan "Wye"), NC to Cary (Fetner), NC
14. **NCRR** - Cary (Fetner) to Greensboro (Pomona), NC
15. **NCRR** - Greensboro (Pomona), NC to Lexington, NC
16. **NCRR** - Lexington, NC to Charlotte, NC
17. **K-line** - Greensboro (Pomona), NC to Winston-Salem, NC
18. **WSSB** - Winston-Salem, NC to Lexington, NC
19. **S-line** - Cary (Fetner) to Colon, NC
20. **NS Line & CF Line** – Colon, NC to Gulf, NC
21. **ACWR** – Gulf, NC to Charlotte, NC

The following presents general information about each of these segments. Later in this Chapter, these study segments are pieced together to form the Study Areas Alternatives.

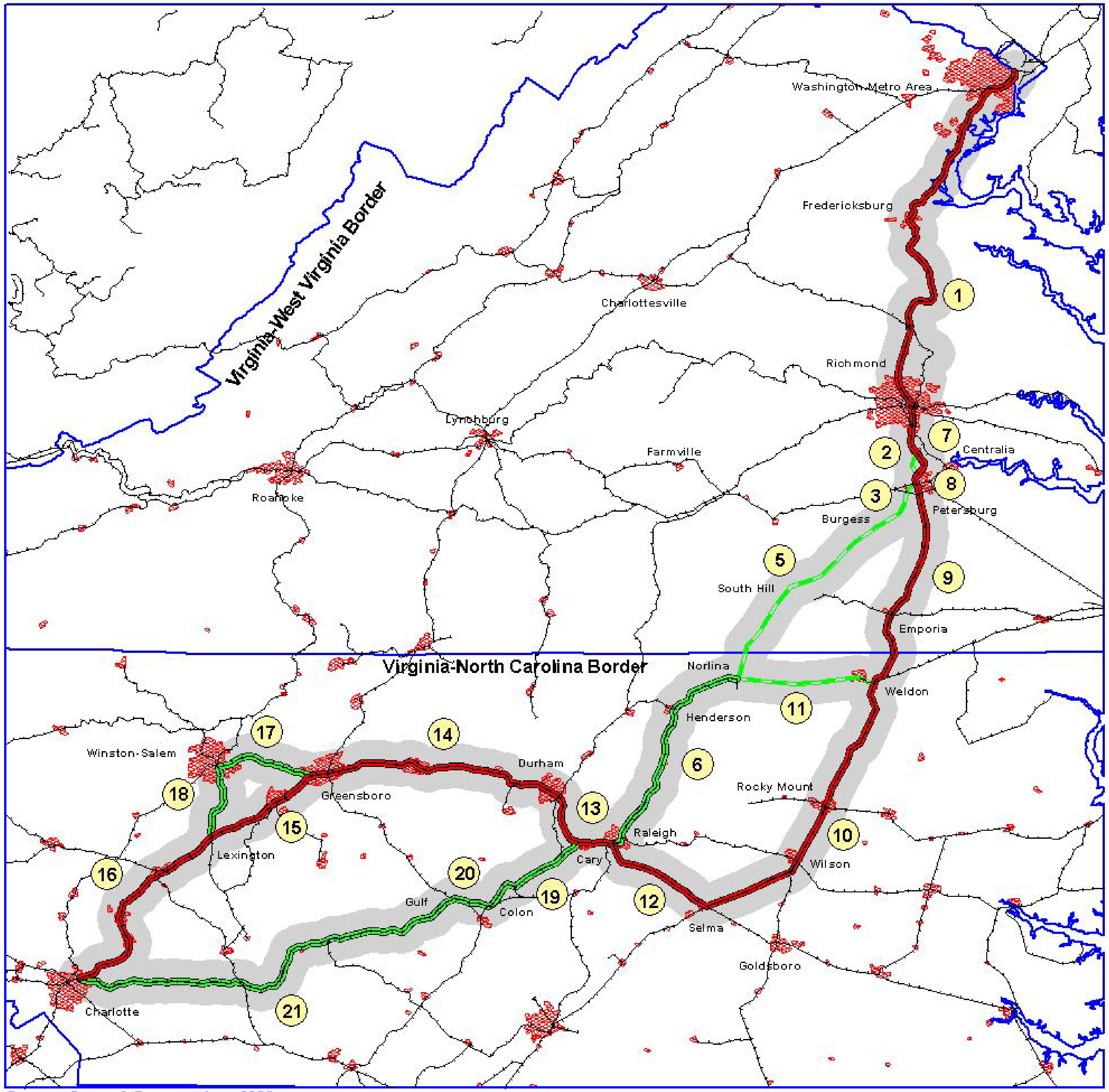
In order to provide a description of the of the Study Area Alternatives without a tremendous amount of repetition, it was believed by NCDOT and VDPRT that this "segment approach" was the most efficient process for alternatives development. Figure 2.3 shows a schematic drawing of the various existing railroads that are within these segments.

Segment 1 Former RF&P and S-line – Washington, DC to Centralia, VA

This segment encompasses very heavily urbanized portions of the Washington DC/northern Virginia region. The former RF&P is actively used by both passenger and freight operations (Amtrak, Virginia Railway Express, CSX Transportation, and Norfolk Southern). Most of the freight operations through this area carry general merchandise and include coal trains serving a principal destination. Additional passing sidings, signals and switches will be required. Main Street Station in downtown Richmond has been purchased by the City of Richmond and is currently under refurbishment for the purposes of attracting more ridership and enhancing

Figure 2.2

Segment Description - SEHSR



Source: Carter & Burgess, Inc., 2000

1. Former RF&P and S-line - Washington, DC to Centralia, VA (common to all 9 alternatives).
2. S-line (pre-1969) - Centralia, VA to Ettrick Station, VA (includes a portion of the A-line from north of Centralia to north of Chester and from approximately South Dunlop to Ettrick Station)
3. S-line (pre-1969) - Ettrick Station, VA to Burgess, VA (includes a portion of the A-line from Ettrick Station to the Appomattox River)
4. S-line Burgess Connector - may be included for study later if appropriate
5. S-line - Burgess, VA to Norlina, NC
6. S-line - Norlina, NC to Raleigh (Boylan "Wye"), NC
7. A-line - Centralia, VA to Ettrick Station, VA
8. A-line - Ettrick Station, VA to Collier (Yard), VA
9. A-line - Collier (Yard), VA to Weldon, NC
10. A-line - Weldon, NC to Selma, NC
11. SA-line - Weldon, NC to Norlina, NC
12. NCRR - Selma, NC to Raleigh (Boylan "Wye"), NC
13. NCRR - Raleigh (Boylan "Wye"), NC to Cary (Fetner), NC
14. NCRR - Cary (Fetner), NC to Greensboro (Pomona), NC
15. NCRR - Greensboro (Pomona), NC to Lexington, NC
16. NCRR - Lexington, NC to Charlotte, NC
17. K-line - Greensboro (Pomona), NC to Winston-Salem, NC
18. WSSB - Winston-Salem, NC to Lexington, NC
19. S-line - Cary (Fetner), NC to Colon, NC
20. NC Line & CF Line - Colon, NC to Gulf, NC
21. ACWR - Gulf, NC to Charlotte, NC

Legend

- Existing Rail Lines
- Existing Intercity Rail Passenger Service
- Other Existing Rail Lines Under Consideration
- Other Existing Right-Of-Way in Study Area (tracks removed)
- Preliminary Study Areas
- Urban Areas
- State Boundaries
- Segment Numbers

*Segment 1 - The RF&P and S-line are common to all Alternatives

*Segment 4 - (S-line Burgess Connector) May be included in future studies if appropriate

*ACWR includes short segments of the S-line, NS-line and CF-line (Cary to Gulf)

N

downtown development. Amtrak is adding the station to its service schedule and the station will serve as a modal interface for Amtrak trains, intercity buses, local transit, taxis, and airport limousines.

The heavy volume of passenger and freight traffic on the former RF&P has led to congestion that may require an additional track to accommodate the Southeast High Speed Rail service and/or to relieve congestion. There are approximately 60 to 80 trains per day on the segment portion between Washington, DC to Staples Mill Station north of Richmond, VA. Approximately 8 to 10 coal trains per day use the Richmond to Centralia portion. Currently there are 9 daily round trip Amtrak trains operating the length of the Washington, DC to Richmond corridor. There are six round trip commuter trains operating between Washington, DC and Fredericksburg. In addition, another 7 round trips operate between Washington, DC and Alexandria before switching to the Norfolk Southern line to Manassas. Two round-trip Amtrak trains also operate on this segment. On average, a total of 14 daily round trip passenger trains operate in the Washington, DC to Richmond corridor.

Residents of Ashland and Woodbridge who attended SEHSR public workshops held during the spring and summer of 2000, expressed concerns about the need for an additional track in the area to relieve congestion. They also expressed concerns about related noise, vibration, and safety for residences located in close proximity to the existing RF&P. Residents were also concerned about potential impacts to the Doswell Historic Store and Junction, the Ashland Historic District and Gwathmey area, all located in close proximity to the former RF&P.

Segment 2 S-line (pre-1969) - Centralia, VA to Petersburg (Ettrick Station), VA (Includes a portion of the A-line from approximately South Dunlop to Ettrick Station)

Since 1987, the S-line – between Centralia to Petersburg, VA -- has been out of service and the tracks have been removed. The S-line traverses recently developed residential neighborhoods. Although the S-line is still predominately owned by the railroad, some of the right-of-way has been sold off or released for public and/or private use. A portion of the A-line from north of Centralia to north of Chester and from approximately South Dunlop to Ettrick Station is also included in this segment.

Previous reports indicate that future service on this restored line could include, in addition to the planned SEHSR service, one Amtrak train each way per day, four CSX intermodal trains each way per day, and one CSX merchandise train each way per day.[9]

Segment 3 S-line (pre-1969) - Petersburg (Ettrick Station), VA to Burgess, VA (Includes a portion of A-line from Ettrick Station to Appomattox River)

This segment begins on the A-line at Ettrick Station. Construction of a new bridge across the Appomattox River and a new alignment would be required to connect the A-line at Ettrick Station to the former S-line south of the Appomattox River.

The original S-line alignment crossed the A-line north of Ettrick Station and proceeded along the Chesterfield County/Colonial Heights City boundary, across the Appomattox River and into the old business district of Petersburg. South of the river, the S-line turned west and crossed the A-line again before turning south. At this point it turned south, passing under I-85 and under the Norfolk & Western Railroad and continuing south to Burgess (located southwest of Petersburg). In 1969, CSX constructed a connector between a point on the S-line (south of Burgess) to a

[9] Michael Holowaty. "Restoration of the Missing Link - The S-line from Centralia, VA to Norlina, NC". Paper presented to the SEHSR Conference and Expo, Richmond, VA, November 2000.

point on the A-line south of Collier Yard. The S-line tracks from south of Ettrick Station to Burgess were removed along with the bridge across the Appomattox River. Only remnants of the crossing remain, including some unique tall pier structures that once supported the viaduct over the old business district. When the I-85 bridges reached structural deficiency, the overpass was filled in. The only bridge remaining is an over grade crossing of the S-line by the Norfolk and Western Railroad south of I-85.

Portions of the S-line in this segment have been used for the development of adjacent properties. A steel manufacturer has constructed a major fabrication plant (south of I-85) and uses portions of the old railroad right-of-way for an entrance road. There is the potential for community impacts in Chester, VA. There is also the potential need for a new, long span bridge crossing of the Appomattox River.

Input received from the initial round of public workshops in the spring/summer of 2000, showed support for the use of the S-line right-of-way for the proposed SEHSR service. The Southside Planning District, which includes: Brunswick, Mecklenburg, and Nottoway Counties, of Virginia; the towns of Lawrenceville, Alberta, South Hill, La Crosse, Chase City, Boynton, and Clarksville, VA; and the Chamber of Commerce for South Hill, VA; the Economic Development Office of Brunswick County, VA; the Boynton and Chase City Ruritan Clubs and The Industrial Development Authority of Mecklenburg County, VA sent letters and resolutions in support of the S-line route and the reintroduction of both freight and passenger service. These stakeholders feel that this reintroduction is vital to the economic growth and development of the area. They seek one or more rail passenger stops as well as freight service, in La Crosse, Alberta, or Broadnax, VA.

Segment 4 S-line Burgess Connector - may be included for study later if appropriate. Originally segment 4 was under consideration as a separate segment. Once the six-mile wide buffer width was established for the analysis of Study Area Alternatives, this segment became a part of the buffer. Thus it was not necessary to continue to study it as a separately numbered segment. All conceptual calculations were based on the segments, thus the segment 4 number was maintained for consistency.

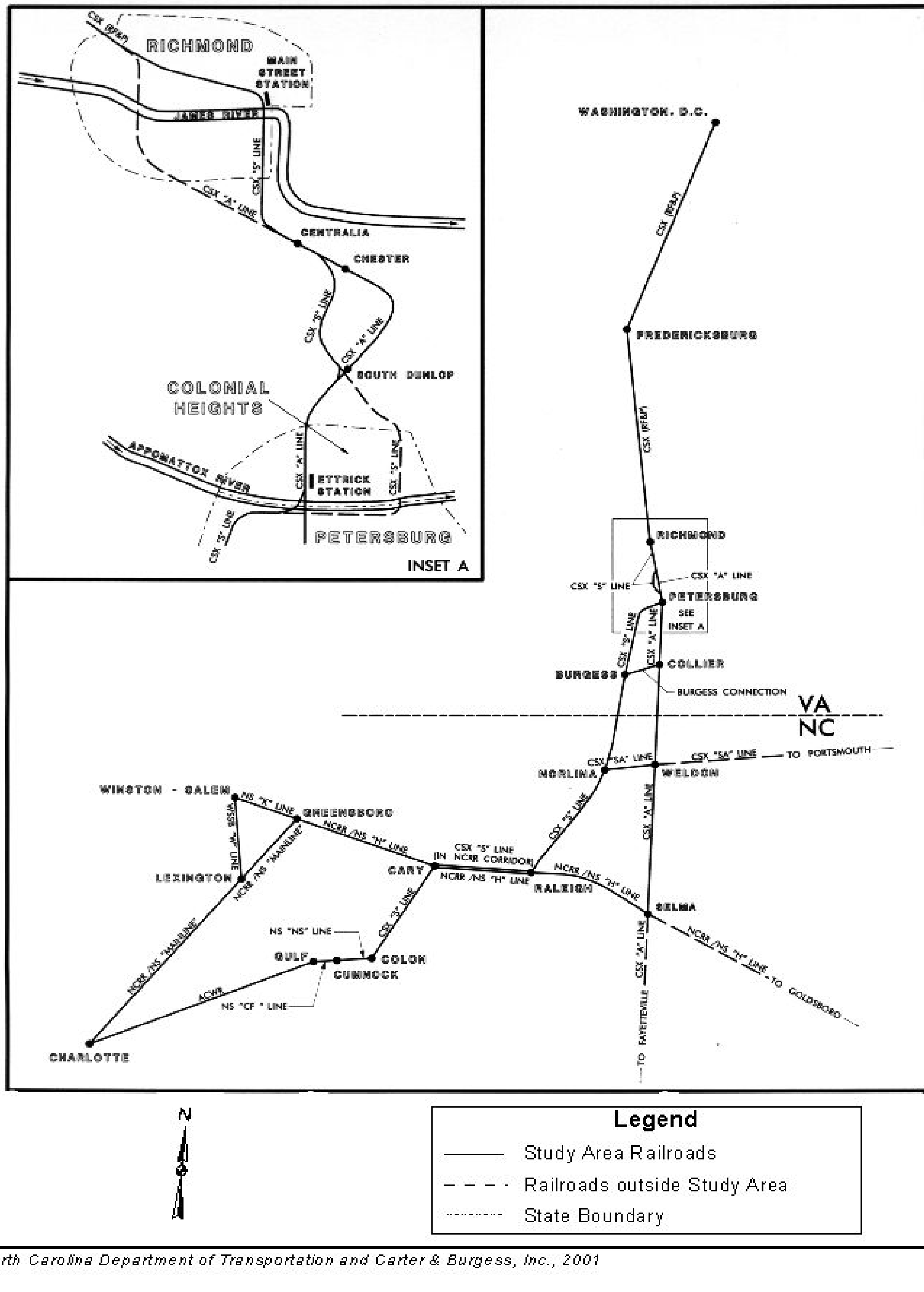
Segment 5 S-line - Burgess, VA to Norlina, NC

The tracks in this segment were removed in 1987. The right-of-way remains intact for most of the corridor because of a fiber optic cable, which was installed in the 100-foot right-of-way. Only two areas were observed where right-of-way is being used for other purposes. One is in McKenney, VA where a bridge contractor has acquired right-of-way and constructed a building and storage yard. Another is north of Burgess, where residents have purchased a section of the right-of-way and are using it to access some recently constructed homes.

According to track charts, 18 overpass bridges (roadways or railroads) and 13 underpass bridges (over streams) existed. Some of the roadway separations have been filled in. Approximately half of the roadway bridges can be retained for future service. The railroad bridges over streams are in good shape, and with a few exceptions (Taylor Creek, Great Creek), can be retained with some retrofit work. It appears that the three long bridges across the Meherrin River, the Nottoway River and Lake Gaston can be retrofitted to carry the loadings anticipated for passenger and freight service. The Meherrin River Bridge is the newest of these bridges, constructed in the 1970's with a ballasted deck. The other two bridges will require retrofitting to a ballasted deck.

Figure 2.3

Southeast High Speed Rail: Schematic of Study Area Railroads



Source: North Carolina Department of Transportation and Carter & Burgess, Inc., 2001

Segment 6. S-line from Norlina, NC to Raleigh (Boylan), NC

This segment is the only segment of the S-line between Petersburg and Raleigh remaining in service. Although it only serves local freight operation, it has been maintained and could be opened to through freight with limited speed. Bridge crossings (except Cedar Creek) are in good condition and could be maintained for SEHSR service. The southern ten miles of the corridor is being considered by the Triangle Transit Authority (TTA) for joint use of the right-of-way for construction and operation of a regional rail transit system. It would not operate on the same tracks as the freight and passenger trains.

Two local freight trains (each way, every day) operate north of Capital Yard. South of Capital Yard two local freight trains and two Amtrak passenger trains operate daily. Previous reports indicate that future service on this restored line could include, in addition to the existing service and planned SEHSR service: one daily, round trip Amtrak train, four intermodal trains (each way, every day), and one merchandise train each way per day.[10]

Segment 7 A-line - Centralia, VA to Petersburg (Ettrick Station), VA

This segment is actively used for freight operations with 40 to 50 trains on the A-line. The A-line is the major north-south line for CSX from Richmond to Jacksonville, FL. It crosses the former S-line north and south of Richmond and crosses twice in Petersburg. When CSX consolidated the services of the former Seaboard Airline and Atlantic Coast Line, the S-line was removed from service south of Centralia. Since the A-line bypasses Main Street Station in Richmond, it is not considered a viable alternative route for the SEHSR service (from ACCA Yard in north Richmond to the intersection with the S-line at Centralia). South of Centralia, the A-line follows a route east of the former S-line and just west of the Petersburg Turnpike, crossing the S-line again just north of Ettrick Station at the City/County boundary line.

Segment 8 A-line - Ettrick Station, VA to Collier (Yard), VA

This segment is actively used for freight operations with 40 to 50 trains per day on the A-line. The A-line extends south from Ettrick Station crossing the Appomattox River, I-85 and the Norfolk and Western Railroad before entering the Collier Yard. This A-line segment is a continuation of the A-line described in Segment 7. Collier Yard is the major makeup yard for Petersburg.

Segment 9 A-line - Collier (Yard), VA to Weldon, NC

This segment from Collier Yard south is a very active line with approximately 40 to 50 trains per day. Since this section of the A-line, which is a continuation of the A-line described in Segments 7 and 8, is single track for over half of its length, it currently operates at capacity. The line passes through Emporia, an urban area north of the North Carolina/Virginia state line. No scheduled Amtrak stops exist along this 52-mile section.

Segment 10 A-line – Weldon, NC to Selma, NC

This segment currently handles 40 to 50 freight trains per day and is a continuation of the A-line described above. A major freight yard in Rocky Mount contributes additional local movements as well as impacting a number of the north and south bound through movements. This section passes through Wilson and Rocky Mount, both significant urban areas that also support an Amtrak station stop. Selma also has a station stop.

[10] Michael Holowaty. "Restoration of the Missing Link - The S-line from Centralia, VA to Norlina, NC". Paper presented to the SEHSR Conference and Expo, Richmond, VA, November 2000.

Segment 11 SA-line – Weldon, NC to Norlina, NC

The tracks along the SA-line were removed over 20 years ago but the right-of-way appears to be intact for a large percentage of the corridor. The segment follows a ridgeline but the terrain undulates. At Weldon the SA-line passed under the A-line at the Weldon station platform. A SA-line bridge crossed the Roanoke River at a lower elevation than the A-line bridge. A tie to the A-line still exists in the form of a switchback to the south between the station platform and the former bridge, which gradually catches grade with the A-line. When the SA-line Roanoke River Bridge was removed, the southern leg of the switchback was extended to the north and under the A-line bridge to provide service to industry in Weldon and Roanoke Rapids. The track dead-ends at the west side of Roanoke Rapids.

Segment 12 (Study Areas G, H and J) NCRR - Selma, NC to Raleigh (Boylan "Wye"), NC

This segment is single track with only two passing sidings, at Clayton and in Garner. Train traffic is moderate - supporting 8 trains a day. Amtrak operates four of the eight trains along this segment. Norfolk Southern operates the freight traffic. Existing station stops are located at the ends of this section in Raleigh and Selma.

Segment 13 NCRR - Raleigh (Boylan "Wye"), NC to Cary (Fetner), NC

This segment is a convergence of the S-line operated by CSX and the H-line operated by Norfolk Southern. It serves up to 20 trains a day, six of which are Amtrak service. The local transit authority (TTA) is planning to also use this corridor for regional rail transit by adding up to two tracks within the 200-foot right-of-way. The vertical alignment coupled with the urban setting of the corridor offers some restrictions to high speed operation. Station stops currently exist at each end – Cary and Raleigh.

Segment 14 NCRR - Cary (Fetner) to Greensboro, (Pomona), NC

This segment is primarily a single-track railroad with passing sidings and no existing signaling. North Carolina Department of Transportation (NCDOT) has developed plans to extend three of the passing sidings in coordination with Norfolk Southern and the North Carolina Railroad (NCRR). The signalization of this segment is being studied by NCDOT for improvements that may be constructed prior to SEHSR implementation. There are approximately 14 trains per day along this segment, including 4 Amtrak trains and local freight service.

In Durham there is concern over potential impacts to the downtown area. There are also possible restrictions on the proposed SEHSR service based upon the shared use of the NCRR ROW and potential impacts to properties located in close proximity to the existing right-of-way. There is also the potential for property relocations in Hillsborough, Mebane, and Haw River.

Segment 15 NCRR - Greensboro, (Pomona), NC to Lexington, NC

Amtrak provides service on this line between Raleigh and Charlotte, as well as between Charlotte to Washington, DC. It extends from a point west of the Pomona Yard in west Greensboro where the K-line intersects with the NCRR to a point south of Lexington where the Winston-Salem South Bound Railroad (WSSB) passes under the NCRR. NCDOT Rail Division, in cooperation with NS and NCRR, has prepared plans to double track a 9-mile section between I-40 and High Point. This will provide double track for the entire segment except for 4 miles south of Thomasville. Train traffic is heavy along this segment carrying approximately 40-50 trains per day including 6 Amtrak and numerous local trains.

During the spring/summer 2000 public workshops, over 60 people expressed their support for SEHSR service and a station stop in Lexington. A special committee of Lexington 2000 has been formed to facilitate acquiring a rail passenger stop in Lexington. The city is interested in building a multi-modal center at the confluence of the WSSB and the NCRR.

Segment 16 NCRR - Lexington, NC to Charlotte, NC

This is a segment of the NCRR operated by NS and Amtrak. The freight traffic is high with up to 50 trains a day, including six Amtrak trains. It is a part of the NS central artery of operation through North Carolina between Greensboro and Charlotte. There are potential water quality issues related to the Yadkin River and High Rock Lake. There is the potential for possible community impacts issues in Harrisburg and Kannapolis as well as a potential hazardous material impact in Kannapolis.

Segment 17 K-line - Greensboro, (Pomona), NC to Winston-Salem, NC

The K-line is a local line owned and operated by Norfolk Southern from Greensboro through Winston-Salem to Rural Hall. The existing track alignment has a sharp (8-degree) curve in Winston-Salem. The alignment passes through an area west of Greensboro known as Gasoline Alley where tank farms reside on both sides of the track. A supply gasoline pipeline passes under the tracks in this same area. This segment supports approximately 2 to 4 trains per day. This is one of three segments being considered for the future Triad Intercity Rail west of Winston-Salem.[11]

Segment 18 WSSB from Winston-Salem, NC to Lexington, NC

The WSSB is a section of a shortline railroad that extends from Winston-Salem south through Lexington to Badin Lake. There are approximately 2 to 4 trains a day operating on this shortline. This is also one of three segments being considered for the future Triad Intercity Rail west of Winston-Salem. Connections to the K-line to Greensboro and the NCRR to Charlotte present a challenge. The former connection to the K-line has been removed and Winston-Salem State University, a Historically Black College/University (HBCU), has constructed buildings where the alignment once crossed. This area is also a traditionally African American residential section of Winston-Salem. Thus there is the potential for environmental justice issues and community impacts based upon the potential need for residential relocations. The southern crossing of the NCRR by the WSSB, is grade separated in a congested industrial and residential area.

Over 200 people attended the spring/summer 2000 public workshop held in Winston-Salem. They expressed strong support for direct SEHSR service and a station in the Winston-Salem area. Workshop participants felt the development of the proposed SEHSR service and station would be a positive economic development boost for the area.

Segment 19 S-Line from Cary (Fetner), NC to Colon, NC

This segment is located just south of Segment 13. It is owned and operated by CSX Transportation (CSXT) and ties Durham and Raleigh to points south through the Hamlet Yard. Six trains operate over this line each day, including two Amtrak operations to and from Florida. It is a critical route for CSXT with markets north and south. In 2000 a new Sanford-Lee County Regional Airport was opened north of SR 1425 adjacent to the east side of the S-line (MP S-190).

[11] Source: Piedmont Triad Intercity Rail Study Briefing, September 2000 by Parsons Brinckerhoff Quade & Douglas, Inc.

Segment 20 Norfolk Southern NS-Line/ Norfolk Southern CF-line from Colon, NC to Cumnock, NC to Gulf, NC

South, and west, from Raleigh, this segment includes portions of the S-line, the NS-line, and the CF-line. A majority of the existing NS-line and CF-line are single track, in poor condition with numerous curves (three to eight degrees) - many of which are back-to-back, reverse and multiple curves. These conditions do not facilitate high speed rail operations. In addition, to improve conditions, extensive earthwork would be required and numerous bridges would have to be replaced or new bridges built to span drainage basins. This type of construction would cause the potential relocation of roadways, residences, and businesses adjacent to the railroad

Segment 21 ACWR Gulf, NC to Charlotte, NC

This segment is single track with several passing sidings. There are two freight trains per day. There are numerous curves along this segment in the four to eight degree range. Many curves are back-to-back, reverse and multiple-reverse curves. Speeds on this track are limited to 25 mph. Many of the vertical curves are inadequate for high speed operation and will require extensive earthwork to correct.

Data collected during a field survey indicate there are 15 overhead bridges and 35 underpass bridges. Preliminary assessment concludes that possibly four of the overpass structures and eight of the underpass structures can be retained with refurbishment. The construction required in this segment would cause potential relocation of roadways, residences, and businesses. Potential community impacts could be incurred from Spies to Star, and in the towns of Troy, Mount Gilead, Norwood, Aquadale, Oakboro, and Wilgrove, NC.

2.4.2 Development and Characteristics of Study Area Alternatives

Following identification of the study segments, Study Area Alternatives were developed. Each study area contains linked segments that create a corridor from Washington, DC to Charlotte, NC. Each Study Area Alternative is six miles in width, with an existing (or former) rail line at the centerline.

A building block approach was utilized by the States to develop the Build Alternatives. At this level of analysis, specific routes were not identified, rather swatches of study areas were used to help guide the environmental analysis. As analysis becomes more specific and focused in Tier II studies, specific SEHSR service routes would by analyzed. Service routes could be developed and implemented on existing rail lines, or on segments of existing rail lines in conjunction with areas of new track. As such, general Study Area Alternatives for this document combine various rail line (or potential rail line) segments. In addition to these alternatives, a No Build Alternative was developed. The No Build Alternative encompasses the travel corridor's existing transportation network, as well as planned infrastructure improvements for the network.

This section presents each Study Area Alternative and describes its segments, rail lines, location, and basic characteristics.

The former Richmond, Fredericksburg and Potomac Railroad (RF&P) is contained in each Study Area Alternative. The nine Study Area Alternatives, and their segments, are:

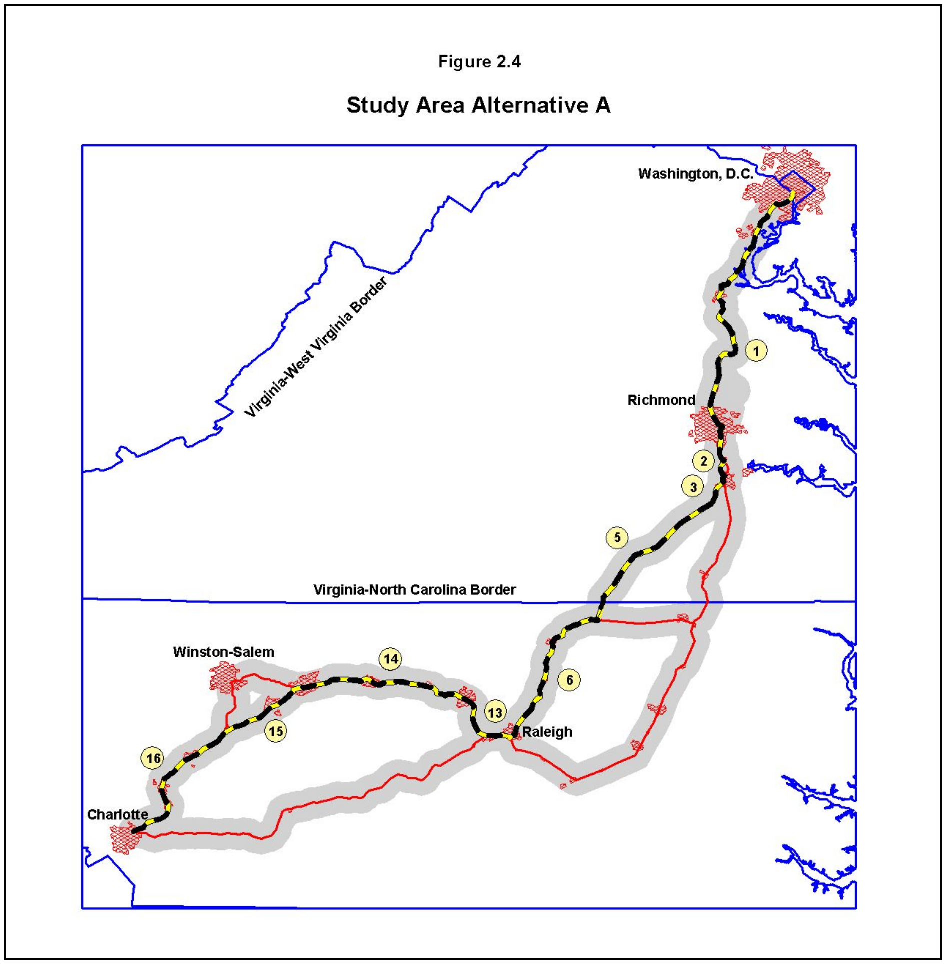
- **Study Area Alternative A** – Segments 1, 2, 3, 5, 6, 13, 14, 15, and16 - Former RF&P, S-line, A-line, and the NCRR;
- **Study Area Alternative B** – Segments 1, 2, 3, 5, 6, 13, 14, 16, 17, and 18 - Former RF&P, S-line, A-line, NCRR, K-line, and the WSSB;

- **Study Area Alternative C** – Segments 1, 2, 3, 5, 6, 13, 19, 20, and 21 - Former RF&P, S-line, NS-line, CF-line, A-line, and the ACWR;
- **Study Area Alternative D** – Segments 1, 7, 8, 9, 11, 6, 13, 14, 15, and 16 - Former RF&P**,** A-line, SA-line, S-line, and the NCRR;
- **Study Area Alternative E** – Segments 1, 7, 8, 9, 11, 6, 13, 14, 16, 17, and18 - Former RF&P, A-line, SA-line, S-line, NCRR, K-line and the WSSB;
- **Study Area Alternative F** – Segments 1, 7, 8, 9, 11, 6, 13, 19, 20, and 21 - Former RF&P**,** A-line, SA-line, S-line, NS-line, CF-line, and the ACWR;
- **Study Area Alternative G** – Segments 1, 7, 8, 9, 10, 12, 13, 14, 15, and 16 - Former RF&P, A-line and the NCRR;
- **Study Area Alternative H** – Segments 1, 7, 8, 9, 10, 12, 13, 14, 16, 17, and 18 - Former RF&P, A-line, NCRR, K-line, and the WSSB; and
- **Study Area Alternative J** – Segments 1, 7, 8, 9, 10, 12, 13, 19, 20 and 21 - Former RF&P, A-line, NCRR, S-line, NS-line, CF-line, and the ACWR.

Please note, in an effort to avoid confusion, the letter “I” was not used as a Study Area Alternative label.

Study Area Alternative A

Study Area Alternative A includes the following segments: 1, 2, 3, 5, 6, 13, 14, 15 and 16.



This Study Area Alternative contains portions of the former RF&P, S-line, A-line and the NCRR. It includes the former RF&P right-of-way south of Washington, DC and encompasses the locations of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond, VA. South of Richmond the study area travels southwest from Main Street Station over the S-line (and portions of the A-line) and the cities of Centralia, Petersburg (Ettrick Station), Burgess and La Crosse, Virginia. Entering North Carolina, the study area continues south and includes the cities of Norlina, Henderson, and Raleigh, NC. In the vicinity of Raleigh the study area includes the NCRR and travels west-northwest to include the cities of Cary, Durham, Burlington, and Greensboro, NC. In the Greensboro vicinity the study area travels southwest, generally following the NCRR to include the locations of High Point, Lexington, Salisbury and terminates in the City of Charlotte.

Table 2.1 Study Area Alternative A Characteristics	
Length	448 miles
Existing Railroad right-of-way	677.8 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.23 hours
Average Travel Speed	72.6 mph
Conceptual Capital Cost (Year 2000 $s)	$2.61 billion
Year 2025 Annual Ridership	1,790,600
Year 2025 Revenue	$107 million/$59.85 per passenger
Year 2025 Net Operating Costs	$78.81 million

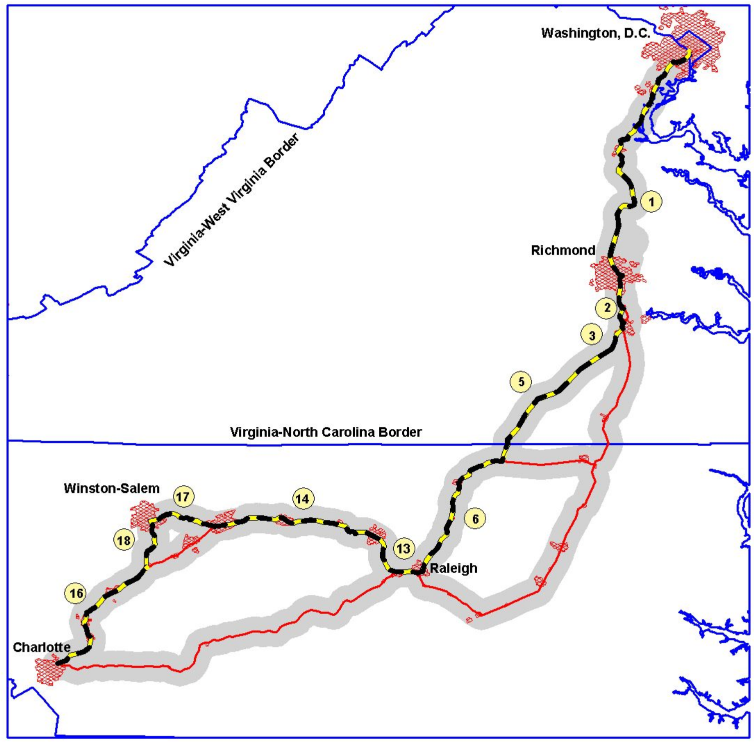
Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

Study Area Alternative B

Study Area Alternative B contains the following segments 1, 2, 3, 5, 6, 13, 14, 16, 17 and 18.

Figure 2.5

Study Area Alternative B



This Study Area contains portions of the former RF&P, S-line, A-line, the NCRR, the K-line and the WSSB. It includes the former RF&P right-of-way south of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond, VA. South of Richmond the study area travels southwest along the S-line (and portions of the A-line) through the cities of Centralia, Petersburg (Ettrick Station), Burgess, and La Crosse, Virginia. Entering North Carolina, the study area continues south and includes the cities of Norlina, Henderson, and Raleigh, NC. In the vicinity of Raleigh the study area includes the NCRR and travels west-northwest to include the locations of Cary, Durham, Burlington, and Greensboro, NC. In the Greensboro vicinity the study area travels due west to serve Winston-Salem via the K-line. The study area goes south out of Winston-Salem via the WSSB, which rejoins the NCRR at Lexington. The study area continues south via the NCRR to serve Salisbury and terminates in the City of Charlotte.

Table 2.2 Study Area Alternative B Characteristics	
Length	463 miles
Existing Railroad right-of-way	731.31 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.90 hours
Average Travel Speed	68.7 mph
Conceptual Capital Cost (Year 2000 $s)	$2.72 billion
Year 2025 Annual Ridership	1,756,700
Year 2025 Revenue	$109 million/$62.06 per passenger
Year 2025 Net Operating Costs	$81.7 million

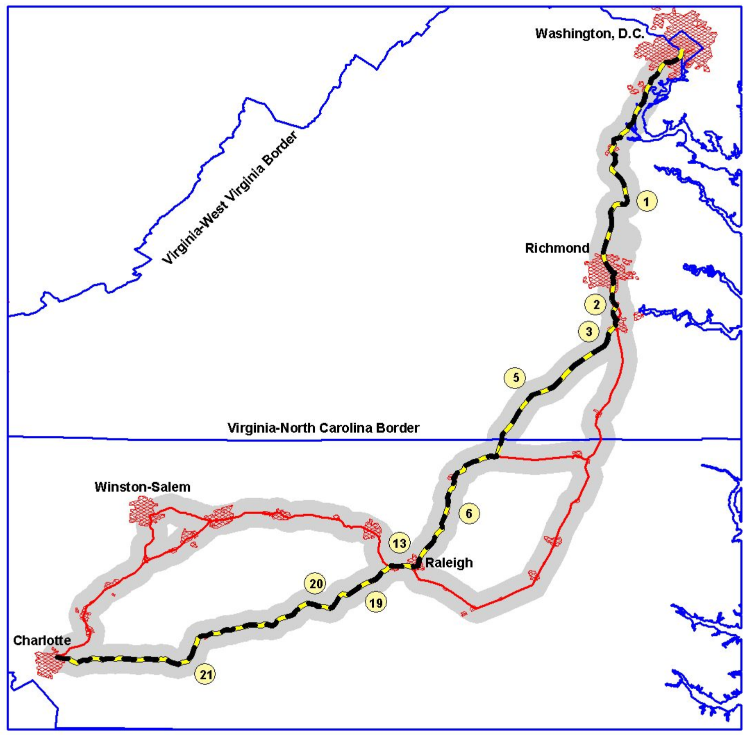
Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

Study Area Alternative C

Study Area Alternative C contains the following segments 1, 2, 3, 5, 6, 13, 19, 20 and 21.

Figure 2.6

Study Area Alternative C



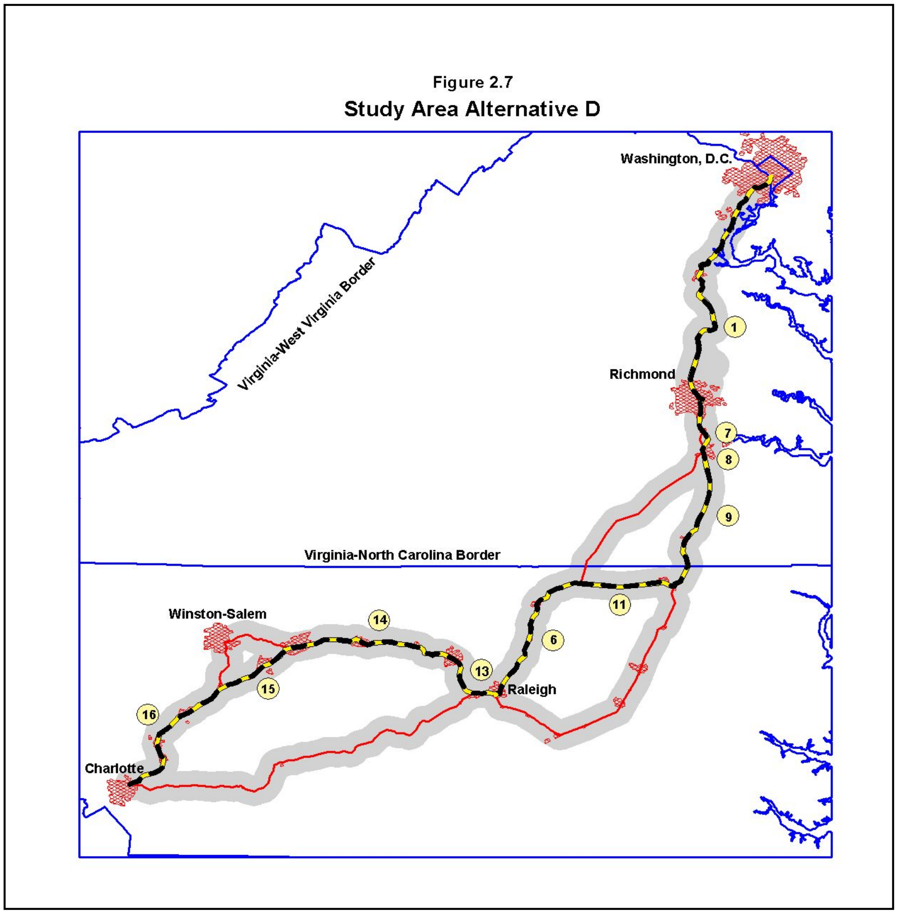
This Study Area contains portions of the former RF&P, the S-line, the A-line and the ACWR. It includes the former RF&P right-of-way south of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond. South of Richmond the study area travels southwest, including the S-line (and portions of the A-line) and the cities of Burgess and La Crosse, Virginia. Entering North Carolina, the study area continues south and includes the cities of Norlina, Henderson, and Raleigh. In the vicinity of Raleigh the study area travels southwest. Cities served include Apex, New Hill, and Moncure, NC. The study area continues to follow the general alignment of the S-line to Colon, NC where it travels west along the NS-line and CF-line to Gulf, NC. In the vicinity of Gulf, the study area includes the ACWR right-of-way. It follows the general alignment of the ACWR southwest to serve the southwestern counties of North Carolina. Locations served include Robbins, Star, Troy, Norwood, Oakboro, Aquadale, and Midland, NC. The study area terminates in the City of Charlotte.

Table 2.3 Study Area Alternative C Characteristics	
Length	428 miles
Existing Railroad right-of-way	929.95 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.20 hours
Average Travel Speed	70.0 mph
Conceptual Capital Cost (Year 2000 $s)	$2.52 billion
Year 2025 Annual Ridership	1,400,900
Year 2025 Revenue	$73.89 million/$52.71 per passenger
Year 2025 Net Operating Costs	$73.15 million

Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

Study Area Alternative D

Study Area Alternative D contains the following segments 1, 6, 7, 8, 9, 11, 13, 14, 15 and 16.



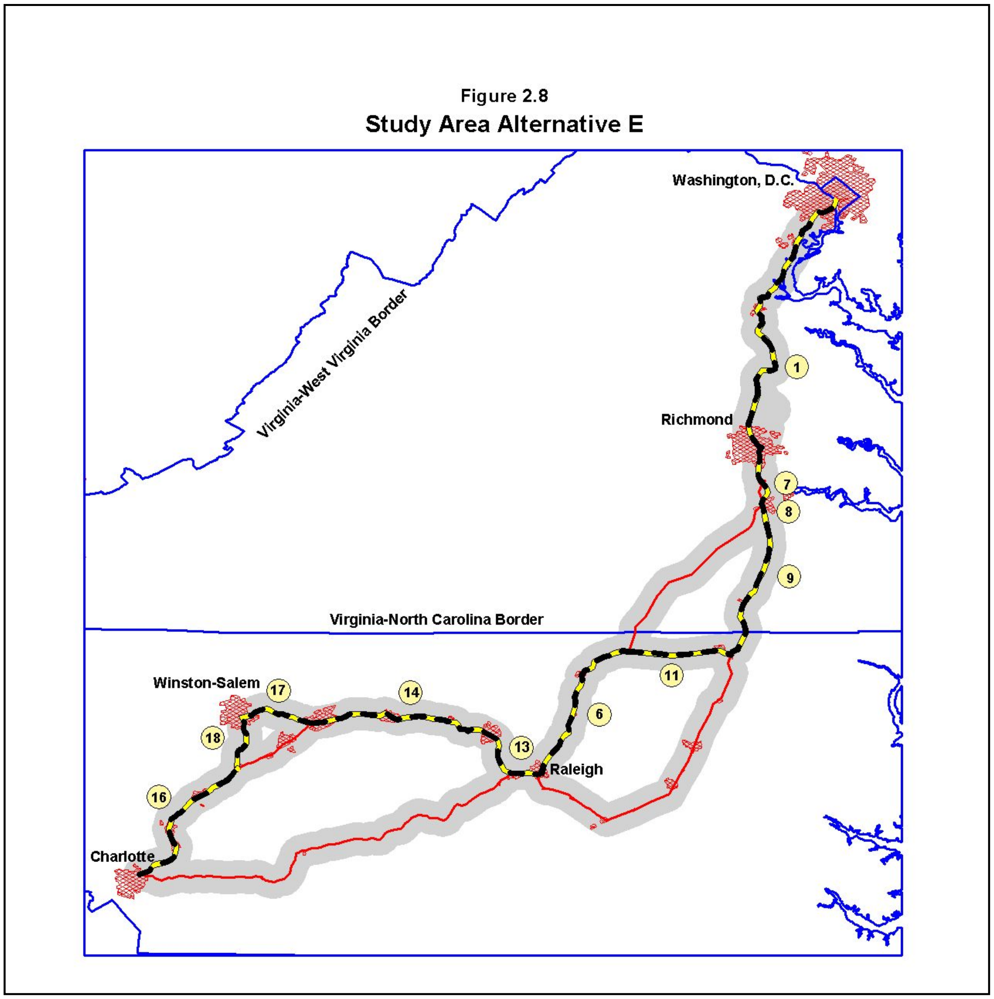
This study area contains portions of the former RF&P, the A-line, the SA-line, the S-line and the NCRR. It includes the former RF&P south of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond, VA. South of Richmond the study area travels south and east, along the A-line and serves the cities of Chester, Colonial Heights, Petersburg (Ettrick Station), Collier, Emporia, VA and Weldon, NC. In the vicinity of Weldon, the study area includes the SA-line and follows it west to the City of Norlina. The study area heads south out of Norlina over the S-line to Raleigh. Heading west out of Raleigh the study area follows the general alignment of the NCRR to serve Cary, Durham, Hillsborough, Burlington and Greensboro, NC. In the vicinity of Greensboro, the study area continues to follow the general alignment of the NCRR travels south and west to serve the locations of High Point, Lexington, Salisbury, and Concord/Kannapolis, NC and terminates in the City of Charlotte.

Table 2.4 Study Area Alternative D Characteristics	
Length	468 miles
Existing Railroad right-of-way	620.13 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.55 hours
Average Travel Speed	73.1 mph
Conceptual Capital Cost (Year 2000 $s)	$2.71 billion
Year 2025 Annual Ridership	1,700,700
Year 2025 Revenue	$99.40 million/$58.44 per passenger
Year 2025 Net Operating Costs	$78.5 million

Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

Study Area Alternative E

Study Area Alternative E contains the following segments 1, 6, 7, 8, 9, 11, 13, 14, 16, 17 and 18.



This Study Area includes portions of the former RF&P, the A-line, the SA-line, the S-line, the NCRR, the K-line and the WSSB. It includes the former RF&P south out of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond, VA. South of Richmond the study area travels south and east, and serves the cities of Chester, Colonial Heights, Petersburg (Ettrick Station), Collier, Emporia, and Weldon, NC. In the vicinity of Weldon, the study area follows the SA-line and travels west to the City of Norlina. The study area heads south out of Norlina to Raleigh. Heading west out of Raleigh the study area follows the general alignment of the NCRR to serve the locations of Cary, Durham, Hillsborough, Burlington and Greensboro, NC. In the vicinity of Greensboro, the study area travels due west to serve Kernersville and Winston-Salem via the K-line. The study area goes south out of Winston-Salem, generally following the alignment of the WSSB to serve Lexington. The study area continues south via the NCRR to serve Salisbury and terminates in the City of Charlotte.

Table 2.5 Study Area Alternative E Characteristics	
Length	483 miles
Existing Railroad right-of-way	673.59 acres
Average Total Travel Time (Washington, DC to Charlotte)	7.23 hours
Average Travel Speed	69.3 mph
Conceptual Capital Cost (Year 2000 $s)	$2.82 billion
Year 2025 Annual Ridership	1,660,600
Year 2025 Revenue	$101.6 million/$61.18 per passenger
Year 2025 Net Operating Costs	$81.55 million

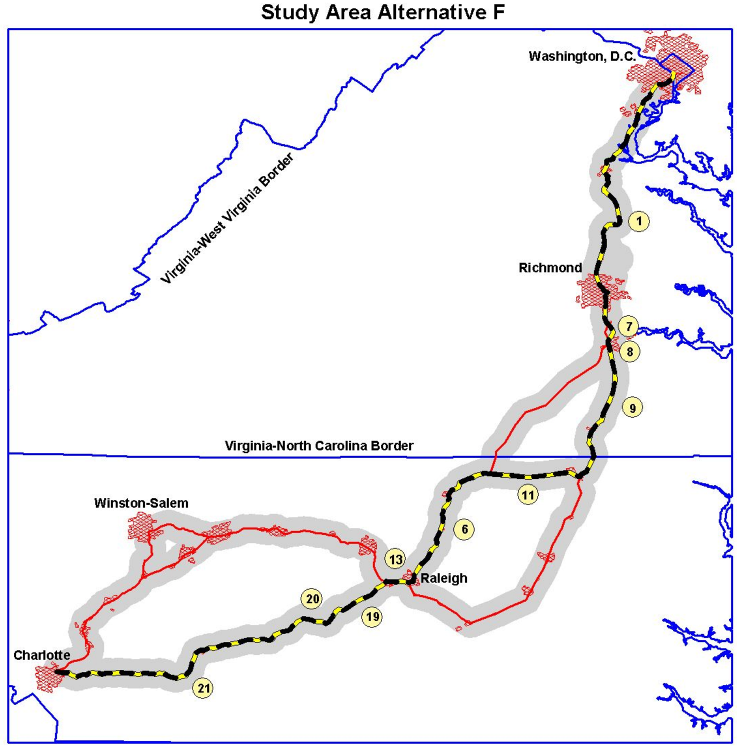
Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

Study Area Alternative F

Study Area Alternative F contains the following segments 1, 6, 7, 8, 9, 11, 13, 19, 20 and 21.

Figure 2.9

Study Area Alternative F



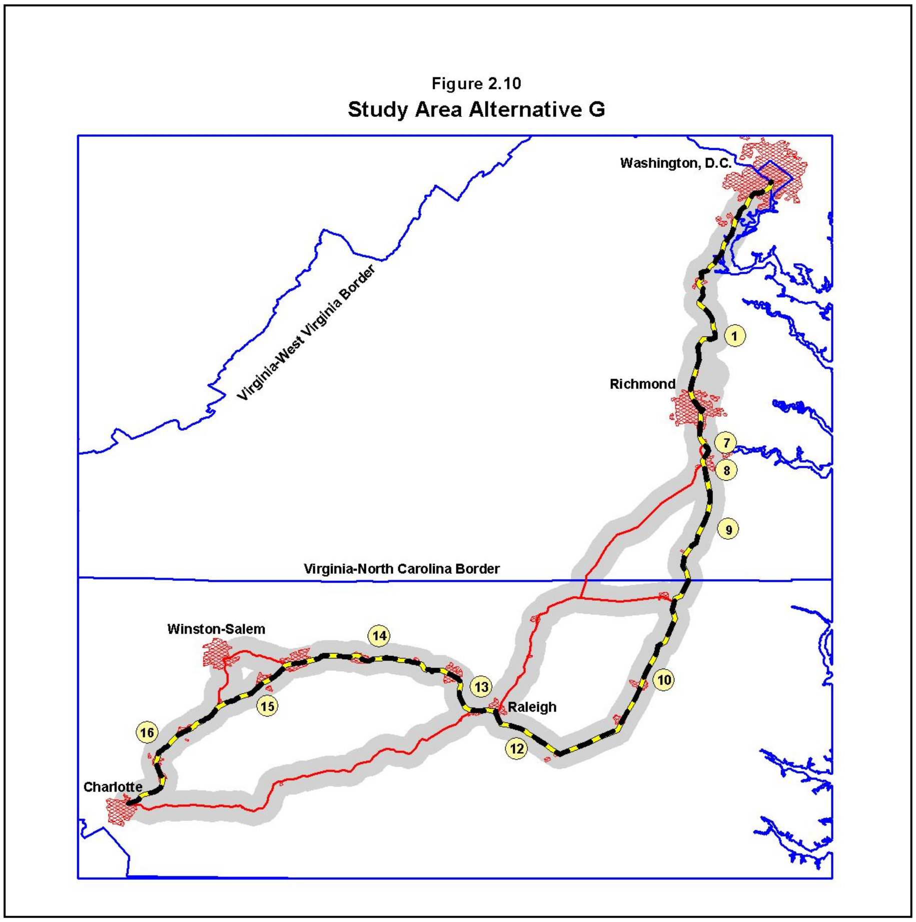
This Study Area includes portions of the former RF&P, the A-line, the SA-line, the S-line, and the ACWR railroad. It includes the former RF&P south out of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond, VA. South of Richmond the study area travels south and east and serves the cities of Chester, Colonial Heights, Petersburg (Ettrick Station), Collier, Emporia, and Weldon, NC. In the vicinity of Weldon, the study area travels west to the City of Norlina. The study area heads south out of Norlina to include the S-line to Raleigh. Heading south out of Raleigh the study area follows the general alignment of the S-line. Cities served include Apex, New Hill, and Moncure, NC. The study area continues to follow the general alignment of the S-line to Colon, NC where it travels west along the NS-line and CF-line to Gulf, NC. In the vicinity of Gulf, the study area includes the ACWR. It follows the general alignment of the ACWR southwest to serve the southern counties of North Carolina. Locations served include Robbins, Star, Troy, Norwood, Oakboro, Aquadale, and Midland, NC. The study area terminates in the City of Charlotte.

Table 2.6 Study Area Alternative F Characteristics	
Length	448 miles
Existing Railroad right-of-way	872.23 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.53 hours
Average Travel Speed	70.5 mph
Conceptual Capital Cost (Year 2000 $s)	$2.62 billion
Year 2025 Annual Ridership	1,333,300
Year 2025 Revenue	$82.04 million/$61.53 per passenger
Year 2025 Net Operating Costs	$73.29 million

Source: Carter & Burgess November 2000: KPMG Model Forecast Data; October 2000.

Study Area Alternative G

Study Area Alternative G contains the following segments 1, 7, 8, 9, 10, 12, 13, 14, 15 and 16.



This study area contains portions of the former RF&P, the A-line and the NCRR. It includes the former RF&P south of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond. South of Richmond the study area travels south and east and serves the cities of Chester, Colonial Heights, Petersburg (Ettrick Station), Collier, Emporia, and Weldon, NC. It continues to follow the general alignment of the A-line south including the communities Rocky Mount, Wilson, and Selma. In the vicinity of Selma, the A-line intersects the NCRR. The study area heads north and west generally following the alignment of the NCRR and includes the cities of Clayton, Garner, Raleigh, Cary, Durham, Hillsborough, Burlington, and Greensboro. In the vicinity of Greensboro, the study area continues to follow the general alignment of the NCRR, which travels south and west to serve the locations of High Point, Lexington, Salisbury, and Concord/Kannapolis and terminates in the City of Charlotte.

Table 2.7 Study Area Alternative G Characteristics	
Length	481 miles
Existing Railroad right-of-way	544.99 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.75 hours
Average Travel Speed	72.1 mph
Conceptual Capital Cost (Year 2000 $s)	$2.85 billion
Year 2025 Annual Ridership	1,669,700
Year 2025 Revenue	$94.87 million/$56.82 per passenger
Year 2025 Net Operating Costs	$78.36 million

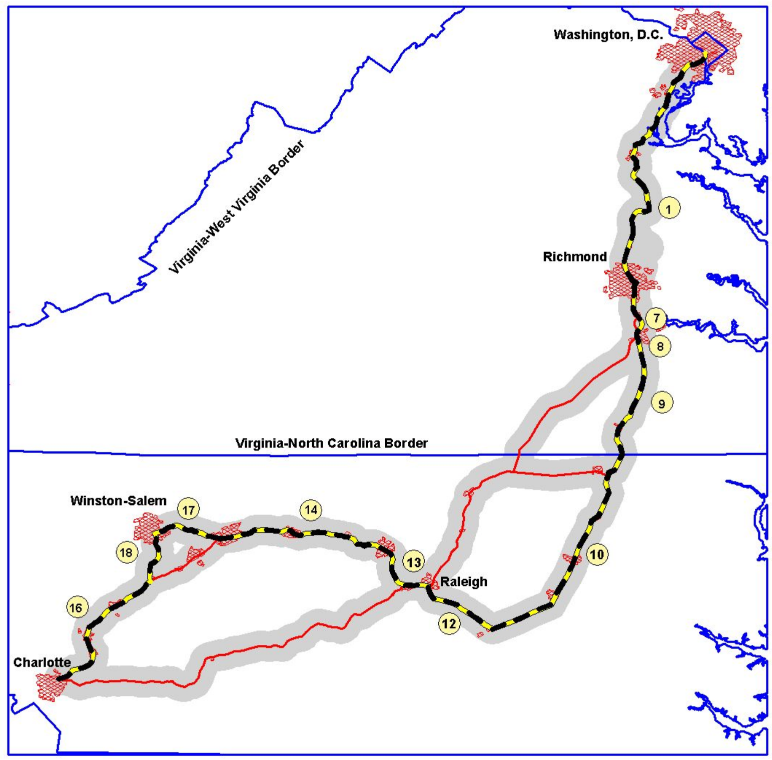
Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

Study Area Alternative H

Study Area Alternative H contains the following segments 1, 7, 8, 9, 10, 12, 13, 14, 16, 17 and 18.

Figure 2.11

Study Area Alternative H



This study area contains portions of the Former RF&P, the A-line and the NCRR. It includes the Former RF&P south of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond. South of Richmond the study area travels south and east and serves the cities of Chester, Colonial Heights, Petersburg, (Ettrick Station), Collier, Emporia, and Weldon, NC. It continues to follow the general alignment of the A-line south including the communities of Rocky Mount, Wilson, and Selma. In the vicinity of Selma, the A-line interfaces with the NCRR. The study area heads north and east generally following the alignment of the NCRR and includes the locations of Clayton, Garner, Raleigh, Cary, Durham, Hillsborough, Burlington, and Greensboro. In the vicinity of Greensboro, the study area continues west to generally follow the alignment of the K-line and includes the Cities of Winston-Salem and Kernersville. The study area goes south out of Winston-Salem, generally following the alignment of the WSSB to serve Lexington. The study area continues south via the NCRR to serve Salisbury and terminates in the City of Charlotte.

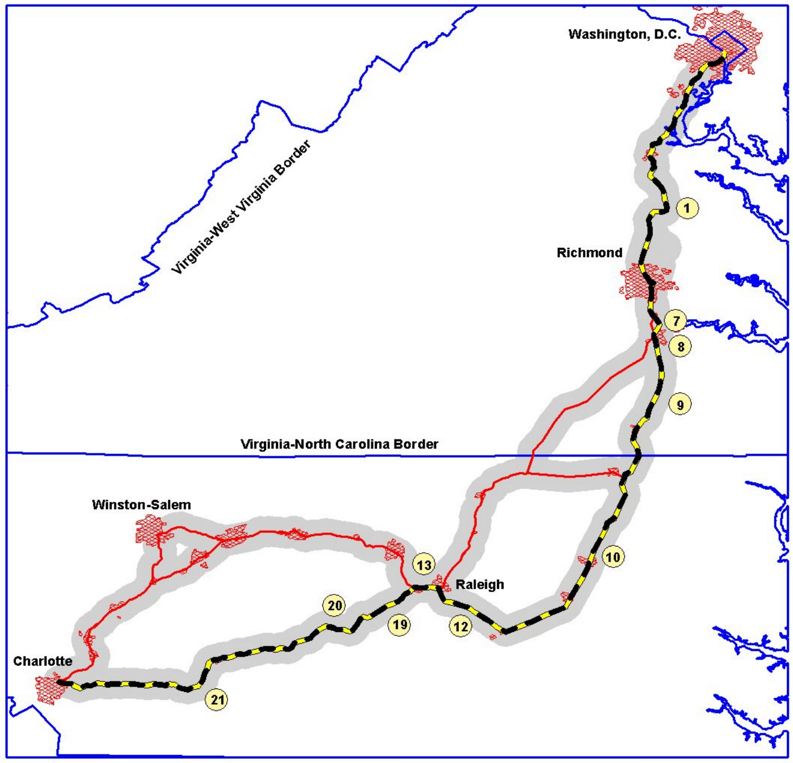
Table 2.8 Study Area Alternative H Characteristics	
Length	496 miles
Existing Railroad right-of-way	598.0 acres
Average Total Travel Time (Washington, DC to Charlotte)	7.43 hours
Average Travel Speed	68.5 mph
Conceptual Capital Cost (Year 2000 $s)	$2.96 billion
Year 2025 Annual Ridership	1,625,000
Year 2025 Revenue	$96.89 million/$59.62 per passenger
Year 2025 Net Operating Costs	$81.47 million

Source: Carter & Burgess November 2000: KPMG Model forecast Data, October 2000.

Study Area Alternative J

Study Area Alternative J contains the following segments 1, 7, 8, 9, 10, 12, 13, 19, 20 and 21.

Figure 2.12
Study Area Alternative J



This study area contains portions of the former RF&P, the A-line and the NCRR. It includes the former RF&P south out of Washington, DC and encompasses the metropolitan areas of Alexandria, Woodbridge, Fredericksburg, Ashland, and Richmond. South of Richmond the study area travels south and east and serves the cities of Chester, Colonial Heights, Petersburg (Ettrick Station), Collier, Emporia, and Weldon, NC. It continues to follow the general alignment of the A-line south including the communities of Rocky Mount, Wilson, and Selma. In the vicinity of Selma, the A-line intersects the NCRR. The study area heads north and west generally following the alignment of the NCRR and includes the cities of Clayton, Garner, and Raleigh. Heading south out of Raleigh the study area follows the general alignment of the S-line. Cities served include Apex, New Hill, and Moncure. The study area continues to follow the general alignment of the S-line to Colon, NC where it travels west along the NS-line and CF-line to Gulf, NC. In the vicinity of Gulf, the study area includes the ACWR. It follows the general alignment of the ACWR southwest to serve the south western counties of North Carolina. Locations served include Robbins, Star, Troy, Norwood, Oakboro, Aquadale, and Midland. The alternative terminates in the vicinity of the City of Charlotte.

Table 2.9 Study Area Alternative J Characteristics	
Length	461 miles
Existing Railroad right-of-way	579.0 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.73 hours
Average Travel Speed	69.6 mph
Conceptual Capital Cost (Year 2000 $s)	$2.75 billion
Year 2025 Annual Ridership	1,312,000
Year 2025 Revenue	$78.88 million/$60.12 per passenger
Year 2025 Net Operating Costs	$73.32 million

Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.

2.5 No Build Alternative

The No Build Alternative consists of the existing transportation network in the Southeast travel corridor. Included in this alternative are:

- the major highways that make up the roadway network;
- air travel;
- existing conventional passenger rail service (Amtrak);
- intercity bus services;
- local public transit services;
- commuter rail services; and,
- freight railroad services

The No Build Alternative also includes existing and committed highway, rail and airport improvements.

Without the full implementation of the proposed SEHSR program, annual rail ridership along the corridor connecting Washington, DC with Charlotte, NC is projected to grow from its current level of 418,000 to 498,000 by 2015 and to 543,000 by 2025 (or slightly more than one percent per year).

A 1999 report presented to Congress by FRA entitled *Potential Improvements to the Washington D C to Richmond Railroad Corridor* studied existing travel conditions and noted that the 1999 operating capabilities and traffic volumes along that corridor are already producing delays that are affecting intercity passenger, commuter, and freight trains on the Washington, DC - Richmond corridor. The travel delays within the corridor are due to the increasing volumes of both passenger and freight service in the corridor. The need to efficiently manage peak passenger and freight rail traffic will become even more critical over the next 15 years. Both the CSX Transportation (CSXT) and Norfolk Southern (NS) have identified the I-95 corridor (which traverses much of the SEHSR Study Area Alternatives) as a key growth corridor for freight movement. A second congressional report detailing potential improvements to the Richmond, VA to Charlotte, NC corridor will be completed by USDOT during 2001.

According to a September 1997 Federal Railroad Administration (FRA) Report, as population and travel demand grow, intercity transportation by air and auto will increasingly suffer from congestion and time delays, particularly in metropolitan areas, at and around airports, and during weekend, holiday and bad weather periods.[12] This decline in the level of service and the quality of the travel experience adversely affects the intercity traveler, other transportation system users, carriers and the general public.

Since the No Build Alternative encompasses the actual transportation network within the areas under review, reference is made - throughout discussion of this alternative - to the Study Area Alternatives (and their Study Segments). In other words, the No Build Alternative includes the geographic area contained within the combined Study Area Alternatives.

The No Build Alternative provides a foundation of comparison between doing nothing and implementing the SEHSR program. This alternative will be used as a baseline throughout this environmental document.

[12] High Speed Ground Transportation for America, Federal Railroad Administration, September 1997.

2.5.1 Highway Network

The No Build Alternative contains several highways on the Interstate and National Highway Systems (NHS) in Virginia and North Carolina. Interstate highways serve and link major metropolitan centers in the Study Area Alternatives. Smaller cities are also linked to these major metropolitan areas by these interstate highways. Interstates 95, 295, 395, 495, and 66 originate and travel through or around the Washington, DC metropolitan area. Interstates 95 and 64 travel through Richmond, VA. Richmond is also served by I-295, which provides a beltline around Richmond. Petersburg, VA is located at the junction of I-95 and I-85. Raleigh, Durham, and Chapel Hill, NC are located at the connection of I-40 and I-85. I-40 and I-85 serve most of the cities of North Carolina's Piedmont crescent: Burlington, Greensboro, Winston-Salem, and High Point, NC. Interstate Highways 85 and 77 travel through the Charlotte metropolitan area. The majority of intercity automobile travel in the Charlotte to Washington corridor is accommodated on Interstates 95 and 85. I-85 runs parallel to the NCRR rail line between Charlotte and Cary, NC and follows the S-line from Cary north to Petersburg, VA. From Petersburg, VA north to Washington, I-95 parallels the A-line to Richmond, VA and the former RF&P from Richmond north.

Automobiles, including cars, trucks, buses and vans carry 74% of the passenger traffic between Washington and Richmond. Daily traffic volumes regularly exceed the design capacity of both I-85 and I-95 through the Study Area Alternatives, causing delays and safety concerns. Traffic volumes exceed I-95's design capacity for this segment daily. From 1986 to 1996, overall traffic volumes increased by 68% on I-85 and 40% on I-95 in North Carolina.

Vehicle miles traveled within North Carolina's urban areas are expected to grow by 60% between 1990 and 2010. Truck traffic on I-85 and I-95 is also very high compared with other facilities within the two states. Average highway speeds (particularly during rush hour) are declining, while concerns about air quality along these highways are rising.

Existing and Committed Highway Improvements

The national trend shows the number of vehicles using the highways has increased faster than have efforts to widen and construct new roads. Virginia and North Carolina are in the process of planning or constructing the expansion of many of the Interstate highways that traverse the Study Area Alternatives to provide additional capacity. Table 2.10 provides a general overview of the committed improvements for the major interstates in the Study Areas.

Table 2.10
Existing and Committed Interstate Improvements in the Study Area Alternatives

State	Interstate Facility	Committed Improvements 2002-2008
VA	I-95 from Washington DC to Fredericksburg	The expansion of the park and ride lot at the intersection of I-95 and Prince William County Parkway is underway. In Fairfax interchange modifications are planned for the northbound express and HOV lanes and various ramps. HOV lanes are being constructed between I-95/I-395/I-495. The reworking of the Springfield interchange at the junction of I-395 and I-95
VA	I-95 Richmond area	The restoration of 13 bridges is planned as well as the restoration of the James River bridge through the city of Richmond.
VA	I-295 Richmond Beltline	A new flyover bridge at the junction of I-295 and I-64 is planned for construction.
VA	I-85 Petersburg	One mile of I-85 around Petersburg at exit 68 is being constructed.

Table 2.10 Existing and Committed Interstate Improvements in the Study Area Alternatives		
State	**Interstate Facility**	**Committed Improvements 2002-2008**
VA	I-64 Newport News	One mile of I-64 between exits 255 and 262 around Newport News is being widened.
NC	I-40 between I-440 and Durham	There is a study underway to add HOV lanes between the Raleigh Beltline (I-440) and Durham.
NC	I-40 Between Greensboro and Winston-Salem	The construction of additional lanes and bridge reconstruction is currently underway between Mount Hope Church Road and the Piedmont Triad Regional Airport.
NC	I-540 Raleigh Outer Beltline	Portions of I-540, the Raleigh outer beltline are currently under construction.
NC	I-85 from Durham to Burlington	A portion of I-85 between Durham and Burlington has been widened to 8 lanes with the widening of the remainder of this section to be completed by 2002.
NC	Eastern Urban Loop- (U-2525) Greensboro	Construction of U-2525 is underway for this new roadway from U.S. 70 to I-40/I85 near Mc Connell Road. The segment from US 70 to Lawndale Drive is to be completed by 2006.
NC	Southern Urban Loop (2402)/I-85 Bypass – Greensboro	This segment will join the eastern Loop at I-40/I-85 near Mc Connell Road and connect to existing I-85 south of Holden Road to be complete by 2003.
NC	Western Urban Loop (U2524) Greensboro	The Western Urban Loop from I-40 to Airport Parkway (Piedmont Triad) is to be completed by 2005.
NC	I-85 from Lexington to Kannapolis	The existing portion of I-85 from Lexington to Kannapolis is to be improved to 8 lanes beyond 2008.
NC	I-85 from Kannapolis to Charlotte	Additional lanes for I-85 from Kannapolis to Charlotte are planned for construction beyond 2008.
NC	I-485 Charlotte Beltline	Portions of this new I-485 roadway are complete with the facility scheduled for completion by 2004.
NC	I-77 between Charlotte and Statesville	I-77 between Charlotte and Statesville will be resurfaced.

Source: Virginia Department of Transportation, Traffic Engineering Division, 1999 and the North Carolina Department of Transportation, Statewide Planning Branch, 1997, 1998.

2.5.2 Air Travel Network

Six major airports and four smaller airports serve the Study Areas Alternatives. The six major airports include:

- Ronald Reagan Washington National Airport (DCA)- located in Arlington, Virginia directly across the Potomac River from Washington, DC. DCA has approximately 44,000 daily passengers with domestic service on 18 passenger airlines providing daily non-stop service to 62 cities.
- Washington Dulles International Airport (IAD)- located in Northern Virginia (Fairfax and Loudoun Counties). IAD has approximately 43,000 daily passengers with more than 900 commercial, general aviation and commuter flights to 75 US cities and 28 foreign cities.
- Richmond International Airport (RIC) - located in the Richmond-Petersburg Metropolitan Statistical Area (MSA). RIC provides service to 43 cities, both foreign and domestic. RIC is one of the fastest growing air cargo facilities in the US with a 20% increase in cargo volumes over the last 10 years.
- Charlotte/Douglas International Airport (CLT) - located in the Charlotte-Gastonia-Rock Hill MSA. CLT has approximately 500 daily flights with service to 160 cities.

- Piedmont Triad International Airport (PTI) - located in the Winston-Salem-Greensboro-High Point MSA. PTI has approximately 1,306,000 enplanements, approximately 3,600 daily passengers, in 1998 with daily service to 17 cities.
- Raleigh-Durham International Airport (RDU) - located in the Raleigh-Durham-Chapel Hill MSA. RDU has approximately 8.9 million passengers in 1999, approximately 24,400 daily passengers, with service to 50 cities both domestic and foreign.

In addition to these six major airports, four smaller regional airports that offer limited, scheduled service, include: the Manassas Regional Airport in Virginia, and the Rocky Mount-Wilson Airport, the Smith Reynolds Airport (Winston-Salem), and the Concord Regional Airport (Concord outside of Charlotte) in North Carolina. Both states are also serviced by a number of municipal, county and general aviation airports. As airlines continue to consolidate into major hub airports and focus on the more profitable long-haul services, passenger service to the smaller airports may be further reduced. USAir recently announced plans to discontinue passenger service from the Rocky Mount Wilson Airport in March of 2002.

Existing and Committed Air Facility Improvements

The demand for air travel is rapidly increasing nationwide and in the nine Study Area Alternatives. Over the past two decades, the expansion of air traffic has far outpaced the growth in airport capacity. Of the six major airports within the Study Areas, five have either recently implemented airport expansion plans or are currently expanding their facilities to meet increasing air travel demands. Projections show that by 2003, the major east coast airports linking the northeast and southeast are estimated to generate 20,000 annual hours of flight delays. For many of these airports, the FAA has determined that recommended improvements alone would not adequately meet the projected growth in demand.[13] Table 2.11 provides a general overview of the existing and committed improvements for the six major airports that serve the Study Area Alternatives.

Table 2.11
Existing/Committed Improvements at the Major Airports in the Study Area Alternatives

Airport	Location	Existing and Committed Improvements
Ronald Reagan Washington National (DCA)	Arlington, Virginia directly across the Potomac River from Washington, DC.	A new 1 million square foot terminal opened in 1997 with 35 new gates and a direct connection to the Metrorail (WMATA) public transportation system.
Washington Dulles International Airport (IAD)	Northern Virginia-Fairfax and Loudoun Counties	An expansion of the airport was recently completed and there are plans for an underground connection to the main terminal and permanent mid field terminals. An extension of Metrorail commuter service to the airport is in planning stages.
Richmond International Airport (RIC)	Richmond –Petersburg Metropolitan Statistical Area (MSA)	The airport has several expansion projects planned or currently underway, including a new air traffic control tower, terminal expansion, parking expansion, and the extension of its longest runway.
Charlotte/Douglas International Airport (CLT)	Charlotte-Gastonia-Rock Hill MSA	Charlotte's transit plan recommends bus rapid transit to serve the airport and connect it to the proposed SEHSR service in downtown Charlotte. CLT is also looking at another terminal and adding a runway.
Piedmont Triad International Airport (PTI)	Winston-Salem, Greensboro, High Point MSA	Currently, PTI is expanding its facilities and ground airport access to accommodate the new hub for Federal Express.

[13] Federal Aviation Administration. 1994 Aviation Capacity Enhancement Plan.

Table 2.11 Existing/Committed Improvements at the Major Airports in the Study Area Alternatives		
Airport	**Location**	**Existing and Committed Improvements**
Raleigh-Durham International Airport (RDU)	Raleigh-Durham-Chapel Hill MSA	The airport is currently expanding its parking facilities and overhauling its general aviation facilities. TTA serves the airport with bus service and plans to continue to enhance and expand this service to tie into their planned future regional commuter rail service and would connect to the proposed SEHSR service at hub stations. The airport's long-term plans include expanding the passenger air terminals and adding a runway.

Source: Federal Aviation Administration. 1994 Aviation Capacity Enhancement Plan

.

2.5.3 Passenger Rail Services

Amtrak currently provides conventional passenger rail service within the Study Area Alternatives on the *Crescent*, the *Silver Meteor*, the *Silver Star*, the *Silver Palm,* the *Piedmont* and the *Carolinian*. The Virginia Railway Express (VRE) provides commuter rail service from northern VA along the I-95 and I-66 corridors from Fredericksburg and Manassas. VRE makes stops at Metrorail stations located in Alexandria, Crystal City, L' Enfant Plaza and Union Station in downtown Washington, DC. In December of 2000, Amtrak introduced its new high speed train service known as the *Acela Express*, which provides 135 - 150 mph service between Washington, DC, New York, and Boston.

Nationally, Amtrak operates a 22,000-mile intercity passenger rail system, serving more than 500 communities. Currently, Amtrak runs eight trains per day between Washington, DC and Richmond, carrying over 700,000 passengers a year. Amtrak, in partnership with NCDOT, operates two trains that traverse North Carolina's "Piedmont Crescent," a corridor where 50% of the state's population lies within 30 miles of the railroad. The *Carolinian*, which travels daily between Charlotte, Raleigh, and New York is one of the most successful conventional speed trains in the Nation, carrying more than 170,000 passengers in 1996 and recovering over 100 percent of its operating cost over the length of its route. The *Piedmont* provides daily round trip service between Raleigh, Greensboro and Charlotte. The *Carolinian Connector* provides daily thruway van service for ticketed Amtrak passengers connecting between Winston-Salem and the Greensboro Amtrak station to meet the *Carolinian* for points north.

Growth rates for ridership on Amtrak trains by travelers to and from Virginia and North Carolina have significantly exceeded Amtrak's national growth. Amtrak ridership originating or ending in Virginia grew from just under 830,000 to over 930,000 passengers, an increase of 13%, between federal FY 1992 and FY 1999. Amtrak ridership originating or ending in North Carolina grew from just over 360,000 to almost 517,000 passengers, an increase of 43% between federal FY 1992 and FY 1999.

However, travel on existing conventional passenger rail service accounts for a small component of interstate travel within the SEHSR corridor. Currently, passenger trains in the United States account for less than one percent of all long-distance travel. The number of Amtrak passengers increased slightly from 21 million in 1980 to 21.5 million in 1999. However, passenger miles traveled on Amtrak increased at a greater rate growing from 4.5 billion to 5.3 billion miles during this same period.[14] These increases came over a period of time when Amtrak cut back its system route miles and raised fares in efforts to move towards financial self-sufficiency.

[14] National Association of Railroad Passengers, Amtrak Operating Statistics, 2000

Growth in Amtrak ridership in North Carolina and Virginia, particularly in the markets that would be served by the proposed SEHSR service, has outpaced growth rates for Amtrak ridership nationwide.

Unfortunately, existing conventional rail service in North Carolina is currently subjected to travel delays due to the increasing volumes of both passenger and freight service within the Washington, DC to Charlotte corridor.

Existing and Committed Rail Improvements

The No Build Alternative represents a continuation of existing Amtrak service with some operational and service improvements. Such improvements would consist of maintenance, rehabilitation and improvement to track capacity, signal work, highway-rail crossings, and passenger stations.

The current average speed for passenger rail service between Washington, DC and Charlotte is less than 50 mph. Existing and committed rail improvements in Virginia and North Carolina are projected to reduce the rail trip time from Washington, DC to Charlotte from ten hours to between eight hours thirty minutes to nine hours. The planned improvements to the existing rail line will improve capacity, reliability and travel times along some segments of the Washington, DC to Charlotte corridor. Other segments will continue to operate at slow speeds and experience delays. Table 2.12 summarizes the planned improvements in NC and VA.

2.5.4 Intercity Bus Services

Intercity bus service is privately owned and operated. In North Carolina most routes are concentrated in the densely populated corridor from Charlotte to Greensboro to Raleigh with slightly less intensive service along major highways in eastern North Carolina. Greyhound and Carolina Trailways are the two largest intercity bus systems operating in North Carolina. Greyhound bus lines operate bus service in the Charlotte to Washington, DC corridor. A total of 23 routes operate daily in the corridor, with twelve trips from Charlotte to Washington, DC and eleven trips from Washington, DC to Charlotte (Greyhound 2000). Scheduled travel times for end-to-end service range from 7.5 hours to 17 hours.

No long-range planning data is available to estimate the future number of bus trips that will operate between Charlotte and Washington, DC. Therefore, it is assumed that the number of bus trips will increase proportionately to the projected bus travel demand growth in the corridor. Buses must use the interstate highway system. HOV lanes, that could potentially increase the

Table 2.12
Existing and Committed Rail Improvements in the Study Area Alternatives

	Location	Program/Improvement	Description
VA	Washington to Richmond Freight/Passenger Rail Corridor; Metrorail expansion in Northern VA.	Multi-Year Capital Improvement Program	VA/Virginia Railway Express (VRE)/CSXT/Norfolk Southern (NS)/Amtrak and FRA are sponsoring infrastructure improvements and equipment purchases to alleviate corridor congestion and reduce rail travel times. There are also planned VRE related capital improvements.
VA	Washington to Richmond Corridor	Highway-Rail grade crossing improvements	VA/FRA are sponsoring upgrades to 21 crossings including 2 pedestrian grade separations and installation of constant warning time devices.

Table 2.12 Existing and Committed Rail Improvements in the Study Area Alternatives			
	Location	**Program/Improvement**	**Description**
VA	Richmond	Historic Station Restoration	Main Street Station in Downtown Richmond is being restored and Amtrak will provide service, which will interface with intercity and local bus service, taxis and airport limousines.
VA	Petersburg to Norfolk Corridor	Feasibility Study	VDRPT is currently conducting a feasibility study looking at operational issues, environmental concerns and potential demand for passenger service between Petersburg and Norfolk, VA. The results of this study will be incorporated in the Tier II studies in the Petersburg area for connections to the SEHSR.
NC	NCRR – Raleigh to Greensboro to Charlotte	Multi-Year Infrastructure Improvements	NCDOT,NCRR and Norfolk Southern are sponsoring signalization, curve work, interlocking improvements, track additions and equipment purchases to alleviate freight and passenger delays. Double track a 9-mile segment of the NCRR between I-40 and High Point. First series of improvements = $50 million in the next 2 to 3 years.
NC	NCRR – Raleigh to Greensboro to Charlotte	Federal Aid (Signal) Safety Program; Sealed Corridor Program; Traffic Separation Studies	NCDOT/Federal Government/Municipalities/Freight Railroads are upgrading and improving highway-rail crossings with four quadrant gates, median barriers, grade separations and closures. Improvements have been made at 39 highway-rail crossings.
NC	Historic Station Restoration-Salisbury, Wilson, Rocky Mount, Selma, High Point and Greensboro; Station Improvements-Kannapolis &Burlington; Intermodal Centers – Charlotte, Greensboro, Durham and Raleigh	NCDOT Rail Improvement Program	Historic station restoration; station improvements, and multimodal transportation center development

Source: NCDOT Rail Division and VDRPT, 2000.

efficiency of this bus service, are limited to the Washington, DC area of the Southeast corridor. HOV lanes are being considered in the I-40 Durham to Raleigh corridor studies.

The impact of the proposed SEHSR service on bus travel would likely be negligible. “Bus data failed to show any measurable increase in total bus passenger miles in the significant year of 1971, when private railroads ceased operations virtually overnight and intercity rail traffic dropped by approximately two billion passenger-miles.”[15]

[15] Rail Passenger Service: A Critical Link in the National Transportation System, Amtrak, 1995

2.5.5 Public Transit Services

Municipalities, public transit agencies, and the State Departments of Transportation (NCDOT/VDRPT) Public Transportation Divisions, provide a variety of public transportation services in the Study Areas. These services usually focus on fixed route bus service to major destinations, activity employment centers, medical care/hospitals, and other community/government facilities and service centers. Lifeline/demand responsive public transit services and services for the elderly, physically challenged and mobility impaired populations are generally provided by an array of social service agencies in the Study Area Alternatives.

Virginia

The Virginia Department of Rail and Public Transportation (VDRPT) administers and manages state and federal grant programs, conducts performance evaluations, provides technical assistance and works to support ridesharing operations and alternative commute options. The Public Transportation Division oversees and manages various public transit projects in the both urban and rural areas.

The Rail Division supports rail improvement, industrial access and grade crossing projects as well as assistance to passenger rail operations. Table 2.13 presents an overview of the Virginia public transit service providers in the Study Areas.

Table 2.13 Characteristics of VA Public Transit Service Providers in the Study Area Alternatives		
Service Provider	**Service Area**	**Description of Services Provided**
Washington Area Metropolitan Transit Authority (WAMTA)	Alexandria, Arlington, 7 Fairfax counties, Washington D.C.	Metrobus provides a full service bus transit system with connections to local transit systems and connections to Metrorail, Amtrak, and VRE. WMATA Rail provides passenger rail service from 78 stations, along a 93-mile rail transit system. There is commuter rail service from Washington, DC and Alexandria along I-95 and I-66 to Fredericksburg and Manassas with service from 5:30 a.m. to midnight on weekdays and weekend service.
Virginia Railway Express (VRE)	Northern VA suburbs, Fredericksburg, Manassas	Commuter rail service from northern VA along the I-95 and I-66 corridor from Fredericksburg to Manassas. VRE makes stops at Metrorail stations located in Alexandria, Crystal City, L' Enfant Plaza and Union Station in downtown D.C.
Potomac & Rappahannock Transportation Commission (PRTC)	Manassas, Manassas Park, Fredericksburg, eastern Prince William County	Commuter bus service from eastern Prince William County and Manassas to downtown D.C. with shuttle service to nearby Metrorail stations. (OmniRide). Deviated fixed route local bus service (OmniLink). Ridesharing matching services (OmniMatch).
DASH	City of Alexandria	Fixed route bus service within the City of Alexandria with connections to Metrobus, VRE, and all local bus systems with service to all Metrorail stations
CUE Bus service	City of Fairfax	Fixed route bus service for the City of Fairfax and to the Vienna/Fairfax Metrorail station. City Wheels and Metro Access provide specialized services for the disabled.
Fredericksburg Regional Transit (FRED)	Fredericksburg, Spotsylvania County	Fixed route bus service
Petersburg Area Transit	City of Petersburg	Fixed route bus service offering 11 routes and 2 demand responsive vans.
Greater Richmond Transit Company (GRTC)	City of Richmond	Full service transit system offering fixed route transit, demand responsive transit a jobs access program, ridesharing program, a Virginia Commonwealth University (VCU) shuttle and administration of the regions taxis.
Hampton Roads Transit	Cities of Hampton Roads (Newport News, Hampton, Norfolk, Chesapeake, Virginia Beach, and Portsmouth)	Fixed route transit bus service and other services

Source: VDRPT Website-www.drpt.state.va.us. Updated January 2001.

North Carolina

Public transportation operates in all 100 counties in North Carolina. Nearly half of these counties are rural. There are 17 city transit systems, one metropolitan regional transit commission and two regional transit authorities. City transit systems operating in the Study Area Alternatives include Charlotte, Salisbury, High Point, Winston-Salem, Greensboro, Durham, Raleigh, Rocky Mount, and Wilson. The two regional Transit Authorities include the Triangle Transit Authority (TTA) serving Raleigh, Durham, Chapel Hill and the Research Triangle Park; and the Piedmont Authority for Regional Transportation (PART) serving the Winston-Salem, Greensboro, High Point area. The Metropolitan Transit Commission serves the City of Charlotte and other municipalities within Mecklenburg County.

Each year North Carolina's public transportation systems operate more than 1,900 vehicles and carry over 40 million passengers.[16] There are six types of public transportation systems currently operating in North Carolina: human service, community transit, urban transit, regional transit, vanpool/carpool programs and intercity buses. The NCDOT Public Transportation Division does not operate buses or vans but provides financial support, technical and administrative assistance, statewide marketing and training for transit operators.

Community transit systems in North Carolina provide transportation for human service agencies and members of the general public. They operate as single county or multiple county systems and use federal grant monies for rural transit. Table 2.14 provides characteristics of community transit services in North Carolina.

The 17 North Carolina urban transit systems provide fixed route bus services, dial-a-ride services and often coordinate car and vanpool services. The nine urban transit systems operating in the Study Area Alternatives include Charlotte, Salisbury, High Point, Winston-Salem, Greensboro, Durham, Raleigh, Rocky Mount, and Wilson. Table 2.15 presents an overview of the services provided by these systems.

The Triangle Transit Authority (TTA) provides regional transportation services to the Research Triangle metropolitan region to connect Durham, Cary, Chapel Hill, Raleigh and Research Triangle Park (RTP). TTA *operates* fixed route commuter bus service throughout the RTP region, connecting to local routes operated in Durham, Chapel Hill, Raleigh, as well as buses operated by Duke and NC State Universities and the RDU airport. Park and ride facilities are available and the hours of operation are 5:00 a.m. to 8:00 p.m. TTA also operates vanpools and bus pools between primary counties of the RTP region. Another similar authority was established in 1999 to serve the Winston-Salem, Greensboro and High Point areas. The authority known as the Piedmont Authority for Regional Transportation or PART serves Forsyth, Guilford, and Davidson Counties. In Mecklenburg County, the Metropolitan Transit Commission provides regional service to the City of Charlotte and other municipalities within the county with the Charlotte Area Transit System (CATS). A description of these services is found in Table 2.15.

[16] NCDOT Public Transportation Department. *Gazetter of Intermodal Transportation in North Carolina* September 2000.

Table 2.14 Characteristics of NC Community Transit Systems in the Study Area Alternatives		
System	**Areas(s) Served**	**Description of Services Provided**
Rowan County –Rowan Area Transit System (RTS)	Rowan County	Subscription and dial-a-ride services for authorized rural residents of the County
Mecklenburg County Transportation services (MCTS)	Citizens of Mecklenburg County who reside outside of the City of Charlotte	Deviated fixed route, subscription and dial-a-ride services from 6:30 a.m. to 5:30 p.m.
Trans-Aid of Forsyth County	Citizens who reside outside of the City of Winston-Salem	Subscription, dial-a-ride and paratransit services from 6:00 a.m. to 6:00 p.m. Monday through Friday
Specialized Community Area Transportation	Guilford County-for residents outside the cities of High Point and Greensboro	Subscription and dial-a-ride services from 6:00 a.m. to 7:00 p.m.
Orange County Public Transportation (OPT)	Citizens outside the City of Chapel Hill and the Towns of Carrboro, Hillsborough	Deviated fixed route, subscription and dial-a-ride services from 6:30 a.m. to 6:00 p.m.
Durham County Access	Residents of Durham County outside of Durham	Subscription and dial-a-ride services form 6:00 a.m. to 6:00 p.m.
Wake Coordinated Transportation Services (WCTS)	Wake County	Subscription and dial-a-ride services for citizens who live outside of Wake County
Accessible Raleigh (ART)	Authorized residents of the City of Raleigh	Dial-a-ride and paratransit services
Suburban Cary Dial-a-ride transportation	Town of Cary	Assistance with taxi cabs for authorized residents 60 years old or older
Wilson County Transportation Services	Wilson County	Subscription and dial-a-ride services for authorized citizens of Wilson County. Hours of operation are 6:00 a.m. to 6:00 p.m. Monday through Saturday
Nash-Edgecombe Transportation Services	Rural residents of Nash and Edgecombe Counties	Subscription and dial-a-ride services for Nash and Edgecombe counties

Source: *NCDOT Department of Public Transportation- September 2000. Compiled by Carter & Burgess, Inc; February 2001.*

Table 2.15 Characteristics of NC Urban Transit Systems in the Study Area Alternatives		
System	**Areas (s) Served**	**Description of Services Provided**
Charlotte Area Transit System (CATS)	City of Charlotte, Mecklenburg County, the Towns of Cornelius, Davidson, Huntersville, Matthews, Mint Hill, and Pineville	Fixed route and express bus service, paratransit and carpool/vanpool service and service to and from a system of park-and-ride lots. Service hours are from 5:30 a.m. to 1:30 p.m. and 7:00 a.m. to 1:30 a.m. on Saturdays and Sunday. Express bus service is Monday through Friday only. Several public and private transit systems offer special event and shuttle services in the region. A system of regional light rail and busways are being planned for the region.
Salisbury Transit	City of Salisbury; Rowan-Cabarrus Community College; Towns of Spencer and East Spencer	Fixed route bus service from 6:15 a.m. to 6:45 p.m. with most routes connecting at the City of Salisbury transfer center in the train depot. Dial-a-ride paratransit service is provided for authorized residents of the city and the towns of Spencer and East Spencer.
High Point (Hi Tran)	City of High Point	Fixed route bus service connecting with City of Greensboro routes at Guilford Community College. Hours of operation are form 5:45 a.m. to 6:30 p.m.
Winston-Salem Transit Authority (WSTA)	City of Winston-Salem	Fixed route bus service with all routes connecting in downtown at the transportation center with service to and from a system of park and ride lots. Service hours are 6:00 a.m. to 12:00 a.m. Trolleys operate in historic Old Salem and ridesharing and vanpool services are provided by the Ridesharing and Vanpooling of the Piedmont (RSVP) for Winston-Salem and the Triad region.
Greensboro Transit Authority (GTA)	City of Greensboro	Fixed route bus service with express route service to the Piedmont Triad Airport, with park and ride facilities available. Hours of operation are 6:00 a.m. to 8:00 p.m. and 7:00 a.m. to 6:00 p.m. Saturdays
Durham Area Transit Authority (DATA)	City of Durham	Fixed route bus service, subscription and dial-a-ride paratransit services. Service hours are 5:30 a.m. to 11:30 p.m. Monday through Saturday. Most routes intersect with Duke University transit routes that serve the university and medical center.
Raleigh –Capital Area Transit System (CAT)	City of Raleigh	Fixed route bus service for the City of Raleigh including a system of connector vans that provides service beyond the regular routes. All routes connect with Triangle Transit Authority (TTA) regional commuter bus service at the downtown transit transfer station and downtown trolleys that link the state capitol with the area museums. Hours of operation are from 6:00 a.m. to 10:00 p.m. Monday through Saturday
Rocky Mount Transit	City of Rocky Mount	Fixed route bus service and Dial-a-ride paratransit services for authorized residents (DARTS). Hours are 6:00 a.m. to 6:30 p.m.
Wilson Transit System (WTS)	City of Wilson	Fixed route bus service, taxicab shuttle services, and dial-a-ride paratransit services for authorized residents of Wilson. Hours of operation are from 6:30 a.m. to 6:30 p.m. Monday through Saturday.

Source; NCDOT *Department of Public Transportation, September 2000. Complied by Carter & Burgess, Inc; February 2001*.

Existing and Committed Transit Improvements

Virginia

Their five-to-ten year service and maintenance programs guide the fixed route transit systems in Virginia. In addition, the state of Virginia has a variety of planning efforts underway to investigate transit investments and implement improvements throughout the State. In 2000, the Virginia General Assembly earmarked $10 million for VRE-related capital improvements along the Washington to Richmond freight and passenger rail corridor, $75 million for Metrorail expansion in Northern Virginia and $9.3 million to begin work on rail service to Southwest Virginia that will connect in Richmond. This effort includes an approximately 23-mile extension of Metrorail service in Northern Virginia in the Dulles corridor. Design is underway for the new Quantico Bridge, which will add another track. The improvements to the AF Interlocking, station improvements and storage facilities are also being undertaken. VRE is also currently obtaining additional passenger cars.

Virginia and the City of Richmond are currently in the process of restoring the historic Main Street Station in downtown Richmond. Upon restoration of Main Street Station, Amtrak has plans to add the station to its passenger rail schedule to attract more business riders to Washington, DC and the Northeast Corridor. The Main Street Station will become a multi-modal facility that serves intercity bus, local transit, taxis, and airport limousines.

North Carolina

Most of the urban transit systems have a short range (5 to 10 year) plan for improvement, which involves plans for the expansion or maintenance of their existing services and facilities. In addition, the transit authorities and the Metropolitan Transit Commission are making plans for regional and commuter rail systems to serve their areas.

The Triangle Transit Authority (TTA) is conducting an Environmental Impact Statement (EIS) process for Phase I of a proposed Regional Rail System. The proposed system consists of regional rail service from Durham to downtown Raleigh and downtown Raleigh to North Raleigh. The system would utilize the existing North Carolina Railroad (NCRR) and CSX Transportation railroad rights-of-way with a total length of approximately 35 miles. The system will serve 16 anticipated stations, linking Durham, Research Triangle Park, Morrisville, Cary, Raleigh, and North Raleigh. The system will connect residential areas; major employment areas, including downtown business districts and the Research Triangle Park; RDU International Airport via shuttle; three major universities; and sports and entertainment destinations. The service will use exclusive railroad tracks located adjacent to the existing freight tracks and operate rail vehicles that will be articulated, bi-directional, diesel-powered multiple units (DMUs).

The Piedmont Authority for Regional Transportation (PART) is getting organized and conducting feasibility studies for regional rail connecting the major cities of the region and studying commuter rail possibilities between Winston-Salem and Asheville. The Metropolitan Transit Commission serves the Charlotte/Mecklenburg County cities and towns and collects a $.01 sales tax to provide transit service and to plan and implement a multi modal transit system along with the expansion and improvements to the existing bus system. The Commission is currently planning a system of fixed guideway improvements (bus, light rail, commuter rail) along 5 corridors that radiate out from the center city of Charlotte. This effort would enhance the planned improvements and expansions of the existing bus system and offer a modal alternative to residents. The planning effort was supplemented with a future plan that marries land use and development patterns with the proposed investment in transit.

2.5.6 Freight Railroad Network

Freight rail service is a vital component of interstate commerce. The recent acquisition of Conrail by CSX Transportation (CSXT) and Norfolk Southern is increasing the freight service in the Study Areas. Proposed regional rail (i.e., Triangle Transit Authority between Raleigh, NC and Durham, NC) and expanding commuter rail passenger services (i.e., Virginia Railway Express between Washington, DC and Fredericksburg, VA) in the Study Areas further increase the daily train traffic and contribute to the existing railway congestion. Increased passenger services must be provided while maintaining or enhancing freight rail service efficiency.

CSXT, NS (and its subsidiaries), and the Aberdeen, Carolina & Western (ACWR) provide freight rail service in the nine Study Area Alternatives. Most of this freight service is general merchandise and intermodal with some unit trains. CSXT increased the number of carloads originated system-wide in 2000 by 5.1% over 1999 carloads.[17] During the same period, NS increased the number of carloads originated system-wide by 19.0%.[17] Both CSXT and NS have identified the I-95 corridor as one of the growth corridors for freight services. Daily freight train traffic peaks at over 40 trains per day in the segments from Richmond, VA to Selma, NC and from Greensboro, NC to Charlotte, NC. While there are no freight trains on the four segments where track has been removed, there are six segments with fewer than five freight trains per day.

Variations in times of departure and arrival as well as train sizes and performance are much greater in freight services than in passenger services. Freight service schedules and train sizes/performance for the Study Areas are closely guarded due to the competitive nature of freight railroading. Therefore, the unpredictable nature of freight service and the projections of increased freight traffic support the projections of decreasing efficiency in the existing study areas. Increasing this efficiency may be accomplished by reestablishing track in existing corridors where the track has been removed and by coordinating the schedules of both freight and passenger trains diverted to the reestablished tracks.

Within the Study Area Alternatives, CSXT operates along most of the north-south segments with the exception of the NCRR from Cary, NC to Charlotte, NC NS operates along the NCRR and WSSB as well as most of the east-west segments with the exception of the ACWR from Gulf, NC to Charlotte, NC. There are no current freight operations on the former S-line from south of Petersburg to Norlina, NC and the on former SA-line from Roanoke Rapids, NC to Norlina, NC due to the removal of tracks.

Existing and Committed Freight Railroad Improvements

Under the No Build Alternative, maintenance and rehabilitation of the existing freight rail system would continue. Rehabilitation would consist of improvements to track capacity, signalization, and highway-rail crossing improvements.

In 1999 NCDOT, NS, and the NCRR developed a $400 million multi-year capital improvements program for the Raleigh to Greensboro to Charlotte corridor that provides for future freight service growth while alleviating freight and passenger train delays.[18] This program includes signalization, curve and interlocking improvements, and additional track to alleviate passenger and freight delays.

[17] AAR/Policy and Communications as printed in “Progressive Railroading” page 7, January 2001.
[18] A Congestion Mitigation Study for Proposed Passenger Service Improvements, prepared for NCDOT, 1999.

The Virginia Department of Rail and Public Transportation (VDRPT) working with VRE, CSXT, NS, Amtrak, and the FRA has identified the need for more than $770 million to implement a multi-year capital improvement program. The Virginia General Assembly designated $67 million in year 2000 for the first phase of this program. It additionally designated $10 million for VRE-related capital improvements along the corridor. FRA assigned $750,000 to Virginia to fund 21 highway-rail grade crossing upgrades, including two pedestrian grade separations in the RF&P segment.

Freight railroad improvements, whether existing or committed, are projected to temporarily alleviate existing congestion and delays in Virginia and North Carolina. For the most congested segments of the study are, the first phases of these improvements are scheduled for completion within the next two to five years. It is anticipated that these improvements will result in fewer delays and congestion for freight services. However, without the full implementation of improvements associated with the SEHSR program, freight and passenger services along the study areas from Washington, DC to Charlotte, NC are projected to experience greater delays and congestion over time.

2.6 Summary of Alternatives

This environmental document focuses on the evaluation of the nine Study Area Alternatives compared to the No Build Alternative. The Study Area Alternatives encompasses a number of existing rail lines, cross numerous jurisdictional lines, and contain a diverse social, economic and natural environment. These study areas contain six-mile wide corridors that will be reviewed in Chapters 3 and 4. Because these study areas are so large, the general nature of the existing environment, and potential benefits and impacts, will also be reviewed at a larger scale. The nine Study Area (Build) Alternatives are summarized in Table 2.16. Table 2.17 presents the general operational characteristics of each of these Study Area Alternatives.

2.7 Tier II Alternatives Development

After the Tier I DEIS is published and the public hearings are held, it is anticipated that a recommended Study Area report would be prepared. The report would recommend the Study Area Alternative(s) to be discussed in the final environmental impact statement (FEIS) and in the record of decision.

Following the publication of the FEIS, FHWA/FRA will issue a record of decision (ROD) prepared in consultation with NCDOT and VDRPT. If the ROD selects a build alternative, a program would be developed by each state department of transportation that would identify the proposed actions necessary to implement the high speed rail in that recommended Study Area Alternative(s). The anticipated type of environmental documentation needed (CE, EA, EIS) for each action, or group of actions, would be determined by the VDRPT and NCDOT in conjunction with FRA and FHWA, and a phased program of project development then can be established based on availability of resources and on the priorities of Virginia and North Carolina.

The VDRPT and the NCDOT Rail Division would then proceed with Tier II project development, which would involve further refinements within the recommended Study Area(s), including the identification of specific alignments, station locations, detailed environmental and engineering analysis, and more accurate capital cost estimates. A schedule for the development of the Tier II actions would be developed and initiated. During the Tier II efforts, detailed agency coordination would take place including the securing of permits following the appropriate environmental documentation.

Table 2.16
Study Area Alternatives: Geographic Characteristics

Study Area	A	B	C	D	E	F	G	H	J
Rail Lines	Former RF&P NCRR S-line A-line	Former RF&P S-line NCRR K-line WSSB A-line	Former RF&P S-line NS Line CF Line ACWR A-line	Former RF&P A-line SA-line S-line NCRR	Former RF&P A-line SA-line S-line NCRR K-line WSSB	Former RF&P A-line SA-line S-line NS Line CF Line ACWR	Former RF&P A-line NCRR	Former RF&P A-line NCRR K-line WSSB	Former RF&P A-line NCRR S-line NS Line CF Line ACWR
Segments	1, 2, 3, 5, 6, 13, 14, 15 and 16	1, 2, 3, 5, 6, 13, 14, 16, 17 and 18	1, 2, 3, 5, 6, 13, 19, 20 and 21	1, 6, 7, 8, 9, 11, 13, 14, 15 and 16	1, 6, 7, 8, 9, 11, 13, 14, 16, 17 and 18	1, 6, 7, 8, 9, 11, 13, 19, 20 and 21	1, 7, 8, 9, 10, 12, 13, 14, 15 and 16	1, 7, 8, 9, 10, 12, 13, 14, 16, 17 and 18	1, 7, 8, 9, 10, 12, 13, 19, 20 and 21
Communities Served: *Virginia*	Alexandria Woodbridge Fredericksburg Ashland Richmond Centralia Petersburg Burgess La Crosse	Alexandria Woodbridge Fredericksburg Ashland Richmond Centralia Petersburg Burgess La Crosse	Alexandria Woodbridge Fredericksburg Ashland Richmond Burgess La Crosse	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia	Alexandria Woodbridge Fredericksburg Ashland Richmond Chester Colonial Heights Petersburg Collier Emporia
Communities Served: *North Carolina*	Norlina Henderson Raleigh Cary Durham Burlington Greensboro High Point Lexington Salisbury Charlotte	Norlina Henderson Raleigh Cary Durham Burlington Greensboro Winston-Salem Lexington Salisbury Charlotte	Norlina Henderson Raleigh Apex New Hill Moncure Colon Gulf Robbins Star Troy Norwood Oakboro Aquadale Midland Charlotte	Weldon Norlina Raleigh Cary Durham Hillsborough Burlington Greensboro High Point Lexington Salisbury Concord/ Kannapolis Charlotte	Weldon Norlina Raleigh Cary Durham Hillsborough Burlington Greensboro Kernersville Winston-Salem Lexington Salisbury Charlotte	Weldon Norlina Raleigh Apex New Hill Moncure Colon Gulf Robbins Star Troy Norwood Oakboro Aquadale Midland Charlotte	Weldon Rocky Mount Wilson Selma Clayton Garner Raleigh Cary Durham Hillsborough Burlington Greensboro High Point Lexington Salisbury Concord/ Kannapolis Charlotte	Weldon Rocky Mount Wilson Selma Clayton Garner Raleigh Cary Durham Hillsborough Burlington Greensboro Kernersville Winston-Salem Lexington Salisbury Charlotte	Weldon Rocky Mount Wilson Selma Clayton Garner Raleigh Apex New Hill Moncure Colon Gulf Robbins Star Troy Norwood Oakboro Aquadale Midland Charlotte

Source: Carter & Burgess November 2000; Compiled by The Resource Group, June 2001

Table 2.17
Study Area Alternatives: Operational and Physical Characteristics

Study Area	A	B	C	D	E	F	G	H	J
Length	448 miles	463 miles	428 miles	468 miles	483 miles	448 miles	481 miles	496 miles	461 miles
Existing Railroad ROW	677.8 acres	731.31 acres	929.95 acres	620.13 acres	673.59 acres	872.23 acres	544.99 acres	598.0 acres	579.0 acres
Average Total Travel Time (Washington, DC to Charlotte)	6.23 hours	6.90 hours	6.20 hours	6.55 hours	7.23 hours	6.53 hours	6.75 hours	7.43 hours	6.73 hours
Average Travel Speed	72.6 mph	68.7 mph	70.0 mph	73.1 mph	69.3 mph	70.5 mph	72.1 mph	68.5 mph	69.6 mph
Net Energy Reduction Fuel (gal/yr)	10,015,119	9,724,939	6,679,376	9,924,448	9,557,693	6,564,192	10,433,752	9,993,470	6,910,545
Conceptual Capital Cost (Year 2000 $s)	$2.611 billion	$2.720 billion	$2.515 billion	$2.711 billion	$2.820 billion	$2.6215billion	$2.848 billion	$2.957 billion	$2.752 billion
Year 2025 Annual Ridership	1,790,600	1,756,700	1,400,900	1,700,700	1,660,600	1,333,300	1,669,700	1,625,000	1,312,000
Year 2025 Ticket Revenue*	$107.17 million	$109.02 million	$87.91 million	$99.40 million	$101.6 million	$82.04 million	$94.87 million	$96.89 million	$78.88 million
Year 2025 Operating Expenses	$80.83 million	$83.75 million	$74.76 million	$80.42 million	$83.48 million	$74.81 million	$80.21 million	$83.32 million	$74.79 million
Net Operating Income	$26.340 million	$25.270 million	$13.160 million	$18.980 million	$18.120 million	$18.30 million	$20.06 million	$13.570 million	$4.090 million

Source: Carter & Burgess November 2000: KPMG Model Forecast Data, October 2000.
**Note: Additional revenues are expected from food and beverage, mail, express and baggage.*

3.0 AFFECTED ENVIRONMENT

This Chapter discusses the existing human, physical and natural environmental settings that exist within the nine Study Area Alternatives. This chapter provides a foundation for comparison of Study Area Alternatives and does not attempt to characterize the existing conditions within each Study Area. Specific conditions and comparisons are presented later in this document (Chapter 4). For the purpose of the following discussion the term ‘Study Area Alternatives’ refers to the aggregated findings for both the counties and cities that make up the nine Study Area Alternatives.

Data in this Chapter are presented at a conceptual level and are based primarily on secondary data sources and general trends within the Study Area Alternatives. Discussions in this Chapter do not attempt to identify specific characteristics at specific locations. The purpose of this Chapter is to merely characterize the general resources within the Study Area Alternatives.

3.1 Existing Physical Environment

3.1.1 Meteorology & Climate

The climate for the Study Area Alternatives varies substantially. This large climate variability is due to topographical diversity and the offshore presence of the Gulf Stream. The simplified Köppen climate system, a standard in recognizing climate classification, classifies the Study Area Alternatives as having a humid mesothermal climate.

When measuring climate, a formula is used to identify Caf climatic regions. These regions identify general climatic characteristics of that geographic area. According to the Rand McNally Goode’s World Atlas, 1993, the ‘Caf’ climatic region where the Study Area Alternatives are located has characteristics of being humid with warm summers and rainfall year round. The ‘C’ in the climatic formula represents a mesothermal forest climate where the coldest month has an average temperature above $32^{?}$ Fahrenheit ($0^{?}$ Celsius), but below $64.4^{?}$ Fahrenheit ($18^{?}$ Celsius). The ‘a’ in the formula represents the warmest month having an average temperature above $71.6^{?}$ Fahrenheit ($22^{?}$ Celsius). The ‘f’ is a subtype classification that designates an area as being constantly moist with rainfall present year round.

Within the Study Area Alternatives, there are three regions (Piedmont, Coastal Plains and Northern Virginia) that have substantially different precipitation totals ranging from 38 to 56 inches annually. Based on information from the National Oceanic and Atmospheric Administration (NOAA) and the National Climate Data Center (NCDC), annual precipitation in Northern Virginia ranges from 38 to 44 inches and is substantially lower than other regions of the Study Area Alternatives. In the central locales of North Carolina and Virginia (Piedmont), annual precipitation totals range from 44 to 48 inches, while closer to the Coastal Plains, totals increase from 48 to 56 inches annually. Table 3.1, shows annual climatological normals for precipitation and temperature for the six major airport weather monitoring stations within the Study Area Alternatives.

Table 3.1 Climatological Normals for Airport Weather Monitoring Stations within Study Area Alternatives						
	Ronald Reagan Washington National Airport (DCA)	Washington Dulles International Airport (IAD)	Richmond International Airport (RIC)	Charlotte/Douglas International Airport (CLT)	Piedmont Triad International Airport (PTI)	Raleigh-Durham International Airport (RDU)
Minimum Average Annual Daily Temperature (Fahrenheit)	48.8	48.8	46.6	49.7	47.1	48.4
Maximum Average Annual Daily Temperature (Fahrenheit)	66.7	66.7	68.8	70.4	68.4	70.1
Average Annual Daily Temperature (Fahrenheit)	57.7	57.7	57.7	60.05	57.75	59.25
Average Annual Precipitation (Inches)	38.61	38.61	43.13	43.09	42.62	41.43
Average Annual Snowfall (Inches)	18.5	18.5	16.9	6.9	10.2	7.9

Note: Annual data calculated on mean average for twelve-month interval.
Source: National Climate Data Center and National Oceanic Atmospheric Administration, 2001.

3.1.2 Water Resources

Surface Waters

For purposes of this report, discussions of surface waters is limited to waters identified as rivers, impoundments of rivers, and large natural lakes such as Lake Drummond.

Virginia

The Study Area Alternatives cross six river basins in Virginia, specifically the Potomac River Basin, the Rappahannock River Basin, the York River Basin, the James River Basin, the Chowan and Dismal Swamp Basin, and the Roanoke River Basin. These basins combine to drain over three-quarters of the land area in the Commonwealth. There are no large natural lakes in the Piedmont or Coastal Plain of Virginia. The first four river basins are part of the larger Chesapeake Bay Watershed.

Potomac-Shenandoah River Basin

The Potomac-Shenandoah River Basin consists of the Potomac River Basin and the Shenandoah River Basin. This basin has approximately 5,600 miles of streams that drain approximately 14 percent of the Commonwealth's total land area. The Potomac River drains portions of four states (Virginia, Maryland, West Virginia and Pennsylvania) and the District of Columbia. A majority of the approximately 2 million people who inhabit the combined Potomac-Shenandoah River Basin live in the Washington, DC metropolitan area. Besides the two arms of the Shenandoah River in the Virginia Mountains, the Occoquan River is the only other major Virginia river in this basin. There is one major impoundment or lake in the Virginia portion of this basin. It is the Occaquan Reservoir on the mainstem of the Occaquan River, west of Woodbridge, VA.

Rappahannock River Basin

The Rappahannock River Basin originates on the eastern slope of the Blue Ridge Mountains and flows southeast to the Chesapeake Bay. The Basin covers approximately 2,715 square miles or about seven percent of the Commonwealth's total area. There are 2,676 miles of streams in this river basin. It is one of only three river basins that are located entirely within the Commonwealth. There are only two major rivers in the basin, the Rappahannock River and its one major tributary the Rapidan River. There are no major impoundments or lakes in this basin.

York River Basin

The York River Basin originates in the upper Piedmont region of north central Virginia. It is one of only three river basins located entirely within the Commonwealth. The York River is formed at the confluence of its two major tributaries, the Mattaponi and Pamunkey Rivers near High Point. From there it continues to flow southeast into the Chesapeake Bay. The Mattaponi River has no large tributaries, is made up of a series of small rivers including the Po River, Ta River, Mat River and Ni Rivers. Two large rivers, the North Anna and South Anna River, are the major tributaries of the Pamunkey River. Lake Anna is the one large impoundment located in the basin. It is located on the North Anna River southwest of Fredericksburg.

James River Basin

The James River Basin is Virginia's largest river basin covering approximately 10,206 square miles or about 25 percent of the Commonwealth's land area. The James River originates in the Allegheny Mountains, along the Virginia/West Virginia state line, as the Jackson and Cowpasture Rivers. From this confluence at Clifton Forge the James River flows southeast towards Hampton Roads where it empties into the Chesapeake Bay. There are over 12,800 miles of streams in the basin. The largest tributary to the James River is the Appomattox River, which drains the southern half of the basin. Lake Chesdin, an impoundment of the Appomattox River, is one of the largest impoundments in the James River Basin. The Lake is located to the west of Petersburg.

Chowan and Dismal Swamp Basin

The Chowan and Dismal Swamp Basin consists of the Chowan River and the Dismal Swamp sub-basins. This basin has approximately 4,060 miles of streams that drain approximately ten percent of the Commonwealth's total land area. Some portions of the Study Area Alternatives are located within the Chowan River sub-basin of the larger combined basin. The Chowan River originates in southeastern Virginia as the Nottoway and Meherrin Rivers. Their confluence, which forms the Chowan River, is across the North Carolina state line. The Blackwater River, a tributary of the Nottoway River, is the only other major river within the Chowan River sub-basin. There are no major lakes in the Chowan River sub-basin and one large natural lake in the Dismal Swamp sub-basin, Lake Drummond.

Roanoke River Basin

The Roanoke River Basin arises from the eastern slopes of the Blue Ridge Mountains and upper Piedmont of west central Virginia and north central North Carolina. In Virginia, the basin covers approximately 6,380 square miles or about 16 percent of the Commonwealth's land area. The Roanoke River mainstem is impounded by two reservoir complexes, the Smith Mountain-Leesville Lake complex south of Roanoke, and the Kerr Reservoir-Lake Gaston complex along the Virginia-North Carolina state line. The Dan River, which originates in North Carolina, is one of the major tributaries of the Kerr Reservoir-Lake Gaston complex.

North Carolina

The North Carolina portion of the project study area crosses seven river basins: the Chowan River Basin, the Roanoke River Basin, the Tar-Pamlico River Basin, the Neuse River Basin, the Cape Fear River Basin, the Yadkin-Pee Dee River Basin, and the Catawba River Basin. These basins combine to drain over two-thirds of the land area in the state.

Chowan River Basin

The Chowan River Basin is located in the northeastern coastal plain of North Carolina and southeastern Virginia. Approximately 76 percent of the drainage basin lies in Virginia. The Chowan River is the second largest tributary of the Albemarle Sound. Much of the lower reaches of this river are brackish and tidally influenced. The Meherrin River, which originates in Virginia, is the only major tributary to join the Chowan in North Carolina. Anadromous fish spawning areas have been designated for the mainstems of the Meherrin and Chowan River from and including the Albemarle Sound to the Virginia state line.

Roanoke River Basin

The Roanoke River Basin begins in the Blue Ridge Mountains of Virginia. Over 64 percent of the basin is located in that state. The Roanoke River itself enters North Carolina as Lake Gaston and continues southeastward through the state to the Albemarle Sound. The Dan River is one of the major tributaries to the Roanoke River. There are several major impoundments in North Carolina in the Roanoke River Basin including: Lake Gaston, Kerr Reservoir, and Hyco Reservoir.

Tar-Pamlico River Basin

The Tar-Pamlico River system is a major tributary to the Pamlico Sound, one of the most productive estuarine systems in the country. This river basin is the fourth largest in North Carolina and is one of only four basins that are located entirely within the state. It originates in the Piedmont of north central North Carolina, specifically in Orange and Person Counties. Fishing Creek and Contentnea Creek are two larger tributaries to the Tar River. The only river impoundment in the basin is the Tar River Reservoir near Rocky Mount.

Neuse River Basin

The Neuse River Basin is the third largest river basin in North Carolina and is one of only four basins that is located entirely within the state. The Neuse River is one of the major tributaries of the Pamlico Sound. The Neuse River arises in Person and Orange Counties as the headwaters of the Flat and Eno River. The confluence of these two rivers forms the Neuse River and is currently impounded as part of Falls Lake Reservoir. This reservoir is the only major impoundment of the Neuse River mainstem. The Little River east of Raleigh is the only other major river draining into the Neuse River.

Cape Fear River Basin

The Cape Fear River Basin is the largest river basin in North Carolina, covering over 9,000 square miles. It arises in the north central Piedmont as the Haw and Deep Rivers near Greensboro and empties into the Atlantic Ocean south of Wilmington. This basin is one of only four basins located entirely within the state. The Cape Fear River has many large rivers draining into it including the Rocky River in the Piedmont, and the Black River and Northeast Cape Fear River in the Coastal Plain. The two largest impoundments in the Cape Fear River Basin are B. Everett Jordan Reservoir and Harris Reservoir, both located southwest of Raleigh.

Yadkin-Pee Dee River Basin

The Yadkin-Pee Dee River Basin is the second largest basin in North Carolina covering approximately 7,213 square miles. The basin is located primarily in the Piedmont Physiographic Region. The Yadkin River originates on the eastern slope of the Blue Ridge Mountains in northwestern North Carolina. The Yadkin River flows northeasterly, then southeasterly, until it joins the Uwharrie River to form the Pee Dee River. The Pee Dee River continues to flow southeasterly through South Carolina. Some of the major tributaries of the Yadkin River include the Fisher River, Ararat River and the South Yadkin River. Major tributaries to the Pee Dee River in North Carolina, include the Rocky River and the Little River. There is a string of four major impoundments of the Yadkin-Pee Dee Rivers. From Salisbury southeast they include High Rock Lake, Tuckertown Reservoir, Badin Lake and Lake Tillery.

Catawba River Basin

The Catawba River Basin is the western-most basin in the project study area. The river rises from high elevation streams on the eastern slope of the Blue Ridge Mountains. It flows eastward and southward to Lake Wylie, which straddles the North Carolina-South Carolina state line. The river mainstem is almost entirely impounded by a series of seven hydropower reservoirs running from Lake James at the foot of the mountains to Lake Wylie. The remaining five lakes are Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, and Mountain Island Lake. Major tributaries to the Catawba River include Linville River, South Fork Catawba River and the Broad River.

3.1.2.1 Wetlands

Section 404 of the Clean Water Act requires regulation of discharges into "Waters of the United States." The United States Environmental Protection Agency (USEPA) is the principal administrative agency of the Clean Water Act; however, the United States Army Corps of Engineers (USACE) has the responsibility for implementation, permitting, and enforcement of the provisions of the Act. The USACE regulatory program is defined in CFR 320-330.

Water bodies, including lakes, rivers, and streams, are subject to jurisdictional consideration under the Section 404 program. Wetlands are also identified as "Waters of the United States and are therefore subject to jurisdiction." Wetlands defined in 33 CFR 328.3, are those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Any action that proposes to discharge fill into these areas falls under the jurisdiction of the USACE under Section 404 of the Clean Water Act (33 U.S.C. 1344).

The functions and values of wetlands can be divided into different categories including hydrology, water quality, habitat, and direct use parameters. Hydrologic values include water storage or flood control and groundwater recharge. Water quality values include pollutant removal and nutrient/sediment retention. Habitat values include food and cover for aquatic wildlife, as well as both resident and transient terrestrial wildlife. Habitat values can also refer to critical areas for protected species and migratory waterfowl. Direct use parameters are based on the direct use of wetlands by people for recreation, education, timber production, and hunting. Each wetland system is different and may demonstrate some or all of these functions and values.

Wetlands within the Study Area Alternatives were identified based on information gathered from National Wetland Inventory (NWI) mapping and county soil surveys. The NWI project was established to generate information about the characteristics, extent and status of the nation's wetlands and deepwater habitats. NWI maps are generally used for planning purposes only. No field surveys were conducted for this Tier I environmental investigation. Actual wetland data delineations would be conducted during Tier II environmental field investigations.

The wetland system descriptions used in this report conform to those as defined in Cowardin *et al*. (1979). Four main types of wetland systems are found in the Study Area Alternatives: estuarine, lacustrine, riverine, and palustrine systems. The estuarine systems found in the Study Area Alternatives consist of tidal wetlands that are semi-enclosed by land, but have open to partially obstructed or sporadic access to the open ocean, and in which ocean or salt water is diluted by freshwater runoff from the land. The lacustrine systems include wetland and deepwater habitats situated in a topographic depression or dammed river channel which lack trees, shrubs or persistent emergents with greater than 30 percent areal coverage, and have a total area that exceeds 8.00 hectares (20.0 acres). The riverine system includes all freshwater wetlands and deepwater habitats contained within a channel bounded by the channel bank, where a channel is defined as an open conduit which periodically or continually contains moving water or which forms a link between two bodies of standing water. Palustrine wetlands are those nontidal wetlands dominated by trees, shrubs, persistent emergents, and emergent mosses and lichens.

Virginia

The Virginia portion of the Study Area Alternatives contains four types of wetland systems: estuarine, lacustrine, palustrine and riverine. Palustrine wetlands account for approximately 95 percent of the wetlands in the Virginia portion of the Study Area Alternatives. Forested wetlands are the most predominant sub-type, accounting for about 55 percent of the identified palustrine wetlands. Emergent marsh is the second most common type, accounting for an additional 15 percent. The most common forested wetland communities in the Piedmont and upper Coastal Plain of Virginia include wet, hardwood bottomland or floodplain forests along streams and rivers and the flooded forests at the backwaters of impoundments such as Lake Gaston on the state line, and/or Cypress-Tupelo swamp forests along low gradient coastal streams and rivers. Other types of common palustrine systems include palustrine shrub/scrub and emergent marsh, both usually associated with shallow beaver impoundments; and palustrine aquatic bed, which describes the areas of submerged aquatic vegetation found in deeper areas of beaver ponds and most smaller man-made ponds and impoundments. Forested and shrubby palustrine wetlands generally receive high ratings for pollutant removal, sediment retention, water storage, and aquatic and wildlife habitat.

Riverine systems are the second predominant type of wetland system identified in the Virginia portion of the project study area. However, riverine systems account for only approximately one percent of the Virginia wetlands. This wetland system includes most of the major and minor streams and rivers located in the project study area. Riverine wetland systems provide good aquatic and wildlife habitat and recreational functions. Due to their flow characteristics they are not good at pollutant removal, sediment retention, or flood control (water storage).

Estuarine systems, which were not found in the North Carolina portion of the Study Area Alternatives, account for an additional one percent of the identified wetlands in Virginia. The estuarine wetlands are mostly emergent marshes just on the brackish side of freshwater. These wetlands occupy areas in the extreme eastern portions of the Study Area Alternatives located along the larger river systems, such as the Potomac River below Washington DC and the James River below Richmond. Common community types may include switchgrass (*Panicum* spp.), cordgrass (*Spartina* spp.) or rush (*Juncus* spp.) dominated marshes. Estuarine system wetlands function in pollutant removal, sediment retention, water storage, and as aquatic and wildlife habitat.

The last type of wetland system found in the Virginia portion of the Study Area Alternatives is lacustrine, which accounts for less than one percent of the identified wetlands. Lacustrine systems describe most of the large open bodies of water along the Study Area Alternatives, specifically the larger man-made impoundments utilized for flood control or as water-supply reservoirs. Examples of lacustrine systems are the John H. Kerr Reservoir, Lake Gaston, and the numerous medium-sized flood control reservoirs surrounding most metropolitan areas. There are no large naturally occurring lakes in the Piedmont or upper Coastal Plain of Virginia. Man-made impoundments are very good at sediment retention, water storage, and recreational functions. They also provide both aquatic and terrestrial wildlife value, but of a modified nature from the historic habitat available prior to flooding.

North Carolina

In the North Carolina portion of the Study Area Alternatives three types of wetland systems are found: lacustrine, palustrine and riverine. As in Virginia, palustrine wetlands account for the majority of identified wetlands (approximately 92 percent). Sixty-seven percent of these palustrine wetlands are classified as forested, mostly with deciduous hardwood trees. Common forested wetland communities in the Piedmont of North Carolina include wet bottomland or floodplain forests, and the flooded forests at the backwaters of impoundments such as High Rock Lake south of Lexington. In the Sandhills and Coastal Plain of North Carolina, common forested wetlands include those previously mentioned, plus Cypress/Tupelo swamp forests along low gradient coastal streams and rivers, and wet pine savannas and high pocosins on broad interstream divides.

Riverine systems are the second predominant type of wetland system identified in the North Carolina portion of the Study Area Alternatives. Riverine systems account for approximately five percent of the North Carolina wetlands. This wetland system includes most of the major and minor streams and rivers located in the project study area. The final type of wetland system found in the North Carolina portion of the Study Area Alternatives is lacustrine, which accounts for less than five percent of the identified wetlands. Examples of lacustrine systems include High Rock Lake, Badin Lake, Falls Lake Reservoir, and the numerous medium-sized flood control reservoirs surrounding most metropolitan areas. There are no large naturally occurring lakes in the Piedmont or upper Coastal Plain of North Carolina.

3.1.3 Water Quality

Virginia

The Commonwealth of Virginia has designated all waters in the state, including wetlands, for the following uses:

- recreational uses such as swimming and boating;
- the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them;
- wildlife; and
- the production of edible and marketable resources such as fish and shellfish (9 VAC 25-260-10(A)).

Water quality standards and appropriate measuring criteria have been established to support these designated uses. There are additional supplemental classifications that may be applied to surface waters that identify unique characteristics of that system. These special designations and standards have been established for public water supply watersheds (PWS); nutrient enriched waters (NEW); scenic rivers; estuarine, transition zone and tidal freshwaters (Classes I, II, and III); and shellfish waters (9 VAC 25-260-5 et seq.).

The water quality in the state is monitored via two networks of ambient monitoring stations: one sampled by the Virginia Department of Environmental Quality (VaDEQ), and a second sampled through citizen monitoring programs. There are approximately 2,800 sampling stations currently monitored in the state. Most monitoring stations are strategically located for the collection of physical and chemical water quality data from known or suspected water quality problem areas. Recently VaDEQ randomly moved some sampling locations to monitor for potential non-point source water quality problems. The type of water quality data or parameters collected is determined by the waterbody's classification and corresponding water quality standards. The information gathered from the monitoring stations determines the "use support" status of waterbodies, or how well a waterbody supports its designated uses. The ratings are divided into four groups: fully supporting, fully supporting but threatened, partially supporting, and not supporting waters.

Potomac-Shenandoah River Basin

The Potomac-Shenandoah River Basin consists of the Potomac River Basin and the Shenandoah River Basin. The overall travel corridor that begins in Washington DC crosses only the Potomac River sub-basin of this large combined basin. Of the designated uses in this sub-basin, approximately 20 percent of the 1,712 miles of streams monitored for aquatic life uses are considered partially- or not-supporting of this designated use. In addition, about 50 percent of the 1,450 miles of streams evaluated for swimming uses are considered partially- or not-supporting this designated use. The remaining uses, where evaluated, are mostly considered fully supporting.

The major causes of impairment in the basin are thought to be agricultural runoff, fecal coliform bacteria problems, and contamination leading to fish consumption advisories. In this basin, the Study Area Alternatives cross two watersheds that the Commonwealth has designated as nutrient enriched waters, the Belmont and Occoquan Bays watershed and the Aquia Creek watershed, to the north and south of Quantico, respectively.

Rappahannock River Basin

The Rappahannock River Basin originates on the eastern slope of the Blue Ridge Mountains and flows southeast to the Chesapeake Bay. Most of the basin is rural in character with only six percent of the land area considered urban. Fredericksburg is the largest urban center in the basin. There are 2,676 miles of streams in this river basin. Roughly ten percent or 262 miles of streams in this basin were monitored for use-support ratings. Of the designated uses for this basin, only swimming-uses appear to be impaired, with ten percent of the monitored streams considered partially- or not-supporting for this use.

Fecal coliform bacteria problems from unknown sources are the leading cause of impairment in this basin.

York River Basin

The York River Basin originates in the upper Piedmont region of north central Virginia. Most of the basin is rural in character with only ten percent of the land area considered urban. There are no large urban centers located in the basin. Just over 20 percent or about 790 miles of freshwater streams in the basin were evaluated for use-support ratings. Approximately eleven percent of the streams evaluated for aquatic life uses were considered partially- or not-supporting this use. In addition, 25 percent of those evaluated for recreational uses were considered partially- or not-supporting this designated use.

The leading cause of impairment is fecal coliform bacterial problems from unknown sources.

James River Basin

The James River Basin is Virginia's largest river basin covering approximately 10,206 square miles or about 25 percent of the Commonwealth's land area. The James River originates in the Allegheny Mountains, along the Virginia/West Virginia state line and flows southeast towards Hampton Roads where it empties into the Chesapeake Bay. There are over 12,800 miles of streams in the basin. Over 65 percent of the James River Basin is considered forested lands and 12 percent is considered urban lands. The second largest urban center in the basin is the Greater Richmond - Petersburg area. Approximately ten percent or about 350 miles of the streams evaluated for aquatic life uses were considered partially- or not-supporting this designated use. In addition, 32 percent or 630 miles of those evaluated for recreational uses were considered partially- or not-supporting this use.

The causes of impairment were determined to be pH exceedences, organic enrichment/low dissolved oxygen, and fecal coliform bacterial problems. These causes were attributed to natural, agricultural, and unknown sources.

Chowan and Dismal Swamp Basin

The Chowan and Dismal Swamp Basin consists of the Chowan River and the Dismal Swamp sub-basins. This basin is primarily rural in character with only six percent of its lands considered urban. The Study Area Alternatives divide into two major routes south of Colonial Heights; one heads west towards South Hill and the other continues south towards Emporia. Both alternatives cross the Chowan River sub-basin of this larger combined basin. The Dismal Swamp sub-basin is not located within the Study Area Alternatives. Approximately 36 percent or about 740 miles of the streams in this basin evaluated for aquatic life uses were considered partially- or not-supporting this designated use. Additionally, 17 percent or 290 miles of those evaluated for recreational uses were considered partially- or not-supporting this use.

The causes of impairment were determined to be pH exceedences, organic enrichment/low dissolved oxygen, and fecal coliform bacterial problems. These causes were attributed to natural and unknown sources.

Roanoke River Basin

The Roanoke River Basin arises from the eastern slopes of the Blue Ridge Mountains and upper Piedmont of west central Virginia and north central North Carolina. In Virginia the basin covers approximately 6,380 square miles or about 16 percent of the Commonwealth's land area. The largest urban complex in the basin is the city of Roanoke, which is located at the headwaters of the river. The remainder of the basin is rural in character with only ten percent of the land area considered as urban. Approximately ten percent or about 120 miles of the streams evaluated for aquatic life uses were considered partially- or not-supporting this use. Additionally, 75 percent or 815 miles of those evaluated for recreational uses were considered partially or not supporting this designated use.

The major causes of impairment in the basin were determined to be exceedences of general standards, high levels of priority organics (PCBs - polychlorinated byphenals), and fecal coliform bacterial problems. These causes were attributed to contamination leading to fish consumption advisories, agricultural practices, urban runoff, and unknown sources.

North Carolina

The North Carolina Division of Water Quality (NCDWQ) classifies surface waters of the state based on their intended best uses. Public water supply watersheds are designated WS-I, WS-II, WS-III, WS-IV, or WS-V depending on the type and density of development in the watershed, with WS-I the least developed and WS-IV and WS-V the most densely urbanized. Critical areas (CA) are those portions of a water supply watershed within one-half mile of the intake, where the risk of contamination is greatest. Waters frequently used for swimming are designated class B. Waters used for neither public water supply nor frequent swimming are designated class C and are protected for fishing, boating, aquatic life, and other uses. There are additional supplemental classifications that may be applied to surface waters that identify unique characteristics of that system.

Water quality in the state is monitored through the Ambient Monitoring System (AMS). It is a network of stream, lake, and estuarine water quality monitoring stations strategically located for the collection of physical and chemical water quality data. The type of water quality data or parameters collected is determined by the waterbodies' classification and corresponding water quality standards. The AMS determines the "use support" status of waterbodies, meaning how well a waterbody supports its designated uses. The ratings are divided into two main groups: "supporting" which includes fully supporting and support-threatened waters, and "impaired" which includes partially supporting and not supporting waters.

Chowan River Basin

The Chowan River Basin is located in the northeastern coastal plain of North Carolina and southeastern Virginia. Approximately 76 percent of the drainage basin lies in Virginia. The river basin in North Carolina is rural in character. Forested and agricultural lands account for over 87 percent of the land use in the basin, with only two percent of the land use considered urban. In 1979 the Chowan River was the first waterbody in North Carolina to be designated as Nutrient Sensitive Waters (NSW). The management strategy to control nutrient inputs has been largely successful and as of 1990 had achieved the goal of 20 percent reduction in nitrogen loading. Efforts continue to reach the goal of 35 percent reduction phosphorous loading. Sixty-four percent of the 507 miles of streams in the basin have been evaluated for use-support ratings. Twenty-two percent of the rated streams area is considered impaired. Nutrient loading from several sources continues to be the primary water quality concern in the basin. Other major sources of impairment are agricultural operations, both vegetative and animal, and stream channelization (NCDWQ, 1997).

Roanoke River Basin

The Roanoke River Basin begins in the Blue Ridge Mountains of Virginia. Over 64 percent of the basin is located in that state. The river basin in North Carolina is relatively rural in nature except for the region near Greensboro, Winston-Salem, and High Point. Over 2,390 miles or approximately 92 percent of the freshwater streams in the North Carolina portion of the Roanoke River Basin have been evaluated for use-support ratings. Approximately 215 miles or just nine percent of the evaluated streams are considered as impaired. The major sources of pollution and associated threats to water quality in the basin are sediment, urban stormwater, nutrient loading, and fecal coliform bacteria problems (NCDWQ, 1996a).

Tar-Pamlico River Basin

The Tar-Pamlico River system is a major tributary to the Pamlico Sound, one of the most productive estuarine systems in the country. This river basin is the fourth largest in North Carolina and is one of only four basins that are located entirely within the state. The basin is relatively rural in character with an average of 80 persons per square mile, as compared to the state average of 127 persons per square mile. Despite this relatively rural character, approximately 25 percent of the freshwater streams in the basin evaluated for use-support ratings are considered impaired and about 43 percent of the Pamlico River's saltwaters are considered impaired. Sedimentation is the most widespread cause of freshwater stream impairment followed by low pH and fecal coliform bacteria problems. The largest cause of impairment in the estuarine portion of the basin is related to nutrient overloading from agricultural and urban runoff, wastewater discharges and atmospheric deposition. Due to cumulative nutrient overloading problems in the Pamlico River and Sound, the entire Tar-Pamlico River Basin was designated as Nutrient Sensitive Waters (NSW) in 1989. To reduce the nutrient loading into the river, a two-phased nutrient sensitive water management strategy was adopted to control point and nonpoint source discharges in the basin. The voluntary use of best management practices and newly adopted regulations control activities in the basin that could possibly effect water quality, including construction and stormwater management.

Neuse River Basin

The Neuse River Basin is one of only four basins that are located entirely within the state. Over 2,600 miles or approximately 76 percent of the streams in the Neuse River Basin have been evaluated for use-support ratings. Fourteen percent of the rated streams are considered impaired, a decrease from the 1993 rating period. The major sources of impairment in the basin include urban non-point source pollution, crop and animal production runoff, wastewater discharge, and low flows associated with dam releases, and irrigation withdrawals (NCDWQ, 1998a). Due to cumulative, nutrient overloading problems in the lower Neuse River and the Pamlico Sound, the entire Neuse River Basin was designated in 1983 as Nutrient Sensitive Waters (NSW). To reduce the nutrient loading into the river the Nutrient Sensitive Water Management Strategy for the Neuse River was adopted in 1997. The nine rules in the strategy regulate most activities in the basin that could possibly affect water quality, including construction and stormwater management.

Cape Fear River Basin

The Cape Fear River Basin is the largest river basin in North Carolina, covering over 9,000 square miles. This basin is one of only four basins located entirely within the state. Approximately 90 percent of the streams in the basin have been evaluated for use-support ratings. About 1,000 miles or 18 percent of the evaluated streams are considered as impaired. Sedimentation is the most widespread cause of stream impairment in the basin, but urban stormwater, construction, agriculture, and wastewater treatment plants are the major sources of pollution and associated threats to water quality (NCDWQ, 1996b).

Yadkin-Pee Dee River Basin

The Yadkin-Pee Dee River Basin is the second largest basin in North Carolina covering approximately 7,213 square miles. The basin is located primarily in the Piedmont Physiographic Region. The most populated areas in the basin are near the cities of Winston-Salem and Charlotte. Approximately 91 percent of the streams in the basin have been evaluated for use-support ratings. About 500 miles or nine percent of the evaluated streams are considered impaired. Sediment loading leading to turbidity and fecal coliform problems from both point and non-point source inputs is a major factor leading to impairment (NCDWQ, 1998b).

Catawba River Basin

The Catawba River Basin is the western-most basin in the project study area. The river rises from high elevation streams on the eastern slope of the Blue Ridge Mountains. This river system is a unique combination of relatively pristine mountain headwaters and dense population. It is the most densely populated river basin in the state with over a million residents and the state's largest city, Charlotte. Urban stormwater runoff is of particular concern in the lower portion of the basin in and around Gaston and Mecklenburg Counties, a region that includes the study area. It contributes to nutrient enrichment, sedimentation and fecal coliform problems in the streams, rivers and impoundments. A determination of the use support rating has been made of 90 percent of the streams in the Catawba River Basin. Sixteen percent of the rated streams were considered impaired. A high percentage of those impaired reaches are found in the southern portion of the basin near Charlotte, including the region of the study area. Sediment was the most widespread cause of impairment (NCDWQ, 1999).

3.1.4 Floodplains and Floodways

A floodway and floodplain evaluation was conducted in accordance with Executive Order 11988- *Floodplain Management.* The intent of the Executive Order was to avoid, to the extent possible, the long and short term adverse impacts associated with the occupancy and modification of floodplains. It also requires efforts to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, and prohibits floodplain encroachments which are uneconomic, hazardous, or result in incomplete uses of the floodplain, as well as any action which would cause a critical interruption of an emergency transportation facility, a substantial flood risk, or adverse impact on the floodplain's natural resource values. Information on the floodplains within the Study Area Alternatives was obtained from the Federal Emergency Management Agency Flood Insurance Rate Maps (FIRM). It should be noted that most, but not all, local governments within the Study Area Alternatives participate in the Federal Emergency Management Agency's National Flood Insurance Program (NFIP), therefore, only limited information is available in some areas. Many rural communities in northern North Carolina and southern Virginia do not participate in the program. In addition, many others have not had detailed flood studies prepared for their community. In some cases, large portions, if not the entire municipality, may be designated as a floodplain.

In NFIP regular program communities, the Federal Emergency Management Agency (FEMA), in cooperation with other federal agencies and state and local governments, conducts detailed flood studies to determine designated floodways to safely remove floodwater during flood events. These studies result in floodway boundaries, which are illustrated on Flood Insurance Rate Maps (FIRM). The information obtained through these studies is utilized by local jurisdictions in their land development ordinances and regulations to discourage development in flood prone areas.

The NFIP defines a floodplain as any land area susceptible to being inundated by water. The floodplain is divided into two sections, the floodway and floodway fringe. The floodway is defined as the channel of the stream and adjacent floodplain area that should be kept free of encroachment so that a 100-year flood event may occur without increasing the level and extent of the base flood elevations. The base, or 100-year flood, is defined as an event that is equaled or exceeded, on average, once every one hundred years. The floodway fringe, or the 100-year floodplain, is the area between the floodway boundary and the 100-year floodplain boundary. The locations of these 100-year floodplains associated with all major streams and rivers within the Study Area Alternatives where identified.

For the purposes of this document only crossings of FEMA mapped floodplains are noted.

3.1.5 Topography, Geology & Soils

Topography

The natural regions of Virginia and North Carolina are differentiated by the interaction of topography, geology and soils. The Rand McNally Goode's World Atlas (1993) indicates that the Study Area Alternatives traverse two physical geographic regions: Appalachian Piedmont and Gulf-Atlantic Coastal Plain. Within these regions there are three physical geographic sub-provinces: Coastal Lowlands (Triassic), Coastal Upland (Terraces) and Outer Piedmont. These regions are generally characterized by gently sloping, rolling terrain and coastal lowlands drained by an elaborate network of streams and rivers, which flow east to the Atlantic Ocean.

The Coastal Lowland sub-province is flat, with low relief areas along major rivers and near coastal areas. Elevations in the Coastal Lowland are between 0-18 meters (0-60 feet) above mean sea level (MSL).

The Coastal Upland sub-province has broad uplands with low slopes and gentle drainage divides. Steep slopes develop where dissected by stream erosion. Elevations range from 18-76 meters (60-250 feet) above MSL.

The Outer Piedmont sub-province has broad uplands with low to moderate slopes and elevations between 183-305 meters (600-1000 feet) above MSL in west, gradually diminishing to 61-91 meters (200-300 feet) above MSL along eastern periphery (The Geology of the Carolinas, 1991).

The approximate low to high elevation change for the Study Area Alternatives ranges from ± 10 meters (± 30 feet) above MSL near Washington, DC, in the Coastal Terrace to ± 280 meters (± 910 feet) above MSL near High Point, NC, in the Eastern Piedmont. The average elevation of the corridor is ± 125 meters (± 410 feet) above MSL. Table 3.2 shows topographic elevations at random locations along the Study Area Alternatives from Washington, DC to Charlotte, NC. The slopes along the existing rail lines in the Study Area Alternatives range from 0 percent too slightly greater than 2.5 percent. There is less than 103 miles of slopes steeper than one percent in the Study Area Alternatives.

Geology

Within the Study Area Alternatives there are substantial geological variations. The coastal terraces and plains consist essentially of horizontally sedimentary rocks, many of which are partially unconsolidated. A narrow belt of slightly to moderately tilted, older sedimentary rocks exists between Raleigh and Durham, NC southwest toward Charlotte, NC. Located to the west of these sedimentary rock formations, in central North Carolina and Virginia, are metamorphic and intrusive igneous rocks (Rand McNally Goode's World Atlas, 1993).

The Study Area Alternatives lie within several lithotectonic belts and fault zones of widely fractured, sheared and intruded rocks. Beginning at Washington, DC, and heading south to Raleigh, NC, four geologic belts are located in the Study Area Alternatives: Western Piedmont, Charlotte Chopawamsic, Goochland Raleigh, and Triassic (Mesozoic basin). In addition, six fault zones are located in the Study Area Alternatives: Spotsylvania, Stafford, Hylas, Hollister, Nutbush Creek and Old Hickory (Generalized Geologic Terrain Map of the Virginia Piedmont & Blue Ridge, 1999). East of Raleigh, NC, in a westerly direction towards Charlotte, NC, the Study Area Alternatives traverse the Eastern slate, Goochland Raleigh, Carolina slate, Triassic (Mesozoic basin) and Charlotte Chopawamsic geologic belts. In North Carolina portion of the Study Area Alternatives, an additional three fault zones exist: Gold Hill, Silver Hill and Nutbush Creek (The Geology of the Carolinas, 1991).

The core of both the Eastern slate and Goochland Raleigh belts was regionally metamorphosed to sillimanite or kyanite grade. The Carolina slate belt consists almost entirely of chlorite and biotite grade while much of the Chopawamsic Charlotte belt is comprised of plutonic and volcanic rocks with sillimanite being most common. The Western Piedmont consists of early Paleozoic sedimentary and igneous rocks, metamorphosed to sillimanite but in some areas the grade decreases to kyanite and garnet (The Geology of the Carolinas, 1991). Gneiss and schist are two typical types of metamorphic rocks in North Carolina and Virginia.

Table 3.2 Summary of Sample Elevations in Study Area Alternatives				
Cross Street (with Study Area Alternatives)			Approx. Elevation (above MSL)	
			Meters	Feet
15th St	Arlington, VA	Alexandria	15-18	50-60
Telegraph Rd	Alexandria, VA	Alexandria	6-9	20-30
US17	Fredericksburg, VA	Fredericksburg	15-18	50-60
SR626	Woodford, VA	Woodford	37-40	120-130
US54	Ashland, VA	Ashland	67-70	220-230
Chamberlayne Ave	Richmond, VA	Richmond	34-37	110-120
Richmond/Petersburg Turnpike	Petersburg, VA	Petersburg	49-52	160-170
SR654	Emporia, VA	Emporia	46-49	150-160
US58	La Crosse, VA	La Crosse	140-143	460-470
Montgomery St	Henderson, NC	Henderson	155-158	510-520
West Jones St	Raleigh, NC	Raleigh West	113-116	370-380
SR 1641	Weldon, NC	Weldon	30-33	100-110
West Thomas St	Rocky Mount, NC	Rocky Mount	37-40	120-130
Hanes St	Wilson, NC	Wilson	34-37	110-120
Massey St	Selma, NC	Selma	55-58	180-190
SR1415	Gulf, NC	Goldston	94-97	310-320
SR134	Troy, NC	Troy	171-174	560-570
East 36th St	Charlotte, NC	Charlotte East	235-238	770-780
SR1314 near bench mark (BM) 443	Durham, NC	Northwest Durham	128-131	420-430
South Main St near BM 663	Burlington, NC	Burlington	201-204	660-670
Aycock St near BM 858	Greensboro, NC	Greensboro	259-262	850-860
Sprague St	Winston-Salem, NC	Winston-Salem East	262-265	860-870
Cotton Grove Rd	Lexington, NC	Lexington West	244-247	800-810
Taylor Ave	High Point, NC	High Point East	277-280	910-920
US601 Bypass	Concord, NC	Concord	207-210	680-690

Note: Elevations are approximate; metric elevations were generated through conversion of the English unit contour from maps and rounded to the nearest meter.
Source: United States Geological Survey 7.5 minute (1:24,000) digital raster graphics; compiled by Carter Burgess, Inc.; 2001.

Soils

The soils within the Study Area Alternatives were identified using United States Department of Agriculture Soil Conservation Service (USDASCS) County Soil Surveys. Soils classified by the USDASCS are grouped into general soil map units and have broad areas with distinctive patterns of soils, relief and drainage. Each unit is named for the major soils it contains, but also may consist of several minor soil classifications. The soils in any one general soil map unit may differ from place to place in slope, depth, drainage and other characteristics.

The Coastal Plain is the eastern-most province in North Carolina and Virginia and covers approximately 30-40% of both states. Twenty to thirty percent of the Study Area Alternatives are located within this province. Parent material in the Coastal Plain consists mainly of marine and alluvial deposits and is very rich in quartz. Most soils in the Coastal Plain contain 50% quartz in the parent material and may contain up to 80-90% quartz. Feldspars are also common in Coastal Plain parent materials, but in lower quantities (may comprise up to 25% of the parent material). Micas, iron oxides, heavy minerals and clay minerals are common in small amounts. Organic parent materials are found in swamps and marshes.

The Piedmont, centrally located in both states, covers approximately 40-50% of both states. Seventy to eighty percent of the Study Area Alternatives are located in this province. Parent material in the Piedmont is mainly derived from a variety of igneous and metamorphic rocks. There are some discrete zones of sedimentary rocks. Mica schist is a typical source of parent material in the Piedmont and soils are usually very deep, very rich in weathering products (clays and Fe oxides) and very red. Soils tend to have a high shrink-swell potential, which means that when the soils are wet certain minerals will absorb large quantities of water and overall the soil expands or swells. As the soil dries out, those mineral particles shrink back to their original size.

As defined by the Comprehensive Soil Classification System (CSCS), the Study Area Alternatives consist predominantly of Ultisols. Ultisols are comprised of Groundwater laterite, humic, reddish-brown lateritic, and red-yellow podzolic soils (Conservation of Natural Resources, 1991). To determine soils conditions and characteristics within the Study Area Alternatives, 19 of the 46 county soil surveys were evaluated. By referencing county soil surveys within the Study Area Alternatives, information was collected on major soil type, classification, permeability and parent material. Table 3.3 lists the sampling of soil data collected by county, within the Study Area Alternatives.

Table 3.3
Study Area Alternatives Soil Data

		Most Common Soil Associations in Study Areas			
Mecklenburg	NC	Cecil	Predominately clayey subsoil	Moderately well drained	Residuum from acid igneous & metamorphic rock
		Wilkes-Enon	Predominately clayey subsoil	Well drained	Residuum from diorite, hornblende schist, or from mixed acidic and basic rock
		Iredell-Mecklenburg	Predominately clayey subsoil	Moderately well drained	Residuum from diorite, gabbro, and other rock high in ferromagnesian minerals
		Georgeville-Goldston-Lignum	Clayey or loamy subsoil	Moderately well drained	Residuum from fine grained schist or slate
Stanly	NC	Tatum-Badin-Georgeville	Loamy surface layer and loamy to clayey subsoil	Well drained	Residuum from Carolina slate on uplands

Table 3.3 Study Area Alternatives Soil Data					
		Most Common Soil Associations in Study Areas			
		Badin-Goldston	Loamy surface layer and loamy to clayey subsoil	Well drained	Residuum from Carolina slate on uplands
		Misenheimer-Kirksey-Badin	Loamy surface layer and loamy to clayey subsoil	Poorly to well drained	At head of and along drainageways, and on knolls and ridges
		Tatum-Badin-Georgeville	Loamy surface and clayey subsoil	Well drained	Residuum from Carolina slate on uplands
Davidson	NC	Davidson-Mecklenburg	Loamy surface and clayey subsoil	Well drained	Residuum from mafic and intermediate crystalline rocks on uplands
		Chewacla-Congaree	Loamy surface and subsoil	Poorly to well drained	Formed in recent alluvium on flood plains
		Cecil-Pacolet	Loamy surface and clayey subsoil	Well drained	Residuum from felsic crystalline rocks on uplands
		Poindexter-Enon-Zion	Loamy surface and a loamy or clayey subsoil	Well drained	Residuum from mafic and intermediate crystalline rocks on uplands
		Vance-Wedowee-Pacolet	Loamy surface and clayey subsoil	Well drained	Residuum from felsic crystalline rocks on uplands
Forsyth	NC	Chewacla-Congaree	Loamy surface and subsoil	Poorly to well drained	Formed in recent alluvium on flood plains
		Cecil-Pacolet	Loamy surface and clayey subsoil	Well drained	Residuum from felsic crystalline rocks on uplands
		Madison-Pacolet	Loamy surface and clayey subsoil	Well drained	Residuum from mica schist and mica gneiss
Durham	NC	White Store-Creedmoor	Predominately clayey subsoil	Moderately well drained	Residuum from shale and sandstone
		Appling-Cecil	Predominately clayey subsoil	Well drained	Residuum from material derived from granites
		Mayodan-Granville-Creedmoor	Friable sandy clay loam	Moderately well drained	Residuum from shale and sandstone
		Chewacla-Wehadkee-Congaree	Loamy surface and subsoil	Poorly to well drained	Formed in recent alluvium on flood plains
Wake	NC	White Store-Creedmoor	Predominately clayey subsoil	Moderately well drained	Residuum from shale and sandstone
		Mayodan-Granville-Creedmoor	Friable sandy clay loam	Moderately well drained	Residuum from shale and sandstone
		Appling-Cecil	Predominately clayey subsoil	Well drained	Residuum from material derived from granites
		Cecil	Predominately clayey subsoil	Moderately well drained	Residuum from acid igneous & metamorphic rock
		Appling	Subsoil of firm clay loam to clay	Well drained	Residuum from granite, gneiss and schist

Table 3.3 Study Area Alternatives Soil Data					
		Most Common Soil Associations in Study Areas			
		Appling-Louisburg-Wedowee	Subsoil of very friable coarse sandy loam to firm clay	Well drained	Residuum from granite, gneiss and schist
Orange	NC	Georgeville-Herdon-Tatum	Surface layer of silt loam and a subsoil of clay loam, silty clay loam, silty clay and clay	Well drained	Residuum from granite, gneiss and schist. Underlying material of red saprolite that crushes to loam
		Tatum-Goldston	Surface layer of silt loam and slaty silt loam and subsoil of silty loam to clayey loam	Well drained	Residuum from granite, gneiss and schist. Underlying material of red saprolite that crushes to loam
		Appling-Helena	Surface layer of sandy loam and subsoil of sandy clay loam, clay or sandy clay	Well drained and moderately well drained	Residuum from granite, gneiss and schist. Underlying material of yellow saprolite that crushes to sandy loam
Moore	NC	Nason-Georgeville-Goldston	Clayey or loamy subsoil	Well drained to excessively drained	Residuum from igneous and metamorphic rock from Piedmont. Rocks outcrops apparent and bedrock at shallow depths
		Mooshaunee-Hallison-Mayodan-Pinkston	Clayey or loamy subsoil	Moderately well drained to excessively drained	Residuum from igneous and metamorphic rock from Piedmont. Rocks outcrops apparent and bedrock at shallow depths
Lee	NC	White Store-Creedmoor	Predominately clayey subsoil	Moderately well drained	Residuum from shale and sandstone
		Chewacla-Wehadkee-Congaree	Loamy surface and subsoil	Poorly to well drained	Formed in recent alluvium on flood plains
		Mayodan-Pinkston	Loamy surface and clayey to loamy subsoil	Well drained	Residuum from igneous and metamorphic rock from Piedmont. Rocks outcrops apparent and bedrock at shallow depths
		Tetotum-Wickham-State	Loamy surface and loamy subsoil	Well drained to moderately well drained	Residuum from igneous and metamorphic rock from Piedmont. Rocks outcrops apparent and bedrock at shallow depths
Johnston	NC	Norfolk-Goldsboro-Rains	Sandy or loamy surface layer and predominately loamy subsoil	Well drained to poorly drained	Residuum from mica schist and mica gneiss mixed with residuum from shale and sandstone

Table 3.3 Study Area Alternatives Soil Data					
		Most Common Soil Associations in Study Areas			
		Rains-Goldsboro-Lynchburg	Loamy surface layer and predominately loamy subsoil	Well drained to poorly drained	Residuum from mica schist and mica gneiss mixed with residuum from shale and sandstone
		Cecil-Pacolet-Nason	Loamy surface layer and predominately clayey subsoil	Well drained, moderately well drained and poorly drained	Residuum from acid igneous & metamorphic rock
		Wedowee	Loamy surface layer and predominately clayey subsoil	Well drained, moderately well drained and poorly drained	Residuum from acid igneous & metamorphic rock
		Wehadkee-Bibb-Chewacla	Loamy surface layer and loamy subsoil or loamy and sandy underlying material	Well drained to poorly drained	Residuum from acid igneous & metamorphic rock
		Altavista-State-Augusta	Loamy surface and subsoil	Well drained to poorly drained	Residuum from acid igneous & metamorphic rock
Wilson	NC	Norfolk-Gritney-Wagram	Loamy or clayey subsoil	Well drained and moderately well drained	Residuum from shale, sandstone and quartz
		Rains-Goldsboro	Loamy subsoil	Poorly drained and moderately well drained	Residuum from mica schist and mica gneiss
		Tomotley-Altavista-State	Loamy subsoil	Poorly drained, moderately well drained and well drained	Formed in recent alluvium on flood plains
		Bibb-Wilbanks-Wehadkee	Loamy or clayey subsoil	Poorly drained and very poorly drained	Formed in recent alluvium on flood plains
		Tatum-Wedowee-Varina	Clayey or loamy subsoil	Well drained	Residuum from acid igneous & metamorphic rock
Nash	NC	Norfolk-Rains	Loamy or clayey subsoil	Well drained and poorly drained	Residuum from shale, sandstone and quartz
		Rains-Norfolk-Goldsboro	Loamy or clayey subsoil	Poorly drained, well drained and moderately well drained	Residuum from shale, sandstone and quartz
		Wehadkee-Altavista-Wickham	Loamy subsoil	Poorly drained, moderately well drained and well drained	Residuum from shale, sandstone and quartz mixed with residuum from granite, gneiss and schist
Vance	NC	Appling	Subsoil of firm clay loam to clay	Well drained	Residuum from granite, gneiss and schist
		Wedowee-Louisburg-Pacolet	Loamy or sandy surface layer and a clayey or loamy subsoil	Well drained to excessively drained	Residuum from granite, gneiss and schist mixed with residuum from acid igneous & metamorphic rock

Table 3.3 Study Area Alternatives Soil Data					
		Most Common Soil Associations in Study Areas			
Edgecombe	NC	Goldsboro-Rains	Loamy subsoil	Well drained to poorly drained	Residuum from shale, sandstone and quartz mixed with residuum from granite, gneiss and schist
		Norfolk-Aycock-Wagram	Loamy subsoil	Well drained	Residuum from shale, sandstone and quartz
		Tarboro-Altavista-Wickham	Loamy subsoil and sandy underlying material	Excessively drained to moderately well drained	Residuum from shale, sandstone and quartz
		Wehadkee-Congaree	Loamy and sandy inderlying material	Well drained to poorly drained	Residuum from shale, sandstone and quartz mixed with residuum from granite, gneiss and schist
Fairfax	VA	Lunt-Hilly	Loamy and gravelly sediments	Well drained to excessively drained	Residuum from shale, sandstone and quartz (coastal plain sediment)
		Matapeake-Mattapex-Woodstown	Loamy and gravelly sediments	Well drained to excessively drained	Residuum from shale, sandstone and quartz (coastal plain sediment)
		Beltsville-Elkton-Sassafras	Loamy and gravelly sediments	Well drained to excessively drained	Residuum from shale, sandstone and quartz (coastal plain sediment)
Prince William	VA	Dumfries-Lunt-Marr	Loamy or clayey subsoil	Well drained	Soils are underlain by unconsolidated sediments of sand, silt and clay. Rounded quartz found in soil.
Hanover	VA	Fluvaquents-Chewacla-Altavista	Mixed sandy, loamy and clayey substratum, loamy subsoil	Poorly drained	Formed in recent alluvium on flood plains
		Pamunky-Dogue-Forestdale	Loamy or clayey subsoil	Well drained and poorly drained	Formed in recent alluvium on flood plains
		Norfolk-Orangeburg-Faceville	Loamy or clayey subsoil	Well drained	Residuum from igneous and metamorphic rock from Piedmont
		Duplin-Coxville-Dunbar	Dominantly clayey subsoil	Moderately well drained	Residuum from igneous and metamorphic rock from Piedmont
		Vance-Orange-Colfax	Dominantly very firm clayey subsoil or have fragipan	Moderately well drained	Residuum from igneous and metamorphic rock from Piedmont
		Creedmoor-Udalfs-Mayodan	Dominantly clayey and loamy subsoil	Moderately well drained	Residuum from igneous and metamorphic rock from Piedmont
Greensville	VA	Woodington-Slagle-Emporia	Loamy soils	Poorly to well drained	Formed in recent alluvium on flood plains and upland depressions
		Peawick-Roanoke-Altavista	Clayey to loamy soils	Poorly to moderately well drained	Residuum from igneous and metamorphic rock from Piedmont

Table 3.3 Study Area Alternatives Soil Data					
		Most Common Soil Associations in Study Areas			
		Roanoke-Altavista	Clayey to loamy subsoil	Poorly to moderately well drained	Residuum from igneous and metamorphic rock from Piedmont
Dinwiddie	VA	Montross-Rains-Lynchburg	Loamy subsoil	Moderately well drained poorly drained and somewhat poorly drained	Formed in recent alluvium on flood plains (fluvial and marine sediments on uplands)
		Slagle-Emporia-Bonneau	Loamy subsoil	Moderately well drained and well drained	Formed in recent alluvium on flood plains (fluvial and marine sediments on uplands)

Source: United States Department of Agriculture, Soul Conservation Service, in cooperation with North Carolina and Virginia Agricultural Experiment Station, 2001.

Study Area Alternatives soil conditions can be characterized as poorly to well drained. Permeability is directly related to content of parent material, slope, elevation and surrounding topography. In the western most regions of the Study Area Alternatives of North Carolina, near Mecklenburg County, soils are moderately to well drained. In the eastern Piedmont region of North Carolina, near Forsythe County, soils tend to be poorly to well drained. In the central areas of North Carolina, soils are moderately to well drained. The eastern areas of North Carolina, near the North Carolina/Virginia state line soils are poor to well drained. The majority of soils near Wilson and Edgecombe Counties of eastern North Carolina are poorly drained to moderately well drained. In southern Virginia, within the Study Area Alternatives, soils tend to be poorly drained to moderately well drained. Further north, in central Virginia, soils are moderately well drained to well drained. Soils in northern Virginia, near Fairfax and Prince William Counties, are well drained to excessively drained.

3.1.6 Mineral Resources

Mineral resources have played a significant role in the growth and development of North Carolina and Virginia since the first settlement of Colonial America in the seventeenth century. According to the United States Geological Survey, in 1999, the estimated value of non-fuel mineral production for North Carolina was $761 million, and the estimated value for Virginia was $667 million. North Carolina ranked nineteenth among the 50 states in total non-fuel mineral production value, and Virginia ranked twenty-second. Crushed stone is the leading non-fuel mineral in both North Carolina and Virginia, providing 66% and 61% of the total value of non-fuel minerals in each State, respectively. North Carolina is the leading state in feldspar, mica, and pyrophyllite; second in common clays and second of two states that produce olivine; and the seventh in industrial sand and gravel and peat. Virginia is the only state to mine kyanite; second in feldspar; second of two states that produce titanium concentrates, zircon concentrates and vermiculate; seventh in fuller's earth; eighth in lime; and ninth in crushed stone.

Information on the mineral industries in North Carolina and Virginia was obtained from the US Geological Survey, the North Carolina Geological Survey, and the Virginia Department of Mines, Mineral, and Energy. The US Geological Survey Mineral Database (2000), provided a GIS data layer which was mapped over the Study Area Alternatives to present a comprehensive summation of historic mines that exist within the six-mile wide areas.

A combined total of 167 historic mining operations exist in the North Carolina portion of the Study Area Alternatives. A combined total of 89 historic mining operations exist in the Virginia portion of the Study Area Alternatives. Historic mines are all existing mines, including active and inactive permitted mines. Table 3.4 summarizes the number of historic mines by Study Area Alternative. Table 3.5 summarizes the number of historic mines in Virginia counties, while Table 3.6 summarizes the number of historic mines in North Carolina counties. Areas of high concentrations of historic mines (greater than 20) within the limits of the Study Area Alternatives are located in Cabarrus, Mecklenburg, and Moore Counties in North Carolina, and Fairfax County in Virginia. Cabarrus and Mecklenburg Counties are located in the Charlotte and Milton Belts geologic region of North Carolina, and Moore County is located in the Triassic Basins geologic region.

Table 3.4 Summary of Historic Mines within each Study Area Alternative	
	Number of Historic Mines
A	134
B	131
C	174
D	128
E	133
F	177
G	142
H	139
J	183

Source: U.S. Geological Survey Digital Data Series DDS-52, 2000.

Table 3.5 Summary of Historic Mines By County in Virginia Within the 6-mile Study Buffer	
	Number of Historic Mines
Arlington	0
Brunswick	2
Carolina	15
Chesterfield	3
Dinwiddie	2
Fairfax	29
Greensville	0
Hanover	1
Henrico	1
Lunenburg	0
Mecklenburg	0
Prince George	2
Prince William	3
Spotsylvania	15
Stafford	13
Sussex	0
TOTAL	**89**

Source: U.S. Geological Survey Digital Data Series DDS-52, 2000.

Table 3.6 Summary of Historic Mines By County in North Carolina Within the Study Area Alternatives	
	Number of Historic Mines
Alamance	4
Anson	2
Cabarrus	22
Chatham	10
Davidson	3
Durham	3
Edgecombe	6
Franklin	0
Forsythe	1
Guilford	13
Halifax	3
Johnston	2
Lee	6
Mecklenburg	27
Montgomery	9
Moore	34
Nash	1
North Hampton	1
Orange	4
Rowan	7
Stanly	4
Vance	1
Wake	4
TOTAL	**167**

Source: U.S. Geological Survey Digital Data Series DDS-52, 2000.

3.1.7 Hazardous Materials

Hazardous materials and waste sites, including their use and remediation, are regulated by a number of federal laws, including the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Hazardous waste is generally defined as any material that has, or when combined with other materials will have a deleterious effect on humans or the natural environment. Characterized as reactive, toxic, infectious, flammable, explosive, corrosive, or radioactive; hazardous wastes may be solids, sludges, liquids, or gases. Potential hazardous waste sites include landfills, dumps, pits, lagoons, salvage yards, and industrial sites, as well as above and below ground storage tanks.

Impacts to hazardous waste and/or material sites are an important consideration in the development of any major transportation improvement project. Remediation of such sites can dramatically increase the overall cost of a project. Therefore, it is important to know early in the environmental analysis process where potential conflicts with these sites may occur, so that proper planning can be conducted to avoid these locations, where possible.
Information obtained on hazardous material and waste sites includes those sites regulated by or otherwise known to North Carolina and Virginia governmental agencies and the U.S. Environmental Protection Agency. The information was gathered from a number of sources, including:

- Environmental Data Resources, Inc. (EDR), who conducted a government records search of the following databases:
- National Priority List (NPL)
- Resource Conservation and Recovery Information System (RCRIS)
- Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
- Corrective Action Report (CORRACTS)
- RCRA Administrative Action Tracking System (RAATS)
- Toxic Chemical Release Inventory System (TRIS)
- Superfund (CERCLA) Consent Decrees (CONSENT)
- North Carolina Center for Geographic Information Analysis, which provided the following data layers:
- Solid Waste Facilities
- Hazardous Materials Points
- Superfund Points and Areas (Hazardous Substance Disposal Sites
- Groundwater Incidents
- U.S. Environmental Protection Agency (EPA):
- Virginia RCRA Sites
- Virginia Solid Waste Sites

This information for all nine of the Study Area Alternatives is summarized in Table 3.7.

Table 3.7 Summary of Hazardous Substance Sites and Superfund Sites within the Study Area Alternatives		
		Hazardous Substance Sites (each)
A	36	23
B	42	24
C	7	23
D	36	29
E	42	30
F	7	29
G	42	29
H	48	30
J	13	29

Source: North Carolina Center for Geographic Information Analysis and U.S. Environmental Protection Agency. Compiled by AG&M and EDR

Areas of high concentrations of hazardous material and waste sites within the limits of the Study Area Alternatives include Washington, DC and its suburbs; Richmond, Virginia and its suburbs; Springfield, Virginia and its suburbs; Raleigh, North Carolina; Durham, North Carolina; Research Triangle Park, North Carolina; Greensboro, North Carolina; High Point, North Carolina; Winston-Salem, North Carolina; and Charlotte, North Carolina.

In addition to the sites identified during this effort, other potential hazardous material and waste sites may exist in the study area due to illegal dumping, lack of regulatory compliance, or limited regulatory information.

Service stations are one of the most common generators of potential hazardous material sites, as older underground storage tanks may deteriorate and contaminate surrounding soil and groundwater with gasoline and diesel fuel. Because service stations are ubiquitous throughout the Study Area Alternatives and many have been determined to have leaking underground storage tanks, no attempt was made to identify all locations of these facilities or other regulated underground storage tanks.

3.1.8 Air Quality

Regulatory Environment

A set of primary and secondary Ambient Air Quality standards for six criteria pollutants was established under the authority of the Clean Air Act and the 1990 Clean Air Act Amendments (CAAA) [42 U.S. Code (USC) 7401 *et seq.*]. The US Environmental Protection Agency (EPA), using health-based criteria as the basis for setting permissible levels, regulates criteria air pollutants. One set of limits (primary standard) protects health; another set of limits (secondary standard) is intended to prevent environmental and property damage. The primary and secondary standards are shown in Table 3.8, including the revised 1997 standards for ozone and particulate matter 2.5 microns or smaller in diameter ($PM_{2.5}$). Except for sulfur dioxide, the secondary standards are the same as the primary standards for all pollutants.

In accordance with the CAAA, all regulatory regions within Virginia and North Carolina that are in compliance with the National Ambient Air Quality Standards (NAAQS) primary standard are designated as an "attainment area"; areas that don't meet the primary standard are designated as “nonattainment areas”. In 1997 EPA reviewed the air quality standards for ground-level ozone and particulate matter. Based on new scientific evidence, revisions have been made to both standards. These revisions are currently not in effect, pending a court decision.

Clean Air Act Amendments – Title I:

Title I of the CAAA addresses nonattainment issues related to ozone, CO, and PM10. Nonattainment areas are progressively ranked according to the severity and type of their air pollution problems. Each category of nonattainment has a label such as severe or moderate and a date for meeting the federal air quality standards.

Clean Air Act Amendments – Title II*:*

Title II of the CAAA addresses mobile sources and stipulate more stringent emission standards for cars, trucks and buses. This title regulates fuel quality (such as gasoline volatility and diesel sulfur content); requires reformulated gasoline in the worst ozone areas and oxygenated fuels in the worst CO areas; and requires clean-fueled vehicles for certain fleets and other pilot programs.

Clean Air Act Conformity:

The 1990 CAAA requires Federal agencies to ensure that their actions conform to the appropriate State Implementation Plan (SIP). States are required to develop SIPs that explain how each state will do its job under the Clean Air Act. A state implementation plan is a collection of the regulations a state will use to mitigate air pollution. The states must involve the public, through hearings and opportunities to comment, in the development of each state implementation plan. The North Carolina Department of Environment and Natural Resources (DENR) administers the (SIP) for the implementation, maintenance, and enforcement of the national standards within North Carolina. For Virginia, the State Air Pollution Control Board administers the SIP.

Conformity to a SIP, as defined in the CAAA, means conformity to a SIP’s purpose of reducing the severity and number of violations of the NAAQS to achieve attainment of such standards. The Federal agency responsible for the action is required to determine if its action conforms to the applicable SIP. The U.S. Environmental Protection Agency (EPA) has developed two sets of conformity regulations:

- Transportation projects developed or approved under the Federal Aid Highway Program or Federal Transit Act are governed by the “transportation conformity” regulation [40 Code of Federal Regulation (CFR) Part 93, Subpart A}; and
- Other projects, which include the Federal action planned for the Washington DC to Charlotte Rail project, are governed by the “general conformity” regulations. The regulations for *Determining Conformity of General Federal Actions to State or Federal Implementation Plans* were published in the *Federal Register* on November 30, 1993. The general conformity rule (40 CFR Part 93, Subpart B) became effective January 31, 1994. In Virginia, general conformity criteria and procedures are set forth in 9VAC5-10-20. In North Carolina, these criteria and procedures are set forth in 15 NCAC.200-.2004.

The conformity regulations apply to Federal actions occurring in air basins designated as nonattainment for criteria pollutants or in attainment areas subject to maintenance plan (maintenance areas). Federal actions occurring in air basins that are in attainment with criteria pollutants are not subject to the conformity rule.

Table 3.8 National Ambient Air Quality Standards			
Pollutant	**Standard Value***		**Standard Type**
Carbon Monoxide (CO)			
8-hour Average	9 ppm	(10 mg/m^3)	Primary
1-hour Average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual Arithmetic Mean	0.053 ppm	(100 *u*g/m^3)	Primary & Secondary
Ozone (O_3)			
1-hour Average	0.12 ppm	(234 *u*g/m^3)	Primary & Secondary
8-hour Average**	0.08 ppm	(157 *u*g/m3)	Primary & Secondary
Lead (Pb)			
Quarterly Average	1.5 *u*g/m^3		Primary & Secondary
Particulate (PM 10)			
Annual Arithmetic Mean	50 *u*g/m^3		Primary & Secondary
24-hour Average	150 *u*g/m^3		Primary & Secondary
Particulate (PM 2.5)	*Particles with diameters of 2.5 micrometers or less*		
Annual Arithmetic Mean**	15 *u*g/m^3		Primary & Secondary
24-hour Average**	65 *u*g/m^3		Primary & Secondary
Sulfur Dioxide (SO2)			
Annual Arithmetic Mean	0.03 ppm	(80 ug/m3)	Primary
24-hour Average	0.14 ppm	(365 ug/m3)	Primary
3-hour Average	0.50 ppm	(1300 ug/m3)	Secondary

** The ozone 8-hour standard and the PM 2.5 standards are included for information only. A 1999 federal court ruling blocked implementation of these standards, which EPA proposed in 1997. EPA has asked the U.S. Supreme Court to reconsider that decision.
Source: EPA Parenthetical value is an approximately equivalent concentration.*

Affected Environment

Potential air quality impacts within the Study Area Alternatives include:

- Changes in rail-related emissions due to an increase in train operations each day and a change in equipment,
- Changes in the overall emissions from transportation sources, due to ridership diversion, and
- Changes in local or microscale ambient air quality concentrations. These include changes from locomotive passbys; changes at various crossings that could handle additional traffic due to nearby highway-railroad crossing closures; and changes in

vehicular delay due to trains stopping to load and unload passengers and increased traffic resulting from increased ridership.

Ambient Air Quality in the Study Area Alternatives

Nonattainment Areas:

Currently in Virginia, the only 1-hour ozone nonattainment area within the Study Area Alternatives is in Northern Virginia. This portion of the Study Area Alternatives is part of the Metropolitan Washington, DC ozone nonattainment area, and includes the jurisdictions of Arlington, Fairfax, Loudoun, Prince William, and Stafford Counties, and the cities of Alexandria, Fairfax, Manassas, Manassas Park, and Falls Church. The Richmond area is an ozone maintenance area for the 1-hour standard (0.12 ppm).

In North Carolina currently seven counties are in maintenance, with all remaining counties in attainment for the criteria pollutants including the 1-hour average for ozone. The seven maintenance counties include: Wake, Durham, Guilford, Forsyth, Davidson, Mecklenburg and Gaston (Figure 3.1).

Several areas within the study area alternatives might become non-attainment areas for an 8-hour ozone standard. The U. S. Supreme Court recently upheld the authority of the EPA to set such a standard, but ruled the EPA needed to consider certain provisions of the CAAA, which it had failed to consider in its initial rulemaking [Whitman v. American Trucking Association, 531 U.S. 457-(2001)]. The revised EPA rulemaking is expected in the indeterminate future.

Monitoring Stations:

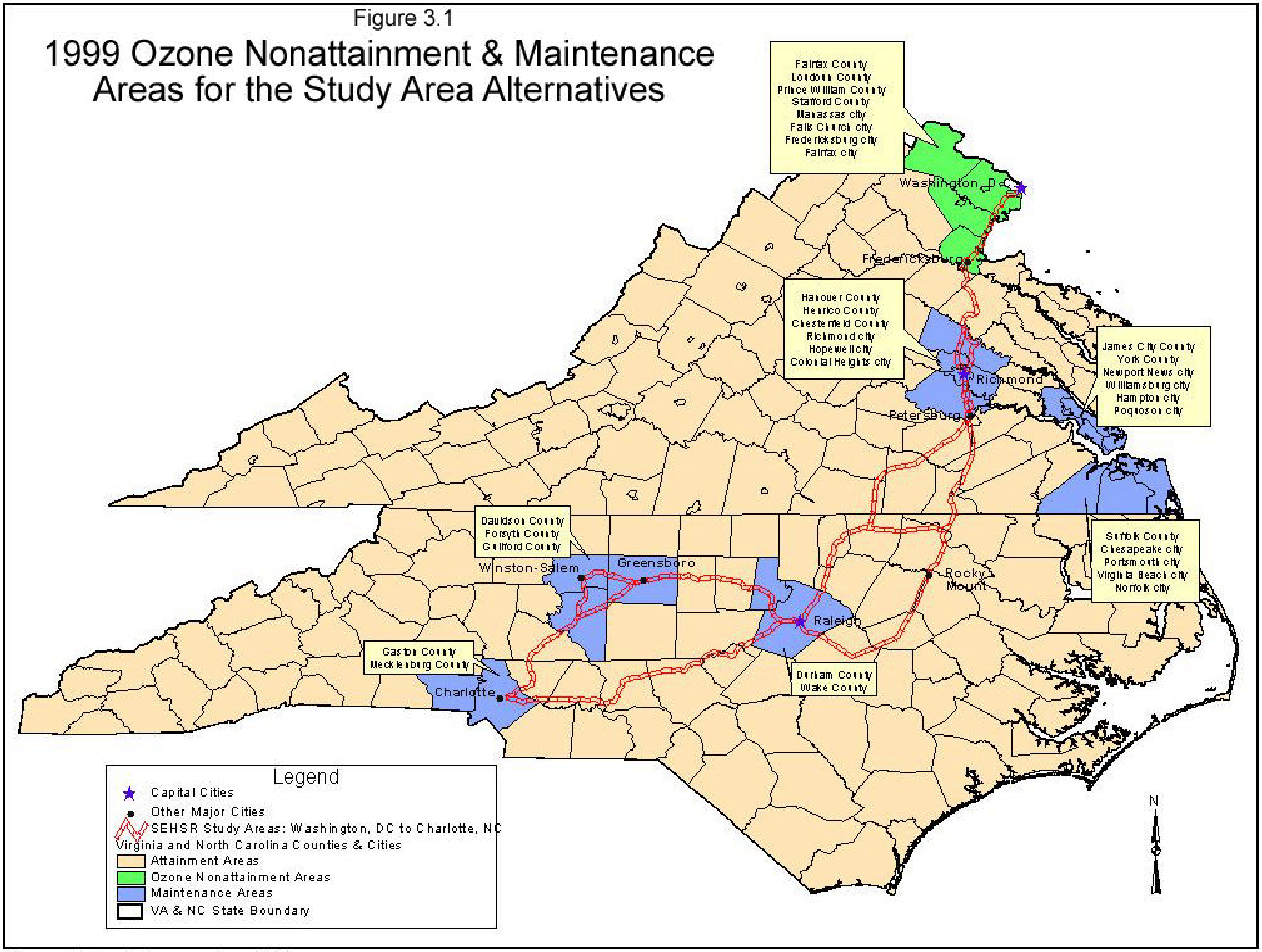
The methods used to measure the effects of a transportation project on the ambient air quality depend on the pollutants to be considered and the location of the project. The air quality impacts of within Study Area Alternatives in rural areas can be assessed using simplified procedures. In urban non-attainment and maintenance areas, the impact within Study Area Alternatives would require very detailed analysis. The Virginia Department of Environmental Quality and the North Carolina Department of Environmental Health and Natural Resources Division of Air Quality maintain networks of monitoring stations, which sample ambient air concentrations and provide data to assess the impact of control strategies. The pollutants of concern for this project are those pollutants that are emitted from transportation sources. These include ozone, CO, NO_x, and PM.

Emission information by pollutants are summarized as follows:

- Ozone – In Virginia during year 2000, there were thirteen one-hour ozone exceedences of the 124 parts per billion standard in cities and counties located within the Study Area Alternatives. These include: Alexandria, Arlington County, Fairfax County, Stafford County, Hanover County and Henrico County.
- In North Carolina during 1999, there were a total of eleven one-hour exceedences that occurred in the counties of Wake, Forsyth, Rowan and Mecklenburg within the Study Area Alternatives.
- Additionally, for the new eight-hour standard, eleven sites reported exceedences in counties and cities in Virginia within the Study Area Alternatives. In North Carolina, thirteen sites reported exceedences.
- Carbon Monoxide – There were no exceedances of either the one-hour primary standard of 35.0 ppm or the eight-hour primary standard of 9.0 ppm in 1999 in Virginia or North Carolina.
- Particulate Matter – For $PM_{10,}$ no sites in Virginia or North Carolina during 1999 exceeded the primary annual standard of 50 ug/m^3.
- Nitrogen Dioxide – There were no violations of the annual primary standard of 0.053 ppm recorded in Virginia or North Carolina in 1999.

Figure 3.1

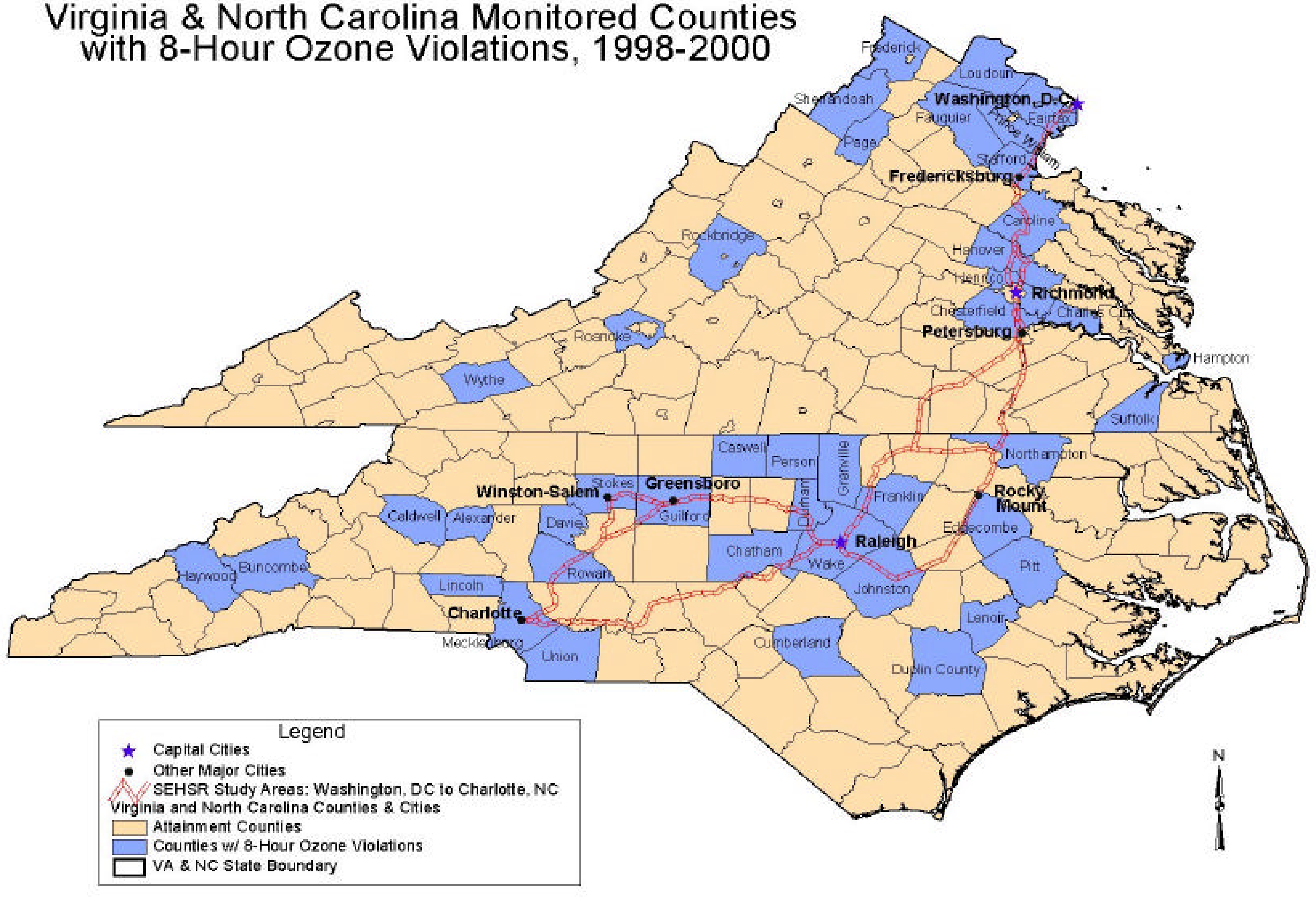
1999 Ozone Nonattainment & Maintenance Areas for the Study Area Alternatives



Source: Carter & Burgess, Inc., 2001

Figure 3.1B

Virginia & North Carolina Monitored Counties with 8-Hour Ozone Violations, 1998-2000



Source: Carter & Burgess, Inc., 2001

Existing Air Quality Effects of Locomotive Pas sbys:

Air quality data for the F59 PHI locomotive, which was modeled for use in the SEHSR corridor, were used for this review. The emission rates for this locomotive, when tested by the Association of American Railroads, generated 0.6 grams per hp hour. This meets the present EPA CO emission standards for freight locomotives, under Tier Zero. It is assumed that this locomotive could have a negligible effect on ambient air quality based on the findings discussed in the *Chicago – St. Louis High Speed Rail P roject Draft Environmental Statement* which cited the effect of existing diesel locomotive passbys on ambient CO and NO_x air quality. This study found that locomotive passbys only minimally increase background concentration levels and do not exceed NAAQS standards. These findings were based on assessments of other railroad projects in the U.S., particularly the Northeast Corridor Improvement Project (NECIP). For example, peak CO concentrations at sites evaluated for the NECIP did not exceed 0.03 ppm. This was converted to a one-hour concentration below 0.01 ppm, which is nominal compared to the 35.0 ppm one-hour NAAQS standard (USDOT, 1994). The assessments for the NEC were of F40 locomotives.
To date no studies have been conducted to assess the impacts of locomotive passbys, including F59 PHI locomotives, within the Study Area Alternatives.

3.1.9 Noise and Vibration

Passenger trains generally travel through or near populated areas making evaluating noise and vibration a key part of the environmental impact assessment process. Experience has shown that noise and vibration are perceived as a major concern of surrounding communities. The following sections describe basic noise and vibration concepts, provide an overview of the process that will be conducted to assess noise and vibration, and lists techniques that can be applied to minimize and mitigate the effects of noise and vibration.

Existing noise levels in the Study Area Alternatives are attributable to intercity passenger, commuter, and freight rail traffic. The primary source of vibration in the Study Area Alternatives is attributable to the interaction of train wheels on the tracks. No monitoring of ambient noise levels was conducted for this analysis.

Regulatory Setting

The Federal Railroad Administration (FRA) and the Federal Transit Administration (FTA) consider certain land uses to be noise and vibration "sensitive". Land uses within this category include residences, schools, churches, libraries, hospitals, hotels/motels, and parks. FRA and FTA have developed guidance manuals, *High Speed Ground Transportation Noise and Vibration Impact Assessment* and *Transit Noise and Vibration Impact Assessment* , which include criteria for noise and vibration impact evaluation. These noise criteria are based on a comparison of the new rail system activity with the outdoor ambient noise from other sources in the community. They incorporate both absolute thresholds, which consider activity interference caused by the rail system alone, and relative limits, which consider annoyance due to the change in noise environment caused by the train.

The noise criteria is based on the existing ambient noise levels using the measurement terms of L_{eq} or L_{dn}. The term $L_{eq,}$ or Equivalent Level, is a descriptor based on the average acoustic intensity over time. This allows for the conversion of sound events of different durations to a comparable noise level over a standard time interval. The term $L_{dn,}$ or Day-Night Level, is the cumulative A-weighted sound level over a 24-hour period. This helps to describe the quality of the habitable, 24-hour noise environment. L_{dn} is applied to residences and other buildings where people normally sleep, and L_{eq} is applied to all other noise-sensitive land use categories.

Based on extensive social survey data relating noise exposure to annoyance, two levels of noise impact are included in the criteria and defined by FTA as follows:

- Severe: Severe noise impacts are considered “significant” as this term is used in the National Environmental Policy Act (NEPA) and implementing regulations. Noise mitigation will normally be specified for severe impact areas unless there is no practical mitigation measure.
- Impact: In this range, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors can include the predicted increase over existing noise levels, the types and numbers of noise-sensitive land uses affected, existing outdoor-to-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.

Under the FTA criteria, the extent of potential noise impact depends on land use category. The three land use categories are described in Table 3.9.

In addition to the rail noise, high speed rail operations have the potential to cause vibration impacts. Ground-borne vibration is a small but rapid fluctuating motion transmitted through the ground. Ground-borne vibration diminishes (or “attenuates”) over distance. Some soil types transmit vibration quite efficiently; others do not. The response of humans, building, and sensitive equipment to vibration is described in terms of root-mean square (RMS) velocity level in decibel units (VdB). The average person can just barely perceive vibration velocity levels below 70 VdB. Common sources of ground-borne vibration are heavy trucks, rough roads, trains and earth-moving equipment. Several factors influence the rail related vibration level at a particular location, including:

- Rail operations, including train length and speed;
- Track design and condition;
- Geologic conditions;
- Affected building characteristics.

Unlike noise criteria, vibration impact criteria are based on the typical maximum vibration level from repeated events such as the passbys of a high-speed train. The ground-borne vibration criteria used for this review is summarized in Table 3.9.

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent[1] Events	**Infrequent[2] Events**	**Frequent[1] Events**	**Infrequent[2] Events**
Category 1: Building where low ambient vibration is essential for interior operations.	65 VdB[3]	65 VdB[3]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:

1. Frequent Events is defined as more than 70 vibration events per day.
2. Infrequent Events is defined as fewer than 70 vibration events per day.
3. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes.
4. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: FTA Transit Noise and Vibration Impact Assessment, April 1995

Affected Environment

As indicated in Table 3.9, the noise impact criteria and descriptors for human annoyance depend on land use (designated Category 1, Category 2, and Category 3). Category 1 includes tracts of land where quiet is an essential element of their intended purpose, such as outdoor concert pavilions or National Landmarks where outdoor interpretation routinely takes place. Category 2 includes residences and buildings where people sleep, while Category 3 includes institutional land uses with daytime and evening use, such as schools, places of worship and libraries.

The major sources of existing train noise in the Study Area Alternatives are: (1) the locomotive engines; (2) the rolling interaction of the train wheels on the track rails; and (3) locomotive horns that are sounded at highway-railroad at-grade crossings. The major source of existing ground-borne vibration is the rolling interaction of the rail vehicle wheels on the rails. Secondary noises along the corridor include motor vehicle traffic on nearby roadways, aircraft over flights in some areas, and general community activities.

Existing Noise and Vibration Environment

Field measurements were not collected during this Tier I environmental process. Noise and vibration measurements would be collected at representative locations within the Study Area Alternatives during the Tier II phase. These measurements would help define the existing noise and vibration environments. Further noise and vibration analyses for the Study Area Alternatives would be conducted in a manner consistent with federal guidance. The major steps of the noise and vibration analysis include:

- Inventory noise and vibration sensitive land-uses;
- Determine existing noise and vibration levels;
- Estimate future levels of noise and vibration;
- Compare findings with federal standards and make a determination of impact;
- Consider reasonableness and feasibility of mitigation; and
- Recommend mitigation if warranted.

Information regarding train speed, train volume; time of operation, and distance from the track will be used to estimate noise and vibration levels.

As an indication of the potential for noise and vibration impacts in the Study Area Alternatives, data from a similar project between Chicago and St. Louis is presented. With the Chicago – St. Louis High-Speed Rail Project all sensitive receptors located within 250 feet of the track centerline were analyzed. This came to a total of 3,529 residential receptors and 71 non-residential receptors.

Noise Estimates:

Existing noise level estimates for the Chicago – St. Louis High-Speed Rail Project for residential receptors analyzed ranged from 52 to 74 dBA. For non-residential receptors analyzed, noise levels ranged from 61 to 64 dBA. The highest noise levels estimated for residential receptors were in instances where the receptors were as close as 25 feet from the centerline of the track.

Vibration Estimates:

Existing vibration estimates for the Chicago – St. Louis High-Speed Rail Project were typically between 65 and 75 VdB. The highest existing vibration levels were 81 VdB, where residential development, as in the noise analysis, were as close as 25 feet from the centerline of the track.

3.1.10 Energy

Energy, its sources, and uses are becoming more critical considerations in decisions to implement and invest in transportation programs and improvements. In 1992, transportation use accounted for over 66 percent of U.S. oil consumption.1 In 1992, automobiles accounted for 39% of all transportation energy use, trucks 32.5 percent, other highway use accounted for 17 percent, aircraft accounted for 8.9 percent, and intercity passenger rail less than one tenth of 1 percent.

Under existing conditions, 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 (BTU's) of energy per mile. Diesel fuel is a hydrocarbon based petroleum product. A typical automobile uses about 6,200 BTU's of energy per vehicle mile. This energy is in gasoline form and is also petroleum based. Because of the higher passenger capacity of the train, it is more efficient than a single occupant vehicle. In addition, typical intercity passenger rail is 45 percent more energy efficient than domestic commercial airline service and 76% more energy efficient than general aviation.[2]

---

[1] U.S. Bureau of the Census; Statistical Abstract of the United States: 1993. (113th edition): Washington, DC 1993: page 808.

[2] *Transportation Energy Data Book, Edition 16,* Oak Ridge national Laboratory, July 1996. These numbers reflect Amtrak equipment in use in 1994, both fossil fuel and electric and represent BTU's/passenger mile as compared with air travel.

Because transportation accounts for such a high percentage of the U.S. energy consumption, energy efficient transportation choices greatly contribute to petroleum demand and dependence on the oil production of foreign nations. Thus transportation choices and investments in transportation improvements and infrastructure are key elements in any national energy conservation or use strategy.

3.1.11 Prime Farmland

The Farmland Protection Policy Act establishes criteria for identifying and considering the effects of federal programs on the conversion of farmland soils to non-agricultural uses. For the purposes of the Act, important farmland soils are divided into three categories: prime, unique, and statewide importance (Public Law 97-98, Subtitle 1, Section 1540). Prime farmland is land that has "the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion." No effort was made to calculate the acres of land utilized for agriculture, silviculture, or pasture and grazing in the Study Area Alternatives.

Criteria for prime farmland were published January 31, 1978 in the *Federal Register*. These criteria are also found in Section 603 of the Soil Conservation Service (SCS) National Soils Handbook. In general, all soils with slopes between 0 and 8 percent that are in soil capability classes I and II (and some that are in capability class III) meet the requirements for prime farmland. Soils that flood and soils which are somewhat poorly drained, poorly drained, and very poorly drained, meet the requirements for prime farmland under certain conditions if the following requirements are met:

The soils are drained and the drainage system is adequate to maintain the water table at a sufficient depth during the growing season to allow cultivated crops common to the area to be grown.

The soils are protected or not frequently flooded during the growing season.
Table 3.10 exhibits, by county, the percentage of prime farmland soils without qualifications for drainage and flood protection (also known as P1 farm soils) within 0.5-miles of the existing rail lines within the Study Area Alternatives.

Virginia boasts a total of 347,731 acres of prime farmland soils within the Study Area Alternatives. Caroline County showed the highest percentage of prime farmland soils with 50 percent. Henrico, Hanover, and Greensville Counties each exhibited approximately 15 percent prime farmland soils. In North Carolina, 649,111 acres of prime farmland soils were identified within the 0.5-mile study area. Halifax County showed 31 percent prime farmland soils, the highest percentage within the Study Area Alternatives in North Carolina. Mecklenburg and Wilson Counties exhibited 21 percent prime farmland soils, while Cabarrus and Guilford Counties exhibited 17 percent and 15 percent prime farmland soils, respectively.

Table 3.10 Prime Farmland Soils Without Qualifications for Drainage or Flood Protection In the Study Area Alternatives		
	Acres within Study Area	**% Of PF Soils In Study Area Within County**
Virginia		
Greensville	31,159	16
Hanover	45,214	15
Henrico	28,787	19
Caroline	169,628	50
Mecklenburg	36,594	8
Stafford	12,736	7
Chesterfield	1,464	5.6
Spotsylvania	7,849	3
Lunenburg	2,530	.09
Prince George	11,063	6
Prince William	2,171	.010
North Carolina		
Forsyth	25,241	9.5
Guilford	63,637	15
Mecklenburg	75,476	21
Cabarrus	40,356	17
Randolph	2,536	.05
Rowan	47,865	14
Johnston	56,900	10
Wilson	51,108	21
Franklin	25,125	8
Granville	130	.003
Nash	21,339	6
Edgecombe	23,724	7
Halifax	149,680	31
Northampton	33,927	10
Orange	32,067	12

Source: USDA, 1997-2001.

3.1.12 Visual Characteristics

Eastern Virginia and the central and eastern areas of North Carolina embrace a full spectrum of visual classifications. Both Virginia and North Carolina are known for their tall green pines and rolling topography. The rolling topography in both states, as well as the presence of many major watersheds and great rivers such as the Potomac, the James, the Appomattox, the Neuse, the Cape Fear and others, create opportunities for great natural views. Many of the northern Virginia communities have a rich supply of historic sites and districts that provide a visual connection to the past while centers of technology and business in both states provide a vision of the future. From dense urban development characterized by a mixture of mid to high-rise buildings to virgin forests, the Study Area Alternatives include examples of all visual classifications. For the purposes of this discussion, nine types of visual classifications have been identified within the Study Area Alternatives. These include metropolitan, urban, suburban, industrial, commercial, agricultural, business/rural urban, residential/rural community and natural.

As the destination of most SEHSR passengers, the metropolitan class is the most densely developed of the classes. Characteristics of this class include dense centers of business and residences with surrounding areas of mixed commercial/industrial development. Included in this class are both mid to high-rise structures along with low-rise commercial development, high-density single-family subdivisions, and multi-family developments. The older development in both Virginia and North Carolina reflect the popularity of the use of red brick as structures material while modern high-rise structures combine glass and colorful masonry as exterior materials. Often in this classification, the network of interstate highways, major thoroughfares, and collector streets, complemented by some form of mass transit, typify the transportation network. Mass transit and transportation features are an integral part of the development along these corridors. This development provides the most dominant features of the metropolitan visual environment. The downtown areas of Washington, DC, Richmond, VA, Raleigh, NC, Greensboro, NC, Winston-Salem, NC, and Charlotte, NC are typical of this class and are also destinations in one or more of the nine Study Area Alternatives.

The urban class is as densely developed as the metropolitan class at a visually smaller scale. Dense centers of business and residences are smaller in land area than the metropolitan class and are surrounded by fewer areas of mixed commercial/industrial development. Business centers and multi-family developments have fewer high-rise structures and development tracts tend to be less dense with more landscaping. Many of these smaller, urban class cities contain a mixture of historic and modern buildings, linking the past to the future. These structures are often visual or sentimental landmarks for the cities, and in some cases the surrounding areas. Urban classes of development are generally located along an interstate highway with a transportation network of major thoroughfares and collector streets. While the transportation network is still a major visual feature, it does not dominate the aesthetics of the urban class since fewer transportation features are present in the area. Fredericksburg, Colonial Heights, and Petersburg in Virginia as well as Rocky Mount, Wilson, Durham, Burlington, High Point, Kannapolis, and Concord in North Carolina are typical of areas in the urban class. These cities may be future destinations in one or more of the nine Study Area Alternatives.

Suburban class development may adjoin the metropolitan or urban classes or may stand alone as separate areas. The suburban class generally has dense residential areas interspersed with commercial areas and small businesses. Most of the development in both residential and commercial areas is mid to low rise with a greater emphasis on landscaping. There are few high-rise massive structures dominating the landscape. Transportation to and from the suburban class development is along collector streets branching from a major thoroughfare with possible spur services from metropolitan area mass transit. The transportation structures and facilities are much less of a visual feature in this classification dominated visually by landscaped lawns and “natural” areas. Suburban areas, including Woodbridge and Ashland in Virginia and Cary and Salisbury in North Carolina, exist to varying degrees in all nine of the Study Area Alternatives.

Occurrences of the industrial class appear as clusters of development near urban and metropolitan classes and as single sites in other classes. Industries ranging in size from local manufacturers to international pharmaceuticals are the lifeblood of the freight rail service in the Study Area Alternatives. While massive in land area, these developments tend to be mostly low-rise structures with visually appealing roadway entrances. These structures generally have mechanical equipment and storage areas beside the railroad and may include towers or stacks or other features that extend above the structure. Since this class of development relies on both roadway and rail access, most industrial class areas are located near a US or state highway with a spur track or siding connection to the railroad, thus the transportation network becomes more of a visual feature due to its functional purpose. Power plants, quarries, pharmaceutical manufacturers, petroleum distribution “farms”, forest products yards, and building material manufacturers are a few of the industries located in the industrial class of development. Examples of these industries exist in Quantico and McKenney, VA and in Greystone and Clayton, NC and are interspersed among all nine visual classifications in all of the study area alternatives.

Dense areas of retail businesses exist near metropolitan, urban and suburban classifications and comprise the commercial class. These areas are often a grouping of multiple retail businesses in low-rise, single story “strip” or “mall” developments with large areas of pavement and sparse landscaping. By the nature of these businesses, commercial class areas require high-visibility locations along major thoroughfares or busy collector streets, but generally do not require access to the railroad. Thus they are designed to be a visual feature of the streetscape with loading docks and mechanical equipment located behind the buildings. The Millbrook community in north Raleigh, NC as well as strip developments in Mebane and High Point, NC exemplifies the commercial class. Commercial class developments occur in all of the nine study area alternatives.

The roots of Virginia and North Carolina can be traced to the rich agricultural history of these two states. Large areas within the Study Area Alternatives are tilled, planted and harvested consistent with an agricultural class of development. These areas could be visually described as pastoral. Fields, terraces and livestock operations occur throughout the Study Area Alternatives. Maintenance and support equipment cross the railroad regularly to access adjoining fields. As the most visually diverse of the classifications, the agricultural class changes appearances with the seasons and crop rotations. Cotton crops one growing season may yield to soybeans the next and to wheat straw or rye grass during the winter and/or alternating seasons. Located mainly on secondary or county roads, agricultural class areas require occasional access to state roads and rarely access the railroad. Thus the transportation network is less of a visual feature in these areas. Timber harvesting beside the Little River near Star, NC and farming operations near Harrisburg, NC are typical of the agricultural class, which is the connecting visual feature in all nine of the Study Area Alternatives.

Small towns have grown and suffered some decline at the intersections of state highways, and at state highways crossing railroads, due to the changing economy. At these locations, rows of privately owned businesses and professional services have also grown and died with the economy. The business/rural urban classification characteristically has a cluster of small businesses and/or professional offices near a small residential community. This development tends to be low-rise and low-density with few large structures or massive developments. Small towns vary from the visually pleasing main streets with residences on either end having manicured lawns to the less-pleasing empty storefronts in economically depressed areas. Unlike commercial areas, the business/rural urban class is not necessarily in high-visibility locations nor does it require access to the railroad. Thus the transportation network is not a major visual feature of these areas. While areas of this classification can be found in all of the study area alternatives, Emporia, VA and Henderson, NC have business districts typical of the business/urban class.

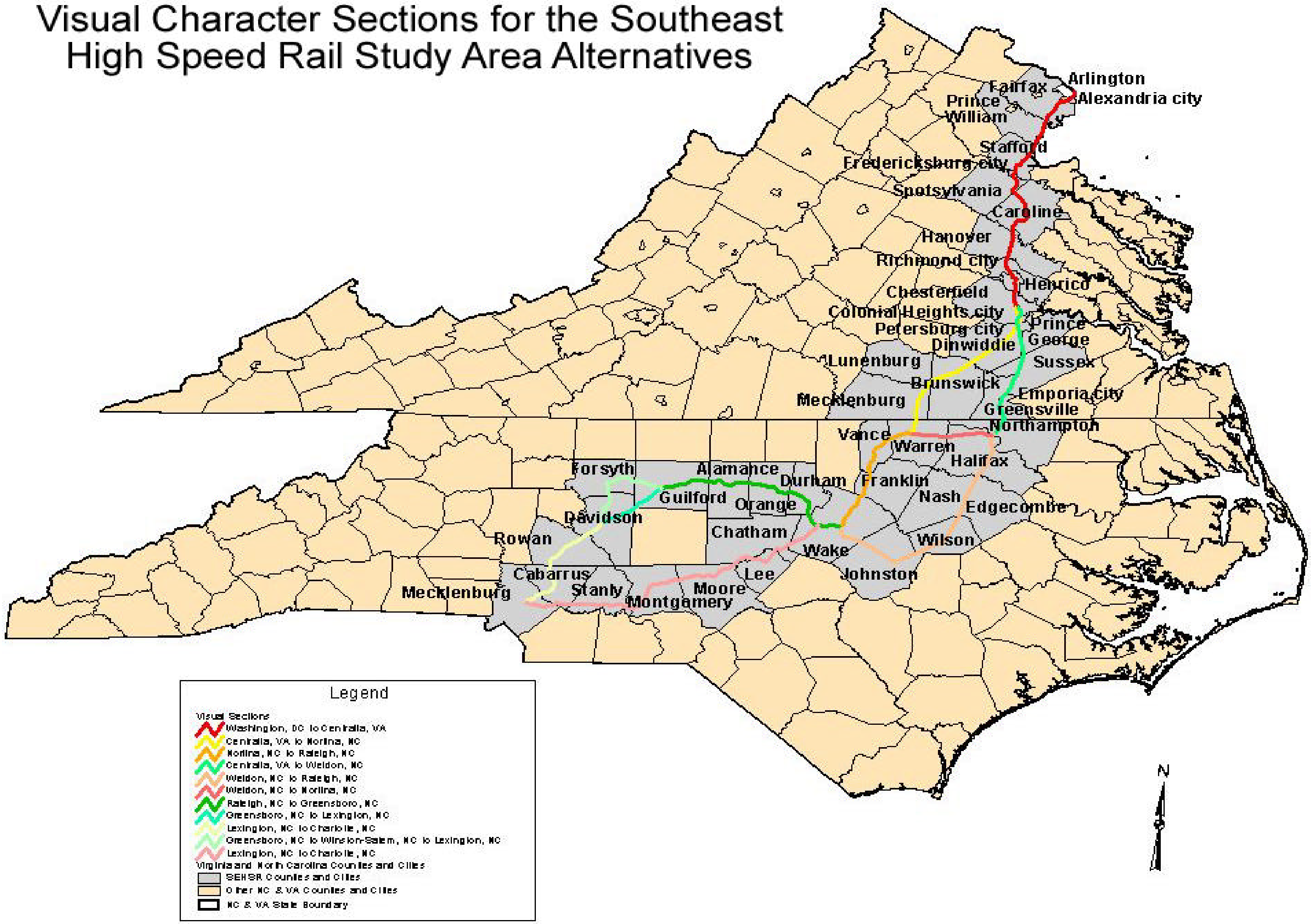
Although residences are common throughout the Study Area Alternatives, most residences are grouped in areas of similar density. Rural sections of the Study Area Alternatives contain residential/rural community classifications. Residences in a rural community that has one or two small businesses and possibly a post office, or houses on larger lots, identify the residential/rural classifications. There is no high to mid-rise development and most residential development is low-density. All structures are single story or at most two-story and there are few massive land developments. The lack of major developments often provides the unique village character that is the image of the visual nature of these areas. A state road or major thoroughfare that originally provided access to these areas may now bypass them. Thus the major roadway is not the key visual feature. The location of US 1 near Moncure, NC and near Alberta, VA places these communities in the residential/rural community class. Areas of this class in each of the Study Area Alternatives provide a view of small-town America.

While void of any development, the natural classification is the most rapidly shrinking area of the nine classes within the Study Area Alternatives. This class represents natural, undisturbed land areas. The visual image is that created by the trees and the topography of the land. Expanding development, urban sprawl, agricultural advances and timbering are depleting the natural class. Typified by remote areas that are neither suitable nor accessible for development and are generally unsuitable for agricultural use, but popular for recreational or other passive uses, natural areas exist as swamps, forests, rocky slopes, lakes, rivers, or other natural occurring impediments to development. The swamps of eastern Virginia and North Carolina as well as the Uwharrie National Forest represent the largest areas of natural class development. Large areas of this class are present along the A-line and the ACWR in Study Area Alternatives C through J and in intermittent locations in the other study area alternatives.

Each of these visual classes is present in all Study Area Alternatives to varying degrees. A verbal description of the visual characteristics of each area has been prepared to provide a visual image of the existing environment. To visually describe each Study Area Alternative without repetition, this discussion is divided into eleven common routes that comprise all Study Area Alternatives. The following discussion presented each of their routes and their visual features. The eleven common routes are shown on Figure 3.2.

Figure 3.2

Visual Character Sections for the Southeast High Speed Rail Study Area Alternatives



Source: Carter & Burgess, Inc., 2001

Washington, DC through Richmond, VA to Centralia, VA

From the metropolitan class in Washington, DC, the first route progresses through the suburban class in Alexandria and Woodbridge, VA to the natural shorelines of the Potomac River. Along the Potomac are some industrial class sites before returning to the agricultural class areas north of urban Fredericksburg, VA. South of Fredericksburg the route passes through another agricultural area dotted with business/rural urban and residential/rural community classes approaching the suburban areas of Ashland and north Richmond, VA. Through Richmond are areas of commercial, industrial, urban, metropolitan, and suburban visual classes before reaching the end of this route in the residential/rural community of Centralia, VA.

Centralia, VA along the S-line to Norlina, NC

South of Centralia, VA the former S-line bypasses suburban Chester, VA traveling through agricultural and natural areas before entering the suburban and urban areas of Colonial Heights/Petersburg, VA. After crossing the Appomattox River between Colonial Heights and Petersburg, this second route passes through an industrial and commercial area of Petersburg before entering the alternating areas of agricultural and natural classes of southern Virginia. Throughout the route from Petersburg to the Virginia-North Carolina state line are intermittent areas of business/rural urban and residential/rural community developments. Crossing the natural class area created by Gaston Lake, the route continues through the agricultural and natural visual classes of northern North Carolina before terminating in the business/rural urban town of Norlina, NC.

Norlina, NC to Raleigh, NC

Continuing along the existing S-line from Norlina, NC, the third route passes agricultural, natural and spotted industrial classes as it proceeds to the suburban and business/rural urban visual classes in Henderson, NC. This pattern of suburban, agricultural/natural with single industrial sites, suburban and business/rural urban is repeated through Franklinton and Wake Forest, NC to the commercial, industrial, suburban, urban, and metropolitan vistas provided in Raleigh, NC.

Centralia, VA along the A-line to Weldon, NC

Returning to Centralia, VA to traverse the A-line, the fourth route visits suburban Chester, VA before entering alternating agricultural and natural areas north of Colonial Heights, VA. The A-line passes through suburban and commercial areas of Colonial Heights and crosses the Appomattox River into industrial, commercial, urban and suburban areas of Petersburg, VA. On the way through more agricultural and natural visual classes, intermittent residential/rural communities and the business/rural town of Emporia, VA provide the visual variations for an interesting panorama through southern Virginia and northern North Carolina to Weldon, NC.

Weldon, NC through Selma, NC to Raleigh, NC

Weldon establishes the start of a pattern of visual classes that continues along the A-line and NCRR to Raleigh, NC. This pattern begins as a business/rural urban area followed by a mixture of agricultural and natural areas with intermittent residential/rural community areas. These areas lead to suburban, commercial, industrial and urban areas in the cities of Rocky Mount and Wilson before ending in Raleigh.

Weldon, NC to Norlina, NC

Another route from Weldon follows the former SA-line through the suburban, commercial and industrial areas of Roanoke Rapids, NC. This route continues into the mixture of agricultural, natural, and residential/rural communities that comprise northern North Carolina. From the natural shores of Roanoke Rapids Lake, along the roadside through residential/rural communities named Littleton and Macon, to the business/rural urban landscape of Norlina, NC, this sixth route is both beautiful and bucolic in its visual presentation of rural North Carolina.

Raleigh, NC to Greensboro, NC

From the intersection of the third and fifth routes in metropolitan Raleigh, NC, the NCRR follows a portion of the “piedmont crescent” (a fertile, developing corridor along two interstate highways through central North Carolina). This crescent includes traditionally agricultural and natural areas that are being rapidly developed into suburban, commercial, industrial, urban and metropolitan classes. Leaving Raleigh through an industrial area, the seventh route quickly enters a mixture of commercial and suburban areas before passing several agricultural areas. Due to the location of the Research Triangle Park, these agricultural areas lead to a small area of commercial development and into the large campuses of modern mid-rise buildings among the tall pines of piedmont North Carolina. Another small agricultural area precedes the industrial, commercial, and urban city of Durham, NC. West of Durham the route generally parallels I-85 through a mixture of agricultural, natural, commercial and intermittent industrial visual classes. This mixture of classes continues through the historic town of Hillsborough, NC, the suburban areas of Mebane, NC, and the growing urban areas around Burlington, NC before terminating in the suburban, commercial, industrial, urban and metropolitan views that characterize Greensboro, NC.

Greensboro, NC along the NCRR to Lexington, NC

The first of two routes from Greensboro turns south along the NCRR through suburban and commercial areas leading to the suburban and urban classes of High Point, NC and the business/rural urban class of Thomasville, NC. South of Thomasville the eighth route follows a stream through agricultural and natural areas of central North Carolina before entering the commercial, industrial and suburban areas of Lexington, NC.

Lexington, NC to Charlotte, NC

Continuing south from Lexington, NC along the NCRR begins another pattern of mixed agricultural and natural areas interrupted by commercial, industrial, urban, business/rural urban, suburban, and residential/rural community visual classes. The suburban town of Salisbury, NC is followed by the residential/rural communities of China Grove and Landis, NC, the urban town of Kannapolis, NC, and a business/rural urban area in Concord, NC. A span of agricultural and natural areas reappear south of Concord and continue until replaced by the suburban, commercial, industrial, urban, and metropolitan terminus of the SEHSR in Charlotte, NC.

Greensboro, NC through Winston-Salem, NC to Lexington, NC

Returning to Greensboro, the second of the two routes continues west through a heavily developed industrial area before passing a mixture of residential/rural communities and agricultural areas. This mixture along the tenth route leads to the business/rural urban town of Kernersville, NC and returns to a mixture of residential/rural communities and agricultural areas. After crossing the natural class created by Salem Lake, this route enters industrial, commercial, suburban, urban, and metropolitan areas of Winston-Salem, NC. The WSSB provides the route out of Winston-Salem through urban, commercial, industrial and suburban visual classes to a mixture of residential/rural community, agricultural and natural areas. These visual areas lead back to the commercial, industrial and suburban areas of Lexington, NC before connecting the WSSB to the NCRR.

Raleigh, NC via the ACWR to Charlotte, NC

The eleventh route is arguably the most scenic in visual characteristics. From the beginning of this route in metropolitan Raleigh, NC, it passes through all nine visual classes with the longest areas of natural and agricultural vistas in the SEHSR corridor. West of Raleigh lies the suburban town of Cary, NC where this route continues along the S-line south through the business/rural urban town of Apex. The S-line leaves Apex passing through a mixture of natural, agricultural and residential/rural community areas, along a ridge between B. Everett Jordan Lake and Harris Reservoir, to the industrial community of Colon, NC centered on a brick manufacturing plant. From Colon, the route follows two Norfolk Southern lines west through natural and agricultural areas replete with virgin forests, hillside views to the Deep River below the railroad, and rustic farms. A connection to the ACWR in Gulf, NC provides the continuation of these natural and agricultural vistas on the way to the industrial areas in Robbins, NC. Several residential/rural community areas, as well as business/rural urban and industrial areas, between Gulf and Charlotte, NC provide different perspectives on the history of rural North Carolina. From the railroad yard in Star, NC to the forest products yards of Troy, NC and the residential areas of Mount Gilead, Norwood and Oakboro, NC, the ACWR is rich in visual character that culminates with a return to today in the metropolitan areas of Charlotte.

3.2 Existing Natural Environment

3.2.1 Protected Species

Some populations of fauna and flora have been, or are, in the process of decline due to either natural forces or their inability to coexist with humans. Federal law, under the provisions of Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires that any action likely to adversely affect a species classified as federally-protected be subject to review by the U.S. Fish and Wildlife Service (USFWS). Other species, not at issue for this proposed project, fall under the purview of the National Marine Fisheries Service (NMFS). Other species may receive additional protection under separate state laws. As of January 2001, the Virginia Field Office of the USFWS identified nine species as federally endangered (E) or threatened (T) and 42 species as federal species of concern (FSC) potentially occurring in the Virginia portion of the Study Area Alternatives. The Virginia Division of Natural Heritage (VaDNH) list (February 2000) also includes these species and identifies an additional 15 species receiving protection under state laws. The North Carolina Field Office of the USFWS identifies 14 species as federally endangered or threatened, one species as threatened due to similarity of appearance (T S/A), and 49 species as federal species of concern potentially occurring in the North Carolina portion of the Study Area Alternatives. The North Carolina Natural Heritage Program (NCNHP) list (July 2000) also includes these species and identifies an additional 38 species receiving protection under state laws.

Table 3.11 lists federally protected species and the counties in which populations have been identified. Tables 3.12 and 3.13 list the remaining FSCs and state protected species, their status, habitat requirements, and the counties in which populations have been identified. Appendix A lists the species identified in these three tables and discusses their characteristics and attributes.

Table 3.11

Federally Protected Species Known from Virginia and North Carolina Counties Within the Study Area Alternatives

Scientific Name	Common Name	Federal Status	City of Alexandria	Arlington	Brunswick	Caroline	Chesterfield	City of Emporia	Fairfax	City of Fredericksburg	Greensville	Hanover	Henrico	Mecklenburg	City of Petersburg	Prince George	Prince William	City of Richmond	Spotsylvania	Stafford	Sussex		Alamance	Cabarrus	Chatham	Davidson	Durham	Edgecombe	Forsyth	Franklin	Guilford	Halifax	Johnston	Lee	Mecklen.	Montgomery	Moore	Nash	Northampton	Orange	Randolph	Rowan	Stanly	Vance	Wake	Warren	Wilson
Aeschynomene virginica	Sensitive joint-vetch	T				X	X		X			X	X			X	X		X	X																												
Alasmidonta heterodon	Dwarf wedgemussel	E					X				X	X					X			X	X									X		X	X					X		X				X	X	X	X
Cardamine micranthera	Small-anthered bittercress	E																											X																		
Clemmys muhlenbergii	Bog Turtle	T (S/A)																								X			X																		
Echinacea laevigata	Smooth coneflower	E																									X								X	X				X							
Elliptio steinstansana	Tar spinymussel	E																										X		X		X	X					X								X	
Felis concolor couguar	Eastern cougar	E																																		X											
Haliaeetus leucocephalus	Bald eagle	T				X	X		X			X	X	X		X	X	X		X	X				X	X	X				X				X	X			X			X	X	X	X		
Helianthus schweinitzii	Schweinitz's sunflower	E																						X		X									X	X					X	X	X				
Helonias bullata	Swamp pink	T				X							X																																		
Isotria medeoloides	Small whorled pogonia	T				X			X			X	X				X		X	X																				X							
Lasmigona decorata	Carolina heelsplitter	E																						X											X												
Notropis mekistocholas	Cape Fear shiner	E																							X									X			X				X						
Percina rex	Roanoke logperch	E			X						X			X							X																										
Picoides borealis	Red cockaded woodpecker	E																			X				X			X	X			X	X	X		X	X	X	X	X					X		X
Ptilimnium nodosum	Harperella	E																							X									X													
Rhus michauxii	Michaux's sumac	T			X		X				X			X							X						X			X			X		X		X			X					X		X
Schwalbea americana	American chaffseed	E									X										X																X										

Table 3.12
Federal Species of Concern and Virginia State Protected Species Within the Study Area Alternatives

Scientific Name	Common Name	Status		Habitat Requirements	City of Alexandria	Arlington	Brunswick	Caroline	Chesterfield	City of Emporia	Fairfax	City of Fredericksburg	Greensville	Hanover	Henrico	Mecklenburg	City of Petersburg	Prince George	Prince William	City of Richmond	Spotsylvania	Stafford	Sussex
		Federal	Virginia																				
Mammals																							
Corynorhinus rafinesquii	Eastern big-eared bat	--	E	old buildings, hollow trees, caves, mines, and bridges usually near water									x										x
Birds																							
Aimophila aestivalis	Bachman's sparrow	FSC	T	open longleaf pine forests and old fields			x	x					x										x
Ammodramus henslowii	Henslow's sparrow	--	T	clearcut pocosins and other damp weedy fields																			x
Certhia americana	Brown creeper	--	SC	high elevation forest, especially spruce-fir mixed with hardwoods							x												
Falco peregrinus	Peregrine falcon	--	E	cliffs for nesting overlooking open landscapes														x					
Gallinula chloropus	Common moorhen	--	SC	freshwater ponds, rice fields, and backwaters of the Coastal Plain							x												
Lanius ludovicianus	Loggerhead shrike	--	T	open fields and pastures									x										
Nyctanassa violacea	Yellow-crowned night-heron	--	SC	swamps, woods, or thickets in the Coastal Plain							x												
Fish																							
Ambloplites cavifrons	Roanoke bass	FSC	--	Chowan and Roanoke drainages																			x
Enneacanthus chaetodon	Blackbanded sunfish	--	E	heavily vegetated, acidic waters of the Chowan drainage														x					x
Etheostoma collis	Carolina darter	FSC	T	Roanoke drainage												x							
Notropis alborus	Whitemouth shiner	--	T	medium sized streams of the Chowan and Roanoke drainages												x							
Reptiles and Amphibians																							
Ambystoma tigrinum	Tiger salamander	--	E	fish-free ephemeral pools, especially in sandy pine woods										x									
Bufo quercicus	Oak toad	--	SC	pine flatwoods and savannas			x						x										x
Clemmys insculpta	Wood turtle	--	T	mesic to moist hardwood forests	x	x					x												
Hyla gratiosa	Barking treefrog	--	T	sandy areas near shallow pools in pine savannas and woodland swamps					x														x
Mollusk																							
Alasmidonta varicosa	Brook floater	FSC	E	Piedmont drainage systems															x				
Elliptio lanceolata	Yellow lance	FSC	SC	Piedmont drainage systems			x		x	x	x	x	x	x					x		x		x
Elliptio roanokensis	Roanoke slabshell	FSC	SC	large rivers and streams of the Roanoke River system						x			x			x							x
Fusconaia masoni	Atlantic pigtoe	FSC	T	most Atlantic drainages in the lower Piedmont and upper Coastal Plain			x						x		x	x							x
Lampsilis cariosa	Yellow lampmussel	--	SC	Pamunkey, Nottoway, Meherrin, James, and Roanoke River systems			x			x			x	x		x	x						x
Lampsilis radiata	Eastern lampmussel	--	SC	a number of river systems			x	x		x			x	x		x					x		x
Lasmigona subviridis	Green floater	FSC	SC	Potomac, Shenandoah, Pamunkey, James, and New Rivers						x	x			x	x	x					x		
Other Invertebrates																							
Gomphus ventricosus	Skillet clubtail	FSC	SR	large rivers, primarily in the Piedmont							x												
Orconectes virginiensis	Chowan River crayfish	FSC	SR	small streams of the Chowan River system			x						x										
Pyrgus wyandot	Appalachian grizzled skipper	FSC	SR	openings and edges in wooded hilltops; host - Rosaceae							x												
Sigara depressa	Virginia piedmont water boatman	FSC	SR	small Piedmont streams				x						x					x		x		
Speyeria diana	Diana fritillary	FSC	--	rich woods, adjacent edges, and openings					x									x					
Speyeria idalia	Regal fritillary	FSC	SR	open grassy areas either natural meadows or disturbed pasturelands							x								x		x	x	
Stygobromus indentatus	Tidewater amphipod	FSC	SC	Coastal Plain seepage areas and springs				x															
Stygobromus kenki	Rock Creek groundwater amphipod	FSC	SR	extirpated; from deep wells in northern Virginia							x												
Stygobromus phreaticus	Northern Virginia well amphipod	FSC	SR	deep wells and springs in northern Virginia	x						x												
Stygobromus pizzinii	Pizzini's amphipod	FSC	SC	deep wells and springs in northern Virginia		x					x												
Vascular Plants																							
Agalinis auriculata	Earleaf foxglove	FSC	SR	dry prairies, fallow fields, and edges of upland forests		x					x								x				
Carex decomposita	Epiphytic sedge	FSC	SR	blackwater swamp forest, especially with bald cypress							x												x
Chamaecrista fasciculata macrosperma	Marsh senna	FSC	watch list	freshwater tidal marshes				x	x		x			x	x			x	x			x	
Collinsonia verticillata	Whorled horse-balm	FSC	SR	rich cove forest, especially over mafic or calcareous rocks			x									x							
Desmodium ochroleucum	Creamflower tick-trefoil	FSC	SR	dry woodlands				x	x														
Eriocaulon parkeri	Parker's pipewort	FSC	SR	natural lakes and tidal marshes				x			x											x	
Hypericum adpressum	Creeping St. John's-wort	FSC	SR	boggy depressions									x										x
Isoetes virginica	Virginia quillwort	FSC	SR	upland depression swamp forest												x							
Juncus caesariensis	New Jersey rush	FSC	SR	sphagnous seepages in the Coastal Plain				x							x								
Lilium iridollae	Panhandle lily	FSC	watch list	peety swamp margins									x										x
Lotus helleri	Carolina prairie-trefoil	FSC	SR	dry woodlands and openings, prairie-like sites, and rights-of-way												x							
Oxypolis ternata	A cowbane	FSC	SR	wet savannas									x										
Paronychia virginica virginica	Yellow nailwort	FSC	SR	shale barrens, rocky riversides, calcareous rock outcrops, and talus		x					x												
Portulaca smallii	Small's purslane	FSC	SR	thin soils on granitic and diabase flatrocks, and adjacent disturbed area			x																
Pycnanthemum clinopodioides	Basil mountain-mint	FSC	SR	forests and woodland borders									x										
Pycnanthemum torrei	Torrey's mountain-mint	FSC	SR	dry rocky woodlands over mafic, ultramafic, or calcareous rocks	x	x					x		x										x
Rudbeckia heliopsidis	Sun-facing coneflower	FSC	SR	seasonally wet roadsides, sandy riverine deposits, and adjoining open woodlands														x					x
Sabatia kennedyana	Plymouth gentian	FSC	SR	exposed river banks, ditches, disturbed flats, and shores of beaver ponds				x															
Scirpus flaccidifolius	Reclining bulrush	FSC	SR	bottomlands									x										x
Sida hermaphrodita	Virginia mallow	FSC	SR	sandy or rocky areas along riverbanks		x					x												
Trillium pusillum virginianum	Virginia least trillium	FSC	SR	swamps and bottomland forests, and other moist forest					x				x		x			x					x
Vitis rupestris	Sand grape	FSC	SR	stream and riverbank scour areas, especially with calcareous rocks							x											x	
Non-vascular Plants																							
Sphagnum carolinianum	Carolina peatmoss	FSC	SR	Coastal Plain wetlands																	x		x
Sphagnum cyclophyllum	Circular-leaved peatmoss	FSC	SR	Coastal Plain wetlands													x						

SEE TABLE 3.13

3.2.2 Wild and Scenic Rivers

The Wild and Scenic Rivers Act of 1968 (the Act) (16 USC 1271 and as amended Public Law 90-542), is a federal act adopted to preserve certain free-flowing rivers that have outstanding natural, cultural, or recreational features. The Act classifies designated rivers as Wild, Scenic, or Recreational.

Wild rivers are rivers that are:

- Free of impoundments (no dams);
- Inaccessible except by trails;
- Have primitive and pristine shorelines; and
- Have unpolluted waters.

Scenic rivers must meet these same criteria, however, they can be accessible by roadways. Recreational rivers are the least pristine of the three classifications. This classification allows some development along the river's shoreline. Recreational rivers are generally accessible by roadways and may be impounded in some areas.

All rivers classified under the Act must first be listed on the National Rivers Inventory (NRI). The NRI is a federal list that includes rivers that are free-flowing and have one or more "outstandingly remarkable values."

Under provisions of the Act, if a federal action compromises the designation of a Wild and Scenic River or forecloses the possibility of future designation (of a NRI river) under the Act, implementation of the federal action must be coordinated with the U.S. Department of Interior. The Commonwealth of Virginia Scenic Rivers Act affords protection to waters of statewide importance. The North Carolina Natural and Scenic Rivers Act provides similar protections within North Carolina. There are no rivers subject to either of these acts within the Study Area Alternatives.

There are no Wild, Scenic, or Recreation Rivers designated under the Federal Act that exist within the Study Area Alternatives. However, there are several rivers listed in the National Rivers Inventory located within, or adjacent to, the corridor. These rivers are listed in Table 3.14.

Table 3.14
National Rivers Inventory For Study Area Alternatives

Barnes Creek	Montgomery, Randolph	NC	Confluence with Uwharrie River to headwaters one mile above Montgomery County Line	Scenic mountain stream that flows through the Uwharrie National Forest.
Cane Creek	Alamance	NC	Confluence with Haw River to River Mile (RM) 16 near Snow Camp	Natural steam with significant historic values.
Cape Fear River	Cumberland, Harnett, Lee, Chatham	NC	Approximately four miles above I-95 bridge to RM 195, confluence with Haw and Deep Rivers	Popular recreational trail with unique geological features and 150 feet cliffs, rare plant species, and numerous historic features.
Deep River	Lee, Chatham, Moore	NC	Confluence with Cape Fear River to NC 22 bridge	Abundant wildlife, very scenic and remote flat water stream with a variety of aquatic flora.
Dutchman's Creek	Montgomery	NC	Confluence with Uwharrie	Typical cool water scenic mountain

Table 3.14 National Rivers Inventory For Study Area Alternatives				
			River to headwaters west of Troy	stream that supports small mouth bass fishery.
Eno River	Durham, Orange	NC	Roxboro Road in Durham, to Churton Street in Hillsborough	Highly scenic stream providing quality recreational opportunities.
Fishing Creek	Edgecombe, Halifax, Nash, Franklin, Warren	NC	Confluence with Tar River to one mile above NC 561 Bridge	Essentially primitive shoreline; excellent game fishery.
Haw River	Alamance, Orange, Guilford, Rockingham	NC	Chatham County Line to US 220/NC 150 Bridge	Outstanding whitewater course that drops through constricted scenic valley.
Neuse River	Lenoir, Wayne, Johnston, Wake	NC	RM 88 above Kinston to RM 199 below Bridges Lake	Varying degrees of contrast within segment drops; superb scenery; outstanding historic features.
Pee Dee River	Anson, Richmond, Montgomery, Stanly	NC	SC State Line to Lake Tillery	Traverses Piedmont region, much of its course flowing through lowland swamps; scenic bluffs; numerous oxbows, lakes, and sandbars.
Rocky River	Chatham	NC	Confluence with Deep River to State Road 1904 Bridge	Excellent canoeing stream with exciting whitewater.
Tar River	Nash, Franklin, Vance, Granville, Person	NC	State Road 1933 Bridge to headwaters north of Denny's Store	Attractive stream with several whitewater segments; secluded picturesque ravines and gorges.
Uwharrie River	Montgomery, Randolph	NC	Confluence with Pee Dee River to headwaters south of High Point and Guilford County Line	Scenic stream with stretches of gentle rapids, oxbow lakes, islands, several high bluffs and rock outcrops; spawning habitat for white bass.
Appomattox River	Amelia, Chesterfield, Powhatan, Cumberland	VA	Lake Chesdin to Farmville	Longest, largest, least developed river in the Upper Piedmont region; Wigwam National Register Historic Site.
Blackwater River	Prince George, Southampton, Sussex, Isle of Wight, Surry	VA	Franklin to Headwaters	Part of 10,000 acres of bogs and pine barrens with rare plants including northern and southern relicts.
Bull Run	Prince William, Fairfax	VA	West of Route 66 to Route 659	Site of Manassas National Battlefield Park, including the Battles of Bull Run in 1861 and 1862.
Chickahominy River	Henrico, Hanover, New Kent, Charles City	VA	Providence Forge to Route 360	Well developed cypress-tupelo gum swamp and bottomland forest. Unique proximity to high, urban population in Richmond.
James River	York, Isle of Wight, Surry, James City, Charles City, Prince George	VA	Mogarts Beach to Hopewell	One of the most significant, historic, relatively undeveloped rivers in the northeastern region of Virginia.
James River	Henrico, Chesterfield, Goochland, Powhatan, Cumberland, Fluvanna, Buckingham	VA	Above Bosher Dam near Richmond to Bremo Bluff	Segments include numerous historic sites, including Bremo Bluffs Plantation, Muddy Creek Mill at Tamworth, Cartersville Bridge, Hardware Aqueduct, Rockfish Aqueduct, and numerous lock and canal structures.
Meherrin River	Greenville, Brunswick, Mecklenburg,	VA	Emporia to Route 1	Surrounding watersheds are essentially undeveloped.

Table 3.14 National Rivers Inventory For Study Area Alternatives				
	Lunenburg			
North Anna River	Caroline, Hanover, Spotsylvania	VA	1.5 miles above Morris Bridge to Lake Anna	Numerous historic sites, including Civil War battlefields and breastworks, and Indian artifact sites. One of the most populated whitewater canoe runs in Virginia.
Nottoway River	Southampton, Sussex	VA	North Carolina State Line to Fort Nottoway	Longest river swamp in region with 10,000 acres of cypress forests.
Potomac River	Montgomery, Loudon, Fairfax	VA	David Taylor Model Basin to Broad Run	One of the largest free-flowing, relatively undeveloped rivers in the region. Chesapeake and Ohio National Historic Park parallels the river. Unique proximity to urban population in Washington, D.C., Alexandria, and Arlington. Rare gorges and cliffs up to 150 feet high.
Rapidan River	Spotsylvania, Orange, Culpeper	VA	Rappahannock River to north of Indian Town	Rapidan Canal of the Rappahannock Navigation System is a linear National Historic site. Significant topographic variation. Offers excellent small mouth bass fishery.
Rappahannock River	Spotsylvania, Stafford, Culpeper, Fauquier	VA	I-95 near Fredericksburg to one mile past Route 620	Contains the historic Rapidan Canal. Most diverse stream gradient in the area. Unspoiled, undeveloped stream available to large urban populations.
South Anna River	Hanover	VA	North Anna River to Gouldin	Numerous historic sites, Civil War battlefields and breastworks. A noted small mouth bass fishing river.

Source: National Park Service, Rivers, Trails, and Conservation Assistance; 2001.

3.3 Existing Human Environment

3.3.1 Socioeconomic Conditions

3.3.1.1 Population

Methodology

Population data for the Study Area Alternatives were collected from the United States Census Bureau. These data were sorted by county and compiled into two tables.

There are 46 counties located within the combined Study Area Alternatives. In Table 3.15, 1999 census projections were calculated using 1990 populations and 1995 percentage growth rates. Table 3.16 presents estimated population characteristics for these counties in the Study Area Alternatives.

Population Characteristics

The Study Area Alternatives collectively have experienced a total population growth of 17.48 percent, based on percent change from 1990 to 1999. In Virginia, jurisdictions within the Study Area Alternatives experienced an average growth of 14.82 percent, while those in North Carolina experienced an average growth of 19.61 percent (Table 3.15). In general, overall estimated population totals within the Study Area Alternatives increased from approximately 5.28 million in 1990 to an estimated 6.21 million in 1999.

Four jurisdictions experienced a decline in population from 1990 to 1999. Of these four jurisdictions, three were located in urban cities of Virginia (Fredericksburg, Richmond and Petersburg) and the fourth was Edgecombe County, North Carolina. The smallest increase in population growth occurred in Halifax County, North Carolina and the largest increase was in Spotsylvania County, Virginia (Refer to Study Area Map of Counties, Figure 3.3).

The population in the Study Area Alternatives is primarily white. As shown in Table 3.16, the median percentage of white population compared to non-white population is 66.57 to 33.43 percent. There are ten counties and cities where the non-white population is the majority. In Virginia these include Brunswick County (63.3 percent), Emporia (50.5 percent), Greensville County (64.2 percent), Petersburg (75.6 percent), Richmond (60.2 percent) and Sussex County (62.3 percent). In North Carolina these include Edgecombe (57.0 percent), Halifax (54.0 percent), Northampton (60.2 percent) and Warren (62.0%) Counties.

In Table 3.16, the median percentage for population under 18 years of age is 24.26 percent while the elderly population (65 years of age and older), averages 12.80 percent of the total Study Area Alternatives population. An average of 39.3 percent of the Study Area Alternatives' population 25 years and older have graduated from high school, while the median percentage for population with college degrees is 10.7. The median persons-per-household in the Study Area Alternatives is 2.59, which calculates to 2 million plus households. Based on 1997 income statistics, the median household income was $37,899 with 13.75 percent of population in the Study Area Alternatives at or below the poverty level of $17,050 for a family of four according to US Department of Health and Human Services poverty guidelines.

Table 3.15 Population by County for Southeast High Speed Rail Study Area Alternatives				
County/City	**State**	**1999 Est. Pop.**	**1990 Pop.**	**% Change, 1990-99**
City of Alexandria	VA	117,390	111,183	5.6
Arlington Co.	VA	174,848	170,936	2.3
Brunswick Co.	VA	18,340	15,987	14.7
Caroline Co.	VA	22,075	19,217	14.9
Chesterfield Co.	VA	253,365	209,274	21.1
Colonial Heights	VA	16,235	16,064	1.1
Dinwiddie Co.	VA	25,663	20,960	22.4
City of Emporia	VA	5,662	5,306	6.7
Fairfax Co.	VA	945,717	818,584	15.5
City of Fredericksburg	VA	18,826	19,027	-1.1
Greensville Co.	VA	11,332	8,853	28.0
Hanover Co.	VA	85,410	63,306	34.9
Henrico Co.	VA	244,652	217,881	12.3
Lunenburg Co.	VA	11,789	11,419	3.2
Mecklenburg Co.	VA	30,991	29,241	6.0
City of Petersburg	VA	34,398	38,386	-10.4
Prince George Co.	VA	28,812	27,394	5.2
Prince William Co.	VA	270,841	215,686	25.6
City of Richmond	VA	189,700	203,056	-6.6
Spotsylvania Co.	VA	87,361	57,403	52.2
Stafford Co.	VA	93,160	61,236	52.1
Sussex Co.	VA	12,345	10,248	20.5
VA Study Areas County/City		**2,698,912**	**2,350,647**	**14.82**
Alamance Co.	NC	121,100	108,213	11.9
Cabarrus Co.	NC	124,844	98,935	26.2
Chatham Co.	NC	46,503	38,759	20.0
Davidson Co.	NC	142,852	126,677	12.8
Durham Co.	NC	204,097	181,835	12.2
Edgecombe Co.	NC	54,659	56,558	-3.4
Forsyth Co.	NC	288,810	265,878	8.6
Franklin Co.	NC	45,612	36,414	25.3
Guilford Co.	NC	391,380	347,420	12.7
Halifax Co.	NC	55,832	55,516	0.6
Johnston Co.	NC	110,850	81,306	36.3
Lee Co.	NC	49,452	41,374	19.5
Mecklenburg Co.	NC	648,400	511,433	26.8
Montgomery Co.	NC	24,323	23,346	4.2
Moore Co.	NC	72,885	59,013	23.5
Nash Co.	NC	92,369	76,677	20.5
Northampton Co.	NC	21,234	20,798	2.1
Orange Co.	NC	111,533	93,851	18.8
Rowan Co.	NC	126,585	110,605	14.4
Stanly Co.	NC	56,547	51,765	9.2
Vance Co.	NC	42,496	38,892	9.3
Wake Co.	NC	586,940	423,380	38.6
Warren Co.	NC	18,848	17,265	9.2
NC Study Areas County		**3,506,952**	**2,931,971**	**19.61**
Study Area Alt. County/City		**6,205,864**	**5,282,618**	**17.48**

Source: U.S. Census Bureau: 1990 Census of Population and Housing and State and County QuickFacts. Data derived from 1990 Census Population Figures and Compiled by Carter & Burgess, Inc., 2001.

Note: In the Commonwealth of Virginia cities are self contained governmental entities, separate from the counties that may surround them. Data in this table is presented by the city and county in Virginia, and by county in North Carolina.

Table 3.16
Population Characteristics by County for the Southeast High Speed Rail Study Area Alternatives

		Ethnicity, 1999 Estimates									
					65 years & older (%)	High school graduates, 25 yrs. & older (% of total pop.)	College graduates, 25 yrs. & older (% of total pop.)				
City of Alexandria	VA	70.1	29.9	15.9	13.1	60.7	33.9	53,249	2.04	51,052	10.2
Arlington Co.	VA	78.7	21.3	16.6	10.4	62.9	37.6	78,745	2.12	57,244	8.1
Brunswick Co.	VA	36.7	63.3	21.0	13.3	28.2	3.9	5,576	2.64	25,652	23.1
Caroline Co.	VA	56.2	43.8	25.5	11.8	32.9	4.6	6,588	2.87	34,799	14.3
Chesterfield Co.	VA	81.9	18.1	29.0	5.6	43.2	15.0	73,665	2.81	55,324	6.4
Colonial Heights	VA	95.4	4.6	21.0	16.9	53.1	11.4	6,332	2.51	40,923	7.5
Dinwiddie Co.	VA	58.5	41.5	22.8	12.4	32.3	4.6	7,519	2.75	34,830	12.7
City of Emporia	VA	49.5	50.5	24.1	19.9	36.5	8.4	2,032	2.51	24,255	26.9
Fairfax Co.	VA	79.5	20.5	24.2	7.8	52.2	28.0	292,943	2.75	71,057	5.3
City of Fredericksburg	VA	73.9	26.1	18.1	17.6	43.6	15.4	7,469	2.23	35,484	17.8
Greensville Co.	VA	35.8	64.2	19.1	10.1	24.9	2.6	3,131	2.82	27,923	20.7
Hanover Co.	VA	87.2	12.8	23.9	12.7	37.5	9.2	22,650	2.73	53,618	5.0
Henrico Co.	VA	73.6	26.4	22.9	12.2	48.9	16.9	89,026	2.42	44,122	7.9
Lunenburg Co.	VA	54.9	45.1	22.8	15.9	33.9	4.3	4,388	2.60	25,500	21.9
Mecklenburg Co.	VA	57.3	42.7	22.7	17.5	37.4	6.4	11,307	2.51	27,752	16.2
City of Petersburg	VA	24.4	75.6	23.0	17.1	45.1	9.8	14,664	2.48	25,428	25.6
Prince George Co.											
Prince William Co.	VA	81.8	18.2	30.2	4.5	41.0	12.9	70,253	3.02	57,133	6.4
City of Richmond	VA	39.8	60.2	20.1	17.5	48.3	17.2	85,268	2.25	29,234	24.9
Spotsylvania Co.	VA	85.3	14.7	30.1	7.3	30.6	7.6	18,978	3.01	51,218	6.8
Stafford Co.	VA	89.4	10.6	30.1	5.4	31.5	8.4	19,443	3.05	58,005	5.7
Sussex Co.	VA	37.7	62.3	19.4	13.2	29.6	4.7	3,808	2.65	27,489	21.0
Alamance Co.											
Cabarrus Co.	NC	85.7	14.3	25.7	12.1	35.2	6.4	37,598	2.59	41,781	8.0
Chatham Co.	NC	75.9	24.1	23.2	15.8	40.4	11.3	15,337	2.50	41,632	7.7
Davidson Co.	NC	88.9	11.1	25.1	12.5	37.6	5.9	48,886	2.56	36,099	10.1
Durham Co.	NC	59.4	40.6	24.1	10.6	45.1	19.1	72,379	2.40	40,007	12.4
Edgecombe Co.	NC	43.0	57.0	29.1	11.2	37.7	5.2	20,442	2.74	27,464	21.9
Forsyth Co.	NC	73.5	26.5	23.3	13.4	47.4	14.7	107,459	2.40	39,536	10.8

Table 3.16
Population Characteristics by County for the Southeast High Speed Rail Study Area Alternatives

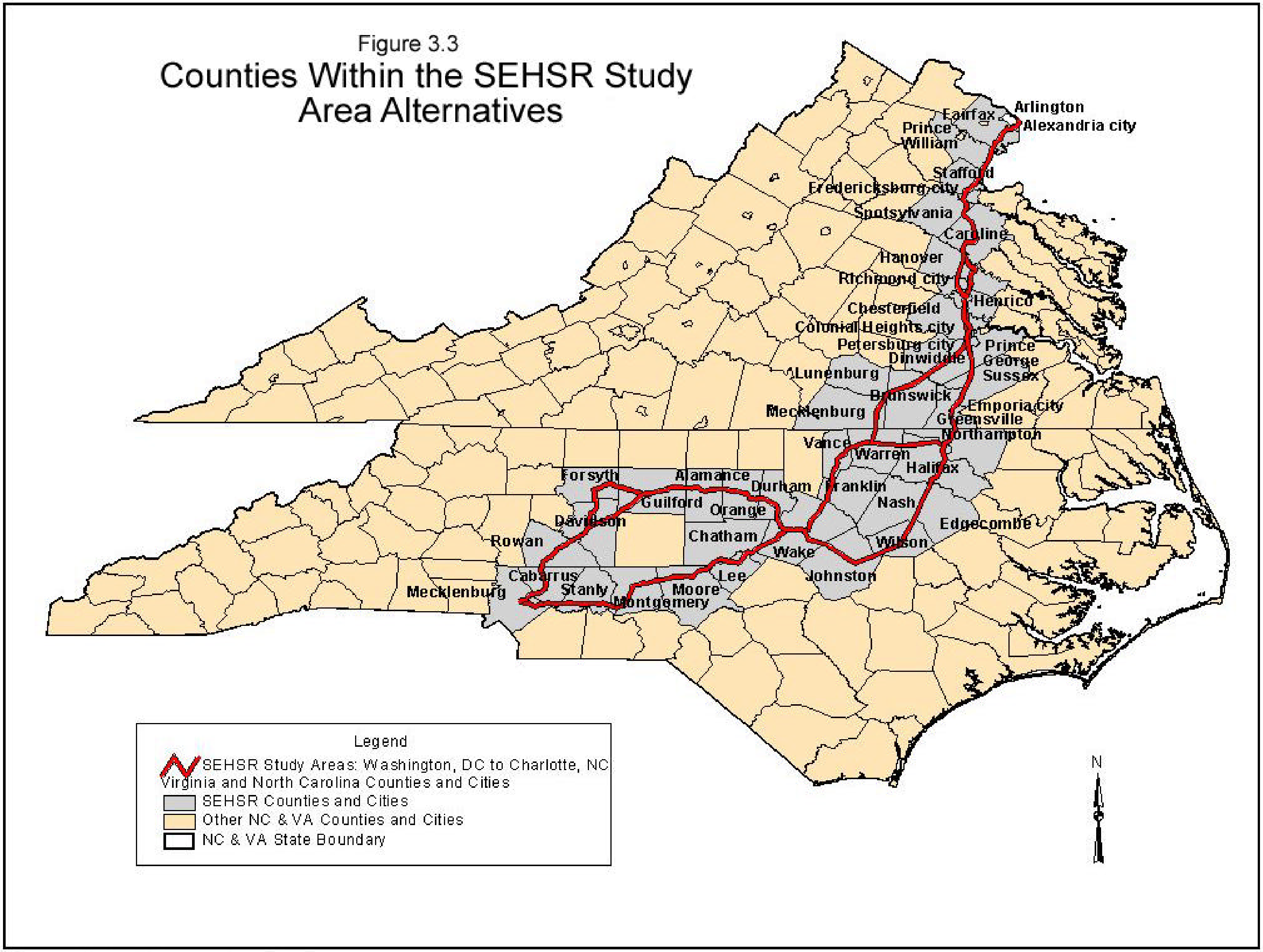
		Ethnicity, 1999 Estimates									
					65 years & older (%)	**High school graduates, 25 yrs. & older (% of total pop.)**	**College graduates, 25 yrs. & older (% of total pop.)**				
Franklin Co.	NC	62.8	37.2	25.9	11.6	32.4	4.8	13,418	2.63	33,713	13.5
Guilford Co.	NC	71.0	29.0	23.4	12.2	43.9	14.3	137,627	2.44	39,721	11.2
Halifax Co.	NC	46.0	54.0	27.8	14.5	33.9	5.4	15,066	2.66	24,741	23.6
Johnston Co.	NC	80.9	19.1	26.6	10.4	31.2	5.3	31,524	2.55	36,406	12.3
Lee Co.	NC	75.6	24.4	27.1	13.1	39.3	7.7	15,765	2.58	34,864	12.9
Mecklenburg Co.	NC	70.2	29.8	25.6	9.1	41.6	14.4	135,050	2.50	45,350	9.7
Montgomery Co.	NC	72.8	27.2	27.0	14.8	34.0	4.8	8,265	2.69	28,832	16.0
Moore Co.	NC	80.3	19.7	23.3	22.2	41.8	11.2	23,684	2.45	36,688	10.9
Nash Co.	NC	67.3	32.7	25.7	14.3	35.1	7.4	28,974	2.60	34,079	13.7
Northampton Co.	NC	39.8	60.2	25.1	17.6	34.2	5.7	7,518	2.67	24,218	23.1
Orange Co.	NC	79.2	20.8	21.0	9.7	41.0	22.6	36,278	2.33	39,410	10.5
Rowan Co.	NC	82.4	17.6	25.2	14.1	38.3	6.8	42,396	2.53	35,112	11.8
Stanly Co.	NC	87.0	13.0	26.0	14.5	37.0	5.6	19,832	2.56	34,437	10.8
Vance Co.	NC	54.2	45.8	27.8	12.2	32.7	5.4	14,412	2.69	26,499	19.3
Wake Co.	NC	75.5	24.5	24.7	7.6	39.5	16.3	165,760	2.46	51,391	7.8
Warren Co.	NC	38.0	62.0	24.6	17.9	33.0	4.4	6,349	2.67	23,025	23.4
Wilson Co.	NC	61.3	38.7	26.7	13.8	37.9	8.8	25,107	2.56	30,191	18.7
SEHSR Study Area Median Calculations (both states)		**66.57**	**33.43**	**24.26**	**12.80**	**39.33**	**10.74**	**S=1,957,273 (42,549)**	**2.59**	**37,899**	**13.75**

Note: In the Commonwealth of Virginia cities are self-contained governmental entities, separate from the counties that may surround them. Data in this table is presented by the city and county in Virginia, and by county in North Carolina.

Source: U.S. Census Bureau: 1990 Census of Population and Housing and State and County QuickFacts. Data derived from Population Estimates, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, 1997 Economic Census and 1997 Cen sus of Governments. Compiled by Carter & Burgess, Inc., 2001.

Figure 3.3

Counties Within the SEHSR Study Area Alternatives



Source: Carter & Burgess, Inc., 2001

3.3.1.2 Environmental Justice Populations

Background

Over the past several decades, public concerns have increased over economic, racial, and ethnic fairness in the distribution of the environmental and socioeconomic burdens of transportation projects, as well as the economic and mobility benefits derived from transportation projects. A series of federal legislation and policies have been implemented to address these concerns.

Title VI of the Civil Rights Act of 1964 bars intentional discrimination as well as disparate impact discrimination for certain protected groups. Under Title VI, no person on grounds of race, color, or national origin can be excluded from participation in, denied the benefits of, or in any other way be subjected to discrimination under any program or activity receiving Federal financial assistance.

The Environmental Justice Executive Order (EO 12898) of 1994 provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations."

In response to Executive Order 12898, the U.S. Department of Transportation issued USDOT Order 5610.2 on April 15, 1997 which established an Environmental Justice strategy for the National Environmental Policy Act (NEPA) process, Title VI Civil Rights Act of 1964, and other applicable statutes (as amended) concerning planning, public participation, social and economic factors, and health issues. The strategy promotes public involvement efforts targeted for minority and low-income groups to facilitate access to general information and input into transportation planning and project decisions. The Federal Highway Administration has issued guidance on this issue, most notably FHWA Order 6640.23 on December 2, 1998 establishing policies and procedures to use in complying with the strategies established by EO 12898 and USDOT Order 5610.2.

A joint memorandum from FHWA and FTA was issued in January 2000 regarding the implementation of environmental justice requirements.

Definition of Environmental Justice

The term "environmental justice" as well as related terms "minority" and "low-income" are not explicitly defined in Executive Order 12898. The Executive Order states that environmental justice is achieved when the actions of Federal agencies impose no disproportionately high and adverse environmental effects on low-income and minority populations. Data sources for this analysis focus specifically on minority and low-income populations.[1]

Definitions provided by the FHWA Memorandum "FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (December 1998)" and other guidance documents include general descriptors of adverse and disproportionate impacts, definitions of minority populations, and definitions of low-income populations.

---

[1] 1990 Census Summary Tape File 3 and the 1999 population estimates and 2004 projections calculated from the 1990 data sets using forecasting factors developed by CACI Marketing, CACI Marketing is a nationally based firm who specializes in population projections. During the past quarter century, CACI has processed three U.S. Censuses and have created their own current-year updates and five-year forecasts. They are currently assisting with the processing of the 2000 census.

Adverse Effects – the totality of significant individual or cumulative human health or environmental effects, including interrelated social and economic effects, which may include, but are not limited to, exclusion or separation of minority or low-income individuals with a given community or from the broader community; and the denial of, reduction in, or significant delay in the receipt of, benefits of transportation programs, policies, or activities.

A Disproportionately High and Adverse Effect on Minority and Low -Income Populations is one that:

- Is predominantly borne by a minority population and/or a low-income population; or
- Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non low-income population.

Minority Populations

Minority Person is a person who is:

- Black (having origins in any of the black racial groups of Africa);
- Hispanic (of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
- Asian American (having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands); or
- American Indian and Alaskan Native (having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition).

Minority Population is defined as any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed transportation program, policy, or activity.

According to the Council for Environmental Quality (CEQ) guidance document on Environmental Justice (Section 1-1. Implementation of EO 12898) "Minority populations should be identified where either:

- The minority population of the affected area exceeds 50% or,
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis."

Table 3.17 provides information on the minority population in the Study Area Alternatives by County.

Table 3.17 Minority Populations in the Study Area Alternatives by County													
		1990						1999					
County/City	**State**	**White**	**African American**	**Hispanic**	**American Indian**	**Asian and Pacific Islander**	**Other**	**White**	**African American**	**Hispanic**	**American Indian**	**Asian and Pacific Islander**	**Other**
	VA	69.2%						63.9%		6.6%			
	VA	76.5%						71.2%		10.1%			
	VA	41.3%						36.1%		0.1%			
	VA	60.6%						56.0%		0.4%			
	VA	84.7%						81.5%		1.2%			
	VA	97.0%						95.3%		1.1%			
	VA	63.6%						57.2%		0.4%			
	VA	53.7%						50.8%		0.4%			
	VA	81.4%						76.2%		5.7%			
Fairfax City	VA	85.6%	5.2%	4.6%	0.3%	7.0%	1.8%	81.2%	5.4%	5.7%	0.2%	10.4%	2.8%
City of Falls Church	VA	89.1%	2.8%	3.2%	1.1%	4.5%	2.6%	85.1%	3.4%	5.5%	0.5%	7.1%	3.9%
	VA	75.9%						71.7%		1.7%			
	VA	44.1%						33.9%		0.7%			
	VA	89.3%						87.0%		0.6%			
	VA	77.3%						73.2%		1.0%			
	VA	61.8%						53.6%		0.5%			
Manassas City	VA	83.5%	10.3%	2.8%	0.4%	3.0%	2.8%	78.9%	12.2%	4.1%	0.3%	4.6%	4.0%
Manassas Park	VA	88.2%	7.4%	2.9%	0.1%	2.5%	1.7%	84.5%	8.6%	4.3%	0.1%	3.9%	3.0%
	VA	61.4%						57.0%		0.3%			
	VA	26.5%						23.4%		0.5%			
	VA	66.8%						61.9%		2.2%			
	VA	83.5%						79.4%		4.1%			
	VA	43.3%						38.8%		0.5%			
	VA	87.5%						84.9%		1.8%			
	VA	90.9%						87.9%		2.2%			
	VA	41.4%						37.8%		0.1%			
	NC	80.0%	19.2%	0.4%	0.3%	0.2%	0.2%	78.7%		1.0%	0.3%	0.8%	0.4%
	NC	86.0%	13.0%	0.3%	0.4%	0.4%	0.1%	85.6%		0.7%	0.3%	0.6%	0.2%
	NC	75.9%	22.9%	0.5%	0.4%	0.3%	0.6%	74.4%		1.4%	0.4%	0.3%	1.6%
	NC	89.5%	9.6%	0.3%	0.4%	0.4%	0.1%	88.8%		0.7%	0.4%	0.6%	0.3%
	NC	60.3%	37.2%	0.7%	0.2%	1.8%	0.4%	58.6%		1.3%	0.3%	2.8%	0.6%

Table 3.17
Minority Populations in the Study Area Alternatives by County

		1990						1999					
County/City	**State**	**White**	**African American**	**Hispanic**	**American Indian**	**Asian and Pacific Islander**	**Other**	**White**	**African American**	**Hispanic**	**American Indian**	**Asian and Pacific Islander**	**Other**
	NC	43.7%	56.1%	0.1%	0.1%	0.1%	0.1%	43.0%		0.3%	0.1%	0.2%	0.2%
	NC	74.2%	24.8%	0.5%	0.2%	0.6%	0.2%	72.8%		1.1%	0.2%	1.1%	0.5%
	NC	64.1%	35.4%	0.3%	0.3%	0.2%	0.1%	62.3%		0.6%	0.3%	0.3%	0.8%
	NC	71.9%	26.4%	0.5%	0.5%	1.0%	0.2%	70.3%		1.1%	0.5%	1.8%	0.4%
	NC	46.9%	49.6%	0.3%	3.2%	0.2%	0.1%	45.5%		0.4%	3.4%	0.4%	0.2%
	NC	80.9%	17.7%	0.4%	0.4%	0.1%	0.8%	79.2%		1.1%	0.3%	0.3%	2.0%
	NC	75.7%	22.8%	0.7%	0.3%	0.6%	0.7%	73.9%		1.5%	0.4%	0.8%	2.0%
	NC	71.3%	26.3%	0.7%	0.4%	1.6%	0.4%	69.4%		1.8%	0.4%	2.8%	0.7%
	NC	71.7%	25.7%	0.8%	0.6%	0.7%	1.2%	69.9%		1.9%	0.3%	1.0%	2.6%
	NC	80.6%	18.4%	0.3%	0.5%	0.2%	0.3%	79.3%		0.8%	0.6%	0.5%	0.8%
	NC	67.8%	31.5%	0.3%	0.3%	0.2%	0.1%	66.7%		0.8%	0.3%	0.5%	0.5%
	NC	40.4%	59.4%	0.1%	0.2%	0.0%	0.0%	39.6%		0.2%	0.2%	0.1%	0.1%
	NC	80.8%	15.9%	0.7%	0.4%	2.5%	0.5%	78.1%		1.9%	0.4%	4.0%	1.0%
	NC	83.1%	16.0%	0.3%	0.4%	0.3%	0.1%	81.8%		0.6%	0.3%	0.7%	0.5%
	NC	87.4%	11.5%	0.3%	0.3%	0.6%	0.2%	86.6%		0.7%	0.3%	0.8%	0.5%
	NC	54.3%	45.2%	0.4%	0.1%	0.1%	0.3%	53.6%		0.6%	0.2%	0.2%	0.5%
	NC	76.7%	20.7%	0.7%	0.3%	2.0%	0.4%	74.4%		1.5%	0.3%	3.3%	0.9%
	NC	38.2%	57.2%	0.1%	4.4%	0.0%	0.2%	37.2%		0.2%	4.9%	0.1%	0.5%
	NC	61.6%	37.7%	0.2%	0.1%	0.1%	0.5%	60.3%		0.5%	0.1%	0.4%	0.8%
Median		74.9%	22.8%	0.4%	0.3%	0.6%	0.3%	71.4%	24.4%	1.0%	0.3%	0.9%	0.5%
Minimum		26.5%	0.4%	0.0%	0.0%	0.0%	0.0%	23.4%	0.8%	0.1%	0.1%	0.1%	0.0%
Maximum		97.0%	72.1%	7.1%	4.4%	8.4%	6.0%	95.3%	74.9%	10.1%	4.9%	11.8%	8.2%

Note: In the Commonwealth of Virginia cities are self-contained governmental entities, separate form the counties that may surround them. Data in this table is presented by city and county in Virginia and by county in North Carolina.

Sources: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992; and 1999 population estimates and 2004 projections, CACI Marketing. Compiled by SAIC, 2001.

Low-Income Populations

As defined by the USDOT Order on Environmental Justice, low-income refers to a person whose median household income is at or below the Department of Health and Human Services *poverty guidelines*.[2]

However, Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," Annotated with Proposed Guidance on Terms in the Executive Order (Section 1-1 Implementation p. 25 of the CEQ document), provides an alternative definition of low-income based on *poverty thresholds.*[3] In this case, low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, "Series P-60 on Income and Poverty." The Bureau of the Census series continues the Social Security Administration definition of poverty levels for the base year 1963, except that the differential between poverty levels for farm and non-farm families is reduced from 30 percent to 15 percent. Annual adjustments in Census series are based on changes in the average annual total Consumer Price Index (CPI) instead of changes in the cost of the U.S. Department of Agriculture's Economy Food Plan. The establishment of the Bureau of the Census standard data series does not preclude departments and agencies from more detailed analyses or from publication of tabulations for specialized needs although, where applicable, totals must agree with totals published by the Bureau of the Census.

The Department of Housing and Urban Development uses the term "low-income" to designate households whose self-reported income would likely not be sufficient to allow them to purchase a house in their county or metropolitan statistical area of residence. The "low-income" concept is intended to respond to local income levels and can vary noticeably from location to location. The Council of Environmental Quality recommends that poverty thresholds be used to identify "low income" individuals. However, there are a number of households whose income would be above the poverty threshold but who would still be considered as "low income" according to the Department of Housing and Urban Development.

These two different versions of a federal low-income measure, poverty threshold versus poverty guidelines, can be largely reconciled by examining the application of the definitions. Poverty thresholds are updated each year and published by the Bureau of the Census and are used mainly for statistical summary and trend analysis purposes such as preparing estimates of the number of Americans in poverty each year. Consequently, all official poverty population figures are calculated using the poverty thresholds, not the poverty guidelines (USDHHS guidance). The poverty guidelines are issued each year in the Federal Register by USDHHS. The guidelines are a simplification of the poverty thresholds for administrative purposes, for example in determining financial eligibility for certain programs. A major reason for issuing poverty guidelines distinct from the poverty thresholds is that the thresholds for a particular calendar year are not published in final form until late summer of the following calendar year. If poverty guidelines were not issued, USDHHS and other agencies would have to use two-year-old poverty threshold data in determining eligibility for programs during the first half of each year.

The poverty threshold definition is used for this preliminary analysis. The percentage of persons below the poverty threshold can be found in Table 3.6 in Section 3.3.1.1 Population. The definition used for a low-income household is one whose self-reported income is less than 80 percent of the median household income for its county. Although this does not satisfy the

[2] As an illustrative reference point, the 2000 poverty guideline for a family of four is $17,050.
[3] The 1999 poverty threshold for a family of four (two related children) was $16,895.

explicit Environmental Justice guidance that defines low-income as “at or below the Department of Health and Human Services poverty guidelines”, it has been applied to other environmental justice analyses for the U.S. Environmental Protection Agency and is more inclusive than the 15 percent threshold used by the Bureau of the Census.

Table 3.18 shows the estimated percentage of low-income households for counties within the Study Area Alternatives.

Table 3.18
Estimated Low Income Households in the Study Area Alternatives by County

County/City	State	Average Median Household Income (1990)	Households with less than 80% of Average Median Household Income (1990)	% Of Low Income Households (1990)
City of Alexandria	VA	47821	25151	47%
Arlington Co.	VA	51873	37494	48%
Brunswick Co.	VA	19410	2591	46%
Caroline Co.	VA	28194	2520	38%
Chesterfield Co.	VA	41088	26582	36%
City of Colonial Heights	VA	36658	2669	42%
Dinwiddie Co.	VA	26600	2884	38%
City of Emporia	VA	21718	809	40%
Fairfax Co.	VA	59200	105675	36%
Fairfax City	VA	37504	1644	22%
City of Falls Church	VA	28693	664	16%
City of Fredericksburg	VA	23029	2637	35%
Greensville Co.	VA	23158	1403	45%
Hanover Co.	VA	39806	8385	37%
Henrico Co.	VA	38099	35664	40%
Lunenburg Co.	VA	18633	612	14%
Manassas City	VA	27803	1276	13%
Manassas Park	VA	33137	490	23%
Mecklenburg Co.	VA	21765	4699	42%
City of Petersburg	VA	21409	6267	43%
Prince George Co.	VA	27110	2264	27%
Prince William Co.	VA	47180	24462	35%
City of Richmond	VA	22704	36466	43%
Spotsylvania Co.	VA	32317	4340	23%
Stafford Co.	VA	44820	6532	34%
Sussex Co.	VA	22269	1643	43%
Alamance Co.	NC	27762	17279	40%
Cabarrus Co.	NC	29374	14039	37%
Chatham Co.	NC	27581	6094	40%
Davidson Co.	NC	27692	19466	40%
Durham Co.	NC	29094	26369	36%
Edgecombe Co.	NC	22074	8520	42%
Forsyth Co.	NC	30543	43924	41%
Franklin Co.	NC	23637	5511	41%

Table 3.18 Estimated Low Income Households in the Study Area Alternatives by County				
		Average Median Household Income (1990)	**Households with less than 80% of Average Median Household Income (1990)**	**% Of Low Income Households (1990)**
Guilford Co.	NC	29700	56758	41%
Halifax Co.	NC	19099	8367	41%
Johnston Co.	NC	24413	15656	50%
Lee Co.	NC	26869	5513	35%
Mecklenburg Co.	NC	35872	86717	43%
Montgomery Co.	NC	22897	3642	44%
Moore Co.	NC	27616	9404	40%
Nash Co.	NC	26372	12756	44%
Northampton Co.	NC	17276	3135	42%
Orange Co.	NC	30845	15475	43%
Rowan Co.	NC	26384	18139	43%
Stanly Co.	NC	25385	7717	39%
Vance Co.	NC	23597	6521	46%
Wake Co.	NC	35481	66671	40%
Warren Co.	NC	18674	2863	45%
Wilson Co.	NC	23680	10607	42%
Median		27598	7125	40%
Minimum		17276	490	13%
Maximum		59200	105675	50%

Note: In the Commonwealth of Virginia cities are self-contained governmental entities, separate from the counties that may surround them. Data in this table is presented by the city and county in Virginia, and by county in North Carolina.

Sources: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992; and 1999 population est imates and 2004 projections, CACI Marketing. Estimated and compiled by SAIC, 2001 .

3.3.1.3 Economic Characteristics

The nine Study Area Alternatives collectively pass through 15 counties in Virginia and 24 counties in North Carolina. The economies of these areas vary dramatically. Development is diverse, ranging from rural agricultural land to industrial and commercial development to high population neighborhoods. Some counties within the Study Area Alternatives have economies that are dominated by one industry while others have a diversified economic base.

Employment - Virginia

For purposes of economic development and analysis, the Virginia Department of Commerce has divided the State into six geographic regions. Portions of the Study Area Alternatives pass through three of these regions: the Northern Virginia Region, the Central Virginia Region, and the Southern Piedmont Region.

The Northern Virginia Region, which includes a portion of the Washington, DC metropolitan area, is the fastest growing area in the state and is home to more than 2 million people. This region is becoming one of the nation's leading high-technology centers for computer software, information technology, and telecommunications, which has played an important role in growth. This region includes the counties of Fairfax, Loudoun, Arlington, and Prince William and the cities of Fairfax, Leesburg, Falls Church, Vienna, Manassas, and Alexandria. Service industries dominate this area due to its proximity to Washington, DC. In 1999, Northern Virginia recorded 20,874 new jobs and capital investments of $1.4 billion. Non-manufacturing firms accounted for 97.4 percent of the new announced jobs in Northern Virginia and 99.1 percent of investments.

The Central Virginia Region includes the Richmond-Petersburg metropolitan area, which has a population of 974,000. In 1999, Central Virginia attracted 6,424 jobs and $490.41 million in investments. New non-manufacturing jobs accounted for 59.1 percent of the investment and 76.0 percent of the employment. Richmond, Virginia's state capital, is a leading center for manufacturing, finance, trade, and corporate headquarters. Five Fortune 500 firms have their headquarters in this region of Virginia. Many companies are relocating their headquarters or planning to build manufacturing plants in this region, which also is known for important federal government activities. In addition to manufacturing, this region is attracting medical science. The Virginia Biotechnology Research Park, a 1.5-million-square-foot complex, is under construction and already fully leased. When completed, the research park will employ approximately 3,000 scientists and support personnel.

The Southern Piedmont Region, which includes Brunswick and Mecklenburg counties, received announcements for 3,423 new jobs and investments of $169.02 million during 1999. Manufacturers accounted for 66.7 percent of the announced new jobs and 82.5 percent of the capital investment. Food processing, manufactured goods like truck and aircraft tires, electronics, glass, and coaxial cable and packaging materials helped fuel commercial and industrial growth. Much of this regions growth has been centered in Pittsylvania and Henry Counties.

Employment – North Carolina

The North Carolina Department of Commerce also divides North Carolina into regions for economic analysis. Portions of each of the nine Study Area Alternatives pass through three of these regions: Eastern Piedmont, Piedmont Triad, and Southern Central Piedmont. Two of the three regions have had population and employment grow more rapidly than the state averages in recent years. The exception being the Piedmont Triad Region, which has grown slightly slower than the state averages.

The Eastern Piedmont (Research Triangle Regional Area) Region, a thirteen county area, contains almost one fifth of North Carolina's population. This region has a projected population growth rate above the state average. The region's labor force is about 20 percent of North Carolina's labor force. This region's share of the population in the labor force is above the statewide average. The business failure rate is barely above the state average, and the business startup rate is the highest in North Carolina. The unemployment rate is the lowest in North Carolina, and the poverty rate is below the state average. The largest employment sectors in the Eastern Piedmont region are service, wholesale/retail trade, government, and manufacturing. The fastest growing sectors in the region are construction, agriculture, and service. Average annual wages are higher than statewide averages for all sectors except agriculture, finance/insurance/real estate, and transportation/communication/public utilities.

The Central Piedmont (Piedmont Triad) Region, a twelve county area, contains approximately one fifth of North Carolina's population. In addition, its projected growth rate is below the state average rate. The region's labor force is 20 percent of the North Carolina labor force, and its share of the population in the labor force is above the statewide average. The business failure rate and the business startup rate are below the state average. The unemployment rate and the poverty rate are lower than the state averages. The largest employment sectors in this region are manufacturing and wholesale/retail trade. The fastest growing sectors are agriculture, construction, and services.

The Southern Central Piedmont (Charlotte) Region, a thirteen county area, has almost a quarter of the North Carolina population, and its projected population growth rate is just above the state average growth rate. The region's labor force is 25 percent of the North Carolina labor force, and its share of the population in the labor force is above the statewide average. The business failure rate and business start up rate are slightly below the state average. The unemployment rate is lower than the state average, and the region's poverty rate is the lowest in North Carolina. The largest employment sectors in this region are manufacturing and wholesale/retail trade. The fastest growing sectors are construction and services.

Income

Table 3-19 shows the median household and per capita incomes for Virginia and North Carolina counties that are located in one or more of the Study Area Alternatives. In Virginia, the county with the highest median household income is Fairfax at $71,057. The area with the highest personal income is the City of Arlington at $35,333; the county with the highest personal income is Fairfax at $33,529. In Virginia portions of the Study Area Alternatives, median household income increased on average by 25 percent from 1989 to 1997. Personal income grew by an average of 13 percent from 1990 to 1994.

In North Carolina, six counties have an equally high median household income of $62,800 dollars. These are Wake, Chatham, Durham, Johnston, Franklin and Orange. For per capita personal income Mecklenburg County has the highest in the state at $35,245 then followed by Wake, Forsyth and Guilford counties. For all three of the North Carolina Department of Commerce economic analysis regions (discussed above), per capita income and average wages are seven percent or higher than the state averages. For two of the regions, Piedmont Triad and Research Triangle, the average real wage (wages adjusted for inflation) fell by 0.7 percent from 1992 to 1994, compared to a decline of 0.2 percent for the entire state. For the Charlotte region the average real wage rose by 0.5 percent during the same period.

Table 3.19 Median Household Income Per Capita in the Study Area Alternatives					
Virginia			North Carolina		
County/City	Median Household Income (1997)	Personal Income (1994)	County	Medium Household Income (2000)	Personal Income (1998)
City of Fairfax	$71,057	$33,529	Northhampton	$34,000	$18,452
Prince William Co.	$59,080	$21,544	Halifax	$32,800	$18,357
Stafford Co.	$58,005	$16,959	Warren	$29,300	$15,874
Arlington Co.	$57,244	$35,376	Vance	$37,000	$19,008
Chesterfield Co.	$55,324	$24,261	Franklin	$62,800	$20,932
Hanover Co.	$53,618	$22,065	Nash	$44,900	$23,572
Spotsylvania Co.	$51,218	$20,977	Edgecombe	$44,900	$19,349
City of Alexandria	$51,052	$35,333	Wilson	$44,500	$22,823
Prince George Co.	$44,845	$17,887	Durham	$62,800	$28,492
Henrico Co.	$44,122	$26,661	Wake	$62,800	$33,780
City of Colonial Heights	$40,923	NA	Johnston	$62,800	$23,288
City of Fredericksburg	$35,484	NA	Orange	$62,800	$28,256
Dinwiddie Co.	$34,830	$18,738	Alamance	$51,000	$24,836
Caroline Co.	$34,799	$16,758	Chatham	$62,800	$27,489
City of Richmond	$29,234	$27,410	Lee	$48,600	$24,563
Greensville Co.	$27,923	$15,195	Guilford	$51,000	$29,229
Mecklenburg Co.	$27,752	$16,309	Forsyth	$51,000	$31,304
Sussex Co.	$27,489	$17,476	Davidson	$51,000	$23,034
Brunswick Co.	$25,652	$13,574	Rowan	$57,100	$21,594
Lunenburg Co.	$25,500	$14,299	Moore	$50,400	$28,493
City of Petersburg	$25,428	NA	Montgomery	$39,100	$18,789
City of Emporia	$24,255	NA	Stanly	$43,500	$21,689
			Cabarrus	$57,100	$26,480
			Mecklenburg	$57,100	$35,245

Note: In the Commonwealth of Virginia cities are self-contained governmental entities, separate from the counties that may surround them. Data in this table is presented by the city and county in Virginia, and by county in North Carolina.
Source: Virginia Data, United State s Census Bureau: North Carolina Data, North Carolina Department of Commerce – Economic Development Information System.

3.3.1.4 Community Facilities and Services

There are many schools, hospitals/medical centers, fire and police stations, religious institutions and public facilities that serve the residents that live within the Study Area Alternatives. Access to these facilities directly affects the general welfare of those individuals served.

School districts within the Study Area Alternatives often extend beyond municipalities and are generally limited by county boundaries. Approximately 50 educational facilities are located within 300-400 feet of the rail lines located in the Study Area Alternatives. The majority of those schools are located in North Carolina, specifically:

- the North Carolina Railroad (NCRR) between Selma, NC and Charlotte, NC;
- the CSX S-Line from Henderson, NC to Raleigh, NC;

- the K-line from Greensboro, NC to Winston-Salem, NC; and
- the Winston-Salem Southbound (WSSB) from Winston-Salem, NC to Lexington, NC.

Public school bus transportation for elementary and secondary schools generally follow the shortest and most direct route. Each year these routes change to accommodate the student population. In larger cities (such as Washington, DC, Alexandria, VA, Richmond, VA, Raleigh, NC, Durham, NC, Greensboro, NC, Winston-Salem, NC and Charlotte, NC) regional and local public bus transit systems operate routes between most institutions of higher education. These routes provide a means of transportation for students and employees between surrounding residential areas and campus facilities. Students and employees that do not utilize bus transit either live close enough to walk or bike, or commute by automobile via personal vehicle or car pool.

Most towns and cities within the Study Area Alternatives are served by local law enforcement and fire stations, while county sheriff departments and fire districts serve unincorporated areas. Emergency services tend to be more regionalized, serving several counties or cities. Municipalities with larger populations have several fire stations with district boundaries crossing Study Area Alternatives. Health care facilities are generally located in more populated cities but may exist in less populated, regional centers that serve rural areas. In addition, private ambulance companies work with health care and safety services and are generally located in regional centers. Regional centers with health and safety services exist within all Study Area Alternatives. The highest concentration of these facilities and services, which are a direct result of more regional centers and larger populations, are located in proximity to the former RF&P and NCRR rail lines within the Study Area Alternatives.

As part of regional safety, US 158, US 64, US 264, US 70, I-40 and I-95 in eastern North Carolina have been designated as hurricane evacuation routes to aid in the transport of vehicles away from coastal areas and provide access to and from health and safety facilities during the event of a major disaster.

There are approximately 200 churches and religious facilities of various sizes and religious denominations located within 300-400 feet of the rail lines located in the Study Area Alternatives. The majority of these religious facilities are located along:

- the S-Line between Norlina, NC and Raleigh, NC;
- the A-line from the VA/NC State line to Selma, NC;
- the North Carolina Railroad (NCRR) from Raleigh, NC to Charlotte, NC; and
- the Aberdeen Carolina and Western Railroad (ACWR) from Apex, NC to Charlotte, NC.

There are approximately 65 churches located along the NCRR from Raleigh, NC to Charlotte, NC.

There are many local public and private parks and recreational facilities located in the vicinity of the Study Area Alternatives but few are adjacent to existing railroad tracks and rights-of-way. There are approximately ten parks within the Study Area Alternatives, with the majority being along the RF&P from Washington, DC to Richmond, VA and between Greensboro, NC and Charlotte, NC along the NCRR. Community recreation facilities tend to be located away from Study Area Alternatives.

3.3.1.5 Land Use and Planning

Development Patterns

Development within the Study Area Alternatives has been influenced by the transportation infrastructure. During the 19th Century, vast networks of rail transportation routes were built as a way of linking cities. This rail network construction spawned the growth of numerous communities, which served as economic centers for the collection and distribution of goods. The influence of the railroad remained strong until interstate highways were added to the transportation infrastructure in the 1950s and 1960s. The new interstates bypassed many older communities; hence, county (minor) roads were constructed to serve as farm-to-town roads for farmers to get goods to town. These have evolved or improved, in many cases, into connectors to the interstates for those bypassed communities.

Downtown areas of many communities within the Study Area Alternatives developed in a compact pattern along railroads. The location of buildings resulted in a clustering around train stations and sidings. Land uses that relied heavily upon rail service concentrated in this area and included uses such as: agricultural activities, passenger train stations, and commercial/industrial development. Other facilities also developed around these areas such as the town hall, parks, schools, churches, hotels and dining establishments.

Interstate highways stimulated growth along the fringes of these communities where land was available and often bypassed older communities. The growth along interstate highways developed in somewhat of a similar pattern to that of rail but tended to cluster near interchanges with existing streets and highways. Development in the vicinity of interchanges tended to be manufacturing plants, shopping centers, industrial facilities, and convenience services for the automobile and driver, which relied upon the highway network for accessibility.

Interstate highways 40, 85 and 95 are located in the Study Area Alternatives and link communities to the major metropolitan areas of Washington, DC; Richmond, VA; Raleigh, NC; Greensboro, NC; Winston-Salem, NC; and Charlotte, NC. More information about the existing transportation network within the Study Area Alternatives can be found in Chapter Two's discussion of the No Build Alternative. A discussion regarding potential impacts and changes to this infrastructure (as a result of the SEHSR program) can be found in Chapter Four.

Generalized Land use Description of Study Areas

The Study Area Alternatives are very diverse in land use, varying from urban to rural settings. Table 3.20, presents, by county, the general land use that appears in the nine Study Area Alternatives' jurisdictions. For this analysis, land uses are grouped into six categories: residential, industrial, commercial, recreational, public and environmental. Each contains sub-land use classes that can be specifically linked to urban or rural settings.

Residential land use is broken down into low, medium and high-density areas. Low density refers to rural living with single family homes on large lots while medium and high density refers to suburban and urban housing consisting of mostly single and mutli-family units. Industrial land uses are categorized as light and heavy industry but have been grouped together. Commercial refers to business parks, retail and service uses, hotels and restaurants, and general office land use. For this analysis, restaurants, hotels and other services are presented as retail use. Utility, business parks and small businesses are grouped into office land use. Recreational refers to parks and greenways as well as recreational areas. Public land use refers to community and governmental facilities, historic sites and districts, and schools. Environmental use refers to vacant/open lands, floodplains and agricultural areas.

Urban area land use within the Study Area Alternatives typically consist of medium to high-density residential, light and heavy industrial, public and all facets of commercial land use. Most urban areas and downtown districts of cities along the study area are dominated by shops and small businesses; restaurants and hotels; service industries; community, government and school facilities; and historic sites and districts. Land use becomes more spread out moving away from urban areas into suburban. The majority of urban land uses are also seen in suburban areas with the addition of more open/vacant lands and parks.

Rural land use focuses more on low density residential, environmental, recreational and industrial uses. Housing is usually single-family dwellings and is more spread out. Commercial land use is located along interchanges of major highways and interstates and in downtown areas. Environmental land use, such as vacant and agricultural lands, become much more abundant.

Table 3.20 depicts existing land use by county within the Study Area Alternatives.

Table 3.20 Study Area Alternatives Land Use by County

	Counties	Residential			Industrial	Commercial		Recreatinal (public lands)		Public			Environmental		
		Low (Rural)	Medium (Sub.)	High (Urban)		Retail (Service)	Office	Parks	Water-fronts	Gov't	Historic	Schools	Vacant (open)	Floodplain	Agricultural
Virginia (Washington, DC to the Viginia/North Carolina State Line)	***Counties along RF&P (Segments 1)***														
	Alexandria (city) County		X	X	X	X	X	X	X	X	X		X		
	Arlington County		X	X	X	X	X	X		X	X				
	Fairfax County		X	X	X	X	X	X		X	X				
	Prince William County	X	X	X	X	X	X	X			X		X		X
	Stafford County	X	X	X	X		X	X	X	X					X
	Fredericksburg (city) County		X	X	X	X	X		X	X	X				
	Spotsylvania County	X	X					X		X	X		X		
	Caroline County	X			X	X	X							X	X
	Hanover County	X	X	X	X	X	X	X							
	Henrico County		X	X	X	X	X	X		X	X		X		
	Richmond (city) County		X	X	X	X	X	X					X	X	
	Chesterfield County	X	X		X	X	X	X			X	X	X		
	Counties along A-Line(Segments 7,8,9)														
	Petersburg (city) County		X	X	X	X	X	X		X					
	Prince George County	X	X		X	X	X				X		X		X
	Sussex County	X			X	X	X			X			X		X
	Emporia (city) County		X		X	X	X						X		
	Greensville County					X	X							X	X
	Counties along S-Line(Segments 2,3,5)														
	Dinwiddie County	X						X			X		X	X	X
	Brunswick County	X				X	X			X			X	X	X
	Lunenburg County	X										X	X		X
	South Hill (city) County	X	X		X	X	X						X		
	Mecklenburg County	X			X	X	X						X		X
North Carolina (Virginia/North Carolina State Line to Charlotte)	***Counties along A-Line(Segments 10)***														
	North Hampton County	X											X		X
	Halifax County	X	X		X	X	X	X					X		
	Edgecombe County	X	X		X	X		X			X				
	Wilson County	X	X		X										X
	Johnston County	X	X		X	X		X					X		X
	Counties along S-Line and SA-Line(Segments 6,11)														
	Warren County	X				X					X		X		X
	Vance County	X				X									X
	Frankling County	X			X	X	X								X
	Counties along NCRR, WSSB and K-Line(Segments 12,13,14,15,16,17,18)														
	Wake County		X	X	X	X	X	X		X	X	X	X		
	Durham County		X	X	X	X	X	X				X			
	Orange County	X	X		X	X	X	X	X		X		X		X
	Alamance County	X	X		X	X	X	X	X						
	Guilford County		X		X	X	X	X		X		X			
	Forsyth County		X	X	X	X	X	X	X		X				
	Randolph County	X	X		X	X	X								
	Davidson County	X	X		X	X	X					X			
	Rowan County	X	X		X	X	X				X				
	Cabarrus County	X	X		X	X	X								
	Mecklenburg County		X	X	X	X	X	X		X		X			
	Counties along ACWR(Segments 19,20,21)														
	Stanly County	X			X										X
	Montgomery County	X						X		X		X			
	Moore County	X				X	X								X
	Lee County	X	X		X	X	X	X			X				X
	Chatham County	X			X			X					X		

Source: Land Use Summaries for Counties and Cities within Study Area Alternatives; *AG&M, 2000*

3.3.1.6 Archaeological and Historical Resources

The National Historic Preservation Act (NHPA), passed in 1966, established a national program to preserve the country's historical and cultural elements as integral parts of the nation's communities. Section 106 of the Act requires Federal agencies to consider the effects of their actions on historic properties, as well as provide the Advisory Council on Historic Preservation an opportunity to comment on a proposed action before implementation.

To complete the Section 106 review process, Federal agencies must gather information to determine:

- which properties within the project area are listed on or eligible for the National Register of Historic Places,[4]
- determine how the historic properties may be affected;
- explore alternatives to avoid or minimize harm to the historic properties; and
- reach agreement with the State Historic Preservation Office (SHPO) or the Tribal Historic Preservation Office (THPO) on measures to mitigate adverse effects.

Information on cultural resources within the Study Area Alternatives was obtained from the historic property survey files of the North Carolina and Virginia State Historic Preservation Offices. This research consisted of identifying previously surveyed properties and districts determined to be eligible for or included on the National Register of Historic Places. Battlefields, national cemeteries and archaeological sites were also identified.

No field reconnaissance surveys were conducted to identify properties or sites that may be eligible for listing on the National Register of Historic Places. More extensive surveys by a qualified architectural historian and archeologist would be required during the Tier II environmental process. The 106-review process would be completed as part of Tier II environmental documentation.

Historic and Architectural Resources

During the nineteenth century, the advent of wood-burning locomotives and iron rails encouraged the development of commercial centers inland, away from the rivers and ports. In Virginia and North Carolina, numerous nineteenth century towns were established and prospered due the textile and tobacco industries and their proximity to railroad lines. Therefore, many historic properties, districts, and sites are now found along the existing rail lines within each of the Study Area Alternatives. The following describes some of the locations within the Study Area Alternatives where substantial concentrations of cultural resources occur. In addition to the locations listed below, other historic properties occur throughout the project area from Washington D.C. to Charlotte, North Carolina.

Arlington, VA

Designated as a military cemetery in 1864, the Arlington National Cemetery includes the Arlington Mansion and 200 acres of grounds surrounding the house. More than 260,000 people are buried at Arlington, including veterans from all of the nation's wars. The cemetery includes the Tomb of the Unknowns and the graves of many historical figures.

---

[4] The National Register of Historic Places is a compendium of properties throughout the nation recognized for their significance in American history, architecture, archaeology, engineering, and culture. Properties included on the Register may include districts, sites, buildings, structures, and objects.

Alexandria, VA

Incorporated in 1779, Alexandria became a port of entry for foreign vessels and a major export center for tobacco, flour, and hemp. During the Revolutionary War, George Washington drilled militia troops at Market Square and the town served as a supply and hospital center. During the War of 1812, Alexandria was captured and held for ransom by the British. The City was occupied by the Union military forces during the Civil War and became a logistical supply center for the federal army. During the twentieth century, heavy industrial buildings dominated Alexandria's waterfront, including the Torpedo Factory, which was constructed during World War I and was again used in World War II as a U.S. munitions factory. The Old Town Historic District consists of many historic landmarks, sites, and buildings from the eighteenth, nineteenth and twentieth-centuries.

Quantico, VA

Quantico, Virginia consists primarily of the Marine Corps Development and Education Command and the Town of Quantico. Prior to the development of the Marine base, the Village of Quantico served as a fishing village, an excursion center, and a naval base for the Commonwealth of Virginia's fleet during the Revolutionary War. After the Civil War, railroads became an integral part of transportation and in 1872, the Richmond, Fredericksburg and Potomac Railroad (RF&P) was formed. The Marine Corps Base was established in 1917 and consists of regimental and disciplinary barracks, three storehouses, commissary, bakery, a rifle range, Brown Flying Field, and numerous other buildings and equipment sufficient to accommodate some 400 officers and 3,000 enlisted men.

Dumfries, VA

Dumfries, established in May 11, 1749, is the oldest continuously chartered town in Virginia. Initially, it was an agricultural center, with tobacco as its main commodity, later supplanted by wheat and sugar. However, Dumfries failed to build roads, canals, or railroads that would facilitate farmers bringing crops to their docks. As the harbor silted in, Dumfries' business largely ceased and the town failed to grow to the extent of its neighboring cities, such as Alexandria, Virginia.

Richmond, VA

Laid out in 1737 on the fall line of the James River, Richmond supports a rich political, architectural, and military history. Richmond replaced Williamsburg as the capital of Virginia in 1779 and was the capitol of the Confederacy during the Civil War. During the Civil War, opposing armies battled in the suburbs for months at a time. Richmond contains several historic neighborhoods, eighteenth and nineteenth century town homes, Victorian homes, neo-classical architecture, churches, monuments, and landmarks. The City contains several National Historic Landmarks. Richmond's Main Street Railroad Station, now undergoing restoration, is listed on the National Register.

Ashland, VA

The center of Ashland still focuses around the railroad, as well does the town's many historic homes, shops, and the oldest Methodist College in the United States, Randolph-Macon College. The National Civil War Battlefield (Beaver Dam Creek) is also located in Ashland. The battlefield is part of the Richmond National Battlefield Park, administered by the National Park Service.

Lorton, VA
Lorton is the site of Camp Humphreys/Fort Belvoir, which was originally part of a land grant from a seventeenth century king and was established in 1915 as a rifle range and training camp.

Fredericksburg, VA
Fredericksburg, Virginia is the site of several historic homes and battlefields dating from colonial times, the Revolutionary War, and the Civil War. The Chancellorsville, Fredericksburg, and Spotsylvania Court House Battlefields are a few examples of National Register sites in and around the town. Fredericksburg was established in 1728 to serve as a frontier river-port and later as a shipping and receiving station for tobacco in Spotsylvania County and areas west. The town suffered severe devastation during the Civil War Battle of December 1862, however, several federal homes survived. Two Confederate cemeteries and one National cemetery are located in the town of Fredericksburg. Fredericksburg's forty-block National Register Historic District includes many restored private historic sites and homes.

Petersburg, VA
Petersburg, Virginia was the setting of the longest siege in American history, after General Ulysses S. Grant failed to capture Richmond in the spring of 1864. Grant settled in to subdue the Confederacy by surrounding Petersburg and cutting off General Lee's supply lines into Petersburg and Richmond. Petersburg is home to several historic sites, including the Petersburg National Battlefield, the Five Forks Battlefield, and several eighteenth and nineteenth century structures, such as the Old Blandford Church. In addition, approximately 30,000 Confederate soldiers are buried in the Blandford Cemetery, where the first Memorial Day was observed.

Selma, NC
Selma became important in 1886 as the junction of the North Carolina and Atlantic Coastline Railroads. Selma's Union Station is on the National Register of Historic Places.

Garner, NC
Garner grew around the railroad, cotton gins, general stores, and farming. The town experienced combat during the closing days of the Civil War with some skirmishes occurring in the area. This history is preserved in the bullet holes in Bethel Church and The Garner House.

Rocky Mount, NC
Rocky Mount developed around a post office established in 1816. Soon after, one of the first cotton mills in North Carolina, Rocky Mount Mills, was established. The Wilmington-Weldon Railroad was built in 1845 just east of the Mill. There are currently five National Register Historic Districts in Rocky Mount including Rocky Mount Mills Village and Rocky Mount Central City.

Wilson, NC
Wilson was established as a town when the Wilmington-Weldon Railroad joined the villages of Toisnot Junction and Hickory Grove. The town's history is preserved in several historic districts, such as the Old Wilson historic district, West Nash Street historic district, and the Wilson Central Business-Tobacco Warehouse historic district.

Haw River, NC

In 1894, the North Carolina Railroad (NCRR) secured passage through the mill town when a railroad bridge was erected over the Haw River. Haw River continued to develop as a mill village in which the mill owned the homes of the workers and operated the company stores.

Hillsborough, NC

Hillsborough was established in the mid-eighteenth century, where the Great Indian Path crossed the Eno River. In addition to being the seat of Orange County, Hillsborough supported the summer homes of many wealthy families from coastal North Carolina. Its historic district consists of many structures from the late eighteenth and early nineteenth centuries.

Durham, NC

In the mid-nineteenth century, Dr. Bartlett Snipes Durham offered the North Carolina Railroad four acres for use to expand the railroad right-of-way. In recognition, the Railroad named the new station and settlement after him. In 1865, General Johnston's confederate troops surrendered to General Sherman at the farmstead called Bennett Place, north of Durham, at the end of the Civil War. After the Civil War, the town and its businesses grew and the commercial district filled with two and three-story buildings and intricate brick financial institutions. The Durham Hosiery Mill exemplifies textile mill architecture at the turn of the century. Built in 1902, the towered Romanesque factory has massive, tapering brick walls and massive structural timbers. In addition, a wide variety of architectural styles remain, including Art Deco and Craftsman. Tobacco production also played a key role in the development of Durham, with many of its historic warehouses now being converted for other uses.

Raleigh, NC

Raleigh became the capital of North Carolina in 1792, but remained a small agricultural town until the Raleigh and Gaston Railroad was completed in 1840. Soon after, the North Carolina Railroad (NCRR) was completed, the cotton, tobacco, and turpentine industries expanded. While there were no Civil War battles in Raleigh, approximately 60,000 Union troops were quartered in the town during and after the war. The modest prosperity resulting from the transport of goods led to the construction of Neo-classical, Victorian, Georgian, Federal, and Greek Revival styled homes in and around the business district. Several areas in Raleigh are designated as historic districts, such as Blount Street, Boylan Heights, Capitol Square, Moore Square, and Oakwood.

Apex, NC

Apex, first settled in 1867, was named due to its location at the highest point on the Chatham Railroad between Richmond, Virginia and Jacksonville, Florida. The Apex railroad station was chartered in 1854 for the purposes of communication and transportation between the North Carolina Railroad Company (NCRR) and the coalfields of Chatham County. Stores and warehouses were built and Apex became an active trading and shopping center. Downtown Apex is now a historic district on the National Register of Historic Places.

Burlington, NC

Burlington developed from a community known as Company Shops, a village that grew around the repair and maintenance shops of the NCRR. In the nineteenth century, the economy of the area was dependent upon textile mills and hosiery mills. This history is reflected in the Southern Railway Passenger Station and the Downtown Burlington historic district, both of which are listed on the National Register of Historic Places.

Greensboro, NC

Greensboro is the site of the Battle of Guilford Courthouse National Military Park. The battle took place in March 1781 as American Major General Nathaniel Greene deployed 4,400 rebels to successfully thwart the invasion of North Carolina by 1,900 redcoats led by Lord Cornwallis. The railroad, when finally completed in 1856, was a key factor in Greensboro's prosperity and industrial growth. During the Civil War, Greensboro acted as a storehouse and railroad center for the Confederacy by providing supplies and troops for Robert E. Lee's Army. In 1865, Greensboro also became the seat of the Confederacy. The city contains several historic sites and districts such as the Old Greensborough and the Downtown Historic District, which is a turn-of-the-century commercial, residential, and industrial district.

High Point, NC

High Point was named after the highest point on the North Carolina Railroad (NCRR) and contains the Oakwood Historic District and the Sherrod Park Historic District.

Winston-Salem, NC

Winston-Salem began as a German settlement in North Carolina in the mid-1700s. Many of the homes and businesses from the eighteenth and nineteenth centuries were constructed in the Germanic building tradition, which included stone foundations, tiled roofs, and patterned brickwork. Until the mid-1800s, Salem remained a church-governed town until it sold part of its land to the new county seat of Winston. Years of growth followed, fueled by the tobacco, furniture, and textile industries followed by the railroad linking Salem and Winston. Prosperity allowed for the construction of Queen Anne style Victorian homes, as found in the West End Historic District. Old Salem, a historic district, is now a popular tourist attraction in the city.

Spencer, NC

Spencer was created to house the families of the Spencer Shops work force, the Southern Railway's vast repair facility. Construction of the shops began in the spring of 1896 and included a machine shop, roundhouse, storehouse, and offices. The Spencer National Register District, located adjacent to the North Carolina Transportation Museum, is the largest contiguous district in North Carolina and contains several residential and commercial buildings.

Salisbury, NC

There are eleven historic districts in Salisbury. The 30-square-block center of Salisbury consists of the historic downtown and the West Square residential district, which was placed on the National Register of Historic Places in 1975.

Charlotte, NC

Prosperity was brought to Charlotte as a result of North Carolina's gold boom, and later by the cotton industry. As a result, a U.S. Mint was constructed in Charlotte in 1837 and railroads were brought into the region. Charlotte became the center of a major new American industrial region, surpassing the northeast in textile production. As a result of the booming economy, Charlotte employed the finest architects and city planners to design grand neighborhoods and business districts, such as the Elizabeth Historic District, North Charlotte Historic District, and Wesley Heights Historic District.

Archaeological Resources

A file search was conducted at the Virginia and North Carolina State Historic Preservation Offices to determine whether any known archaeological sites listed on or determined eligible for listing on the National Register of Historic Places occur within 1,500 feet of the existing railroad lines within the Study Area Alternatives. No such archaeological sites where identified. No studies were performed to determine the probability of locating archaeological sites within the Study Area Alternatives, and no field reconnaissance surveys were conducted. However, numerous historic and pre-historic archaeological sites are known to occur throughout Virginia and North Carolina.

Battlefields

Several battlefields associated with the Revolutionary and Civil Wars are located, in whole or in part, within the Study Area Alternatives. Although now operated as National Parks, they are also archaeological sites, and are described below.

<u>Fredericksburg and Spotsylvania National Military Park,</u> located in Fredericksburg, Virginia, encompasses approximately 9,000 acres including the land on which the battles of Fredericksburg, Chancellorsville, Wilderness, and Spotsylvania Courthouse were fought. The park was designated in 1927 to commemorate the 110,000 causalities that occurred during those battles. The park also includes a number of historic structures, such as Chatham, Ellwood, Salem Church, and the Stonewall Jackson Shrine.

<u>Manassas Battlefield Park,</u> located in Manassas, Virginia, was designated as a National Park in 1940 to preserve the sites of two major Civil War battles. The park contains approximately 5,000 acres north of US Route 66 and the Norfolk Southern Railroad.

<u>Richmond National Battlefield Park,</u> located in Richmond, Virginia, was designated as a park in 1936. The park commemorates eleven sites associated with the Union campaigns to take Richmond during the Civil War. These sites include several battlefields, structures, and cemeteries, including the Tredegar Iron Works, the Cold Harbor Battlefield, Fort Harrison, the Glendale Battlefield, the Malvern Hill Battlefield, and the Gaines Mill Battlefield. The Park encompasses 1,718 acres in and around Richmond.

<u>Petersburg National Military Park</u>, located in Petersburg, Virginia, was designated by Congress in 1926 to commemorate the longest siege in American history when General Ulysses S. Grant failed to capture Richmond in 1864 and 1865. The park was also designated as a National Battlefield in 1962.

<u>Guilford Courthouse National Military Park,</u> in Greensboro, North Carolina, was the site of largest action in the Revolutionary War's Southern Campaign. The 220-acre site was designated as a National Military Park in 1917.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the potential benefits and impacts of the proposed Southeast High Speed Rail (SEHSR) program. These potential benefits and impacts are discussed at a regional level for the nine Study Area Alternatives and the No Build Alternative. Ranges of possible mitigation measures are generally discussed. Specific impacts, benefits, and mitigation would be detailed during the Tier II environmental documentation as appropriate for the action/project being proposed.

Data in this Chapter discuss potential impacts and benefits to the physical, natural, and human environment. Also presented are: construction impacts, indirect and cumulative effects, Section 4(f) and 6(f) properties, the relationship between short-term impacts and long-term benefits, and irreversible and irretrievable commitment of resources. For each resource area, buffer areas of analysis differ based on the type of resource and its geographic features. For some resources, the area of analysis is defined by the six-mile study area, while other resource analyses look at smaller areas. Each resource section presented in this Chapter discusses the buffer area of impact used for its analysis. Because this is a program level document, the analyses are simple inventories (utilizing existing data), which are used to gauge levels of potential impacts between the different Study Area Alternatives.

4.1 Impacts to the Physical Environment

4.1.1 Water Resources

There are eleven river basins and over seven of the basin's main rivers located in the Study Area Alternatives. Numerous other smaller rivers and streams are contained in the Study Area Alternatives. Table 4.2 identifies these river crossings.

The Study Area Alternatives also contains many designated water-supply watersheds. In the Virginia portion of the Study Area Alternatives, only the location of the water-supply intakes was readily available. A five-mile buffer around these intakes was estimated for the water-supply watersheds in and surrounding the Study Area Alternatives.[1] Figure 4.1 depicts the estimated water-supply watersheds in and surrounding the Virginia portion of the Study Area Alternatives. Figure 4.2 depicts the water-supply watersheds in and surrounding the North Carolina portion of the Study Area Alternative.[2]

For the purposes of this report, discussions of surface waters is limited to waters identified as rivers, impoundments of these rivers, and large natural lakes such as Lake Drummond. Analysis of potential impacts was conducted for the entire six-mile wide study area for each Study Area Alternative.

Construction along the existing track bed would have some potential for increased pollutant runoff from train operation and temporary increases in sedimentation during construction. Construction either in or out of the existing right of way, where no track bed exists, has similar potential for impacts, with additional potential for new fill in waters or wetlands. In areas where no rail service is active, the reintroduction of freight traffic would involve some potential for spills depending on the cargo being carried. Bridge construction, restoration, or replacement may involve the placement of bents within the waterway with potential for temporary water quality impacts, and temporary or permanent habitat impacts.

[1] Based on information provided by Chris Adkins, Virginia Department of Health (personal communication 3/27/01).
[2] Designated water-supply watershed boundaries were obtained for the North Carolina portion of the study area alternatives from the North Carolina Center for Geographic Information and Analysis.

Virginia

The following discussion presents a list of water basins located in Study Area Alternatives that may be impacted by the proposed SEHSR program:

Potomac-Shenandoah River Basin

Portions of all Study Area Alternatives are located in the Potomac River sub-basin. Two watersheds designated as nutrient enriched waters: the Belmont and Occoquan Bays watershed and the Aquia Creek watershed, to the north and south of Quantico, respectively, are located in the Study Area Alternative A. The estimated water-supply watershed for the raw water intake is located in the mainstem Occoquan River near Manassas, and is contained in all Study Area Alternatives.

York River Basin

One estimated water-supply watershed for the raw water intake (located in the mainstem North Anna River near Doswell) might be affected. This river basin is contained in all Study Area Alternatives.

James River Basin

The James River Basin and its the estimated water-supply watersheds for raw water intake (located in the mainstem James River near the western edge of the City of Richmond) are located in all Study Area Alternatives.

The estimated water-supply watersheds for raw water intake (located in the mainstem James River near Hopewell, and the mainstem Appomattox River, also near Hopewell) may also be affected in Study Area Alternatives D, E, F, G, H and J.

Chowan – Dismal Swamp River Basin

Through the Chowan River sub-basin two estimated water-supply watersheds for raw water intakes (located in the mainstem Meherrin River east of South Hill) are located in Study Area Alternatives A, B and C.

For Study Area Alternatives D, E, F, G, H and J, the estimated water-supply watershed for the intake located in mainstem Nottoway River north of Jarratt and the watershed for the intake located in the mainstem Meherrin River south of Emporia, may be affected.

Roanoke River Basin

The designated water-supply watersheds of the Kerr Reservoir-Lake Gaston complex along the Virginia-North Carolina state line, located in Study Area Alternatives A, B and C may be affected.

North Carolina

Roanoke River Basin

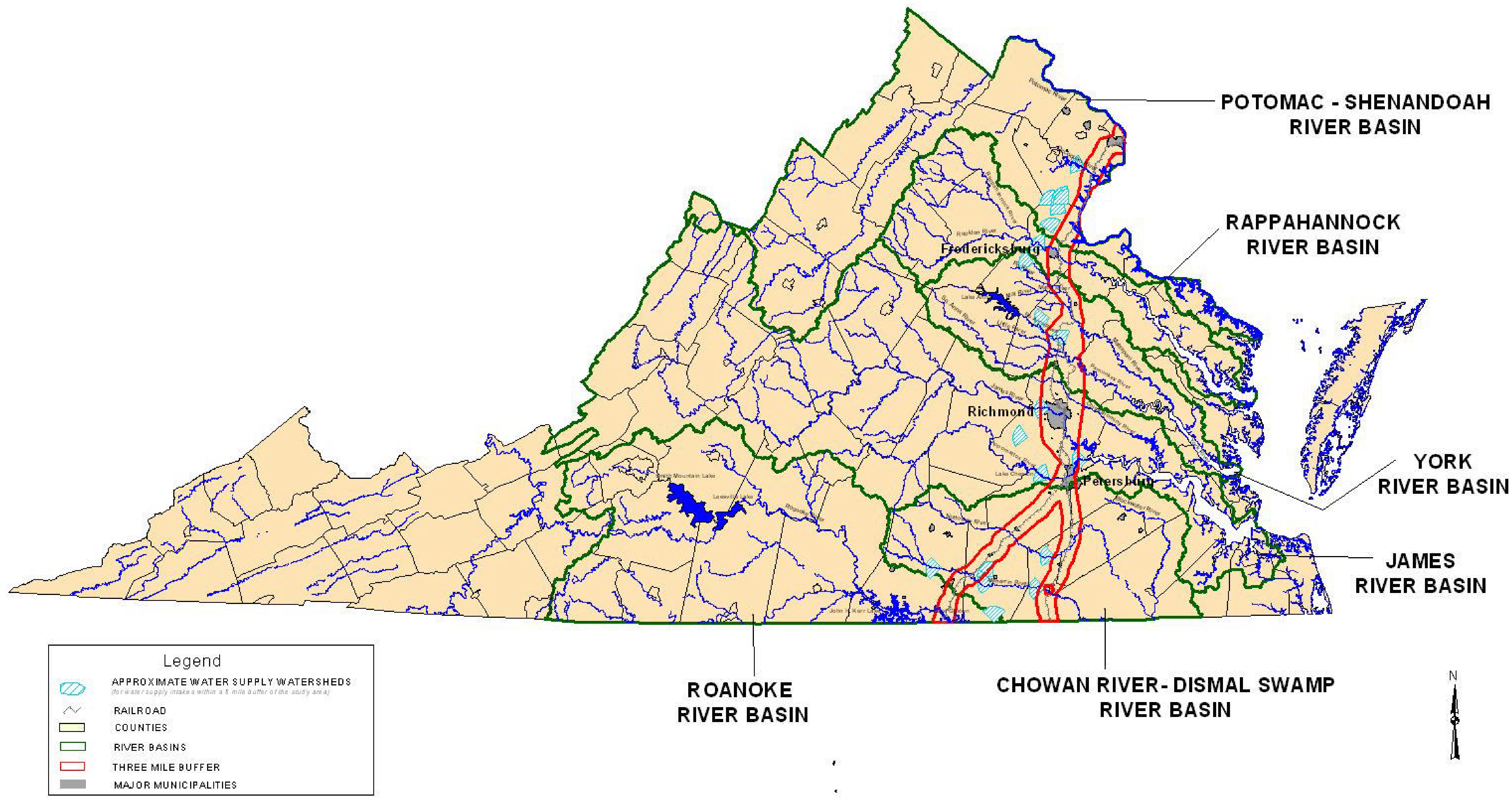
One designated water-supply watershed for the raw water intake located in the Anderson Creek arm of John H. Kerr Reservoir, located in Study Area Alternatives A, B, C, D, E, and F, may be affected. The water-supply watershed for the intake, located in Lake Gaston west of Roanoke Rapids., in Study Area Alternatives D, E, and F, may be affected.

Tar-Pamlico River Basin

The designated water-supply watersheds for raw water intake located at the mainstem Tar River north of Louisburg, and in New Franklinton Lake (Study Area Alternatives A, B, C, D, E and F) may be affected. The designated water-supply watersheds for raw water intake located at Fishing Creek near Enfield, the mainstem Tar River in Rocky Mount, and Tar River Reservoir (Study Area Alternatives G, H and J) may also be affected.

Figure 4.1

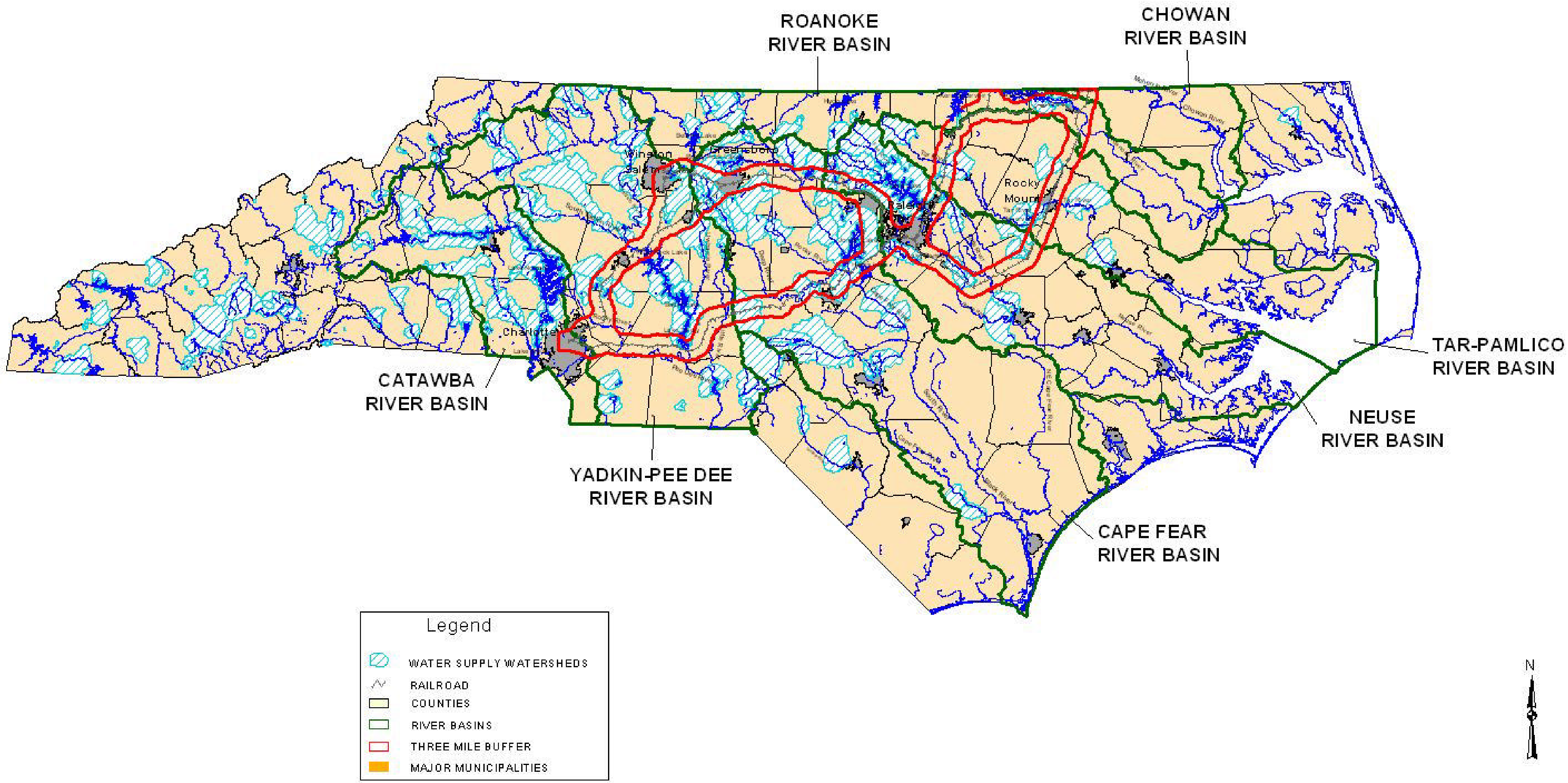
VIRGINIA SURFACE WATERS AND WATER SUPPLY WATERSHEDS WITHIN SEHSR STUDY AREAS



Source: North Carolina Department of Transportation GIS Department, North Carolina Center for Geographic Information and Analysis, 1999-2001

Figure 4.2

NORTH CAROLINA SURFACE WATERS AND WATER SUPPLY WATERSHEDS WITHIN SEHSR STUDY AREAS



Source: North Carolina Department of Transportation GIS Department, North Carolina Center for Geographic Information and Analysis, 1999-2001

Neuse River Basin

The designated water-supply watersheds for raw water intake located at the Wake Forest Reservoir, Austin Creek (near Wake Forest), Falls Lake, and the mainstem Little River east of Zebulon, (located in Study Area Alternatives A, B, C, D, E and F) may be affected. The designated water-supply watershed for raw water intake located in Lake Benson (all Study Area Alternatives), may also be affected. The designated water-supply watersheds for raw water intake located in the lower Eno River north of Durham and the upper Eno River just west of Hillsborough (Study Area Alternatives A, B, E, G, and H), may be affected. The water-supply watersheds for the intakes located at Toisnot Swamp north of Wilson and Contentnea Creek to the south of Wilson(Study Area Alternatives G, H and J) may be affected. The intakes located in the mainstem Neuse River northwest of Selma and north of Smithfield, and at Lake Benson (Study Area Alternatives G, H and J) may also be affected.

Cape Fear River Basin

The Cape Fear River Basin crosses the designated water-supply watersheds for raw water intake located at B. Everett Jordan Lake, Graham Lake, mainstream Haw River north of Burlington, Big Alamance Creek southwest of Burlington, Townsend Lake and Lake Brandt (Study Area Alternatives A, B, E, G, and H). The designated water-supply watershed for raw water intake located at Lake Brandt, Oak Hollow Lake, High Point Lake, the mainstem Deep River at Jamestown, and the mainstem Deep River at Randleman (Study Area Alternatives B, E, and H) may also be impacted. The water-supply watershed for intake located in the mainstem Cape Fear River near Buckhorn Dam (Study Area Alternative C, F, and J) may also be affected. The water-supply watersheds for intakes located in the mainstem Deep River at Cumnock and at Gulf (Study Area Alternatives C, F, and J) may be impacted. Finally, the water-supply watershed for intake located at Bear Creek near Robbins (Study Area Alternatives C, F, and J) may also be affected.

Yadkin River Basin

The designated water-supply watersheds for raw water intake located in the mainstem Uwharrie River west of Asheboro (Study Area Alternatives A, D, and G) may be affected. The designated water-supply watershed for raw water intake located at Salem Lake (Study Area Alternative B, E, and H) may also be impacted. The watersheds for intakes located in Thom-a-Lex Lake (the mainstem Yadkin River near US 64 west of Lexington), located in Study Area Alternatives B, E, and H may be impacted. The designated water-supply watershed for raw water intake located at Kannapolis Lake, Lake Fisher, and Lake Concord (Study Area Alternatives A, B, D, E, G, and H), may also be affected. Finally, the designated water-supply watersheds for raw water intakes located at Lake Tillery (Study Area Alternatives C, F, and J) may be impacted.

Conclusions

If any portion of a watershed was within the Study Area Alternative, it was counted as an impact for that alternative. When the impacts were totaled, Alternative C had the least potential impacts. This Study Area Alternative could impact 19 water supply watersheds. Study Area Alternative E potentially impacts the greatest number of water supply watersheds. Selection of this alternative could impact thirty-five water supply watersheds. Table 4.1 shows the potential impacts to water supply watersheds by each Study Area Alternative. Under the No Build Alternative, the existing and planned improvements in all modes will have impacts similar to the construction of high speed rail: temporary construction runoff impacts; potential placement of fill in waters or wetlands from new location construction; potential for increased pollutant runoff from vehicle operation; and, increased potential for spills. Construction of new bridges over surface waters may also result in the removal of stream bank vegetation, which may alter water temperature, and therefore, aquatic habitats.

Table 4.1 Summary of Water Supply Watersheds within the 6 Mile Wide Study Area Alternative	
Study Area Alternative	**Number of Water Supply Watersheds**
A	27
B	33
C	19
D	28
E	35
F	21
G	27
H	34
J	21

Source: AG&M, May 2001.

A total of thirty-three rivers were identified in the six-mile wide Study Area Alternatives. Most rivers crossed the Study Areas in a perpendicular manner and therefore could only potentially be crossed once. A noteworthy exception to this general rule regards the Deep River in North Carolina. This river runs parallel to and in the center of the Study Area Alternatives D, F and J for approximately 50 miles. Alternatives B and H have the least number of potential river crossings, with 28 each. Alternative F has the greatest number of potential river crossings with 33. Table 4.2 shows the potential impacts to rivers for each Study Area Alternative. Under the No Build Alternative, planned improvements that involve upgrading existing structures over rivers, or construction of new structures would have similar impacts to the construction of high speed rail.

Table 4.2
Potential Crossings of Major Rivers by Each Study Alternative

Study Area Alternatives	Major Rivers																																			Total Crossings
	Potomac River	Occoquan River	Rappahannock River	Po River	Matta River	Mattaponi River	North Anna River	Little River	South Anna River	Pamunkey River	Chickahominy River	James River	Appomattox River	Nottoway River	Meherrin River	Roanoke River as Lake Gaston	Roanoke River as Roanoke Rapids Lake	Roanoke River	John H. Kerr Reservoir	Tar River	Little River (Wake Co.)	Neuse River	Eno River	Haw River	East Fork Deep River	West Fork Deep River	Deep River	Uwharrie River	Yadkin River as High Rock Lake	Rocky River (Stanley Co.)	Cape Fear River	Rocky River (Chatham Co.)	Little River (Montgomery County)	West Fork Little River	Pee Dee River as Lake Tillery	
A	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x						**29**
B	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x			x	x	x	x	x	x	xx	x	x			x	x						**28**
C	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x	x			x	x	x	x		x			x			x	x	x	x	x	x	**29**
D	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x			x	x	x	x	x	x	x	x	x	xxx	x	x	x						**31**
E	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x	x	X	x	x	x	x	x	x	xx	x	x			x	x						**30**
F	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x	x	X	x	x	x	x	x		x			xxx			x	x	x	x	x	x	**33**
G	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x			x		x	x	xx	x	x	x	x	x	x	x	x						**29**
H	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x			x		x	x	xx	x	xx	x	x			x	x						**28**
J	x	x	x	x	x	x	x	x	x	x	x	xx	x	x	x			x		x	x	xx		x			xxx			x	x	x	x	x	x	**31**

NOTE: Number of "X"s represents number of crossings.

Source: Arcadis, Geraghty & Miller, May 2001.

4.1.2 Wetlands

Jurisdictional wetland delineations would be performed during Tier II investigations using the three-parameter approach as prescribed in the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). Supplementary technical literature describing the parameters of hydrophytic vegetation, hydric soils, and hydrology indicators would also be utilized. For this report, impacts to jurisdictional wetlands were estimated based on review of National Wetland Inventory (NWI) maps, county soil surveys, and hydric soils lists.

The NWI project was established to generate information about the characteristics, extent and status of the Nation's wetlands and deepwater habitats. NWI maps are generally used for planning purposes only. No field surveys to confirm the NWI wetland data were conducted for this Tier I environmental investigation. Actual wetland delineations would be conducted during Tier II environmental field investigations as appropriate.

Potential impacts to wetlands were estimated for a 300-foot study buffer surrounding the existing rail lines (600 feet total width) within the Study Area Alternatives. The reviewed buffer area is smaller than the total 6-mile width of the Study Areas in order to more accurately quantify the wetlands located nearest to the existing rail lines. Table 4-3 lists the estimated area of potential wetlands within the 600 foot buffer by Study Area Alternative.

Table 4.3
Summary Potential Wetland Impacts within 300 foot Proximity of the Existing Rail Lines

	Estimated Wetland Impacts (acres)
A	117.3
B	115.8
C	117.0
D	124.0
E	122.5
F	123.7
G	190.7
H	189.2
J	190.4

Source: AG&M, May 2001.

The actual wetland impacts determined during the future Tier II studies should be substantially less than the estimates shown because of the use of existing trackbed in many areas and a smaller actual construction footprint (200 foot versus the 600 foot buffer) Study Area Alternative B has the smallest area of identified wetlands within 300 feet of the existing rail lines at 115.8 acres. Study Area Alternative G has the greatest area of identified wetlands within 300 feet of the existing rail line at 190.7 acres. Under the No Build Alternative, the existing and planned improvements in all modes will have impacts similar to the construction of high speed rail: temporary construction runoff impacts; potential fill in wetlands from new location construction or construction within the existing right of way where no trackbed exists; potential for increased pollutant runoff from vehicle operation; and, increased potential for spills.

Permits

Impacts to “Waters of the United States” come under the jurisdiction of the US Army Corps of Engineers (USACE). Permits would be required for encroachment into wetland communities.

The requirements for the Section 404 permits would be determined through the Tier II environmental investigations. In addition, a Section 401 General Water Quality Certification (WQC # 2745) is also required for any activity which may result in a discharge into "Waters of the United States" or for which an issuance of a federal permit or license is required. The USACE cannot issue a Section 404 permit until a Section 401 certification is issued. In the Commonwealth of Virginia, a Virginia Water Protection Permit (Section 401 certification) can be obtained through the Department of Environmental Quality. In North Carolina, certifications are administered through the Department of Environment and Natural Resources (DENR), Division of Water Quality.

Final determination of permit applicability lies with the USACE. Coordination with the USACE to obtain the necessary permits would be completed during Tier II environmental reviews.

Mitigation

The USACE has adopted, through the Council on Environmental Quality (CEQ), a wetland mitigation policy which embraces the concepts of "no net loss of wetlands" and sequencing. The purpose of this policy is to restore and maintain the chemical, biological, and physical integrity of "Waters of the United States," specifically wetlands. Mitigation of wetland impacts has been defined by the CEQ to include: avoidance of impacts (to wetlands), minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts (40 CFR 1508.20). Each of these three aspects (avoidance, minimization, and compensatory mitigation) must be considered in sequential order.

<u>Avoidance</u> examines all appropriate and practicable possibilities of averting impacts to "Waters of the United States." According to a 1990 Memorandum of Agreement (MOA) between the USEPA and the USACE, "appropriate and practicable" measures to offset unavoidable impacts must be determined. Such measures should be appropriate to the scope and degree of those impacts and practicable in terms of cost, existing technology, and logistics in light of overall project purposes. Some unavoidable impacts to surface waters and wetlands would result from stream crossings.

<u>Minimization</u> includes the examination of appropriate and practicable steps to reduce adverse impacts to "Waters of the United States." Implementation of these steps will be required through project modifications and permit conditions. Minimization typically focuses on decreasing the footprint of the proposed project.

Minimization can be effectively employed along the proposed project. Examples of minimization include:

- strict enforcement of Best Management Practices (BMPs) to control sedimentation during project construction;
- minimizing clearing and grubbing activity;
- decreasing or eliminating discharges into streams;
- reduction of fill slopes at stream/wetland crossings;
- sensitive placement of drainage structures;
- use of spanning structures or bottomless culverts over streams;
- reestablishment of vegetation on exposed areas, with judicious pesticide and herbicide management;
- minimization of "in-stream" activity; and
- use of responsible litter control practices.

Compensatory mitigation is not normally considered until anticipated impacts to “Waters of the United States” have been avoided and minimized to the maximum extent possible. It is recognized that "no net loss of wetlands" functions and values may not be achieved in every permit action. Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts, which remain after all appropriate and practicable minimization has been achieved. Compensatory actions often include restoration, creation, and enhancement of “Waters of the United States,” specifically wetlands. Such actions should be undertaken in areas adjacent to or contiguous to the discharge site if practicable.

4.1.3 Floodplains and Floodways

Executive Order 11988, *Floodplains Management* , prohibits floodplain encroachments which are uneconomic, hazardous, or result in incompatible uses of the floodplain; as well as any action which would cause a critical interruption of an emergency transportation facility, a substantial flood risk, or adverse impact on the floodplain’s natural resource values. The impacts of encroachment on the 100-year floodplain as defined by the Federal Emergency Management Agency (FEMA) were assessed for each Study Area. In the Study Area Alternatives where the existing rail line is located within FEMA mapped 100-year floodplains there would be unavoidable encroachment.

Construction along existing track bed would not likely impact the floodplain. Construction either in or out of the existing right of way where no track bed exists has potential for new fill in floodplains. This new fill will have to be designed in order not to increase the base year flood elevations above acceptable standards.

The No Build Alternative could have potential right-of-way acquisition as discussed in Chapter 2. Construction associated with the existing and planned improvements under the No Build Alternative would have similar impacts from fill in floodplains.

Table 4.4 exhibits the number of FEMA floodplain crossings per Study Area Alternative. The number of floodplain crossings range from 44 in Study Area Alternative C to 97 in Study Area Alternative G. Appendix B also contains a table that exhibits the number of floodplain crossings per study segment. Reviewing the impacts per segment allows for determination of specific areas of potential impact.

Mitigation includes designing the proposed floodplain crossing to minimize or eliminate an increase in the base flood elevation. Mitigation measures include right angle crossings and typical section reductions

Table 4.4 FEMA Mapped 100-Year Floodplain Crossings per Study Area Alternative	
	100-Year Floodplain Crossings
A	83
B	76
C	44
D	89
E	82
F	50
G	97
H	90
J	58

Source: ARCADIS Geraghty & Miller; 2000.

4.1.4 Water Quality

The primary sources of water quality degradation in rural areas are agriculture and construction. Construction of the proposed SEHSR project will remove the vegetative cover and disturb the soil in some locations where new construction off the existing rail right-of-way would be undertaken. This may cause water quality degradation from runoff and sedimentation. Also, any increase in impervious areas would introduce other elements of degradation to water resources. These elements include hydrocarbons, toxic substances, debris, and other pollutants. It is unlikely that construction of the proposed project would increase impervious surface. The exception would be off right of way areas such as parking lots and other support facilities such as stations and yard and shop facilities.

Potential impacts to water resources include: additional substrate destabilization, bank erosion, increased turbidity, altered flow rates, and possible temperature fluctuations within the stream channel caused by the removal of streamside vegetation. Precautions should be taken to minimize impacts to water resources in the Study Area Alternatives. Quick revegetation of these areas helps to reduce the impacts by supporting the underlying soils. Appropriate measures must be taken to avoid spillage and control runoff. Such measures should include an erosion and sedimentation control plan, provisions for waste materials and storage, stormwater management measures, and appropriate maintenance measures. In Virginia, a Memorandum of Agreement (MOA) between the Virginia Department of Transportation (VDOT) and the Virginia Department of Conservation and Recreation (VDCR) covers erosion and sediment control requirements for linear transportation projects, such as the SEHSR program. The guidelines as outlined in this MOA should be strictly enforced during the construction stages of the project. In North Carolina, NCDOT's *Best Management Practices for Protection of Surface Waters* and Sedimentation Control guidelines should be strictly enforced during the construction stages of the project.

Aquatic communities are acutely sensitive to changes in their environment and environmental impacts from construction activities may result in long-term or irreversible effects. Spanning structures or bottomless culverts at stream crossings should be used where practical to maintain fish and aquatic animal passages and minimize impacts. Impacts usually associated with in-stream construction include increased channelization and scouring of the streambed. In-stream construction alters the substrate and impacts adjacent streamside vegetation. Such disturbances within the substrate lead to increased siltation, which can clog the gills and/or feeding mechanisms of benthic organisms, fish, and amphibian species. Siltation may also cover benthos with excessive amounts of sediments that inhibit their ability to obtain oxygen.

These organisms are slow to recover and usually do not, once the stream has been severely impacted. Increasing water temperatures due to the removal of streamside vegetation is also detrimental to aquatic communities. Warmer water contains less oxygen, thus reducing aquatic life that depends on high oxygen concentrations. Quick revegetation of stream banks, with both herbaceous and woody vegetation, helps to reduce the impacts by supporting the underlying soils and providing a shade cover.

Since the proposed project is in the planning process and designs have not been prepared, the need for stream relocations is unknown at this time and would be studied in detail in Tier II analyses as appropriate. Should such actions be needed, coordination with the USFWS and the Virginia Department of Game and Inland Fisheries (VDGIF) or North Carolina Wildlife Resources Commission (NCWRC), in accordance with the Fish and Wildlife Coordination Act (72 Stat.563, as amended; 16 USC 661 et seq.[1976]), would be initiated.

4.1.5 Topography, Geology and Soils

Topography of the Study Area Alternatives was researched for both Virginia and North Carolina and presented on a macro level. Geology of the Study Area Atlernatives is described based upon the rock formations found within the areas and is presented on a macro scale. Soils data was researched and presented at the county level for the counties contained in the Study Area Alternatives.

Topography

Topography in the project Study Area Alternatives traverses two physiographic regions, the Appalachian Piedmont and Gulf-Atlantic Coastal Plain. Slopes of the Appalachian Piedmont are gently rolling to moderately steep, while slopes of the Gulf-Atlantic Coastal Plain are flat to gently rolling. Topography may buffer rail traffic noise and vibration, visually screen rail traffic from surrounding residential areas and help to filter pollution impacts.

Geology

Geology of the Study Area Alternatives consists primarily of a variety of metamorphic and igneous rocks, with discrete zones of sedimentary rocks. Currently there are no active fault zones in the region; however, the Study Area Alternatives are subject to some infrequent, low intensity seismic activity.

Soils

Overall, the majority of Study Area Alternatives' soils have low shrink-swell potential, and are well suited for rail transportation. There are some soils in the Piedmont region that tend to have a higher shrink-swell potential and might create long-term effects on track alignments. Some major Study Area Alternatives' soils such as Cecil, Pacolet and Appling are susceptible to erosion hazard when vegetation or other ground cover is disturbed.

No Build Alternative

Impacts to topography, geology or soils from the No Build Alternative would be similar to those of the Build Alternatives mentioned below. Vertical alignment (or grade) improvements are expected to have minimal effects.

Build Alternatives

Impacts caused by implementation of the proposed SEHSR program would depend on the type of proposed construction and existing conditions at specific locations within the Study Area Alternatives and cannot be specifically determined at this time. Potential impacts from the Build Alternatives would include possible destabilization of slopes due to cut and fill associated with construction and long term maintenance activities. It is also possible that construction on new locations could expose rock types that may affect water quality through runoff to adjacent water ways.

Based on existing railroad right-of-way, the greatest potential impacts could result from Study Area Alternatives A, B, C, D, E, and F. These potential impacts would be directly related to re-establishing track on the S-line and the SA-line. Impacts are also possible in Study Area Alternatives where new right-of-way may be required.

4.1.6 Mineral Resources

The Commonwealth of Virginia boasts over 400 different minerals within its borders. More than 30 different mineral resources are produced in Virginia, at a combined annual value of nearly $2 billion. Virginia is the nation's ninth largest producer of coal, ranks sixth in the production of crushed stone and has experienced a dramatic increase in the production of natural gas. Gold, copper, arsenic, manganese, iron, and many other minerals have all been mined in Virginia. Sand, clay, limestone, granite, slate, mineral sands, vermiculite, and kyanite are examples of minerals currently mined in Virginia.

North Carolina has important deposits of many minerals and annually leads the nation in the production of feldspar, lithium minerals, scrap mica, olivine and pyrophyllite. North Carolina ranks second in phosphate rock production, but does not produce significant quantities of metallic minerals or fossil fuels. Consumer products that come from North Carolina's geologic resources include brick, dimension and building stone, gemstones, gold, crushed stone (aggregate), kaolin clay, olivine, quartz and feldspar, peat, phosphate, silica sand and quartz, spodumene, talc and pyrophyllite.

Impacts to mines and quarries are an important consideration in the development of any major transportation improvement project. Affecting such sites can dramatically increase the overall complexity and cost of a project. Therefore, it is important to know early in the environmental analysis process where potential conflicts with these sites may occur, so that proper planning can be conducted to avoid and minimize impacts to these locations. Potentially a transportation project may divide or otherwise acquire land from a mining operation, and make valuable resources inaccessible. In the case of high speed rail, new rail access may be made available to mines for transport of their products having a positive impact. The No Build Alternative could have the same potential negative impacts, but without the potential benefit of rail access. Potential mitigation measures could include avoidance of existing quarries where possible.

The US Geological Survey Mineral Database, Year 2000, data layer was mapped to present a comprehensive summation of abandoned mines that exist within the Study Area Alternatives. However, mines within a buffer study area of 1500 feet (for a total width of 0.5-mile) to the existing rail lines , are much more likely to be directly affected by any necessary improvements.

A total of 55 mines were identified within 1500 feet of each side of the rail line for a total width of 0.5-miles. Table 4.5 summarizes the number of abandoned mines within the reduced buffer by Study Area Alternative. Table 4.6 summarizes the number of historic mines in Virginia counties within the reduced buffer, while Table 4.7 summarizes the number of abandoned mines in North Carolina counties. Data gathered for these tables correlates the size of the study buffer within the county to the number of historic mines.

Based on the number of abandoned mines identified within the 0.5-mile buffer for each Study Area Alternative, Study Area Alternative G has the lowest impact potential. Study Area Alternative F has the highest potential abandoned mine impacts. The number of abandoned mines per Study Area Alternatives ranged from 33 to 41. In Virginia, Caroline County and Dinwiddie County have the greater number of abandoned mines. In North Carolina, Mecklenburg County, Moore County, Wake County, and Stanley County have the greater number of abandoned mines.

Table 4.5
Summary of Abandoned Mines within a 0.5-Mile Proximity of the Existing Rail Lines

Study Area	Number of Abandoned Mines
A	36
B	37
C	40
D	37
E	38
F	41
G	33
H	34
J	37

Source: U.S. Geological Survey Digital Data Series DDS -52; 2000.

Table 4.6
Summary of Abandoned Mines By County in Virginia Within a 0.5-Mile Proximity of the Existing Rail Lines

	Number of Abandoned Mines
Arlington	0
Brunswick	1
Caroline	8
City of Richmond	1
Chesterfield	0
Dinwiddie	0
Fairfax	7
Greensville	0
Hanover	0
Henrico	0
Lunenburg	0
Mecklenburg	0
Prince George	0
Prince William	1
Spotsylvania	3
Stafford	2
Sussex	0
TOTAL	**23**

Source: U.S. Geological Survey Digita l Data Series DDS -52; 2000

Table 4.7 Summary of Abandoned Mines By County in North Carolina Within a 0.5-Mile Proximity of the Existing Rail Lines	
County	**Number of Abandoned Mines**
Alamance	0
Anson	0
Cabarrus	1
Chatham	2
Davidson	1
Durham	1
Edgecombe	0
Franklin	0
Forsythe	1
Guilford	2
Halifax	2
Johnston	0
Lee	2
Mecklenburg	5
Montgomery	2
Moore	4
Nash	0
North Hampton	0
Orange	0
Rowan	2
Stanly	3
Vance	1
Wake	3
TOTAL	**32**

Source: U.S. Geological Survey Digital Data Series DDS -52; 2000

Tables 4.8 and 4.9 provide specific information for Virginia and North Carolina regarding each mine within the 0.5-mile study buffer, including the USGS ID Number, its location by county, and the mined commodity. Table 4.8 identifies 23 abandoned mines within the 0.5-mile study buffer in Brunswick, Caroline, Fairfax, Prince William, Spotsylvania, and Stafford Counties, and the City of Richmond in Virginia. The most common commodities in Virginia include granite, clay, sand and gravel, and dimension stone. Table 4.9 identifies 32 abandoned mines located within the 0.5-mile study buffer in Cabarrus, Chatham, Davidson, Durham, Forsyth, Guilford, Halifax, Lee, Mecklenburg, Montgomery, Moore, Rowan, Stanly, Vance and Wake Counties in North Carolina. The most common commodities in North Carolina abandoned mines include sand and gravel, clay, crushed stone, granite, iron and titanium, gold, molybdenum, copper, silver, and quartz.

Table 4.8 Summary of Abandoned Mines in Virginia Within a 0.5-Mile Proximity of the Existing Rail Lines		
Virginia		
75892	Brunswick	Granite
66343	Caroline	Clay
66560	Caroline	Sand and Gravel
66562	Caroline	Sand and Gravel
66563	Caroline	Sand and Gravel
66564	Caroline	Sand and Gravel
66566	Caroline	Sand and Gravel
66573	Caroline	Sand and Gravel
75903	Caroline	Sand and Gravel
75915	City of Richmond	Sand and Gravel
66326	Fairfax	Clay
66723	Fairfax	Sand and Gravel
66726	Fairfax	Sand and Gravel
66737	Fairfax	Sand and Gravel
66740	Fairfax	Sand and Gravel
66741	Fairfax	Sand and Gravel
66744	Fairfax	Sand and Gravel
66335	Prince William	Clay
66779	Spotsylvania	Sand and Gravel
66780	Spotsylvania	Sand and Gravel
66781	Spotsylvania	Sand and Gravel
66306	Stafford	Dimension Stone
66683	Stafford	Sand and Gravel

Source: U.S. Geological Survey Digital Data Series DDS -52; 200

Table 4.9 Summary of Abandoned Mines in North Carolina Within a 0.5-Mile Proximity of the Existing Rail Lines		
North Carolina		
USGS ID No.		
73971	Cabarrus	Sand and Gravel
74001	Chatham	Clay
74008	Chatham	Clay
81425	Davidson	Crushed Stone
74065	Durham	Clay
74083	Forsyth	Granite
74116	Guilford	Sand and Gravel
85959	Guilford	Iron and Titanium
74122	Halifax	Clay
85968	Halifax	Iron
74167	Lee	Clay
74168	Lee	Clay
79977	Mecklenburg	Gold
79988	Mecklenburg	Gold
79994	Mecklenburg	Gold
79995	Mecklenburg	Gold

Table 4.9 Summary of Abandoned Mines in North Carolina Within a 0.5-Mile Proximity of the Existing Rail Lines		
North Carolina		
USGS ID No.		
79996	Mecklenburg	Gold
26511	Montgomery	Gold, Copper, Molybdenum
81386	Montgomery	Clay
60213	Moore	Gold, Silver, Copper
60217	Moore	Gold
60248	Moore	Gold
85870	Moore	Gold, Silver
81392	Rowan	Clay
81418	Rowan	Clay
66863	Stanly	Clay
74312	Stanly	Clay
81309	Stanly	Quartz
74326	Vance	Granite
74327	Wake	Granite
74330	Wake	Sand and Gravel
74334	Wake	Granite

Source: U.S. Geological Survey Digital Data Series DDS -52; 2000

4.1.7 Hazardous Materials Sites

A search of appropriate State and Federal agency file records was conducted to identify possible hazardous material and waste sites within the Study Area Alternatives. Tables 4.10 and 4.11 illustrate the number of hazardous substance sites per Study Area Alternative. An assessment of the potential for the proposed SEHSR program to impact any of these sites was made based on reported contamination or regulatory activity and the distance of each site to the existing rail corridors. No field verifications were performed as part of the Tier 1 EIS. The assessment findings are preliminary and are not intended to supplant more detailed studies of subsurface soils and groundwater, if warranted. In addition to the sites identified through the file search, other potential hazardous materials and waste sites may exist within the Study Area Alternatives due to illegal dumping, lack of compliance with regulatory reporting practices, and limited regulatory data. The Build Alternatives would encounter increased complexity and cost associated with impacts to a hazardous material site, however this may result in the clean up of the encountered site, a positive environmental impact. The No Build Alternative would result in similar types of impacts associated with the existing and planned improvements described in Chapter 2, as well as associated right-of-way acquisition.

Table 4.10 illustrates the number of hazardous substance sites per Study Area Alternative based on the 6-mile study buffer. Hazardous substance sites within the Study Area Alternatives ranged from 1,426 sites identified to 1,780 sites identified per Study Area Alternative. Study Area Alternative H had the highest number of hazardous substance sites, followed by Study Area Alternatives G and E. Study Area Alternative C had the smallest number of hazardous substance sites within the 6-mile buffer.

Appendix B also presents a table of hazardous substance sites within each study segment within 1500 feet of each side of the rail line (for a total width of 0.5-mile). Reviewing the number of hazardous substance sites per segment identifies the cities and towns with the highest concentrations of documented impacts from those sites. Table 4.11 lists hazardous substance sites identified within 0.5-miles of the rail corridor. Forty-one hazardous substance sites were identified within the Greensboro, North Carolina area, followed by 21 hazardous substance sites identified in the Raleigh, North Carolina area. Fourteen hazardous substance sites were identified in the Winston-Salem, North Carolina area, and 16 hazardous substance sites were identified in the Richmond, Virginia vicinity.

During subsequent Tier II environmental studies, and the preliminary design phase, additional investigations would be considered for any sites, which could potentially impact the project's right-of-way. The scope of any investigation, if required, would be determined prior to completion of the Tier II documentation. In addition, site conditions would be thoroughly assessed during the right-of-way acquisition phase of the project to insure that no hazardous wastes or materials are encountered.

Table 4.10
Hazardous Substance Sites within each Study Area Alternative (6-Mile Buffer)

Study Area Alternative	Hazardous Substance Sites
A	1,708
B	1,728
C	1,426
D	1,720
E	1,740
F	1,448
G	1,760
H	1,780
J	1,488

Source: EDR, Center for Geographic Information Analysis; 1999

Table 4.11
Explanation of Hazardous Material Sites in Cities and Towns Within Study Area Alternatives (0.5-Mile Buffer)

NORTH CAROLINA

CITY	COUNTY	NAME	EPA_ID	DESCRIPTION OF SITE
Roanoke Rapids	Halifax	Rosemary Finishing Plant	27870DLTFNWE	RCRIS-SQG,FINDS,TRIS
Roanoke Rapids	Halifax	Patch Rubber Co	NC0962982	RCRIS-SQG,FINDS,TRIS
Middleburg	Vance	Georgia-Pacific C M Tucker Lumb	NCD982168460	RCRIS-SQG,FINDS,TRIS
Henderson	Vance	Idaho Timber Corp Of Nc Inc	NCD981863277	RCRIS-SQG,FINDS,TRIS,UST
Henderson	Vance	Perry Builders Mobile	NC0963021	RCRIS-SQG,FINDS,TRIS
Henderson	Vance	Kennametal Inc	NC0779010	RCRIS-SQG,FINDS,TRIS,UST
Enfield	Halifax	Ga-Pacific Corp Hdwd Saw	NCD000773507	CERCLIS
Kernersville	Forsyth	Carolawn Co	NCD980729479	CERCLIS-NFRAP,SHWS
Kernersville	Forsyth	South-East Lumber Co.	NCD981926835	TRIS
Kernersville	Forsyth	Varco-Pruden Buildings	NCD981926835	SHWS,UST
Kernersville	Forsyth	Varco-Pruden Buildings	NCD053485991	LUST,RCRIS-SQG,FINDS,TRIS
Kernersville	Forsyth	Roadway Express Inc	NCD046362117	RCRIS-SQG,FINDS,RCRIS-TSD,U
Kernersville	Forsyth	Kernersville Rubber Dump	403002	CERCLIS,FINDS
Kernersville	Forsyth	Hooker Furniture Corporation	NC0021224	SHWS,LUST,UST,FINDS,R-LQG,T
Kernersville	Forsyth	Highland Industries Inc	NC0021223	FINDS,R-LQG,TRIS,R-TSD,CERC
Glen Raven	Alamance	Glen Raven Mills	NA	SHWS,LUST,UST
Burlington	Alamance	Glen Raven Mills Inc.	NA	TRIS
Winston Salem	Forsyth	Pepsi-Cola	27101PPSCL34	UST,R-SQG,FINDS,TRIS,LUST,I
Winston Salem	Forsyth	Brown & Williamson Tobacco Corp	NCD003227220	RCRIS-SQG,FINDS,TRIS
Winston Salem	Forsyth	Rj Reynolds Tabacco Co-Bldg 23	27102RJRYNPA	RCRIS-SQG,FINDS,TRIS
Winston-Salem	Forsyth	Reynolds Rj Tobacco Company	27102RJRYNPA	SHWS
Greensboro	Guilford	Kay Chemical Co.	NA	TRIS
Mebane	Alamance	White Furniture Co.	NA	SHWS
Winston-Salem	Forsyth	Taracorp Imaco Inc.	NA	TRIS
Winston Salem	Forsyth	Flakt Products	NCD000202549	SHWS
Burlington	Alamance	Burlington Ind. Inc.	NCD981024086	TRIS
Greensboro	Guilford	Sed, Inc. Radar Road	NCD981024086	SHWS
Greensboro	Guilford	American Petrofina Mktg	NCD981024086	SHWS
Burlington	Alamance	Burlington House Finishing	NCD982108508	RCRIS-SQG,FINDS,TRIS
Graham	Alamance	Apollo Chemical Corp.	NCD042423087	UST,TRIS
Greensboro	Guilford	Piedmont Marble Inc.	NA	TRIS
Greensboro	Guilford	Union Oil Co. Se Term	NA	SHWS
Greensboro	Guilford	Amp Inc.	NCD150076123	TRIS
Greensboro	Guilford	Union Oil Co Se Term	NC0026247	UST,CERCLIS,R-SQG,FINDS
Mebane	Alamance	General Electric Co	NC0963017	CERCLIS,FINDS,R-LQG,TRIS
Greenboro	Guilford	Lorillard Tobacco Co	NC0021401	FINDS,R-LQG,TRIS,LUST,UST
Greensboro	Guilford	Chemical Leaman Tank Lines, Inc	NC0021401	SHWS
Winston Salem	Forsyth	Rjr Archer Inc	NCD044514602	LUST,FINDS,R-LQG,TRIS,CERC-
Greensboro	Guilford	Sherwin Williams Co	NC0778517	FINDS,R-LQG,TRIS,RAATS,CERC
Greensboro	Guilford	Procter & Gamble Mfg	NCD003237963	FINDS,R-LQG,TRIS,LUST
Greensboro	Guilford	Star Enterprise	NCD096165121	CERCLIS,FINDS,R-LQG
Greensboro	Guilford	Sherwin Williams Company	NC0778517	SHWS
Greensboro	Guilford	Axton-Cross Company/Van Water	NCD096165121	SHWS
Greensboro	Guilford	Axton-Cross Co	000550NC 001	R-SQG,FINDS,R-TSD,CERC-NFRA
Greensboro	Guilford	Zimmerman And Associates	000550NC 001	SHWS
Greensboro	Guilford	Duke Power/Greensboro Gas Plant	403091	SHWS
Greensboro	Guilford	Marathon Ashland Petroleum Llc	NC0021404	SHWS,R-SQG,FINDS,CERC-NFRAP

Table 4.11 Explanation of Hazardous Material Sites in Cities and Towns Within Study Area Alternatives (0.5-Mile Buffer)				
NORTH CAROLINA				
CITY	COUNTY	NAME	EPA_ID	DESCRIPTION OF SITE
Greensboro	Guilford	Jefferson-Pilot Property	403091	SHWS
Greensboro	Guilford	Carolina Tank Cleaning Co	403075	CERCLIS,FINDS
Greensboro	Guilford	Guilford Mills Inc.	NCD107898223	TRIS
Greensboro	Guilford	Guilford Mills Inc	NC0021490	RCRIS-SQG,FINDS,TRIS
Greensboro	Guilford	Air Products And Chemicals, Inc	NC0021490	SHWS
Greensboro	Guilford	Organic Pigments Corp.	NA	TRIS
Greensboro	Guilford	North State Pyrophyllite Co.	NCD003229911	TRIS
Greensboro	Guilford	Worth Chemical	NCD003471158	SHWS,FIND,R-LQG,R-TSD,COR,C
Greensboro	Guilford	Moreland Mckesson Company	NCD003471158	SHWS
Winston Salem	Forsyth	Sun Chem Corporation/Gpi Div	NCD003471158	SHWS
Greensboro	Guilford	Harvin Reaction Technology Inc	NC0084778	UST,LU,IMD,R-SQG,FINDS,TRIS
Greensboro	Guilford	The Sherwin Williams Company	NC0778458	FINDS,R-LQG,TRIS,CERC-NFRAP
Greensboro	Guilford	Valspar Hilemn Labs.	NCD003218898	TRIS
Greensboro	Guilford	North State Chems Inc	NCD991278839	SHWS,CERC-NFRAP
Greensboro	Guilford	Morflex Inc.	NCD071512036	TRIS,TSCA
Greensboro	Guilford	Morflex Chemical Co. Inc/Pfieze	NCD071512036	SHWS
Greensboro	Guilford	Moreland Mckesson Co	NCD089903983	R-SQG,FINDS,CORRACTS,CERC-N
Winston Salem	Forsyth	Douglas Battery Manufacturing	NCD089903983	SHWS
Winston Salem	Forsyth	Douglas Battery Mfg Co	MO0114952	FINDS,R-LQG,TRIS,TSCA,CER-N
Greensboro	Guilford	Ecoflo, Inc.	NC0970708	PA,FIN,R-LQG,TRIS,R-TSD,COR
Greensboro	Guilford	Ashland Chemical Co	NCD024599011	SHW,IMD,FIN,R-LQG,R-TSD,C-N
Greensboro	Guilford	Chemical And Solvents, Inc.	NCD024599011	SHWS
Greensboro	Guilford	Dow Corning Corp	NC0970642	FINDS,R-LQG,TRIS,C-NFRA,UST
Winston-Salem	Forsyth	Western Elec Co Inc Lex Rd Plt	27102TTNTW33	LUST,FI,R-LQG,R-TSD,CORR,C-
Greensboro	Guilford	Tru Cast Inc	NC0970583	RCRIS-SQG,FINDS,TRIS,UST,LU
Winston Salem	Forsyth	Southern Tool Mfg Co., Inc	27107STHRN53	RCRIS-SQG,FINDS,TRIS
Winston Salem	Forsyth	American National Can Co	27107STRHC40	FINDS,RCRIS-LQG,TRIS
Winston-Salem	Forsyth	Corn Prods.	NA	TRIS
Durham	Durham	Liggett Group Inc Smith Strg	NCD097724009	CERCLIS,R-SQG,FINDS
Durham	Durham	Liggett Group Inc New Cig Fact	NCD982089351	RCRIS-SQG,FINDS,TRIS
Durham	Durham	Liggett And Myers Company	NCD982089351	SHWS
Greensboro	Guilford	Omnova Solutions Greensboro Fac	NCD096158696	US,FI,R-LQG,TRI,TSCA,C-NFRA
Greensboro	Guilford	Burlington Industries, Inc.	NCD096158696	SHWS
Jamestown	Guilford	Monarch Furniture Corporation	405671	SHWS
Durham	Durham	Daugherty Chemical Company	405671	SHWS
Durham	Durham	Carochem	NCD991278714	R-SQG,FINDS,RAATS,C-NFRAP,S
Durham	Durham	Pifer Industries, Inc.	NCD991278714	SHWS
Durham	Durham	Amore/Worth Chemical	NCD991278714	SHWS
Rocky Mount	Nash	Pepsi Cola Bottling Co.	NA	TRIS
Rocky Mount	Nash	Siecor Corp Rocky Mount Plant	27804SCRCR21	RCRIS-SQG,FINDS,TRIS
High Point	Guilford	Prochem Chemicals Inc.	NCD986190213	TRIS
High Point	Guilford	Valspar Coatings	I04#19960403	UST,FINDS,TRR-LQG,TRIS,C-NF
High Point	Guilford	Haworth Wood Seating	NCD003235298	LUST,TRIS
High Point	Guilford	Lilly Industries Inc	NCD003232030	FINDS,R-LQG,TRIS,C-NFRAP
High Point	Guilford	Thomas Built Buses Inc	27260THMSB14	FINDS,R-LQG,TRIS,UST
High Point	Guilford	Snyder Paper Corp.	27260SNYDR11	TRIS
High Point	Guilford	Borden Packing & Industrial Pro	27261BRDNN17	R-SQG,FI,TRIS,TSCA,C-NFRAP,

Table 4.11 Explanation of Hazardous Material Sites in Cities and Towns Within Study Area Alternatives (0.5-Mile Buffer)				
NORTH CAROLINA				
CITY	COUNTY	NAME	EPA_ID	DESCRIPTION OF SITE
High Point	Guilford	Piedmont Chemical Industries	048937NC 001	FINDS,R-LQG,TRIS,TSCA
Rtp	Durham	Scm Metal Products Inc	405234	CERCLIS,R-SQG,FINDS, TRIS
Durham	Durham	Burnham Service Corp.	405234	SHWS
Rtp	Durham	National Inst Envr Hlth Sci	NC0962952	UST,FI,R-LQG,R-TSD,RAATS,CO
High Point	Guilford	High Point Chemical Corp	NC0769513	IMD,FINDS,R-LQG,TRIS,TSCA
Rocky Mount	Edgecombe	Schlage Lock Co	NC0022053	IMD,R-LQG,R-TSD,CORR,C-NFRA
Rtp	Durha	Research Triangle Institute	NCD004868105	FINDS,R-LQG,R-TSD,LUST
Raleigh	Wake	Mallinckrodt Scc Raleigh Plt	I04#19880127	FINDS,R-LQG,TRIS.R-TSD,CORR
Thomasville	Davidson	Thomasville Furniture Ind Plt D	NC0081627	FINDS,RCRIS-LQG,TRIS
Thomasville	Davidson	Thomasville Furniture Ind Plt	NCD003219615	FINDS,RCRIS-LQG,TRIS
Raleigh	Wake	Rowland Landfill	NCD003219615	SHWS,SWF/LF
Raleigh	Wake	Greshams Lake Industrial Park	NCD003233756	SHWS
Thomasville	Davidson	Thomasville Furniture Inds Plan	NC0081621	FINDS,RCRIS-LQG,TRIS
Thomasville	Davidson	Triple Plating	406612	CERCLIS,FINDS
Thomasville	Davidson	Triple Plating, Inc	406612	SHWS
Thomasville	Davidson	Thomasville Furniture Ind Plt A	NC0081617	FINDS,RCRIS-LQG,TRIS
Raleigh	Wake	Accudyne, Inc	NC0963823	FINDS,RCRIS-LQG,TRIS
Lexington	Davidson	Cardinal Container Services	NC0963823	SHWS
Raleigh	Wake	Corning Glass Works	NC0963823	SHWS
Raleigh	Wake	Corning Glass Works	NC0963778	FINDS,R-LQG,TRIS,TSCA,C-NFR
Lexington	Davidson	Stanley Furniture Co	NC0081596	CERCLIS,FINDS,R-LQG,TRIS
Lexington	Davidson	Battery Tech (Duracell-Lexingto	NCD000648402	CERCLIS,FI,R-LQG,TRIS,IMD,U
Lexington	Davidson	Lexington Furn Ind Plant No 1	NC0081604	FINDS,R-LQG,TRIS,LUST
Lexington	Davidson	Burlington Furniture/Cent Main	NC0081604	SHWS
Lexington	Davidson	Burlington Furniture/Cent Maint	NC0021051	R-SQG,FINDS,R-TSD,CORR,C-NF
Lexington	Davidson	Kurz Transfer Products	NCD116001280	FINDS,RCRIS-LQG,TRIS
Raleigh	Wake	Itt Telecoms Corp/Alcatel	NCD116001280	SHWS
Raleigh	Wake	Itt Telecoms Corp	NC0086126	IMD,US,FI,R-LQG,R-TSD,COR,C
Raleigh	Wake	Pepsi-Cola Bottling Co.	NCD982124307	UST,TRIS
Lexington	Davidson	Ti Industries	27293TNDSTPO	FINDS,RCRIS-LQG,TRIS
Lexington	Davidson	Byerly Drum	406613	CERCLIS,FINDS
Raleigh	Wake	Surtronics	NC0904148	FINDS,RCRIS-LQG,TRIS
Cary	Wake	Old State Lab	NC0904148	SHWS
Raleigh	Wake	Usa Reserve Xviii Airborne Corp	NC-210020732	CERCLIS,R-SQG,FINDS
Raleigh	Wake	Raleigh Coal Gas Plant No. 1	NC0912752	SHWS
Raleigh	Wake	Raleigh Coal Gas Plant No. 2	405664	CERCLIS,FINDS
Raleigh	Wake	Raleigh Coal Gas Plant No. 1	405665	CERCLIS,FINDS
Raleigh	Wake	Greshams Lake Industrial Park	406117	CERCLIS,FINDS,SHWS
Raleigh	Wake	Rowland Ldfl	NCD065300113	SHWS,CERC-NFRAP
Raleigh	Wake	East Carolina Metal Treating In	27603STCRL10	R-SQG,FINDS,TRIS,SHWS
Lexington	Davidson	Lexington Furniture Ind. Plnt #	27603STCRL10	SHWS
Raleigh	Wake	Ashland Chemical Company	27603STCRL10	SHWS
Raleigh	Wake	Cargill Inc.	NA	LUST,TRIS,UST
Raleigh	Wake	Ashland Chemical Co Raleigh	NCD088560032	FINDS,R-LQG,R-TSD,SHWS
Raleigh	Wake	International Paper	I04#19950830	FINDS,R-LQG,C-NFRAP,SHWS
Wilson	Wilson	Carolina Classic Mfg Inc	27894LJRPL51	RCRIS-SQG,FINDS,TRIS
Wilson	Wilson	Mellobuttercup Ice Cream Co.	NA	TRIS

Table 4.11 Explanation of Hazardous Material Sites in Cities and Towns Within Study Area Alternatives (0.5-Mile Buffer)				
NORTH CAROLINA				
CITY	**COUNTY**	**NAME**	**EPA_ID**	**DESCRIPTION OF SITE**
Wilson	Wilson	Ershigs Inc	NCD981473127	FINDS,RCRIS-LQG,TRIS
Wilson	Wilson	Toisnot Swamp	405091	CERCLIS,FINDS
Wilson	Wilson	Rental Uniform Service	NCD986215572	R-SQG,FINDS,R-TSD
Spencer	Cabarrus	Finetex Inc.	NCD066327313	TRIS
Garner	Wake	Usa Reserve Xviii Airborne Corp	403181	CERCLIS,R-SQG,FINDS
Wilson	Wilson	Insco Inc.	NA	TRIS
Wilson	Wilson	Smithfield Packing Co. Inc.	NA	TRIS
East Spencer	Rowan	Boral Bricks Salisbury Plt	NCD003214376	RCRIS-SQG,FINDS,TRIS
Buckhorn	Wilson	Buckhorn Pesticides	403108	CERCLIS,FINDS,SHWS
Wilson	Wilson	Export Leaf Tobacco Co	NC0022755	RCRIS-SQG,FINDS,TRIS,LUST
Wilson	Wilson	Nucor Bearing Products Inc	D04#EPCRA-IV	RCRIS-SQG,FINDS,TRIS
Clayton	Johnston	Data Genl Corp	NCD086330412	US,FI,R-LQG,R-TSD,RAT,COR,C
Salisbury	Rowan	Salisbury Coal Gas Plant #1	NCD086330412	SHWS
Salisbury	Rowan	Fieldcrest Cannon Plant 7	NCD981863236	RCRIS-SQG,FINDS,TRIS
Salisbury	Rowan	Hbd Industries Inc	NC0022372	R-SQG,FINDS,TRIS,SHWS
Salisbury	Rowan	Carolina Rubber Hose Company	NC0022372	SHWS
Salisbury	Rowan	W. A. Brown & Son Inc.	NCD003224599	TRIS
Salisbury	Rowan	Fieldcrest Mills Inc Nc Fin Co	28145NRTHCHI	RCRIS-SQG,FINDS,TRIS,CERC-N
Salisbury	Rowan	Baja Prods. Ltd.	NA	TRIS
Salisbury	Rowan	Cooper Abex Friction Products	NC0963477	RCRIS-SQG,FINDS,TRIS
Clayton, Nc	Johnston	Peele Pesticide Disposal Site	405272	CERCLIS,FINDS
Moncure	Chatham	Allied Corp	NCD053488409	PAD,CER,FI,R-LQD,TRI,R-TSD,
Moncure	Chatham	Neste Resins Corp.	NA	TRIS,TSCA
Salisbury	Rowan	Fieldcrest Cannon Inc.	NCD982083883	TRIS
Moncure	Chatham	Weyerhaeuser Co.	NCD982076135	TRIS
Kenly	Johnston	Glaxo Inc	27542RSQBBIN	R-SQG,FINDS,RAATS,C-NFRAP,S
Sanford	Lee	Golden Poultry Co.	NA	TRIS
Sanford	Lee	C.P. Properties Site	406306	CERCLIS,FINDS
Sanford	Lee	Cp Properties	406306	SHWS
Sanford	Lee	Siemens-Allis, Inc/Switchgear D	406306	SHWS
Sanford	Lee	Gkn Ai	NCD085443240	FINDS,R-LQG,TRIS,IMD,UST
Selma	Johnston	Continental Grain Co. Inc.	NA	TRIS
Sanford	Lee	Cherokee Sanford Group	NA	LUST,TRIS
Kannapolis	Cabarrus	Hartsoe Brothers	NCD108702606	SHWS,CERC-NFRAP
Kannapolis	Cabarrus	Kannapolis Drum Site	NCSFN0406889	CERCLIS
Concord	Cabarrus	Gurley Drive Landfill	NA	SHWS
Concord	Cabarrus	Southern Latex Corp.	405813	SHWS
Concord	Cabarrus	Americhem Inc.	NA	TRIS
Rocky River	Cabarrus	Mineral Research & Dev Corp	NC0006351	FI,R-LQG,TRI,R-TSD,RA,COR,C
Harrisburg	Cabarrus	Berenfield Containers (Se), Ltd	NCD003170784	FINDS,RCRIS-LQG,TRIS
Harrisburg	Cabarrus	Galvan Industries Inc	NC0777974	CERCLIS,R-SQG,FINDS, TRIS,R

4.1.8 Air Quality

This section describes the potential air quality impacts and the analysis process to be used in the subsequent Tier II environmental studies as appropriate. This discussion is being based on an evaluation of a No Build Alternative versus the Build Alternatives.

Conformity

Air Quality Impacts from High Speed Passenger Rail Service

The emission constituents of greatest concern from locomotive diesel engines are oxides of nitrogen (NOx), particulate matter (PM) and smoke. NOx is formed at high temperatures and pressures associated with combustion of fuel in the engine, when nitrogen in the air combines with available oxygen in the combustion chamber. PM generally results from incomplete evaporation and burning of the fuel droplets (and lubrication oil) in the combustion chamber (Locomotive Emission Standards, USEPA, April 1998). In determining the emissions impacts associated with SEHSR service for the Tier II analysis, the methodology discussed in the USEPA's *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources* should be used.

The EPA procedure outlines three steps that are required to assess locomotive emissions within an inventory area. This method would be used in future Tier II assessments. The first step is to determine the category of railroad operation. High speed rail service (according to EPA) definition falls into Class I, which is defined as nationwide, long-distance, line-haul railroads that carry the bulk of the railroad commerce. Second, emissions for each pollutant are calculated using methods that are described below. Then third, the total locomotive emissions are calculated by summing the quantities of each pollutant. During the Tier II process the additional high speed rail locomotives would be evaluated along with the existing freight and passenger locomotives to get the overall impacts within the maintenance and nonattainment areas. This method of evaluation as described by EPA is based on annual inventories and annual data.

The recommended method for calculating the emissions of an area is done by multiplying the amount of fuel consumed in the area by the appropriate emission factors. This calculation would be relatively simple if locomotives only traveled within the inventory area; fuel consumption could be determined directly from the amount of fuel dispensed into the units. However, travel for most locomotives is predominantly interstate. To determine fuel consumption in a Study Area Alternative, it requires that the amount of fuel used in an area be determined. To do this, traffic density (amount of traffic along segments within the Study Area Alternative, expressed as gross ton miles) is divided by the system-wide fuel consumption index (total system wide mileage divided by system wide fuel consumption). Emissions for each Study Area Alternative can then be determined by multiplying the fuel consumption value by the fleet average emission factors, shown in table 4.12, for each pollutant.

Table 4.12
Locomotive Emission Factors

Pollutant	Emission Factor (lbs/gal)
HC	0.0211
CO	0.0626
Nox	0.4931
SO_2	0.0360
PM	0.0116

Source: USEPA, Procedure for Emission Inventory Preparation Volume IV: Mobile Sources

EPA has developed changes to emission standards that will be phased in over time. Changes to available technologies for locomotives are anticipated to meet these standards and are discussed as Tier 0, 1, and 2 by USEPA in the document *Locomotive Emission Standards Regulatory Support Document, April 1998* . Tier 0 locomotives are those that are originally manufactured from 1973 to 2001 and will require modifications to meet future air quality standards. Tier 1 locomotives are those that will be manufactured in 2002 through 2004. These locomotives would incorporate improved technologies when manufactured that are currently being added as modifications to the Tier 0 locomotives. These technologies will likely be more effective in the Tier 1 locomotives because more optimization will be possible when they are included in the original design than with retrofit technology. The Tier 2 NOx standards will require HC and PM control as well as additional NOx control. These standards will apply to locomotive engines manufactured in 2005 and later. The proposed SEHSR program is estimated to begin service by 2010; the locomotives used for this service are anticipated to meet the Tier 2 standards.

Air Quality Impacts from Diversion from other Modes of Travel

Ridership projections developed for this project for the year 2025 indicate that approximately 95 percent of the SEHSR passengers that are diverted from other modes would divert from autos. As a result, pollutant emissions from this mode under the Build Alternative would be lower than those for a No Build Alternative. To determine this reduction, emissions will be calculated for automobiles for both the No Build and the Build Alternatives. The difference in VOC and NOx emissions in the ozone nonattainment and maintenance areas between the No Build and Build Alternatives can then be taken as credits as part of the conformity analysis.

No reduction in pollutant emissions from commercial aircraft or buses as a result of riders diverting from these modes to SEHSR service will be assumed for this project. Although much of the projected SEHSR ridership is from travelers diverting from air travel in particular, it is assumed that even if the number of flights in the corridor is reduced, additional flights to cities outside of the corridor will be added. For buses, they tend to serve many rural customers who will continue to need the service they provide. They also can collect riders who may ride to cities where they can connect to SEHSR service; therefore, no reduction in service is expected.

Conformity Determination

The State Implementation Plan (SIP) is the federally enforceable plan for each State, which identifies how that State would attain and/or maintain the primary and secondary National Ambient Air Quality Standards (NAAQS) set forth in Section 109 of the Clean Air Act and 40 Code of Federal Regulations 50.4 through 50.12. In both Virginia and North Carolina an assessment would need to be completed during the Tier II studies for the SEHSR project to determine its ability to comply with the ambient air quality standard and not interfere with attainment or maintenance of national standards. There is strong potential for improved air quality, which would benefit attainment and maintenance efforts.

Study Area Alternatives were examined based on forecasts of future ridership. Ridership varies based on the Study Area Alternative. Study Area Alternatives A, B, D, E, G, H and J -- between the Triangle, Triad and Charlotte have greater ridership than Study Area Alternatives C and F -- which pass through Sanford and Troy before terminating in Charlotte.

Impacts by Alternative

To determine the impacts to air quality the nine Study Area Alternatives were examined based on the amount of ridership diversion from automobiles. The numbers used for automobile diversion were estimates for the design year 2025[1]. The approach taken for this document does not go into the depth of a typical air quality analysis for an EIS. Rather than using MOBILE (standard software program used to model air quality) and travel demand models, an estimate was made of vehicle miles traveled (VMT) using the interstate facilities between Washington, DC and Charlotte, NC and 1997 FHWA highway statistics. Hence, only potential overall impacts to air quality were assessed. Average emission and fuel consumption factors from USEPA were applied to the VMT to develop total fuel consumption and emissions values for comparison. SEHSR train emissions are based on eight engines running 24 hours per day, seven days per week, 365 days per year. The net reductions in emissions for NOx are summarized in Table 4.13 below. This table illustrates that for all Study Area Alternatives there is a net reduction in NOx. Particulate matter emissions were not evaluated since they are negligible for gasoline engine vehicles. Study Area Alternative G shows the greatest reduction in NOx.

The analysis shown below used generalized rates for a standard freight engine. These numbers are normalized for the 24-hour rate over the course of a year where a portion of that time would be at idle. For the proposed equipment for SEHSR service it was found that for a travel time of six hours and fifteen minutes (Study Area Alternatives A, B, C, D and E) the engine would use 419 gallons of fuel, compared to the conventional passenger service currently in place by Amtrak, which uses 670 gallons for a ten-hour travel time. This shows that any diversions from conventional rail to SEHSR service will also show a benefit to air quality.

For the No Build Alternative, no automobiles would be diverted to rail and the reduction in emissions illustrated in table 4.13 would not be realized.

[1] Developed by KPMG and titled Annual Passenger Forecasts for Southeast High Speed Rail, July 2000.

Table 4.13 Change in NOx Emissions by Study Area Alternative								
Study Area Alternative	**Automobile Ridership Diversion [1]**	**Automobile Diversion [1]**	**Auto Diversion VMT [2]**	**Auto Fuel Consumption Reduction (gal/yr) [3]**	**Auto Emissions Reduction (NOx) (lbs) [4]**	**HSR Fuel Consumption (gal/yr) [6]**	**HSR Emissions (NOx) (lbs/yr) [5]**	**Net Reduction by Auto Diversion to Train (lbs/yr)**
A	865,349	618,106	267,021,977	10,680,879	883,175	665,760	328,286	554,889
B	841839	601,314	259,767,463	10,390,699	859,181	665,760	328,286	530,895
C	595092	425,066	183,628,389	7,345,136	607,351	665,760	328,286	279,065
D	858003	612,859	264,755,211	10,590,208	875,678	665,760	328,286	547,392
E	828289	591,635	255,586,320	10,223,453	845,352	665,760	328,286	517,065
F	585760	418,400	180,748,800	7,229,952	597,827	665,760	328,286	269,540
G	899266	642,333	277,487,794	11,099,512	917,791	665,760	328,286	589,505
H	863595	616,854	266,480,743	10,659,230	881,385	665,760	328,286	553,099
J	613821	438,444	189,407,623	7,576,305	626,466	665,760	328,286	298,179

[1] Numbers developed for SEHSR by KPMG year 2025 and applying a factor of 1.4 person/veh

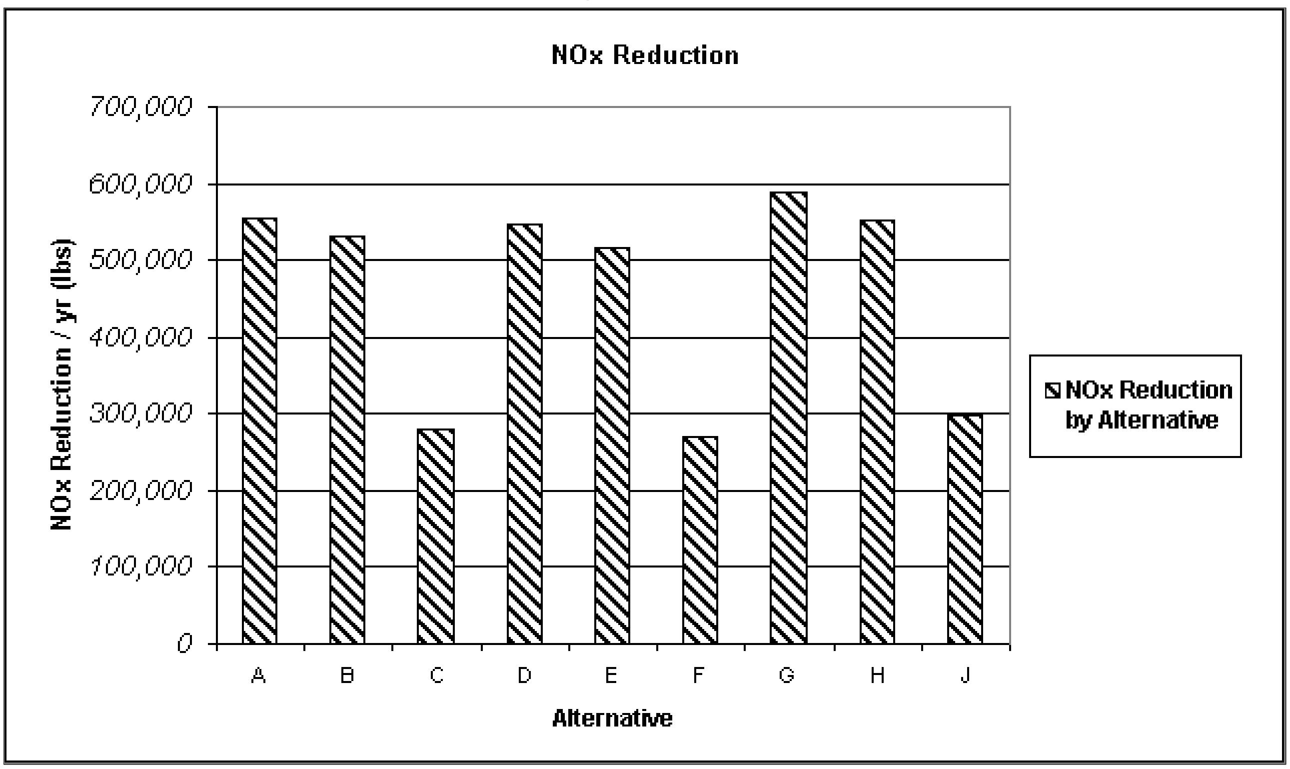
[2] Developed using Interstate miles between Washington DC, and Charlotte, NC.

[3] Based on average in-use passenger car fuel economy of 22.5 miles per gallon. Source: DOT/FHA, Highway Statistics 1995.

[4] Emission factors from standard EPA emission models. Assume "average" car in 1997 operating on a typical summer day (72 to 96 degrees F).

[5] HSR Fuel consumption Assumes 4 train sets with 2 engines each (8 engines) operating 24/7, 365 days/yr with fuel usage of 228 gal/day/ engine. Locomotive Emission Factors, USEP, Procedures for Emission Inventory Preparation Volume IV: Mobile Sources.

Figure 4.2a



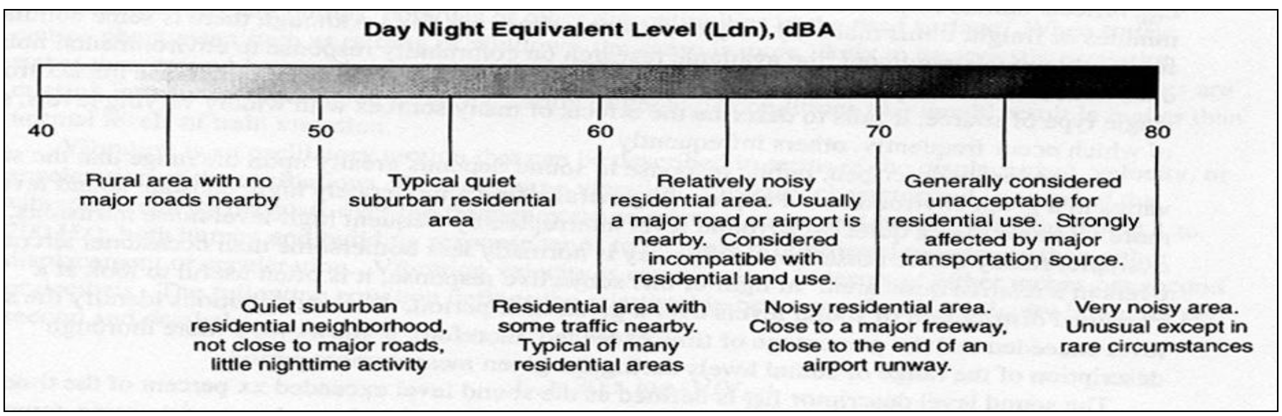
4.1.9 Noise and Vibration

Potential noise and vibration impacts for the Build Alternatives were evaluated using a screening technique. The methodology is described later in this section under comparison of alternatives. Detailed analysis on a project specific level will be conducted, as appropriate, during Tier II environmental studies. This section contains a discussion of the methodology that will be used for these future analyses. In addition, a general discussion of findings from other high speed rail programs is also discussed.

Noise Assessment Methodology

It is anticipated that the SEHSR project noise analysis would be prepared using the evaluation criteria for train noise impacts described in the Federal Railroad Administration manual *High Speed Transportation Noise and Vibration Impact Assessment* . The data used to conduct the noise analysis will include the receptors' distances from the track, the number of cars per train, train speed, and hourly volumes. The peak hourly volumes are used to calculate decibels (noted dBA) L_{eq} for Category 3 land uses. Chapter 3 of this report provides more detail on these land use descriptors and the definition for L_{eq} and L_{dn}. Figure 4.3 provides examples of sound levels at various dBA as measured by the typical day/night sound level. The average daytime (7AM-10PM) hourly train volumes and nighttime (10PM-7AM) hourly train volumes are used to calculate dBA L_{dn} for Category 2 (e.g., residences, hotels, and hospitals) land uses. The type and size of vehicle have not been determined at this time. Consequently the number of cars per train and the hourly volumes are based on a conceptual service plan incorporating a train set of two engines and six typical 87.5-foot passenger cars. This assumption provides a worst-case condition for noise projections because noise increases with the number of cars per train**.**

Figure 4.3
Typical Day/Night Sound Levels (L_{dn})



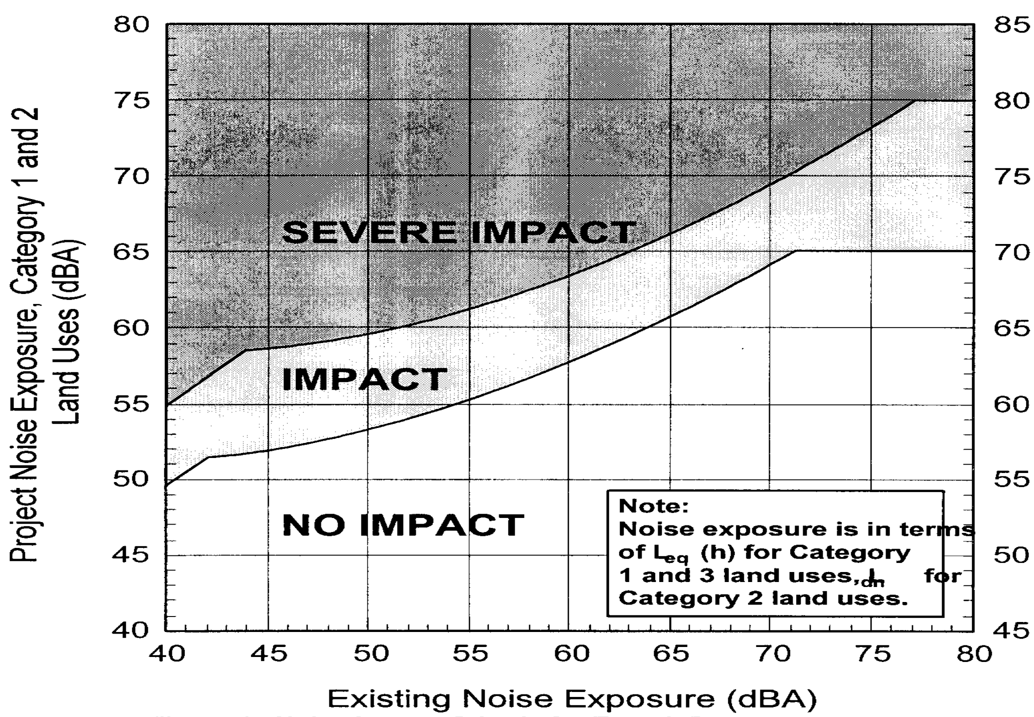
Source: Transit Noise and Vibration Impact Assessment, FTA, April 1995

Noise Impacts / Train Noise

Figure 4.4 illustrates noise impact and severe noise impact thresholds for high-speed rail projects. The noise impact criteria are defined by two curves relating project noise levels to existing noise. Below the lower curve, a proposed project is considered to have no noise impact since, on the average, the introduction of the project will result in an insignificant increase in the number of people highly annoyed by the new noise. The curve defining the onset of noise impact stops increasing at 65 dB for Category 1 and 2 land use, a standard limit for an acceptable living environment as defined by a number of federal agencies. Project noise above the upper curve is considered to cause severe impact since a significant percentage of people would be highly annoyed by the new noise.

Noise levels associated with the SEHSR project for any of the Study Area Alternatives are expected to be slightly higher than those projected for the No Build Alternative throughout most of the project area. This can be accounted for due to some of the Study Area Alternatives being studied are currently along inactive segments of track, providing service along these corridors would bring noise associated with rail service where it hasn't been in several years. Additionally, implementation of SEHSR service will result in higher operating speeds than currently experienced along most of the project area. At speeds in excess of 80 mph (130 kph) the major source of train noise is the rolling of train wheels on the track rail. Such noise grows louder as speeds increase. This fact coupled with increased frequency of intercity services will result in an increase in noise at a given location over a 24-hour period. At some receptor locations noise levels may also be affected by more frequent sounding of locomotive horns at road crossings for safety reasons. Noise increases of less than three dBA are generally considered "not significant."

Figure 4.4
Noise Impacts for High Speed Rail Projects



Source: High Speed Ground Transportation Noise and Vibration Impact Assessment HMMH, March 1997

Noise Mitigation

Lessening the perceived noise problem can be approached in three different fashions: via the noise source, along the sound path, and at the point of perception.

Incorporating noise control features during the specification and design of the vehicle is among the most effective noise mitigation treatments. The development and enforcement of stringent but achievable noise specifications by the project sponsor is a major step toward limiting noise[2].

Options available to minimize noise from wheel-on-track friction include:

- *Resilent and damped wheels* —most effective at eliminating wheel squeal in tight curves with reductions of 10 to 20 decibels. Marginally effective at reducing rolling noise, typically 2 decibels on tangent track
- *Spin-slide control systems*—prevents flat spots on wheels, which can result in up to 20 decibels in noise reduction.
- *Wheel maintenance*—includes truing wheels to eliminate wheel flat spots.

Options available to minimize noise from vehicle mechanical systems related to propulsion, ventilation, and passenger comfort include:

- *Propulsion systems*—the design of the locomotive heavily influences resulting noise levels as does fuel sources which range from electricity to diesel fuel.
- *Ventilation*—installing a new generation of efficient and near-silent fans can reduce fan noise. Forced air-cooled electric traction motors have been found quieter than self-cooled motors at operating speeds. The location of fans on the train can make a significant difference in noise levels affecting bystanders.
- *Vehicle body*—shape and design can shield and absorb the noise of vehicle parts. Sound dampening of the undercarriage has shown to lessen wheel-rail noise as much as 5 decibels. Quiet vehicle design is often the most cost-effective approach for cutting train noise.

Additional means of reducing associated rail noise impacts at the source include:

- *Rail maintenance*— ensures smooth rails, essential for maintaining reasonable noise levels on high-speed trains. An effective maintenance program can reduce associated noise impacts by as much as 10 decibels.
- *Service reductions*—operational restrictions include lower speeds in noise-sensitive areas and nighttime service reductions. Reducing speed by half cuts noise by 6 decibels.
- *Sound barriers*—the effectiveness of sound walls depends on wall height and proximity to track.

One approach toward reducing associated rail noise impacts along the path of sound travel includes:

- *Ground absorption*—the nature of surrounding ground surface heavily determines the noise level perceived by the listener. Track construction can be either reflective (concrete-based) or absorptive (ballast). Reductions range from 3 to 5 decibels.

[2] *High Speed Ground Transportation Noise and Vibration Impact Assessment* , Preliminary Draft, March 1997.

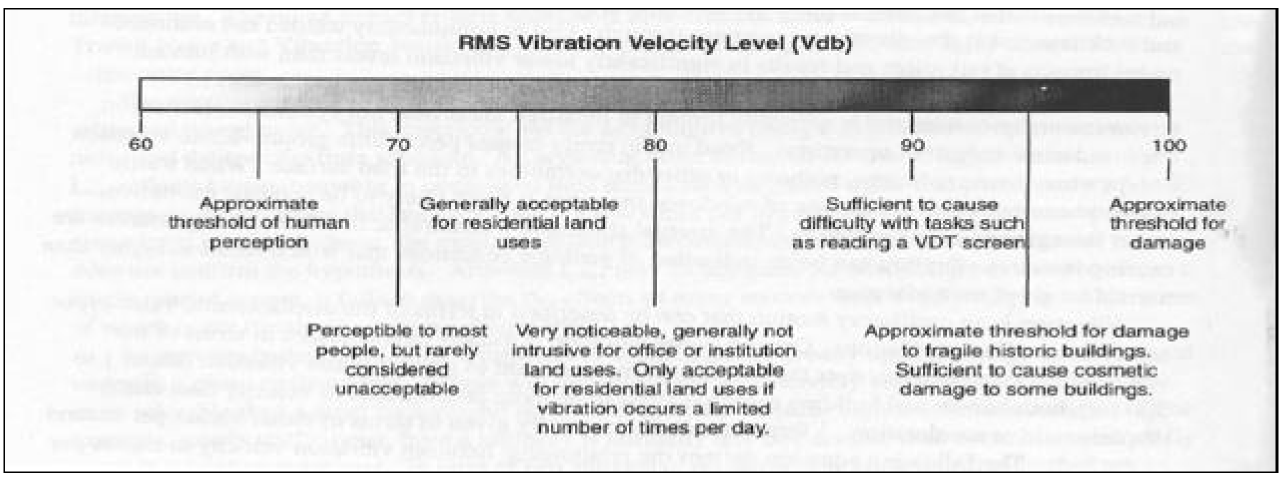
A strategy for reducing associated rail noise impacts at the point of perception is:

- *Building insulation* —most often considered when right-of-way acquisitions and sound walls are impractical, primary methods here are sealing (caulking) building gaps and installing soundproof windows. New windows can reduce noise by 5 to 20 decibels depending on quality of original windows.

Train Vibration Assessment Methodology

In addition to the high speed train noise, potential vibration impacts from SEHSR operations would be evaluated in Tier II studies. Ground-borne vibration is a small but rapidly fluctuating motion transmitted through the ground. Ground-borne vibration diminishes (or "attenuates") over distance. Some soil types transmit vibration quite efficiently; others do not. The response of humans, buildings, and sensitive equipment to vibration is described in terms of root-mean square (RMS) velocity level in decibel units (VdB). As a reference point, the average person can just barely perceive vibration velocity levels below 70 VdB. For a typical ground-borne vibration levels comparison, see Figure 4.5. Unlike noise criteria, vibration impact criteria are based on the typical maximum vibration level from repeated events such as the passbys of light rail vehicles. The ground-borne vibration criteria contained in the FTA manual is summarized previously in Chapter 3 of this document.

Figure 4.5
Typical Ground-Borne Vibration Levels



Source: Transit Noise and Vibration Impact Assess ment, FTA, April 1995

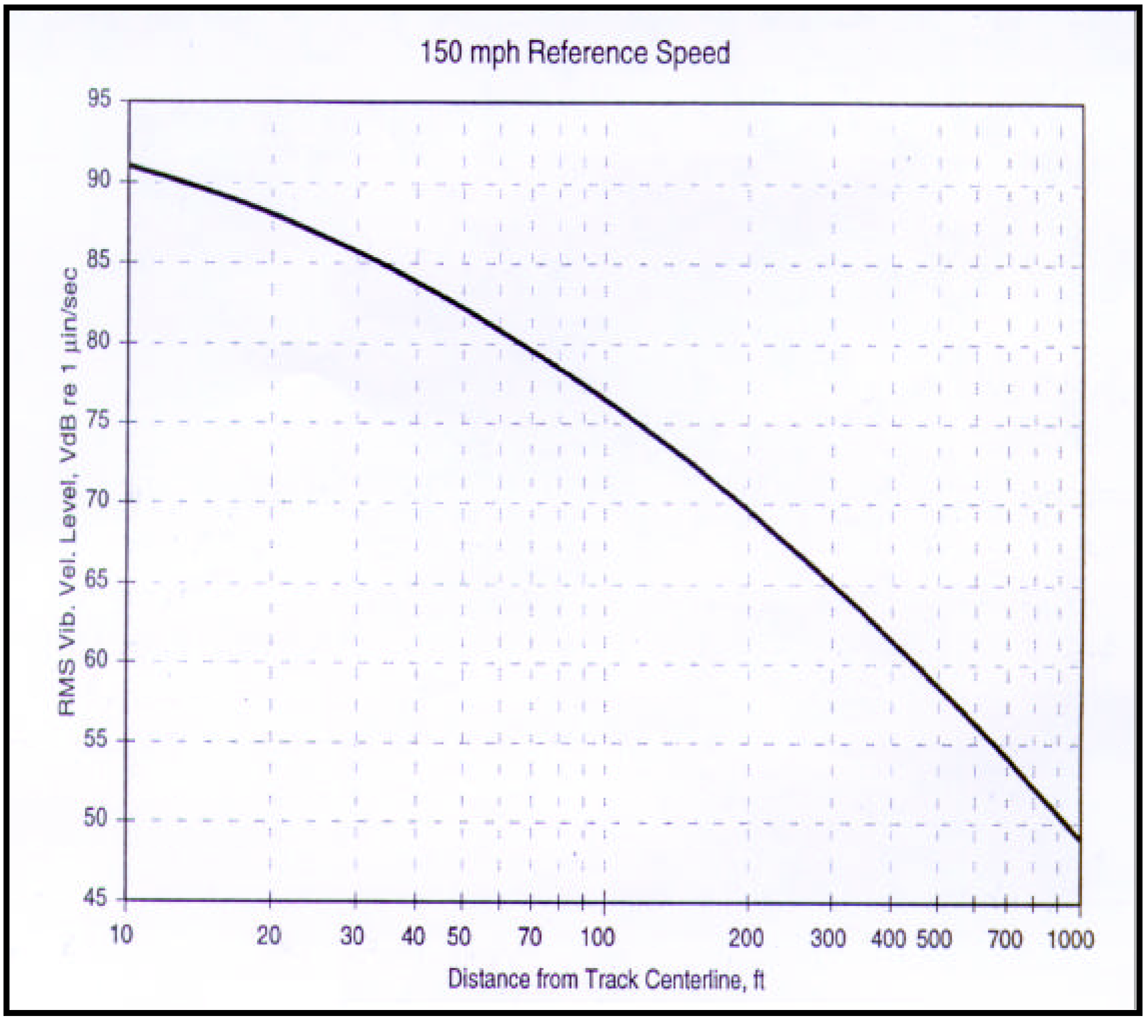
The basic approach to the assessment procedure is to use a base curve of overall ground-surface vibration as a function of distance from the source, then apply adjustment to this curve to account for factors such as track support system, train speed, track and wheel condition, building type, and receiver location with a building.

The generalized projection curve for steel-wheeled high speed trains is shown in Figure 4-17. This curve represents typical ground-surface vibration levels assuming equipment in good condition and speeds of 150 mph. As discussed in the report *High Speed Ground Transportation Noise and Vibration Impact Assessment* , the vibration levels shown in Figure 4.6 must be adjusted to account for different conditions than those assumed in the figure.

The friction of train wheels on rail tracks is the major source of train vibration. The resulting vibration increases at greater speeds. Add increased frequency of service and the result is a clear increase in vibration energy at a given site over a 24-hour period. Improved technology associated with high speed rail equipment reduces vibration effects canceling some of the increased vibrations.

In areas where projected SEHSR operating speed is greater than No Build Alternative speed, projected vibration levels are expected to be slightly higher than for the No Build alternative.

Figure 4.6
Generalized Ground-Borne Vibration Curve



Source: High S peed Ground Transportation Noise and Vibration Impact Assessment, HMMH, March 1997

Vibration Impacts

Vibration generated by a high speed vehicle decreases with distance from the tracks, and increases as train speed increases. The project-induced vibration levels (vibration expected to be generated by the proposed project) will be evaluated at indoor, first occupied floor locations according to appropriate criteria for the Tier II studies. Outdoor vibrations at parks will be included for information purposes only, as there are no applicable vibration criteria for outdoor land uses.

Vibration Mitigation

Since the primary source of ground-borne vibration from trains is wheel/rail friction, an enhanced track and vehicle maintenance program could minimize vibration from wheel/rail interaction. Vibration levels could be further reduced by any of these four measures:

- installation of ballast mats;
- installation of floating concrete slabs (effectively applied in Washington and Toronto);
- switching from concrete to wood ties; or
- construction of deep trenches parallel to the existing ballast to the tracks between the tracks and sensitive receptors.

The ballast mats could be installed under the existing ballast at the locations where the greatest vibration impact is expected. These mats have been shown to be effective in Europe and on rapid transit lines in Boston.

The most problematic noise cause is flat spots on steel train wheels. Fortunately, this occurrence is perhaps the easiest and most economically practical noise solution. Rough wheels can increase vibration levels by as much as 20 dB. A regular maintenance program can be an effective means of reducing system wide vibration.

Another effective means of lessening the effects and occurrence of vibration would be the design and location of track work. Turnouts and crossovers are special track works that are most prone to causing problematic vibrations. Relocating such track work to less vibration-prone areas and the application of vibration-resistant railroad hardware are two remedies.

Comparison of Alternatives

For this Tier I analysis, noise and vibration sensitive land uses within the Study Area Alternatives were inventoried using existing mapping and aerial photography. Sensitive land uses within 150 feet of track centerline were identified for each Study Area Alternative.

The predominant noise and vibration-sensitive land use in the Study Area Alternatives is residential. Additionally, schools, churches and several historic structures are located adjacent to the corridors. Table 4.14 summarizes the number of sensitive receptors by Study Area Alternative that could potentially be impacted at some level if the SEHSR service were implemented.

Table 4.14 Sensitive Receptors for Noise and Vibration by Alternative	
	Number of Category 3 Sensitive Receptors (churches, schools, parks, and historic structures)*
A	333
B	342
C	259
D	371
E	371
F	287
G	369
H	372
J	284
*Numbers are approximate	

Source: Carter & Burgess, Inc. March 2001

The Study Area Alternative with the least number of sensitive receptors is Study Area Alternative C. This alternative travels through primarily rural areas from south of Richmond to Charlotte. Study Area Alternatives D and E pass the highest number of sensitive receptors. These alternatives travel through to major urban areas between Washington, DC and Charlotte, NC.

With the implementation of the proposed SEHSR service, mitigation steps, such as continuous welded track and improved track maintenance, would be implemented to reduce noise impacts. These steps would not only allow the high speed trains to be quiet, they would reduce noise for any other rail traffic using the line.

Since all the study area alternatives being studied contain existing rail lines, many of the sensitive receptors are currently experiencing noise from existing freight and Amtrak service. It is expected that this type of rail traffic will continue and may even increase. The No Build Alternative would most likely not implement mitigation steps, and service would continue at the current level with the potential for increased freight and passenger service in the future. Additionally, no traffic would be diverted from other modes of travel such as automobiles and air therefore no reduction in existing noise levels would be realized.

4.1.10 Energy Impacts

One of the potential benefits of the proposed SEHSR program would be to reduce the bottlenecks in the existing rail system. This could lead to improved travel times for rail passengers and increases in rail ridership, resulting in less vehicular traffic congestion, possible reductions in air pollution levels and more efficient energy use. Additional reductions in energy consumption are anticipated based upon higher, more constant operating speeds, and the use of locomotives that should reflect technology improvements leading to more efficient fuel use.

Energy impacts are discussed on two levels: consumption during construction and consumption during operations. Energy consumption numbers for the No Build Alternative were based upon current (2001) Amtrak use in the Washington, DC to Charlotte, NC travel corridor. Consumption numbers for the Build Alternatives (Study Area Alternatives) were calculated based upon estimated fuel use/passenger mile for the proposed equipment, estimated travel time and travel distance.

Energy Consumption During Construction

No Build Alternative

The No Build Alternative would require energy use for construction of the existing and planned improvements as described in Chapter 2. This energy use would likely be similar to the energy use discussed below for the Build Alternatives.

Build Alternatives

The construction of the Study Area Alternatives would expend additional energy during construction for the operation of construction equipment, and energy consumption related to traffic delays (automobile, freight and existing passenger train traffic) resulting from construction. This construction related energy consumption would be short term. It is assumed that the construction of any of the Build Alternatives would be staged to minimize disruption to existing freight, passenger and automobile traffic. This should minimize the related level of energy consumption. Actions to avoid disruption to traffic would be addressed in a maintenance of traffic plan that is generally developed during the final design stage of a build project. Once the SEHSR service begins, long-term energy savings are anticipated.

Energy Consumption During Operation

The No Build and the Study Area Alternatives were analyzed in terms of energy consumption for all modes of transportation in the Washington, DC to Charlotte, NC travel corridor. Under existing conditions, rail travel is more energy efficient than travel by either air or automobile. Increasing rail capacity can be achieved, incrementally with a relatively small cost when compared to the cost of adding capacity to the roadway network (private auto and intercity bus modes) or to the air travel network. Thus any potentially significant increase in rail ridership resulting from the implementation of the Build Alternatives is anticipated to produce more efficient use of energy for transportation purposes. In addition, technological improvements in train technology should lead to more fuel-efficient equipment being available in the future for use in the Study Areas Alternatives.

Passenger rail service under the No Build Alternative would be a continuation of the present day two round trips in the Washington, DC to Charlotte, NC travel corridor. It was assumed that the amount of diesel fuel consumed per passenger mile would remain at 0.01 gallons per passenger mile. This factor is based upon current Amtrak fuel usage in the Washington, DC to Charlotte, NC travel corridor. A fuel consumption factor of 0.005 to .0066 gallons per passenger mile was estimated for the Build Alternatives, depending on the route chosen, and the fuel consumption rate assumed for use in the Study Area Alternatives. The forecast consumption rate of 65 gallons an hour was multiplied by the travel time projected for each route to determine total fuel consumption per trip. Total fuel consumption per trip was then divided by the alternative’s passenger miles per train mile (multiplied by the alternative’s mileage) to ascertain the fuel consumption per passenger mile. The results are summarized in Table 4.15a below.

Table 4.15a Per Trip Fuel Consumption for SEHSR Alternatives			
Study Area Alternatives	**Best Travel Time per Route (in hours)**	**Total Distance (Route Miles)**	**Fuel Consumption per Trip (In Gallons)**
No Build (existing)	10	479	670
Study Area A	6.2	448	403
Study Area B	6.65	463	432.3
Study Area C	5.9	428	383.5
Study Area D	6.48	468	421.2
Study Area E	6.93	483	450.5
Study Area F	6.18	448	401.7
Study Area G	6.68	481	434.2
Study Area H	7.13	496	463.5
Study Area J	6.38	461	414.7

Sources: Amtrak, William Gallagher & Associates, Complied by Carter and Burgess, June 2001

NOTES: 1) No Build based upon current Amtrak service in the Washington, DC to Charlotte, NC travel corridor; per passenger fuel use is 0.01 gallon per passenger mile and there are 141 passenger miles per track mile. 2) The Build alternatives are based upon fuel consumption levels for possible equipment to be used, distance variations in the route alternatives, and each route's projected passenger miles per train mile.

As demonstrated, the Build Alternatives could significantly reduce fuel consumption by passenger rail based upon the improvement in travel times. A per trip fuel saving of over 200 gallons could be realized through the implementation of any of the Build Alternatives. The shorter potential routes with the lowest travel times could produce the greatest savings in absolute fuel consumption, but when measured by fuel consumption per passenger mile, are in several instances, relatively inefficient providers of transportation compared to alternatives serving greater enroute populations. These include, in order of the potential fuel savings over the No Build condition, Study Area Alternatives C, F, A, J, B, D, G, E, and H. The potential net fuel savings based on auto diversion by alternative are shown in Table 4.15b.

An order of magnitude comparison of fuel consumption by mode is presented in Table 4.16. The data for this table comes from the 2000, *USDOT Bureau of Transportation Statistics Chapter on* Energy Consumption by Mode by year.

In general energy use for all modes has increased over the years, with Amtrak petroleum based energy use decreasing or remaining fairly constant. These numbers are somewhat misleading since the table does not display electric energy consumption for Amtrak. Based upon the table the energy use numbers for passenger rail are generally a lot lower than for air, auto or bus. This bears out the project need for a more balanced transportation network. It also supports the concept that the greater person carrying capacity of the passenger rail mode, and the incremental cost of increasing that capacity when compared to other modes such as air and automobile, should be more energy efficient in efforts to reduce travel congestion and increase mobility. Any increase in rail ridership should lead to an increase in the energy efficiency of that mode.

Table 4.15b
Auto Fuel Consumption Savings by Alternative

SEHSR Alternative	Automobile Diversion [1]	Auto Diversion VMT [2]	Auto Fuel Consumption Reduction (gal/yr) [3]	Train Fuel Usage (gal/yr)[4]	Net Reduction (gal/yr)
A	618,106	267,021,977	10,680,879	665,760	10,015,119
B	601,314	259,767,463	10,390,699	665,760	9,724,939
C	425,066	183,628,389	7,345,136	665,760	6,679,376
D	612,859	264,755,211	10,590,208	665,760	9,924,448
E	591,635	255,586,320	10,223,453	665,760	9,557,693
F	418,400	180,748,800	7,229,952	665,760	6,564,192
G	642,333	277,487,794	11,099,512	665,760	10,433,752
H	616,854	266,480,743	10,659,230	665,760	9,993,470
J	438,444	189,407,623	7,576,305	665,760	6,910,545

[1] Numbers developed for SEHSR by KPMG year 2025 and applying a factor of 1.4 person/veh

[2] Developed using Interstate miles between Washington DC, and Charlotte, NC.

[3] Based on average in-use passenger car fuel economy of 22.5 miles per gallon. Source: DOT/FHA, Highway Statistics 1995.

[4] HSR Fuel consumption Assumes 4 trainsets with 2 engines each (8 engines) operating 24/7, 365 days/yr with fuel usage of 228 gal/day/ engine. Locomotive Emission Factors, USEP, Procedures for Emission Inventory Preparation Volume IV: Mobile Sources.

Table 4.16 Annual Fuel Consumption and Travel by Mode, 1990 and 1995 -98										
	1990		1995		1996		1997		1998	
Travel Mode	**Fuel use**	**Miles of Travel**	**Fuel use**	**Miles of Travel**	**Fuel use**	**Miles of Travel**	**Fuel use**	**Miles of Travel**	**Fuel use**	**Miles of Travel**
Air- (Domestic Carriers)	12,489	3,963	12,812	4,629	13,187	4,811	13,660	4,911	13,877	5,031
Highway-(Auto)	69,568	1,408,000	68,072	1,438,000	69,221	1,470,000	69,892	1,502,556	72,209	1,545,830
Highway (Intercity Bus)	895	5,700	968	6,400	990	6,600	1,027	6,842	1,049	6,996
Freight Rail (Class 1)	380*	3,115	458	3,480	469	3,579	475	3,575	3,583	475
Passenger Rail (Amtrak)	82**	301	66	292	71	276	75	288	75	312

Source: USDOT Bureau of Transportation Statistics, 2000 Tables 4 -8, 4-9, 4-11, 4-15, 4-17, and 4-18.

NOTES: 1)Fuel use is in millions of gallons; miles of travel are in millions. 2)Domestic air fuel consumption is for jet fuel; general aviation fuel is jet and aviation gasoline; automobile and bus are gasoline; Amtrak and freight fuel are diesel.
*The freight train miles does not include yard or passenger train miles
**Amtrak fuel use numbers do not include electric energy use

4.1.11 Prime Farmland

In enacting the Farmland Protection Policy Act (7 CFR Part 658), Congress found that the Nation's farmland was "a unique natural resource" and that each year, "a large amount of the Nation's farmland" was being "irrevocably converted from actual or potential agricultural use to nonagricultural use." The general purpose of the Act is to "minimize the extent" of the role of federal programs in the conversion of farmland to nonagricultural uses and to "assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with state, unit of local government, and private programs and policies to protect farmland" (section 1540(b) of the Act). The Act directs federal agencies to "identify and take into account the adverse effects of federal programs on the preservation of farmland; consider alternative actions, as appropriate, that could lessen such adverse effects; and assure that such federal programs, to the extent practicable, are compatible with state, unit of local government, and private programs and policies to protect farmland."

Potential impacts from implementation of high speed rail may occur where construction would require additional right of way in areas of prime farmland.
Prime farmland is defined as land that has "the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion."

To rate the relative impact of projects on sites subject to the Farmland Protection Policy Act, federal agencies fill out a Farmland Conversion Impact Rating Form (Form AD-1006). The rating form is based on the Land Evaluation and Site Assessment System (LESA). LESA is a numerical system that measures the quality of farmland based on Land Evaluation and Site Assessment. Sites receiving a combined score of less than 160 do not require further evaluation. Alternatives are considered for sites with a combined score greater than 160 points. The Conversion Impacts Rating form will be completed as appropriate during the Tier II studies and specific farmland impacts will be addressed. Mitigation measures for specific farmland impacts could include minimization and avoidance if practicable.

Table 4.17 exhibits the percentage of prime farmland without qualifications for drainage and flood protection per Study Area Alternative. The percentages of prime farmlands within each Study Area Alternative for the six-mile buffer ranged from 18 percent to 34 percent. Study Area Alternatives G and H, with 57,346 acres and 59,134 acres respectively of prime farmland, exhibited the highest percentages, while Study Area Alternatives C, with 26,523 acres of prime farmland, exhibited the lowest percentage.

The No Build Alternative would have similar types of potential impacts due to right-of-way acquisitions associated with the existing and planned improvements as discussed in Chapter 2.

Table 4.17 Exhibit of Prime Farmland without Qualifications for Drainage and Flood Protection per Study Area Alternative		
Study Area	**Total PF (acreage) per Study Area**	**% PF per Study Area**
A	37,219	24
B	39,360	24
C	26,523	18
D	45,137	28
E	46,992	28
F	34,308	22
G	57,346	34
H	59,134	34
J	46,670	29

Source: USDA; 1997-2001

4.1.12 Visual Impacts

This section generally discusses the visual impacts of the proposed SEHSR project on the Study Area Alternatives. As specific alignments are identified during Tier II analysis, a more detailed visual analysis could be developed as apppropriate.

It is likely that most of the improvements related to the proposed SEHSR project would occur within existing railroad right-of-way where existing track and support structures already exist. The development of SEHSR facilities would represent an incremental change in the visual environment that would be noticeable in most locations because of the increase in the volume of trains related to the proposed service. Proposed improvements would facilitate train movements at a faster pace through residential views. Improved train sidings would allow trains to move past each other without one having to wait for the other to past. Thus the trains would past faster through the view of the on looker. Overall, there is not expected to be any change in the visible quality from the proposed project

The visual elements of the proposed SEHSR project would include single or multiple sets of tracks, the supporting rock ballast, vegetated right-of-way, rail signals and/or cross traffic warning signs, the trains and associated grade crossings, bridges and road crossings. The actual configuration of the tracks is often unnoticeable by the train passenger or bystander. A rail corridor is most visible when trains pass and or when one train is waiting on a siding for the other to pass. Passing siding improvements would allow trains to past more quickly through the view of the onlooker. There would be a larger issue where no tracks currently exist.

Grade crossings, bridge and road crossings are most visible when they are in use (flashing signals or gates). Grade separations, or at grade crossings, which could include related crossing guards, crossing signs and possible signal houses, would be similar to what is in use in existing railroad corridors.

A number of bridges would have to be constructed, reconstructed or modified. Most bridges would be built along side of the existing bridge structure or the existing structure would be modified to accommodate the proposed SEHSR project. Thus, there would be only minimal changes in the visual environment.

The operation of additional trains within existing railroad rights-of-ways would have the same impacts as existing trains. The actual change in views would be momentary.

The most significant visual quality impacts would result from construction, when construction equipment would be visible to adjacent residents and land use. Construction of physical improvements may cause some temporary degradation of visual quality. Actual construction would occur quickly and would be similar to existing maintenance activities along the right-of-way. The best construction management practices often include use of slit fencing or construction barriers, which would have a visual presence.

No Build Alternative

The No Build Alternative would have potential for degradation of scenic vistas in areas where the improvements are made on new locations.

Build Alternatives

The most visual element of the Study Area Alternatives would be the stations and other facilities that would need to be built for passenger waiting areas, and any train maintenance areas. Currently the locations for stations and the locations and need for any train maintenance areas have not been identified. There is some potential for degradation of scenic vistas in areas where there is no present rail service. This type of detail would be developed during Tier II analysis, and a more detailed assessment of potential visual impacts and benefits would be conducted. However, the uses of land use controls provide local communities with an effective tool to facilitate the visual compatibility of any facilities related to the Build Alternatives.

4.2 Impacts to the Natural Environment

4.2.1 Protected Species

Information concerning the occurrence of federal and state protected species within the project area was gathered from the United States Fish and Wildlife Service (USFWS) list of protected species, the Virginia Division of Natural Heritage (VDNH) and the North Carolina Natural Heritage Program (NCNHP) databases of rare species and unique habitats. Information regarding known populations of federally protected species was gathered for the entire six-mile wide buffer area for all Study Area Alternatives. Field reconnaissance in the project area would be conducted during Tier II investigations. These surveys would determine natural resource conditions, and document natural communities and the presence of protected species or their habitats. Refer to Appendix A for characteristics of threatened and endangered species.

Implementation of the Build Alternatives could potentially impact protected species by the destruction or disturbance of habit either within the existing right of way or on new location. New location alignments may also fragment habitat, reducing the range of certain species.

During Tier II studies, surveys for protected species would be conducted, as appropriate, in appropriate habitats and in the optimum season for identification. For example, plant surveys are usually conducted during their flowering season because of increased visibility and ease of identification. The following is a list of Threatened and Endangered species that may occur with the Study Area Alternatives:

Sensitive joint-vetch (*Aeschynomene virginica*)

Federal Status: THREATENED
Surveys for sensitive joint-vetch should occur during its flowering season from June through September. Potential habitat includes the intertidal zones usually at the marsh edge near the upper limits of tidal fluctuation. Critical to the survival of this annual species is the presence of bare to sparsely vegetated substrate for seed germination and growth. These areas include accreting point bars, low swales, and meander zones of tidal rivers. In the project area, populations of this species are known only from Virginia. Potential habitat includes the intertidal zones of the Potomac, Rappahannock, Pamunkey-York, and James Rivers.

Dwarf wedgemussel (*Alasmidonta heterodon*)

Federal Status: ENDANGERED
A qualified mussel expert should conduct surveys for dwarf wedgemussel in appropriate habitat. This mussel inhabits large rivers to small streams within its range. The preferred substrate is clay banks stabilized with the root systems of trees. Other bed substrates include coarse sands, mixed sand, gravel and cobble, and very soft silts. The most important feature of their preferred habitat appears to be excellent to good water quality. Populations of the dwarf wedgemussel in the study area are known from the Pamunkey River in Henrico County, VA; Nottoway River in Sussex County, VA; Ruin Creek in Vance County, NC; Swift Creek and Neuse River in Wake County, NC; and Buffalo Creek in Johnston County, NC.

Small-anthered bittercress (*Cardamine micranthera*)

Federal Status: ENDANGERED
Surveys for the small-anthered bittercress should be conducted in appropriate habitat during the flowering season from April to May. Habitat for this plant includes sand and gravel bars in creeks, swampy floodplain woods, and seepages over rocks. This plant is narrowly endemic, with populations known only from Forsyth County, North Carolina to Patrick County, Virginia. Populations of this plant are not known from the study area.

Bog Turtle (*Clemmys muhlenbergii*)

Federal Status: THREATENED (Similar Appearance)
Bog turtles are difficult to find since they are infrequently active above their muddy habitats during specific times of year and temperature ranges. Surveys should be conducted during the spring mating season from June to July and at other times from April to October when the humidity is high, such as after a rain event, and temperatures are in the 70^{o}s. Bog turtle habitat consists of bogs, swamps, marshy meadows, and other wet environments, specifically those that have soft muddy bottoms. In the project area populations of bog turtles are known only from North Carolina; specifically, near the Forsyth and Guilford County line east of Kernersville, and near the Forsyth and Davidson County line south of Winston-Salem.

Smooth coneflower (*Echinacea laevigata*)

Federal Status: ENDANGERED
Surveys for the smooth coneflower should be conducted in appropriate habitat during its flowering season from May to July. This plant is shade intolerant, preferring open sunny habitats maintained by periodic disturbance to reduce the shade and competition of woody species. These habitats include open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and cleared rights-of-way. It is usually found on magnesium- or calcium-rich soils associated with limestone, gabbro, diabase and marble rocks. There are no known populations located within the project study area.

Tar River spinymussel (*Elliptio steinstansana*)

Federal Status: ENDANGERED
A qualified mussel expert should conduct surveys for the Tar River spinymussel in appropriate habitat. This mussel is endemic to the Tar and Neuse River drainages of the lower Piedmont and upper Coastal Plain of North Carolina. Most populations are known from medium streams to rivers with fast flowing water of the Tar River basin. It lives in silt free, unconsolidated gravel or coarse sand usually in shallow water, but will utilize deep water with appropriate substrates. In the study area, Tar River spinymussel populations are currently known the Neuse River in Johnston County.

Eastern cougar (*Felis concolor couguar*)

Federal: ENDANGERED
Eastern cougars are a relatively secretive species and are not readily observed in the wild. Surveys for this species will likely consist of identifying appropriate habitat and documenting observation of tracks, scat, scrapes and scratches, and carcasses. This species utilizes a wide

variety of habitats, mainly requiring large expanses of wilderness/undeveloped lands with an adequate food supply, especially white-tailed deer. There are no known populations of eastern cougar in the project study area.

Bald eagle (*Haliaeetus leucocephalus*)

Federal Status: THREATENED - Proposed Delisted
Surveys for this bird usually consist of binocular searches in appropriate habitat for the birds and their large nesting platforms. Bald eagles are primarily associated with large bodies of water where food is plentiful. Eagle nests are found in close proximity to water (usually within 0.5 mi.) with a clear flight path to the water, in the largest living tree in an area, that has an open view of the surrounding land. Human disturbance can cause nest abandonment. In the Virginia portion of the study area, populations of bald eagles are known from along the Potomac River in Fairfax, Prince William and Stafford Counties; Pamunkey River in Henrico County; and James River in Chesterfield County. In the North Carolina portion of the study area populations are known from Lake Gaston in Warren County, Lake Benson and Harris Reservoir in Wake County, Lake Jordan in Chatham County, High Rock Lake in Rowan County, and Lake Tillery in Montgomery County.

Schweinitz's sunflower (*Helianthus schweinitzii*)

Federal Status: ENDANGERED
Surveys for this sunflower should be conducted in potential habitat during the flowering season from late August through October. Schweinitz's sunflower occurred historically in Piedmont prairies in the Charlotte geologic belt of North and South Carolina. Today, populations of Schweinitz's sunflower occur beneath canopy openings in xeric hardpan forest, and in dry, open, artificial habitats, such as roadsides, utility rights-of-way, and edges of pastures (Weakley, 1993). Most populations are known to occur within 60 miles of Charlotte, North Carolina. In the project study area, a large population cluster occurs in and surrounding the Uwharrie National Forest in Montgomery County, and an additional population is known from near the Mecklenburg and Cabarrus county line north of Charlotte.

Swamp pink (*Helonias bullata*)

Federal Status: THREATENED
Surveys for this plant should occur in potential habitat during the flowering season from March to May. However, due to its large size and distinct evergreen appearance, this plant is readily identifiable outside of its spring flowering season. Its preferred habitat is shady, forested wetlands, especially headwater wetlands and seepage areas. There are no recorded populations from the counties within the North Carolina portion of the project area. In the Virginia portion of the project area, three populations have been recorded near and on Fort A. P. Hill in Caroline County, and one population is known from Henrico County.

Small whorled pogonia (*Isotria medeoloides*)

Federal Status: THREATENED
This small, spring, ephemeral orchid is not observable outside of the spring growing season. It is most readily observable during flowering from mid-May to mid-June. Populations of this plant are reported to have extended periods of dormancy and to bloom sporadically. Habitat for this

species is open, dry to mesic, deciduous woods with acidic soils, which is readily available in the Piedmont and Coastal Plain. They prefer to grow in woodlands that have been previously disturbed and are most often found growing with other orchid species. There are no documented populations of this orchid in the project study area.

Carolina heelsplitter (*Lasmigona decorata*)

Federal: ENDANGERED
A qualified mussel expert should conduct surveys for Carolina heelsplitter in appropriate habitat. The species is reported to inhabit small to large streams and rivers. They are usually found in muddy sand, muddy gravel, or mixed sand and gravel near stable, well shaded stream banks. The current range is a very fragmented relict distribution within the known historic range, which included the Catawba and Pee Dee systems in North Carolina. There are no documented populations of this mussel in the project study area.

Cape Fear shiner (*Notropis mekistocholas*)

Federal: ENDANGERED
A qualified fish expert should conduct surveys for this fish species in appropriate habitat. The preferred habitat is clean streams with gravel, cobble, and boulder substrates with pools, riffles, shallow runs and side channels, and pools. Critical habitat has been designated for this species on several multi-mile reaches of the Rocky River, Bear Creek, Deep River and Fork Creek in Chatham, Lee, Moore and Randolph Counties. The Deep River upstream of Moncure within the six-mile study area for segment #19, and the Deep River north of Robbins at the northern edge of the six-mile study area for segment #21 are designated critical habitat areas and contain populations of the shiner.

Roanoke logperch (*Percina rex*)

Federal: ENDANGERED
The Roanoke logperch inhabits low to moderate gradient reaches with riffle, run, and pool sequences on small- to medium-sized rivers. This fish is typically found over clean, coarse sand to gravel and boulder substrates. This species is currently known from four populations in the Roanoke and Nottoway River drainages of Virginia. In the project study area, populations are known from the Nottoway River in Sussex County and a Nottoway River tributary in Dinwiddie County.

Red cockaded woodpecker (*Picoides borealis*)

Federal: ENDANGERED
The RCW uses open old-growth stands of southern pines, particularly longleaf pine (*Pinus palustris*), for foraging and nesting habitat. Slash, pond, or loblolly pines (*Pinus elliottii, P. serotina* and *P. taeda*) will also be utilized if longleaf is not available. The preferred forested stand contains at least 50 percent pine and lacks a thick understory. Cavities are usually located from 12 feet to 100 feet above ground level and below live branches. "Candles can readily identify these trees" a large encrustation of running sap that surrounds the cavity hole. RCWs surveys generally consist of systematic searches for cavities and associated "candles" in open pinewoods habitats or other areas that may contain pine trees over 60 years old. In North Carolina colonies of RCWs have been documented in the project area south of Selma in

Johnston County; north of Harris Reservoir in Wake County; and near the Uwharrie National Forest in southwestern Montgomery County.

Harperella (*Ptilimnium nodosum*)

Federal: ENDANGERED
Surveys for this plant should be conducted in appropriate habitats during the flowering season which begins in May or June and continues until frost. This plant inhabits a narrow, precarious micro-environment within its known range. It requires bare ground such as rock and gravel shoals and margins of swift-flowing reaches of riverine sites in the Mountains or Piedmont, or the exposed edges of intermittent pineland ponds in the Coastal Plain. One population of harperella is currently known in the project area, along the Deep River in Chatham and Lee Counties, North Carolina.

Michaux's sumac (*Rhus michauxii*)

Federal Status: ENDANGERED
Michaux's sumac flowers in June and its seed heads are visible from August to September. Surveys for this plant can be conducted during either time since the plant is readily visible during both seasons. Michaux's sumac grows in dry, open woodlands and forest edges. In the Piedmont region it is usually associated with clayey soils often derived from mafic rock such as Carolina slates or gabbro. Three documented populations in Wake County, North Carolina are within the project study area.

American chaffseed (*Schwalbea americana*)

Federal Status: ENDANGERED
Surveys for American chaffseed should be conducted in appropriate habitats during its flowering season form May to June. It is found on the Coastal Plain in fire-maintained wet savannas and ecotones, and in the Piedmont in grassy openings and swales of relict longleaf pine woods. The preferred open habitats for this shade intolerant species can be fire-maintained or mechanically maintained as in utility rights-of-way. There are no known populations in the project study area.

Conclusions

The analysis of potential impacts on protected species was completed for the entire six-mile wide Study Area Alternatives. In an attempt to quantify impacts on federally protected species, the number of known populations identified within the Study Area Alternatives was counted by species, by alternative. This quantification is presented in Table 4.18. Some species, such as Roanoke logperch, had clusters of identified populations that crossed the width of the six-mile wide buffer area. It was assumed, since no other parameters have been identified at this time, that all of the populations would be impacted to provide a "worst-case" analysis. Efforts would be made, as appropriate, during the Tier II environmental analysis to avoid impacts to populations of protected species.

Table 4.18 Potential Impacts to Known Federally Protected Species Populations Per Study Area Alternative												
Scientific Name	**Common Name**	**Federal Status**	**Study Area Alternatives**									
			A	B	C	D	E	F	G	H	J
Aeschynomene virginica	Sensitive joint-vetch	T	1	1	1	1	1	1	1	1	1
Alasmidonta heterodon	Dwarf wedgemussel	E	3	3	3	4	4	4	4	4	4
Cardamine micranthera	Small-anthered bittercress	E									
Clemmys muhlenbergii	Bog Turtle	T (S/A)		2			2			2	
Echinacea laevigata	Smooth coneflower	E									
Elliptio steinstansana	Tar spinymussel	E							1	1	1
Felis concolor couguar	Eastern cougar	E									
Haliaeetus leucocephalus	Bald eagle	T	20	20	21	21	21	22	20	20	21
Helianthus schweinitzii	Schweinitz's sunflower	E	1	1	5	1	1	5	1	1	5
Helonias bullata	Swamp pink	T	4	4	4	4	4	4	4	4	4
Isotria medeoloides	Small whorled pogonia	T									
Lasmigona decorata	Carolina heelsplitter	E									
Notropis mekistocholas	Cape Fear shiner	E			4			4		4	
Percina rex	Roanoke logperch	E	1	1	1	10	10	10	10	10	10
Picoides borealis	Red cockaded woodpecker	E			2			2	1	1	3
Ptilimnium nodosum	Harperella	E			1			1			1
Rhus michauxii	Michaux's sumac	T	3	3	3	3	3	3	1	1	1
Schwalbea americana	American chaffseed	E									
Total			**33**	**35**	**45**	**44**	**46**	**56**	**43**	**49**	**51**

Source: AG&M, 2001
T=Threatened; E= Endangered

Study Area Alternative A would potentially have the least amount of impacts of known protected species populations, with a count of 33. Study Area Alternative F would potentially have the greatest amount of impacts of known protected species populations. Fifty-six known populations could be impacted in this Study Area Alternative.

The No Build Alternative is expected to have similar impacts associated with planned improvements as discussed in Chapter 2.

This quantification of protected species impacts is only an estimation of impacts based on known previously identified populations. Actual impacts by each alternative could vary significantly. Field surveys conducted during Tier II environmental investigations would provide a more accurate assessment of impacts to federally protected species.

4.2.2 Wild and Scenic Rivers

As stated in Chapter 3, no rivers designated as "wild and scenic" under the auspices of the Wild and Scenic Rivers Act of 1968, occur within the Study Area Alternatives. However, several rivers and streams designated in the National Rivers Inventory are located within the Study Areas. Figure 4.8 illustrates the locations of these rivers in Virginia and North Carolina. Rivers that may be impacted by the proposed SEHSR project are identified in Table 4.19. During Tier II studies, the VDRPT and the NCDOT would coordinate, as appropriate, with the National Park Service to ensure that their comments concerning potential impacts to the rivers are considered in developing any proposed improvements to the rail corridors within the Study Area Alternatives.

SEE FIGURE 4.8

Table 4.19 National Rivers Inventory by Study Area Alternatives	
Study Area Alternative	
A	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Tar River, Eno River, Haw River, Uwharrie River
B	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Tar River, Eno River, Haw River, Uwharrie River
C	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Tar River, Rocky River, Cape Fear River, Deep River, Dutchman's Creek, Pee Dee River
D	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Eno River, Haw River, Uwharrie River
E	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Tar River, Eno River, Haw River, Uwharrie River
F	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Tar River, Rocky River, Cape Fear River, Deep River, Dutchman's Creek, Pee Dee River
G	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Meherrin River, Fishing Creek, Neuse River, Tar River, Eno River, Haw River, Uwharrie River
H	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Fishing Creek, Neuse River, Tar River, Eno River, Haw River, Uwharrie River
J	Rappahannock River, North Anna River, South Anna River, James River, Chickahominy River, Nottoway River, Meherrin River, Fishing Creek, Neuse River, Rocky River, Cape Fear River, Deep River, Dutchman's Creek, Pee Dee River

Source: AG&M, 2001

As detailed in Table 4.19, 10 to 14 rivers listed on the National Rivers Inventory are located in the nine Study Area Alternatives. Review of the six-mile wide buffer areas reveals that Study Area Alternative D is expected have the least number of impacts to these rivers while Study Area Alternative J is expected to have the greatest number of impacts. The type of impacts associated with the nine Study Area Alternatives may vary substantially. Field surveys conducted during Tier II environmental investigations would provide a more detailed assessment of impacts per alternative. These surveys would be conducted as appropriate for the action proposed.

The No Build Alternative would incur similar types of impacts for those existing and planned improvements in the immediate vicinity of the listed rivers. Potential mitigation could include avoidance, right-angle crossings, reduced typical sections, and enhanced aesthetic characteristics of the crossings. Where avoidance is not feasible, mitigation plans would be coordinated with the U.S. Department of Interior.

4.2.3 Wildlife Impacts

A good diversity of species is expected across the Study Area Alternatives, with exception to those that require large-scale contiguous forests. Important habitat areas are present throughout the study areas that offer all the necessary components including food, water, and cover to support a variety of amphibians, reptiles, birds, and mammals. Clearing and conversion of land from forested and agricultural uses to more urban uses eliminates cover and protection for many forms of wildlife. The presence of a number of habitat types and ecotonal areas is beneficial for many species, but the fragmented distribution and smaller relative size of the habitats is detrimental for others that require large expanses of natural communities.

Loss of wildlife habitat is an unavoidable aspect of development. Temporary fluctuation in populations of animal species that utilize terrestrial areas is anticipated during the course of construction. Slow-moving, burrowing, and/or subterranean organisms would be directly impacted by construction activities, while mobile organisms would be displaced to adjacent communities. Competitive forces in the adapted communities would result in a redefinition of population equilibria. The proposed SEHSR project would constitute a barrier to some wildlife utilizing natural communities within the Study Area Alternatives. As a result, some species could either be killed by vehicles or become forage opportunities for other species. Deer, snakes, raccoons, opossums, and small mammals may suffer fatalities or injury as a result of contact with the trains. The proposed SEHSR service and additional freight traffic would further increase these numbers. Longer bridges and larger culverts would be considered, especially in the vicinity of the stream crossings, to accommodate for wildlife movement. The No Build Alternative would incur similar impacts to the Build Alternatives due to habit degradation, destruction, or fragmentation.

Field reconnaissance, appropriate, would be conducted during Tier II environmental investigations. A walking survey would determine natural resource conditions and document natural communities, wildlife, and the presence of protected species or their habitats. Dominant plant species would be identified in each strata for all natural communities encountered. Plant community descriptions would be based on a standardized classification, such as the International Classification of Ecological Communities: Terrestrial Vegetation of the Southeastern United States (Weakley et al., 1998) where applicable. Names and descriptions of plant species would generally follow Harvill et al. (1992) or Radford et al. (1968), unless more current information is available. Surveys for wildlife would include active searching and capture, as well as observing the characteristic wildlife signs, including sounds, tracks, scat, and burrows. Animal names and descriptions would generally follow Conant and Collins (1998), Lee et al. (1980 et seq.), Rohde et al. (1994), and Webster et al. (1985). Scientific nomenclature and common names (when applicable) would be provided for each plant and animal species listed.

4.2.4 Required Permits and Actions

The implementation of the SEHSR program may require several environmental regulatory permits from various state and federal agencies. A list of anticipated required permits is provided below. Subsequent Tier II investigations may reveal additional requirements or specific necessary actions. The Virginia Department of Rail and Public Transportation (VDRPT) and NCDOT would obtain all permits prior to construction, as appropriate.

National Pollutant Discharge Elimination System (NPDES) Permit. Section 402 of the Clean Water Act (CWA) established the NPDES to limit pollutant discharges into streams, rivers and bays. A permit is required for projects involving sewer systems, treatment works, disposal systems, and stormwater runoff resulting in a discharge to surface waters. In Virginia, this program is administered by the Department of Environmental Quality (DEQ) as the *Virginia Pollutant Discharge Elimination System (VPDES)* . Authority: Virginia Code SS 62.1-44.15 through 44.30 and Virginia Administrative Code 9 VAC 25-30-10 et seq. The State of North Carolina administers the national NPDES program through the North Carolina Division of Water Quality (DWQ), Department of Environment and Natural Resources (NCDENR). Authority: North Carolina General Statute 143, Article 21, Part 1.

In Virginia, stormwater runoff is regulated by three separate state programs managed and coordinated by the DEQ, the Department of Conservation and Recreation and the Chesapeake Bay Local Assistance Department. The three programs include the federal CWA, the Virginia Storm Water Management Act, and the Chesapeake Bay Preservation Act. Separate requirements beyond the VPDES program may be authorized under these separate programs.

A permit must be obtained from the Virginia Marine Resources Commission (VMRC) to build, dump or otherwise trespass upon or over, encroach upon, take or use any material from the beds of the bays, ocean, rivers, streams or creeks within the jurisdiction of Virginia. In addition, the VMRC is responsible for managing and regulating the use of Virginia’s tidal wetlands and coastal primary sand dunes in conjunction with Virginia’s local wetlands boards, where established.

In North Carolina, activities within the Neuse River drainage basin and the Tar-Pamlico drainage basin are subject to the *Nutrient Sensitive Waters Management Strategy* (15A NCAC 2B.0258 has been adopted as published in 15:5 of the North Carolina Register) which includes the *Riparian Buffer Protection Rules* and *Basinwide Stormwater Requirements* adopted by the North Carolina Environmental Management Commission (EMC). Separate requirements beyond NPDES may be authorized under these rules.

Section 401 of the CWA. The CWA requires any applicant for a federal license or permit for any activity that may result in a discharge into navigable waters to obtain a certification that the discharge will not adversely affect water quality from the state in which the discharge will occur. Section 401 requires certification by the state that prospective federal permits comply with the state’s applicable effluent limitations and water quality standards. No federal permit is issued until such certification is obtained. In Virginia, this certification is called the *Virginia Water Protection Permit*, and in North Carolina, it is referred to as the *Water Quality Certification*. A 401 certification is required in conjunction with a U.S. Army Corps of Engineers Section 404 Permit. Authority: Virginia Code SS 28.2-1200 through 28.2-1400 and North Carolina General Statute 143, Article 21, Part 1.

Section 404 of the CWA. Under Section 404, the U.S. Army Corps of Engineers regulates the discharge of dredged or fill material into "Waters of the United States" through the Section 404 Permit Program. "Waters of the United States" are defined to include all wetlands, lakes, intermittent streams, etc., so long as the degradation of such waters could affect interstate commerce. Also under the Section 404 Nationwide Permit System, the Corps issues "general' or "regional" permits for specified categories of activities involving fill that will have minimal adverse effects. Issuance of a permit first requires that impacts to wetlands be avoided or minimized through a "sequencing" process, which refers to avoidance, minimization, and compensatory actions, as stipulated in the *Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines* (February 1990). Authority: Federal Water Pollution Control Act of 1972 and Section 404 of the Clean Water Act of 1977. Implementing regulations are provided in 33 CFR Part 323.

Section 404 Permit Review. The U.S. Fish and Wildlife Service (FWS) is responsible for administering the Endangered Species Act of 1973, as amended. This responsibility includes review of all Section 404 permit applications to determine a project's impact on fish and wildlife resources, including federally protected species. The FWS provides recommendations to the COE on how the project could avoid or minimize impacts to fish and wildlife and their habitat. Authority: Fish and Wildlife Coordination Act, as amended.

Burning Permit. A permit is required in the North Carolina portion of the project area to start a fire within 152 meters (500 feet) of woodlands under the protection of the North Carolina Division of Forest Resources. Thirty-day permits are typically issued for highway projects. Authority: North Carolina General Statute 113, Article 4C, Subsection 60.21-60.31. A similar permit is not required for Virginia.

4.3 Impacts to the Human Environment

4.3.1 Socioeconomic Impacts

4.3.1.1 Community Impacts

Assessment of community impact is a qualitative and quantitative evaluation of the effects of the proposed Southeast High Speed Rail (SEHSR) program on communities within the Study Area Alternatives. A number of community characteristics are assessed to determine both positive and negative impacts, including:

- Social and Psychological Effects
- Physical Aspects
- Visual Environment
- Land Use
- Safety
- Mobility and Accessibility
- Provision of Public Service
- Economic Conditions, and
- Displacements.

Given the programmatic nature of this environmental document, only a high-level assessment is made of these characteristics and potential impacts. The effects of the No Build Alternative are minimal or non-existent, except where noted.

Methodology

To determine community impacts, a number of sources[1] were used. Most of the collected data available focused on the programmatic level. In some instances, specific information about community concerns and the impacts of the proposed SEHSR program on the Study Area Alternatives was captured, however this information tends to be anecdotal and perceptional, and thus would need further verification using primary data sources.

In general, no significantly negative, and some potentially positive, community impacts were found for the Study Area Alternatives. Table 4.24 provides a summary of the programmatic analysis of community impacts.

Social and Psychological Aspects

Changes in or Redistribution of Populations. Based on current and projected ridership estimates, significant changes in or redistribution of, population is unlikely for those Study Area Alternatives with existing rail lines. However, for Study Area Alternatives A through F, there may be more significant population effects. For example, in the South Hill community, which is not currently served by passenger rail, introduction of high speed rail may result in an increase

[1] Sources included: review and analysis of existing town/city/county master plans; review of local, regional, state, and federal databases for population, demographics, and other relevant community characteristics; review and analysis of safety statistics; capture and review of community concerns expressed at public workshops; and review of community leadership interviews and the public opinion survey.

of population in that community. Detailed estimates of population effects are a complex combination of economic conditions, investment incentives, quality of life factors, transportation accessibility, and a host of other important community elements. The potential for changes in population totals within Study Area Alternatives A through F would need to be further investigated in Tier II.

Quality of Life. Based on community leadership interviews, the public opinion survey, and comments received from spring and summer 2000 public workshops, *quality of life* effects on communities affected by the implementation of the proposed SEHSR program has been assessed positively by community representatives. Eighty-four percent of community leaders interviewed indicated, in their opinion, that their constituents would welcome SEHSR service for reasons ranging from better transportation accessibility to opportunities for community revitalization. From the randomly selected households surveyed in the study areas, about 75 percent of respondents believe high speed rail could reduce traffic congestion on highways and air pollution. Approximately 45 percent of survey respondents believe the SEHSR service could help revitalize the downtown areas of their community. Comments received from public workshops tended to focus on specific issues and concerns rather than quality of life issues as a whole. At public workshops, two of the more frequently discussed issues related to community impacts were noise/vibration and safety.

Community Cohesion and Interaction. Types of data typically collected in an analysis of community cohesion and interaction include whether or not residents have relatives living in a community; if families have been in a community for generations; and the existence of informal social-support networks. For those Study Area Alternatives that contain existing rail lines, communities could potentially be affected. Consequently, changes in population, family composition, and information/social-support networks are relatively unaffected by those with rail lines, due to the pre-existing conditions. Only in those alternatives in which new right of way is likely, would more detailed community cohesion analysis be required during Tier II.

Isolation. Based on conceptual engineering of the Study Area Alternatives, community isolation, separation, or segregation potential impacts would be minimal due to limited new right of way or realignment of existing tracks. Effects of closing grade crossings for safety reasons are discussed below. As the engineering and alignment studies develop in greater detail, Tier II studies would capture the potential community isolation effects and offer sufficient design detail to avoid, minimize, or mitigate the potential negative community effects.

Changes in Social Values . Given that many communities are already near existing rail lines, which have had rail passenger and freight traffic for a number of years, the effects of this project on changes in social values would be minimal.

Physical Aspects

As part of the community impacts assessment, those physical aspects of particular concern to communities are noise/vibration and barrier effects.

Sound and Noise Vibration Levels. While the effects of this project on changes in sound/noise vibration levels would be minimal given that many communities are already near existing rail lines, there are several Study Area Alternatives that have sensitive receptors (e.g., churches, schools, parks, community facilities) located close to the existing tracks. For the No Build Alternative there will be an increase in the frequency of rail traffic and subsequent noise and vibration effects due to this increased traffic. Table 4.20 illustrates the number of potentially impacted sensitive receptors for each Study Area Alternative. The table shows that Study Area

Alternative J has potentially the least amount of sound/noise impact, while Study Area Alternative B has potentially the most amount of impact.

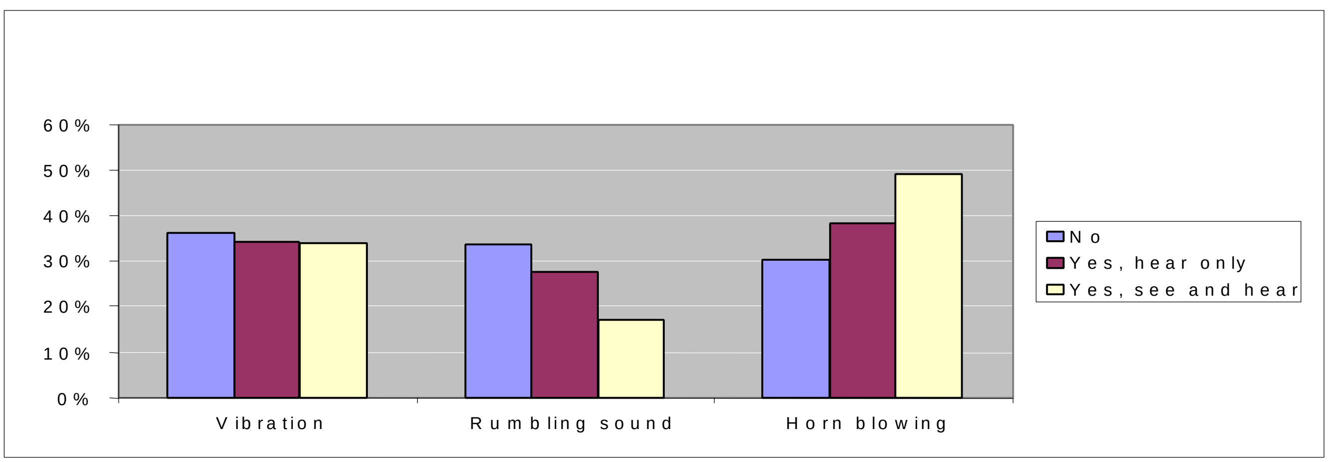
Table 4.20
Potential Sensitive Receptors for Sound and Noise and Vibration Levels for Study Area Alternatives

Study Area Alternative	Sensitive Receptors within 100-150 feet of Alternative	Sensitive Receptors within 300 feet of Alternative	Sensitive Receptors within 500 feet of Alternative	Total Sensitive Receptors
A	141	6	10	157
B	141	9	11	161
C	141	4	3	148
D	135	7	11	153
E	135	10	12	157
F	135	5	4	144
G	135	6	10	151
H	135	9	11	155
J	135	4	3	142
Average (including Northern Line)	137.0	6.6	8.3	152.0

Source: Arcadis Geraghty & Miller, Inc., 2000. Summarized by SAI C, 2001.

In addition, community leadership interviews, comments received from public workshops, and public opinion survey respondents expressed an overall concern about the impact of noise and vibration near rail lines. Figure 4.9 illustrates the concerns of survey respondents regarding noise and vibration.

Figure 4.9
Greatest Expected Nuisances Issues from SEHSR Alternatives For Sound and Noise Vibration Levels Based On Public Survey



Source: SAIC, 2000.

Barrier Effect (Dividing a Community). The impact of barrier effect would not be significantly greater than what exists with the current configuration of the rail lines and safety equipment. A possible exception is the community effects of the closure of grade crossings for safety improvements. However, these closures include enhancements to alternative travel routes to minimize the effects of barrier and isolation due to grade-crossing closures.

Visual Environment

Aesthetics. The predominant community aesthetic impacts of the proposed SEHSR program are on the rail stations. Some of the existing station facilities have fallen into disrepair, serve no public function, or create an eyesore that is detrimental to public safety and aesthetics. The impact of SEHSR service on community aesthetics would be a neutral or positive. This is based on No Build Alternative improvements that involve on-going redevelopment efforts at downtown rail stations in such locations as Richmond, Virginia, and Henderson and Greensboro, North Carolina; restoration on historic passenger stations in Salisbury, Wilson, Rocky Mount, Selma and High Point, North Carolina; and station improvements in Burlington, North Carolina.

Compatibility with Community Goals. Several communities have indicated in their master plans potential opportunities and goals for downtown revitalization. Supporting these community goals are needed improvements to transportation services and facilities. Based on community leadership interviews and the public survey, respondents indicated the proposed SEHSR program positively supports community goals by providing an alternative form of transportation, increasing the potential for local business and enhanced tax revenue base, and offering opportunities for restoration and enhancement of rail stations and surrounding public/private facilities and properties.

Land Use

Two aspects of land use planning and the SEHSR program may affect communities.

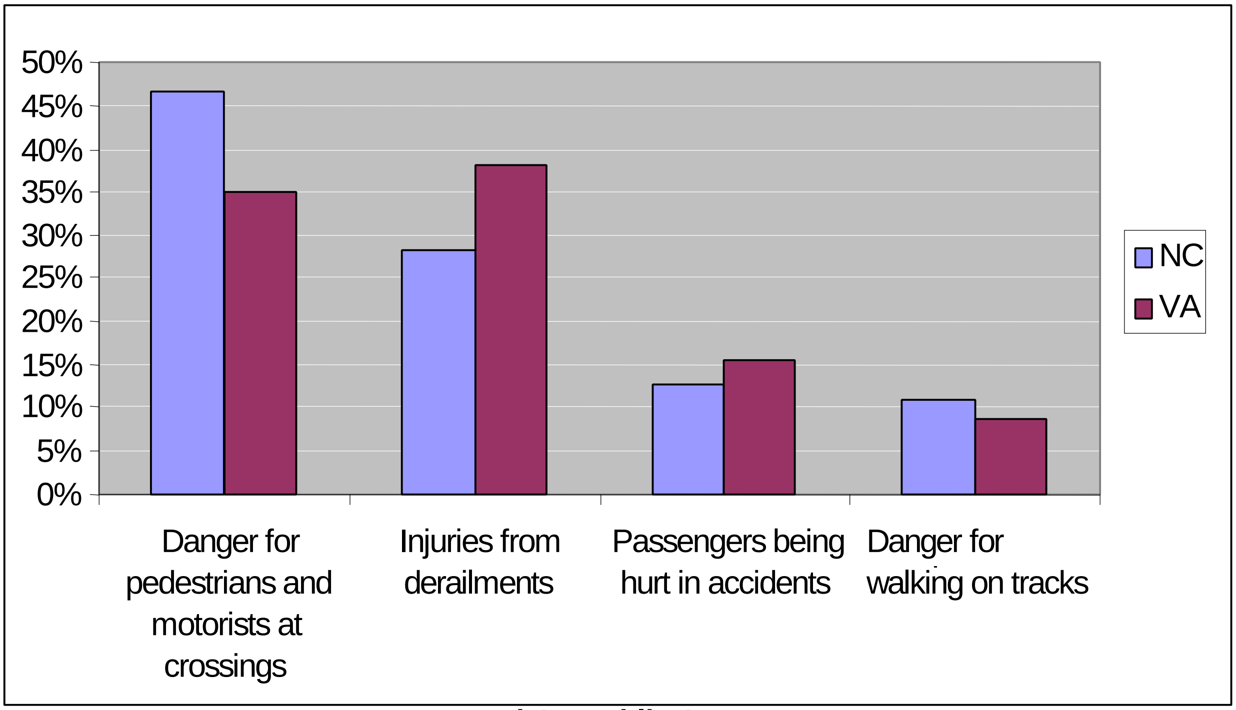
Land Use Patterns Affecting Communities. Given that many communities are already near existing rail lines and have had rail traffic for a number of years, the effects of the SEHSR program on changes in land use patterns would be minimal, except when called for in approved redevelopment or rezoning plans such as the rejuvenation or addition of a station.

Compatibility with Plans Affecting Communities. Since station redevelopment, rail line realignment, and grade crossing studies are conducted with local and state agency planners to ensure compatibility and coordination, no adverse impacts are anticipated.

Safety

Respondents to the public household survey were asked about safety issues related to the proposed SEHSR program. Between 35 to 45 percent of respondents expressed concern for motorist and pedestrian safety at grade crossings. Between 28 to 38 percent of respondents cited injuries due to derailments as the next most significant community safety issue. Figure 4.10 summarizes the four top community safety issues from the public survey.

Figure 4.10
Greatest Expected Community Safety Concerns



Based On Public Survey

Source: SAIC 2000.

Grade Crossings. North Carolina has 4,400 public and 5,000 private crossings along 3,000 route miles. In 1999, there were 109 railway-highway grade crossing collisions, resulting in 99 collisions, 3 deaths, and 30 injuries. These figures rank North Carolina fourth in the nation in number of crossings per mile and 18th in the nation for railway-highway grade crossing accidents. In 2000, Virginia had 35 vehicle/train crashes, resulting in one fatality and 25 injuries. Virginia currently has 69 percent of the 2,050 public at grade crossings equipped with automatic warning systems as compared to 38 percent nationwide.

Improvements to grade crossings are in response to documented needs for increased safety. Safety improvements are currently underway in North Carolina and Virginia to consolidate and close crossings where possible, separate some of the dangerous intersections via bridges and underpasses, and install conventional and enhanced traffic control devices at all remaining crossing to separate all vehicular and rail traffic. The effect of these grade crossing closures is enhanced community safety. Under the No Build Alternative planned improvements at grade crossings will continue, resulting in improved public safety. Under the Build Alternatives these improvements would continue as appropriate. Comments received at public workshops and public opinion survey respondents expressed an overall concern about the safety of train speeds and adequate crossings for pedestrians and cars.

Mobility and Accessibility
Mobility and accessibility effects in a community are influenced by two factors: closure of grade crossings and multi-modal/intermodal services. Participants in the workshops were the most frequent source of comments on the topic of closure of grade crossings.

Mobility and accessibility in a community are usually negatively impacted as a result of closure of grade crossings due to longer travel routes. However, since each potential closure of a grade crossing is subject to an extensive review and analysis of environmental, community, and transportation effects, the final decision to close a grade crossing represents a balanced consideration of these factors by local and state officials. The effect of these grade crossing closures is enhanced community safety.

Mobility and accessibility effects in communities are impacted positively by the SEHSR program due to increased opportunities for multi-modal and intermodal travel. The introduction of passenger rail service in a community has the effect of enhancing access and mobility through pedestrian and bicycle facilities, public transportation and paratransit connectivity, intermodal freight opportunities, and vehicular access.

Provision of Public Services

Based on community leadership interviews and comments from the public workshops, two public services concerns emerged:

Use of public facilities. SEHSR service has a direct and indirect effect on the use of public facilities. The SEHSR program can have positive community effects by facilitating the use of, or providing the opportunity for, public facilities, such as rail stations, public facilities near stations such as parks or public parking/storage sites, and interconnecting public transportation services (as a result of induced demand). SEHSR service can also positively impact the use of public services indirectly by alleviating congestion on other public or quasi-public facilities (e.g., airports, highways, and other forms of intercity public travel).

Displacement of public facilities. Relocation or displacement of public facilities or community centers would be temporary, resulting from short-term actions during reconstruction and renovation.

Economic Conditions

In general, participants at the public workshops expressed concern about impacts to property values. Economic condition impacts related to specific communities would be investigated in Tier II, as appropriate.

Displacements

The issue of displacement was not a widespread concern, based on the public survey, discussions with community leaders, and the public workshops. Survey respondents were about equally split regarding the positive and negative impacts of business and residential displacements due to the need for new tracks. At public workshops, displacements were rarely mentioned, and when discussed were site specific rather than a community-wide concern. Site-specific displacement impacts related to community impacts would be investigated in Tier II, as appropriate.

	Likelihood of Impact	Scale or Severity
Social and Psychological	Moderate to high.	Potential positive affect on quality of life. Additional investigation needed for population changes/ redistribution, community cohesion and interaction, isolation, and changes in social value.
Physical Aspects	Low to high; will vary by location.	Barrier effect would impact no more than current configuration. Sound and noise vibration impact would vary by location.
Visual Environment	Moderate to high.	A potential positive impact for aesthetics of rail stations and compatibility with community plans to redevelop.
Land Use	Low to moderate.	Minimal impact on land use patters with much of trackway currently existing. Compatibility with plans may vary location.
Safety	Low to moderate.	Grade crossing improvements already underway – potential positive impact on safety, may also affect mobility and accessibility.
Mobility and Accessibility	Low to high, will vary by location.	Partly a function of safety. Grade crossing improvements may create longer travel routes. Station locations may provide increase mobility and accessibility.
Provision of Public Service	Low	While relocation or displacement of public facilities or community centers would be a temporary, short-term action during reconstruction and renovation, further identification of potential sites would need to be investigated in Tier II.
Economic Conditions	Low to moderate	Specific economic condition impacts related to community impacts would need to be investigated in Tier II.
Displacement	Low	Specific displacement impacts related to community impacts would need to be investigated in Tier II.

Source: SAIC, 2001.

Environmental Complexity and Community Impacts

Potential community impacts were also evaluated as a component of "environmental complexity" in the *Study and Modal Area Alternatives Report* [2]. Environmental complexity is the level of difficulty required to avoid or minimize environmental impacts in a certain area. It does not attempt to evaluate any specific resource, but rather it identifies areas that will require creativity and resources in order to minimize potential impacts. Sites for environmental complexity were evaluated for each Study Area Alternative and three levels of complexity were assumed: Low, Moderate, and High.

Moderate areas of complexity are those that would require creative avoidance and minimization techniques which may add to the overall construction effort for that segment, but when done would not generate significant public and agency concern.

[2] Prepared by Carter & Burgess for the North Carolina Department of Transportation, November 2000.

High areas of complexity are those that would require creative avoidance and minimization techniques and add substantially to the overall construction effort for that segment, and would potentially generate significant public and agency concern.

All other areas were considered low areas of environmental complexity. Segments cited for potential community impacts were summarized by Study Area Alternative for moderate and high areas of environmental complexity. Table 4.21 shows that no one alternative is significantly more environmentally complex in terms of potential community impacts.

Table 4.22
Potential Community Impacts as a Component of Environmental Complexity

Study Area Alternative	Number of Sites with Potential Community Impacts in Areas of High Environmental Complexity	Number of Sites with Potential Community Impacts in Areas of Moderate Environmental Complexity	Total Number of Sites with Potential Community Impacts in Areas of Environmental Complexity
A	2	3	5
B	3	3	6
C	3	2	5
D	1	3	4
E	2	3	5
F	2	2	4
G	2	2	4
H	3	2	5
J	3	1	4
Average (including Northern line)	**2.3**	**2.3**	**4.6**

Source: Arcadis Geraghty & Miller, Inc., 2000. Compiled by SAIC, 2001.

Conclusions

The effects of the No Build Alternative will be due to normal growth. For the No Build Alternative, there will be an increase in the frequency of rail traffic and subsequent noise and vibration effects due to this increased traffic.

The impact of both the Build Alternatives and the No Build Alternative on community aesthetics would be neutral or positive: improvements and on-going redevelopment efforts at downtown rail stations in such locations as Richmond, Virginia, and Henderson and Greensboro, North Carolina; restoration on historic passenger stations in Salisbury, Wilson, Rocky Mount, Selma and High Point, North Carolina; and station improvements in Burlington, North Carolina.

The effect of grade crossing closures is enhanced community safety. Under the No Build Alternative planned improvements at grade crossings will continue, resulting in improved public safety. Comments received at public workshops and public opinion survey respondents expressed an overall concern about the safety of train speeds and adequate crossings for pedestrians and cars. These concerns are consistent across all Study Area Alternatives.

4.3.1.2 Environmental Justice Impacts

Methodology

Based on a review of Environmental Justice regulations and guidance, the following methodology was developed to allow for a preliminary assessment of Environmental Justice issues. This methodology allows for the detailed calculation and analysis of the location and count of minority populations and the geographic distribution of low-income households. The unit of analysis is at the Census Block Group level; mainly because the resolution of these data sets is commensurate with the overall Tier I study objectives. Moreover, the Census Data is comprehensive, demographic, primary source data and is readily available for all segments of the study area by Census Block (for race and ethnicity) and for Census Block Group (for income). The 1990 Census Data sets are the most recently available. The 1999 population estimates and 2004 projections were calculated from the 1990 data sets using forecasting factors developed by CACI Marketing. 2000 Census information will be utilized in the preparation of the final Tier I Environmental Impact Statement.

An impact area was defined by creating a 150-foot buffer on both sides (300-foot total buffer) of the centerline of the existing rail line rights-of-way located in the Study Area Alternatives. One hundred fifty feet was the distance believed to cover those populations that would be most affected by possible visual and/or noise and vibration impacts. Population and average population density are shown in Tables 4.23 and 4.24.

Table 4.23
Population in the Impact Area (300-Foot Total Buffer) for Each Study Area Alternative

Study Area	Population 1990 (300 ft)	Population 1999 (300 ft)	Population 2004 (300 ft)
A	19757	22757	26504
B	21985	25186	29033
C	12653	14756	18009

Table 4.23 Population in the Impact Area (300-Foot Total Buffer) for Each Study Area Alternative			
	Population	Population	Population
D	23905	27124	30982
E	26133	29553	33511
F	16732	19057	22423
G	23166	26272	30057
H	25394	28701	32586
J	15993	18205	21498

Source: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992; and 1999 population estimates and 2004 projections, CACI Marketing. Compiled by SAIC, 2000.

Table 4.24 Average Population Density in the Impact Area (300-Foot Total Buffer) for Each Study Area Alternative			
Study Area Alternative	Ave. Pop. Density 1990 (300 ft)	Ave. Pop. Density 1999 (300 ft)	Ave. Pop. Density 2004 (300 ft)
A	5352	5928	6304
B	5338	5895	6261
C	4795	5361	5747
D	5547	6070	6426
E	5515	6028	6378
F	5348	5805	6157
G	5480	6001	6354
H	6770	5964	6311
J	5173	5648	5995

Source: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992; and 1999 population estimates and 2004 projections, CACI Marketing. Compiled by SAIC, 2000.

A series of GIS analyses were conducted using the Study Area Alternatives and available census and forecast data. For each of the route combinations, calculations were made at the Census Block Group (CBG) level. Through a relatively straightforward procedure of summing the minority populations in the CBG and then factoring those populations with an area proportional to the 300-foot buffer zone, an estimate of the minority and low-income household populations was derived.

Minority Population Findings

Table 4.25 delineates the estimated minority population by Study Area Alternatives in the 300-foot buffer area for 1990, 1999, and 2004. A high percentage of minority populations, compared to state averages, are concentrated in the Study Area Alternatives. Forty-two percent of the Study Area Alternatives' population is minority compared to the broader, statewide population demographics of 27 percent minority population in North Carolina and 28 percent minority population in Virginia. The percentage of low-income households is approximately equal to the statewide averages. Forty-one percent of the of study area households are classified as low-income compared to the broader statewide statistics of 38 percent low-income households in North Carolina and 44 percent low-income households in Virginia.

Study Area Alternative C has the lowest number of minority community members ; Study Area Alternative E has the highest number. The percentage of minority communities within the 300-foot buffer area is relatively consistent at approximately 40 percent.

To determine environmental justice impacts requires the application of the criteria from the CEQ guidance document on Environmental Justice (Section 1-1, Implementation of EO 12898). Minority populations should be identified where either:

- The minority population of the affected area exceeds 50 percent or,
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

A conclusion from Table 4.25 is that a relatively large percentage (on average 40 percent) of minority communities comprise the total population within a 300-foot buffer of the Study Area Alternatives. While a large percentage of the population is composed of minority communities, the minority population, on average, does not exceed 50 percent, the first CEQ threshold criteria. However, when comparing the 40 percent estimate for the minority populations with comparable statewide averages, there does appear to be a significant difference or meaningfully greater population percentage compared to the general population. For Virginia, the minority population in the buffer of the study area exceeds the general population average by 50%. In North Carolina the minority population in the buffer of the study area exceeds the general statewide population average by 55 percent. Consequently, the application of the second CEQ threshold criteria does raise concerns about potential environmental justice impacts.

Given the variation of the minority population in the Study Area Alternatives, it is not possible to use only Environmental Justice criteria to eliminate or select a preferred Study Area Alternative, based on Table 4.25.

Table 4.25
Estimated Minority Population by Study Area Alternative in the 300-Foot Buffer Area 1990, 1999, and 2004

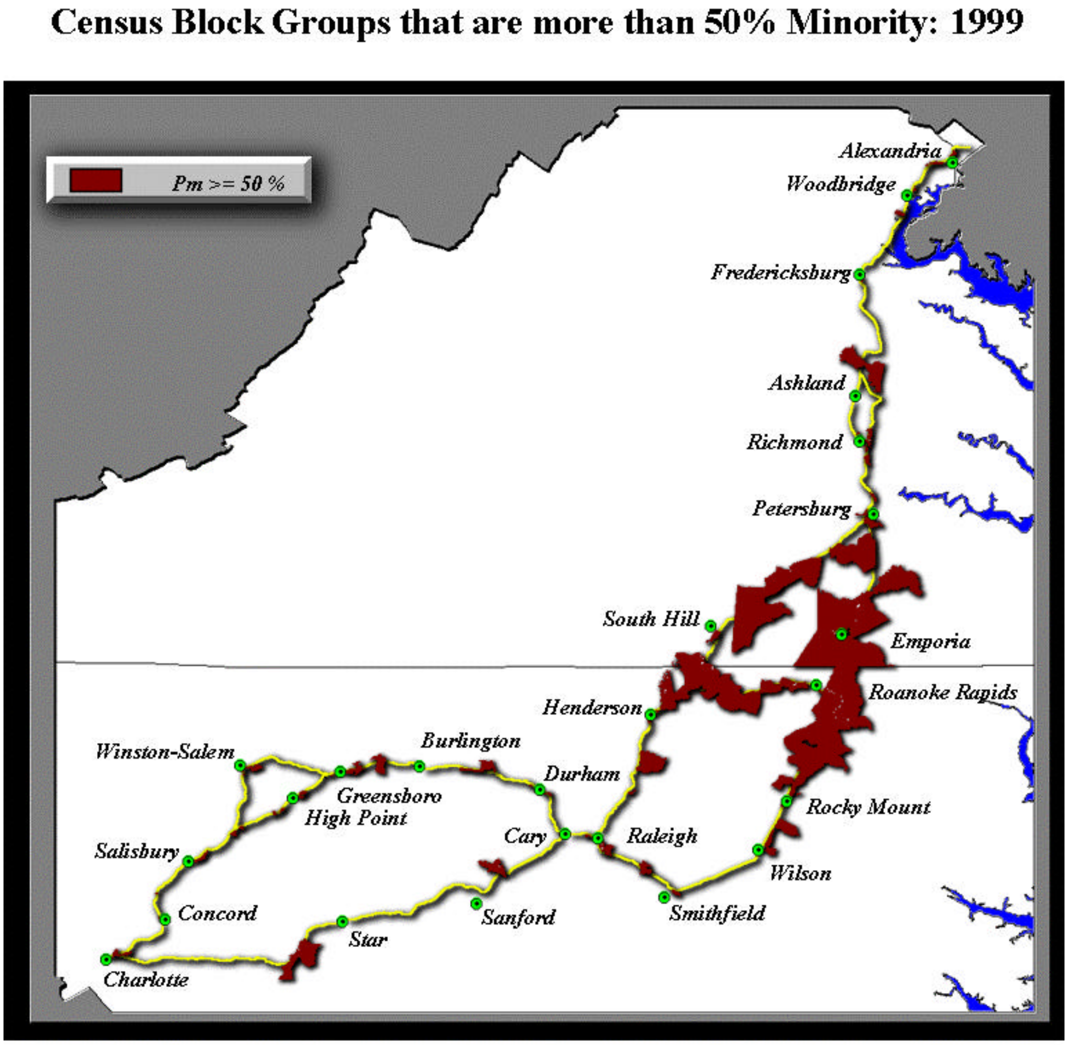
Study Area Alternative	Minority Pop 1990	Percent Minority Pop 1990	Minority Pop 1999	Percent Minority Pop 1999	Minority Pop 2004	Percent Minority Pop 2004
A	7379	37	9322	41	10325	39
B	8174	37	10221	41	11263	39
C	4433	35	5889	40	6632	37
D	10130	43	12264	45	13363	43

Table 4.25 Estimated Minority Population by Study Area Alternative in the 300-Foot Buffer Area 1990, 1999, and 2004						
Study Area Alternative	**Minority Pop 1990**	**Percent Minority Pop 1990**	**Minority Pop 1999**	**Percent Minority Pop 1999**	**Minority Pop 2004**	**Percent Minority Pop 2004**
E	11990	46	13153	44	14302	43
F	7205	43	8785	46	9625	43
G	9179	40	11175	42	12220	41
H	9975	39	12064	42	13158	41
J	6190	39	7696	42	8482	40
Average (including Northern Segment)	8302	40%	10450	43%	7294	40%
Standard Deviation	2298	5%	2368	4%	2511	4%

Source: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992; and 1999 population estimates and 2004 projections, CACI Marketing. Compiled by SAIC, 2000.

Table 4.25 provides a starting point for the further analysis of the effects from the proposed SEHSR program on minority populations in the Study Area Alternatives. Additional analyses were conducted to examine those Census Block Groups in which 50 percent or more of the population is minority. Rather than tabulate these extensive findings, the results are illustrated in Figure 4.20 for year 1999. This analysis yields somewhat more refined and different conclusions from those that could be inferred from the Table 4.25 findings. In this case, minority communities are distributed along various route combinations with significant (greater than 50 percent) minority communities. Given the resolution of the map, these appear as large blocks due to the resolution and blending of the graphical depiction of the individual Census Block Groups in certain segments of the maps. These minority populations are especially prominent in the southern Virginia and northern North Carolina.

Figure 4.11
Minority Populations At or Greater than 50 Percent of the Population Within the Census Block Group For A 300 Foot Buffer Area



Source: 1999 population projections, CACI Marketing. Compiled by SAIC, 2000.

Low-Income Population Findings

The definition used for a low-income household is one whose self-reported income is less than 80 percent of the median household income for its county. Low-income populations are thus groups of low-income households. Percent distributions of low-income households by Census Block Group were mapped. The map legends provide various percent levels of low-income households for 1990, 1999, 2004, thus offering a preliminary sensitivity analysis.

To arrive at these percent distributions, an 80 percent median household income was calculated for each county to ascertain the low-income threshold for each county. A calculation was made of the number of households in each Census Block Group at or below this threshold. This was then divided by the total number of households in the Census Block Group and converted to a percentage. This series of calculations was performed on 1990 Census Data and 1999 and

2004 projected data. The number of low-income households by Study Area Alternative is shown in Table 4.26.

Table 4.26
Estimated Low Income Households in the 300-Foot Buffer Area
1990, 1999, and 2004

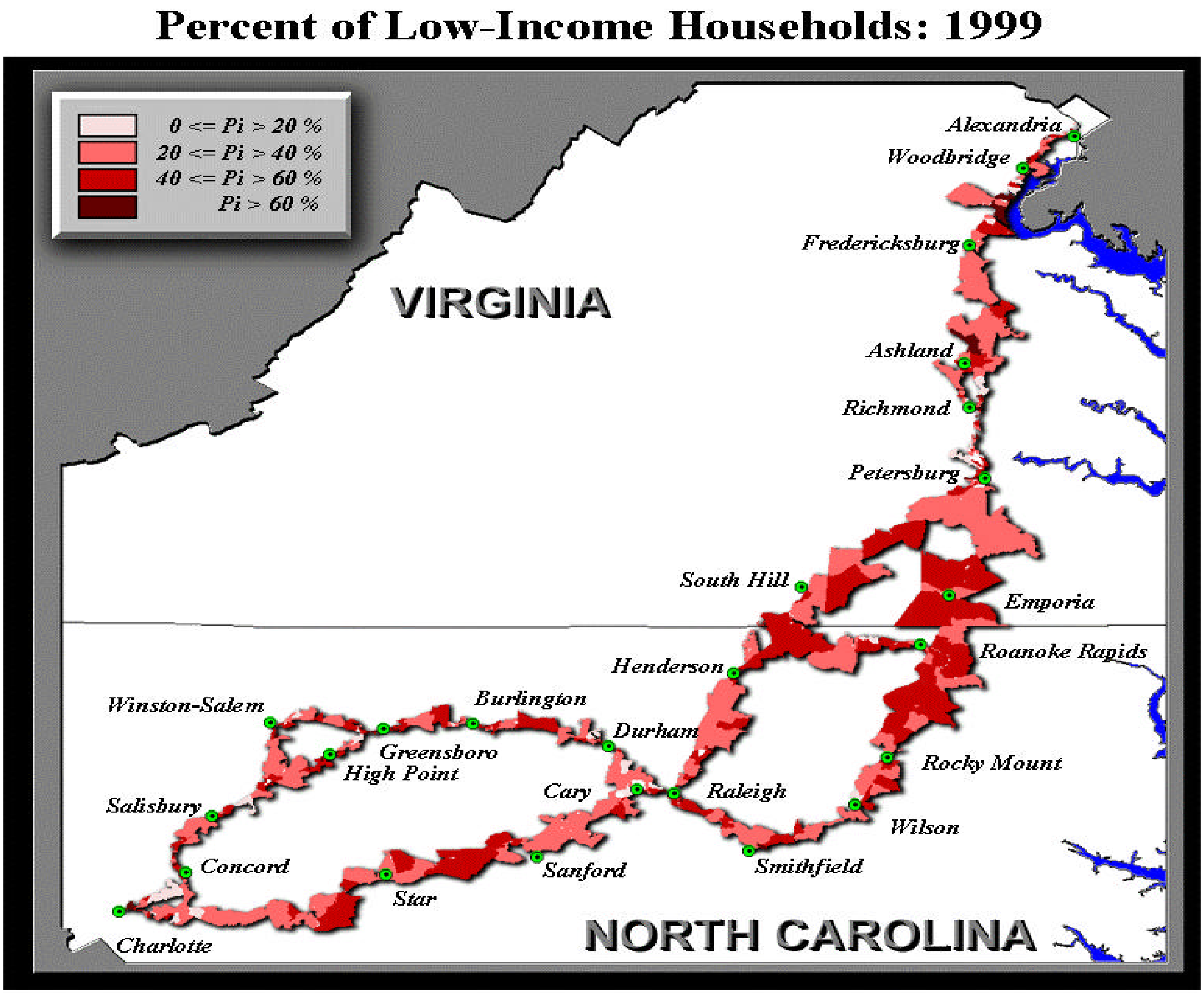
Study Area Alternative	LIH 1990 (300 ft)	Percent LIH 1990 (300 ft)	LIH 1999 (300 ft)	Percent LIH 1999 (300 ft)	LIH 2004 (300 ft)	Percent LIH 2004 (300 ft)
A	3807	50	4225	48	4547	47
B	4205	50	4646	48	4989	48
C	2201	46	2521	44	2738	43
D	4625	51	5051	49	5395	48
E	5023	51	5472	49	5837	48
F	3005	48	3334	46	3973	46
G	4430	50	4849	48	5176	47
H	4828	50	5270	48	5617	47
J	2809	46	3132	45	3354	44
Average (including Northern Segment)	3881	50%	4278	47%	4580	47%
Standard Deviation	1073	4%	1139	3%	1206	3%

Source: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992; and 1999 population estimates and 2004 projections, C   ACI Marketing. Compiled by SAIC, 2000.

Table 4.26, like Table 4.25, presents a summary of the low-income households. The averages are somewhat widespread across the Study Area Alternatives, as reflected in the standard deviations. Consequently, Study Area Alternative C, J or F, which contain some of the lowest counts of low-income households, would be preferable to the Study Area Alternatives, if only using the low-income household criteria.

Similar to the analysis of the minority population, an analysis was conducted on the relative percentage of low-income households in the Study Area Alternatives. These findings are illustrated in Figure 4.12 in which various percentages of low-income households are depicted graphically along the Study Area Alternatives. A review of this figure indicates there is no clearly superior Study Area Alternative.

Figure 4.12
Low-Income Households Within the Census Block Group For A 300 Foot Buffer Area Within the Study Area Alternatives



Source: 1999 population projections, CACI Marketing. Compiled by SAIC, 2000.

Two weaknesses, but acceptable shortcomings, exist with the above approach for low-income household calculations. First, while the definition of low-income has been applied to other environmental justice analyses for the EPA, it does not satisfy the explicit Environmental Justice guidance that defines low-income as “at or below the Department of Health and Human Services *poverty guidelines* .” This Federal guidance definition of low-income was not used in this calculation because of the lack of household size data for 1999 and 2004 datasets. Second, the comparison of the potentially affected populations within the census block groups to the next largest geographic area (County, Census Tract, State, Study Area— that is, multiple choices were possible) runs the risk of either failing to identify potentially affected population groups or identifying more populations than necessary to accomplish the assessment of “disproportional.”

To address these two noted weaknesses, an additional identification of poverty populations was performed.

Poverty statistics from 1990 Census Data STF3A files were obtained. All persons below the poverty threshold were counted and the percent population below the poverty threshold for each Census Block Group was calculated. These results are illustrated in Figure 4.12, Percent of Individuals in Poverty. These poverty statistics use the Bureau of the Census Series P-60 data on income and poverty and thus address the implementation guidance of EO 12898. This technique also avoids the potential bias for over-counting or undercounting low-income populations because the Census Block Group data is not adjusted at the county level. However, data sets only exist for 1990.

Given the resolution of the map, the low-income populations are especially prominent in selected Study Area Alternatives. These findings may have an effect on Study Area Alternative selection based only on environmental justice factors.

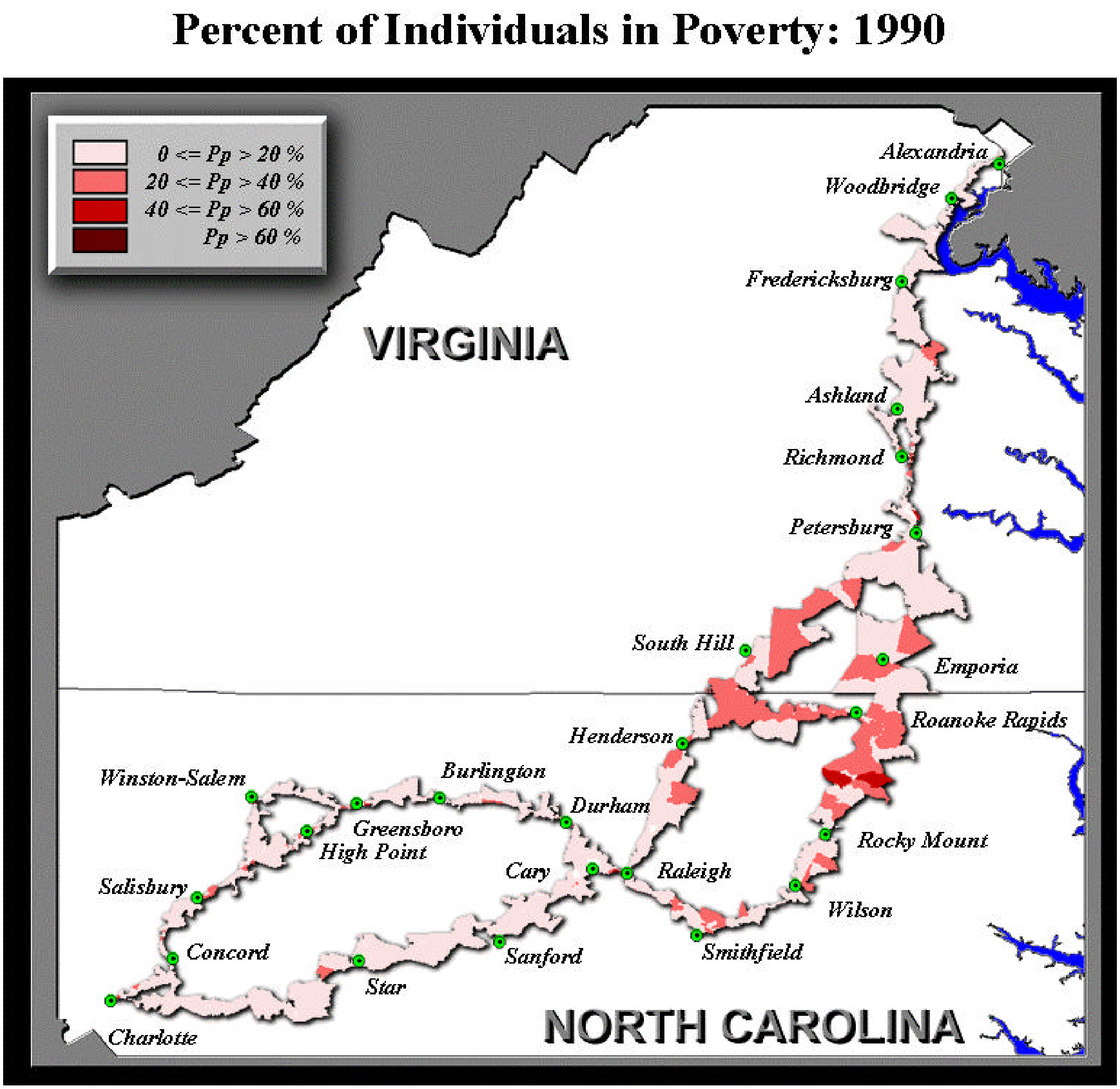
Conclusions from Minority and Low-Income Population Findings

The analysis of minority and low-income populations has yielded some insights on the relative scale and scope of environmental justice issues. It does not give sufficient insight to either select or eliminate a Study Area Alternative, based solely on environmental justice criteria.

At this point in the Tier I analysis, and given the methodological assumptions and preliminary GIS findings, it is premature to conduct detailed assessments of disproportionately high and adverse impacts to low income and minority populations. While this assessment focused on identifying those locations within the Study Area Alternatives that could potentially be adversely affected, these same populations or selected communities may actually support the project, as they could perceive the positive economic development impacts and improved mobility options for their communities. The project is expected to generate economic benefit within communities along the rail corridor. These positive benefits were not factored into this GIS analysis. Furthermore, Amtrak statistics show that current passenger rail service is disproportionately utilized by low-income and minority populations. It is reasonable to conjecture that these population groups would continue to use and benefit from enhanced passenger rail service in the Study Area Alternatives. As the community leadership interview findings indicate, these populations may welcome the project in their communities.

The No Build Alternative would have similar types of potential impacts caused by the completion of existing and planned projects in all modes. However, the No Build Alternative would not have the potential positives associated with increased transportation benefits due to use by minority and low income populations.

Figure 4.13
Percent of Individuals in Poverty



Source: Census of Population and Housing, 1990: Summary Tape File 3, prepared by the Bureau of the Census, 1992. Compiled by SAIC, 2000

Environmental Justice Focused Interviews with Key Community Leaders

In order to help identify issues, concerns, and desired outcomes for a given community or underrepresented group, key interviews were conducted with community leaders in each in the study corridor, NCDOT and VDOT representatives, prominent community members, and Internet searches recommended candidates for interviews. Each interview candidate received a package of information on the project, including a personalized letter asking for participation in a location where a public workshop[3] was conducted. Metropolitan Planning Organizations (MPO) telephone interview, the “Time to Act” brochure, a newsletter, and fact sheets. One hundred forty-four information packets were sent.

In general, interviews took no more than thirty minutes to complete. A structured format was used to conduct the interviews. Each interviewee was asked about the major concerns of constituents; support for high speed rail; community involvement on similar projects; and public participation history and recommendations. Sample questions included:

- Would you anticipate that your constituents or community members would welcome high speed rail or be opposed to the project?
- Has your community been involved with similar types of projects with state and/or local officials involving land-use changes, community impacts, or other changes in living conditions or circumstances?
- How would you rate your constituents’ or community members’ awareness of the planning process?
- Would you recommend additional education about the project in this community?

In total, 39 interviews were conducted, an average of 1.5 interviews per meeting location. Obtaining willing participants proved to be challenging in many locations. In most cases, numerous repeated calls (at least four per interviewee) were not returned; the contact person had changed; or information packets were not received. As a result, the original plan estimate of 15 interviews per location was revised to two calls per location.

Interviewed individuals self-assessed the representation of more than 150,000 constituents collectively within the study area. In several cases interviewees represented more than one constituency group. The following are examples of the types of organizations represented:

- Homeowners and Resident Associations
- Civic/Public Interest Groups
- Religious Groups
- Advocacy Groups

Community Involvement in Similar Projects

To assess past levels of public involvement in planning projects, interviewees were asked if their communities had been involved in similar types of planning for transportation projects. Responses were closely split between yes (41 percent) and no (38 percent). Five respondents (13 percent) did not know and 3 interviewees (8 percent) did not answer the question. Of those that responded yes, many cited involvement in highway, railroad, traffic, and transit projects; but some also noted that constituent involvement has been limited. Some of those who responded in the negative provided reasons for lack of involvement:

- the city is too small;

[3] Twenty-six public workshops were conducted in North Carolina and Virginia from April through June 2000. The primary purposes were to introduce the SEHSR project to the community, understand local/regional community concerns, introduce the project team, and provide points of contact for future interaction.

- participation is very individualized and there are no joint efforts to involve the community; and
- people are typically not involved due to a combination of lack of interest and opportunity.

Interviewees were then asked if their communities had been involved in any type of project with state and/or local officials involving land-use changes, community impacts, or other changes in living conditions or circumstances. Interviewees were more likely to answer affirmatively in this circumstance: 49 percent responded yes; 21 percent responded no; 15 percent did not know; and 15 percent did not answer the question. The most common types of projects cited were housing, historic districts, downtown revitalization, and parks.

Major Community Concerns and Support of High Speed Rail

When asked about the major concerns of constituents, interviewees most often cited local transportation issues or community-wide issues. Local transportation issues tended to include lack of affordable transportation; traffic congestion; and the need for better transportation services for the elderly and home-bound, improved public transit systems, better highways, and more direct routes. Community-wide issues included crime, maintaining the standard of living, neighborhood deterioration, overcoming language barriers, finding and keeping jobs, and basic survival skills. Only five interviewees mentioned concerns directly related to rail transportation.

The concerns with rail transportation included:

- noise near the train tracks;
- re-routing track near river through wetlands and replacing/upgrading rail bridge
- encroachment into African American neighborhoods, splitting up neighborhoods and isolating communities;
- handicapped access to train service (e.g., transportation between rail stations and homes, travel during daylight hours, evening transportation assistance);
- affordability of tickets; and
- increases in taxes to fund the project.

Interviewees were also asked whether or not they believed that their community members or constituents would welcome high speed rail or be opposed to the project. Eighty-four percent of interviewees responded that their constituents would welcome the project. Only two interviewees felt that community members or their constituents would be opposed and noted that opposition would be due to the project cost and lack of use. Four interviewees stated that their community members or their constituents would not have an opinion either way because they would not use the service. Comments from those who believe their community members or their constituents would welcome high speed rail included:

- It would be convenient, a boost for surrounding economy, and a connection to metro areas.
- Connection arteries are very important so that the project benefits the most people.
- We need fast travel; buses are too slow and inconvenient; some people don't care to fly.
- There would be support as long as it makes things better and is cheaper than other means.
- There would be support as long as it would ease some pressure on roads by diverting cars.

Even though they indicated support, several interviewees expressed the concern that there might not be enough people riding high speed rail. In addition, one interviewee suggested that obtaining support might require a great deal of education on the convenience of high speed rail.

4.3.1.3 Economic Impacts

This section assesses the economic benefits that could potentially accrue within the Study Area Alternatives. The addition of the proposed SEHSR service would provide numerous transportation, environmental, and community benefits. An increase in ridership would reduce traffic congestion and dependence on highways and airports, thus adding efficiency to the total transportation system. It is anticipated that the construction and operation associated with the SEHSR program would spur economic activity creating additional jobs; and income and sales that generate additional tax revenues for both Virginia and North Carolina.

Economic Impacts from Construction and Operation

Construction of the proposed SEHSR program between Washington DC and Charlotte NC, could potentially create new jobs for individuals to upgrade the road bed, install signal and safety devices, build frontage/service roads, improve grade crossings, and build bridges to replace grade crossings. Additional jobs - potentially within the Study Area Alternatives – could be created within the manufacturing sector to produce the equipment and devices needed to make these improvements. The additional jobs would increase income, thus affecting the economy of a region.

During construction the economic impact would depend on the location of the firms supplying the labor and materials needed for the project. It is estimated that a high percentage of the new employment during the construction phase would come from within the Study Area Alternatives. Communities along the route will also benefit as construction crews spend money in local hotels, restaurants, and shops.

The impact from expenditures from operation would probably be more concentrated, with the majority of new jobs created in communities that would primarily be served by the proposed service. Ticket agents and other railroad personnel would be located in these communities, and the secondary impacts of their employment will be spread throughout the counties in which the communities are located. Once SEHSR service is in place there would be additional needs such as maintaining the equipment and the track. In North Carolina alone, it has been estimated the SEHSR program would bring $700 million in new state and local tax revenues, $10.5 billion in employee wages over 20 years, over 31,400 new one-year construction jobs, more than 800 permanent new railroad operation positions, and nearly 19,000 permanent full-time jobs from businesses which choose to locate or expand in North Carolina because of the SEHSR service. It can be reasonably assumed that similarly positive benefits would accrue in Virginia.

Changes in Economic Activity

In addition to impacts from direct expenditures on system construction and operation, the proposed SEHSR service would increase the flow of travelers between cities along the route and thus enhance economic activity in those communities with station stops. A ridership projection model developed for the SEHSR service by KPMG estimated current demand and projected future travel between cities along the travel corridor as well as along the entire Atlantic Coast for all modes. Thousands of auto, air, bus and rail travelers were surveyed to find their stated and revealed preferences.

For North Carolina, their study determined that annual intra-state person trips along the Piedmont Crescent between the Raleigh and Winston-Salem areas were almost 1.2 million in

1995. Between Raleigh and Charlotte there were over 900,000 person trips and nearly 1 million between Winston-Salem and Charlotte. Most of these trips were for personal business and other discretionary travel. The next largest category was business trips, followed by recreation trips, which made up less than 25 percent of all trips. Based on current trends and experience along the high speed corridor between New York and Washington, DC business travel will increase faster than other trips for rail.

To serve these business travelers and all other travelers, the model found that speed seems to be the key. The faster the speeds, the more dramatic the effect on revenue, than ridership. Analysis shows that increasing speed on the corridor to 100 mph and adding frequencies increases ridership by over 300 percent, but increases revenue by over 600 percent with enhanced fares. An example of potential economic and fiscal impacts using North Carolina factors is provided in Table 4.27.

In March of 1997 ICF Kaiser Engineers did a study of the phase implementation of high speed rail in the Washington, DC to Richmond, VA corridor. The study showed that a $360 million investment in the project would yield the region over 4,000 permanent jobs, over $146 million in increased gross regional product, $5.65 million in new state, county and local tax revenues annually by 2015 and result in over 2,000 new residential units generating over $2.3 million in annual real estate tax revenues by the year 2015.

Table 4.27
Estimates of Economic and Fiscal Impacts 1996 $s

Economic and Fiscal Impacts	Total
Economic Impacts	
Earning Income	$10,507,629,189
Fiscal Impacts	
State Income Taxes	$332,041,082
Corporate Income Taxes	$62,873,699
State Sales Taxes	$204,898,768
Property Taxes/Recordation Fees	$44,874,257
Franchise Taxes	$2,124,158
Employment Security Taxes	$72,230,023
Total Fiscal Impacts	$719,041,987

Source: KPMG Economic Impact Analysis, 1995 for NC only.

Transportation investments like high speed rail can provide specific locations with improvements to attract growth. The Southeastern Economic Alliance (SEA), a coalition of thirteen chambers of Commerce from across six Southeastern states, cite the following points on why the SEHSR program would have a positive impact on the economy.

- Full implementation of the Southeast High Speed Rail Corridor would drive billions of dollars in new economic development
- Freight-rail commerce would benefit by improving speed of service, enhancing safety of rail crossings and relieving truck congestion on interstates.
- Productivity of business travel would increase through consistently reliable and comfortable travel combined with the potential for reduced business-travel expenses.

- Enhanced economic development and revitalization of urban areas around stations would occur.
- Overall, investments in capital and operation expenses in the Southeast corridor are estimated to return $2.54 in benefits for every dollar invested.

Since development and capital investment seek advantaged locations, the Study Area Alternatives would provide Virginia and North Carolina the infrastructure to remain competitive.

4.3.1.4 Land Use Planning Impacts

Land use and planning impacts for the nine Study Area Alternatives are described and calculated from the six-mile study area buffer, three miles on each side of the existing rail rights of way within the Study Area Alternatives. This analysis was done using city and county comprehensive land use plans. Minimal land use and planning impacts are expected for the No-Build Alternative. Impacts for the No Build Alternative include planned future station improvements and development activities associated with revitalization of stations along existing Amtrak service routes. Development activities associated with the No Build Alternative would occur where Amtrak commuter rail service currently operates. As such, only compatibility impacts and planning associated with the Build Alternatives are described in the following sections.

The proposed SEHSR program could utilize existing rail lines and rail rights of way that run adjacent to established cities and towns within the Study Area Alternatives. As a result, no direct major influences in land use are anticipated at the regional level if this approach is followed. The potential for direct impact on land use and development resulting from the proposed SEHSR program, is generally a function of: land available for development or redevelopment; regional and local markets; and the plans, land use controls such as zoning ordinances and economic development programs of local government.

Communities within the Study Area Alternatives offer unique economic, educational, medical and cultural opportunities. High-speed rail access to the communities in the study areas could enhance the way people live, work, shop, go to school, interact with other businesses and services, and choose to participate in cultural and recreation activities. Many land use categories could benefit from having convenient access to the SEHSR service. Some examples of land use opportunities that might be impacted by the SEHSR service:

- educational facilities;
- religious institutions;
- emergency and medical facilities;
- cultural and historic attractions and sites;
- recreational areas;
- public facilities;
- commercial and industrial services; and
- residential areas.

Implementation of the SEHSR service would increase transportation opportunities, allowing communities within Study Area Alternatives to look to long-term land use planning to spur development and increase redevelopment. The presence of these opportunities would also create an environment favorable for new economic activity and investment.

COMPATIBILITY IMPACTS AND PLANNING

During the public workshops held in the summer of 2000, many counties and cities within the study areas expressed support and enthusiasm for the implementation of the SEHSR program within the nine Study Area Alternatives. Many have developed long-term land use and transportation plans that focus on physical growth and development along existing rail lines and in downtown areas. Most of these plans focus on stations, station development and renovation. Thus the nine Study Area Alternatives are anticipated to generally compliment these future plans. A discussion of some examples of present and future community planning along the Study Areas Alternatives follows.

CITY PLANNING

- *Ashland, VA* – The Town of Ashland is in the process of considering an updated train station. The station will be a focal point of the area, and will be surrounded by shops, restaurants, hotels, a library and other small businesses (*Town of Ashland and Randolph-Macon College Gateway Terminus Master Plan Concept).*

- *Fredericksburg, VA* – With the implementation of the SEHSR program, the City sees an opportunity to centralize development around the train station, protecting the historic character and core of the city. There is an interest in identifying opportunities for infill development around the train station, and adapting existing buildings to provide necessary services to the area (*Fredericksburg Station Community Plan*).

- *Richmond, VA* – In general, there are several historic districts as well as public parks, community centers, and resource protection areas located within the Study Area Alternatives. There is a new, large public park that is being proposed along Broad Rock Creek. Land uses occurring and planned within the Study Area Alternatives are residential, industrial and commercial (*City Master Plan* - DRAFT).

- *Henderson, NC* – The Embassy Block Project is a plan to locate city, police and cultural services on an eight-acre site in the Henderson historic district. The Embassy Block development will serve as a very important center within the community, bringing together diverse resources and opportunities for its citizens (*Embassy Block Redevelopment Plan 2000*).

- *Rocky Mount, NC* – The City plans to construct a greenway system and walkway that will parallel the Tar River and connect Sunset Park and Martin Luther King Park. These pedestrian facility improvements are designed to satisfy the goal of having a more "walkable" community. There are plans to use abandoned railroad rights-of-way for public trails and walkways. There are also plans for future expanded roadway construction to accommodate the foreseen increases in people and traffic. The bus transit system will expand service to accommodate the need for transportation at non-traditional times (*Rocky Mount Urban Area Transportation Plan*).

- *Raleigh, NC* – The City is interested in improving access to and encouraging the use of alternative means of transportation, such as rail and bicycle. The City would like to see high-density residential and mixed-use development occur near the proposed rail transit station in downtown Raleigh, to reduce people's need to drive. The new Children's Museum About the World is proposed for construction in downtown Raleigh, in the block north of Moore Square Park in the Moore Square Historic District. A new Civic and

Convention Center and a new performing arts complex are also planned for the downtown area. The City of Raleigh is aggressively acquiring land to complete a park greenway system for the city. The Raleigh area is anticipating the construction of regional rail service to connect the cities and towns of the Triangle (*A Regional Transit Plan for the Triangle and City of Raleigh Comprehensive Plan).*

- *Cary, NC* - Cary has plans to balance the population by increasing the amount of affordable housing. The Town plans to help meet recreation and alternative modes of transportation needs through a continuous system of greenways and bikeways. The future land use in the Study Area Alternatives A, B, D, E, G, and H. are extremely varied. Cary has four planned Neighborhood Activity Centers, two Community Activity Centers, and at the junction of the rail lines in the CBD is a Special Opportunity Site. There are three Triangle Transit Authority stations planned for Carey. (*Town of Cary Growth Management Plan Map, 1996 and Draft Town of Cary Affordable Housing Plan, 2000).*

- *Morrisville, NC* – Morrisville is interested in making efficient use of its land resources by encouraging infill development, while simultaneously protecting its small town image. The current land use plan proposes bike lanes either adjacent to or crossing the existing railway. One goal of the Town's land use plan is to ensure that supportive and compatible development occurs around the proposed Triangle Transit Authority rail transit stop. Currently there are many single-family and condominium dwelling units near the proposed station (*Town of Morrisville Land Use Plan*).

- *Apex, NC* – The City has developed a plan to preserve, enhance, and improve the Central Business District (CBD). This CBD is within the immediate vicinity of the existing rail corridor. The CBD plan also includes future plans for pedestrians, landscaping, signs, buildings, maintenance, and lighting. Transportation improvements include relieving congestion on Salem Street and parking improvements. The old rail station on the west side of the railroad tracks will be kept as a library annex and a public space. A commuter center is being planned on the east side of the railroad tracks across from the library annex. The commuter vehicles would include buses, bus-rail, and passenger trains, to serve the Triangle Area and Southern Pines (*Apex Central Business District Master Plan*).

- *Durham, NC* – The City's vision consists of urban growth in the form of compact neighborhoods built along major transportation corridors. The City hopes that development will help to preserve Durham County's rural character and to protect valuable natural resources (*Building a Livable Future -The Durham 2020 Comprehensive Plan).*

- *Burlington, NC* - The land use plan focuses on the physical growth and development of Burlington and the surrounding area. West Burlington has a very strong growing economy, with plans for further development and improvements to it's congested thoroughfares. Central Burlington is the CBD of the area. Improvements and revitalization efforts to the downtown area are being made, and historic preservation is vital to this area (*Burlington 2000 Comprehensive Land Use Plan).*

- *Graham, NC* – The growth management plan addresses concerns with better guidance on land development, planning districts, and community involvement on future development patterns. The central business district , located in close proximity of the existing railroad, has seen many revitalization efforts and continues to be home to many of the City's historical landmarks. A greenway system is being developed, particularly along waterways to provide recreation areas, while preserving natural resources. Graham is encouraging interconnectivity between residential areas, as well as preservation of open space (*Draft City of Graham Growth Management Plan 2000 -2020 and Recreation and Parks Master Plan).*

- *Elon College, NC* – The city is hopeful that it will see continued growth of single-family residences. Issues regarding transportation and the development of new and improved thoroughfares are of concern in Elon College as new subdivisions are growing rapidly. The town has proposed the development of several new parks and hike and bike trails for the area. The Town of Elon College uses its zoning ordinance as the principle means for steering land development patterns (Revised Land Development Plan).

- *Greensboro, NC* – The Transit Element of the long-range transportation plan includes an extensive bus route system, paratransit, and a temporary Davie Street transfer center. The center is pending completion of Greensboro's Multimodal Transportation and Community Center (MTCC). This facility is planned to be in the old Norfolk Southern Rail Station, at East Washington and South Davie Streets. Greensboro has several transportation facilities planned, the largest being the Eastern Outer Loop. There is a large interchange planned within the rail study area east of Willowaike Road (*2025 Long Range Transportation Plan and Guilford County Recreation Master Plan*).

- *Thomasville, NC* – The 2010 Land Use Plan for the city recommends mostly industrial, commercial and high density residential in the immediate vicinity of the railway. One large buffer-transitional zone is planned for the western part of the city along the railroad. Facilities such as churches, hospitals and parks would be located in the transition zones. The city also has plans to develop a greenway system in the future, though that project is still in the planning and design stages (*Thomasville Land Use Plan 1990 -2000 and Parks and Recreation Master Plan).*

- *Winston-Salem, NC* – The City's comprehensive plan states that it supports a high-speed rail system, and seeks to ensure that land use policies along the rail transit corridor support increased development densities and are transit-friendly (*Vision 2005 - Comprehensive Plan for Forsyth County and Winston -Salem, NC).*

- *Charlotte, NC* – Charlotte's proposed land plan use includes a transit station at US 29 near the UNC Charlotte Soccer field. In the Northern vicinity of Charlotte there are two proposed transit stations, extensive residential and business planned development and zoning, churches, parks, golf courses, and other public facilities. There is also a proposed I-85 transit corridor and a large parcel of land along I-85 zoned for research. The study area includes Charlotte's proposed Northeast (University) Bus Rapid Transit (BRT) corridor, and two proposed transit hubs. Charlotte's Central District Plan includes plans for a variety of transportation options, and residential and commercial development.

COUNTY PLANNING

- *Brunswick County, VA* – The Southside Planning District, a regional body representing the county of Brunswick has passed a resolution of support for SEHSR Service through their county (Study Area Alternatives A, B and C). Currently there is no rail passenger service within the district (*Comprehensive Economic Development Strategy, Southside Planning District, 2000).*

- *Chesterfield County, VA* – There are proposed greenways, a proposed satellite health facility, a proposed Ironworks Historic Park, as well as existing schools, parks and other community facilities all located within the study areas. Plans also state that the county is considering using the abandoned railroad right of way (the S-line abandonment which is a part of Study Area Alternatives) that passes through the area as a future thoroughfare site. Some medium and light industrial land use is proposed for the area near I-95, and several community facilities including schools, fire stations, and public parks either exist or are proposed for this area (*The Jefferson Davis Corridor Plan, The Ruffin Mill Area Plan, Eastern Area Land Use and Transportation Plan, Chester Village Plan and The Southern and Western A rea Plan).*

- *Lunenburg County, VA* – The County's land use plan encourages future growth in the urban areas and along the highways that connect them. The county is also interested in preserving open space, agricultural land, and natural areas for recreation *(Lunenburg County Comprehensive Plan*).

- *Mecklenburg County, VA* – The Southside Planning District, a regional body representing the county of Brunswick has passed a resolution of support the SEHSR program through their county (Study Area Alternatives A, B and C) . Currently there is no rail passenger service within the district (*Comprehensive Economic Development Strategy, Southside Planning District, 2000).*

- *Spotsylvania County, VA* – Future development plans for the county will concentrate development activity in the Primary Settlement Area of the county's northeast corner. The County has acknowledged that as its population continues to increase, so would the need to provide passenger rail service to its citizens (*Spotsylvania County Comprehensive Plan).*

- *Stafford County, VA* – A portion of the land directly to the west of I-95 is slated for development of the new Stafford Regional Airport, along with ancillary new commercial and residential development. The Fredericksburg Area Metropolitan Planning Organization (FAMPO) future land use map for the county shows rural and urban residential, agricultural, transitional and federal land uses planned for the land surrounding the existing railway (*2020 FAMPO Constrained Long Range Plan).*

- *Sussex County, VA* – The future land use map shows increased residential land use throughout the study area, sustained agricultural use, and one additional pocket of commercial use near the railway in the southern section of the county (*Sussex County Map of Proposed Future Land Use).*

- *Davidson County (City of Lexington), NC* – The majority of land use along the existing rail corridor in Davidson County is residential and rural. Near the town of Lexington there is much industrial development, and future industrial development is planned for this area. The City of Lexington states that it supports a high-speed rail system, and seeks to ensure that land use policies along the rail transit corridor support increased development. The City has expressed interest in obtaining a passenger station stop and already has a station plan in progress (*Draft Davidson County Land Development Plan).*

- *Lee County (City of Sanford), NC* – A proposed new Historic District in downtown Sanford, near Hawkins Avenue is located directly adjacent to the railway. A new city park is proposed in the downtown area, directly adjacent to and between the two railroad tracks. This park proposal is referred to as the Downtown Depot Project, and is incorporating historically significant railroad buildings into its' design. The City of Sanford also has plans to construct a greenway within the city limits (*Sanford & Lee County 2020 Land Use Plan).*

- *Moore County, NC* – The land use plan for the county states that the County is interested in preserving its agricultural, rural, natural, and small town environment, while providing an orderly framework for growth and development. In order to accomplish these goals, the county has established Urban Services Boundaries, areas within which urban services and development can occur over the next 10-15 years (*Moore County Land Use Plan).*

Land Use and Planning Mitigation

Land use mitigation could be needed if more detailed engineering analysis proves that existing right of way or track alignments need to be modified for the implementation of Study Area Alternatives. If a Study Area Alternative were chosen where realignments occur, mitigation involving property owners along right of way would take place.

Conclusion

By comparing the current land use development pattern in each Study Area Alternative there are more land use development and planning activities associated with Study Area Alternatives D, E, G, H and J. The land use development associated with these Study Area Alternatives is due, in part, to the existing freight and commuter rail service, on going station improvements, and large populations adjacent to the rail right of way. When comparing Study Area Alternatives for land use and planning impacts in natural lands more impacts would occur in Study Area Alternatives A, B, C and F. Impacts associated with redevelopment potential cannot be quantified at this stage in the study and is largely dependent on future city and county planning, land use controls and local market conditions.

From this information we can conclude that Study Area Alternative G would have the most land use and planning development impacts, due to the presence of existing rail services within the Study Area Alternative and large population centers located adjacent to the right of way. Study Areas C and J would have the most land use impacts associated with development to natural lands and are directly associated with fewer population and more natural lands adjacent to right-of-way.

4.3.1.5 Right Of Way/Relocation Impacts

No Build Alternative

There would be right of way and relocation impacts due to completion of the existing and planned improvements under the No Build Alternative. These would be similar to those associated with the Build Alternatives.

Build Alternatives

With the implementation of the Build Alternative, each of the nine Study Area Alternatives would require varying degrees of right of way acquisitions and varying numbers of relocations. The projected right of way impact and projected number of relocations are listed in Table 4.28. These were calculated based on conceptual engineering results and assumptions. Potential relocations were estimated using the USGS quarter quad sheets. Building outlines were used to calculate the square footage of potential business relocations. The exact number and types of businesses to be displaced would be researched during the Tier II analysis.

Table 4.28
Projected Right-of-Way Impact and Number of Potential Relocations for Study Areas Alternatives

	Projected Total Right-of-way Acquisition (acres)	Projected Right-of-way Acquisition (acres/mile)	Projected Total Residential Relocations	Projected Residential Relocations per mile	Projected Total Business Relocations (square feet)	Projected Business Relocations (square feet/mile)
A	678	1.50	365	0.81	65145	144
B	731	1.54	371	0.78	110920	234
C	930	2.14	220	0.51	57374	132
D	620	1.30	405	0.85	62191	130
E	674	1.35	411	0.82	107966	216
F	872	1.89	260	0.56	54420	118
G	545	1.12	301	0.62	70344	144
H	598	1.17	307	0.60	116119	228
J	797	1.70	156	0.33	62573	134

Source: Carter & Burgess, Inc 2000.

Right of way acquisitions could result from realigning curves to obtain/maintain the maximum operating speed of the high speed passenger train set. In sections of the corridor where natural and man-made features pose restrictions, preserving these features could require a new location for the rail alignment as well as sufficient right-of-way to construct, maintain and improve this new alignment.

Base upon conceptual design, curves that are realigned are proposed to be shifted “inside” the existing curve to “flatten” the curve for improved travel speed. Depending on the amount of shift for the curve realignment, the impacts on adjoining properties would vary from none where the realignment is contained within the existing right-of-way to residential and/or business relocations where development is “inside” the curve and close to the existing right-of-way.

All persons whose property is acquired or who are displaced as a result of a Federal or Federally-assisted project are ensured of fair, consistent and equitable treatment through the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public law 91-646) and the Uniform Relocations Act Amendments of 1987 (Public law 100-17). The Uniform Act contains specific requirements that govern the manner in which a government entity acquires property for public use. The law is designed to ensure just compensation for all acquired properties and minimal impact on the current owners and lessees. The need for land acquisition and the number and types of properties that might be acquired will be more thoroughly defined during the Tier II environmental process. In addition, information would need to be gathered about the properties and occupants and relocation benefits and sites would be specified.

For the proposed SEHSR program, the conceptual engineering effort assumed of the existing railroad corridors to estimate potential impacts related to the Build Alternative. Most areas of potential disparate impact would occur in the larger towns and cities within the Study Area Alternatives. Initial coordination with housing agencies in the Study Area Alternatives was conducted as a part of the Tier I EIS. A general consensus of the responding housing authorities in the Study Area Alternatives indicates that public housing exists sporadically within most Study Area Alternatives. Section 8 housing that would potentially be impacted is more difficult to define since this housing is tenant-based and therefore transient by nature. Coordination with local housing authorities would be needed to eliminate disparate impacts.

4.3.1.6 Transportation Impacts

This section presents a general discussion of the potential impacts to the transportation network related to the No Build Alternative and the Study Area Alternatives. A discussion of the rail and vehicular traffic flow; possible related delays at grade crossings; and potential generalized impacts related to delay at potential station areas and SEHSR terminal areas are included. There is also a discussion of the analysis of impacts to be conducted, as appropriate, during the Tier II environmental process.

Rail And Vehicular Traffic Flow

According to a September 1997 Federal Railroad Administration (FRA) Report[4], as population and travel demand grow, intercity transportation by air, rail and road will increasingly suffer from congestion and time delays, particularly in metropolitan areas, at and around airports, and during weekend, holiday, and bad weather periods. This decline in the level of service and the quality of the travel experience adversely affects the intercity traveler, other transportation system users, carriers and the general public.

Impacts to Intercity Passenger Rail Service

No-Build Alternative: Existing intercity passenger rail service will increase in ridership and in number of routes under the No Build Alternative. The Amtrak ridership in Virginia and North Carolina has outpaced growth rates for Amtrak ridership nationwide. Ridership on existing Amtrak routes is expected to increase in proportion to travel demand growth in the study areas. Amtrak has indicated they are going to purchase new equipment and possibly add a train. North Carolina has an agreement with Amtrak for a $75 million Amtrak match of state of North Carolina funds to purchase rail passenger equipment, increase service frequency and reduce trip times along the Raleigh-Charlotte high speed rail corridor. North Carolina's funding

[4] High Speed Ground Transportation for America, Federal Railroad Administration, September 1997.

commitment will likely exceed $75 million[5]. These projected increases in passenger service, in addition to projected increases in freight service within the SEHSR corridor, would increase travel delays for rail passengers and contribute to the use of other modes of transportation.

Build Alternative: The implementation of high speed rail service from Washington, DC to Charlotte, NC is expected to complement, rather than replace or diminish, existing Amtrak routes. It should provide better and more options for travel by rail. Model forecast data[6] projects that high speed rail ridership would be approximately three times greater than the No Build Alternative by 2015 and will maintain that 3:1 ratio over the No Build Alternative through 2025.

The *Carolinian* and *Piedmont* services within North Carolina would experience increased ridership flexibility through the creation of a rail "hub" in Raleigh, NC that transfers passengers between east-west and north-south routes. This is expected to increase ridership for the existing service within North Carolina as well as the proposed SEHSR service. With the majority of these passengers diverting from other modes of transportation, the intercity traveler would realize an improved level of service and an increased quality of service in all modes of travel.

Impacts to Freight Rail Service

No-Build Alternative: Existing freight rail service will increase in the Study Area Alternatives with the recent acquisition of Conrail by CSX Transportation (CSX) and Norfolk Southern Corporation (NS). Proposed regional rail (i.e., Triangle Transit Authority between Raleigh, NC and Durham, NC) and expanding commuter rail (i.e., Virginia Railway Express between Washington, DC and Fredericksburg, VA) further increase the daily train traffic. The TTA system is completely separate from heavy rail and would not impact rail congestion. Maintenance and rehabilitation of existing track and facilities would make progress towards relieving current congestion and delays.

Build Alternative: Freight and passenger services within the Study Area Alternatives are projected to experience fewer delays and congestion with the full implementation of the proposed SEHSR program. Full implementation includes realignments and facilities improvements that would allow for increased train speeds and for more passing sidings. Proposed improvements to highway-rail grade crossings would also improve safety for freight operations. Similarly, the implementation of electronic signaling for train traffic control would coordinate the simultaneous use of the railroads by freight and passenger services. Further detailed studies are required to fully assess the impact of reestablishing service in Study Area Alternatives where the track has been removed.

Impacts to Commuter Rail Service

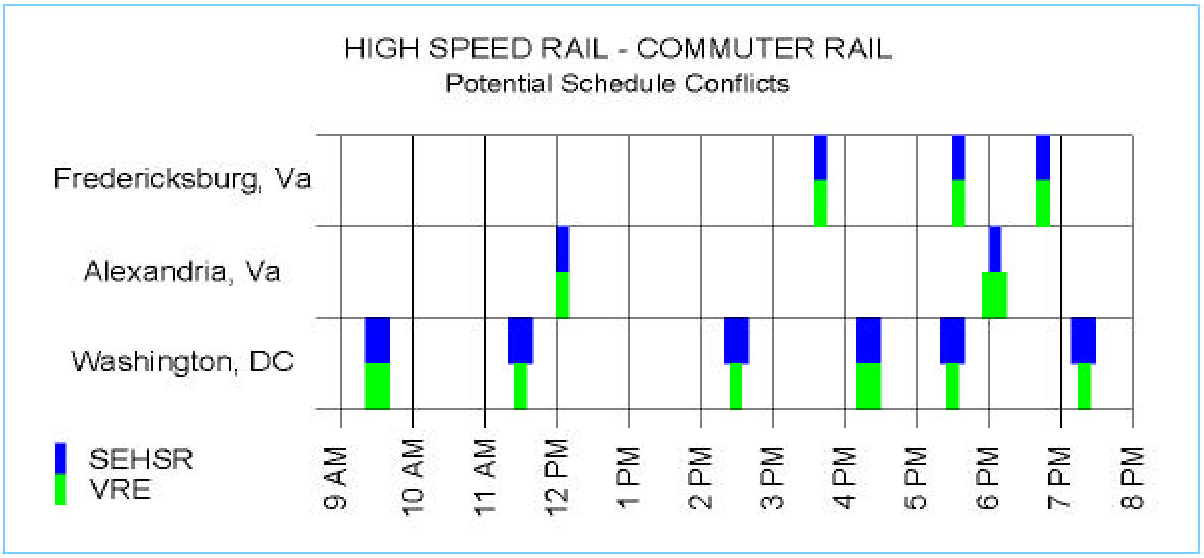
No-Build Alternative: Commuter rail service in the Study Area Alternatives operates in northern Virginia (Virginia Railway Express – VRE) and Washington, DC (Washington Metropolitan Area Transit Authority – WMATA) with future commuter/regional rail services planned for Raleigh-Durham, NC and Charlotte, NC. Amtrak service would remain the same under the No Build Alternative. Commuter rail service could increase with VRE proposing to add more trains

[5] Amtrak 2001 Strategic Business Plan
[6] KPMG, October 2000

depending upon agreements with the major railroad. No impacts are anticipated beyond any projected/anticipated congestion in the Washington, DC to Charlotte, NC travel corridor.

Build Alternative: With the addition of a projected eight intercity, high speed passenger trains per day commuter rail service may require schedule changes to minimize potential conflicts with SEHSR service. WMATA trains have their own closed track loop and stations therefore there would be no conflicts with future high speed rail trains. Table 4.29 shows that two VRE trains may have station stops during projected SEHSR station stops in Washington, DC. In Alexandria, VA there may be two VRE trains with station stops scheduled during projected SEHSR station stops.

Table 4.29
High Speed Rail-Commuter Rail Potential Schedule Conflicts



Source: Washington Metropolitan Area Transit Authority (http://www.wmata.com/timetables/schedules.htm) and VRE (http://www.vre.org/service/schedule.htm)

There are three potential conflicts between VRE and SEHSR trains in Fredericksburg, VA. Additional detailed studies of possible schedule conflicts will be required once train performance and scheduling for the high speed rail service is further developed.

At-Grade Crossing Impacts

No-Build Alternative: At-grade crossings in the Study Area Alternatives will be modified at the discretion of the railroad owner and/or the appropriate state agency. In Virginia the Department of Rail and Public Transportation (VDRPT) will improve at-grade crossings as part of other projects funded through the Virginia Transportation Act of 2000. North Carolina Department of Transportation (NCDOT) Rail Division in a joint effort with Norfolk Southern will improve or close crossings in the Raleigh – Greensboro – Charlotte corridor. The U.S. Department of Transportation's Rail-Highway Crossing Action Plan inspired this Sealed Corridor project. The Sealed Corridor project is "funded through a partnership with the Federal Railroad Administration (FRA) and the Federal Highway Administration (FHWA) … supplemented with

State matching funds and in-kind services from Norfolk Southern."[7] Due to the increasing number of collisions at highway-railroad crossings, federal and state agencies will continue to emphasize at-grade crossing safety and associated improvements or closings. Under the No Build Alternative, at-grade crossings within the Study Area Alternatives will be improved or closed with funds that could be used to improve the safety of crossings outside the these areas.

Build Alternative: During the field reconnaissance and conceptual engineering evaluation phases of this environmental analysis, at-grade crossings were evaluated for safety, potential for improvement, and/or closure. The construction of at-grade crossing improvements or closures would impact highway traffic through lane closures, changing traffic patterns, safety practices, and/or equipment testing. The degree of impact would vary based on the level of service of the highway, the proximity of alternate routes, and the extent of construction required at a given crossing.

At-grade crossings provide personal and private vehicular access via highways or drives across railroad tracks. Continuous use of these crossings without encountering train traffic creates public complacency. This complacency contributes to the rising number of collisions at highway-railroad crossings. Identifying the number of at-grade crossings and conceptual improvements to these crossings establishes a magnitude of safety and traffic delays. Table 4.30 lists the number and type of existing at-grade crossings and of conceptual improvements to at-grade crossings by alternative. Variations between the total number of existing and conceptual at-grade crossings are attributed to closures, consolidations, and grade-separations of some existing at-grade crossings.

Table 4.30
At-Grade Crossings by Study Area Alternative

Study Area Alternative	A	B	C	D	E	F	G	H	J
Existing Crossings									
Public	385	416	356	413	444	384	410	441	381
Private	163	197	188	188	222	213	190	224	215
Quad Gates	1	1	1	1	1	1	1	1	1
Conceptual Crossings									
Quad Gates	229	255	141	240	266	152	214	240	126
Signals & Gates	115	130	110	126	141	121	132	147	127
Upgraded Private	9	9	12	8	8	11	6	6	9
Pedestrian	150	164	110	158	172	118	162	176	122

Source: Carter & Burgess, Inc. November 2000.

[7] Testimony of Paul C. Worley, NCDOT Rail Division before the Committee on Commerce, Science, and Transportation, Surface Transportation and Merchant Marine Subcommittee, United States Senate, March 25, 1999.

The urban and multi-lane, high-volume at-grade public crossings should be considered for grade separation to improve both rail and highway safety. Bridge construction will include detouring either highway traffic to temporary alternate routes or rail traffic to alternate tracks. The impact of bridge construction on highway traffic will extend to the construction of the bridge approaches and related improvements. Access to adjoining properties may be realigned beyond the limits of the bridge fill. Approximately 20 percent to 25 percent of all crossings would be grade separated in the Study Area Alternatives. Grade-separated crossings require traffic studies and economic evaluations to determine need and location and are therefore considered independent of at-grade crossings.

Train activated advance-warning systems "have a basic requirement that minimum warning time be afforded the fastest moving train."[8] Based on computations for length of approach track circuit, warning signal activation would occur when the high speed train is approximately one mile from the at-grade crossing. The proposed high speed train traveling at 110 mph will delay highway vehicles approximately one minute or less from activation of flashing lights to deactivation of the gates and lights except in the cases of traffic signal interconnects. Through the use of constant warning time devices, delays for highway vehicles due to existing intercity passenger trains and freight trains would remain unchanged.

Suburban and rural, medium-volume at-grade public crossings should be considered for safety protection which generally includes quad gates with median barriers and pedestrian crosswalks within the gates. Gate construction would include slowing both highway and rail traffic to ensure the safety of the construction personnel. Highway traffic would be further impacted by delays during testing of the gates and construction of the median barriers. Roads that parallel the railroad may be improved to provide coordinated signalization of the road intersection. Quad gates would be considered at approximately 30 percent to 35 percent of all crossings in the study areas. Virginia would consider the median barriers but would not recommend their use.

Signals and gates should protect all low-volume at-grade public crossings. The impacts to both highway and rail traffic would be similar to those associated with quad gate construction. With approximately 15% to 20% of all crossings in the study areas being in this classification, the overall impact to highway and rail traffic would not be major when compared to impacts associated with either bridge or quad gate construction.

Private crossings are not currently within the jurisdictions of state agencies to effect safety improvements. Therefore any approval of a Study Area Alternative should include legislation authorizing improvements to or consolidation of private crossings. Conceptual engineering evaluations of the Study Area Alternatives recommended closing private crossings that could be connected to existing public crossings or be consolidated with other private crossings by adding less than two miles of travel distance in unincorporated areas and less than one mile of travel distance in incorporated areas. These connections of private crossings would impact highway traffic during construction of the transitions to existing drives or roads. Rail traffic would be impacted during the removal of the existing crossing. Approximately 20 to 25 percent of all crossings in the Study Area Alternatives are private.

[8] USDOT – Federal Highway Administration. Railroad-Highway Grade Crossing Handbook, page 224, August, 1978.

At-Grade Crossing Impacts by Study Area Alternative

Based on the total number of crossings requiring improvements, Study Area Alternatives B, E and H would potentially impact the greatest number of highway vehicles. Study Area Alternatives A, D and G potentially impact fewer highway vehicles due to the reduced number of crossing improvements. With the fewest number of crossing improvements, Study Area Alternatives C, F and J would potentially impact the fewest highway vehicles. The magnitude of these potential impacts can be quantified through detailed traffic studies and accurate traffic counts.

Impacts at Stations and Terminal Areas

Any of the Study Area Alternatives could have an impact on stations and terminal areas. The nature and the magnitude of this potential impact would vary based on current uses, other passenger train schedules, existing traffic patterns and volumes, and community planning. A station or terminal area that currently operates on a limited schedule (i.e., only opens at pre-specified times) may operate on a more conventional schedule with the introduction of the SEHSR service. This would allow vendors of passenger-comfort goods and services to feasibly sustain businesses in or near these stations or terminal areas. Other passenger trains may benefit by the addition of local passengers able to conduct business during commutes or short trips. Community foresight in planning for potential growth in and around stations could determine the type of impact the SEHSR service may have at these stations or terminal areas. It is estimated that implementation of the Build Alternative would have a positive impact on vehicular traffic congestion in general. This would be the result of automobile trips diverted from the roadway network to rail and the corresponding reduction in automobile vehicle miles traveled (VMT).

Based upon the response from SEHSR Study Area communities, during the public workshops held in the spring and summer of 2000, the addition or renovation of a station in their communities is perceived as a benefit. Many of these communities are lobbying for the location of a station in their areas based upon potential economic development benefits. It is possible that the location of a station could have an impact on vehicular travel patterns based upon increased volumes in and out of stations. Issues, benefits and potential impacts related to the volume of traffic as well as the need for and the provision of parking would be assessed when a greater level of detail has been developed during the Tier II analysis.

Tier II Assessment of Impacts

It is anticipated that more exact locations for stations would be determined during the Tier II environmental analysis process. Once stations have been located, ridership levels by station could be generated, including the mode of arrival. This provides the information needed to conduct a more detailed analysis of the impact of station area traffic, circulation, and parking supply. This information would be used to determine the need for and size of any parking facilities and passenger waiting areas, to refine the operating scenarios and to conduct any needed traffic impact analysis. From this analysis the need for and type of traffic mitigation measures could be defined. End of the line stations or terminal areas also tend to be high activity areas. An assessment of the impacts and benefits at these areas would also be part of the more extensive Tier II traffic analysis to be conducted. Coordination with local planners and traffic engineers on these issues would be a part of the Tier II effort.

4.3.1.7 Utilities and Related Services Impacts

No Build Alternative

The No Build Alternative is not anticipated to have any impacts on utilities or utility operators, except as related to routine maintenance and improvements by the railroads. General maintenance of and improvements to existing railroads will be limited to relatively small segments of track with minimal grading operations that might disturb utilities.

Major utility impacts related to No Build improvements are anticipated to occur at or near airports and along interstate and primarily highways. Airport expansions to service would potentially impact electric, natural gas, telecommunications including FAA cabling, and interstate petroleum pipelines supplying jet fuel. Adding travel lanes within the existing right-of-way of interstate highways to improve the level of service may impact underground utilities where depth of cover is a factor or aerial utilities where sag clearance and support structures primary highways where existing development constricts the right of way. Improving the level of service along these highways would require additional right-of-way purchases as well as relocating existing utilities from aerial to underground facilities or from existing roadside to widened roadside locations. Sanitary sewer, municipal water, storm water, electric, gas, telecommunications, and solid waste collection run the risk of suffering potential impacts during the widening of primary highways.

Build Alternative

Utilities are, by definition, a commodity or service provided for public use. From municipal utilities to interstate pipelines, the Study Area Alternatives contain infrastructure for water treatment and supply, sanitary sewer collection and treatment, storm water collection and discharge, electric generation and distribution, communication facilities and cabling, natural gas storage and distribution, petroleum storage and trans-flo facilities, solid waste collection and management facilities, and interstate pipelines. Initial coordination efforts were undertaken as part of this Tier I EIS.

Metropolitan areas, cities, and most towns within the Study Area Alternatives maintain and operate water treatment and supply facilities. Some of the rural counties and communities have joined to form regional water authorities that function similar to municipal water systems. The infrastructure for water systems varies throughout the study areas. Each system may include different combinations of major structures such as treatment plants, pumping stations, and water towers/tanks. Most water systems will include minor structures; i.e., fire hydrants, meters, valves and back-flow preventers. A network of underground pipes interconnects these major and minor structures. These pipes may also be attached to bridges to cross natural or man-made features. Detailed studies will be required to determine the extent of impacts to water treatment and supply facilities. However, it should be possible to minimize the impacts through utility involvement during preliminary design stages for the SEHSR program.

As with water treatment and supply, sanitary sewer collection and treatment facilities exist in the metropolitan areas, cities and most towns within the study areas. There are a limited number of regional sewer authorities. With the exception of treatment plants and certain types of pump stations, most sanitary sewer infrastructure is subsurface. Manholes for system access or air-release provide surface evidence of the sanitary sewer system. Sanitary sewer pipes may be seen at aerial crossings of streams or when attached to bridges crossing natural or man-made features. Impacts to sanitary sewer facilities will also require detailed studies to determine the extent of utility involvement during preliminary design of the SEHSR program.

Storm water collection and discharge occurs throughout the Study Area Alternatives regardless of population or development. These underground systems may be as simple as a single pipe carrying drainage underneath the roadbed or as complicated as a network of pipes connecting drainage inlets designed to collect and detain drainage from heavily developed areas. Since the majority of the study areas follow existing railroads along “ridge” lines, the impact to storm water systems should be limited to realignments requiring pipe extensions and/or sidings requiring pipe extensions or network additions.

Dominion Virginia Power, Carolina Power & Light and Duke Power provide and maintain the majority of the electric generation and distribution systems within the Study Area Alternatives . A number of municipalities provide and maintain a distribution system within their municipal limits and purchase electricity from one of these companies. There are a limited number of small entities that generate and sell electricity to these companies. Power plants within the study areas are generally located near rivers or bodies of water with generators powered by hydraulics, coal-fired or nuclear energy. The distribution system from these plants include high voltage lines on towers, substations, transmission lines both above and below ground, ground and pole-mounted transformers, and service lines. Electric system impacts may be minimized with attention to vertical clearances between top of rail and above or below grade power lines, and with detailed studies of substation and transformer locations.

Communication facilities along railroads began in the late 1800’s with the installation of telegraph poles and cables. As technology improved, the communication facilities increased in importance. From microwave towers for train communications to fiber optics for national telecommunications, communication facilities exist in all study areas. The communications infrastructure includes both freestanding and guyed towers, signal-boosting stations, and both aerial and underground cabling. Impacts to communications facilities are both time-consuming and expensive to resolve. Therefore, early involvement of communications utilities will expedite implementation of the SEHSR program.

Residences and businesses throughout Virginia and North Carolina use natural gas for cooking, space heating and water heating. The infrastructure that supplies natural gas consists of interstate distribution pipes, compressor stations, underground storage tanks, and distribution pipe systems. Cost-effective delivery of natural gas depends on volume sales that require the location of distribution systems in centers of population or industry. Therefore, the impacts of the SEHSR program on natural gas facilities will be at these locations and will depend on information from the utilities and from detailed studies to complete an evaluation.

Refined petroleum products used in vehicles, home heating and industry are delivered by rail as well as by interstate pipelines to trans-flo facilities intermittently located within the Study Area Alternatives. These products are stored in large tanks that are grouped in “tank farms”. Examples of tank farms can be seen west of Selma, NC and in west Greensboro, NC. Distribution of the petroleum products from these tank farms is generally by tanker truck crossing railroads at-grade. This presents a safety issue and also creates an impact to this utility since the tank farms must be accessible by both rail and truck traffic. A secondary impact may occur at locations where the interstate pipelines could be affected by track and/or road realignments. Detailed studies of grade separations, signalization and traffic control may provide solutions to minimize the safety impact, while detailed studies of pipeline locations will allow realignment designs that minimize possible pipeline impacts.

With growing public opposition to new landfills and expansion of existing landfills, communities emphasize the importance of recycling and the proper handling of hazardous waste. Most municipalities within the Study Area Alternatives either manage their own solid waste collection program or contract with a private enterprise to manage a program for the municipality. These programs determine a system of collection and disposal of solid waste that range from large household trash cans emptied into carts or trucks to facilities for sorting waste into large dumpsters or compactors. Based on the type of solid waste, the container of waste is emptied at either a landfill or a recycling facility. Solid waste collection and management will realize impacts from the proposed SEHSR service at at-grade crossings and at sorting facilities located adjacent to railroad rights-of-way.

Variations in depth and criticality of use of the various types of utilities within the Study Area Alternatives complicate the evaluation of potential utility impacts. Keys to quantifying these potential impacts include identifying the number, location and depth of utility crossings, identifying the location, length and depth of parallel utility lines or facilities, identifying the location of horizontal and vertical realignments of the railroad, and correlating these separate nodes of information.

Research was conducted to identify all of the possible utility owners in the study areas. An introductory letter and map of the study areas was sent out to the constituents. Utility owners were asked to respond by letter indicating facilities they have located in the Study Area Alternatives. Approximately 139 letters were sent out and as of April of 2001, responses have been received from 55 owners. This list of utility owners has been added to the SEHSR project database so that they can be contacted about project progress. During the Tier II environmental process, there will be further coordination undertaken with the utility owners.

Utility Impacts by Study Area Alternative

Based on the number of larger municipalities within the corridor and the associated number of utilities, Study Area Alternatives G and H would require the greatest coordination with utility owners and would potentially impact the most utilities. The conceptual improvements within Study Area Alternatives G and H reduce both the extent and severity of these potential impacts.

Study Area Alternatives B and E would impact fewer large municipalities and would therefore require less coordination with utility owners. With smaller municipalities impacted in greater numbers by Study Area Alternatives A and D, the number of utility owners would increase requiring the same level of coordination as Study Area Alternatives B and E. The potential utility impacts for Study Area Alternatives A, B, D and E are similar in extent and severity and are greater than those for Study Area Alternatives G and H.

While Study Area Alternatives C, F and J impact the fewest municipalities and require the least coordination with utility owners, the level of improvements required for these alternatives provides the greatest potential for utility impacts in both extent and severity. Study Area Alternatives C, F and J also risk potential impacts with two interstate petroleum pipeline utilities that cross or parallel portions of these corridors.

4.3.1.8 Archaeological and Historic Sites

Archaeological Resources

Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470 f), as amended, requires that all federal agencies consider the impact of their actions on properties, sites, structures, or objects listed on, or eligible for listing on the National Register of Historic Places (NRHP) and afford the Advisory Council on Historic Preservation (Council) a reasonable opportunity to comment. The NRHP is this country's basic inventory of historic resources and is maintained by the Secretary of the Interior. The list includes buildings, structures, objects, sites, districts, and archaeological resources.

Pursuant to Section 106 of the National Historic Preservation Act, archaeological survey files at the North Carolina and Virginia State Historic Preservation Offices (SHPO) were reviewed to identify known sites found during previous investigations and field inspection of the project study areas. No additional research or field surveys were conducted. This review revealed that no known archaeological sites are located with the 1500-foot survey buffer on each side of the existing rail rights-of-way (which equates to a total width of approximately 0.5 mile), of the nine Study Area Alternatives. Because of this, an evaluation of archaeological resources within the Study Area Alternatives was not conducted as part of this document. The evaluation and assessment of archaeological sites required under Section 106 of the National Historic Preservation Act will be conducted, as appropriate, as part of the Tier II environmental studies. Future evaluation will involve the identification of archaeological sites through background research and field surveys, assessment of the effects, and consultation with interested parties, the State Historic Preservation Offices, and the Advisory Council on Historic Preservation in compliance with the guidelines set forth by North Carolina and Virginia's State Historic Preservation Office.

Historic and Architectural Resources

The process for complying with Section 106 is outlined in regulations issued by the Council (36 C.F.R. Part 800) and includes identification and evaluation of historic properties, assessing effects, and consultation. The federal agency responsible for an undertaking begins by identifying the historic properties the undertaking may affect. To do this, the agency first reviews background information and consults with the State Historic Preservation Officer (SHPO) and others who may know about historic properties in the area. Based on this review the agency determines what additional surveys or other field studies may be needed, and conducts such studies. If historic properties are found, the agency then assesses what effect it's undertaking will have. The agency works with the SHPO, and considers the views of others. The agency makes its assessment based on criteria found in the Council's regulations, and makes a determination of: 1) No historic properties affected; 2) No adverse effect: the undertaking will affect one or more historic properties, but the effect will not be harmful; or 3) Adverse effect: the undertaking will harm one or more historic properties, 36 C.F.R.§ 800.4-.5.

If an adverse effect is anticipated, the agency consults with the SHPO and others in an effort to find ways to make the undertaking less harmful. Others who are consulted may include local governments, Indian tribes, property owners, other members of the public, and the Council. Consultation is designed to result in a Memorandum of Agreement (MOA), which outlines measures agreed upon that the agency will take to reduce, avoid, or mitigate the adverse effect. In some cases the consulting parties may agree that no such measures are available, but that the adverse effects must be accepted in the public interest (Introduction to Federal Projects and Historic Preservation Law, 1994).

National Register Historic Sites and sites on the SHPO “Study List,” including sites determined to be eligible for the National Register were identified for the Study Area. Table 4.31 exhibits the number of National Register Historic Sites and Study List Historic Sites located within the 1500-foot study buffer, (which equates to a total width of approximately 0.5 mile), for each of the Study Area Alternatives. The reviewed buffer area is smaller than the total six-mile width of the Study Area Alternatives in order to more accurately quantify the number of historic sites located nearest to the existing rail lines. This quantity is only an estimation based on known records from the North Carolina and Virginia State Historic Preservation Offices obtained in 2000. Therefore, historic impacts per Study Area Alternative could vary depending on detailed field surveys and further review. The current number of National Register properties range from 61 in Study Area Alternatives A, B, D, and E to 19 in Study Area Alternative J. The existing number of Study List properties ranged from 390 in Study Area Alternatives G and H to 273 in Study Area Alternative C. The highest combined number of National Register properties and Study List properties, estimated at 448, are located within Study Area Alternatives D and E while the least number, estimated at 305, are located within Study Area Alternative C. The No Build Alternative will have similar impacts to historic sties associated with currently planned improvements discussed in Chapter 2. Potential mitigation could include avoiding historic sites by shifting the alignment, minimizing the area of impact through engineering design, landscaping, or adding other aesthetic enhancements to eliminate or lessen visual impacts.

For more detailed information regarding the location of these historic sties, Appendix B provides a table of National Register Historic Sites and Study List Historic Sites by study segment.

In addition to Section 106, the use of property within the historic boundaries of any such property is regulated under Section 4(f) of the Department of Transportation Act of 1966 [49 U.S.C. Section 303 (c)], which prohibits the Secretary from approving any projects which require the direct or indirect use of publicly owned parks, recreation areas, or wildlife and waterfowl refuge or any significant historic site protected under Section 4(f) unless a determination Is made that there is no feasible and prudent alternative to such use and the project includes all possible planning to minimize harm to the property resulting from such use.

Table 4.31
Historic Sites by Study Area Alternative

A	61	317
B	61	317
C	32	273
D	61	387
E	61	387
F	32	343
G	48	390
H	48	390
J	19	346

Source: North Carolina and Virginia State Historic Preservation Offices, 1999. Complied AG& M, 2000.

4.4 Construction Impacts

4.4.1 Air Quality

Construction-related activities can result in short-term impact to ambient air quality in the vicinity of the construction site. These impacts include fugitive dust and mobile source emissions during construction. Construction specifications would require prevention and mitigation measures to minimize the possible particulate pollution problem. During site preparation measures would include:

- minimization of land disturbance;
- use watering trucks to minimize dust;
- covering trucks when hauling dirt; stabilization of any surface of dirt piles not immediately removed; use of windbreaks to prevent accidental dust pollution;
- limits on vehicular paths and stabilization of temporary roads; and
- the paving of unpaved construction roads and parking areas to road grade for a length no less than 50 feet where such roads and parking areas exist the construction site to prevent dirt from washing onto paved roadways.

During construction these measures would include:

- covering trucks when transferring materials;
- use dust suppressants on unpaved traveled paths;
- minimization of unnecessary vehicular and machinery activities; and
- the washing or cleaning trucks before leaving the construction site (alternative to this strategy is to pave a few hundred feet of the exit road, just before entering the public road).

Post-construction measures would include: re-vegetation of all construction related vehicular paths to avoid future off-road vehicular activities.

Since emissions of carbon monoxide (CO) from motor vehicles increase with decreasing vehicle speed, disruption of traffic during construction (such as the closing of crossings and re-routing of traffic to alternate routes increasing congestion and queue lengths) could result in short-term elevated concentrations of CO. In order to minimize the amount of emissions generated, every effort would be made during the construction phase to limit disruption to traffic, especially during peak travel periods.

4.4.2 Noise and Vibration

Construction Noise

To estimate the anticipated construction noise levels, a general assessment was conducted using the methodology in the FTA guidance manual, *Transit Noise and Vibration Impact Assessment*. Construction noise levels vary greatly depending on factors such as type of equipment, condition of equipment, and operation being performed. The primary source of noise from construction equipment is the engine, usually a diesel that lacks sufficient muffling. In noise assessment, construction equipment is considered either stationary or mobile. Stationary and mobile equipment have large differences in noise output based on movement around the site and variances in operating power. Using the FTA method, the two pieces of project construction equipment with the highest continuous noise level shown in Table 4-32 were selected and assumed to operate at full power for one hour. Noise is assumed to originate at a location consistent with the center of the trackway and to propagate to nearby noise-sensitive receivers. Where equivalent noise levels over the one-hour period exceed criteria shown in Table 4-33, adverse community reaction may occur and consequently there is a potential for noise impact.

Project Construction Noise Minimization Policies

As with any construction project, areas around the construction site would likely experience varied periods and degrees of noise impact if the Build Alternative were selected. Under normal circumstances, construction activities would be limited to the hours of 7:00 a.m. to 6:00 p.m., weekdays. As such, critical time periods in which sleep occurs would not be subject to noise intrusion from construction activities. Including specific noise control requirements in the construction contract specifications could reduce construction noise impacts. The specifications should require contractors to:

1) Select the equipment and techniques that generate the lowest noise levels;
2) use equipment with effective mufflers;
3) certify compliance with noise monitoring;
4) select haul routes that minimize truck noise in residential areas; and
5) select air compressors that meet federal noise level standards.

Construction Noise Mitigation

So much can depend on the contractor's sensitivity to and awareness of the community's expectations that it is vital to have early identification and assessment of potential problems. A pre-construction assessment of the potential for complaints could aid contractors in making bids by allowing changes in construction approach and by identifying mitigation costs before construction plans are finalized. Circulation of such an assessment could build goodwill with the affected community.

Upon identifying potential noise impacts, the next step would be to identify appropriate control measures. Remedies could include consideration to practical construction site layout, order of operations planning, and emphasizing quieter operating procedures. The following summarizes possible remedies for each of these elements.

Site and design layout—effective methods could include:

- *Construction of noise barriers such as temporary walls or mounds between construction site and adjacent land uses*
- *Install noise shield surrounding particularly noisy equipment or activities*
- *Select truck traffic routes away from residential neighborhoods*
- *Locate equipment on construction site far from noise -sensitive land uses*

Operations planning:

- Combine noisy activities such that they occur simultaneously
- Avoid nighttime activities

Quieter operations:

- Avoid pile driving in noise-sensitive areas where possible
- Use special quieter equipment that has been enclosed or muffled

- Exercise quieter demolition methods when possible. An example being piecing a bridge apart for transport to an off-site demolition yard.

Table 4.32
Construction Equipment Noise Levels

	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Bulldozer	85
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, April 1995.

Table 4.33 FTA Guidelines For Construction Noise		
	Day (One-hour dBA L_{eq})	**Night (One-hour dBA L_{eq})**
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, April 1995.

Construction Vibration

Similar to the construction noise analysis, FTA provides guidelines for assessing the potential for damage and annoyance from construction vibration. For the onset of damage, a threshold criterion of 0.20-in/sec peak particle velocity (PPV) has been established and a vibration velocity level of 80 VdB inside a building is the criterion for the onset of annoyance from construction vibration. Ground vibrations caused by equipment operation travel through soil, diminishing with distance. Buildings sited in the path of these vibrations perceive impacts with great variance from no detection to slight damage.

Vibration impacts during construction are generally limited to irritation as actual building damage is rare. As mentioned, construction would normally be limited to the daytime. Construction vibration impacts could be mitigated by restricting the procedures and time permitted for vibration-intensive activities, such as pile driving and by requiring vibration monitoring to certify compliance with vibration limits. In addition, an active community liaison program could be implemented to ensure residents are kept informed of construction activities and have a means to register complaints.

For vibration-intensive activities, care should be taken to prevent vibration damage to adjacent structures. In areas where construction-related vibration is anticipated, basement surveys could be conducted before construction begins to document any damage caused by construction.

4.4.3 Water Quality

Refer to Sections 4.1.4 and 4.2.3 for information on potential water quality construction impacts.

4.4.4 Rail and Vehicular Traffic

No Build Alternative: Construction impacts to existing modes of transportation in the Study Area Alternatives would consist of expanding and maintaining existing facilities. While providing temporary relief once construction is completed, studies of intercity transportation indicate that the projected growth in demand will rapidly reach or exceed the capacity of these expansions. Thus, the delays created by construction congestion in existing modes of transportation will not significantly benefit the intercity traveler.

High Speed Rail (Build) Alternative: Of the existing modes of transportation in the study areas, high speed rail construction will not impact air travel. Existing vehicular travel and intercity bus travel will realize impacts at highway-rail grade crossings where proposed improvements could range from temporary lane closures to the removal of unsafe crossings and at road realignments where the road parallels railroad realignment. The existing rail services will potentially realize the greatest impacts from high speed rail construction.

The greatest impacts to existing rail services would occur during the construction of high speed rail facilities at bridges, curves, and realignments. Bridge construction would require a temporary structure and detour track that would reduce train speeds at these locations. While most of the construction for curve improvements may be completed without interrupting existing rail service, the relocation of existing track or connection of new track with the existing may require temporary delays to train traffic on single tracks if construction is not closely coordinated with existing freight and passenger schedules. Similarly, construction of realignments may be nearly completed without interrupting existing rail service except when connecting to existing tracks. The construction of passing sidings, universal crossings, and additional tracks may temporarily delay existing rail service during the installation of turnout panels. Any delays or congestion caused by the construction of high speed rail would quickly benefit all modes of transportation by diverting some of the intercity travelers from air and vehicular modes and by improving the facilities for rail services.

4.5 Indirect and Cumulative Effects

Implementation of the proposed SEHSR project is not expected to substantially alter development patterns in the Study Area Alternatives or in the vicinity of proposed stations. It is possible that the implementation of SEHSR service could result in undeveloped land in the vicinity of stations developing at a faster pace than it would have without the SEHSR program.

The greatest potential for development, economic activity and job creation would occur within a three to five mile radius of the potential station areas with the highest ridership and the greatest market conditions. Since this potential is contingent upon many factors such as current financial and real estate market conditions, and local land use and zoning regulations, there are no existing models that can predict secondary development or economic activity on a small geographic scale. The potential for secondary development would be more specifically assessed if and when specific alignments are developed and station locations identified. This activity could take place during the Tier II environmental study. At best, this potential can be assessed in this Tier I document by estimating construction and operations jobs on a gross and aggregate scale based upon capital and operating cost estimates (refer to Economic Impacts discussion in this chapter).

A diversity of natural resources and habitats are found throughout the Study Area Alternatives. Indirect effects to water quality caused by run-off may result from an increase in impervious surfaces due to station construction, additional parking lots and compaction of the roadbed. Construction activities indirectly related to the SEHSR service may result in the loss of wildlife habitat, including habitat suitable for protected species. This habitat loss would be fairly equal across Study Area Alternatives. It is not expected to result in a loss of such magnitude that the survival of any federally protected species would be jeopardized.

The proposed SEHSR program would enhance the existing transportation network in the Washington, DC to Charlotte, NC corridor, providing many indirect benefits. It would link cities and major metropolitan areas where highway and airline travel volumes are the greatest, thus, providing a travel alternative that will help ease congestion on the existing highway and airway systems. The proposed SEHSR program would offer an alternative mode of transportation between the Northeast and Virginia and North Carolina.

The increased speeds and frequencies proposed for the SEHSR service allows people to make trips that they otherwise would not make, increasing capacity to the overall transportation network and the ability for people to travel. The auto trip diversion levels for the nine Study Area Alternatives would aid in improving air quality through the Study Areas.

The extension of the service into states to the south would allow both Virginia and North Carolina to be more accessible by rail to tourists and business travelers arriving from South Carolina, Georgia, and Florida. The SEHSR program would provide access to rural areas and communities through links with intercity passenger rail service.

Virginia and North Carolina have both evaluated the feasibility of adding passenger train service and routes to eastern and western portions of their respective states. The proposed SEHSR program would serve as the spine to these added routes, allowing passengers to take conventional service to the SEHSR service and connect to points in the Northeast, Southeast, and beyond. These new passenger train services and routes in Virginia and North Carolina would provide linkages to the SEHSR service from parts of Virginia and eastern and western North Carolina not currently served by rail. Passenger rail linkages would be provided to existing and planned commuter rail services at multimodal stations, allowing for connections to suburbs and airports in Washington, DC, Richmond, Greensboro-High Point-Winston-Salem (the Triad), Raleigh-Durham-Chapel Hill (the Triangle), and Charlotte.

4.6 Section 4(f) and 6 (f) Properties

This section generally discusses the legal and administrative framework protecting parklands and other natural and recreational areas. It also presents an order of magnitude discussion of the potential for impacts to such properties. However, this program level Tier I EIS does not complete the documentation requirements of Sections 4(f) and 6(f) which are federally enacted laws that specify requirements for documentation and analysis when any park or recreational area, cultural resource or publicly owned lands may be subject to an impact from a proposed action involving federal funds. The formal 4(f) process and any needed 4 (f) or 6 (f) documentation, coordination and agency consultation would be undertaken, as appropriate, during the Tier II analysis when specific boundaries are be determined. In this Tier I document, Study Area Alternatives are viewed in terms of potential for impacts to these resources – not actual impact.
This section does not discuss the application of section 4(f) to historic properties. Please refer the appropriate discussion in this document for more information about historic and cultural resources and the assessment of potential impacts to these resources.

Section 4(f) and 6(f) properties were identified through a search of databases for federal, state, county and locally owned park sites and recreational facilities, and publicly owned lands. Data on federal, state, county and locally owned park sites and recreational facilities in Virginia was obtained in digital format from the Environmental Science Research Institute (ESRI) website. For North Carolina, this same data was obtained from NCDOT in the digital format from the Center for Geographic Information Analysis (CGIA). This information was supplemented by information obtained from examination of various municipal and county land use and comprehensive plans and parks and recreational plans. These resources were not separately verified as public parks and resources with local, state or federal agencies, nor were these resources verified in the field. Although, Section 6 (f) properties have not been specifically identified, there is usually a close correlation between these properties and Section 4(f) parks. Section 6 (f) properties will be specifically identified in the Tier II documentation.

Regulatory Framework

Section 4(f) of the Department of Transportation Act of 1996 (49 USC § 1653, now 49 USC § 303) declares a national policy that special effort be made to preserve the natural beauty of the countryside, including public park and recreation lands, wildlife and waterfowl refuges, and historic sites. Section 4(f) prohibits the Secretary of Transportation from approving projects that require the direct or indirect use of publicly owned parks, recreation areas, or wildlife and waterfowl refuge, or any significant historic site protected under Section 4(f) unless a determination is made that there is no feasible and prudent alternative to such use, and that the project includes all possible planning to minimize harm to the property resulting from such use. As it applies to historic resources, according to 23 CFR 771.135(f), Section 4(f) requirements may not apply to the restoration, rehabilitation, or maintenance of transportation facilities listed in or eligible for the National Register if such work would not adversely affect the historic qualities of the resource and if the SHPO and Advisory Council concur with the exemption.
A Section 4(f) "use" occurs under three circumstances:

(1) when land is permanently incorporated into a transportation facility;
(2) when there is a temporary occupancy of land that is adverse in terms of the statute's preservationist purposes as determined by the (length of occupancy, scope of work, anticipated permanent adverse physical impact of the occupancy of land, and possibility of restoration to the resource's original condition prior to occupancy); or
(3) when there is a constructive use of land (23 CFR 771.135(p)). Circumstance 1, the physical and permanent procurement of a protected resource for use by a transportation project, is also known as an actual or direct use.

For circumstance 2, a short-term, temporary use (e.g., for a construction easement) of a Section 4(f) resource would not constitute a use under Section 4(f) as long as the following conditions are met: occupancy of the resource is temporary (i.e., shorter than the construction period for the entire project) and there is no change in ownership; changes or effects to the resource are minimal; there are no permanent adverse impacts resulting from the temporary use; and there is a documented agreement between relevant jurisdictions regarding temporary use of the resource.

For circumstance 3, a constructive use occurs when a project does not incorporate land from a protected resource but when the project generates impacts due to proximity (e.g., noise or visual impacts) and these impacts are so severe they impair preservation or utilization of the protected resource. Constructive use occurs when the project negatively affects the purposes for which the resource is of value to the public (i.e., its activities, features, or attributes). A constructive use determination considers the present use of the resource by the public as well as the attributes that made the resource valuable in the first place. Constructive use resulting from increased noise applies only when the protected resource is "noise sensitive" and derives some of its value and use from its relatively quiet setting. To constitute a constructive use, the noise increase must not only be detectable to the human ear (i.e., greater than 2 to 3 dBA) and exceed the Federal Transit Administration abatement criteria, but it must be severe enough to impair enjoyment of the Section 4(f) resource. Constructive use based on visual intrusion occurs when there is substantial impairment to the features, setting, or attributes of a protected resource when those features, setting, or attributes are important contributing elements to the value of the resource.

Section 4(f) Evaluation Process

When a proposed action would use land protected by Section 4(f), a Section 4(f) evaluation must be prepared. In a 4(f) evaluation, alternatives that do not use 4(f) lands must be developed and evaluated. This requires that the specific location of a proposed action and its related facilities be known and the affected 4(f) properties identified. Since this is a program level document, the specific location of the construction of the SEHSR program has not been specifically identified. As stated previously, no Section 4(f) evaluation was prepared for this program level, Tier I EIS. Should this evaluation be necessary, it would be prepared during the Tier II environmental process for the SEHSR program when specific alignments and station locations have been designated.

The section 4(f) evaluation must demonstrate that there are no feasible and prudent alternatives to the use of Section 4(f) land. Thus the evaluation must address the location of the alternatives and design shifts that avoid use of Section 4(f) lands. Supporting documentation must show that these alternatives result in unique problems. The evaluation of alternatives must demonstrate a reasoned methodology for narrowing the field of alternatives to a number sufficient to support a sound judgment that the study of additional variations is not worthwhile. If all build alternatives use some 4(f) land then the alternative with the least overall impact to Section 4(f) properties must be selected, unless it is not reasonable or feasible.

Section 4(f) and FHWA regulations require all possible planning to minimize harm to the Section 4(f) properties. This usually consists of the identification of mitigation measures. These measures are usually worked out in consultation with the official or agency owning the land. Although not required by either Section 4(f) or FHWA regulation, mitigation measures, other than design modifications to lessen the impact on 4(f) properties, usually consist of replacement of land and facilities of comparable value and function or monetary compensation which could be used to enhance remaining land. Mitigation of historic sites usually consists of those measures necessary to preserve the historic integrity of the site and agreed to, in accordance with 36 CFR, Part 800, by FHWA, the State Historic Preservation Officer (SHPO) and as appropriate the Advisory Council on Historic Preservation (ACHP). The cost of mitigation should be a reasonable public expenditure in light of the severity of impact on 4(f) resources.

Preliminary coordination prior to the circulation of a draft Section 4(f) evaluation should be accomplished with the official of the agency owning or administering the land, the Department of Interior (DOI) and other agencies as appropriate. If issues are raised by these agencies as a result of the circulation, follow up coordination must be undertaken to resolve the issues.

Section 6(f) Requirements

Section 6(f) of the Land and Water Conservation Fund Act (Public Law 88-578) requires that recreation land acquired or developed with assistance under this section remain in use exclusively for public outdoor recreation. It may not be converted to other uses without the approval of the National Park Service.

State and local governments often obtain federal grants through the Land and Water Conservation Fund Act (LWCF) with which to improve parks and recreational areas. Section 6 (f) prohibits the conversion of these lands to non-recreational use without the approval of the

DOI National Parks Service and, as appropriate, other departments. Under Section 6(f) DOI is directed to assure that replacement lands are of equal value, location and. Regardless of the mitigation proposed, the Section 4(f) evaluation should document the National Park Service's position relative to the Section 6(f) conversion.

Section 4 (F) and Section 6(f) Properties Within the Study Area Alternatives

As mentioned at the beginning of this section, potential impact properties were identified. This inventory was not checked in the field nor verified with the owner's or administrator's of these lands. This more specific identification of these properties will take place during the Tier II environmental process for the SEHSR program. Table 4.34 presents a summary by Study Area Alternative of the public parks, gamelands and other federally owned lands within the 500- foot buffer for each Study Area Alternative.

Table 4.34
Potential Section 4(f) and Section 6 (f) Resources within Study Area Alternatives

Potential Properties	Study Area A	Study Area B	Study Area c	Study Area D	Study Area E	Study Area F	Study Area G	Study Area H	Study Area J
Public Parks (each)	14	15	11	14	15	11	15	16	12
Gamelands/public Lands (in acres)	5.7	5.7	15.3	5.7	15.7	15. 3	5.7	5.7	15.3
Study List Sites	317	317	273	387	387	343	390	390	346
National Register Sites	61	61	32	61	61	32	48	48	19

Source AG&M, 2000; complied by Carter & Burgess, Inc, May 2001

Based upon this initial identification, with no specific alignment boundaries set, there is little variation between the study areas in the number of public parks. Study areas range from a high of 16 to a low of 11, with most areas having 15 public park areas. There is more variation between Study Area Alternatives for gamelands or public lands, with Study Area Alternatives C, F, and J having a high of 15.3 acres and the other six Study Area Alternatives having approximately 5.7 acres of these lands. The Study Area Alternatives are less consistently the same for historic sites on the study list, ranging from a high of 390 sites to a low of 273, a difference of over 100 sites. For historic sites on the National Register of Historic Places, Study Area Alternatives ranged from a high of 61 sites to a low of 19, with approximately 30 sites being the difference between most of the Study Area Alternatives.

No rivers designated as "wild and scenic" under the auspices of the Wild and Scenic Rivers Act of 1968, occur within the Study Area Alternatives.

During the SEHSR development of the *Study Area and Modal Alternatives Report* (November 2000), Study Area Alternatives were evaluated according to areas of environmental complexity. Environmental complexity has been defined as the level of difficulty required to avoid or minimize environmental impacts in a certain area. It does not attempt to evaluate any specific resource, but rather it identifies areas that will require creativity and resources in order to minimize potential impacts. Three levels of complexity are assumed: High, Moderate, and Low.

<u>High areas</u> of complexity are those that would require creative avoidance and minimization techniques and add substantially to the overall construction effort for that segment, and would

potentially generate significant public and agency concern.

Moderate areas of complexity are those that require normal avoidance and minimization techniques which may add to the overall construction effort for that segment, but when done would not generate significant public and agency concern.

All other areas were considered Low areas of environmental complexity. No areas of high environmental complexity were identified for potential 4(f) impacts. However, moderate areas of environmental complexity were identified for potential 4(f) properties are per Table 4.35.

Table 4.35
Potential Areas of Moderate Environmental Complexity for Section 4(f) and Section 6(f) Resources

Resource or Location	Description
Bryan Park, Leesylvania State Park, and Featherstone National Wildlife Refuge (VA)	Coordinate with parks and avoid 4(f) involvement
Quantico and Fredericksburg	Avoid 4(f) impacts
Colonial Heights, VA	Avoid 4(f) impacts
Henderson and Wake Forest, NC	4(f) concerns and community impact concerns
Rocky Mount, NC	4(f) and 106 concerns
Garner Recreation Park/Garner, NC	4(f) issues
Burlington, Greensboro, Durham, and Hillsborough, NC	Potential 4(f) impacts
China Grove	Potential 4(f) impacts
Salem Lake/Winston-Salem, NC	Potential 4(f) issues
Apex, NC	Potential 4(f) issues
Uwharrie National Forest, NC	Potential 4(f) impacts

Source: AG&M 2000, Table 3 -1, SEHSR Study Area and Modal Alternatives Report, November 2000.

4.7 Relationship Between Long and Short Term Impacts and Benefits

Environmental impacts and benefits to the Study Area Alternatives will result in short and long term impact and benefit relationships. FHWA methodology requires that all significant short and long-term environmental impacts be quantified in terms of avoidance, minimization and compensation for unavoidable impacts on resources. Because this is a program level document the methodology cannot be strictly followed. The analysis, which will more specifically quantify these impacts and benefits, will be conducted, as appropriate, during the Tier II environmental process.

Each of the nine study areas is based upon sound planning for transportation needs within the context of present and possible future land use patterns. This coupled with environmentally sensitive design of the proposed project and the best management practices (BMP) should go a long way to make sure that the short term use of resources related to construction will be out weighted by the long term impacts of implementing the proposed SEHSR project.
Aquatic communities are sensitive to any changes in their environment and impacts from construction activities, particularly siltation and sedimentation, can produce both short-term and long-term effects. Localized water quality may be temporarily affected during construction

activities due to an increased sediment load. The stringent use of BMP would minimize impacts to water quality.
Temporary fluctuations in populations of animal species that utilize terrestrial areas are anticipated during the course of construction. Slow moving, burrowing, and/or subterranean organisms will be directly impacted by construction activities, while mobile organism may be permanently displaced to adjacent communities. Competitive forces in the adapted communities may result in a redefinition of population equilibria. The project poses no significant long-term threat to survival of wildlife within the study areas.
The long term enhancement of the efficiency of the transportation system in the Washington, DC to Charlotte, NC corridor will occur at the expense of short-term construction impacts to adjacent residents and businesses. These short-term impacts would include localized noise, air, water pollution, and traffic delays. Standard environmental specifications that would be a part of the more specific Tier II environmental analysis would not have a lasting impact on the environment.

Short-term gains to the local economy should be recognized as a result of the hiring for local firms, labor, local services and supplies to construct the proposed project.

The implementation of the SEHSR program would enhance the existing transportation network between Washington, DC and Charlotte, NC and provide a viable travel alternative for residents and users. This is consistent with the purpose of the proposed SEHSR project. Based upon the significant contribution to the long term objectives of regional and local plans for development, the proposed SEHSR program is consistent with the maintenance and enhancement of the long term productivity at the local, regional, state and national levels.

4.8 Irreversible and Irretrievable Commitment of Resources

Implementation of the proposed SEHSR program would involve a commitment of some natural, physical, human and fiscal resources. While land to be acquired for the construction of the proposed SEHSR project could be minimized if the project were to be constructed within existing railroad right-of-way, this would be considered an irreversible commitment of land for a transportation use. If a greater need for the use of the land was to arise or if the transportation facility were no longer needed, it could be converted to another use. At present there is no reason to believe such a conversion would be necessary or desirable.
Although the proposed project would be implemented within the existing railroad rights-of-way to the extent practicable, additional right-of-way may be necessary at some locations. This acquisition and new construction within the exiting right-of-way may result in both short-term and long-term losses and alterations to the natural resources in the area. Upland and aquatic biotic communities, as well as agricultural land may be committed to rail service where new right-of-way is required. The most apparent impact may be the loss of aquatic or terrestrial habitat productivity, and therefore, a decline in wildlife abundance in the area, as a result of habitat destruction. Increased noise associated with the project may be intolerable to some wildlife species. Forested areas may be cleared in some locations and wetlands and other surface waters may be filled to accommodate changes to existing crossings. Riprap may be placed along stream banks at bridge crossings, reducing habitat within riparian zone. After construction, some habitat types may be restored within the construction limits, although their value to wildlife is unlikely to equate to that which was lost. If wetlands are filled for new construction, mitigation of impacts will likely involve restoration of degraded wetlands within the project vicinity. In the long-term, this will offset the loss of wetland habitats within the project

construction limits. The commitment of natural resources within existing and additional ROW is a permanent loss of productive wildlife habitat.

Fossil fuels, labor, and construction materials would be expended in the construction of the proposed SEHSR project. In addition, labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, these materials are not in short supply and their use would not have an adverse effect on the continued availability of resources. Any construction would also require the expenditure and allocation of local, state and federal funds, which are not retrievable and could be used by other projects.

The implementation of the proposed project would result in the irreversible commitment of resources. However, this would be outweighed by the beneficial commitment to a safer, improved transportation network for the Washington, DC to Charlotte, NC corridor.

4.9 Areas of Environmental and Engineering Complexity

As a part of the Tier I evaluation process, criteria to assess the areas of environmental and engineering complexity were identified. This criterion was based upon the conceptual engineering and the environmental analysis. The purpose of the criteria is to provide an order of magnitude indicator of the level of difficulty related to avoiding/minimizing potential environmental impacts and of designing and constructing the proposed project.

Environmental complexity is the estimated level of difficulty required to avoid or minimize environmental impacts in a certain area. The measure is not intended to evaluate any specific resource, but rather it identifies areas that may require creativity and resources in order to minimize potential impacts. Three levels of complexity are assumed: Low, Moderate, and High.

Moderate areas of complexity are defined as those that require normal avoidance and minimization techniques which may add to the overall construction effort for that segment, but when done are not anticipated to generate public and agency concern.

High areas of complexity are defined as those that would require creative avoidance and minimization techniques and could substantially add to the overall construction effort and could potentially generate public and agency concern.

All other areas were considered Low areas of environmental complexity. Appendix C provides a table that identifies the areas of moderate and high environmental complexity with a brief description associated with each. The areas of high environmental complexity by study area alternative are summarized in Table 4.36.

Table 4.36

Areas of High Environmental Complexity By SEHSR Study Area Alternative

Areas of High Environmental Complexity	**SEHSR Study Area Alternatives**								
	A	B	C	D	E	F	G	H	J
	6	**8**	**4**	**5**	**7**	**3**	**7**	**9**	**5**

Source: Carter & Burgess, Inc.; Compiled by the Resource Group May 2001

The complexity of the engineering required to design or construct the proposed project was based upon the conceptual engineering effort, assumptions and field visits. Three levels of engineering complexity were assumed: Low, Moderate, and High.

A particular area of the corridor was considered of moderate complexity if it involved challenges from physical constraints that could be overcome with moderate effort based on more detailed data during the Tier II document preparation.

An area was considered high if physical constraints offered major challenges to developing acceptable engineering solutions. High complexity automatically raises the need for more detailed study during the Tier II process. These areas would be investigated as appropriate, during the Tier II effort. All other areas were considered Low complexity. Appendix C provides a table that identifies the areas of Moderate and High engineering complexity with a brief description associated with each.

Table 4.36

Areas of High Environmental Complexity By SEHSR Study Area Alternative

Areas of High Engineering Complexity	**SEHSR Study Area Alternatives**								
	A	B	C	D	E	F	G	H	J
	18	**23**	**25**	**20**	**25**	**27**	**19**	**24**	**26**

Source: Carter & Burgess, Inc.; Compiled by the Resource Group May, 2001

4.10 Summary of Alternatives

This Section presents a summary of the potential impacts within the SEHSR Study Area Alternatives, as presented in Chapter 4. Table 4.40 includes those resource areas where impacts could be quantified. This summary is included to assist the reader in understanding the differences and similarities between the Study Area Alternatives as it relates to the numerous impact areas.

Those impact areas, primarily the human/social environment, for which impacts could not be quantified are not included in Table 4.38. The potential impacts in these areas are more qualitative and the reader is referred to the discussion of impacts in those sections of this Chapter.

The potential impacts presented in this Tier I, program level environmental document are done at the macro level in order to determine the general location for further study. Further investigation and fieldwork would be conducted, as appropriate, during the Tier II analysis process in order to determine exact locations and associated impacts, thus allowing avoidance and minimization to be incorporated into any final designs.

Table 4.38
Summary of Potential Impacts and Benefits of the Study Area Alternatives

	Study Area Alternatives								
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G	Alternative H	Alternative J
4.1.1 Water Resources -# Of Water Supply Watersheds (6 mile wide buffer) - # Of Potential Crossings of Major Rivers	27 29	33 28	19 29	28 31	35 30	21 33	27 29	34 28	21 31
4.1.2 Wetlands _ Potential Impacts in acres (Within 300 ft buffer)	117.3	115.8	117.0	124.0	122.5	123.7	190.7	189.2	190.4
4.1.3 Floodplains and Floodways - # Of crossings of 100-year Floodplain	83	76	44	89	82	50	97	90	58
Mineral Resources # Of Historic Mines within 0.5 miles Of existing rail lines	36	37	40	37	38	41	33	34	37
4.1.1.7 Hazardous Materials Sites - # Of sites within 6 mile buffer	1,708	1,728	1,426	1,720	1,740	1,448	1,1760	1,780	1,488
4.1.1.8 Air Quality Net reduction in Nox emissions From auto diversion to trains (In lbs/yr) *	554,889	530,895	279, 065	547,392	517,065	269,540	589,505	553,099	298,179
4.1.1.9 Noise and Vibration # Of Category 3 noise and vibration sensitive receptors (Within 150' of existing lines)	333	342	259	371	371	287	369	372	284
4.1.1.10 Energy - Fuel consumption per trip (in gallons)	403	432.3	383.5	421.2	450.5	401.7	434.2	463.5	414.7
4.1.1.11 Prime Farmland - Prime farmland in acres	37,219	39,360	26,523	45,137	46,992	34,308	57,346	59,134	46,670
4.2. 1 Protected Species - # Of known populations identified	33	35	45	44	46	56	43	49	51
4.2.2 National Rivers Inventory	11	11	13	10	11	13	12	13	14
4.3.1.1 Community Impacts Sites with potential impacts in areas of Environmental concern	5	6	5	4	5	4	`4	4	4
4.3.1.2Environmental Justice Populations % Minority population (1999) % Low Income Households (1999) (300 ft buffer)	39% 47%	39% 48%	37% 43%	43% 48%	43% 48%	43% 46%	41% 47%	41% 47%	40% 44%
4.3.1.5 Acquisition/Relocation Acres to be acquired # Residential relocations (each)	678 365	731 371	930 220	620 405	674 411	872 260	545 301	598 307	797 156

	Study Area Alternatives								
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G	Alternative H	Alternative J
- Business relocations (sq ft)	65,145	110,920	57,374	62,191	107,966	54,420	70,344	116,119	62,573
4.3.1.6 Transportation Impacts** - At grade crossings	1,053	1,172	918	1,134	1,254	1,100	1,115	1,235	963
4.3.1.8 Historic Sites National Register Sites	61	61	32	61	61	32	48	48	19
Study List Sites (1500ft buffer)	317	317	273	387	387	343	390	390	346
Section 4(f) and Section 6 (f) properties **Parks**	14	15	11	14	15	11	15	16	12
Gamelands/Public lands (acres) (See 4.3.1.8 above for historic sites)	5.7	5.7	14	5.7	15.7	15.3	5.7	5.7	15.3

* Emission factors from standard EPA emissions models. Assume average car in 1997 operating on a typical summer day (72 to 96 degrees F)
**Includes public, private, conceptual, and pedestrian crossings

5.0 DISTRIBUTION OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Draft Environmental Impact Statement is being distributed to the following federal, state, regional and local agencies and other interested parties for their review and comments.

Federal Agencies

Advisory Council on Historic Preservation

Mr. John M. Fowler, Executive Director
Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 809
Washington, DC 20004

Department of Agriculture

Mr. Dan Glickman
Office of the Secretary
U.S. Department of Agriculture
Jeremy Whitten Bldg Room 200A
14th & Independence Avenue, SW
Washington, DC 20250

Mr. William A. Carothers, Field Office Representative
Forest Service - USDA
P.O. Box 2680
Asheville, NC 28802-2680

Mrs. Kay A. Adcock, Chairperson
Wake County Soil & Water Conservation District
4001-D Cary A Drive
Raleigh, NC 27610

Department of Commerce

Director
Office of Public Affairs
U.S. Department of Commerce
Room 5413
Washington, DC 20230

Council on Environmental Quality
Executive Office of the President
722 Jackson Place, N.W.
Washington, DC 20006

Mr. Don A. Chamblee
Acting Director, Office of External Affairs
Federal Energy Regulatory Commission
888 First Street, NE, Room 11H-1
Washington, DC 20426

Department of Health and Human Services

Mr. Jim Mason, Director
Office of Intergovernmental Affairs
Hubert Humphrey Building, 600E
200 Independence Avenue, SW
Washington, DC 20201

Department of the Army

Colonel Alan B. Carroll
U.S. Army Corps of Engineers, Norfolk District
Fort Norfolk
803 Front Street
Norfolk, VA 23510-1096
Attn: Ms Alice Allen-Grimes

C. Wayne Wright
U.S. Army Corps of Engineers, Wilmington District
PO Box 1890
Wilmington, NC 28402-1890
Attn: Mr. David Franklin

Department of Housing and Urban Development

Director
Community Planning and Development
105 South Seventh Street
Philadelphia, PA 19106-3392

Department of the Interior

Mr. Bruce Blanchard, Director
Office of Environmental Project Review
U.S. Department of the Interior
18th and "C" Streets, NW
Washington, DC 20242

Regional Director
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035

Director
U.S. Fish and Wildlife Service
Atlanta Field Office
1875 Century Blvd., Suite 240
Atlanta, GA 30345

Garland Pardue, Ecological Services Supervisor
U.S. Fish and Wildlife Service
Raleigh Field Office
551F Pylon Drive
Raleigh, NC 27606

Brian Cole, Supervisor
U.S. Fish & Wildlife Service
160 Zillicoa St.
Asheville, NC 28801

Laurie Hewitt, Ecological Services Supervisor
U.S. Fish and Wildlife Service
Annapolis Field Office
1825B Virginia Street
Annapolis, MD 21401

U.S. Fish and Wildlife Service, Ecological Services
Mid-County Center, U.S. Route 17
P.O. Box 480
White Marsh, VA 23183

Mr. Robert F. Gift, Chief
Federal Services Division
National Park Service, Mid-Atlantic Region
143 South 3rd Street
Philadelphia, PA 19106

Mr. Gary W. Johnson, Chief
Blue Ridge Parkway
400 BB&T Building
Asheville, NC 28801

Mr. William Hester
U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lanes
Gloucester, VA 23061

Mr. Eric Davis, Supervisor
U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lanes
Gloucester, VA 23061

Environmental Protection Agency

Mr. Peter Stokley
Region III, 3ES43
NEPA Compliance Section
841 Chestnut Building
Philadelphia, PA 19107

Mr. Don Owen, Environmental Protection Specialist
National Park Service, Harpers Ferry Center
Harpers Ferry, WV 25425

National Oceanic and Atmospheric Administration

Ms. Donna Weiting
Ecology and Conservation Division
National Oceanic and Atmospheric Administration
14th and Constitution Avenue, SW, Room 6117
Washington, DC 20230-0001

Director
National Marine Fisheries Service
Oxford Laboratories, Railroad Avenue
Oxford, MD 21654

Department of Transportation

The Honorable Norman Y. Mineta
Office of the Secretary
400 Seventh Street, SW
Washington, DC 20590

Mr. Ed Sundra
Federal Highway Administration
400 North 8th Street, Room 750
Richmond, VA 23240
Mr. Brett J. Gainer, Attorney
Federal Highway Administration
10 South Howard Street
Baltimore, MD 21201

Mr. Jerry Combs
Federal Highway Administration
400 North 8th Street, Room 750
Richmond, VA 23240-0249

Commander
U.S. Coast Guard
Fifth Coast Guard District
Federal Building
431 Crawford Street
Portsmouth, VA 23705
Attn: Ms Ann Denton

Federal Emergency Management Agency

Natural and Technological Hazards Division
Federal Emergency Management Agency
Ninth Division, 2nd Liberty Square Building
105 South 7th Street
Philadelphia, PA 19106

Federal Railroad Administration

Mr. William R. Fashouer, Senior Attorney
Office of Chief Counsel
Federal Railroad Administration
1120 Vermont Avenue, NW
Washington, DC 20590

Federal Transit Administration

Administrator, Region III
Federal Transit Administration
1760 Market Street, Suite 500
Philadelphia, PA 19103-4124

State Agencies

North Carolina State Clearinghouse

Copies are mailed to all North Carolina state agencies through one central location.

Commission for the Arts

Director
Commission for the Arts
James Monroe Building
101 North 14th Street, 17th Floor
Richmond, VA 23219

Department of Agriculture and Consumer Services

Commissioner J. Carlton Courter, III
Washington Building, Capitol Square
1100 Bank Street
Richmond, VA 23219

Department of Aviation

Mr. Kenneth F. Wiegand, Director
5702 Gulfstream Road
Richmond, VA 23150

Department of Commerce and Trade

Secretary Barry E. DuVal
202 North Ninth Street, Suite 723
Richmond, VA 23219

Department of Conservation and Recreation

Ms. Kathleen W. Lawrence, Director
203 Governor Street, Suite 302
Richmond, VA 23219-2010

Ms Synthia Waymack (3 copies)
203 Governor Street, Suite 302
Richmond, VA 23219-2010

Department of Economic Development

Mr. Mark R. Kilduff, Director
901 E. Byrd Street
River Front Plaza
West Tower - 19th Floor
Richmond, VA 23219

Department of Environmental Quality

Mr. Charles Ellis, III
Environmental Impact Coordinator
Council on the Environment
Ninth Street Office Building
Richmond, VA 23219

Office of Water Resources Management
Virginia Department of Environmental Quality
629 East Main Street
PO Box 10009
Richmond, VA 23219

Mr. Larry Lawson, Director
Water Division
629 East Main Street
Richmond, VA 23219

Mr. Hassan Vakili, Director
Waste Division
629 East Main Street
Richmond, VA 23219

Mr. John Daniel, Director
Air Division
629 East Main Street
Richmond, VA 23219

Mr. Thomas Felvey
Division on Intergovernmental Affairs
Office of Environmental Impact Review
629 East Main Street
Richmond, VA 23219

Department of Forestry

Mr. James W. Garner, Jr.
State Forester
900 Natural Resources Drive
PO Box 3758
Charlottesville, VA 22903

Department of Game and Inland Fisheries

Mr. William L. Woodfin, Jr.
Executive Director
4010 West Broad Street
Richmond, VA 23230

Department of Health

Ms. E. Anne Peterson
Acting Commissioner
Main Street Station
1500 E. Main Street
Richmond, VA 23219

Department of Mental Health and Mental Retardation

Mr. Hoard M. Cullum, Commissioner
Department of Mental Health and
Mental Retardation
James Madison Building
109 Governor Street
Richmond, VA 23219

Department of Historic Resources

Mr. H. Alexander Wise, Jr., Director
2801 Kensington Avenue
Richmond, VA 23221

Department of Housing and Community Development

501 North Second Street
Richmond, VA 23219-1321

Department of Mines, Minerals and Energy

Mr. Eugene K Rader
900 Natural Resources Dr.
PO Box 3667
Charlottesville, VA 22903

Virginia Marine Resources Commission

2600 Washington Avenue
PO Box 756
Newport News, VA 23607-0756

Virginia Institute Of Marine Science

Mr. Tom Banard
Rt 1208 Greate Road
Gloucester Point, VA 23062

Document Distribution Location List

The Draft Environmental Impact Statement is being available to the public and other interested parties for their review and comments at 18 locations. Public hearings on the Tier I Draft EIS will also be held in these same cities on the dates indicated. Document viewing locations, addresses and contact information are listed below in chronological order based upon the date scheduled for the public hearing in that city.

Raleigh, NC - 9/11/01

NCDOT District 1 Office
4009 District Drive
Raleigh, NC 27607
Brandon H. Jones (919) 733-3213

Fredericksburg, VA - 9/13/01

VDOT District Office
87 Deacon Road
Fredericksburg, VA
Harry Lee, 540-899-4215

Durham, NC - 9/18/01

NCDOT Division 5 Office
2612 N. Duke Street
Durham, NC 27704
Jon G. Nance, 919-560-6851

South Hill, VA - 9/20/01

South Side Planning District Commission
200 South Mecklenburg Ave
South Hill, VA 23970
Joyce French, 804-447-7101

Sanford, NC - 9/25/01

Lee County Manager's Office
106 Hillcrest Drive
Sanford, NC 27330
Gaynell Lee, 919-718-4605

Wilson, NC - 9/27/01

NCDOT Division 4 Office
PO Box 3165
Wilson, NC 27895
(Courier: 01-53-26)
Jim Trogdon, 252-237-6164

Roanoke Rapids, NC - 10/2/01

NCDOT District 1 Office
PO Box 98
Halifax, NC 27839
(Location: NC 903, 1.5 Miles Northwest of Halifax, NC)
Andy Mills, 252-583-5861

Henderson, NC - 10/9/01

NCDOT District 3 Office
P.O. Box 205
Henderson, NC 27536
Courier: 07-23-13
Scott Capps, 252-492-0111

Springfield, VA - 10/11/01

Northern Virginia District Office
14685 Avion Parkway
Chantilly, VA 20151-1104
Gene Hall, 703-383-2453

Star, NC - 10/16/01

Star Municipal Building
454 South Main Street
Star, NC 27356
Robin Hussey, 910-428-4623

Charlotte, NC - 10/18/01

NCDOT District 2 Office
7605 District Drive
Charlotte, NC 28213
Davis Diggs, 704-596-6900

Salisbury, NC – 10/23/01

NCDOT District 1 Office
4770 S Main Street
Salisbury, NC 28147
C.T. Corriher, 704-639-7560

Emporia, VA – 10/25/01

Emporia City Hall
201 S Main Street
Emporia, VA 23847
Dana Highsmith, 804-634-3332

Winston-Salem, NC – 10/30/01

NCDOT Division 9 Office
2125 Cloverdale Ave.
Winston-Salem, NC 27103
Pat Ivey 336-631-1340

Greensboro, NC – 11/01/01

NCDOT Division 7 Office
1584 Yanceyville Street
Greensboro, NC 27415-4996
Mike Mills, 336-334-3192

Richmond, VA – 11/07/01

Richmond Planning District Commission
2104 West Laburnum Ave, Suite 101
Richmond, VA 23227
Dan Lysy, 804-358-3684

VDOT Office, Colonial Heights
2430 Pine Forest Drive
Colonial Heights, VA 23834
Sam Hayes, 804-524-6145

Petersburg, VA 11/08/01

Crater Planning District Commission
PO Box 1808
1964 Wakefield Street
Petersburg, VA 23805
Joe Vinsh, 804-861-1666

6.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

This chapter discusses the efforts undertaken to involve the relevant resource and other agencies and summarizes the public outreach efforts conducted during the Tier I DEIS process.

6.1 Agency Coordination

Historically, regulatory agencies, resource agencies and other agencies with public trust responsibility have sought early involvement with transportation planning projects. The tiered approach to environmental planning allows the earliest possible involvement by the agencies, and also allows a big picture look at the overall project concept. The challenge for the agencies is one of available staff time. Because of pressing demands for projects at the permit stage, it is difficult to justify time on projects that are in very early planning. With this in mind the Southeast High Speed Rail (SEHSR) team designed an approach that would allow the agencies to stay abreast of the SEHSR planning process and give on-going input, while requiring a minimal amount of actual staff time away from regular duties.

As with the overall public involvement process (refer to Section 6.2), the agency involvement process was designed to be proactive.

FHWA was chosen as the lead federal transportation agency because of their environmental expertise. The FRA chose to be a cooperating agency and FTA chose to be a commenting agency. At the state level, NCDOT was the lead state transportation agency, again because of environmental expertise and staff availability, with VDRPT as a full cooperating partner.

Because of an existing MOA in Virginia, the US Coast Guard, the Army Corps of Engineers, and the US Fish & Wildlife Service were also extended opportunities to participate as formal cooperating agencies. These agencies chose to limit their initial involvement to the normal review process associated with the document.

A Notice of Intent to prepare a Tier I Environmental Impact Statement was published in the Federal Register on August 4, 1999.

6.1.1 Scoping Process

Scoping is the process of gathering input from agencies with areas of responsibility relevant to the proposed action, along with input from the public who are in some way affected by the action. The scoping process helps to guide the extent and nature of the proposed action. The process is an on-going one that continues throughout the different planning phases as they develop.

The approach taken for scoping on the SEHSR Tier I EIS, involves both agency and public involvement. It is composed of the following approaches:

- Informal communications to prepare agencies for coming project;
- Formal joint bi-state scoping meeting;
- Informal briefings and small group meetings
- Written data and input requests
- The formation of an Advisory Committee;
- Use of the same communication tools made available in the public involvement process
    - o Newsletters to inform and update
    - o Web site to keep abreast of more current information

  - o Toll free project line (as well as direct access to the project manager at all times)
  - o Access to the public workshops and officials workshops held all along the corridor
- (Note: all these activities are discussed in detail in section 6.2)

6.1.2 Informal Communications

In July of 1999, informal letters were sent to regulatory and resource agencies, along with some phone calls, in order to introduce them to the project concept and prepare them for the upcoming process. This also provided the agencies with an early chance to ask questions, seek clarification, and give input.

6.1.3 Scoping Meeting

On October 12, 1999, a joint bi-state Scoping meeting was held in South Hill, VA. At this meeting, a full project overview was presented and participants gave oral comments regarding issues of concern by their respective agencies. Agencies, who were invited but unable to attend, were mailed all presentation materials, along with a synopsis of the meeting. They and those who did attend were also able to submit written comments following the meeting. This input helped to direct the study efforts of the project team.

The scoping meeting summary in Appendix D documents comments from the meeting participants. Written comments were also received from the following agencies, these comments are listed in Appendix E.

6.1.4 Briefings and Small Group Meetings

Following the scoping meeting a series of briefings were done in both states for the regulatory and resource agencies. Theses meetings were to familiarize them with the project further and to get their input as to their key issues. These meetings were in addition to the public workshops and officials workshops, Advisory Committee meetings, newsletters and other communications, and were done either at the offices of the agencies, or at a convenient location to their offices.

Small group meetings were also made available to interested organizations along the corridor within both states.

6.1.5 Written requests for Data and Input

Project consultants by way of letters made requests for data regarding planning efforts within the study areas to the planning directors and school boards. Coordination with the State Historic Preservation Officers (SHPOs), other than the scoping letter, was through telephone conversations and meetings rather than in writing.

6.1.6 Advisory Committee

An advisory committee was formed to facilitate sound decisions and to insure input from a broad range of stakeholders in both states. This committee will continue to function throughout the life of project. The committee is comprised of representatives from Metropolitan Planning Organizations; Planning District Commissions; local, state, and federal transportation officials; Amtrak; the freight railroads (Norfolk Southern Railroad and CSX Transportation); regulatory and resource agencies.

The committee met in March of 2000 in Raleigh, NC and Richmond, VA for a project overview and timetable, with opportunity to question the project staff and to give input on all aspects of the project process. The committee then reconvened in November of 2000 for review and input concerning the *Draft Purpose & Need Statement*, and the Draft *Study Area & Modal Alternatives Analysis Report*. Copies of all presentation materials, along with meeting summaries were provided to all invitees whether or not they were able to attend.

6.2 Public Involvement

The Southeast High Speed Rail (SEHSR) public involvement program was founded on the belief that it is the responsibility of the study team to take the proposed SEHSR program directly to the public, rather than expecting the public to seek out the study. The mission of the public involvement plan is to ensure that:

- Opportunities are provided for the diverse publics to participate in the SEHSR planning and decision making process through a variety of convenient and accessible venues;
- The general public is informed, educated and engaged early and continuously throughout the process;
- Public comments receive meaningful consideration and are integrated into SEHSR plans as appropriate;
- Public issues and concerns are considered prior to final decisions on the preferred study area(s) in a way that is clear and understandable;
- The Plan and the Media Involvement Strategy component are designed to work together to establish and develop effective lines of communicating information to and from the public; and
- Traditionally under-represented populations are actively involved in the process.

The public involvement program was designed to be responsive to Federal and State guidelines for public involvement, which reflect the desire to effectively involve the public in the planning and decision-making process. It is based on a proactive approach to ensure that the communities in the study areas will be integrated throughout the entire process.

There are six components to the public involvement program:

- Public opinion survey;
- Public workshops;
- Community outreach tools/techniques;
- Media outreach;
- Community outreach research; and
- Public feedback on public involvement activities.

6.2.1 Public Opinion Survey

A public opinion survey was conducted near the beginning of the public involvement program to determine public opinions and concerns about potential high speed rail service and to help shape outreach approaches and techniques. The survey was conducted via telephone interviews with adults living within the study areas for the proposed high speed rail service in North Carolina and Virginia. A stratified sampling plan was used to assure that there would be a sufficient number of respondents living in urban, suburban and rural areas for separate analysis.

The sample frame consisted of zip codes corresponding to the Study Area Alternatives. Using a geographic information system, a one-half mile buffer on each side of the proposed high speed rail study area was used. Any zip code that intersected this buffer was chosen as part of the study area. The Study Area sampling was further classified by zip codes as urban, suburban or rural according to the following standard definitions:

Urban: the U.S. Office of Management and the Budget (OMB) define the “central city” of a Metropolitan Statistical Area (MSA), as this term. Most MSAs have central cities, and some have more than one. Since “city” is a non-technical term with different legal significance in each state, the census concept of “place” is used to precisely define the geographic extent of each “central city.”

Suburban: Any portion of an MSA that is not a “central city” is considered suburban.

Rural: All areas that are not part of MSAs are considered rural.

Because the study areas are more suburban and somewhat more urban than is the nation as a whole, rural areas were oversampled. Urban areas were undersampled and, to a much lesser extent, suburban areas. This was necessary in order to have an adequate number of rural respondents for analysis.

Sampling of more than 4,600 Study Area households was conducted during January and February 2000. One thousand, two-hundred adult members of households in Virginia and North Carolina completed the survey, as shown in Table 6.1. This yielded a 26 percent cooperation rate. On average, the telephone interviews took 18 minutes to complete, although some respondents required as much as 45 minutes. Questions consisted of a mixture of interval-based preference response, multiple response, and open-ended formats, plus the usual standard demographic elements. Analysis and summary interim results were prepared and reported in March and April.

Table 6.1
Sampling of Households for the Public Opinion Survey

	Virginia	North Carolina	Total
Urban	200	200	400
Suburban	200	200	400
Rural	200	200	400
TOTAL	600	600	1200

Source: SAIC, 2000

The public opinion results were generally positive. Key findings included:

- While only 25% of respondents had heard of the project prior to the survey, about half of the respondents approved of the high-speed rail project concept, while about half reserved final judgment until they knew more about the project. Those who were familiar with high-speed rail in general, and who had recently traveled by train, tended to approve of the project. Those who were less familiar with passenger rail service, including rural populations, showed a stronger tendency to withhold judgment rather than voice approval or disapproval.
- The public believes that the SEHSR service could reduce air pollution; be more relaxing and safer than car travel; be more relaxing and less expensive than air travel; and help decrease traffic congestion.
- The public also voiced some concerns about safety at crossings for pedestrians and cars; noise and vibration at housing near train tracks.
- Continuous information regarding the SEHSR program is a strong need.

Findings from the survey related to outreach and public information activities include:

- The need for a multi-channel approach to outreach. Meeting attendance was a more popular civic participation activity than writing letters to the editor or elected officials, calling a toll-free hotline, or requesting brochures or newsletters. However, only 37% reported they would attend a public workshop on high speed rail, assuming their travel time was 15 minutes. At travel times of 30 minutes or greater, respondents were more likely not to attend a public workshop.
- Workshops may not be the most effective means of reaching those who either disapprove or are withholding judgment of the project. Respondents who either disapprove of the project or are withholding judgment are less likely to attend a public workshop.
- Respondents reported television and newspapers as the means by which they receive information about state and local issues four to five times more often than they reported using the Internet or obtaining project newsletters

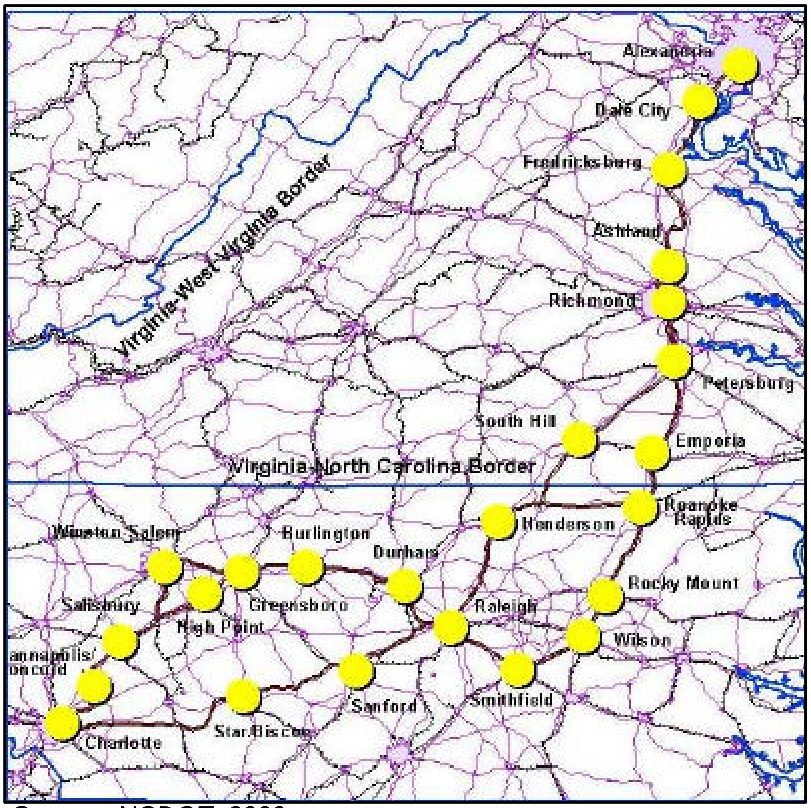
6.2.2 Public Workshops

Twenty-six public meetings were held at locations in the Study Area in North Carolina and Virginia between April and June 2000. Major population centers as well as locations with potentially environmentally sensitive impacts were chosen as workshop sites. Public workshops were held in the late afternoon/early evening and locations were ADA-accessible. Figure 6-1 shows all of the workshop locations.

These workshops consisted of a one-hour briefing to local officials followed by a two and one-half hour public session. At the public session, the local officials briefing was usually repeated, with time reserved for a question-and-answer period. The public also had the opportunity to view display maps of the entire study area, detailed maps related to the specific workshop location, and display materials of the SEHSR project organization and schedule. Figure 6-2 shows an example of format and interaction at a representative public workshop.

The public was notified of the workshops through a direct mail to 225,000 residents within one mile of the proposed study route. In addition, the workshops were advertised in a cross-section of major, community, and minority newspapers. More than 1,100 attended these workshops. The attendance range was 5 (Rocky Mount) to 230 (Winston-Salem); the average was 44. Results of the public workshops can be found in 6.2.6 Public Feedback.

Figure 6.1
Public Workshops in Study Area Alternatives
April-June 2000



Source: NCDOT, 2000.

Figure 6.2
Attendees at a SEHSR Public Workshop

Source: SAIC, 2000.

6.2.3 Community Outreach Tools

Several tools have been used to provide information to the public. The SEHSR Web site, www.sehsr.org, was launched in January 2000 to educate the public and provide ongoing updates about the project. The Web site also allows visitors to add themselves to the mailing list. There have been over 35,000 hits on the Web site since January 2000; the monthly average is approximately 3,200. Mobile display units have also been utilized for education on key project concepts. The displays cover project background, personal, economic, and community benefits, and the project timeline. They are used at small group meetings as well as in stand-alone settings. The displays have been used at the North Carolina State Fair, the Durham Inter-Neighborhood Summit, and the High Speed Rail Conference and Expo 2000 held in Richmond, VA.

The SEHSR Newsletter has provided timely information about project progress. Two editions have been published to date. The first edition concentrated on introducing the project to the general public and advertising the workshop locations and times. The second edition provided an update of project activities and a summary of public feedback from the workshops and other sources. Since the first edition, the mailing list for the newsletter has increased from 3,500 to 7,000. Small group meetings have also provided a forum for outreach and involvement. These meetings are designed for more in-depth information for concerned groups, such as elected officials, planning organizations, and community groups, and will continue to be used to work with groups targeted through community outreach research.

6.2.4 Media Outreach

To involve the media in coverage of the SEHSR program, 141 packets were mailed to reporters and editors in nine metropolitan media markets in the study area between April and June 2000. The media packets included copies of project history and schedule, a preliminary study area map, a brochure, newsletters, and fact sheets, and a contacts list. Eighteen follow-up phone calls were made to reporters in key areas prior to public workshops. In addition, many smaller and statewide newspapers used press releases distributed through NCDOT.

To increase the visibility of the project, nine editorial board briefings and transportation beat reporter interviews were conducted in May-June, 2000 in Charlotte, Salisbury, Durham, Fairfax, Fredericksburg, Concord/Kannapolis, Raleigh, and High Point. A sample list of project representatives at the board briefings included the Deputy Secretary for NCDOT, the Rail Division Administrator for VDRPT, the SEHSR EIS Manager, and the Public Information Officer for NCDOT Rail Division. As a result, 39 members of broadcast (10) and print (29) media attended public workshops. The SEHSR program was covered in all 9 media markets and 20 of the 26 public workshop locations.

6.2.5 Community Outreach Research

To develop strategies to involve underrepresented groups in decision-making, a two-part, technical and qualitative approach was taken to conduct community outreach research. For the technical approach, an environmental justice analysis was conducted to examine the disproportionate affects or benefits of the proposed action on minority or low-income communities. While the analysis provided no sufficient insight to selecting or eliminating route combinations, it did assist in identifying communities in the study area requiring greater attention.

For the qualitative approach, community leadership interviews were conducted to identify community issues, concerns, and desired outcomes. Sample questions from the structured interview included:

- Would you anticipate that your constituents or community members would welcome high speed rail or be opposed to the project?
- Has your community been involved with similar types of projects with state and/or local officials involving land-use changes, community impacts, or other changes in living conditions or circumstances?
- How would you rate your constituents' or community members' awareness of the planning process?
- Would you recommend additional education about the project in this community?

Those interviewed indicated a collective representation of more than 150,000 community members. An analysis of the interviews revealed that community members generally support the high speed rail concept. However, many interviewees found it difficult to react either positively or negatively without having more specific information about possible alignments. Community concerns included safety, noise/vibration, and connectivity. In addition, the interviews highlighted a need for specifically tailored outreach to affected communities. Continuation of the community outreach research could help to connect and identify with affected communities and allow use of more targeted outreach strategies.

6.2.6 Public Feedback at Public Involvement Activities

Up to the release of this Draft Environmental Impact Statement (DEIS), public comments were recorded at workshops, through a hotline, with mail-in comment forms, and in interviews. Between 500 and 600 comments were received. Over 250 of these were substantive feedback, e.g., identification of community concerns. The remaining comments were requests for information. The following are a sample of the types of issues brought forth through public feedback:

- Safety, noise, vibration, and impact on property values (Cary, NC)
- Mix of commuter and freight rail and increased congestion (Woodbridge, VA)
- Access to high speed passenger rail service (Winston-Salem, NC)
- Impact on tourism and preservation of historic districts (Ashland, VA)

As the project evolves, more refined and targeted public involvement opportunities in potentially affected communities could be possible. The insights and feedback gained from this first phase of public outreach would be used to inform and refine all aspects of the public involvement activities, especially the use of public workshops, public hearings, and the media to raise public awareness and provide opportunities for review and comment.

7.0 LIST OF PREPARERS

This report was prepared by Carter & Burgess, Inc. (C&B) in association with Arcadis Geraghty & Miller (AG&M) Science Applications International Corporation (SAIC), and the Resource Group in cooperation with the United States Department of Transportation (USDOT), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), Virginia Department of Rail and Public Transportation (VDRPT) and North Carolina Department of Transportation (NCDOT) - Rail Division.

Federal Highway Administration (FHWA):

North Carolina Division

Ms. Kay Batey	Ms. Batey serves as a member of the Southeast High Speed Rail Draft EIS review team to maintain compliance with FHWA policy and guidelines. Ms. Batey has over 14 years of experience in the areas of civil engineering, NEPA, transportation planning and air quality.
Mr. Mike Dawson	Mr. Dawson serves as a member of the Southeast High Speed Rail Draft EIS review team for compliance with FHWA policy and guidelines. Mr. Dawson has over 18 years of experience in Local, County and Federal Government in the areas of urban planning, right-of-way, real estate property appraisal, environmental programs management and NEPA.

Virginia Division

Mr. Jerry Combs	Transportation Specialist providing (1) assistance to the FHWA North Carolina Division Office and other partners, (2) coordination with the other Federal agencies in Virginia, and (3) comments on the environmental analyses in the preparation of the Tier I Draft EIS. Mr. Combs has over 3 years of experience in ensuring compliance with the requirements of NEPA and related statutes in the development of environmental documents on Federal-aid highway projects.

Federal Railroad Administration (FRA):

Mr. David Valenstein, FRA Environmental Program Manager	Mr. Valenstein serves as a member of the Southeast High Speed Rail Draft EIS review team to maintain compliance with FRA policy and guidelines. Mr. Valenstein has over 11 years of related experience in the areas of design, planning, and environmental issues of transportation.

Virginia Department of Rail and Public Transportation (VDRPT):

Mr. George Conner, PE	Rail Administrator responsible for the administration of the Rail Division. Mr. Conner has 40 years of experience in transportation engineering and planning with approximately 26 years in railroad issues, both freight and passenger.
Mr. Tom Stewart	Project Manager responsible for the review of the EIS documentation relative to the Commonwealth. Mr. Stewart has 45 years of experience in traffic engineering and planning with approximately 26 years with freight and passenger railroad projects.
Mr. Alan Tobias	Rail Transportation Engineer responsible for assisting with the management of the EIS project. Mr. Tobias has eight years experience in transit operations and planning with eight years in railroad projects.

Virginia Department of Transportation (VDOT):

Mr. John Simkins Environmental Program Planner	Environmental program planner that advised NCDOT regarding environmental processes in Virginia. Mr. Simkins has over 6 years environmental experience, the last 3 years dealing with environmental planning for transportation facilities. Mr. Simkins currently works for FHWA in the State of Virginia.

Ms. Sherry Munford VDOT Public Involvement Coordinator	Public involvement coordinator for public meetings in the State of Virginia for VDOT. Ms. Munford has over 22 years experience in transportation with 10 years experience in public coordination for transportation related projects.

North Carolina Department of Transportation - Rail Division:

Mr. Patrick B. Simmons Director	Program direction and project oversight, stakeholder involvement, document review, engineering and technical feasibility and financial plan. Mr. Simmons has over 20 years experience in transportation program development and management.
Mr. Mark Sullivan Assistant Director	Program conception and development, and project founder. Mr. Sullivan has over 33 years of state and local planning, land use planning, and environmental documentation.
Mr. David B. Foster, P.E. Project Manager for SEHSR	Mr. Foster is also the Manager of the Rail Environment & Planning Branch, and has over 20 years of engineering related experience with approximately 14 years related to environmental issues within the context of transportation planning.
Mr. David P. Bender, AICP Transportation Planner II	Assisted with oversight and coordination regarding the public involvement portion of each phase of the SEHSR EIS. Mr. Bender has over 14 years of experience in Planning in both local government and private industry with emphasis in land use and transportation planning.
Ms. Pam Davis Rail Revitalization Manager	Mrs. Davis is a transportation planner and was instrumental in early project initiatives. Ms. Davis has over 20 years of experience in rail freight and economic development planning.
Mr. Marc Hamel Rail Environmental Planning Engineer	Responsible for review and oversight regarding NEPA documentation and historical rail aspects. Mr. Hamel has over 15 years of experience in NEPA documentation and transportation feasibility planning.

Mr. James B. Harris, P.E. Engineering Manager of Engineering & Safety Branch	Mr. Harris is responsible for review of the environmental document with particular concentration on rail engineering and route identification issues. Mr. Harris has over 24 years of railroad related engineering experience, the last 4 of which have been with the NCDOT Rail Division. Prior to joining NCDOT, experience included 10 years of direct railroad engineering along with 10 additional years of railroad and highway related consultant engineering.
Ms. Julia Hegele Communications Manager	Ms. Hegele serves as the primary media contact for the SEHSR project and all other NCDOT rail matters. During the Tier 1 phase, she met with reporters to discuss the project, wrote news releases and helped to prepare printed materials about the project used in public meetings. Ms. Hegele has over 10 years of experience in transportation-related communications.
Ms. Ellen Holding Graphic Designer	Ms. Holding has worked in various divisions of the Department of Transportation for over 22 years, including Transportation Planning, Public Transportation and Public Affairs. Ms. Holding designed the SEHSR logo and provides graphics advice.
Ms. Ann Steedly, P.E. Public Involvement Officer	NCDOT Public Involvement and Community Studies. Ms. Steedly managed public outreach activities for the high-speed rail project during the two and a half years she served in the Rail Division. Ms. Steedly will conduct public hearings for the project and has continued to advise the Rail Division on community outreach and impact evaluation activities.
Ms. Diana Young-Paiva Rail Transportation Planner and Assistant Project Manager	Responsible for document review and project activities. Ms. Young-Piava has over 8 years experience in local and state public transportation planning.
Mr. Bill Gallagher High Speed Rail Advisor	High Speed rail Advisor responsible for directing the technical effort in the development of the operating concepts for the SEHSR and overall project coordination, including interface with the freight railroads. Mr. Gallagher has over 30 years of

experience in rail operations, project management and implementation.

Carter & Burgess, Incorporated:

Ms. Cheryl King, AICP Consultant Team Project Manager/ Senior Planner	Consultant Team Project Manager/Chief planner responsible for the management of the NEPA process, development of the EIS documentation and the design and implementation of the public involvement program. Ms. King has over 25 years of experience in transit/transportation planning and the preparation of NEPA documentation for major transportation projects and public involvement.
Mr. Wes Stafford, P.E. Planning Engineer/Senior Planner	Planning Engineer/senior planner responsible for the development of the project NEPA documentation in the areas of air quality, noise and vibration, and economics and the development of public information materials. Mr. Stafford has over 12 years of experience in transportation planning and analysis, travel demand modeling and NEPA documentation.
Mr. Kirby Becker GIS Analyst/Project Planner	Project planner responsible for GIS data development, analysis and presentation, database development and management, project mapping and the development of EIS sections on land use and planning, community facilities, geology topography and soils, and climate. Mr. Becker has over 5 years of experience in the development, organization and display of data in the GIS format.
Ms. Lorraine Entwisle Graphic Artist/Marketing Coordinator	Graphic artist/marketing coordinator responsible for the development of graphics standards, and graphic materials for the EIS and public outreach effort, including newsletters, fact sheets and the project webpage. Ms. Entwisle has over 10 years of experience in the development of technical materials for presentation to the general public and lay people.
Mr. Wayne Hyatt, RLS Project Engineer	Project engineer responsible for conceptual engineering and cost estimates and EIS sections on right-of-way and acquisitions, utilities and existing visual conditions, and Rail and vehicular traffic flow. Mr. Hyatt has

over 15 years of experience in civil engineering and land development.

Mr. Shane York, P.E. Project Engineer/Planner	Project engineer/planner responsible for database management and updates and document review. Mr. York has over 5 years of experience in transportation engineering design and traffic analysis.
Mr. Thomas Goodwin, P.E. Project Engineer	Project engineer responsible for quality assurance /quality control and document review Mr. Goodwin has over 15 years of experience in project management and control transportation design and planning.

Arcadis Geraghty & Miller:

Ms. Leza Wright-Mundt, AICP Project Planner	Project planner responsible for data collection, analysis, and preparation of sections addressing natural and cultural resources. Ms. Mundt developed information on land use planning, hazardous materials, provided oversight on the development of the GIS database, and assisted in the preparation of the project's purpose and need statement and public involvement activities. Ms. Mundt has over 17 years of experience in transportation and environmental planning, including project management and quality assurance.
Ms. Kristina Miller, P.E. Project Engineer	Project engineer assisting in data collection and public involvement. Ms. Miller has over 6 years of experience in transportation engineering and environmental planning, including project management.
Mr. Ron Lucas, P.E. Project Engineer	Project engineer assisting in data collection, map preparation, and public involvement. Mr. Lucas has 10 years of experience in transportation engineering and NEPA document preparation.
Ms. Wendy Travis, AICP Project Planner	Project planner responsible for development of the project's purpose and need statement. Ms. Travis has over 10 years of experience in environmental planning, including project management.

Mr. Scott Phelps GIS Specialist	GIS specialist responsible for data collection and map production. Mr. Phelps has over 7 years of experience in GIS.
Mr. Amin Davis Biologist	Biologist assisting in the development of information on mineral resources, federally protected species, and wetlands. Mr. Davis also assisted in the preparation of mapping for the project. Mr. Davis has over 2 years of experience in environmental planning.
Ms. Martha Brewster Botanist	Botanist responsible for development of sections on federally protected species, wetlands, and water quality. Ms. Brewster has over 4 years of experience in environmental planning.
Ms. Melissa Elefante Environmental Scientist	Environmental scientist responsible for the preparation of the hazardous materials sections. Ms. Elefante has over 3 years of experience in environmental site assessment and environmental planning.
Ms. Rhonda Zuchowski Project Planner	Project planner responsible for the development of the cultural resources sections of the document. Ms. Zuchowski has over 4 years of experience in the preparation of environmental documents.

Science Applications International Corporation:

Mr. David Keever, PhD Senior Public Involvement Advisor	Senior Public Involvement Program Advisor responsible for assisting with the design and implementation of the public involvement program and community outreach research. Mr. Keever has more than 18 years of research and project development experience, 11 of which are directly related to federal and state transportation projects.
Ms. Karen Weiss Research Associate	Research Associate involved in coordinating public involvement communication strategy development, survey design, implementation, and analysis. Ms. Weiss has more than 6 years of experience in consultation to the federal and state governments on a wide range of issues including developing electronic and printed public outreach materials, and participating in media interaction.

Ms. Calah Young
Project Planner/Researcher

Project Planner/Researcher involved in the development of the outreach program, implementation of the community outreach research, and preliminary collection of community data, which led to first-round analysis of conditions, trends, and potential community impacts. Ms. Young is a former Research Associate with SAIC and is now full-time graduate student in transportation policy and planning.

Ms. Jana Lynott, AICP
Project Planner

Project Planner/Public Involvement Specialist responsible for the environmental justice analysis and serving as the media point of contact in Virginia. She oversaw the design and development of the project website, database, and public information materials. Ms. Lynott is a former Project Planner with SAIC and has 5 years experience in designing and implementing NEPA public involvement programs.

The Resource Group:

Ms. Linda Amato, AICP
Master Editor

Master editor responsible for the final edits to the document and the development of the executive summary. Ms Amato has over 20 years of experience in project management and technical writing, transit/transportation planning and the preparation of NEPA documentation for major transportation projects.

8.0 REFERENCES

This Chapter presents a listing of the source materials used to develop this document.

1990 Census of Population and Housing and State and County QuickFacts. U.S. Census Bureau. Data derived from Population Estimates, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, 1997 Economic Census and 1997 Census of Governments. Compiled by Carter & Burgess, Inc., 2001

1990 Census of Population and Housing: Summary Tape File 3. Bureau of the Census, 1992. 1999 population estimates and 2004 projections, CACI Marketing. Compiled by SAIC, 2001.

1994 Aviation Capacity Enhancement Plan. Federal Aviation Administration, 1994.

2000 Emergency Response Guidebook. Developed jointly by Transport Canada, the U.S. Department of Transportation, and the Secretariat of Transport and Communications of Mexico, 2000.

2020 FAMPO Constrained Long Range Plan. Stafford County, Virginia.

2025 Long Range Transportation Plan and Guilford County Recreation Master Plan. Guilford County, NC.

7.5-minute (1:24,000) Digital Raster Graphics. United States Geological Survey. Compiled by Carter & Burgess, Inc., 2001.

"AAR/Policy and Communications." Progressive Railroading, January 2001, page 7.

A Congestion Mitigation Study for Proposed Passenger Service Improvements. Prepared for NCDOT, 1999.

A Regional Transit Plan for the Triangle and City of Raleigh Comprehensive Plan. Raleigh, NC.

Apex Central Business District Master Plan. Apex, NC.

Amtrak Operating Statistics, 2000. National Association of Railroad Passengers, 2000.

Bailey, C. M. "Generalized Geologic Terrain Map of the Virginia Piedmont & Blue Ridge." The Geology of Virginia. College of William & Mary Geology Department. http://www.wm.edu/cas/geology/virginia/terranes.html. 1999.

Bailey, C. M. "Simplified Geologic Map of Virginia." The Geology of Virginia. College of William & Mary Geology Department. http://www.wm.edu/cas/geology/virginia/geologic_map.html. 1999.

Bailey, C. M. "Physiographic Relief Map of Virginia." The Geology of Virginia. College of William & Mary Geology Department. http://www.wm.edu/cas/geology/virginia/physiography.html. 1999.

Bailey, C. M. "Major Faults & High-Strain Zones." The Geology of Virginia. College of William & Mary Geology Department. http://www.wm.edu/cas/geology/virginia/faults.html. 2000.

Building a Livable Future -The Durham 2020 Comprehensive Plan. Durham, NC.

Burlington 2000 Comprehensive Land Use Plan. Burlington, NC, 2000.

Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. US Federal Government, July 29, 1999.

Cape Fear River Basinwide Water Quality Management Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1996.

Catawba River Basinwide Water Quality Management Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1995.

Charlotte's Central District Plan. Charlotte, NC.

Chowan River Basinwide Water Quality Management Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1997.

City Master Plan - DRAFT. Richmond, Virginia.

Climatological Normals for Airport Weather Monitoring Stations. National Climate Data Center and National Oceanic Atmospheric Administration, 2001.

"Coastal Plain Province." The Geology of Virginia. College of William & Mary Geology Department. http://www.wm.edu/cas/geology/virginia/coastal_plain.html. 2001.

Comprehensive Economic Development Strategy, Southside Planning District, 2000. Brunswick County, Virginia, 2000.

Comprehensive Economic Development Strategy, Southside Planning District, 2000. Mecklenburg County, Virginia, 2000.

Comprehensive Plan and Master Plan for Parks & Recreation. Knightdale, NC.

Conant R., and J.T. Collins. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Edition, Expanded. Peterson Field Guides. New York, NY: Houghton Mifflin Publishing, 1998.

Conservation of Natural Resources. 1991.

Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi: Environmental Laboratory, 1987.

Cowardin, L.M., V. Carter, F.C. Golet and E.T. La Roe. Classification of Wetlands and Deepwater Habitats of the United States. Fish and Wildlife Service, U.S. Department of the Interior, 1979.

“Determining Conformity of General Federal Actions to State or Federal Implementation Plans.” Federal Register. November 30, 1993.

Draft City of Graham Growth Management Plan 2000-2020 and Recreation and Parks Master Plan. Graham, NC, 2000.

Draft Davidson County Land Development Plan. Davidson County, NC.

Draft Town of Cary Affordable Housing Plan. Cary, NC, 2000.

Embassy Block Redevelopment Plan 2000. Henderson, NC, 2000.

Environmental Justice. Council for Environmental Quality, Section 1-1, Implementation of EO 12898.

Espenshade, Jr., Edward B., ed. Goode’s World Atlas. 18th Edition. New York: Rand McNally, 1990.

Farmland Protection Policy Act. American Farmland Trust, March 15, 2001.

Feasibility Study Summary & Implementation Plan. NC Department Of Transportation - Rail Division, April 1999.

Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, Annotated with Proposed Guidance on Terms in the Executive Order. Executive Order 12898, Section 1-1 Implementation, p. 25.

FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Federal Highway Administration Memorandum, December 1998.

Final Guidance for Consideration of Environmental Justice in Clean Air Act 309 Reviews. US Environmental Protection Agency, July 1999.

Final Guidance for Incorporating Environmental Justice Concerns in EPA’s NEPA Compliance Analyses. US Environmental Protection Agency, 1998.

“Five Minute Look at Section 106.” Introduction to Federal Projects and Historic Preservation Law. The Advisory Council on Historic Preservation, January 1994.

Fredericksburg Station Community Plan. Fredericksburg, Virginia.

Gazetteer of Intermodal Transportation in North Carolina. NCDOT Public Transportation Department, September 2000.

Horton, Jr., J. Wright, and Victor A. Zullo, eds. The Geology of the Carolinas. Carolina Geological Society 50th Anniversary Volume. Knoxville, TN: The University of Tennessee Press, 1991.

Guidelines For Local Surveys: A Basis For Preservation Planning. National Park Service National Register Bulletin 24, Parker, 1985.

Harvill, A.R., T.R. Bradley, C.E. Stevens, T.F. Wieboldt, D.M.E. Ware, D.W. Ogle, G.W. Ramsey, and G.P. Fleming. Atlas of Virginia Flora. 3rd edition. Burkeville, Virginia: Virginia Botanical Associates, 1992.

Hazardous Substance Sites. Center for Geographic Information Analysis, 1999.

High Speed Ground Transportation for America. US Department Of Transportation - Federal Railroad Administration, September 1997.

High Speed Ground Transportation Noise and Vibration Impact Assessment. HMMH, March 1997.

Holowaty, Michael. Restoration of the Missing Link - The S-line from Centralia, VA to Norlina, NC. Paper presented to the SEHSR Conference and Expo, Richmond, VA, Nov. 2000.

The Jefferson Davis Corridor Plan, The Ruffin Mill Area Plan, Eastern Area Land Use and Transportation Plan, Chester Village Plan and The Southern and Western Area Plan. Chesterfield County, Virginia.

KPMG Model Forecast Data. KPMG, October 2000.

Land Use Summaries for Counties and Cities along the Southeast High Speed Rail Study Areas. AG&M, 2000.

Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer Jr., 1980-et seq. Atlas of North American Freshwater Fishes. North Carolina Museum of Natural History, North Carolina Department of Agriculture. Raleigh, NC: North Carolina Biological Survey #1980-12, 1980.

Locomotive Emission Standards Regulatory Support Document. US Environmental Protection Agency, April 1998.

Lunenburg County Comprehensive Plan. Lunenburg County, Virginia.

Moore County Land Use Plan. Moore County, NC.

"Mineral Industry of North Carolina" and "Mineral Industry of Virginia". US Geological Survey Minerals Yearbook, 1999.

National Flood Insurance Program. Federal Emergency Management Agency, April 11, 2001.

National Pollution Discharge Elimination System. North Carolina Department of the Environment and Natural Resources, April17, 2001.

Neuse River Basinwide Water Quality Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1998.

North Carolina Geological Survey. US Geological Survey, March 1, 2001.

Piedmont Triad Intercity Rail Study Briefing. Parsons Brinckerhoff Quade & Douglas, September 2000.

Prime Farmland Soils Without Qualifications for Drainage or Flood Protection. US Department of Agriculture, 1997-2001.

Prime Farmlands. US Department of Agriculture, March 28, 2001.

Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources. US Environmental Protection Agency, April 1998.

Rail Passenger Service: A Critical Link in the National Transportation System. Amtrak, 1995.

Radford, A.E., H.E. Ahles, and C.R. Bell. Manual of the Vascular Flora of the Carolinas. Chapel Hill, North Carolina: University of North Carolina Press, 1968.

Revised Land Development Plan. Elon College, NC.

Ridership/Revenue Study. KPMG Peat Marwick, March 2000.

Rivers, Trails, and Conservation Assistance. National Park Service, 2001.

Roanoke River Basinwide Water Quality Management Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1996.

Rocky Mount Urban Area Transportation Plan. Rocky Mount, NC.

Rodhe, F.C., R.G. Arndt, D.G. Lindquist, and J.P. Parnell. Freshwater Fishes of the Carolinas, Virginia, Maryland, and Delaware. Chapel Hill, NC: The University of North Carolina Press, 1994.

Sanford & Lee County 2020 Land Use Plan. Lee County, NC.

Section 106 Regulatory Summary. Advisory Council on HistoricPreservation, April12, 2001.

Soil Conservation Service. United States Department of Agriculture, in cooperation with North Carolina and Virginia Agricultural Experiment Station, 2001. Compiled by Carter & Burgess, Inc. 2001.

Spotsylvania County Comprehensive Plan. Spotsylvania County, Virginia.

Statement of Ross B. Capon. Executive Director, National Association of Railway Passengers, before the Subcommittee of Transportation of the Committee on Appropriations. US Senate, April 10, 1997.

Stokes, Donald and Lillian. Stokes Field Guide to Birds, Eastern Region. New York, NY: Little, Brown, and Company, 1996.

Sussex County Map of Proposed Future Land Use. Sussex County, Virginia.

Tar-Pamlico River Basinwide Water Quality Management Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1994.

Testimony of Paul C. Worley. NCDOT Rail Division before the Committee on Commerce, Science, and Transportation, Surface Transportation and Merchant Marine Subcommittee, United States Senate, March 25, 1999.

Title VI Legal Manual. U.S. Department of Justice, Civil Rights Division, September, 1998.

Thomasville Land Use Plan 1990-2000 and Parks and Recreation Master Plan. Thomasville, NC.

"Time Schedule." http://www.wmata.com/timetables/schedueles.htm. Washington Metropolitan Area Transit Authority, 2000.

"Time Schedule." http://www.vre.org/service/schedule.htm. Virginia Railway Express, 2000.

Town of Ashland and Randolph-Macon College Gateway Terminus Master Plan Concept. Ashland, Virginia.

Town of Morrisville Land Use Plan. Morrisville, NC.

Transit Noise and Vibration Impact Assessment. Federal Transit Administration, April 1995.

Transportation Energy Data Book. Edition 16. Oak Ridge National Laboratory, July 1996.

US Geological Survey Digital Data Series DDS-52. 2000.

US Geological Survey Mineral Database. 2000.

Virginia's Environmental Permit Guide. Virginia Department of Environmental Quality, April 13, 2001.

Virginia Water Quality Assessment 2000; 305(b). Report to the EPA Administrator and Congress for the period January 1, 1994 to December 31, 1998. Richmond, Virginia: Virginia Departments of Environmental Quality, and Conservation and Recreation, 2000.

Virginia Water Quality Standards. Code of Virginia. 9 VAC 25-260-5 et seq.

Vision 2005 - Comprehensive Plan for Forsyth County and Winston-Salem, NC. Forsyth County, NC.

Weakley, A.S., K.D. Patterson, S. Landaal, M. Pyne and others (compilers). International Classification of Ecological Communities: Terrestrial Vegetation of the Southeastern United States. Working Draft. Chapel Hill, NC: The Nature Conservancy, Southeast Regional Office, Southern Conservation Science Department, Community Ecology Group, March 1998.

Yadkin-Pee Dee River Basinwide Water Quality Plan. North Carolina Division of Water Quality. Raleigh, North Carolina: North Carolina Department of Environment and Natural Resources, 1998.

9.0 INDEX

A

B

C

D

E

F

G

H

I

L

M

N

P

R

S

T

U

V

W