New Business: Item B

BRISTOL TENNESSEE / VIRGINIA URBAN AREA METROPOLITAN PLANNING ORGANIZATION

Meeting Date: August 4, 2016

New Business

Item B: Draft Long-Range Transportation Plan Year 2040

Background:

The MPO is currently in the process of updating the Regional Long-Range Transportation Plan Year 2040. The regional transportation plan provides an overview of the existing transportation system, including roadways, bicycle/pedestrian facilities, and public transportation services, and evaluates future transportation needs and proposed improvements within the Metropolitan Planning Area. The plan is required to be financially constrained and to represent at least a 20-year planning horizon.

The goals and objectives of the long-range plan are based on the Federal planning factors established by the Fixing America's Surface Transportation Act (FAST-Act) and include *System Efficiency and Asset Management, Economic Development, Healthy and Sustainable Communities, Mobility Options,* and *User Safety and Security*. Proposed projects identified in the draft plan are based on the MPO's previous long-range plan as well as local jurisdictions comprehensive plans and project priorities.

MPO staff will provide a presentation of the Bristol Tennessee/Virginia Urban Area Long-Range Transportation Plan Year 2040 at the August 4th meeting.

Recommendation:

The Regional Long-Range Transportation Plan requires a 30-day public review and comment period prior to final adoption. Executive Board's concurrence to release the plan for public comment is requested.

LRTP2040

Long-Range Transportation Plan Year 2040

Bristol Tennessee/Virginia Urban Area
Metropolitan Planning Organization

DRAFT

July 1, 2016

Bristol Tennessee/Virginia Urban Area Metropolitan Planning Organization

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BRISTOL TENNESSEE – VIRGINIA URBAN AREA METROPOLITAN PLANNING ORGANIZATION

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CHAPTER 1: INTRODUCTION

The movement of people and goods is, to a great extent, regional. People often live in one locality and commute to another. Various businesses, medical, educational and other services are oriented towards meeting the needs of a metropolitan area market, which requires access and mobility at the regional level. Basic mobility needs of the local population are satisfied through a network of roadways, transit routes, pedestrian and bicycle paths, paratransit services, and other systems that enhance the movement of people. In addition to ensuring the efficient movement of people throughout the region, it is equally important to provide for transportation choices for the movement of goods.

The *Bristol Tennessee/Virginia Urban Area Long-Range Transportation Plan Year 2040* is the initial step and framework in developing a regionally based network of transportation facilities and services that meets the travel needs of the region in the most efficient and effective manner as possible. As traffic patterns shift because of changes in land use patterns, the original design of an established transportation network may become outdated. Analysis behind the transportation plan strives to identify those portions of the transportation network which are or will be overburdened by traffic conditions and to categorically quantify those developing weaknesses in the transportation system in order to formulate short-term and long-term priorities for improvement.

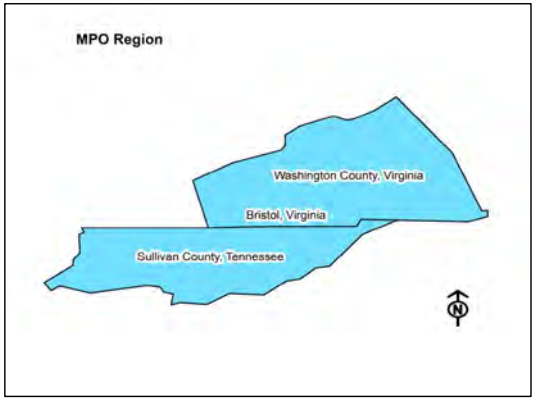
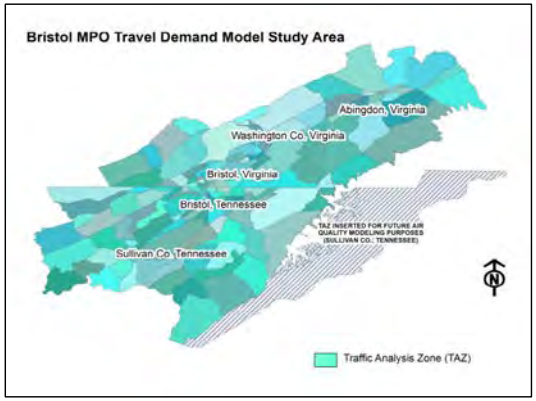
BRISTOL TENNESSEE/VIRGINIA URBAN AREA LONG-RANGE TRANSPORTATION PLAN YEAR 2040

The intent of the *Bristol Tennessee/Virginia Urban Area Long-Range Transportation Plan Year 2040* is to create the best possible plan of action to help maintain a functional transportation system for the Metropolitan Planning Area. As required by federal law, the plan is updated on a regular cycle and includes a planning horizon of at least 20 years. This plan represents an update of the Year 2035 Transportation Plan.

For transportation projects to be eligible for federal funding, they must first appear in the long-range transportation plan. This document provides an overview of the existing transportation system, including roadways, public transportation services, bicycle/pedestrian facilities, and freight movements, and evaluates future transportation improvements. Additionally, federal law requires the preparation of a long-range transportation plan that is realistic, both from an implementation and a financial standpoint.

Geographies referenced in the *Bristol Tennessee/Virginia Urban Area Long-Range Transportation Plan Year 2040* include the MPO Region, the Metropolitan Planning Area (MPA), and the MPO Study Area. The significance of each of these areas is addressed in the following illustration (Map 1-1).

Map 1-1
MPO Geography

MPO Region	Metropolitan Planning Area (MPA)	MPO Study Area
		
The MPO Region consists of all of Sullivan County, Tennessee; Washington County, Virginia; and the independent city of Bristol, Virginia.	Federal regulations base the Metropolitan Planning Area on the census-defined urbanized area. This includes Bristol Tennessee/Virginia; Abingdon, Virginia; and a portion of Sullivan County, Tennessee and Washington County, Virginia.	The MPO Study Area is based on census tract geography and includes the entire Metropolitan Planning Area as well as additional fringe territory for the purposes of data collection and continuity of the highway network.
What does it mean?	**What does it mean?**	**What does it mean?**
Many demographic data sets provided the U.S. Census Bureau are only available at the county geography level. In order to provide an overview of statistical data as it relates to the region, county-wide data is utilized. The MPO Region is for statistical purposes only and has no impact on the planning requirements for this Plan.	This is the official planning boundary of the MPO, approved by the Governors of Tennessee and Virginia. This boundary relates to project eligibility for federal transportation funds. Federal funds cannot be utilized for projects within the Metropolitan Planning Area unless they are included in this Plan.	Creating a regional traffic demand model is an important component of transportation planning. This boundary is based on Transportation Analysis Zones utilized for traffic modeling and is larger than the Metropolitan Planning Area to incorporate the impact of regional mobility on the highway network.

WHAT IS AN MPO?

Greatly enhanced by the freedom of the automobile, the settlement of land around cities and into suburban environs has developed into regional economies that span across governmental boundaries. The federal government recognized that regional economics are dependent on the large-scale movement of people and goods over regional transportation networks; however, it is difficult to address regional transportation impacts and needs when you have multiple jurisdictions of political authority.

The federal government sought to address regional transportation by requiring states to establish Metropolitan Planning Organizations (MPO), composed of local elected officials and state representatives to review and approve transportation investments in urbanized areas. The *Highway Act of 1962* required a Metropolitan Planning Organization to be established in all urbanized areas over 50,000 in population and made federal highway aid contingent a continuing, comprehensive, and cooperative transportation planning process know as the "3-C Process". Over the years, Congress has significantly added and revised the expectations for the 3-C Process, such as the addition of performance-based planning. The current legislation for federal metropolitan planning requirements is the *Fixing America's Surface Transportation (FAST) Act*.

The five core functions of an MPO include:

Establish a setting: Establish and manage a fair and impartial setting for effective regional decision-making in the metropolitan area.

Identify alternatives: Use data and planning methods to generate and evaluate alternative transportation improvement options.

Maintain a Long-Range Transportation Plan (LRTP): Develop and maintain a transportation plan covering a planning horizon of at least twenty years that is multimodal, fiscally constrained, fosters mobility and access for people and goods, provides efficient system performance and preservation, and improves the quality of life.

Develop a Transportation Improvement Program (TIP): Develop a short-term (four-year) program of transportation investments based on the long-range transportation plan.

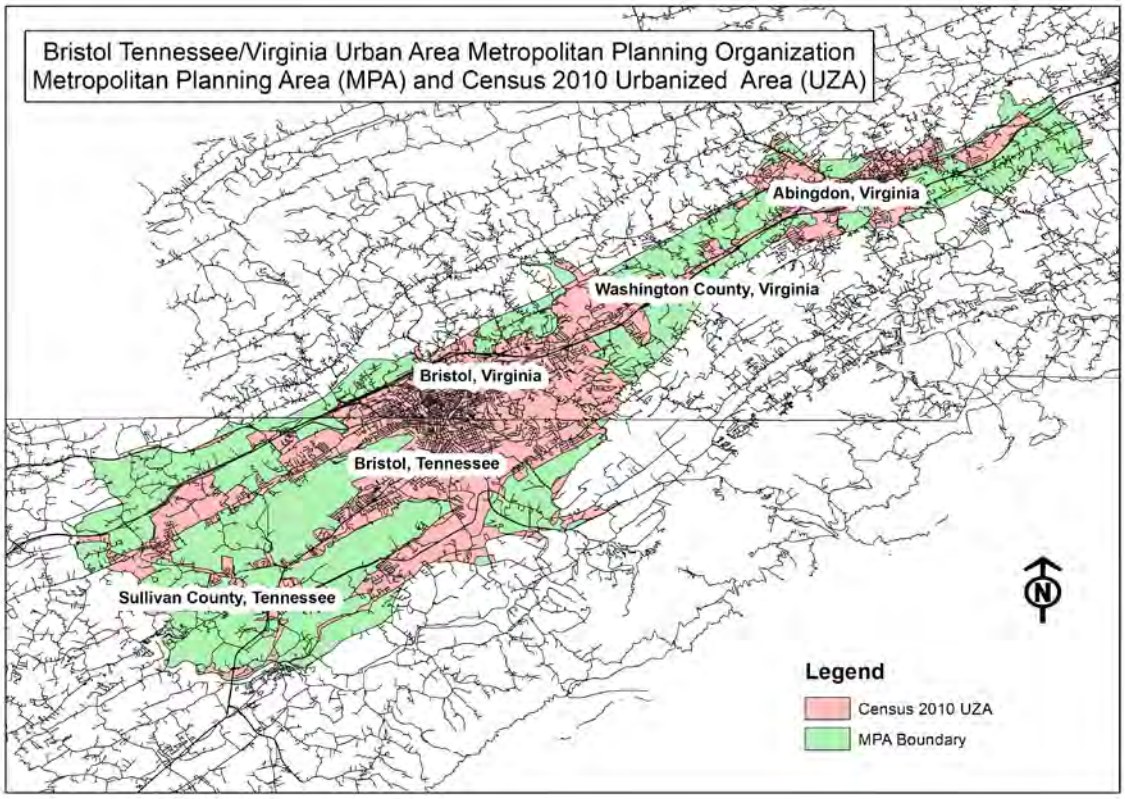
Involve the Public: Involve the general public and other interested parties in the essential MPO functions listed above.

BRISTOL TENNESSEE/VIRGINIA URBAN AREA MPO

Following the 1980 Census of Population the U. S. Bureau of the Census designated Bristol, Tennessee/Virginia as an "Urbanized Area." As a result, the Bristol MPO was established in 1982 under agreement with the governors of the State of Tennessee and Commonwealth of Virginia, and the local governments within the urbanized area. Each successive Census redefines the urbanized area based on the changes in population characteristics. As delineated in the Bureau of the Census 2010 urbanized area designations, the Bristol Tennessee/Virginia urbanized area includes the City of Bristol, Tennessee; the City of Bristol, Virginia (an independent city outside of the jurisdiction of any county); the Town of

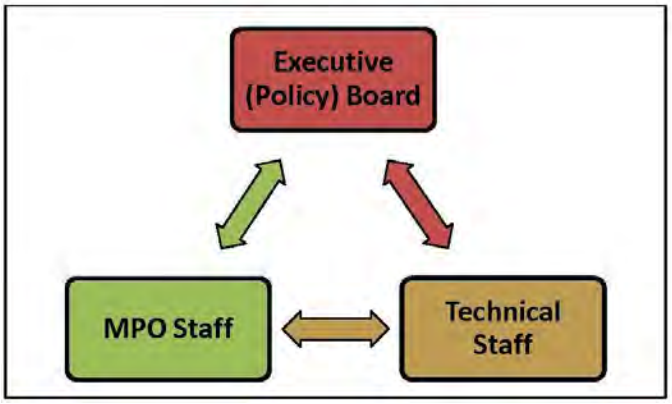
Abingdon, Virginia; and certain surrounding areas of Sullivan County, Tennessee, and Washington County, Virginia. The Metropolitan Planning Area (MPA), as identified in Map 1-2, for the Bristol Tennessee/Virginia Urban Area Metropolitan Planning Organizations represents the existing urbanized area and the contiguous geographic area expected to become urbanized within a 20-year forecast period of the transportation plan.

Map 1-2



MPO Structure. The MPO functions under a committee structure comprised of an Executive Board and Technical Staff (Chart 1-1). Final responsibility for transportation planning and policy decision-making is vested with the Executive Board. The Technical Staff is comprised of individuals of governments and agencies with technical responsibility for implementation of transportation planning activities. Daily administrative functions and coordination of the Metropolitan Planning Organization is provided by the MPO staff.

Chart 1-1



The **Executive Board** of the Bristol Tennessee/Virginia Urban Area Metropolitan Planning Organization is composed of the principal elected officials from:

State of Tennessee
Commonwealth of Virginia
City of Bristol, Tennessee
City of Bristol, Virginia
Town of Abingdon, Virginia
Sullivan County, Tennessee
Washington County, Virginia
Federal Highway Administration (non-voting)
Federal Transit Administration (non-voting)

The **Technical Staff** is composed of representatives of governments and agencies having functional responsibility for transportation planning in the metropolitan area. The Technical Staff primarily consists of planners and engineers from the following agencies:

Abingdon, Virginia
Bristol, Tennessee
Bristol, Virginia
Sullivan County, Tennessee
Washington County, Virginia
Abingdon Local Transit System
Bristol Tennessee Transit (BTT)
Bristol Virginia Transit (BVT)
District Three Public Transportation
NET Trans
Virginia Highlands Airport
First Tennessee Development District
Mount Rogers Planning District Commission
Tennessee Department of Transportation
Virginia Department of Transportation
Virginia Department of Rail and Public Transportation (DRPT)
Federal Highway Administration (non-voting)
Federal Transit Administration (non-voting)

TRANSPORTATION PLANNING PROCESS

The MPO, in cooperation with the Tennessee and Virginia Departments of Transportation and local transit services, are responsible for carrying out the metropolitan planning process. Transportation planning is a cooperative process designed to foster involvement by all users of the system such as the business community, community groups, the traveling public, freight operators, and the general public. The planning process (Chart 1-2) includes an analysis of current and projected future transportation needs and identifies alternatives and strategies to address those needs. The process includes a number of steps from establishing a vision and guiding principles to developing a financial plan for project implementation.

Chart 1-2
MPO Planning Process

CHAPTER 2: GOALS, OBJECTIVES, AND PLANNING FACTORS

The creation of goals and objectives in the development of a long-range transportation plan establishes the foundation for achieving the results most desired and needed for the metropolitan area. It is important for MPO member jurisdictions and local communities to have a unified vision of the role that regional transportation will have in defining the quality of life for the community.

One of the first steps in the metropolitan planning process is to establish guiding principles. The following goals and objectives provide the foundation for the development of this long-range transportation plan. The goals and objectives were developed to meet the ten planning factors identified under the Fixing America's Surface Transportation (FAST) Act, as well as provide consistency with local land use and comprehensive plans.

GOAL: SYSTEM EFFICIENCY AND ASSET MANAGEMENT

Develop and maintain a transportation system to move people and goods at the most effective level of public and private cost.

Objectives:

- Maintain the efficiency and state of good repair of the existing transportation system.
- Maximize the cost-effectiveness of transportation investments.
- Select and program projects based on identified need and effectiveness.

GOAL: ECONOMIC DEVELOPMENT

Provide transportation resources to support economic growth and strengthen the regional economy.

Objectives:

- Enhance the transportation access to commercial and industrial areas.
- Increase the accessibility options for freight movement.
- Proactively plan and accommodate for growth in the regional economy.

GOAL: HEALTHY AND SUSTAINABLE COMMUNITIES

Develop a transportation system to preserve and enhance the natural environment and improve quality of life.

Objectives:

- Minimize adverse environmental impacts of the urban transportation system.
- Reduce vehicle emissions and promote activities that reduce greenhouse gases.
- Coordinate the provision of transportation facilities with land use activities to promote active transportation and healthy multimodal lifestyles that minimize vehicle travel.

GOAL: MOBILITY OPTIONS

Develop a transportation system that provides an opportunity for a choice of mode for the movement of people and goods.

Objectives:

- Encourage the development of bicycle facilities, sidewalks, and greenways.
- Enhance the connectivity of the transportation system between modes.
- Maintain an efficient and cost effective public transportation system.

GOAL: USER SAFETY AND SECURITY

Develop a transportation system for the movement of people and goods, which is safe for all modes and provides security for users and transportation infrastructure.

Objectives:

- Reduce motorized crashes, injuries, and fatalities.
- Reduce non-motorized crashes, injuries, and fatalities.
- Coordinate with state and local agencies to improve transportation security for critical infrastructure.

CONSISTENCY WITH FEDERAL PLANNING FACTORS

In order to ensure a continuing, coordinated and comprehensive transportation planning within the Metropolitan Planning Area, the principles and strategies of the long-range transportation plan must consider the ten federal planning factors in the FAST Act. These ten planning factors are addressed in the goals and objectives of the *Bristol Tennessee/Virginia Urban Area Long-Range Plan Year 2040* (Chart 2-1).

1) Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
2) Increase the safety of the transportation system for motorized and non-motorized users.
3) Increase the security of the transportation system for motorized and non-motorized users.
4) Increase the accessibility and mobility of people and freight.
5) Protect and enhance the environment, promote energy conservation, and improve quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
6) Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
7) Promote efficient system management and operation.
8) Emphasize the preservation of the existing transportation system.
9) Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation.
10) Enhance travel and tourism.

Chart 2-1
FAST Act Planning Factors Addressed

FAST Act Planning Factors	Transportation Plan Goals & Objectives				
	System Efficiency & Asset Management	Economic Development	Healthy-Sustainable Communities	Mobility Options	Safety & Security
1) Economic Vitality		♦			
2) System Safety				♦	♦
3) System Security					♦
4) Mobility Options		♦	♦	♦	
5) Protect Environment			♦		
6) System Connectivity		♦	♦	♦	
7) System Efficiency	♦			♦	
8) System Preservation	♦				♦
9) System Resiliency/Stormwater	♦		♦		
10) Enhance Tourism		♦	♦	♦	

CHAPTER 3: PERFORMANCE MANAGEMENT

Increasing the accountability and measuring the effectiveness of investments in the transportation infrastructure has become a priority at the Federal level. Beginning with Federal legislation Moving Ahead for Progress in the 21st Century (MAP-21) and continued under the current legislation, the FAST Act, the Federal-aid program for transportation improvements is being transformed by refocusing project decision-making on performance-based planning.

Performance Measures. The U.S. Department of Transportation (USDOT) is currently implementing the new requirements and establishing performance measures through a number of Federal rulemakings released in several phases. The rulemaking process provides public and private transportation stakeholders with the opportunities to review and comment on proposed performance measures. The FAST Act identifies specific elements in establishing the performance management framework. With the exception of the Final Rule for the Highway Safety Performance Measures, the Notice of Proposed Rulemaking is on-going to define the USDOT performance measures (Chart 3-1).

Chart 3-1
USDOT Performance Measures

Planning		**Status**
Metropolitan and Statewide Planning Rule	▪ Establish a performance-based planning process at the metropolitan and state level.	Final Rule May 2016.
	▪ Define coordination in the selection of targets, linking planning and programming to performance targets.	
Highway Safety		**Status**
Safety Performance Measure Rule	▪ Propose and define fatalities and serious injuries measures, along with target establishment, progress assessment and reporting requirements.	Final Rule March 2016.
	▪ Discuss the implementation of MAP-21 performance requirements.	
Highway Safety Improvement Program (HSIP) Rule	▪ Integration of performance measures, targets, and reporting requirements into the HSIP.	Final Rule March 2016
	▪ Strategic Highway Safety Plan updates.	
Highway Safety Program Grants Rule	▪ State target establishment and reporting requirements.	Final Rule January 2013
	▪ Highway safety plan content, reporting requirements, and approval.	

Highway Conditions		Status
Pavement and Bridge Performance Measures Rule	▪ Propose and define pavement and bridge condition measures, along with minimum condition standards, target establishment, progress assessment and reporting requirements.	Proposed Rule January 2015
Asset Management Plan Rule	▪ Contents and development process for asset management plan.	Proposed Rule February 2015
	▪ Minimum standards for pavement and bridge management systems.	
Congestion/System Performance		**Status**
System Performance Measure Rule	▪ Define performance of the interstate system, non-interstate national highway system, and freight movement on the interstate system.	Pending
	▪ Finalize interpretation of scope of CMAQ performance requirements, including congestion and on-road mobile source emissions.	
	▪ Summarize MAP-21 highway performance measure rules.	
Transit Performance		**Status**
Transit Asset Management Rule	▪ Define state of good repair and establish state of good repair performance measures.	Pending
	▪ Require transit providers to set targets and report on progress.	
	▪ Transit asset management plans.	
National Transit Safety Program Rule	▪ Define transit safety criteria and standards.	Pending
	▪ Include definition of state of good repair.	
Transit Agency Safety Plan Rule	▪ Transit safety plan content and reporting requirements.	Pending
	▪ Target setting requirements for transit agencies and states.	

The Final Rule for the Highway Safety Improvement Program identifies five performance measures. Each measure is based on a 5-year rolling average and each measure has a defined methodology for data collection and calculation. The highway safety performance measures include:

1) Number of fatalities;
2) Rate of fatalities;
3) Number of serious injuries;
4) Rate of serious injuries; and
5) Number of non-motorized fatalities and non-motorized serious injuries.

Once the USDOT performance measures are finalized, TDOT and VDOT will set state performance targets in reference to the national performance measures. Lastly, the MPO will establish performance targets after the state-wide performance targets have been defined (Chart 3-2).

Chart 3-2
Flow Chart of Performance Measures and Performance Targets

After performance targets are selected, the FAST Act requires the MPO to reflect these targets in metropolitan transportation plans and programs. The intent of performance-based planning and programming is to link investment priorities to achieving performance targets.

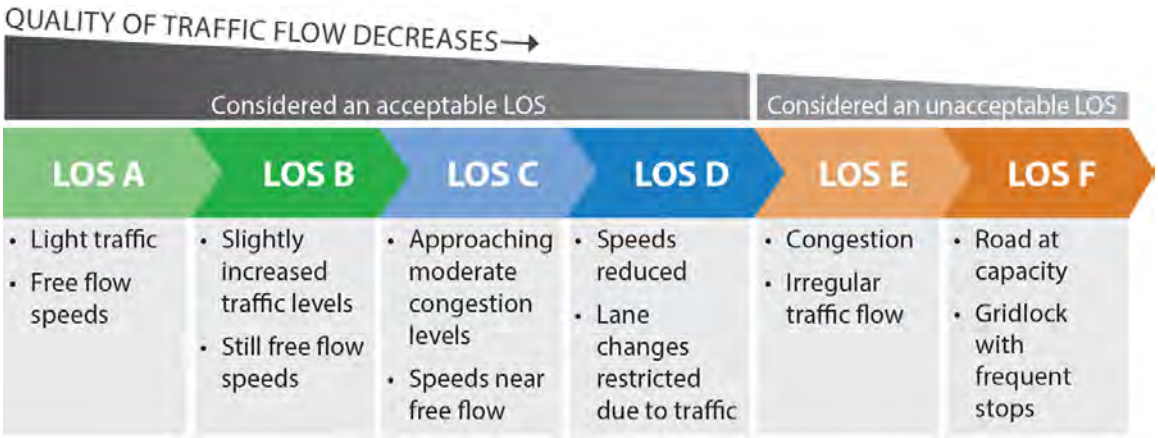
Sample of Current State (TDOT/VDOT) Measures. Performance-based planning and programming is inherently data-driven. Both Tennessee and Virginia maintain and update various databases in reference to performance measures at the state level. Some on-going data collection and performance areas include the National Fatality Analysis Reporting System (FARS), the Highway Performance Monitoring System (HPMS), the National Bridge Inspection (NBI) Program, State Strategic Highway Safety Plan (SHSP), and the National Transit Database (NTD). A sample of current performance areas utilized by TDOT and VDOT include:

- Fatality Rate on Roadways.
- State-wide Transit Trips.
- Interstate Roughness Index (IRI) Rating.
- Pavement Quality Index (PQI) Rating.
- Bridge Condition Rating System.
- Roadway Volume/Capacity Ratio (congestion)

Current MPO Measures. The Bristol Tennessee/Virginia Urban Area MPO has a number of measures as a part of other planning efforts; however, it is important to note that these will need to be consistent with TDOT and VDOT performance requirements when those are determined.

Level of Service – Evaluation of roadway performance is based on volume-to-capacity ratio which indicates what volume of traffic a roadway is carrying compared to its maximum capacity. Level of Service (LOS) is a process utilized to describe how well traffic flows on a roadway based on a scale from A to F (Chart 3-3). A Level of Service analysis is applied to all roads in the Study Area. The current and projected LOS for specific roads in the MPA is discussed in Chapter 5.

Chart 3-3
Level of Service



Crash Data – Roadway intersection and lane departure crash data is maintained for the Metropolitan Planning Area to provide an analysis of crash rates and trends. For Tennessee crash data, the MPO utilizes Critical Rate Factors (CRF) as a statistical measure of how many crashes are occurring at a given location at a given volume of traffic compared to similar intersections across the State of Tennessee. Virginia does not provide the statewide statistics to develop CRFs. As a result, Virginia crash rates in the Metropolitan Planning Area are compiled per million entering vehicles which provides the MPO an indication of high-crash locations when comparing one intersection against another.

Public Transportation – Transit agencies within the MPO's Metropolitan Planning Area collect a variety of performance data that can be used to evaluate the effectiveness of services they provide. Commonly used transit performance factors include:

- Revenue per Mile
- Revenue per Vehicle Hour
- Passengers per Mile
- Passengers per Hour

CHAPTER 4: CURRENT TRENDS AND FUTURE CHALLENGES

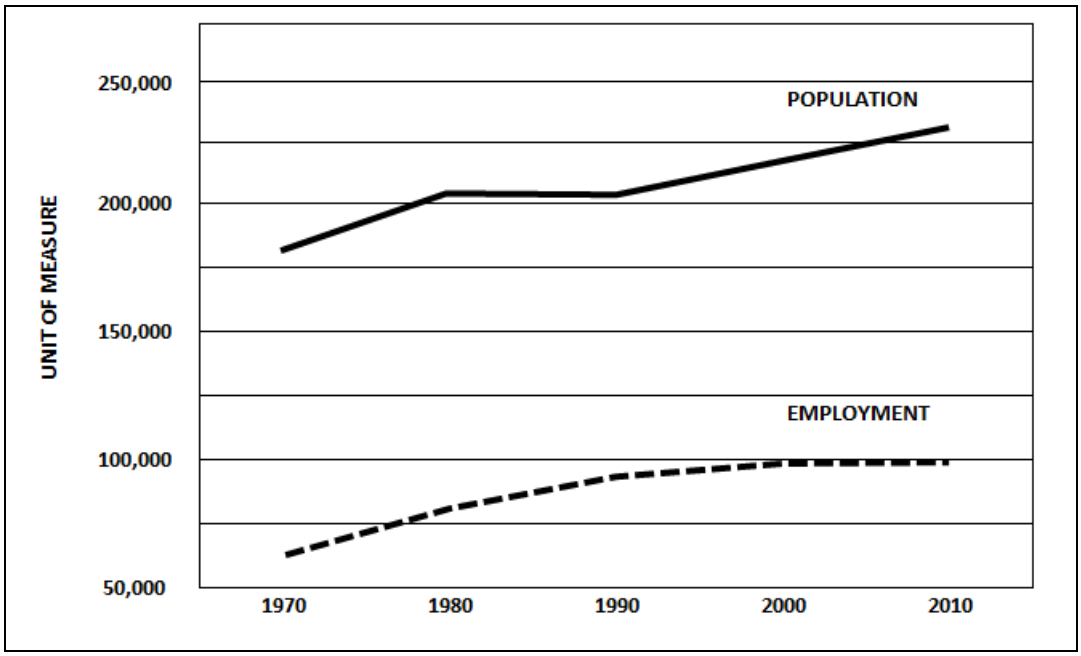
CURRENT TRENDS

The demand for transportation within the region is directly related to the demographic, economic, and land use characteristics of the area. Population, households, and employment patterns help to characterize an area – be it urban, suburban, or rural. Because the transportation network influences to varying degrees where people live and work, the evaluation of demographic, socio-economic, and commuting characteristics is important in developing the long-range transportation plan. Population and employment growth increases the demand for transportation as well as decisions on land use and zoning at the city and county level.

Data for the Bristol Urban Area was gathered from the 2010 U.S. Census, the 2010 Census Transportation Planning Package, and the 2013 American Community Survey. Since a majority of data is configured by county, the evaluation of some general demographic and transportation trends represent the "MPO Region", which includes all of Sullivan County, Tennessee, and Washington County, Virginia (inclusive of the independent city of Bristol, Virginia).

Population and Employment. Population in the MPO Region increased from 183,021 in 1970 to 229,534 in 2010 (Chart 4-1). In recent years, much of the growth has been concentrated in Washington County, Virginia. Over the last 40 years the MPO Region increased by 25% with the strongest growth demonstrated between 1970 and 1980.

Chart 4-1
Population and Employment Trends



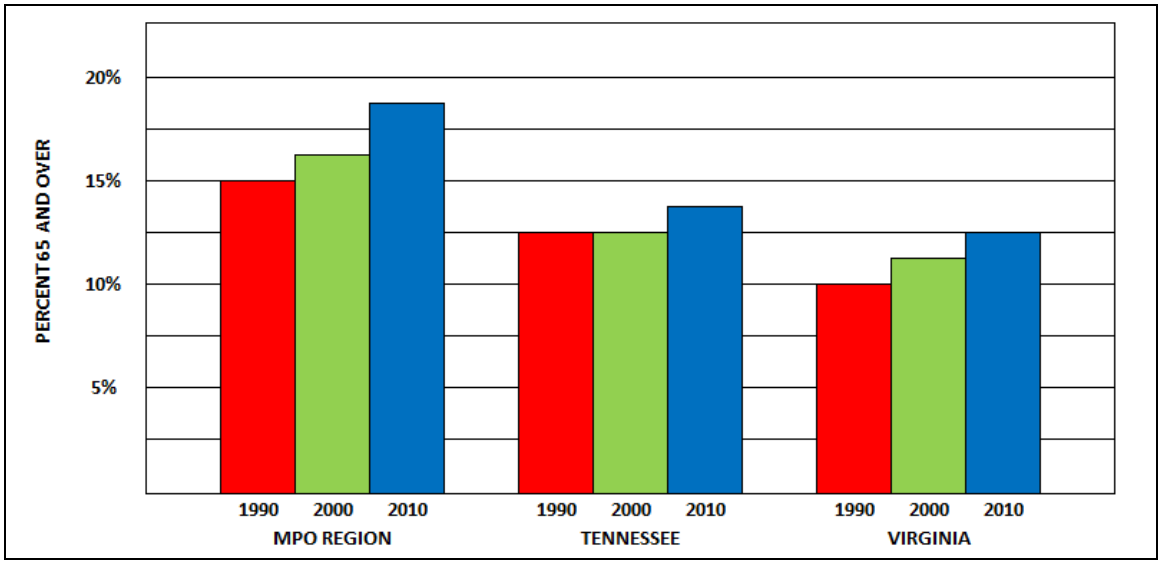
Source: U.S. Census Bureau

Employed persons in the MPO Region has grown from 87,502 in 1970 to 99,283 in 2010, which represents a 13.5% growth in employment over a 40 year period. Employment growth was strongest between 1970 and 1990, but has tapered off in recent years in part due to the effects of the 2007-2009 Recession.

Detailed population and employment forecasts for the MPO Study Area are discussed in Chapter 5, Travel Demand Modeling Process and Data Sources.

Age. The proportion of the MPO Region's population represented by individuals 65 and over has increased from 15% in 1990 to 19% in 2013. This trend is projected to continually increase based on State and National population forecasts. The MPO Region represents a larger percentage of persons 65 and over than the Tennessee and Virginia statewide percentages (Chart 4-2).

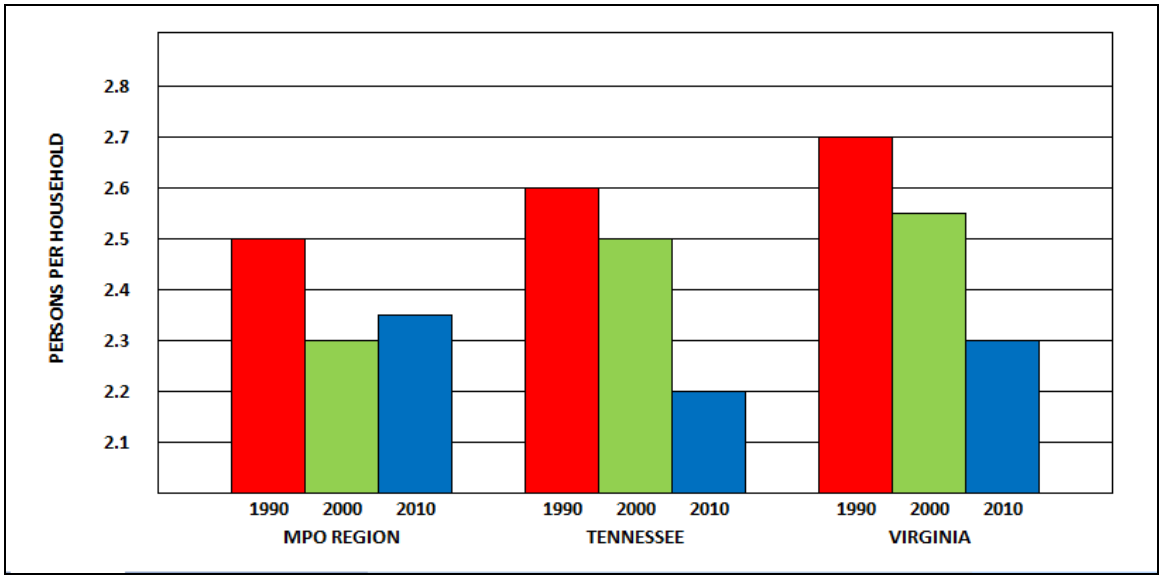
Chart 4-2
Persons 65 and Older



Source: U.S. Bureau of the Census

Households. The number of persons per household is an important factor in determining trip rates for an area. Statewide, for both Tennessee and Virginia, the average household size continued to decrease from 1990 to 2010. In the Bristol Region the average number of persons per household decreased from 2.47 in 1990 to 2.30 in 2000, but rose again to 2.36 in 2010 (Chart 4-3).

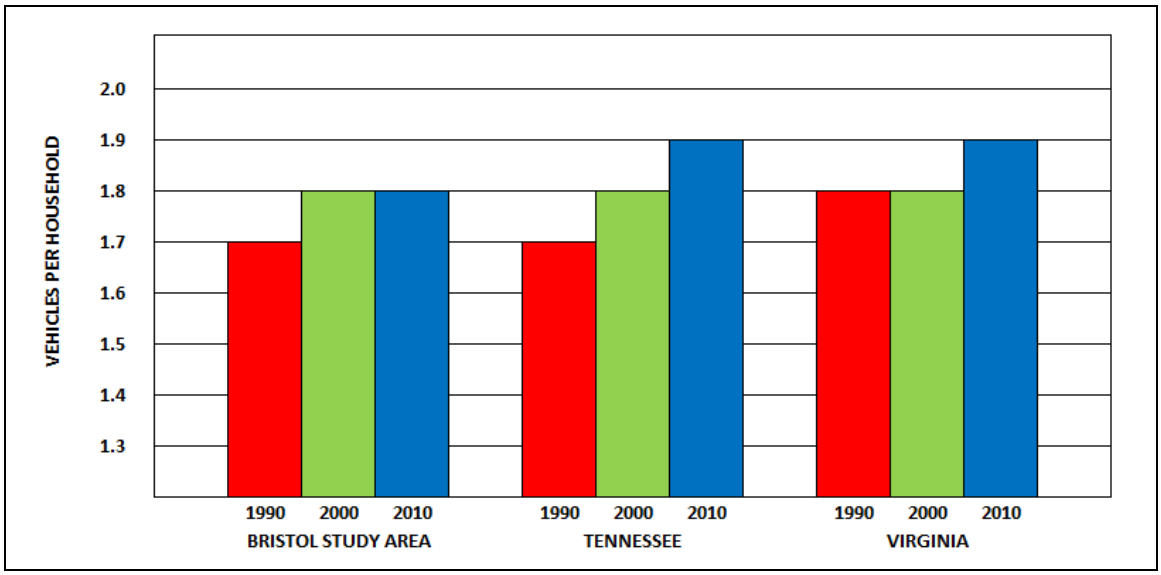
Chart 4-3
Average Household Size



Source: U.S. Bureau of the Census

Vehicle Availability. While the average household size at the state level has trended downward, the number of vehicles has increased. Although lower, the number of vehicles available per household for the MPO Region has been consistent with the statewide averages for Tennessee and Virginia (Chart 4-4).

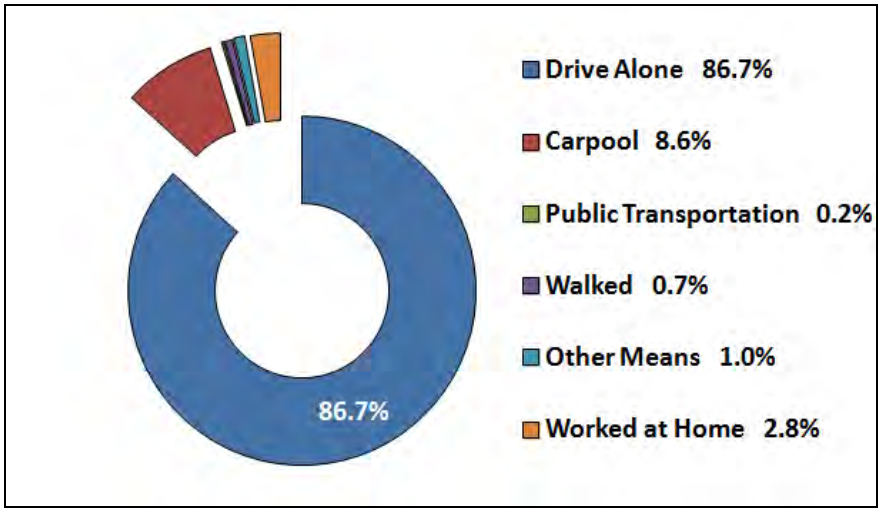
Chart 4-4
Average Vehicles per Household



Source: U.S. Bureau of the Census

Commuting to Work. Travel characteristics of all transportation modes play an important role in determining future transportation needs. The automobile is the predominate choice of transportation within the MPO Region, with over 86 percent of workers commuting to work in a single-occupant vehicle (Chart 4-5). In 2010, public transportation represented 0.2 percent of the work trips; however, regional transit service is limited in the Bristol Region outside the municipal limits of both Bristols and Abingdon.

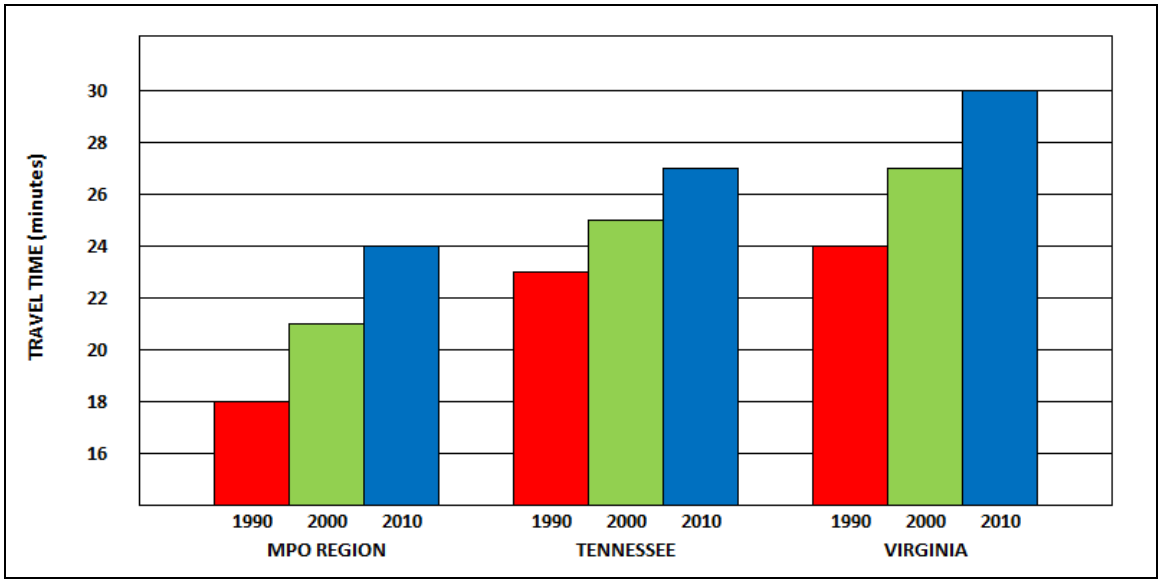
Chart 4-5
Bristol Region Commute to Work by Mode of Transportation (2010)



Source: U.S. Bureau of the Census, American Community Survey 2013

Throughout the MPO Region commuting times have also increased, although they still remain less that the two statewide averages (Chart 4-6). For the Bristol Region, this is consistent with the national trend of suburban growth and the availability of the automobile.

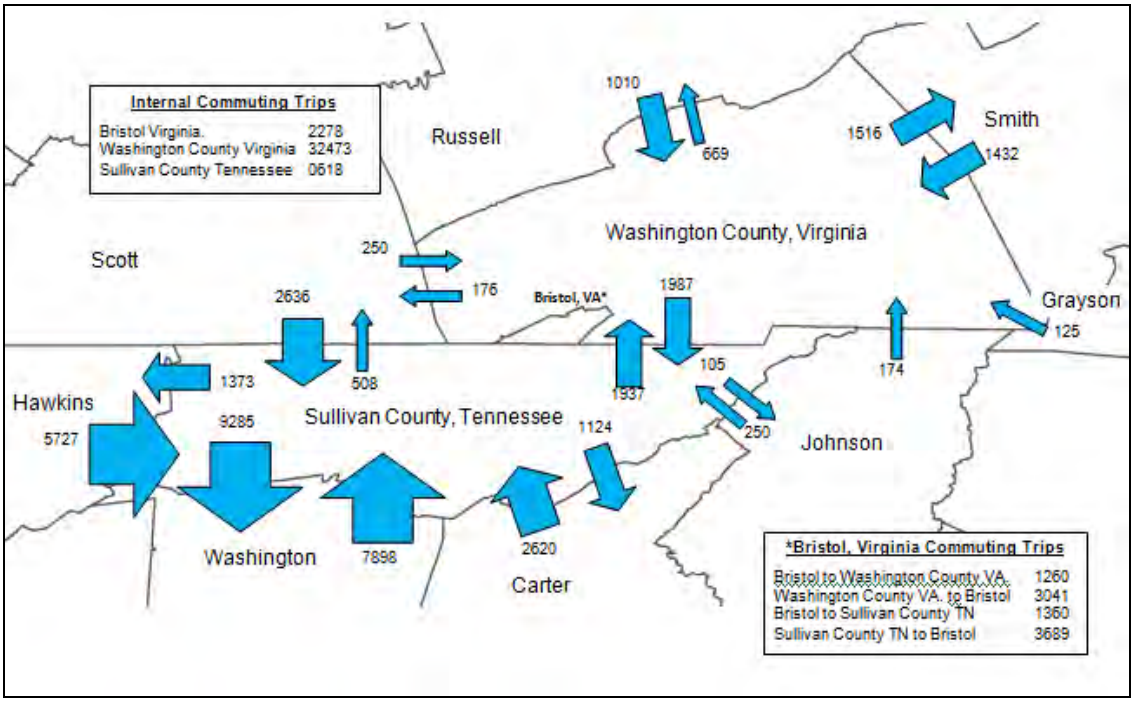
Chart 4-6
Bristol Region Travel Time to Work (Minutes)



Source: U.S. Bureau of the Census 2010, American Community Survey 2013

The counties surrounding the Bristol area function coherently as a single economic region. Residents from one county often commute to another county for work. Some of the larger county-to-county commuting patterns within the Bristol region are between Washington County, Tennessee, and Sullivan County, Tennessee (Map 4-1).

Map 4-1
Bristol Region County-by-County Daily Commuter Flows
Between Adjacent Counties (2010)

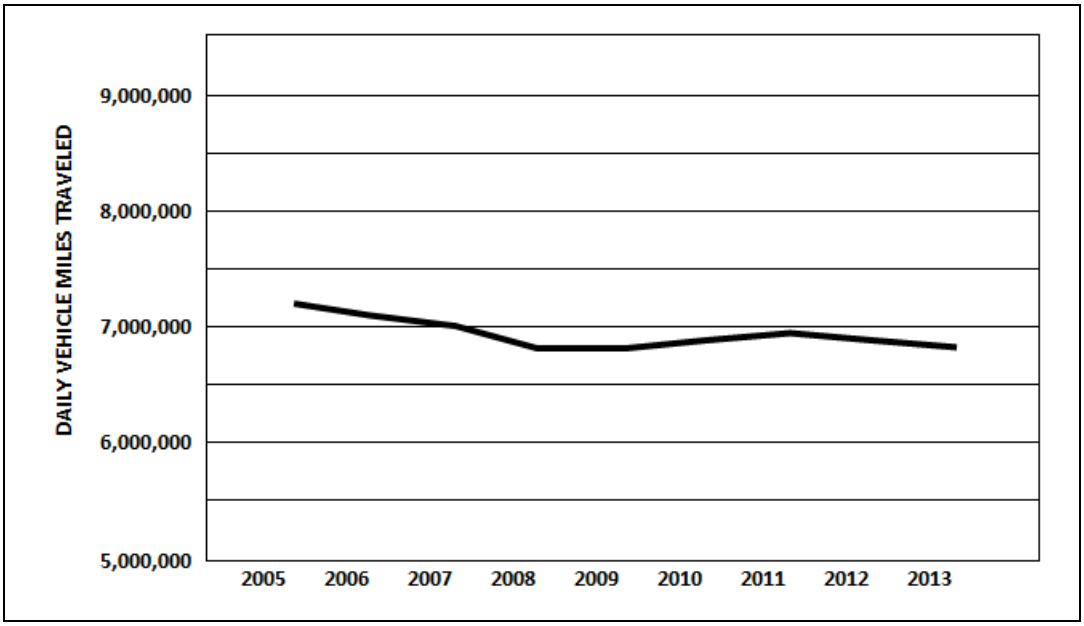


Source: Bureau of the Census 2010

Daily Vehicle Miles (VMT) Traveled. The demand for travel on a national level, at least for highway travel, appears to be slowly decreasing since the onset of the 2007 recession. Speculation for this decline has included many causes from generational, economic and technological factors, and lifestyle preferences. However, it should be noted a substantial contributor to VMT is freight movements.

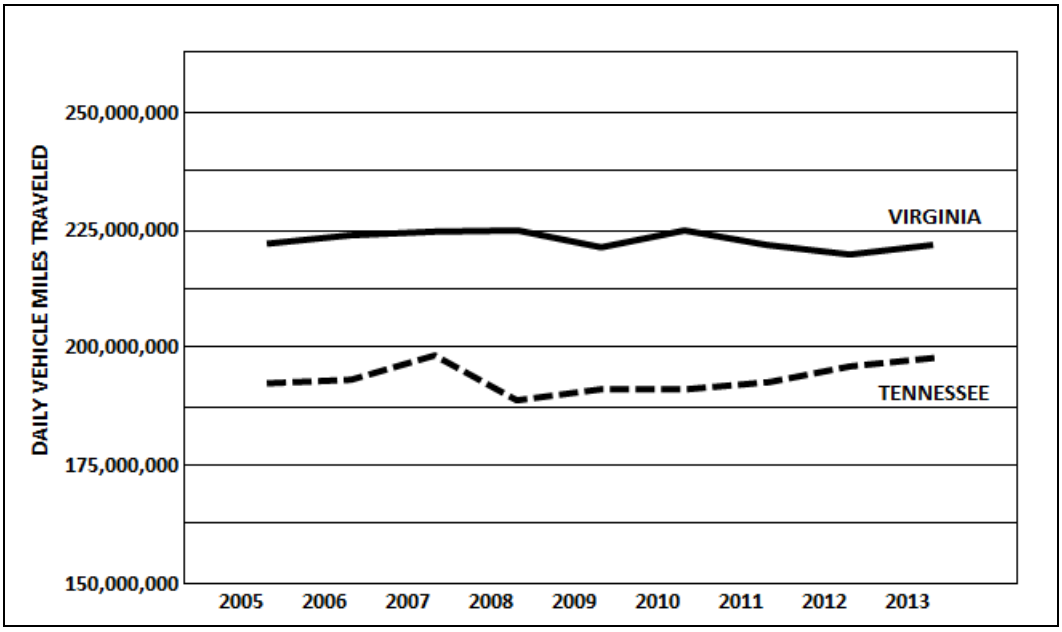
Overall, the MPO Region (Chart 4-7), as well as Tennessee and Virginia (Chart 4-8), has generally mirrored the national trend in Daily Vehicle Miles Traveled although Tennessee has been trending toward a steady increase in VMT since the recession.

Chart 4-7
Daily Vehicle Miles Traveled for the MPO Region



Source: Tennessee Department of Transportation, Virginia Department of Transportation

Chart 4-8
Daily Vehicle Miles Traveled by State



FUTURE CHALLENGES

Aging Population. The characteristics and transportation needs of senior populations is unique to that age group. Typically, seniors drive fewer miles that the rest of the adult population because retirement diminishes daily driving needs, specifically at peak travel times. Seniors also report a higher incidence of disability and may be less likely to drive or may cease driving entirely, relying on other forms of transportation, such as public transportation.

Public Health and Transportation. Transportation systems that encourage walking or bicycling can help people to increase physical activity, resulting in significant potential health benefits and disease prevention. The Centers for Disease Control and Prevention reports 33.7% of adults in Tennessee and 27.2% of adults in Virginia are obese. Because the transportation system impacts how communities are designed and operate, it can have a profound influence, both positive and negative, on public health. Where transportation infrastructure is designed to accommodate non-motorized transportation, it can have a positive effect on public health. The benefits on physical activity, including active transportation activities like walking and bicycling, can help prevent weight gain and lower the risks of obesity, diabetes, and heart disease.

Household Transportation Costs. Due to the cost of gasoline, vehicle upkeep and insurance, and longer driving distances and commuting times, household transportation costs are rising. Transportation expenditures can be particularly burdensome for the middle and lower income families. For the average American, transportation expenditures rank second only to housing expenditures (Chart 4-9). Given how much Americans spend on transportation, public investments which lower the cost of transportation could have a meaningful impact on families' budgets. Reducing fuel consumption, reducing the costs associated with congestion, and providing the availability and accessibility of public transportation would allow Americans to spend less money on transportation.

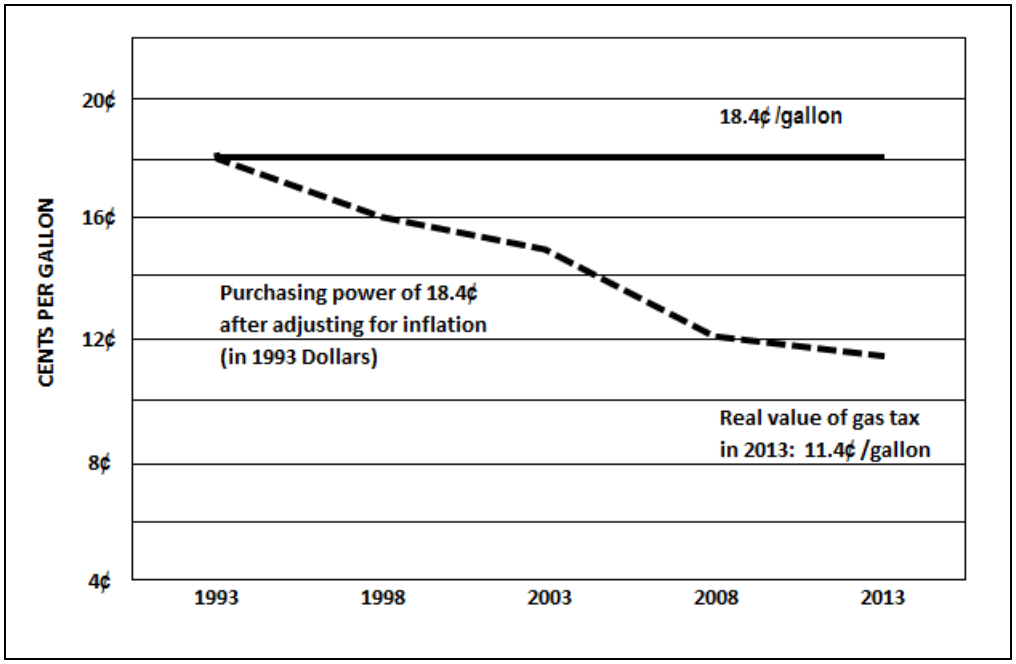
Chart 4-9
Average Household Expenditures

Source: July 2012 through June 2013 Consumer Expenditure Survey, Bureau of Labor Statistics

Transportation Funding. The economics of building and maintaining the transportation system has historically been associated with the gas tax, the single most important source of transportation funding for the federal government. Currently, the federal gas tax is levied as a fixed amount of 18.4 cents per gallon. Two unrelated developments have greatly reduced the purchasing power of the federal gas tax, which has not been increased since 1997 (Chart 4-10). Improvements in vehicle fuel-efficiency have cut gas tax revenues by allowing drivers to travel farther distances while buying less gas. At the same time, inevitable growth in the cost of asphalt, machinery, and other construction materials has put additional strain on the gas tax because the rate has not been adjusted to keep pace with inflation.

Much like improvements to fuel efficiency, decreases in the amount of driving or vehicle miles traveled (VMT) have reduced the gas tax revenue. At the national level, not only is the aging population driving less, but young American's transportation preferences and needs have changed as technology has allowed more would-be drivers to work from home as well as socialize from home. The Millennial generation, presently age 20-34, have different driving habits than their predecessors including preferences for urban housing/employment locations and replacing driving with other forms of transportation such as public transportation.

Chart 4-10
Purchasing Power of the Federal Gas Tax



The current gas tax revenue shortfall has resulted in the growth rate of federal (and state) transportation funds not keeping up with increasing transportation needs. As a result, fewer funds are available for transportation investments at a time when our infrastructure continues to age, requiring more maintenance. The necessity to maintain and preserve the existing transportation system, when coupled with less revenue, means less available revenue for new infrastructure. Providing additional federal support for transportation infrastructure investment would be prudent given the ongoing budgetary pressures facing state and local governments.

CHAPTER 5: TRAVEL DEMAND MODELING PROCESS AND DATA SOURCES

This section describes the transportation related data that was collected, assimilated, and analyzed in the development of the *Bristol Urban Area Long-Range Transportation Plan Year 2040.* The MPO has obtained data from various sources, collected some of its own, and assimilated them into this document to present the existing state of the regional transportation system as well as future traffic estimates utilizing the TransCAD travel demand model.

The *Bristol Urban Area Long-Range Transportation Plan 2040* was developed with consultation and input from the public, municipal officials, TDOT, VDOT, FHWA, FTA, and other transportation, economic development, environmental, and land use planning agencies throughout the MPO region. Numerous plans and studies were referenced prior to the development of this document to ensure coordination and to promote consistency between transportation improvements and State and local planned growth areas as well as economic development patterns.

Part A: TRAVEL DEMAND MODEL DEVELOPMENT

Travel demand models provide the capability of performing a traditional four-step transportation planning process that includes trip generation, trip distribution, mode split[1], and traffic assignment. It was decided early in the process that the size and scope of the Bristol model did not require the additional complexity of an activity based model; the traditional model approach was sufficient.

To incorporate the impact of the regional highway network, the boundary of the regional travel demand model is represented by the MPO Study Area, which is larger than the federally recognized Metropolitan Planning Area (Map 5-1). Topography plays a large role in development of the traffic model's boundary. For instance, one could argue that it is not practical to expect the Hickory Tree area of southeastern Sullivan County to become urbanized in the foreseeable future. However, because of the presence of Holston Mountain and South Holston Lake, practically all trips in and out of the Hickory Tree area must pass through the Bristol study area. Instead of representing the Hickory Tree area as a series of external nodes[2], it was decided to include the entire area of Hickory Tree up to Holston Mountain in the modeled network. The MPO Study Area also includes that portion of Sullivan County east of South Holston Lake in the model for air quality purposes.

In reference to the current Census 2010 population of the MPA and the MPO Study Area (Table 5-1), the difference between the two boundaries represents the impacts of the rural populations of Washington and Sullivan County since all three of the incorporated cities are within the Metropolitan Planning Area.

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[1] For a typical four-step model, a mode split (sometimes referred to as *mode choice*) step is included. However, the Bristol transit ridership is small enough that the mode split step is skipped, and all trips are assigned as highway trips, with the error thus introduced being negligible and resulting in slightly conservative future traffic volumes.

[2] See the *Roadway Network* section of this chapter for a fuller explanation of external nodes.

Map 5-1
MPO Study Area and Metropolitan Planning Area

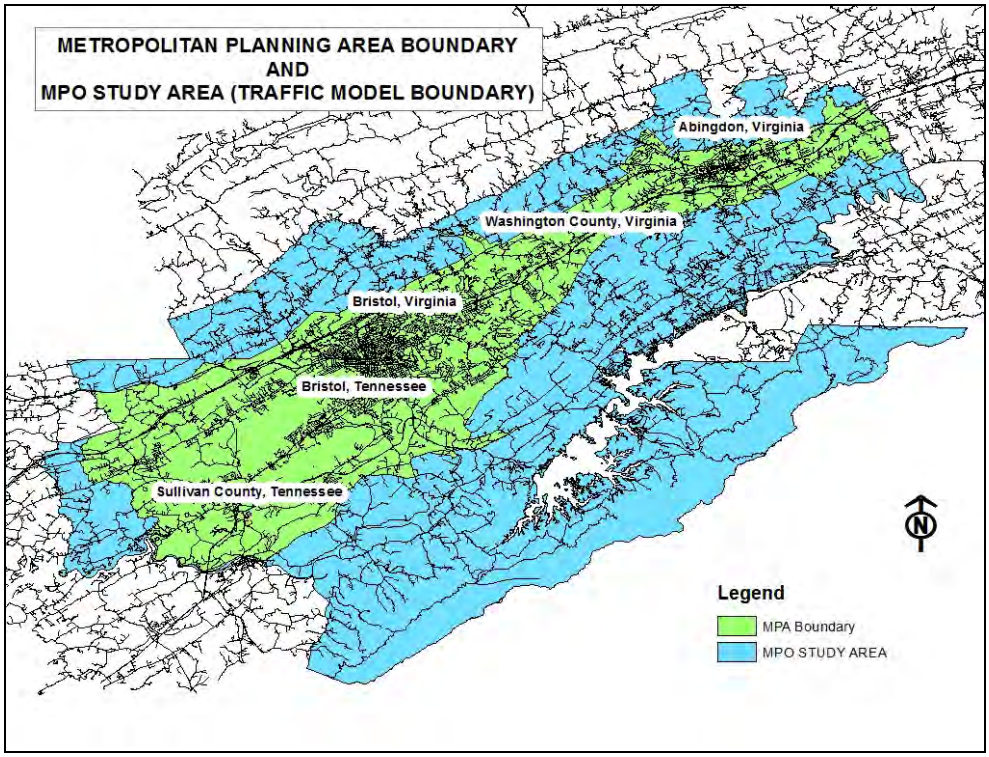


Table 5-1
MPO Metropolitan Planning Area and Study Area Population in 2010

Area	Metropolitan Planning Area Population	MPO Study Area Population
Bristol, Tennessee	26,702	26,702
Sullivan County, Tennessee (part)	14,813	29,474
Tennessee Subtotal	***41,515***	***56,176***
Bristol, Virginia	17,835	17,835
Abingdon, Virginia	8,191	8,191
Washington County, Virginia (part)	11,820	24,095
Virginia Subtotal	***37,846***	***50,121***
Total Populati0n	**79,361**	**106,297**

Source: U.S. Bureau of the Census 2010

The model was validated and calibrated for 2010 traffic volumes and land use conditions and was then updated to the year 2015 to represent the current transportation network, including the existing-plus-committed (E+C) roadway sections that were either under construction as of the date of the model (December 31, 2015) or for which the funding was obligated. The model could then be utilized to develop future year traffic models and volume estimates. The following discussion provides an overview of the modeling process.

MODELING PROCESS

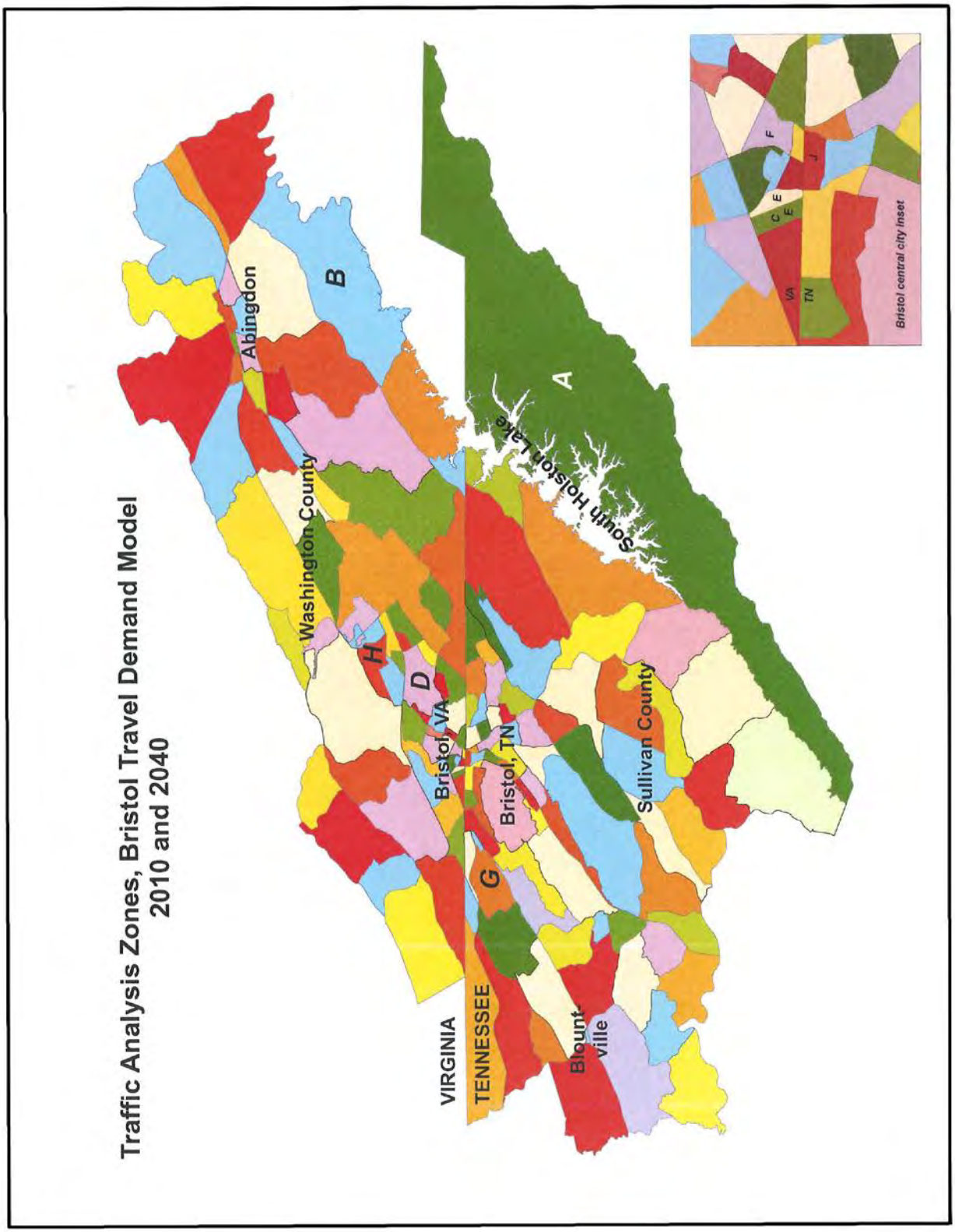
Traffic Analysis Zones. The study area is broken down into Traffic Analysis Zones, or TAZs. Each TAZ should represent a relatively homogenous area from a land-use standpoint without being so small as to be excessively detailed. For instance, a single TAZ can be predominantly residential, but still have small sections of retail areas within it. The MPO Study Area has 150 TAZs, of which 76 are in Tennessee and 74 are in Virginia (Map 5-2). TAZs are typically bound by physical features, such as roadways, railroads, water courses, ridge tops and large power lines. TAZ boundaries cannot cross the state line or county[3] boundaries. Employment (by class) and populations are geographically assigned as being within a specific TAZ. While the TAZs are in and of themselves relatively homogenous, there are vast differences between them (Table 5-2 and shown on Map 5-2). Each TAZ is assigned a name based on its location and a unique number (for instance, TAZ SUL091 is in Sullivan County; BVA021 is in Bristol, Virginia; BTN005 is in Bristol, Tennessee; WSH107 is in Washington County, Virginia; and ABN005 is in Abingdon).

Table 5-2: 2010 TAZ Statistics

(letters correspond to TAZ labels shown on Map 5-2)

A	Largest TAZ	TAZ SUL091, at 58.90 square miles (Holston Mountain in Sullivan County)
C	Smallest TAZ in area	TAZ BVA021, at 0.06 square miles (west of downtown Bristol, Virginia, at old Southern Railway yard)
D	Largest TAZ in population	TAZ BVA079, at 2,346 population (northeastern Bristol, Virginia, north of Kings Mill Pike and east of Bonham Road)
E	Smallest TAZ in population	Two industrial-area TAZs in Bristol, Virginia, have no population (TAZs BVA021 and BVA025)
F	Highest Population Density TAZ	TAZ BVA033, at 10,763 persons per square mile (just northeast of downtown Bristol, Virginia)
E	Lowest Population Density TAZ	Two industrial-area TAZs in Bristol, Virginia, have no population (TAZs BVA021 and BVA025)
G	Highest Employment TAZ	TAZ BTN005, at 2,643 employees (hospital/Exit 74 area of Bristol, Tennessee)
H	Lowest Employment TAZ	TAZ WSH039, in Wallace community of Washington County, has no employees
J	Highest Employment Density TAZ	TAZ BTN029, at 24,289 employees per square mile (downtown Bristol, Tennessee)
H	Lowest Employment Density TAZ	TAZ WSH039, in Wallace community of Washington County, has no employees

[3] For the purposes of this document, the City of Bristol, Virginia, as an independent city, will be considered as a county, as it is by the Census Bureau. Thus, there are three county-level jurisdictions in the Bristol study area (Bristol, Virginia; Washington County, Virginia; and Sullivan County, Tennessee).



Map 5-2
Transportation Analysis Zones (TAZ)

Population and Employment. Population and employment data are generated to determine the trips that are produced, attracted, and thus taken on the highway network. Population data was available from the 2010 Census. The 2040 population forecasts were developed through a top-down allocation process, following an analysis by the consultant team to determine the overall population growth for the entire area as a control total. In this top-down allocation process, local planning staff from the various jurisdictions allocated the population growth to various areas based on such factors as land availability (i.e., not in floodplains, steep slopes, or heavy rock areas), planned utility extensions, soil conditions, and other local knowledge.

The employment data was purchased from InfoUSA for 2010, to match the same timeframe as the available Census data. In a process similar to the population data, the 2040 employment overall control amount was determined and allocated top-down to the various areas by local staff, using local knowledge. The employment data included location, number of employees by class[4], and type of employee by class based on the North American Industry Classification System (NAICS) codes (agricultural/mining/construction, manufacturing, retail, service, office, and governmental). School attendance for both public and private schools were collected separately from the various school districts and allocated appropriately.

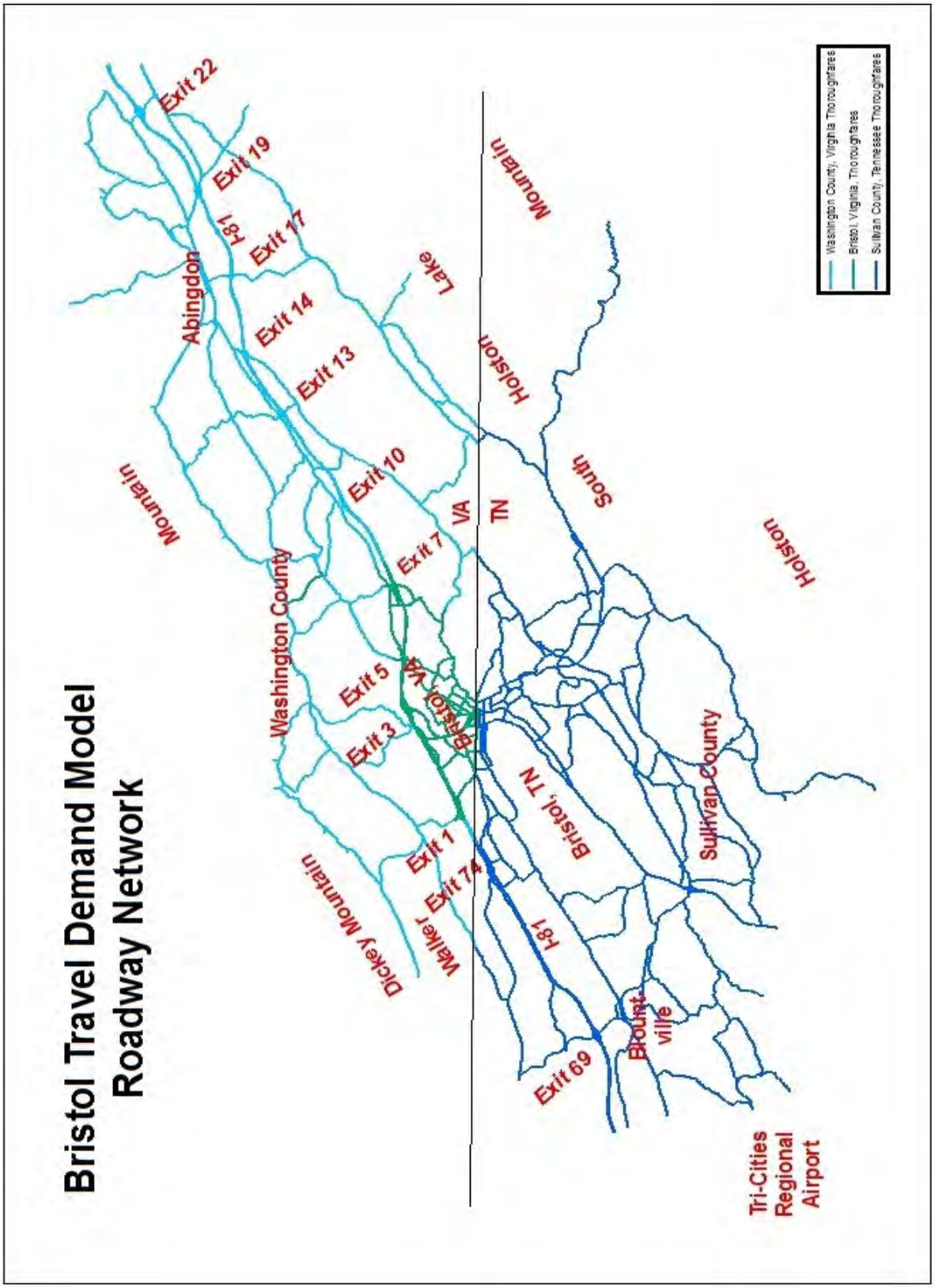
The planning assumptions and methodology for the population and employment forecasts are documented in Part B of this chapter.

Roadway Network. The roadway network for the Bristol travel demand model is a mathematical representation of the actual roadway network (Map 5-3). Roadways within the study area are broken into segments, or *links*; such a break is made when the travel or roadway characteristics change (such as number of lanes or speed limit) or when the roadway crosses a county boundary. Each link is assigned particular data of the roadway (such as road segment length, capacity, number of lanes, travel times, and free-flow speeds) to represent its characteristics. A junction of links is referred to as a *node*; a node thus represents an intersection or a point where a link crosses a boundary.

The TAZs are condensed to a single point, called a *centroid*, and they are connected to the roadway network at a node by a special type of link, called a *centroid connector*. In the mathematical representation of the network, trips to and from a particular TAZ can travel on centroid connectors, but through trips that do not begin or end in that TAZ cannot.

For the outer boundary of the model, or *cordon line*, a special type of link and node (*external node* and *external link*) are used to show the interaction between the roadways along the model boundary and the world outside of that boundary. The external node is thus always shown at the end of a dead-end link on the periphery of the network. For the Bristol travel demand model, there are 35 external nodes.

[4] The data did not include the exact number of employees per location. Instead, it aggregated the number of employees into broad categories (1 to 5 employees, 6 to 20 employees, etc.). By assigning the average number of employees in the group (such as assigning three employees to every location that had 1 to 5 employees) to each location, the error in employee assignment should average out.


Bristol Travel Demand Model
Roadway Network
Washington County, Virginia Thoroughfares
Bristol, Virginia, Thoroughfares
Sullivan County, Tennessee, Thoroughfares
Exit 22
Exit 19
Exit 17
Exit 14
Exit 13
Exit 10
Exit 7
Exit 5
Exit 3
Exit 1
Exit 74
Exit 69
I-81
Abingdon
Washington County
Mountain
Dickey Mountain
Walker
Lake
Holston
Mountain
VA
TN
Bristol, VA
Bristol, TN
South
Holston
Sullivan County
Blount-
ville
Tri-Cities
Regional
Airport

Map 5-3

For a smaller network such as Bristol, the level of detail can be additionally focused to include minor arterials, collectors, some local streets, and even one private roadway that is heavily used by public traffic[5]; however, it is impractical to model every roadway. The network is dominated by Interstate 81, running southwest to northeast, and its twelve interchanges in the study area (Exits 69 and 75 in Tennessee, and Exits 1, 3, 5, 7, 10, 13, 14, 17, 19, and 22 in Virginia).

Trip Generation. The raw demographic data has to be converted into trips as part of the *trip generation* step of the four-step modeling process. In trip generation, the number of persons and employees are input into equations to predict the number of vehicle trips that would be produced or attracted to each traffic zone. Those equations developed for each TAZ to predict the number of trips produced (outgoing) or attracted (incoming) for several different trip purposes:

- Home-based work trips
- Home-based shopping trips
- Home-based social-recreational trips
- Home-based school trips
- Home-based other trips
- Non-home based trips (trips that do not start or end at home, such as going to a restaurant for lunch from work)
- Internal/external trips (trips that pass over the cordon line defining the outer edges of the study area)
- Truck trips, broken down into light (four-tire), single-unit (SU) and combination unit (CU) trucks

Such demographics as population, vehicle availability, number of children in the household, and number of workers in the household are used to develop the trip rates by purpose through a cross-classification process. At this point in the analysis, the numbers of trips produced and attracted in each TAZ are person-trips. For external nodes, trip generation values are based on traffic counts at those locations.

The vehicle-trip productions and attractions thus calculated are loaded onto the mathematical model network at those points in the network where such trips would enter or exit one of the modeled roadways as an attribute of the centroids.

Trip Distribution. The next step in the four-step process is *trip distribution*. In trip distribution, it is known, for example, that so many trips are produced as home-to-work trips in a certain TAZ. Trip distribution will determine how many of those outgoing trips are attracted to each of all the TAZs. In the Bristol model, a gravity model was used. For example, if a trip produced in a TAZ can go to either of two other TAZs, and one of those two TAZs is twice as far away as the other, then trips are four times more likely to go to the nearer TAZ than they are to the further TAZ. The end result of trip distribution is a trip table, by trip purpose, that identifies how many trips are going between each pair of TAZs for each trip purpose. For the 150-zone Bristol network, each of the trip purposes will have a 150 by 150 matrix listing the number of trips between each

[5] Since the traveling public uses this private roadway (Craig Drive in Bristol, Tennessee), to leave it out of the travel demand model would not faithfully represent the actual trip paths in this part of the network and introduce errors on the adjacent public roadway links.

pair of TAZs. Trips are also calculated for trips that stay within a particular TAZ and thus do not enter the major thoroughfare network.

Mode Choice. The third step in the four-step process is *mode split,* or *mode choice*. In mode choice, the trips between each TAZ pair is examined to determine how many will travel by car, by public transit, by vanpool, by walking, etc. For mathematical simplicity, the Bristol model postulates that all trips will be by vehicle and not by public transit or other modes. This results in a conservative error of overestimating the number of trips using the highways. However, the number of trips utilizing transit or other modes in the Bristol area is small enough that any such error will not be great. The one portion of mode choice that was used in the Bristol travel demand model was the mathematical process of converting the calculated trips, which are person-trips, into vehicle-trips by using equations that describe the occupancy of vehicles by trip purpose and trip length.

***Traffic Assignment*.** Finally, *traffic assignment* loads the trip tables onto the appropriate highway to produce traffic volumes for each roadway segment. Highway assignment in the Bristol model uses two different approaches. For truck trips, an all-or-nothing assignment is used first, loading the network with these trips first only on those links that are coded as truck routes. Afterward, for the balance of the trips, the model utilizes a mathematical equilibrium process to simulate congestion effects on the roadway system that is loaded onto the network after the truck trips have been assigned. Output from the highway assignment is a network file that includes the assigned roadway volumes for each roadway segment.

Model Calibration and Future Year Model Development. The network is then calibrated using the 2010 data. That is, if the employment, population, and network information for the year 2010 is inputted into the mathematical model, then the answers should be close to the 2010 traffic counts measured in the field. The network and its data are then adjusted in a calibration process to match the 2010 traffic counts as closely as possible and within the calibration parameters established by FHWA and the Tennessee Modeler User's Group (TNMUG) organization. An exact fit is never possible for several reasons: (a) since every street is not modeled, those trips that use nonmodelled roadways are assigned to other, modeled roadways; (b) the model postulates that all motorists will behave the same way; and (c) the model assumes that every motorist has an omnipotent knowledge of the network and real-time congestion levels throughout the system. A purely mathematical process will not account for a trip route choice because a motorist wants to avoid a steep grade on a snowy day, or takes a new route because they are tired of the old one, or any of a thousand other reasons other than pure mathematical optimization of travel.

Once the model is calibrated, it represents predicted travel demand for the year 2010. The next step is to update the network from 2010 to the current calendar year of 2015 to account for modifications made in the roadway network since 2010. Included as well are projects that may not be completed, but are committed to construction, either because construction is actually underway or that the financial commitment is in place. This results in a 2015 network that is referred to as the "existing + committed" (*E+C*) network.

For the selected target year (in this case, the year 2040), the predicted population and employment data for the TAZs must be generated. Once these are generated, they are loaded onto the 2015 E+C network. The end result of this process should be the predicted traffic

volumes on each roadway segment of the network in the year 2040 by time of day if no additional projects are built. This is referred to as the 2040 "no build" network. This network will illustrate those links that have volume/capacity ratios in the ranges of interest, showing locations where volume is nearing or greater than capacity and thus congestion may result if remedial action is not taken. Those needs then contribute in analyzing proposed projects for the study period.

Projects may also be selected for other reasons besides inadequate volume/capacity ratios. Projects may also be selected to alleviate safety issues, to help develop multi-lane roadway networks within a jurisdiction, to add capacity for proposed economic development, for better operations of intersections, or for combinations of these and other factors.

Accounting for Truck and Rail Movements in the Bristol Travel Demand Model. Because of the importance of freight in the Bristol study area as elsewhere, the travel demand model featured a freight component. Mainline railroad operations have a considerable impact on road travel in the Bristol study area. For rail movements, all mainline surface crossings are mathematically represented in the network of roadways by reducing the capacity of those roadways. Capacity is not reduced on modeled roadways to account for the spur crossings.

Where appropriate (because of weight restrictions, size restrictions, or local ordinances), links in the network are coded as a truck route or as a no-truck route. For truck routes, as mentioned above, capacities are further reduced on links with mainline railroad crossings to account for the additional induced delays. Truck trips are generated separately from the demographic data (broken down further into single-unit [light] and combination-unit [heavy] trucks) and assigned to the network first with an all-or-nothing assignment. Only after the trucks are assigned to the network are the passenger vehicles assigned to the network with an equilibrium assignment, using the capacity left over after the truck assignment.

References. The model used in this process for this document was developed using TransCAD, a software package developed by Caliper Corporation. The Bristol TransCAD model was developed by the Kimley-Horn and Associates consultant firm, utilizing network and demographic data supplied by the MPO. Future demographic data was developed by the MPO, its member jurisdictions, and Kimley-Horn and Associates.

Part B: Population and Employment

Analysis and forecasts for population and employment data is specific to the MPO Study Area. To better interpret the study area, the population and employment data are analyzed by transportation analysis zones (TAZs). TAZs serve as the geographic unit for socioeconomic data used in the travel demand model to project future trips. To project future travel demand, population and employment within the MPO Study Area are estimated for the target year 2040. Future population and employment projection rates and trends were developed by the consultant team.

As part of the development of the long-range transportation plan, each of the MPO jurisdictions' comprehensive plans were reviewed in an effort to make the plan consistent with adopted goals and objectives, land use, and economic growth plans proposed by local jurisdictions.

POPULATION

The primary source of population and household data is the U.S. Bureau of the Census. The population of any study area is generally a reflection of the complexity of its economic and social structure. The Census was the source of the aggregate base year population data utilized for development of the travel demand model (Table 5-3).

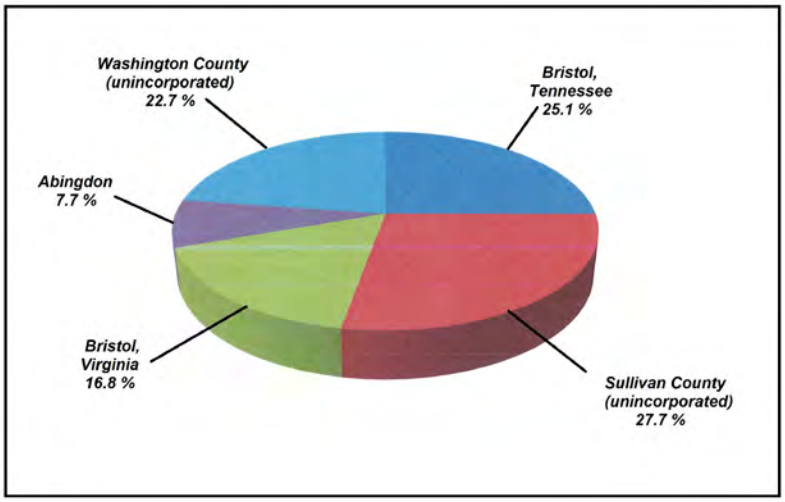
Table 5-3
MPO Study Area Population in 2010

MPO Study Area	Population
Bristol, Tennessee	26,702
Sullivan County, Tennessee (part)	29,474
Tennessee Subtotal	***56,176***
Bristol, Virginia	17,835
Abingdon, Virginia	8,191
Washington County, Virginia (part)	24,095
Virginia Subtotal	***50,121***
Total Population	**106,297**

Source: U.S. Bureau of the Census 2010

The Tennessee portion of the MPO Study Area represents approximately 53 percent of the 2010 population, which includes Bristol; the unincorporated community of Blountville; and the eastern part of Sullivan County. The Virginia portion of the MPO Study Area includes the City of Bristol, Virginia; Town of Abingdon; and the southwestern part of Washington County, and contains approximately 47 percent of the population of the study area between them. Chart 5-1 illustrates the percent of year 2010 population by jurisdiction for the MPO Study Area boundary.

Chart 5-1
MPO Study Area
Year 2010 Percent of Population by Jurisdiction



Source: U.S. Bureau of the Census 2010

Methodology. The overall study area population was projected to increase approximately eight percent between 2010 and 2040 based on normal growth trends. Projections were obtained from secondary sources, which served as control totals for the study area. These included Woods and Poole Economics, University of Virginia Cooper Center, University of Tennessee Center for Business and Economic Research, and local resources. While some forecasts were prepared exclusively for the urban areas Bristol, Tennessee, Bristol, Virginia, and Abingdon, the other estimates were prepared for unincorporated portions of Sullivan County, Tennessee, and Washington County, Virginia, which have extensive areas outside the study area.

Once an overall total population for the target year was determined by jurisdiction, this was broken up further to allocate those populations to each of the TAZs. This was accomplished by first assigning the 150 TAZs into eighteen "super regions". Based on the local land use and comprehensive plans of the various jurisdictions, as well as local knowledge of such issues as slopes, utility availability, and floodplains, a certain proportion of the additional population was allocated to each of the "super regions." Then, in turn, the additional population for each "super region" was further allocated to each TAZ.

Population Estimates. Ultimately an aggressive growth scenario was developed for the MPO Study Area and utilized for the travel demand model to develop 2040 population estimates. Such a scenario accounts for demographic influencing factors as proactive local governmental initiatives to foster growth, as well as accounting for the changes in household size and vehicle availability indicated by the trends that have become evident. This scenario also assumed the development of a new sewage treatment facility in Washington County, Virginia, that would support substantial population growth in that county. Based on these assumptions, an aggressive population estimate was developed, which represented a projected increase of approximately eight percent between 2010 and 2040 for the entire study area (Table 5-4).

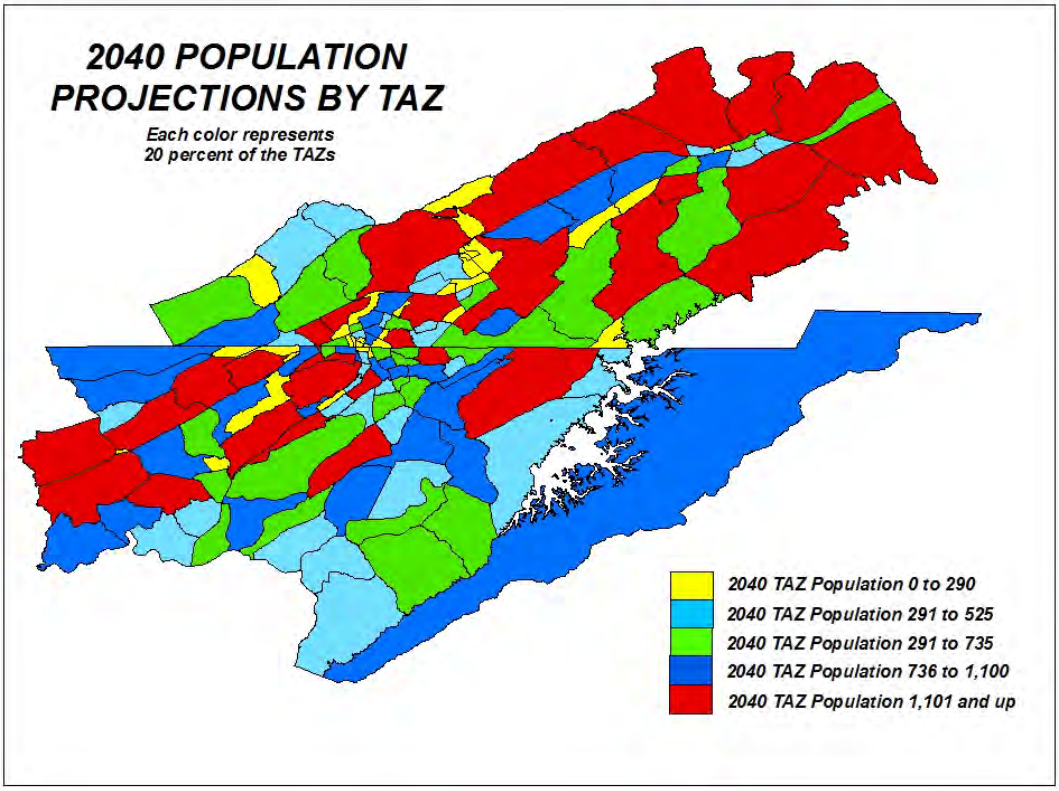
Because population projections are developed at the TAZ level, which are not consistent with political boundaries, 2040 population by jurisdiction for the MPO Study Area is not provided.

Maps 5-4 and 5-5 show the projected 2040 population and population density, respectively, for the entire study area by TAZ.

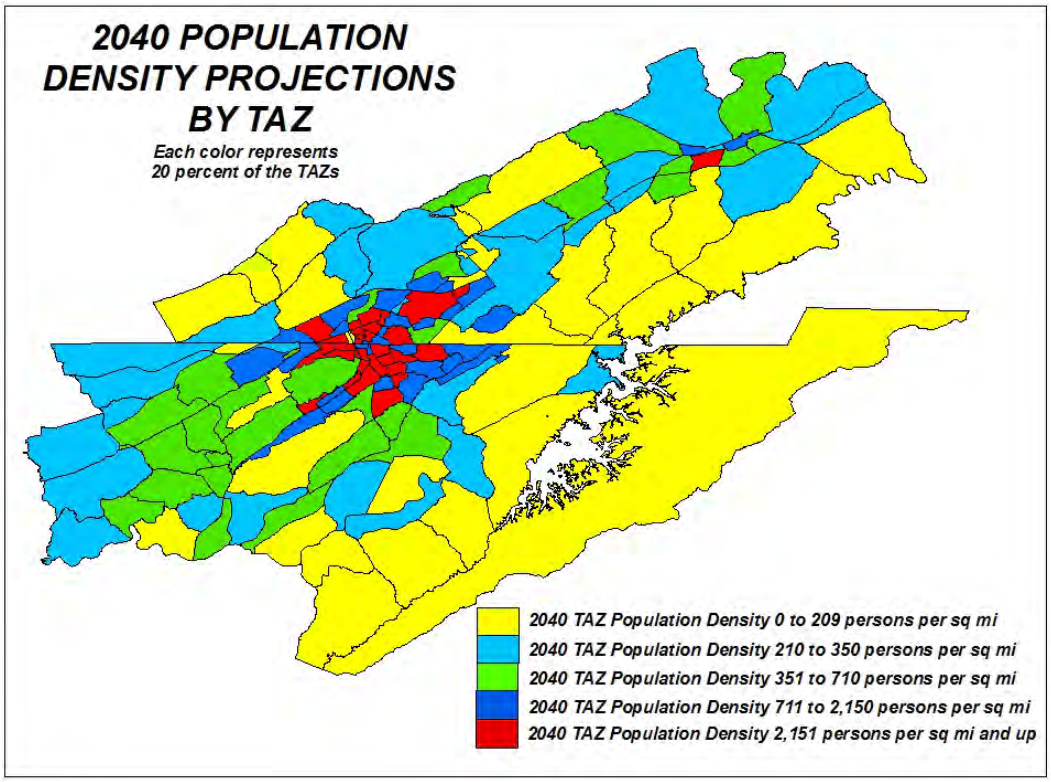
Table 5-4
Population for Years 2010 and 2040

MPO Study Area	2010 Population	2040 Population	Percent Change
Tennessee *City of Bristol* *Sullivan County (part)*	*56,176*	*58,532*	*4.2%*
Virginia *City of Bristol* *Town of Abingdon* *Washington County (part)*	*50,121*	*56,372*	*12.5%*
Total MPO Study Area	**106,297**	**114,904**	**8.1 %**

Source: U.S. Bureau of the Census, Kimley-Horn and Associates



Map 5-4



Map 5-5

EMPLOYMENT

Employment growth in the study area has generally followed regional and state patterns and the cyclical nature of the national economy. Throughout the nation, a shift in the employment base has occurred. The service industry is replacing traditional industries such as manufacturing and wholesale trade. The Bristol region is no exception. No longer does the Central Business District serve as the region's sole primary employment center. Instead, the percentage of employment is expanding away from the central business district, where land is more abundant and less expensive. 2010 employment data for the MPO Study Area were purchased from InfoUSA, which provides employment records for employers by SIC/NAICS code and address (Table 5-5). Because employment data is compiled at the TAZ level, 2010 employment by jurisdiction for the MPO Study Area is not provided.

The data used in Bristol's travel demand models continues to become more sophisticated and detailed. In the 2000 model, there were only two employment categories (basic and service). For the 2010 model, this was expanded to six employment categories (agricultural/mining, manufacturing, retail, office, service, and governmental) to allow for more sophisticated trip generation equations to be used. In addition, school enrollment figures for the 2010 base year were included for more detailed trip generation analysis.

Table 5-5
MPO Study Area
2010 Employment by Category and School Enrollment

CATEGORY	TENNESSEE *City of Bristol* *Sullivan County (part)*	VIRGINIA *City of Bristol* *Town of Abingdon* *Washington County (part)*	MPO STUDY AREA
Agricultural/Mining	1,733	2,040	3,773
Manufacturing	5,725	6,519	12,244
Retail	2,410	4,881	7,291
Office	2,292	4,009	6,301
Service	9,509	9,315	18,824
Government	2,605	3,231	5,836
TOTAL EMPLOYMENT	**24,274**	**29,995**	**54,269**
SCHOOL ENROLLMENT	**9,046**	**8,243**	**17,289**

Source: InfoUSA and Bristol MPO

Methodology. An initial estimate of 2040 employment by category was based on a constant ratio of jobs to population for the MPO Study Area. This initial estimate was modified when it was determined that the growth rates for population and employment did not converge. Additional analysis on growth of the available labor force by jurisdiction to fill those employment needs resulted in the final modified employment values used for the target year to account for the aging population of the region. In addition to the ambient employment growth, economic development initiatives by local jurisdictions were included in the employment forecasts that promote economic activity beyond the ambient population growth. Specific initiatives include reutilization of the former Raytheon industrial plant and construction of the Bristol Business Park and Partnership Park II in Tennessee, Oak Park in Washington County, and additional retail development (The Pinnacle at Exit 74 in Bristol, Tennessee, and The Falls at Exit 5 in Bristol, Virginia).

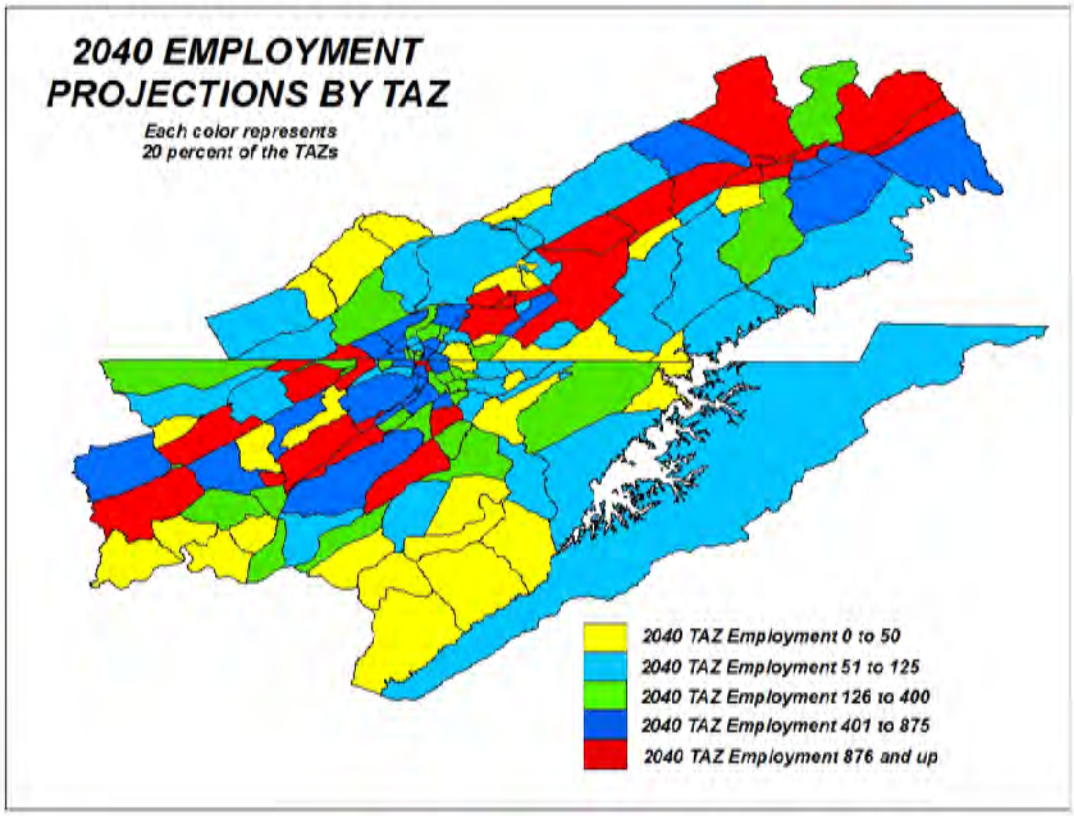
The consultant team determined the original overall growth in employment for the entire study area by jurisdiction and by employment type for the target year based on the above data. Once the overall employment for the target year was determined by jurisdiction, this was broken up further to allocate those employees to each of the TAZs. This was accomplished by first assigning the 150 TAZs into eighteen "super regions". Based on the local land use and comprehensive plans of the various jurisdictions, as well as local knowledge of such issues as slopes, zoning, utility availability, and floodplains, a certain proportion of the additional employees were allocated to each of the "super regions." Then, in turn, the additional employees for each "super region" were further allocated to each TAZ. Thus, the impact of various types of employment growth is reflected into the travel patterns developed in the traffic model.

Employment Estimates. The employment estimates for 2040 (Table 5-6) were developed utilizing the methodology described above. Maps 5-6 and 5-7 show the projected 2040 employment and employment density by TAZ.

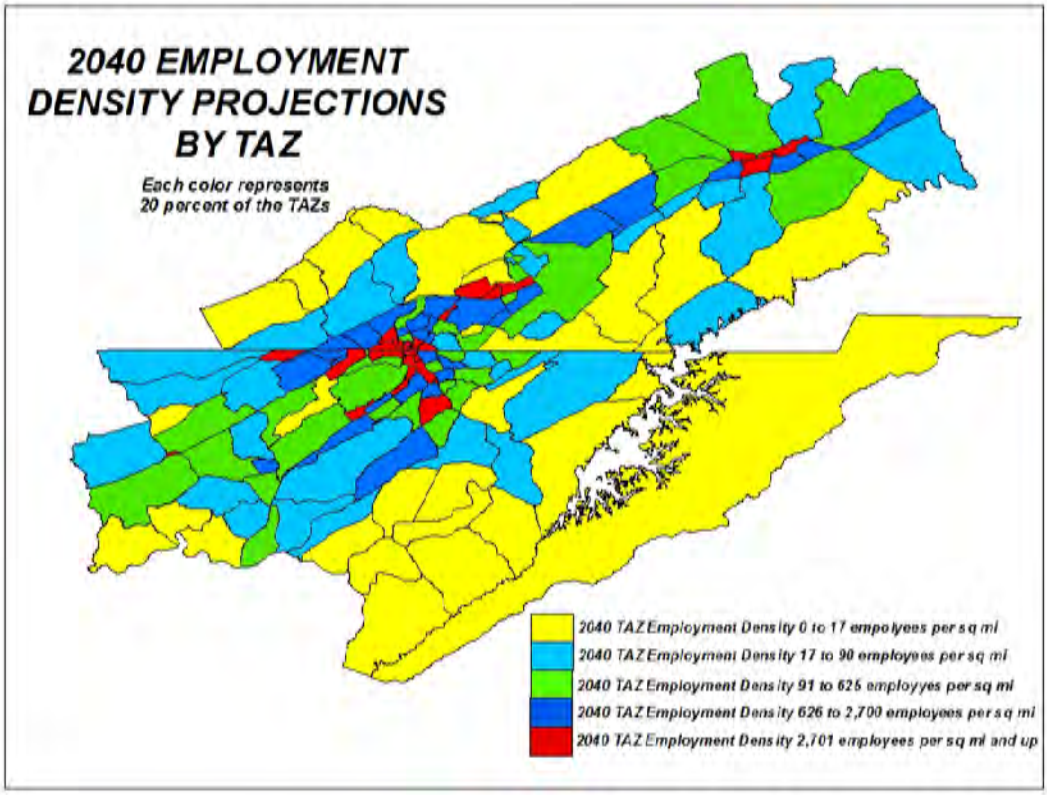
Table 5-6
Employment for Years 2010 and 2040

MPO Study Area	2010 Employment	2040 Employment	Percent Change
Tennessee *City of Bristol* *Sullivan County (part)*	*24,274*	*33,502*	*38.0%*
Virginia *City of Bristol* *Town of Abingdon* *Washington County (part)*	*29,995*	*45,769*	*52.6%*
Total MPO Study Area	**54,269**	**79,271**	**46.1 %**

Source: InfoUSA and Kimley-Horn and Associates



Map 5-6



Map 5-7

Part C: History of the Bristol Travel Demand Model

History of the Modeling Process in Bristol. The 2015 travel demand model is the seventh edition of this model, and the fourth one utilizing the TransCAD software package. As Map 5-8 shows, travel demand models were developed based on the roadway networks in 1969, 1985[6], 1995, 2000, 2005, 2010, and 2015. The initial 1969 network (innermost gray area) did not extend very far from the Bristol downtown; such areas now considered integral to the Bristol area network that were outside of the model in 1969 includes Blountville, Exit 69, much of the Bristol Motor Speedway area, and much of the Exit 7 area of Bristol, Virginia.

1985. The 1985 study boundary was expanded by the MPO to include such areas as State Route 37[7] south of Interstate 81; Blountville; the Wallace community of Washington County; Exit 13 (then Exit 6); and all of the four-lane portion of Highway 421 (then under construction) to the Vinegar Hill community.

[6] The 1985 model was started by TDOT and VDOT's predecessor, VDH&T (Virginia Department of Highways and Transportation) in the early 1980s, prior to the creation of the Bristol MPO, based on the 1980 Census; the model was completed by those agencies, but the long-range transportation plan developed from that data was the first plan developed by the newly formed Bristol MPO.

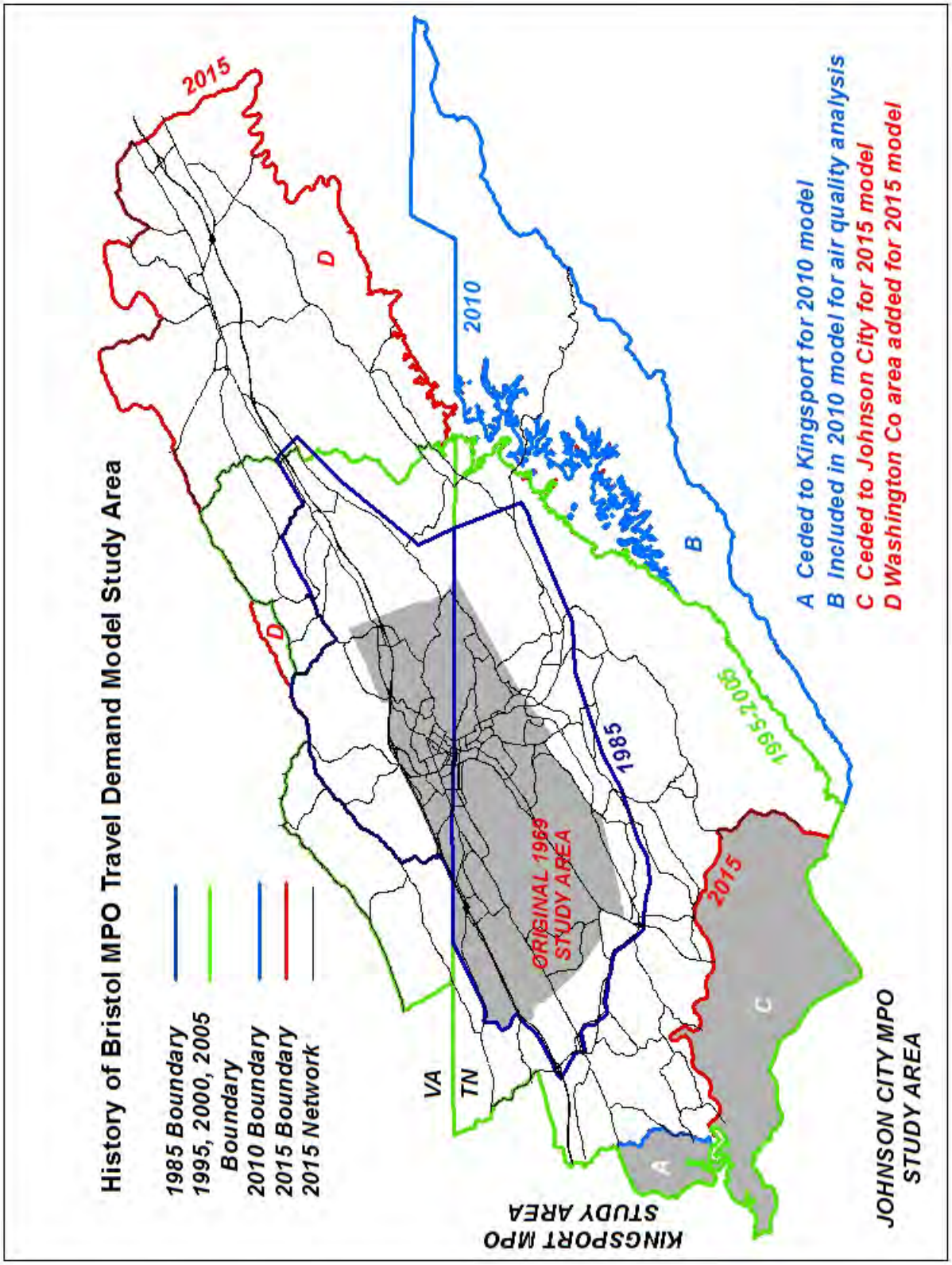
[7] The two-lane State Route 37 was superseded by the multi-lane Highway 394, starting in the 1990s and working westward.

1995. For the 1995 travel demand model, which was based on the data from the 1990 Census, the study boundary was considerably expanded to include Bluff City; Sullivan County north and east of Exit 66 and west of South Holston Lake; and Washington County west to the Scott County line and east to include the Mock Knob area and portions of the Old Jonesboro Road area. This study area boundary was unchanged for the 2000 and 2005 models.

2010. Based on the 2000 Census, a small area in the Muddy Creek community east of Tri-Cities Regional Airport was removed from the Bristol 2010 model and ceded to the Kingsport study area, since it contained a small corner of the Kingsport urbanized area (area A on Map 5-8). It was for this model that, for the first time, air quality considerations were added. At that time, there were three areas of Sullivan County that were not included in any travel demand model of the three MPOs. It was decided that each MPO would add one of these three unmodeled areas to their study networks, so that if air quality modeling were to become necessary, all of Sullivan County would be modeled at the MPO level. The Cold Springs area of Sullivan County north of Highway 11W was modeled by Kingsport; the southern Piney Flats area south of Allison Road/Piney Flats Road was included by Johnson City; and the Bristol model was expanded to include Holston Mountain in the east to the county boundary (area B on Map 5-8).

2015. The 2015 model, based on the 2010 Census, represents a major shift in modeling focus. With the continued growth of the Tri-Cities and the new definitions by the Census Bureau to determine urbanized area boundaries, all three MPO travel demand models are fully contiguous. Piney Flats, Bluff City, and part of the Chinquapin community were removed from the Bristol study area and added to the Johnson City travel demand model study area (area C on Map 5-8). The Bristol study area cannot grow westward, as it contacts the Kingsport study area. It cannot grow southward, as it contacts the Johnson City study area. With the new definitions of urbanized areas that included not only population densities but also impervious surfaces and commercial activity, the gap near Virginia Highlands Airport and Exit 13 between the Bristol urbanized area and the Town of Abingdon was closed, which brought the Abingdon and Exit 22 areas into the Bristol study area (the eastern area D on Map 5-8). A small area was also added north of the Clear Creek area so that all of the Bristol, Virginia corporate limits are inside of the study area. The resulting study area boundary is shown on Map 5-8. The 2010 Census urban population split is nearly equal between Tennessee and Virginia, with just under 4,000 more Tennesseans than Virginians in the Bristol Tennessee/Virginia urbanized area; however, for the overall study area, however, there are about 6,000 more Tennesseans than Virginians.

The 2015 model is also a “first” for the Bristol area in that it is a true time-of-day model. For previous models, the future AADT (average annual daily traffic) volume was forecasted, and ten percent of that total was designated as the peak hour flow; the hourly volume-to-capacity ratios were then calculated on that ten-percent ratio. For this model, there are actually four models: morning peak, midday, afternoon peak, and off-peak. The volumes used in the volume-to-capacity calculations are a composite value of these four time-of-day models, as per approved TDOT practice.


History of Bristol MPO Travel Demand Model Study Area
1985 Boundary
1995, 2000, 2005 Boundary
2010 Boundary
2015 Boundary
2015 Network
2015
D
D
2010
1985
1995-2005
ORIGINAL 1969 STUDY AREA
VA
TN
A
B
C
2015
A Ceded to Kingsport for 2010 model
B Included in 2010 model for air quality analysis
C Ceded to Johnson City for 2015 model
D Washington Co area added for 2015 model
KINGSPORT MPO STUDY AREA
JOHNSON CITY MPO STUDY AREA

Map 5-8

CHAPTER 6: OPERATIONAL ANALYSIS AND CONGESTION MANAGEMENT

Based on national trends, congestion studies show that over half of traffic delay is non-recurring, meaning it is caused by various types of incidents such as crashes, disabled vehicles, work zones, poor weather, and special events. The remaining portion is recurring congestion, delay that occurs in the same place at the same time of day. The Federal Highway Administration (FHWA) Office of Operations identifies seven general causes of roadway congestion and unreliable travel, as discussed below.

SOURCES OF CONGESTION

Category 1: Traffic-Influencing Events

- *Traffic Incidents:* These are incidents that physically impede the flow of traffic. Such incidents include traffic crashes, vehicular breakdowns, and debris in the roadway. Other examples include incidents that distract the driver and thus influence driver behavior, such as activity or debris on the shoulder. Finally, incidents completely off the highway can also influence driver behavior through distraction (such as a structure fire visible to motorists).
- *Work Zones:* This is a separate example of a phenomenon that physically impedes the flow of traffic. This can take the form of actual lane closures, or other techniques that influence driver behavior (such as lane shifts and shoulder closures). Work zones are often cited as frustrating encounters by motorists, again influencing their driving behavior, often in counterproductive ways such as road rage.
- *Weather:* It is desired that motorists alter their driving behavior based on environmental conditions, which can take the form of influencing roadway characteristics (water, snow, ice, or wet leaves on the roadway) or influencing visibility characteristics (fog, heavy precipitation, smoke, or bright sunlight at sunrise or sunset) to increase safety as appropriate, which often reduces roadway capacity as an unintended by-product.

Category 2: Traffic Demand

- *Fluctuations in Normal Traffic:* Since traffic volumes are shown to vary by month-to-month, as well as displaying day-to-day variations, this can create issues at certain times on roadways with fixed capacities that do not react to such fluctuations. It is not economically sound to design a roadway to handle the traffic flow for the heaviest-volume day of the year; rather, typical engineering standards call for a roadway design to handle the 30th-highest hour of traffic in a given year. Such a standard results in certain times of the year that the demand is greater than the design capacity. Another example is the difference in acceleration and deceleration characteristics of heavy vehicles mixed in with lighter vehicles and thus influencing the latter's travel experience as well.
- *Special Events:* This is an example of how traffic flow patterns, often in volumes far in excess of or vastly different from typical traffic patterns, can overwhelm a roadway network. Special techniques to alleviate congestion issues in response to increased

traffic demand (such as temporary one-way streets or contraflow lanes) bring additional issues for everyday ambient motorists in the area as their typical travel patterns are disrupted. Often, increased on-street parking demand further degrades traffic operations. Examples include sporting events and weather- or industrial incident-induced evacuations.

Category 3: Physical Highway Features

- *Traffic Control Devices:* Poorly timed or coordinated traffic signals are often identified as a culprit in congestion, but other traffic control devices can be included as well, such as excessive STOP sign usage and ramp metering.
- *Physical Bottlenecks:* Congestion-inducing features in this category include such items as inadequate lane and shoulder widths; grades and curves; lane drops and merging requirements; and features that stop traffic altogether, such as railroad crossings and manual toll booths.

Better management of work zones, better incident response and better traveler information can significantly reduce congestion caused by traffic influencing events such as weather and special events. Solving recurring congestion related to fluctuations in normal traffic, traffic control devices, and physical bottlenecks requires strategies to maximize the capacity of the infrastructure already in place or investing in additional lanes to increase capacity.

OPERATIONAL ANALYSIS

One of the primary purposes of long-range planning is to determine at which locations additional road capacity will be required in the future so that facilities can be constructed to manage that predicted travel demand and thus help to alleviate additional congestion induced by traffic volume growth. As such, the data from the travel demand model is aimed at alleviating future congestion induced by recurring congestion. For the Bristol Study Area, this was done by contracting with the consultant firm of Kimley-Horn and Associates to develop and operate a mathematical model of the Bristol network utilizing the TransCAD software developed by the Caliper Corporation. A year 2010 model was developed, utilizing year 2010 population, employment, network, and traffic count data that could be used for calibration purposes. Once the 2010 network was calibrated, it was converted to a 2015 “existing + committed” (E+C) network to update the network to projects completed or committed. Population and employment data predicted for the target year 2040 is then loaded onto that network and run to serve as the year 2040 “no build” scenario to determine what traffic volumes could be predicted if no further projects were built beyond what is committed in 2015.

Evaluation of roadway performance is based on volume-to-capacity (V/C) ratio which indicates what volume of traffic a roadway is carrying compared to its maximum capacity. For example, a V/C of 1.0 indicates the roadway facility is operating at its capacity. Level of Service (LOS) is the process utilized to describe on a scale from A to F how well traffic flows on a roadway based on it’s volume/capacity ratio (Chart 6-1). There are several areas within the Study Area that were identified as having volume/capacity (V/C) problems by the TransCAD model; however, the vast majority of roadway segments fell into the LOS categories of A, B, and C.

Chart 6-1
Level of Service

LOS A	Free flow speeds	V/C < 0.7
LOS B	Slightly increased traffic	
LOS C	Moderate congestion	
LOS D	Speeds reduced	V/C 0.7 - 0.85
LOS E	Congestion-Irregular flow	V/C 0.85 - 1.0
LOS F	Road at capacity-Gridlock	V/C > 1.0

Those of special interest for this chapter are those roadways with higher V/C ratios and an LOS identified as D, E, and F. If consecutive modeled roadway segments have the same high LOS rating, they are listed as a single long section, rather than as each individual segment. In some cases, the higher V/C ratio is because a traffic signal or stop sign reduces the capacity at the intersection at one or both ends of the roadway segment (Big Hollow Road in Sullivan County is a case in point, where the STOP sign at Highway 394 is the capacity restraint).

In some cases, the level of detail for the TransCAD model is not sufficient to illustrate the full capacity of the different turn lanes available on a particular approach to an intersection, and so the higher V/C rate does not necessarily indicate that additional lanes are needed. This is particularly evident for off-ramp segments. Examples of this phenomenon are the northbound Highway 11E off-ramp to Highway 394 in southern Bristol, Tennessee, where the downstream traffic signal does not serve the YIELD-controlled right-turn movement but does control a dual-left turn lane. However, since this ramp is a single link in the model, it is listed as a single-lane link (which it is at the upstream-end gore of the ramp) rather than the three lanes at the downstream end of the ramp. Had the model broken this link into two sections (the upstream one-lane section at the gore and the downstream three-lane section at the traffic signal), it likely would not have shown up in the 2040 model as LOS F. Other likely examples of this exit ramp phenomenon are at northbound Exit 69, northbound Exit 1, and both directions of Exit 7. This phenomenon also shows up in the model at both directions of Exits 5 and 17; in these cases, there is a genuine lack of turning movement capacity in addition to issues arising from insufficient model detail.

For these analyses, the green time-to-cycle time ratio (G/C) of an approach to a traffic signal was calculated as the same ratio of approach volumes. In this manner, the traffic signal is postulated to be optimized, so that real-time efforts to optimize traffic signals would already be accounted for in the model. In the same vein, an approach controlled by a YIELD sign was assigned a G/C ratio of 0.8, while a STOP-controlled approach was assigned a G/C ratio of 0.6. Finally, for links that crossed mainline railroad tracks, an additional capacity reduction was included to account for periods when the roadway is effectively out of service while trains block the crossing.

The model developed for this long-range plan is the first Bristol model that was a "time-of-day" model rather than an "all-day" model. For previous models and long-range plans, the future volumes were predicted for the entire day, and ten percent of that volume was assigned to peak hours and thus used as a basis for the hourly V/C calculations. For this model, four time periods were modeled (morning peak, midday, afternoon peak, and off-peak) for each future scenario. The V/C ratios shown in this plan are an aggregation of those time-specific V/C ratios.

The following list (Table 6-1) describes the roadway segments identified on the 2040 Level of Service maps (Map 6-1 through 6-5). Any roadways not listed have an acceptable Level of Service of A, B, or C. The maps indicate the predicted ratio of volume to capacity in the year 2040 if no further projects were constructed after those completed or committed in 2015.

Table 6-1
Level of Service

Unincorporated Sullivan County, Tennessee

LOS	STREET	FROM	TO	MAP
F	Hwy 126	Hwy 75	Hwy 394	6-2
E	Hwy 75	Hwy 126	Camp Placid Rd	6-2
E	Interstate 81 northbound Exit 69 off-ramp			6-2
D	Big Hollow Rd	Hwy 394	Knob Hill Dr	6-2
D	Franklin Dr	Hwy 126	Hwy 394	6-2
D	Hwy 126	Blountville Blvd/ Blountville Bypass	Fain Rd	6-2
D	Hwy 126	Carden Hollow Rd	Carlton Rd	6-2
D	Hwy 394	Hwy 126	Blountville Bypass	6-2
D	Interstate 81 northbound	cordon line south	Exit 69 ramp gore	6-2
D	Interstate 81 northbound	Exit 69 merge point	Walnut Hill Rd bridges[1]	6-2
D	Interstate 81 southbound	Walnut Hill Rd bridges[1]	Exit 69 ramp gore	6-2
D	Interstate 81 southbound	Exit 69 merge point	cordon line south	6-2

Bristol, Tennessee

LOS	STREET	FROM	TO	MAP
F	Exide Dr	Bethel Dr	Hwy 11E/Volunteer Pkwy	6-2
F	Hwy 11E northbound off-ramp to Hwy 394			6-2
F	W State St, eastbound	Exit 74 easternmost ramp merge	Medical Park Blvd	6-2, 6-3
E	Volunteer Pkwy	Windsor Ave	Hill St/Holston Ave	6-3
E	Weaver Pike	Volunteer Pkwy	College Ave	6-3
D	Blountville Hwy	W State St/ Grove Park Dr	Stafford St	6-3
D	Hwy 11W	Island Rd/Stevens Trl	Pinnacle Pkwy	6-2

[1] Interstate 81 changes from a six-lane facility to a four-lane facility at the Walnut Hill Road bridges just west of Tennessee Exit 74, with six lanes northeast of these bridges and four lanes southwest of these bridges.

Bristol, Tennessee (continued)

D	Medical Park Blvd	Meadow View Rd	southern end of four-lane facility	6-2, 6-3
D	Pennsylvania Ave	State St/E State St	Ash St	6-3
D	Virginia Ave	E Cedar St	Lakeview St	6-3
D	Volunteer Pkwy	State St/W State St	Shelby St	6-3
D	W State St	Carson Ln	Euclid Ave/ Gate City Hwy	6-3
D	Weaver Pike	Vance Tank Rd	South Acres Dr	6-3

Along state line between Bristol, Tennessee, and Bristol, Virginia

LOS	STREET	FROM	TO	MAP
D	W State St	state line near 22nd St	17th St/Peters St	6-3
D	W State St	Bob Morrison Blvd	Commonwealth Ave/ Volunteer Pkwy	6-3

Bristol, Virginia

LOS	STREET	FROM	TO	MAP
F	Interstate 81 northbound Exit 5 off-ramp			6-3
F	Interstate 81 southbound Exit 5 off-ramp			6-3
F	Interstate 81 southbound Exit 7 off-ramp			6-3, 6-4
F	Lee Hwy	Bonham Rd	signalized shopping center entrance east of Bonham Rd	6-3
F	Lee Hwy	Clear Creek Rd/ Old Airport Rd	Mt Vernon Dr/ Resting Tree Dr	6-3, 6-4
E	Euclid Ave	Bob Morrison Blvd	Commonwealth Ave	6-3
E	Interstate 81 northbound Exit 7 off-ramp			6-3, 6-4
E	Gate City Hwy	Midway St	Euclid Ave/Gate City Hwy	6-3
E	Lee Hwy	Alexis Dr/Travalite Dr	Bonham Rd	6-3
E	Old Airport Rd	Linden Dr	Lee Hwy	6-3, 6-4
D	Commonwealth Ave	Euclid Ave	Sycamore St	6-3
D	Cumberland St	Piedmont Ave	Moore St	6-3
D	Interstate 81 northbound Exit 1 off-ramp			6-3
D	Interstate 81 northbound	Exit 3 merge point	Exit 5 ramp gore	6-3
D	Interstate 81 southbound	Exit 5 merge point	Exit 3 ramp gore	6-3
D	Lee Hwy	Euclid Ave/ Euclid Ave Ext	Overhill Rd/ Wendover Rd	6-3
D	Lee Hwy	Mt Vernon Dr/ Resting Tree Dr	Bristol corporate limits north	6-4
D	Old Airport Rd	Bonham Rd (south intersection)	Kings Mill Pike	6-3
D	W Mary St	Martin Luther King, Jr Blvd	Goodson St	6-3

Abingdon, Virginia

LOS	STREET	FROM	TO	MAP
F	Cummings St	Cook St	Exit 17 southbound ramps	6-5
F	Russell Rd	W Main St	Valley St	6-5
F	W Main St	Russell Rd	Court St	6-5
F	W Main St	Jonesboro Rd	Abingdon corporate limits west	6-4, 6-5
E	E Main St	Exit 19 southbound on-ramp/Empire Dr	Old 11 Dr	6-5
E	Interstate 81 northbound	Exit 17 merge point	Abingdon corporate limits east	6-5
E	Interstate 81 southbound	Abingdon corporate limits east	Exit 17 ramp gore	6-5
E	Interstate 81 southbound	Exit 17 merge point	Exit 14 ramp gore/ Abingdon corporate limits west	6-4, 6-5
E	Interstate 81 northbound Exit 17 off-ramp			6-5
E	Interstate 81 southbound Exit 17 off-ramp			6-5
E	Russell Rd	Valley St	Academy Dr	6-4, 6-5
E	W Main St	Charwood Dr	Jonesboro Rd	6-4, 6-5
D	Cummings St	W Main St	Bradley St	6-5
D	E Main St	Court St	Tanner St	6-5
D	E Main St	Trigg St	Boone St	6-5
D	E Main St	Hillman Hwy	Old 11 Drive	6-5
D	Interstate 81 northbound	Abingdon corporate limits west	Exit 17 ramp gore	6-4, 6-5
D	Russell Rd	Porterfield Hwy	Campus Dr	6-4, 6-5
D	Valley St	Cummings St	Russell Rd	6-5
D	W Main St	Porterfield Hwy	Wyndale Rd	6-4, 6-5

Unincorporated Washington County, Virginia

LOS	STREET	FROM	TO	MAP
F	Lee Hwy	Forest Hills Cemetery entrance	Abingdon corporate limits west	6-4
F	Spring Creek Rd	Lee Hwy	Exit 13 southbound ramps	6-4
E	Interstate 81 northbound	Bristol corporate limits north[2]	Exit 10 ramp gore	6-4
E	Interstate 81 northbound	Exit 10 merge point	Exit 13 ramp gore	6-4
E	Interstate 81 northbound	Exit 14 merge point	Exit 14 ramp gore	6-4, 6-5
E	Interstate 81 northbound	Abingdon corporate limits east	Exit 19 ramp gore	6-5
E	Interstate 81 southbound	Exit 19 southern-most merge point	Abingdon corporate limits east	6-5
E	Interstate 81 southbound	Exit 14 merge point	Exit 13 ramp gore	6-4

[2] Interstate 81 changes from a six-lane facility to a four-lane facility at the eastern Bristol/Washington County line, with six lanes in Bristol and four lanes in Washington County east of Bristol.

(Unincorporated Washington County, Virginia (continued)

E	Interstate 81 southbound	Exit 13 merge point	Exit 10 ramp gore	6-4
E	Interstate 81 southbound	Exit 10 ramp gore	Bristol corporate limits north	6-4
E	Lee Hwy	Majestic Dr	point north of Industrial Park Rd[3]	6-4
E	Lee Hwy	Astor Rd	Virginia Highlands Airport entrance	6-4
D	Interstate 81 northbound	Exit 10 ramp gore	Exit 10 merge point	6-4
D	Interstate 81 northbound	Exit 13 ramp gore	Exit 14 merge point	6-4, 6-5
D	Interstate 81 northbound	Exit 14 ramp gore	Abingdon corporate limits west	6-4, 6-5
D	Interstate 81 northbound	Exit 19 northern- most merge point	cordon line north	6-5
D	Interstate 81 southbound	cordon line north	Exit 22 ramp gore	6-5
D	Interstate 81 southbound	Exit 22 merge point	Exit 19 northernmost ramp gore	6-5
D	Interstate 81 southbound	Abingdon corporate limits west	Exit 14 ramp gore	6-4, 6-5
D	Interstate 81 southbound	Exit 13 ramp gore	Exit 13 merge point	6-4
D	Interstate 81 southbound	Exit 10 ramp gore	Exit 10 merge point	6-4
D	Lee Hwy	Bristol corporate limits north[2]	Majestic Dr	6-4
D	Lee Hwy	point north of Industrial Park Rd[3]	Astor Rd	6-4
D	Lee Hwy	Virginia Highlands Airport entrance	Forest Hills Cemetery entrance	6-4
D	Majestic Dr	Lee Hwy	Exit 10 southbound ramps	6-4

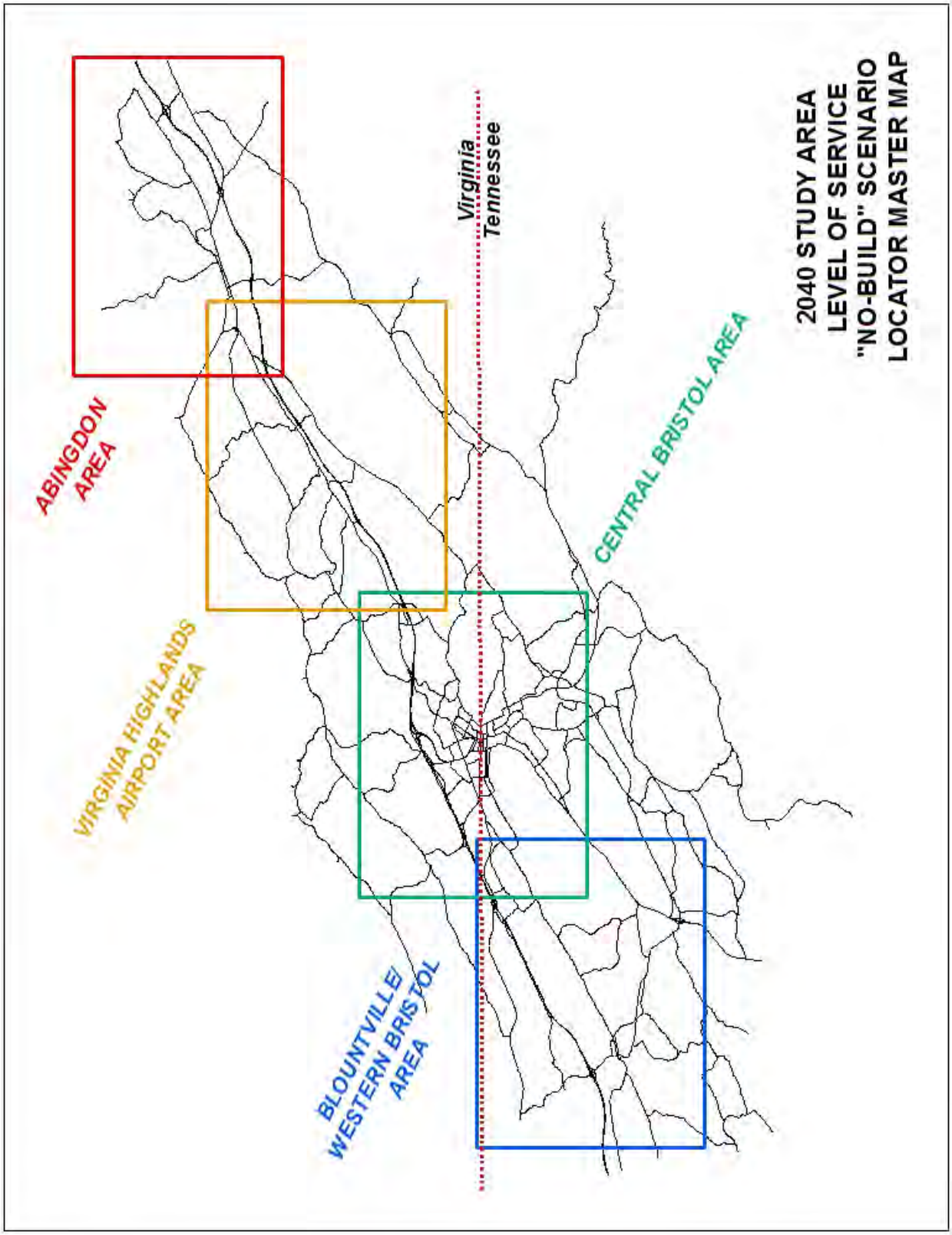
It is interesting to observe the changes in levels of service as one travels along Interstate 81 in both Tennessee and Virginia. In numerous cases (such as Tennessee Exit 69 and Virginia Exits 10, 13, 17, 19, and 22), the level of service drops from the mainline sections between the off-ramps and on-ramps. It is also interesting to note that the level-of-service is different for Interstate 81 northbound and southbound between the Exit 13 and Exit 17 interchanges in Virginia.

At Exit 14 on northbound Interstate 81, a similar phenomenon occurs where the section between the off-ramp and on-ramp has a *higher* level-of-service than the mainline upstream and downstream of the interchange. In this case, however, this interchange has the on-ramp merge upstream of the off-ramp gore in the northbound direction, with a weaving section between the two, so one would expect the volume here to be higher as both the exiting and entering ramp volumes are traveling across this section.

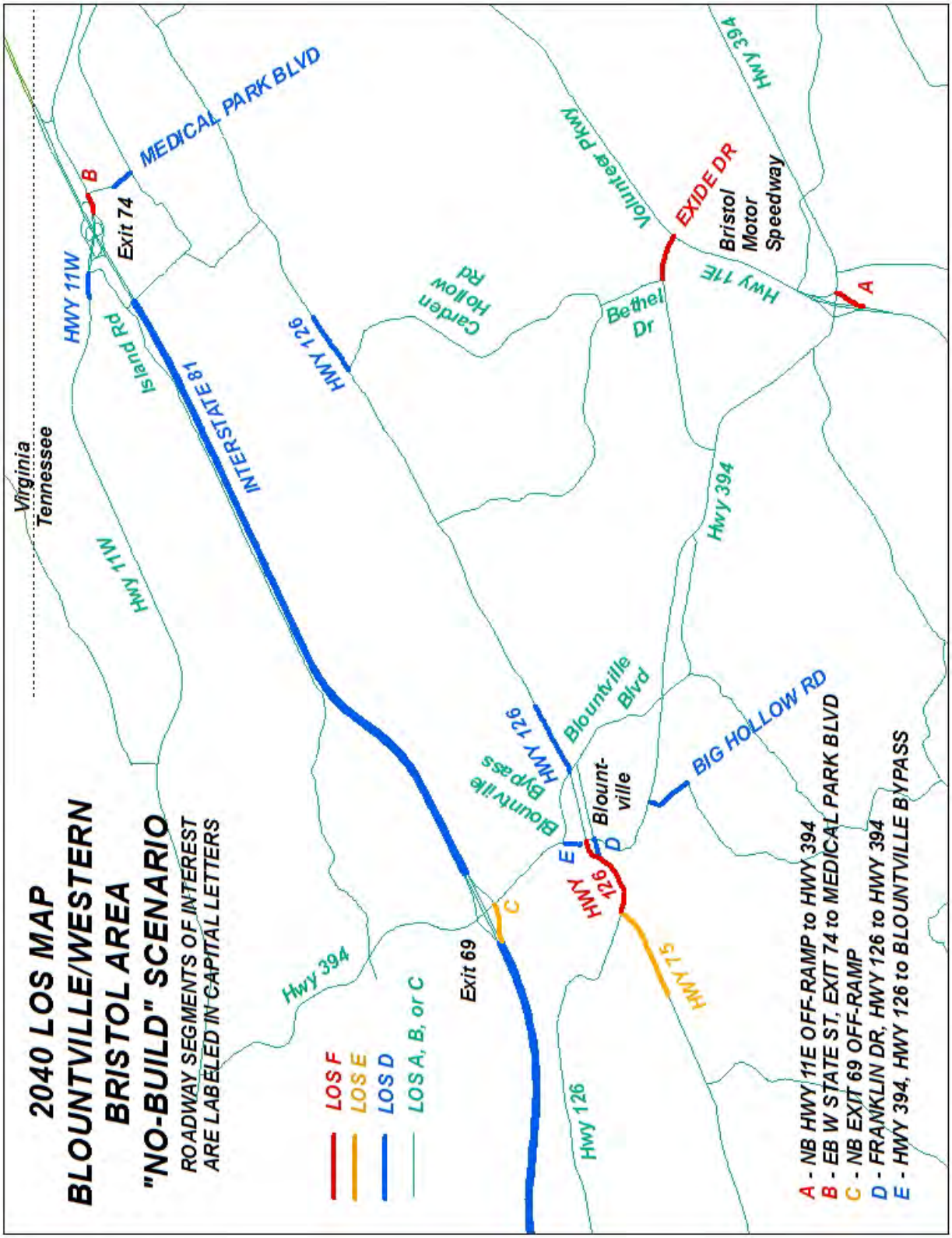
It is important to note that the travel demand model is only one tool that can be used to determine deficient roadways. One drawback of the model is that it can only measure effects of

[3] This point was programmed into the model as a point above the turn lanes for the Industrial Park Road intersection.

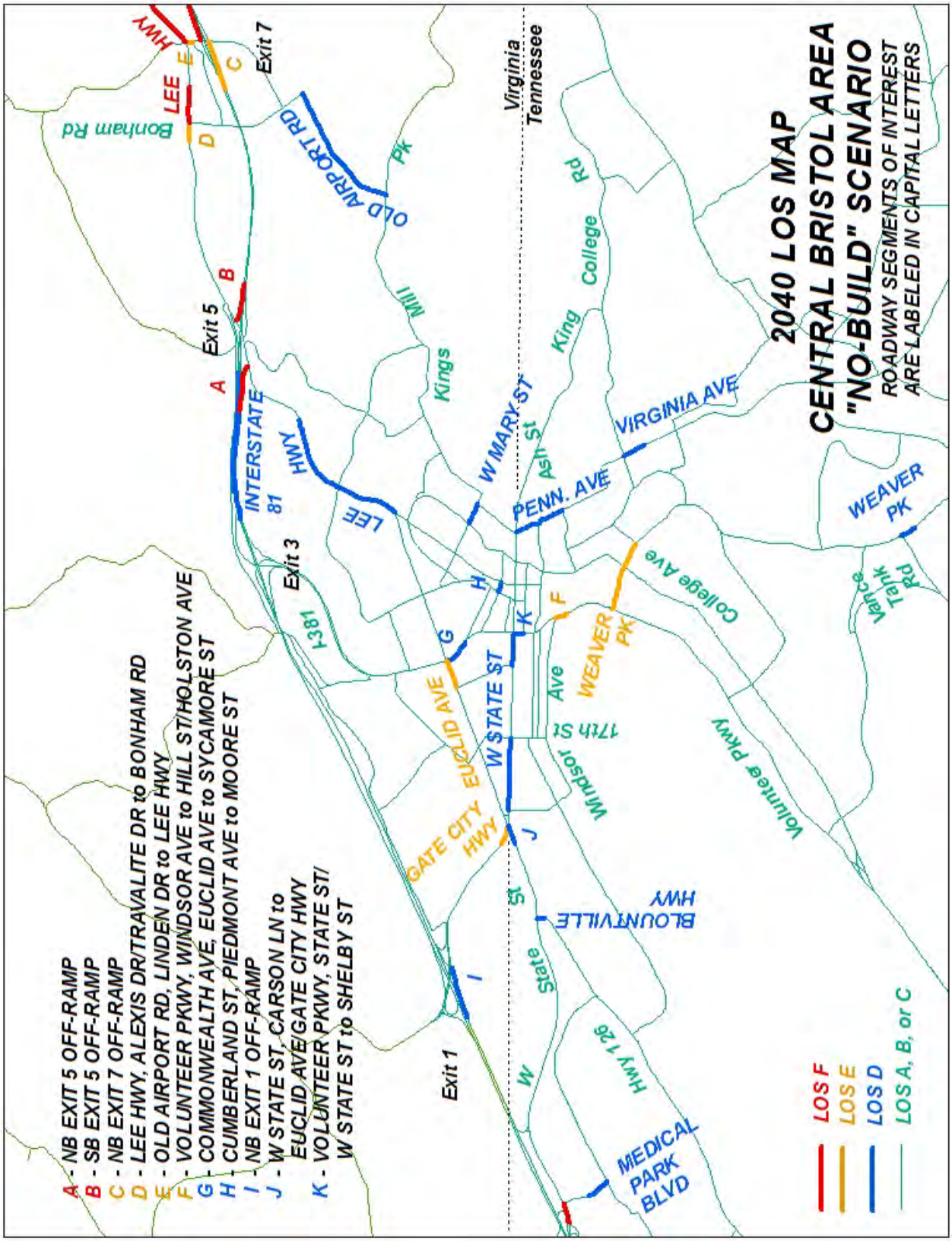
major improvement projects such as additional lanes or new roadways whereas smaller capacity improvements such as additional turn lanes at an intersection may not typically show much effect in the model. Congestion can also be a function of delay. In the Bristol transportation network, delay over a roadway segment is a function of delay at the intersections, in addition to delay generated by congestion on the roadway itself because of insufficient capacity. In those cases, particular sources of congestion at intersections are best identified by analysis on a more detailed level than TransCAD can provide.


2040 STUDY AREA
LEVEL OF SERVICE
"NO-BUILD" SCENARIO
LOCATOR MASTER MAP
ABINGDON AREA
VIRGINIA HIGHLANDS AIRPORT AREA
BLOUNTVILLE/ WESTERN BRISTOL AREA
CENTRAL BRISTOL AREA
Virginia
Tennessee

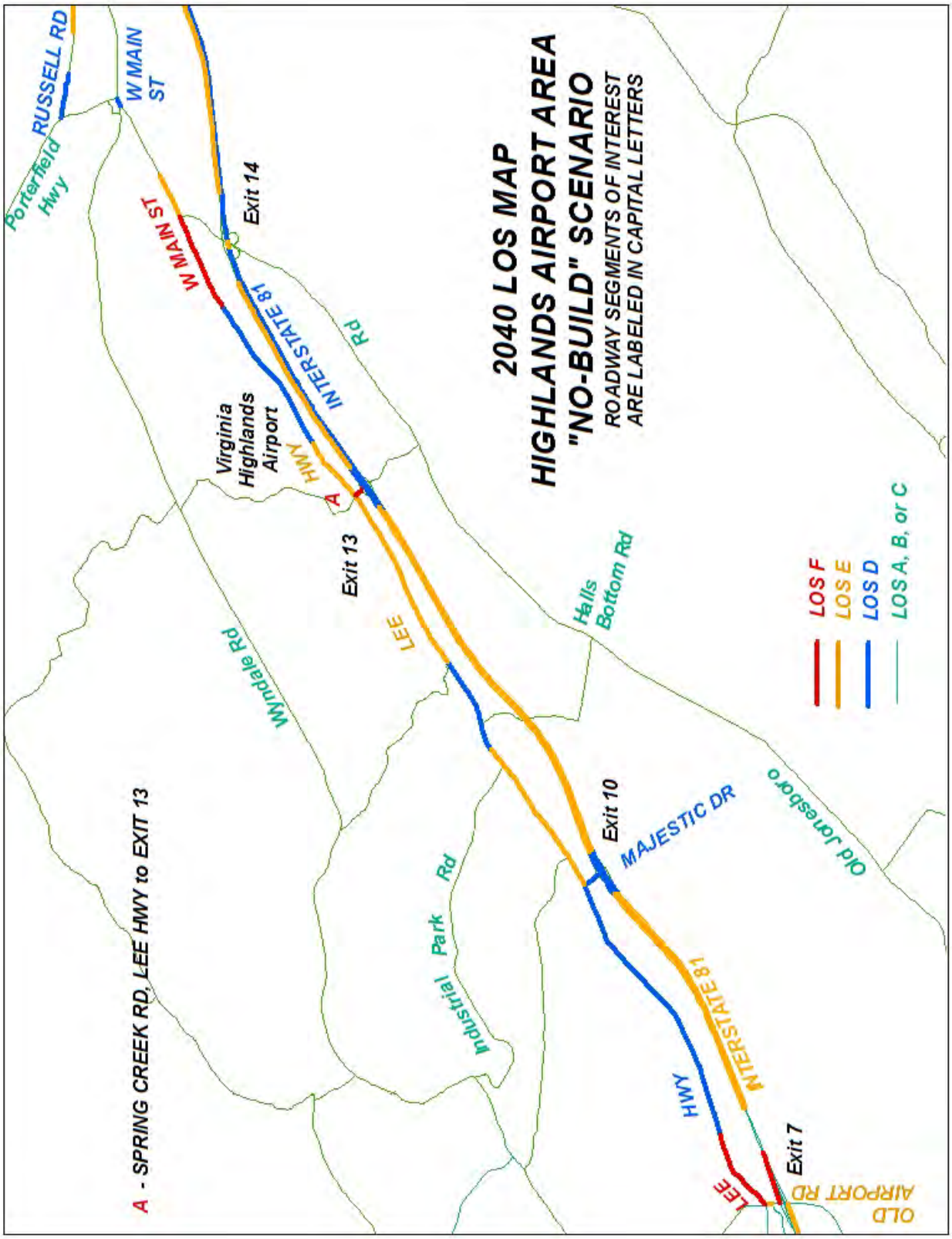
Map 6-1


2040 LOS MAP
BLOUNTVILLE/WESTERN
BRISTOL AREA
"NO-BUILD" SCENARIO
ROADWAY SEGMENTS OF INTEREST
ARE LABELED IN CAPITAL LETTERS
LOS F
LOS E
LOS D
LOS A, B, or C
Virginia
Tennessee
HWY 11W
Island Rd
Hwy 11W
Hwy 394
INTERSTATE 81
Exit 69
Exit 74
MEDICAL PARK BLVD
HWY 126
Garden Hollow Rd
Blountville Bypass
HWY 126
Blountville Blvd
Blount-ville
Hwy 126
HWY 126
HWY 75
BIG HOLLOW RD
Bethel Dr
Volunteer Pkwy
EXIDE DR
Bristol Motor Speedway
Hwy 11E
Hwy 394
Hwy 394
A - NB HWY 11E OFF-RAMP to HWY 394
B - EB W STATE ST, EXIT 74 to MEDICAL PARK BLVD
C - NB EXIT 69 OFF-RAMP
D - FRANKLIN DR, HWY 126 to HWY 394
E - HWY 394, HWY 126 to BLOUNTVILLE BYPASS

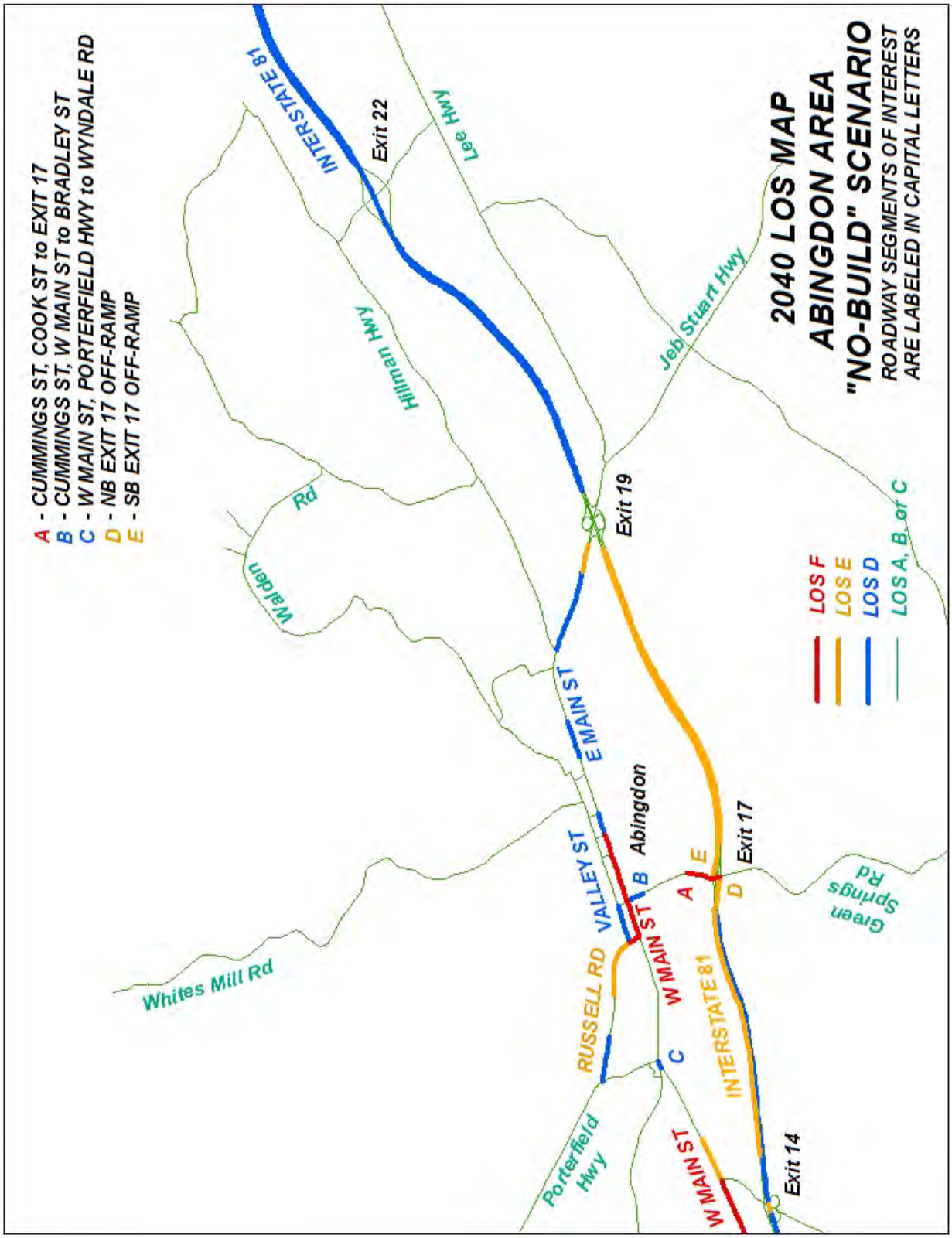
Map 6-2


2040 LOS MAP
CENTRAL BRISTOL AREA
"NO-BUILD" SCENARIO
ROADWAY SEGMENTS OF INTEREST
ARE LABELED IN CAPITAL LETTERS
A - NB EXIT 5 OFF-RAMP
B - SB EXIT 5 OFF-RAMP
C - NB EXIT 7 OFF-RAMP
D - LEE HWY, ALEXIS DR/TRAVALITE DR to BONHAM RD
E - OLD AIRPORT RD, LINDEN DR to LEE HWY
F - VOLUNTEER PKWY, WINDSOR AVE to HILL ST/HOLSTON AVE
G - COMMONWEALTH AVE, EUCLID AVE to SYCAMORE ST
H - CUMBERLAND ST, PIEDMONT AVE to MOORE ST
I - NB EXIT 1 OFF-RAMP
J - W STATE ST, CARSON LN to EUCLID AVE/GATE CITY HWY
K - VOLUNTEER PKWY, STATE ST/ W STATE ST to SHELBY ST
LOS F
LOS E
LOS D
LOS A, B, or C
Virginia
Tennessee
Exit 1
Exit 3
Exit 5
Exit 7
I-81
INTERSTATE 81
LEE HWY
Bonham Rd
OLD AIRPORT RD
Mill Pk
Kings
W MARY ST
PENN. AVE
VIRGINIA AVE
King College Rd
College Ave
WEAVER PK
Valley Talk Rd
Volunteer Pkwy
Windsor Ave
17th St
W STATE ST
EUCLID AVE
GATE CITY HWY
BLOUNTVILLE HWY
State St
W
HWY 126
MEDICAL PARK BLVD

Map 6-3


2040 LOS MAP
HIGHLANDS AIRPORT AREA
"NO-BUILD" SCENARIO
ROADWAY SEGMENTS OF INTEREST
ARE LABELED IN CAPITAL LETTERS
LOS F
LOS E
LOS D
LOS A, B, or C
A - SPRING CREEK RD, LEE HWY to EXIT 13
Porterfield Hwy
RUSSELL RD
W MAIN ST
W MAIN ST
Exit 14
INTERSTATE 81
Rd
Virginia Highlands Airport
HWY
A
Exit 13
LEE
Wyndale Rd
Halls Bottom Rd
Industrial Park Rd
Exit 10
MAJESTIC DR
Old Jonesboro
INTERSTATE 81
HWY
LEE
Exit 7
OLD AIRPORT RD

Map 6-4


2040 LOS MAP
ABINGDON AREA
"NO-BUILD" SCENARIO
ROADWAY SEGMENTS OF INTEREST
ARE LABELED IN CAPITAL LETTERS
A - CUMMINGS ST, COOK ST to EXIT 17
B - CUMMINGS ST, W MAIN ST to BRADLEY ST
C - W MAIN ST, PORTERFIELD HWY to WYNDALE RD
D - NB EXIT 17 OFF-RAMP
E - SB EXIT 17 OFF-RAMP
LOS F
LOS E
LOS D
LOS A, B, or C
INTERSTATE 81
Exit 22
Exit 19
Exit 17
Exit 14
Lee Hwy
Jeb Stuart Hwy
Hillman Hwy
Walden Rd
Whites Mill Rd
Green Springs Rd
E MAIN ST
VALLEY ST
Abingdon
W MAIN ST
RUSSELL RD
Porterfield Hwy
INTERSTATE 81
W MAIN ST

Map 6-5

CONGESTION MANAGEMENT STRATEGIES

The previous listing of locations with higher V/C ratios is only one potential source for determining project needs for the long-range transportation plan. Transportation projects can also be developed to alleviate safety issues, develop a network of multi-lane roadways throughout a jurisdiction or region, or to add additional capacity for economic development and adjacent commercial/industrial activity. Thus, not every road project candidate will be on a location with a high V/C ratio, nor will every roadway with a predicted future high V/C ratio appear on the project list. Those locations with high V/C ratios resulting from lack of lane capacity, rather than capacity constraints induced only by traffic control devices, may become candidates for future projects under the system efficiency criterion. The relative need for projects under this criterion, when compared to system-wide project needs, is part of the balance required for development of a long-range transportation plan.

Operating deficiencies that are related to a high V/C ratio can be targeted, or mitigated, with the strategies discussed below. Certain strategies that deal with land use policies and growth management can be effective in managing congestion although they are somewhat beyond the control of the MPO since land use decisions are made by local jurisdictions. Also, utility providers can exert a great amount of influence on growth patterns depending on where sewer and water lines are extended.

- Appropriate timing of traffic signals can decrease congestion, improve air quality, and reduce fuel consumption. To respond to changes in traffic demand, retiming of traffic signals should occur regularly. Those traffic signals that operate independently can sometimes work more efficiently with only minor investments in equipment and labor. Agencies can enhance efficiency of traffic signals by coordinating or interconnection of certain closely spaced traffic signals so they share a common time reference.
- Transportation systems management and operations strategies must be used to maximize the capacity of the existing infrastructure already in place. More efficient operation of the highway network can be a successful approach to addressing congestion. These strategies can include the addition and/or modification of turn lanes and traffic control devices.
- The number and design of access points can be a major factor in the operations of a roadway. Where access must be provided, access points should be spaced sufficiently apart in order for traffic control devices and turn lanes to operate effectively.
- Crashes and other non-recurring incidents can cause significant delays, especially if lanes are completely blocked. Incident management allows the roadway's available capacity to be restored by removing incidents as quickly as possible.

Projects identified in the *Bristol Tennessee/Virginia Urban Area Long Range Transportation Plan 2040* to address the problems associated with high LOS ratings include:

- Blountville Highway/Highway 126/Highway 75 widening (Bristol, Tennessee/ Sullivan County)
- Interstate 81 enhancements (Washington County)
- Lee Highway widening and traffic signal projects, multiple sections (Bristol, Virginia/Washington County)

Intelligent Transportation Systems. The implementation of Intelligent Transportation Systems (ITS) can be a strategic element in reducing congestion and incident management. ITS deployment refers to the use of advanced technologies to enhancement management and operation of transportation facilities. ITS program areas include many elements, some of which include surveillance equipment to monitor roadways for congestion and incidents; variable message signs that display traffic information to motorists, vehicle detection devices that report traffic counts, speed, and travel time, and motorist service patrols that respond to incidents in a timely manner.

The current *Bristol Regional ITS Architecture and Deployment Plan* covers all of Washington County, Virginia, Bristol, Virginia; and that portion of Sullivan County within the Bristol MPO Study Area (but not the area east of South Holston Lake). The jurisdictions within the Bristol MPO Study Area are stakeholders in this ITS plan, the bounds of which were designed to complement the operational ITS characteristics of both TDOT and VDOT's pre-existing ITS operations. The ITS plan provides the guidelines and structure for the implementation and operation of ITS technology within the MPO Study Area, and defines the transportation needs, ITS solutions, agencies to be involved, and projects to be deployed. This document also supports the expansion of Interstate motorist service patrols into the Tri-Cities, including the Bristol area. Such expansion of service has been endorsed by the various communities in the Tri-Cities area.

The current ITS plan is scheduled to be updated to determine changes in project status, prioritization, or the addition of new projects. In addition any new stakeholders will be included and any changes to the National ITS Architecture will be evaluated.

Special Events. One of the common features of community special events is the traffic congestion that is often caused by the double impact of additional traffic generated by the event, and the loss of roadway capacity to accommodate the traffic needs and parking demands of the special event. In the Bristol Study Area, the most prominent of these events are the annual Rhythm and Roots Reunion music festival in downtown Bristol, the annual Virginia Highlands Festival in Abingdon, and the semi-annual visits by NASCAR to Bristol Motor Speedway.

For special events in downtown Bristol or Abingdon, congestion impacts the roadways to a localized level in the downtown areas, characterized by street closures and impacts on other nearby roadways because of added traffic demand and parking. For the NASCAR visits to Bristol Motor Speedway, the impacts to the roadway and transit systems are much larger. A Multi-Agency Command Center (MACC) is activated for race weekends, as well as the VDOT Bristol District temporary race traffic command center and the permanent regional Traffic Operations Centers (TOCs) in Knoxville and Roanoke, serve to operate the roadway systems impacted by race traffic.

During race weekend periods, traffic volumes on roadways utilized for race traffic can reach up to 700,000 vehicles. This results in some short-term congestion issues as well as temporary countermeasures to accommodate traffic flows, which include, but are not limited to, the following techniques:

- Manual coordination of traffic signals through multiple jurisdictions
- Contraflow lanes (lane direction reassignment)
- Temporary median opening closures to eliminate left turns, U-turns, and remove intersection conflict points
- Interstate lane closures for merging traffic control
- Interchange ramp closure and left-turn prohibitions
- Special event-related messages on variable message boards, both overhead permanent and trailer-mounted temporary units
- Additional transit operations, both public and private

Since traffic generated for such events at Bristol Motor Speedway are not everyday flows, the traffic analysis to determine high-LOS locations did not include traffic generated by such events. However, it is a common practice for local transportation projects to include provisions to accommodate race traffic, such as the ability to manually advance phases for certain traffic signals.

CHAPTER 7: MULTI-MODAL TRANSPORTATION SYSTEM

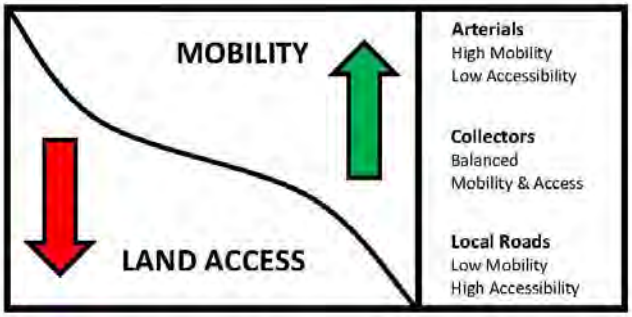
The Bristol Metropolitan Planning Area (MPA) lies astride the Tennessee/Virginia state line on both sides of one of the United States' major roadways, Interstate 81. It is located near the headwaters of the Tennessee River system, in the Holston River tributary watershed, above the head of navigation of that waterway. As such, it is not accessible to waterborne transportation systems. Both Bristols and Sullivan County, along with several other jurisdictions, are part owners through an airport authority of the Tri-Cities Regional Airport, located just outside of the study area to the southwest and centrally located site between the cities of Bristol, Kingsport, and Johnson City. Virginia Highlands Airport, a general aviation airport, is located between Bristol and Abingdon adjacent to Interstate 81 at Exit 13. The MPA is also located astride a major natural gas pipeline that runs from Texas to Pennsylvania roughly parallel to Interstate 81, and one of the major Class I railroad main lines (Norfolk Southern Railway) in the United States. Transit and paratransit services are provided by several public agencies in the Bristol/Abingdon area. There are also several greenways and bicycle/pedestrian routes in the Bristol and Abingdon areas, providing the study area with a variety of mode choices for some trips as well as recreation.

This chapter will discuss the existing transportation system for the various modes as well as specific projects proposed within the Bristol Metropolitan Planning Area.

PART A: STREETS AND HIGHWAYS ELEMENT

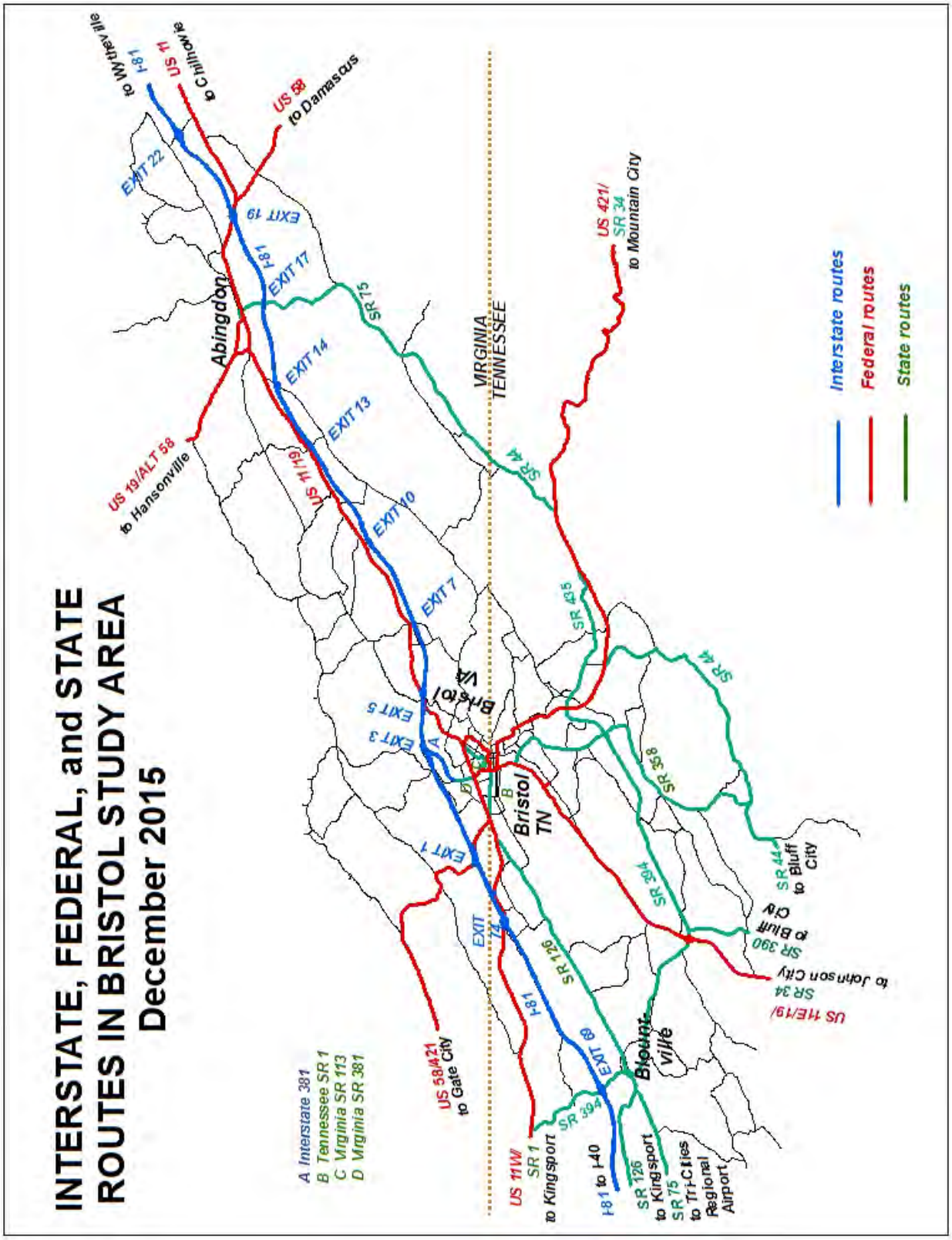
EXISTING CONDITIONS

Chart 7-1



Like all urbanized areas in the United States, the roadway system in the Bristol study area follows a hierarchy of functionality, based on an inverse relationship between accessibility and through traffic flow (Chart 7-1). At the top of the hierarchy are *Interstate* roadways, of which there are two in the Bristol area (Interstate 81 as a through route and Interstate 381 in Bristol, Virginia, as a spur route). *Arterials* primarily move through traffic, with ideally limited or no access available to adjacent pieces of property. Below arterials are *collector* roadways, which serve an intermediate function of collecting trips to and from the arterials and distributing them among the local streets. At the bottom of the public roadway hierarchy are the *local* streets, whose primary purpose are to allow access to adjacent properties and upon which through traffic is discouraged. As one moves up the hierarchy from local to collector to arterial to Interstate, speeds generally increase and access availability to adjacent properties decrease.

There are different classification systems for the roadways in the Bristol MPA for different purposes. The federal and state governments classify and identify certain roadways as Interstate routes, Federal (or U.S.) routes, and state routes (Map 7-1).


INTERSTATE, FEDERAL, and STATE
ROUTES IN BRISTOL STUDY AREA
December 2015
A Interstate 381
B Tennessee SR 1
C Virginia SR 113
D Virginia SR 381
Interstate routes
Federal routes
State routes
VIRGINIA
TENNESSEE
Abingdon
Bristol VA
Bristol TN
Bluff City
Johnson City
Gate City
Kingsport
Tri-Cities Regional Airport
to Wytheville
to Chilhowie
to Damascus
to Hansonville
to Mountain City
to Bluff City
to Johnson City
to Kingsport
to I-40
I-81
US 11
US 58
US 19/ALT 58
US 11/19
US 58/421
US 421/ SR 34
US 11W SR 1
SR 394
SR 126
SR 75
SR 435
SR 358
SR 44
SR 390
SR 34
US 11E/19/
EXIT 22
EXIT 19
EXIT 17
EXIT 14
EXIT 13
EXIT 10
EXIT 7
EXIT 5
EXIT 3
EXIT 1
EXIT 74
EXIT 69

Map 7-1

In Virginia, since there are no county roads *per se*, there is also a breakdown of state routes into primary and secondary routes. The Bristol MPO maintains a functional classification system for the purposes of identifying eligibility for funding from various federal and state sources. Local planning commissions, on the other hand, maintain highway classification systems as a requirement to determine the need for future right-of-way dedication as land is subdivided and developed, often in conjunction with local land use or comprehensive plans. It is not unheard of for a roadway to be classified in one class under one system and another class for another system.

As with most communities, the roadway network for both Bristols continued to grow as the cities grew. Part of that growth is the replacement of formerly major routes with upgraded (and in some cases realigned) facilities, and the older routes move down the hierarchy of streets. The best example of this is Interstate 81, which superseded the former major north/south routes in Bristol (US 11, US 11E, and US 11W); they, in turn, superseded Island Road—the first major wagon road in the State of Tennessee.

Other roadways were initially constructed as industrial access routes. Examples of this phenomenon are Exide Drive, Raytheon Road, and Industrial Drive on the Tennessee side, and Industrial Park Road and Westinghouse Road in Washington County. In Virginia, Linden Drive was built as a facilitator for commercial development, as was the early 1990s-realignment of Clear Creek Road just north of Lee Highway.

The current roadway network for the *Bristol Tennessee/Virginia Urban Area Long Range Transportation Plan Year 2040* contains just over 1,100 lane-miles of roadway. This includes the 2015 existing plus committed (E+C) projects.

Traffic Signals. There are a total of 128 traffic signals in full operation in the Bristol Metropolitan Planning Area (Map 7-2). Of these, 50 (plus one in the engineering stage) are operated by the City of Bristol, Tennessee (through Bristol Tennessee Essential Services); 35 by the City of Bristol, Virginia (through Bristol Virginia Utilities); 19 by the Virginia Department of Transportation (five in Bristol, Virginia, two in Abingdon, and the balance in Washington County); 18 by the Town of Abingdon; and six by Sullivan County (five in the Blountville area and one on Highway 390 just outside of Bluff City, plus one under construction).

Of these 128 traffic signals, there are 17 coordinated operating systems (comprised of 45 traffic signals) of either physically interconnected or time-based coordinated traffic signals, as listed below. All of the traffic signals in operation have at least two of their approaches on roadways modeled in the long-range transportation plan network, except for the three traffic signals on Pinnacle Parkway north of Highway 11W in Bristol, Tennessee.

Coordinated Traffic Signals

Bristol, Virginia

- Commonwealth Avenue (at Keys Street, Spurgeon Lane, and Glenway Avenue)
- Gate City Highway (at Osborne Street, Catherine Street, and Midway Street)
- Lee Highway (at Bonham Road, Lee Highway shopping center entrance, Clear Creek Road/Old Airport Road, and Clear Creek Road shopping center entrance)

Bristol, Tennessee

- Northern Volunteer Parkway (at Broad Street/Anderson Street, Anderson Street [southern intersection], Windsor Avenue, and Hill Street/Holston Avenue)
- Central Volunteer Parkway (at Godsey Road [northern intersection] and Kennedy Road)
- West State Street (at Carson Lane, Euclid Avenue/Gate City Highway, and 24th Street)
- Western Highway 394 (at Blountville Boulevard, Feathers Chapel Road [western intersection], and Cox Farm/Crown Plaza shopping centers)
- Central Highway 394 (at Highway 11E western ramps, Highway 11E eastern ramps, and Highway 390)
- Pinnacle Parkway (at Stevens Trail, Bass Pro Drive, and a private commercial entrance; this is the only signal system in the Bristol study area that is not located on a modeled roadway)

Abingdon, Virginia

- Western West Main Street (at Porterfield Highway and Holston Street)
- Eastern West Main Street (at Cummings Street and Russell Road)
- Thompson Lane (at East Main Street and Baugh Lane)

Sullivan County, Tennessee

- Highway 394 in Blountville (at Highway 126 and Franklin Drive)
- Exit 69 interchange at Highway 394 (northbound off-ramp operational, southbound off-ramp under construction as of December 2015)

Virginia Department of Transportation in Bristol, Virginia

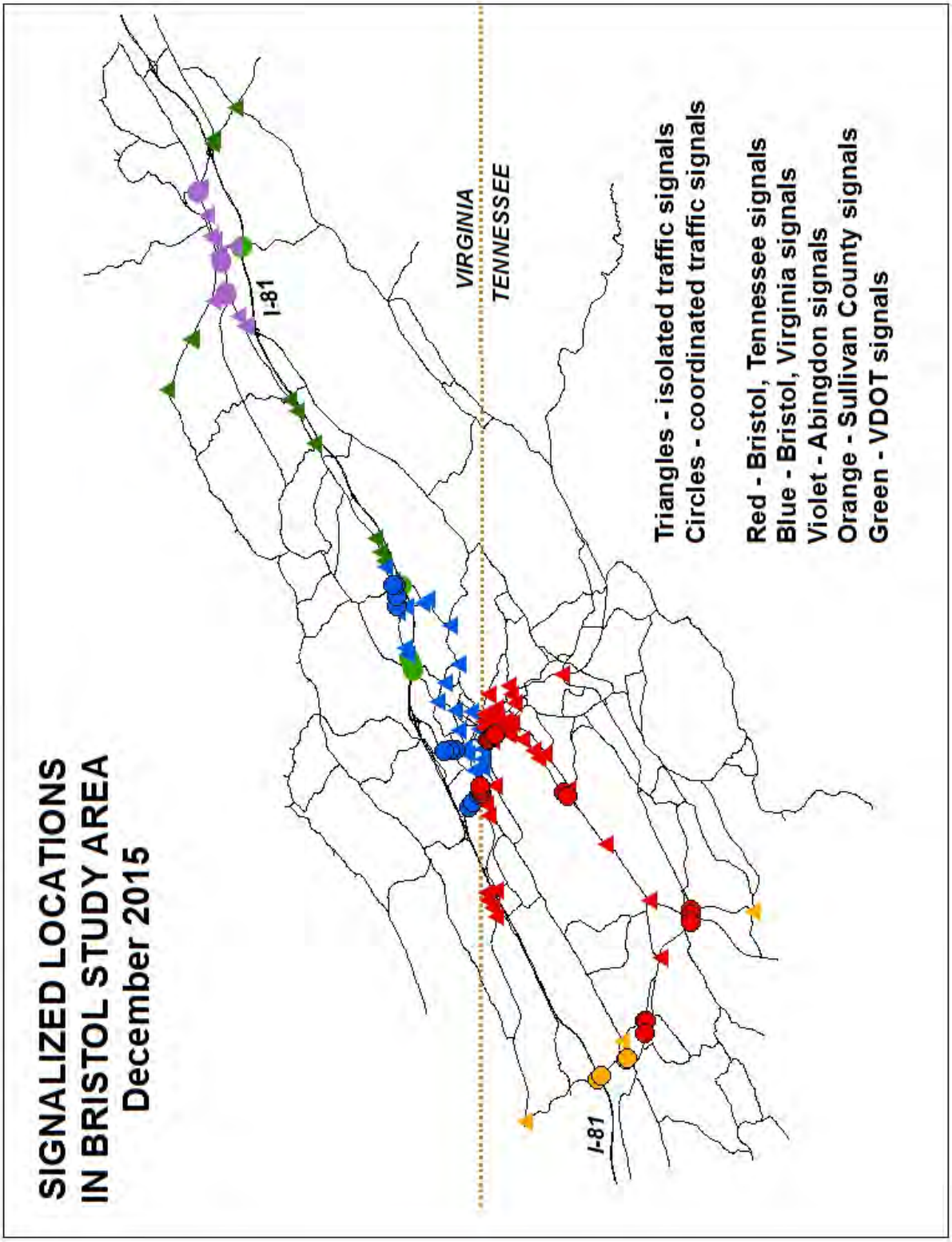
- Lee Highway (at Exit 5 northbound off-ramp, Exit 5 southbound off-ramp, and Old Abingdon Highway)
- Old Airport Road (at Exit 7 northbound and southbound off-ramps)

Virginia Department of Transportation in Abingdon

- Cummings Street (at Exit 17 northbound and southbound off-ramps)

The two Bristols long ago developed a protocol for the operation of traffic signals along the West State Street/State Street/East State Street corridor that spans across the state line. The two cities agreed that each city will operate certain signalized intersections in their entirety, so that Bristol, Virginia, is maintaining traffic signal equipment at a particular intersection on both sides of the state line, and likewise for Bristol, Tennessee, at other locations. Although this agreement functions well for the provision of municipal services and maintenance, this has been an issue along the state line corridor to interconnect signals powered by different utility systems.

Different jurisdictions have, in the recent past, followed a program of examining their traffic signals to determine if any of them can be removed. Since 1985, Bristol, Virginia, has removed eleven traffic signals from service (two temporarily), and Bristol, Tennessee, has removed nine traffic signals from service, for a total of 18 traffic signals permanently removed from service.


SIGNALIZED LOCATIONS
IN BRISTOL STUDY AREA
December 2015
I-81
VIRGINIA
TENNESSEE
I-81
Triangles - isolated traffic signals
Circles - coordinated traffic signals
Red - Bristol, Tennessee signals
Blue - Bristol, Virginia signals
Violet - Abingdon signals
Orange - Sullivan County signals
Green - VDOT signals

Map 7-2

***Interstate 81 Corridor Improvement Studies*.** For several years, the Virginia Department of Transportation has been studying improvements along the I-81 corridor in Virginia to address existing and future transportation deficiencies on the interstate facility. The Commonwealth Transportation Board (CTB) has approved the immediate need for safety and operational improvements along I-81, apart from possible long-term expansion. VDOT has been in the process of implementing short-term spot safety improvements including building dedicated truck climbing lanes and extending ramps at interchanges. In addition to widening of the ramps at Exit 7, a major interchange reconstruction is on-going at Exit 14 in Abingdon, Virginia.

The Tennessee Department of Transportation completed the *I-40/I-81 Corridor Feasibility Study* for Tennessee in 2008. The study identified improvement solutions to a variety of transportation issues and compiled a list of recommended projects. Projects encompass capacity, roadway operations and maintenance, safety, freight movement, inter-modal connections, and economic access opportunities along the interstate corridor. For the Bristol MPO, the widening and signalization of the north and southbound Exit 69 off-ramps to Highway 394 have been completed. No additional corridor improvements are identified in the study for the Bristol Metropolitan Planning Area.

PROGRAMMED AND PLANNED PROJECTS

The projects proposed for the *Bristol Tennessee/Virginia Urban Area Long Range Transportation Plan 2040* are from a variety of sources and address a variety of needs, from roadways with inadequate volume/capacity ratios to local governmental visions of roadway networks for economic development, to safety and maintenance issues. Some of these projects are "carry-overs" from previous long-range plans; however, some projects have not been carried forward, as the needs for those projects have been alleviated by other transportation network modifications or changes in land use. A number of projects included in previous long-range transportation do not appear in this document, as briefly discussed below.

Tennessee

- *Exit 69 Northbound Off-Ramp*. Project completed 2013.
- *Highway 11E and Highway 19E Interchange*. Project completed December 2015; project lies in area removed from Bristol MPO jurisdiction.
- *Cross-Bristol Thoroughfare, western portion*. Project removed from plan between Pennsylvania Avenue and Highway 126.
- *State Route 357 Extension from Tri-Cities Airport to Highway 11E.* Project lies in area removed from Bristol MPO jurisdiction.
- *Extension of Carden Hollow Road to Interstae 81.* Project removed from plan.
  Meadow View Road. Project removed from plan.

Virginia

- *Old Airport Road.* Project removed from plan.
- *Spring Creek Road.* Project completed in 2015.
- *East Valley Drive.* Project removed from plan.
- *Lee Highway, Old Airport Road, and Linden Drive.* Project removed from plan.
- *Exit 11 and Connector Road.* Project removed from plan.
- *West State Street.* Project completed in 2011.
- *"Eastern Beltway."* Project removed from plan.

Project Selection. It is important to understand that transportation projects originate with the development of the *Bristol Tennessee/Virginia Urban Area Long Range Transportation Plan Year 2040* and for implementation they are programmed for funding in the MPO's four-year Transportation Improvement Program. For project development, the long-range transportation plan establishes criteria for transportation projects to be included into the plan by evaluating projects based on whether they meet the goals and objectives of the plan. Those goals and objectives include system efficiency and asset management, economic development, healthy and sustainable communities, mobility, user safety and security (Table 7-1).

In addition to these goals, local priorities for projects are also based on future land use and comprehensive plan implications as well as network connectivity. Project priorities are established by local governmental jurisdictions in cooperation with the Department(s) of Transportation and the MPO; however, the MPO is responsible for evaluating proposed projects for inclusion in the long-range transportation plan. This is accomplished with the technical staff's evaluation and project recommendations to the MPO Executive Board, which approves the final project selections for the long-range plan.

Table 7-1
Project Selection Criteria

System Efficiency
Improves Traffic Operations
Improves Access to Major Highways
Improves Freight Movement
Economic Development
Improves Access to Commercial and Industrial Areas
Increases Accessibility Options for Freight
Promotes Revitalization and Infill Development
Healthy and Sustainable Communities
Contributes to Maintaining or Improving Air Quality
Reduces Greenhouse Gas Emissions
Promotes Active Transportation Opportunities
Mobility
Alternate Transportation Mode
Access Management
Transit Capital Project
User Safety and Security
Addresses Safety/Functional Issues
Improves Security of the Transportation System

Virginia House Bill 2 (HB2) was adopted in 2014 and requires the development of a prioritization and scoring process for project funding. The prioritization process evaluates projects as they relate to congestion, mitigation, economic development, accessibility, safety, environmental quality and land use coordination. Although HB2 provides a quantifiable process for making project funding decisions, projects still require inclusion in the MPO planning process and long-range transportation for HB2 eligibility.

Financial Constraint. Federal planning regulations require the *Bristol Tennessee/Virginia Urban Area Long Range Transportation Plan 2040* to be fiscally constrained. The fiscal constraint requirement is intended to ensure that metropolitan long-range transportation plans reflect realistic assumptions about future revenues, rather than merely being "wish lists" that include many more projects than could realistically be completed with available revenues. Unfortunately, all project needs identified in the transportation plan cannot be funded based on the current revenue projections. As a result, the plan includes "illustrative projects," which would be included in the adopted transportation plan if reasonable additional resources beyond those identified in the financial plan were available. Also, projects that are regional in nature and require separate state-level funding above and beyond the typical annual allocations are listed as illustrative. Although illustrative projects are not part of the fiscally constrained transportation plan, the inclusion of a listing of such projects presents an opportunity for the MPO to identify projects for future consideration in the event that additional funding sources were identified.

Roadway Projects. Proposed projects included in the *Bristol Tennessee/Virginia Urban Area Long-Range Transportation Plan Year 2040* are listed in Table 7-2 and identified on Map 7-3. For reference, a listing of Illustrative projects is also provided in Table 7-3. Detailed project descriptions are included in the following narrative for the 2016-2040 roadway projects as well as illustrative projects. For project level funding sources, see Appendix A.

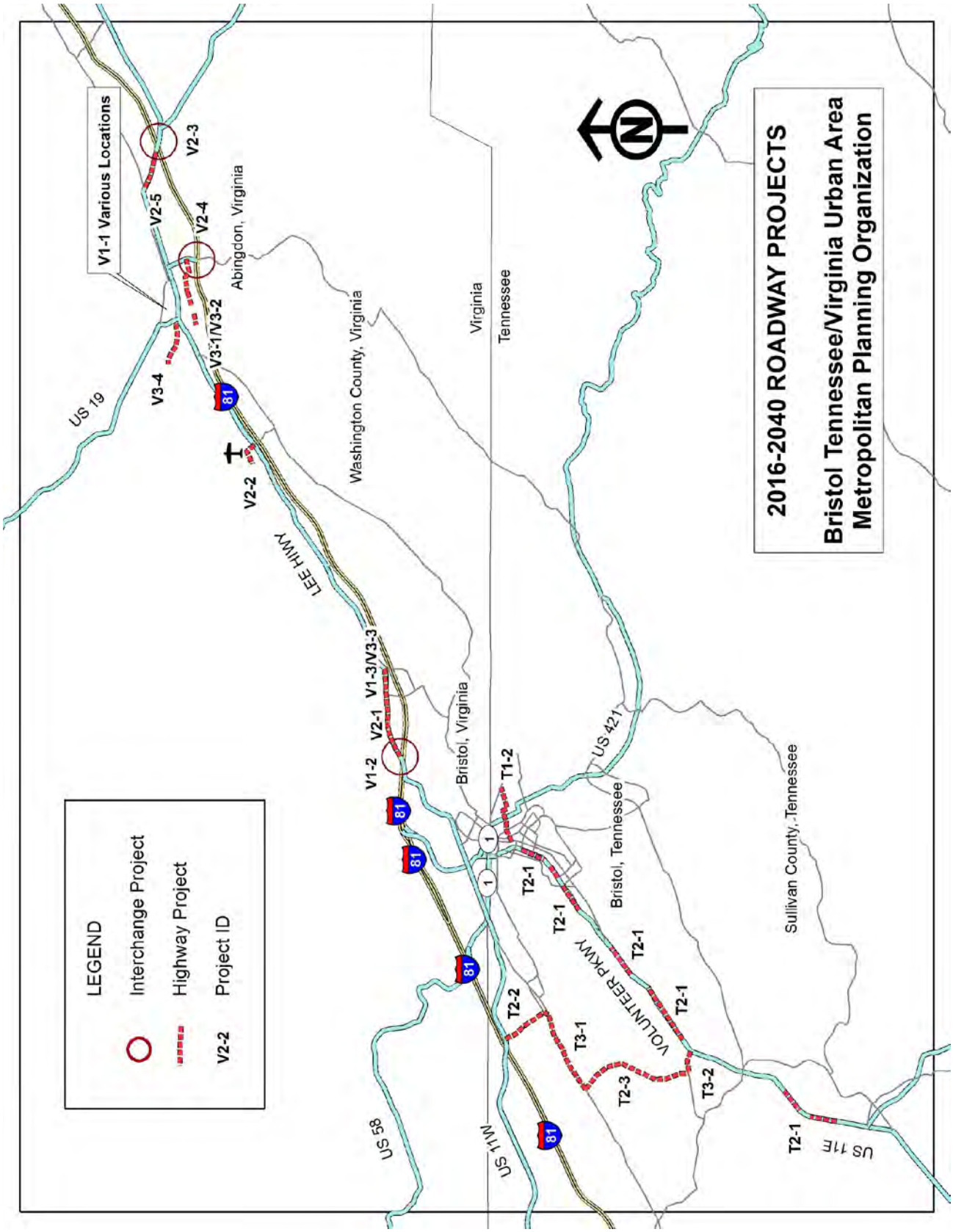
Table 7-2
2016-2040 Roadway Projects

Tennessee Roadway Projects 2016-2040

MPO Project #	Jurisdiction	Project	Termini	Length (miles)	Description	Horizon Year	Costs
T1-2	Bristol TN	East Cedar St.	5th St. to King College Rd.	1.2	Reconstruction/realignment of 2-lane facility	2016-2020	$ 6,650,000
T2-1	Bristol TN	Volunteer Parkway	Melrose St. to River Rd.	9.7	Median modifications at select intersections	2021-2030	$ 4,488,000
T2-2	Bristol TN	North-South Connecter Route (Medical Park Blvd. Extension)	Medical Park Blvd to SR 126	1.0	Construction new 4- lane roadway from Medical Park Blvd. to SR 126	2021-2030	$ 17,302,000
T2-3	Sullivan Co. TN	North-South Connecter Route (Carden Hollow Rd.)	SR 126 to Bethel Dr./Exide Dr.	2.8	Reconstruct 2-lane facility, improve horizontal alignment and add turn lanes.	2021-2030	$ 24,707,000
T3-1	Bristol TN Sullivan Co. TN	North-South Connecter Route (SR 126)	Carden Hollow Rd. to West State St.	3.5	Widening to 4- lane facility and intersection improvements	2031-2040	$ 58,645,000
T3-2	Bristol TN	North-South Connecter Route (Exide Dr.)	Volunteer Pkwy to Bethel Dr.	0.3	Widening to 4-lane and intersection improvements	2031-2040	$ 5,872,000

Virginia Roadway Projects 2016-2040

MPO Project #	Jurisdiction	Project	Termini	Length (miles)	Description	Horizon Year	Costs
V1-1	Abingdon VA	Intersection Modifications	Various (i.e. Main St. at Cummings St; Old Reedy Creek Rd; Colonial Rd; and Jonesboro Rd.)	n/a	Intersection modifications/turn lanes.	2016-2020	$ 5,152,000
V1-2	Bristol VA	Lee Highway	Exit 5	n/a	Improved turn lanes at Exit 5 on/off ramps at Exit 5. Widening Lee Hwy. to 6-lanes at the interchange.	2016-2020	$ 5,850,000
V1-3	Bristol VA	Lee Highway Signal Interconnect	Alexis Dr. to Old Airport Rd.	0.7	Traffic signal interconnection into a signal coordinated system	2016-2020	$ 3,225,000
V2-1	Bristol VA	Lee Highway	Cabelas Dr to Alexis Dr.	0.9	Widening Lee Hwy. to 4-lane with turn lanes, signalization and access management improvements.	2021-2030	$ 9,987,500
V2-2	Washington Co. VA	Providence Rd.	Lee Highway to Repass St.	1.0	Relocation for Virginia Highlands Airport runway extension	2021-2030	$ 14,241,000
V2-3	Abingdon VA Washington Co. VA	Interstate 81 Exit 19	Exit 19 and Lee Highway	n/a	Reconfiguration of interchange	2021-2030	$ 9,736,000
V2-4	Abingdon VA Washington Co. VA	Interstate 81 Exit 17	Exit 17 and Cummings St.	n/a	Reconfiguration of interchange	2021-2030	$ 21,000,000
V2-5	Abingdon VA	East Main St.	Hillman Hwy. to Exit 19	0.7	Widening to 4-lane	2021-2030	$ 13,858,455
V3-1	Abingdon VA	Cook St./Lowry Dr.	Cummings St. to Stone Mill Rd.	0.8	Extension of Cook St. to Lowry Dr. and reconstruction of Lowry Dr. to Stone Mill Rd.	2031-2040	$ 16,802,000
V3-2	Abingdon VA	Dr. French Moore Jr. Blvd.	Dr. French Moore Jr. Blvd. to Stone Mill Rd.	0.8	New construction to connect Dr. French Moore Jr. Blvd. to Stone Mill Rd.	2031-2040	$ 4,575,000
V3-3	Bristol VA	Lee Highway	Alexis Dr. to Old Airport Rd.	0.7	Reconstruction to 4-lane with turn lanes and intersection improvements at Old Airport Rd.	2031-2040	$ 31,872,000
V3-4	Abingdon VA	Wyndale Rd.	West Main to East Town Limit	0.9	Reconstruction to urban 2-lane.	2031-2040	$ 15,081,000


2016-2040 ROADWAY PROJECTS
Bristol Tennessee/Virginia Urban Area
Metropolitan Planning Organization
LEGEND
Interchange Project
Highway Project
V2-2 Project ID
V1-1 Various Locations
V2-3
V2-5
V2-4
V3-1/V3-2
V3-4
V2-2
V1-3/V3-3
V2-1
V1-2
T1-2
T2-1
T2-2
T3-1
T2-3
T3-2
Abingdon, Virginia
Washington County, Virginia
Virginia
Tennessee
Bristol, Virginia
Bristol, Tennessee
Sullivan County, Tennessee
US 19
LEE HWY
US 58
US 11W
US 421
VOLUNTEER PKWY
US 11E
81
1

Map 7-3

- ***Project T1-2: East Cedar Street*** *(Bristol).* To enhance East Cedar Street's operation as a gateway to King University, this plan proposes improvements to East Cedar Street between 5th Street and King College Road. This will include the realignment of East Cedar Street between Georgia Avenue and Halverstadt Drive (an entrance roadway into the King University campus) to alleviate several sharp curves, and the modification of the intersection at Virginia Avenue (US 421/SR 34) with the installation of turn lanes, increased turning radii, and a modernized traffic signal. It is also proposed to install a northbound right-turn lane on 5th Street at East Cedar Street, increase the turning radii and modernize the traffic signal at this intersection as well. Sections of East Cedar Street east of Virginia Avenue are proposed to be reconstructed as a two-lane boulevard. In addition, the at-grade railroad crossing signal on East Cedar Street is proposed to be interconnected with the traffic signal at 5th Street and East Cedar Street. As part of this project, the potential removal of the traffic signal at East Cedar Street and Georgia Avenue is to be investigated.

- ***Project T1-3: Volunteer Parkway/Highway 11E*** *(US 11E-19/State Route 34) Median Modifications (Bristol).* This project involves installation of left turn lanes at selected median opening locations along Volunteer Parkway and Highway 11E from Melrose Street to River Road. Not every median along this portion of Volunteer Parkway/Highway 11E is included in this project; some median openings already have left-turn lanes, while others have little or no demand for left turns or U-turns because of the relationship between the median opening locations, driveway locations, topography, the proximity of Beaver Creek, and adjacent land uses. This project also includes the installation of second left-turn lanes on the southbound and westbound approaches at the Weaver Pike (SR 358) intersection with the associated traffic signal modifications; and modifications of side street approaches with median modifications at Avoca Road/Phillipswood Drive, Blue Bonnet Drive/Main Street, and consolidation of median openings north and south of Hilltop Street into a single median opening at Hilltop Street. Because this is a project consisting of work at a series of isolated locations, rather than a continuous work zone, this project lends itself to being broken into myriad combinations of small sections for dealing with fiscal and operational constraints.

- ***North-South Connector Route*** *(Bristol/Sullivan County).* This project would provide a continuous roadway connecting The Pinnacle/Exit 74 area of western Bristol to the Bristol Motor Speedway area of southern Bristol. This could be accomplished in phases by the implementation of the (listed north to south) Medical Park Boulevard Extension (Project T2-2), Highway 126/Blountville Highway project (Project T3-1), Carden Hollow Road project (Project T2-3), and the Exide Drive project (Project T3-2). The nature of these stand-alone, independent projects also lends itself to phasing of the overall North-South Connector Route improvements.

- ***Project T2-2: Medical Park Boulevard Extension*** *(Bristol).* This is the northernmost portion of the proposed roadway connecting The Pinnacle/Exit 74 area with the Bristol Motor Speedway area (North-South Connector Route). Medical Park Boulevard exists as a four-lane roadway from West State Street to the main hospital entrance and as a two-

lane roadway (with sufficient right-of-way and drainage structures for four lanes) from the main hospital entrance to Meadow View Road. In 2009, a joint committee consisting of officials from Bristol, Sullivan County, and the hospital worked together to study several alternative routes for the portion between Meadow View Road and Highway 126 (State Route 126). In the end, a route was selected that is reflected in the project map. Such a project would consist of three parts. Part (a) is the widening of Medical Park Boulevard from the main hospital entrance to Meadow View Road from two lanes to four lanes, and the lengthening of the westbound West State Street left-turn lane to Medical Park Boulevard or the addition of a second left-turn lane. Part (b) is the upgrading of a portion of Meadow View Road (two lanes to four lanes, vertical alignment modifications) from Medical Park Boulevard to point east of the Collingwood subdivision near Kinkead Drive. Part (c) is the construction of a new four-lane facility east of the Collingwood subdivision connecting Meadow View Road near Kinkead Drive to the intersection of Highway 126 at Steele Creek Drive and the installation of turn lanes at the latter intersection on the existing approaches as appropriate. All three parts would also include accommodation of bicycle facilities along its length, as this is identified in the Bristol's bicycle plan as a future bicycle route to connect the hospital area to Steele Creek Park.

- ***Project T2-3: Carden Hollow Road*** *(Sullivan County).* This is a central portion of the proposed roadway connecting The Pinnacle/Exit 74 area with the Bristol Motor Speedway area (North-South Connector Route). This project proposes to improve the horizontal alignment of Carden Hollow Road and add turn lanes at the intersections of Carden Hollow Road and Highway 126 *and* at Carden Hollow Road and Bethel Drive. The discontinuous nature of this project easily lends itself to implementation by phase.

- ***Project T3-1. Highway 126*** *(Bristol/Sullivan County)*. This is a central portion of the connector facility between The Pinnacle/Exit 74 and Bristol Motor Speedway areas (North-South Connector Route). This project involves the widening of this corridor from the current end of multi-lane roadway on Blountville Highway at Neal Drive (just southwest of its intersection with West State Street), to the intersection of Highway 126 and Carden Hollow Road. This would also involve a reconfiguration of the intersections at Walnut Hill Road and Paramount Drive from two three-leg intersections separated by a narrow bridge to a single four-leg intersection. Logical break points for widening of this roadway into phases for construction include Highway 126 at Collingwood Drive, Walnut Hill Road, and Carden Hollow Road.

- ***Project T3-2: Exide Drive*** *(Bristol).* This is the southernmost portion of the proposed roadway connecting The Pinnacle/Exit 74 area with the Bristol Motor Speedway area (North-South Connector Route). This project involves the widening of Exide Drive from the Volunteer Parkway/Highway 11E intersection to the intersection of Bethel Drive, with intersection improvements at each end (particularly the installation of dual left-turn lanes from eastbound Exide Drive to northbound Volunteer Parkway). Whether this is a single-phase project or a two-phase project (with the second phase being the replacement of the existing two-lane bridge over Back Creek with a four-lane bridge) may depend on the timing of the need for bridge replacement relative to the available funding for the widening the balance of this project. Signalization of the Bethel Drive intersection may also have to be investigated as part of this project.

VIRGINIA ROADWAY PROJECTS: 2016-2040

- ***Project V1-1: Abingdon Intersection Modifications*** *(Abingdon).* Under this project, certain intersections along major thoroughfares in Abingdon would be modified, including:

  (a) Install a second westbound Main Street left-turn lane at Cummings Street, and a left-turn lane on northbound Cummings Street at Main Street.
  (b) Reconstruct the Old Reedy Creek Road approach to West Main Street to allow only right turns to eastbound West Main Street; signalize the intersection of West Main Street and Colonial Road as the alternative route to Old Reedy Creek Road. This traffic signal could be interconnected with the existing traffic signal at West Main Street and Charwood Drive.
  (c) Add a second right-turn lane from eastbound West Main Street to southbound Jonesboro Road and modify the traffic signal accordingly. This project could proceed independently and in advance of the Jonesboro Road extension referenced elsewhere in this document.

- ***Project V1-2: Lee Highway/Exit 5*** *(US 11-19, Bristol).* The project involves Interstate 81 Exit 5 improvements by widening a 5-lane section of Lee Highway to a 6-lane urban typical section with pedestrian facilities and median to improved access management. The project will provide modifications at the Exit 5 interchange with the addition of turn lanes on the various interchange ramps and intersection approaches and traffic signal upgrades. In addition, the project includes development of a new Park and Ride lot.

- ***Project V1-3: Traffic Signal Interconnection Along Lee Highway, Alexis Drive to Resting Tree Drive/Mount Vernon Drive; Clear Creek Road/Old Airport Road, north and south of Lee Highway*** *(Bristol).* This project would take the series of traffic signals along Lee Highway (US 11-19) between Alexis Drive and Resting Tree Drive/Mount Vernon Drive in Bristol, and the traffic signals at Clear Creek Road and the shopping center entrance as well as the two traffic signals at Old Airport Road and the Exit 7 interchange, and connect them into a single coordinated traffic signal system. As of December 2015, there are currently ten traffic signals in this area of Bristol.

- ***Project V2-1: Lee Highway*** *(US 11-19, Bristol).* This project would extend the multi-lane portions of Lee Highway from near the Blevins Boulevard/Cabela Drive intersection to Alexis Drive and improves the existing 3-lane to a 4-lane facility with the addition of turn lanes at intersections, access management improvements, new signals for additional access to the Fall Development. In addition the project will include a multimodal shared use path. Bridge work (replacement and/or widening) integral to this project includes the Lee Highway bridge over a Beaver Creek tributary near Flanagan Drive. Major infrastructure improvements to the Norfolk Southern Railway overpass, east of Alexis Drive, are not anticipated due to the existing 4-lane highway section at this location.

- ***Project V2-2: Providence Road*** *Relocation (Route 611) (Washington County).* This project involves the relocation of a portion of Providence Road from Lee Highway to a point south of Repass Street in order to make room for an extension of a runway at the

adjacent Virginia Highlands Airport, which is located immediately east of Providence Road. This project would cut this roadway into two sections, with the section north of the runway being extended westward to connect to Westinghouse Road north of Lee Highway, while the section south of the runway would be a dead-end section that still connects to Lee Highway adjacent to Exit 13.

- ***Project V2-3: Exit 19 Interchange*** *(Abingdon/Washington County).* Under this project, Exit 19 would be reconstructed to current Interstate standards in regard to ramp and Interstate configurations, with Interstate bridge replacements to accommodate a new alignment as necessary. This project would also include intersection modifications along East Main Street/Lee Highway at Empire Drive, Falcon Place Boulevard, and Jeb Stuart Highway, including turn lane additions and reconfigurations and interconnection of the traffic signals in Washington County along this portion of Lee Highway. Such a project could also be expanded to include intersection modifications and signalization of the intersection of Lee Highway and the primary entrance to Johnston Memorial Hospital, with signal interconnection to the other Lee Highway traffic signals referenced above.

- ***Project V2-4: Exit 17*** *(Abingdon/Washington County).* This project calls for the reconfiguration of Exit 17, which currently consists of a "standard" diamond interchange with very little distance between the two signalized ramp intersections, and only a three-lane passage on Cummings Street (State Route 75) under the Interstate 81 bridges. The new configuration would move the two northbound ramps and their Cummings Street intersections away from the bridges to new locations further south to provide queuing space and room for turn lanes in the interchange, as well as lane additions to the southbound ramps and appropriate traffic signal modifications. A second right-turn lane could be added to the southbound exit ramp with traffic signal modifications as well. Intersection modifications along Cummings Street in support of this project could also occur at Country Club Drive, Birdie Drive, Commerce Drive, Gravel Lake Road, and Vances Mill Road (Route 640) as these "side" streets are reconfigured away from the existing bridge structures as appropriate. Ultimately, as structural needs require, the Interstate 81 bridges would be replaced with longer structures to accommodate at least five lanes on Cummings Street under the Interstate.

- ***Project V2-5: East Main Street*** *(Abingdon).* This project calls for the widening of East Main Street between Hillman Highway and the Exit 19 interchange to four lanes with turn lanes as appropriate or a five-lane facility. Such a project may include signalization of the intersection of East Main Street and Old Eleven Drive.

- ***Project V3-1: Cook Street/Lowry Drive*** *(Abingdon).* This project would extend and modify Cook Street from Cummings Street to Lowry Drive, and Lowry Drive from Cook Street to Stone Mill Road as a two-lane facility. The intersection work at Cummings Street and Cook Street would also include the realignment of Green Spring Road so that it intersects Cummings Street at Cook Street, forming a four-leg intersection, rather than intersecting Cummings Street south of Cook Street as it does at present. Turn lanes would be added at the Cook Street and Cummings Street intersection as required and the traffic signal reconfigured as appropriate. Three project phases are envisioned: Green Spring Road portion, Cook Street portion, and Lowry Drive portion.

- ***Project V3-2: Dr. French Moore Jr. Boulevard/VHCC Drive*** *(Abingdon).* This project would extend Dr. French Moore, Jr. Boulevard (State Route 372) from its current eastern end to intersect Stone Mill Road at Lowry Drive, thus providing a connection between Cummings Street and Jonesboro Road away from than Main Street. A second portion of this project would widen Virginia Highlands Community College Drive to a 36-foot urban standard road width.

- ***Project V3-3: Lee Highway*** *(US 11-19, Bristol).* This project would extend the multi-lane portion of Lee Highway from Alexis Drive to the Clear Creek Road/Old Airport Road intersection, as well as possibly modify lane configurations between the latter intersection and the Beaver Creek bridge. This project involves widening of this roadway to four through lanes with additional lanes at intersections, as appropriate; some short sections may have to be accommodated with a center two-way left-turn lane cross-section. Bridge work (replacement and/or widening) integral to this project include the Lee Highway bridge over Goose Creek, and the Bonham Road bridge over Beaver Creek that is immediately adjacent to Lee Highway; the latter bridge should be widened to at least six lanes for proper intersectional operation. At the intersection of Clear Creek Road/Old Airport Road and Lee Highway, the need for northbound Lee Highway dual left-turn lanes to Clear Creek Road has been obviated by subsequent construction; the section of Lee Highway between Clear Creek Road/Old Airport Road and Beaver Creek Road should be reconfigured to allow for southbound Lee Highway dual left-turn lanes to Old Airport Road while the second northbound Lee Highway left-turn lane to Clear Creek Road is eliminated. For obvious reasons, there is a relationship that has to be accounted for between this project and the Lee Highway traffic signal system project described in Project V1-3.

- ***Project V3-4: Wyndale Road*** *(Abingdon).* This project would upgrade Wyndale Road from West Main Street to the western corporate limits near Woodland Hills Road to a 36-foot, two-lane urban roadway. Depending on how the different projects are constructed, this project has the potential to intersect the Jonesboro Road (SR 140) extension northward to Porterfield Highway.

Table 7-3
2016-2040 Illustrative Roadway Projects

Tennessee Illustrative Projects (Unfunded)

Project #	Jurisdiction	Project	Termini	Length (miles)	Description
T-IL-1	Bristol TN	Edgemont Ave/Bluff City Hwy	Queen St. to Volunteer Pkwy	2.8	Spot modifications for lane reconfiguration, realignments and traffic signal upgrades
T-IL-2	Bristol TN	King College Rd	Tadlock Rd to Old Jonesboro Rd	2.3	Spot modifications for turn lanes at various intersections including
T-IL-3	Bristol TN	Old Jonesboro Rd	Bristol Caverns Hwy to Kilcoote Way	3.2	Geometric modifications at various locations
T-IL-4	Bristol TN	Weaver Pike	Partnership Park Rd to Stonecraft Rd.	2.3	Construction new 4- lane roadway
T-IL-5	Bristol TN	West State St	Sycamore St to Island Rd	2.8	Median modifications to include turn lanes at select median openings
T-IL-6	Bristol TN	West State St	At Memorial Dr./Kmart Dr.	n/a	Intersection reconstruction
T-IL-7	Bristol TN Sullivan Co. TN	Highway 126/Highway 75	Carden Hollow Rd (SR-126) to Adams Chapel Ro (SR-75)	4.8	Widening to 4- lane facility and turn lanes at various intersections
T-IL-8	Bristol TN	US 421	Anderson St. to US 394	2.5	Widening to 3-lanes with realignment at Maple St.

Virginia Illustrative Projects (unfunded)

Project #	Jurisdiction	Project	Termini	Length (miles)	Description
V-IL-1	Bristol VA	Kings Mill Pike	East Valley Dr. to Eastern Corporate Limits	1.3	Vertical and horizontal alignment modifications
V-IL-2	Bristol VA	Bonham Rd	Sincerest Dr to Lee Highway	0.4	Intersection modifications and pedestrian enhancements
V-IL-3	Washington Co. VA	Kings Mill Pike/Old Jonesboro Rd	Bristol Corporate Limit to Exit 14	8.3	reconstruction of 2-lane facility with horizontal and vertical curve modifications
V-IL-4	Bristol VA	Lee Highway	Euclid Ave/Moore St/Oakview Ave to Overhill Rd	1.1	Widening from 4 to 5-lane facility
V-IL-5	Bristol VA	Old Abingdon Hwy	Vicinity of Railroad Underpass	n/a	Various alternatives for realignment of the Railroad Underpass
V-IL-6	Bristol VA	Old Airport Rd	Kings Mill Pike to Bonham Rd	1.0	Extension of widening from 2-lane to 4/5-lane facility
V-IL-7	Bristol VA	West Mary St.	Bridge over Norfolk Southern Railway	0.1	Bridge replacement and widening
V-IL-8	Bristol VA	Piedmont Ave	Sycamore St to Tennessee State Line	0.3	Beaver Creek bridge replacement
V-IL-9	Abingdon VA	Bonnycastle Dr.	Jonesboro Rd to Stone Mill Rd	1.3	2-lane extension of Bonnycastle Dr from its western terminus
V-IL-10	Bristol VA Washington Co. VA	Gate City Hwy	Exit 1 to Scott County line	6.2	Widening to multi-lane facility
V-IL-11	Washington Co. VA	Lee Highway	West Highlands Blvd to Exit 10	1.9	Reconstruction as a 4-lane divided highway
V-IL-12	Washington Co. VA	Lee Highway	Exit 10 to Abingdon Town Limit	3.3	Reconstruction as a 4-lane divided highway
V-IL-13	Abingdon VA	Hillman Highway	East Main St to Old Saltworks Rd	1.3	Reconstruction as a 2-lane facility and modifications to realign Old Saltworks Rd railroad overpass
V-IL-14	Abingdon VA Washington Co. VA	Old Jonesboro Rd Extension	Main St northward to Porterfield Hwy	1.4	Construct new 4-lane divided highway

TENNESSEE ROADWAY PROJECTS ILLUSTRATIVE (UNFUNDED)

- ***Project T-IL-1: Edgemont Avenue/Bluff City Highway****, (Bristol).* This project calls for spot modifications along this corridor from Queen Street to Volunteer Parkway as a continuation to the previous improvements to Edgemont Avenue completed in the 1990s. Such modifications can be made at the intersections of Bluff City Highway and Edgemont Avenue; Bluff City Highway and Southside Avenue; Bluff City Highway in front of Haynesfield School; and at Bluff City Highway and Lavinder Lane, for lane reconfiguration and realignments as well as traffic signal upgrades. The discontinuous nature of this project easily lends itself to implementation by phase.

- ***Project T-IL-2: King College Road*** *(Bristol).* The plan identifies spot modifications along King College Road to add turn lanes at Old Jonesboro Road, Melody Lane/Holston View School, Trammel Road, and East Cedar Street. Included as well are safety widening of the Sinking Creek bridge and two culverts that carry King College Road over tributaries of Sinking Creek (one west of Kingsbridge and one south of Reserve Boulevard). Like Old Jonesboro Road, another facet of this project would be shoulder widening of King College Road from Tadlock Road to Trammel Road to accommodate an extension of the bicycle route system to eastern Bristol. Like other projects described above, the discontinuous nature of this project lends itself to different combinations of phasing for operational and fiscal considerations.

- ***Project T-IL-3: Old Jonesboro Road*** *(Bristol/Sullivan County).* The project calls for geometric modifications at specific locations along Old Jonesboro Road from Bristol Caverns Highway (SR 435) to Kilcoote Way. Vertical modifications also desired at the Carolina Avenue intersection. The addition of left-turn lanes are proposed at Trammel Road, Paperville Road, King College Road, Valley Pike Road, Carolina Avenue, and Bristol Caverns Highway. The section between Valley Pike Road and Carolina Avenue needs widening to provide additional two-lane width, and modifications to intersections to promote Old Jonesboro Road as the through movement. Like other projects described above, the isolated discontinuous nature of this project lends itself to being broken into various sections. A separate facet of the project is shoulder widening in Bristol between Trammel Road and Kilcoote Way for the accommodation of bicycle lanes in accordance with existing bicycle route plans. Modifications at King College Road, Trammel Road, part of the Paperville Road area, and the shoulder widening facet are currently within the corporate limits of Bristol.

- ***Project T-IL-4: Weaver Pike****, (Bristol).* This plan promotes a more limited approach to the wide-sweeping five-lane realigned roadway called for in previous long-range transportation plans. Instead, this plan calls for limited modifications at spot locations. These spot modifications include intersection modifications at Stonecroft Road/Stine Street, 5th Street, Cedar Valley Road, Industrial Drive, Bellebrook Road/Industrial Boulevard, Vance Tank Road/Ridgedale Drive, and Partnership Park Road in the form of adding left-turn lanes with curvature realignments and earthwork as required for proper intersection operation and sight distance. At the Vance Tank Road/Ridgedale Drive intersections, the proximity of the Weaver Pike railroad overpass precludes the installation of left-turn lanes on Weaver Pike and sight distance improvements without

replacement of the railroad bridge. Instead, it is proposed to relocate the Vance Tank Road intersection approximately 400 feet north of the railroad bridge and reconstruct it with left-turn lanes. This project also calls for the addition of shoulders from Bellebrook Road/Industrial Boulevard to Industrial Drive for bicycle lanes. Finally, this project would include modification of certain bridges (over Cedar Creek, Hogtown Creek, and Beeler Branch) for proper bridge and rail approach treatments. Like other projects described above, the discontinuous nature of this project lends itself to different combinations of phasing for operational and fiscal considerations.

- ***Project T-IL-5: West State Street/Highway 11W*** *Median Modifications (Bristol).* This project involves the installation (or lengthening at Medical Park Boulevard; see the discussion of the Medical Park Boulevard project) of left turn lanes at selected median opening locations on West State Street from Sycamore Street to Interstate 81, and on Highway 11W at its intersection with Stevens Trail/Island Road. As along Volunteer Parkway and Highway 11E, not every median opening requires modification as part of this project. Because this is a project consisting of work at a series of isolated locations, rather than a continuous work zone, this project lends itself to being broken into myriad combinations of small sections for dealing with fiscal and operational constraints.

- ***Project T-IL-6: West State Street and Memorial Drive/KMart Drive*** *(Bristol).* This project calls for the reconstruction of this signalized intersection to allow the currently prohibited northbound KMart Drive left turns and through movements, with traffic signal upgrades as appropriate.

- ***Project T-IL-7: Highway 126/Highway 75*** *(Sullivan County).* . This project involves the widening of this corridor from Carden Hollow Road to the intersection of Highway 126 and Highway 75 in Blountville, and then along Highway 75 to the western cordon line near Adams Chapel Road. This project would then extend beyond the Bristol study area into the Kingsport study area, eventually linking up with the multi-lane portion of Highway 75 proximate to Tri-Cities Regional Airport near State Route 357. This would also involve the widening of several bridges along the route as well as reconfiguration of major intersections in Blountville. Logical break points for widening of this roadway into phases for construction include Highway 126 at Bethel Drive, Blountville Boulevard/Blountville Bypass, Highway 394, and Highway 75. Along Highway 75, logical break points for widening phases could include Muddy Creek Road [northern intersection[1], and the Booher Creek bridge at the cordon line separating the Bristol and Kingsport study areas.

- ***Project T-TL-8: Highway 421*** *(Bristol).* This plan proposes the modification of the US 421 corridor east and south of the Anderson Street bridge over the Norfolk Southern Railway in eastern Bristol, with the other end at the north end of the existing four-lane portion of US 421 just north of Highway 394. Such a thoroughfare could include the following phased components:

[1] The southern intersection of Highway 75 and Muddy Creek Road is outside of the Bristol study area near Tri-Cities Regional Airport.

(a) Widening of Highway 421 and Virginia Avenue northward from the end of the current four-lane roadway just north of its signalized intersection with Bristol Caverns Highway/Highway 394. This would take the form of a three-lane roadway cross-section with bicycle lanes.
(b) A realignment of the "shift" that now transfers the state route from Virginia Avenue to Pennsylvania Avenue via Maple Street and two 90° turns. This would involve a relocation of US 421 north of Lakeview Street along a new alignment that would tie into East Cedar Street at Pennsylvania Avenue. Design of such a roadway would have to account for the East Cedar Street railroad crossing as integral part of the design, with a possible new traffic signal at Pennsylvania Avenue and East Cedar Street. Another alternative "shift" location is in the vicinity of Chesnut Street so as to avoid interaction with the East Cedar Street railroad crossing. By keeping the "shift" south of Maple Street, this eliminates impacts on adjacent properties in the recently-designated Fairmount Historic District north of Maple Street. This could also be a three-lane cross-section with bicycle lanes.
(c) Widening of Pennsylvania Avenue from the "shift" to Anderson Street (US 421-SR 34) to a three-lane section with bicycle lanes.
(d) Relocate both the Highway 421 left-turn lanes at the Bristol Caverns Highway (SR 435/Highway 394 intersection) to an offset configuration for improved sight distance and modify the traffic signal accordingly.

The Tennessee Department of Transportation has completed a Transportation Planning Report (TPR) for this portion of the US 421 corridor, which identified several alternatives for lane configurations and the location of the "shift" to transfer between Pennsylvania Avenue and Virginia Avenue.

VIRGINIA ROADWAY ILLUSTRATIVE PROJECTS (UNFUNDED):

- ***Project V-IL-1: Kings Mill Pike****, East Valley Drive to Bristol Eastern Corporate Limits (Bristol).* Vertical and horizontal alignment modifications to Kings Mill Pike from East Valley Drive to the eastern corporate limits of Bristol is proposed to enhance the recent widening of Kings Mill Pike at its signalized intersection with Old Airport Road/Pendergrass Road. The Old Airport Road/Pendergrass Road intersection is also a logical break point for splitting this project into two phases.

- ***Project V-IL-2: Bonham Road****, south of Suncrest Drive to Lee Highway (US 11-19) (Bristol).* This document calls for certain discreet modifications along this portion of Bonham Road, including pedestrian modifications from Suncrest Drive to Lee Highway; widening of Bonham Road up to six lanes at the Lee Highway intersection at the bridge over Beaver Creek (see the discussion of Project V2-1 above); and a potential traffic signal at Bonham Road and Suncrest Drive with turn lane modifications.

- ***Project V-IL-3: Kings Mill Pike/Old Jonesboro Road*** *(Route 647), Bristol Corporate Limits to Exit 14 (Washington County).* This project involves widening the roadway (while remaining a two-lane facility) with horizontal and vertical curve modifications, bridge upgrades, and left-turn lane installations at Sinking Springs Road (Route 648), Junction Drive (Route 649), High Point Road (Route 649), Mock Knob Road (Route 666), Halls

Bottom Road (Route 808), and Spring Creek Road (Route 611). For multiple phases, any of these proposed left-turn lane installation locations could serve as a break point.

- ***Project V-IL-4: Lee Highway*** *(US 11-19), Euclid Avenue (US 11-19) to Overhill Road/Wendover Road (Bristol)* ***and Moore Street****.* This project includes widening of this portion of Lee Highway to four or five lanes, including intersection improvements and a traffic signal upgrade at East Valley Drive/West Valley Drive, as an extension of the existing five-lane portion north of Overhill Road/Wendover Drive. This could be done as a two-phase project split at the East Valley Drive/West Valley Drive intersection. Signalization of the Lee Highway/Moore Street and Euclid Avenue intersection and its interconnection with the traffic signal at Moore Street, Oakview Avenue, and Martin Luther King, Jr. Boulevard ("Five Points") to its south may have to be investigated, if desired, as part of the preliminary analysis. Alternatively, the signalized intersection at Moore Street, Oakview Avenue, and Martin Luther King, Jr. Boulevard ("Five Points") could be investigated for its replacement with a roundabout.

- ***Project V-IL-5: Old Abingdon Highway*** *Underpass Widening (Bristol).* Previous long-range plans have discussed the need for a wider passage for Old Abingdon Highway under the Norfolk Southern Railway (the current passage is 20 feet zero inches wide on this truck route serving multiple industrial sites). There are several alternative treatments that could provide relief to this problem, as discussed below.

  (a) Replace the underpass with an at-grade railroad crossing north of the bridge, coupled with a re-alignment of Old Abingdon Highway away from its current intersection with Lee Highway, instead intersecting Lee Highway at the Exit 5 northbound off-ramp signalized intersection, and thus eliminating a signalized intersection within the Exit 5 interchange, which would affect Lee Highway project at Exit 5 described above.
  (b) Eliminating the intersection of Lee Highway and Old Abingdon Highway, and replacing it with an extension of Old Abingdon Highway that would remain east of the railroad tracks, cross under Interstate 81 at its bridge over the railroad and Beaver Creek, and connect to Cabela Drive (which in turn, connects to Lee Highway at the Blevins Boulevard/Cabela Drive signalized intersection north of Exit 5).

- ***Project V-IL-6: Old Airport Road****, Kings Mill Pike to Bonham Road, southern intersection (Bristol).* This project is a logical extension of the widening of Old Airport Road north of this location that is already complete; this project would replace the existing two-lane section with a roadway with four through lanes (and either turn lanes as appropriate at intersections or a center two-way left-turn lane).

- ***Project V-IL-7: West Mary Street*** *(Bristol).* This project would replace the existing, nearly century-old West Mary Street bridge over the Norfolk Southern Railway yard in southern Bristol, Virginia, east of Martin Luther King, Jr. Boulevard (Truck US 11-19). The existing two-lane bridge (weight-posted as of December 2015 at 13 tons for two-axle vehicles and 18 tons for three-or-more-axle vehicles) should be replaced with a new structure at least four lanes wide to allow for operational improvements at the Martin Luther King, Jr. Boulevard intersection by allowing for turn lanes at that signalized

intersection. The timing of this project is, in part, predicated on the deterioration rate of this structure and the need for replacement based on structural capacity.

- ***Project V-IL-8: Piedmont Avenue Bridge*** *(Bristol).* Unlike most bridges that cross water courses transversely, the Piedmont Avenue bridge over Beaver Creek in downtown Bristol, Virginia, crosses Beaver Creek longitudinally from just north of Sycamore Street to the Tennessee state line in the center of State Street, a distance of about one-quarter mile, with both businesses and the Bristol Public Library main branch facility along both sides of the structure (and thus along both banks of Beaver Creek). This same structure extends under State Street in Tennessee to the southerly right-of-way line of State Street, and is weight-posted as of December 2015 at 17 tons for two-axle vehicles and 26 tons for three-or-more-axle vehicles. However, the replacement of the portion of the structure under State Street should be considered separately from the balance of the structure under Piedmont Avenue in light of its two-state status and the differences in operational and fiscal environment.

- ***Project V-IL-9: Bonnycastle Drive*** *(Abingdon).* This project calls for the extension of Bonnycastle Drive from its existing western terminus to Jonesboro Road, constructed to a two-lane urban standard, thus providing a link between Jonesboro Road and Stone Mill Road south of Interstate 81.

- ***Project V-IL-10: Gate City Highway*** *(US 58/US 421) Modifications, Exit 1 interchange to Scott County line (Washington County).* The replacement of the existing US 58 roadway between Weber City (in Scott County, Virginia, in the Kingsport study area) and Exit 1 with a multi-lane facility is proposed as part of the larger statewide initiative to provide a multi-lane continuous US 58 facility from Cumberland Gap to the Atlantic Ocean. Phasing for this project would be delineated with one portion extending from the eastern intersection with Reedy Creek Road (Route 633) to the Miller Hill Road intersection immediately north of the recently reconstructed Exit 1 interchange of Interstate 81, and the other portion being between the eastern Reedy Creek Road intersection and the Scott County line.

- ***Project V-IL-11: Lee Highway****, West Highlands Boulevards to just north of Majestic Drive (F-310) (US 11-19) (Washington County).* This project includes widening of Lee Highway from the West Highlands Boulevard at the Bristol corporate limits to Majestic Drive (the connector road between Lee Highway and Interstate 81's Exit 10) in Washington County to a four-lane divided highway cross-section, with additional lanes as required at selected intersections and bicycle facilities.

- ***Project V-IL-12: Lee Highway*** *(US 11-19), Majestic Drive (F-310) to Abingdon western corporate limits (Washington County).* This project would continue the widening of Lee Highway to a four-lane cross-section with turn lanes at intersections and bicycle facilities from Majestic Drive (the connector roadway to Interstate 81 at Exit 10) to the western corporate limits of Abingdon east of Virginia Highlands Airport.

- ***Project V-IL-13: Hillman Highway/Old Saltworks Road*** *(Abingdon).*This project calls for the widening of Hillman Highway from East Main Street to the eastern corporate limits to a typical two-lane urban section (36 feet wide) with curb-and-gutter and sidewalks.

Another phase of this project would replace the one-lane under-height (clearance 12 feet 2 inches) semi-circular Norfolk Southern Railway mainline railroad overpass at Old Saltworks Road and reconstruct Old Saltworks Road to a two-lane urban-standard roadway from Hillman Highway to the corporate limits of Abingdon just north of the railroad.

- ***Project V-IL-14: Jonesboro Road Extension*** *(Abingdon/Washington County).* This is the largest new-roadway proposal for the Abingdon area. This project calls for the extension of Jonesboro Road (as State Route 140) from West Main Street northward as a four-lane divided highway, crossing the Norfolk Southern Railway main line, intersecting Wyndale Road near Woodland Hills Drive, and then connecting to Porterfield Highway near the southern Rustic Lane intersection in Washington County. This project could be completed in two phases, with Wyndale Road is the phase break point. Modifications to the intersection of West Main Street and Jonesboro Road may also be required, including but not limited to providing a dual right-turn arrangement from northbound Jonesboro Road to eastbound West Main Street.

PART B: PUBLIC TRANSPORTATION ELEMENT

As the years pass the need for transit services will continue. The elderly, children, people with disabilities, and the economically disadvantaged should not be confined without mobility options. The majority of public transportation riders in the Bristol region are transit dependent, and without that source of transportation they would be without access to essential services or potential employment.

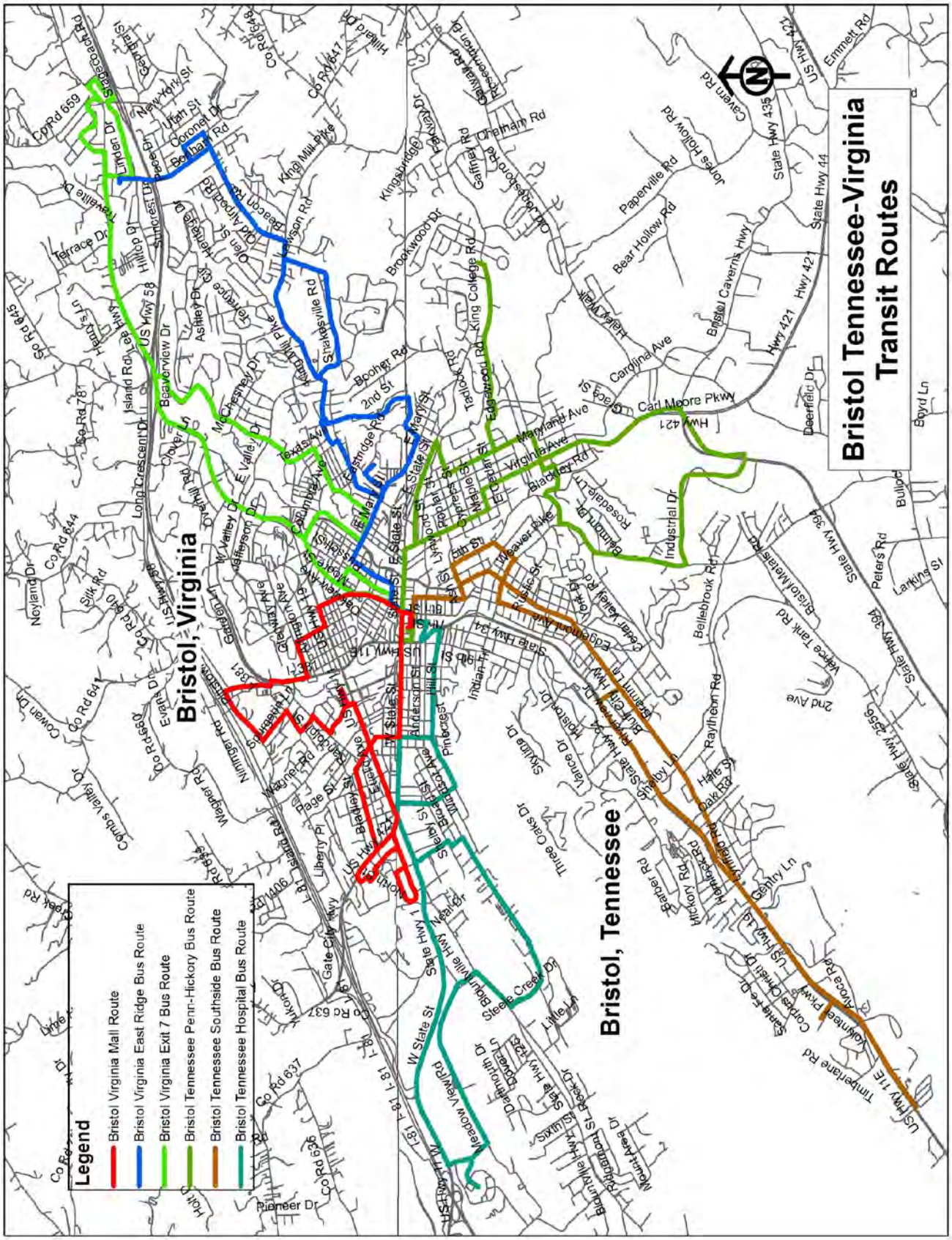
There are multiple agencies providing public transportation in the Bristol Study Area; however, despite a variety of alternative transportation options, there remains unfulfilled needs, gaps in services, and lack of coordination of services. The area has been reactionary instead of proactive towards alternative forms of transportation, but transit must also be a product which people will desire to use. Through the education of the general public and government officials, the acceptance of transit and its importance to the community can occur.

EXISTING CONDITIONS

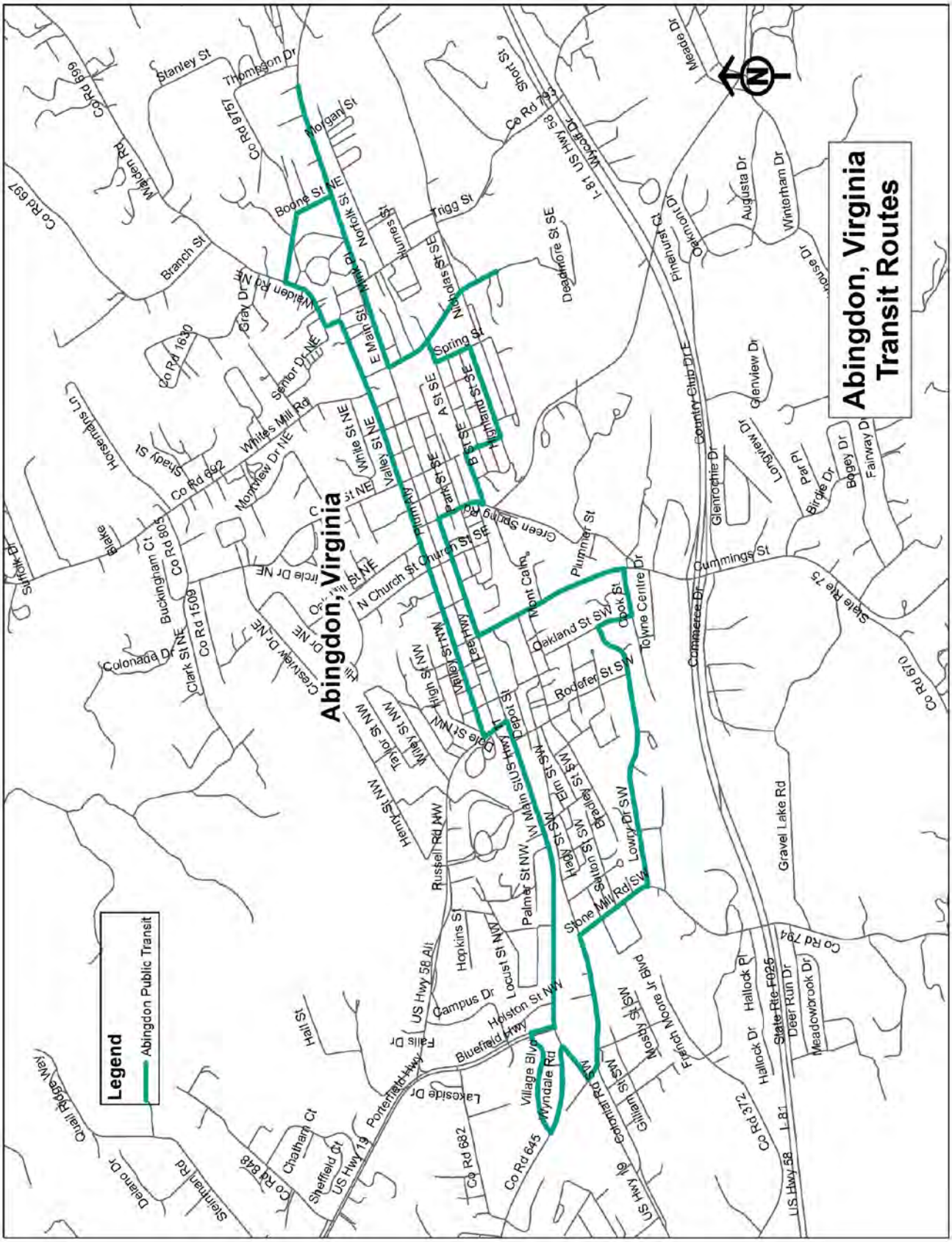
Bristol Transit. The cities of Bristol, Tennessee, and Bristol, Virginia, comprise a single small metropolitan area, but each entity has its own government and separate transit system. However, the two transit systems are integrated and operate on a pulse system from the downtown transfer center in the 800 block of State Street. Both Bristol Tennessee Transit and Bristol Virginia Transit operate a system of three fixed routes each, which provides service to commercial and residential areas as well as medical/hospital campuses and educational institutions (Map 7-4). Transit service is offered on weekdays from 6:15 a.m. to 6:15 p.m. During 2013, Bristol Tennessee Transit provided 70,711 annual trips and Bristol Virginia Transit 99,905 annual trips.

Bristol Tennessee Transit and Bristol Virginia Transit are required by Federal law to comply with the provisions of the Americans with Disabilities Act of 1990 (ADA) and provide paratransit service to those persons who are eligible. Public entities providing fixed-route systems must provide paratransit or other special service to individuals with disabilities that are comparable to the level of service provided to persons without disabilities who use the fixed-route systems. ADA transportation is provided by deviation of the fixed-route as well as point-to-point van service. ADA services are available during the same operating hours as fixed-route service.

Abingdon Transit. Public transportation for the Town of Abingdon is provided by Abingdon Transit, which is operated by the District Three Governmental Cooperative. The service includes the use of handicapped accessible vans and two trolley cars. From 8:00 am to 12:00 pm demand-response service is available by reservation only. From 12:00 pm to 5:00 pm a deviated fixed loop service is available (Map 7-5). During the fixed loop service passengers may catch the bus at a designated stop without making reservations. In 2015, Abingdon Public Transit had approximately 7,134 passenger trips.


Bristol Tennessee-Virginia Transit Routes
Legend
Bristol Virginia Mall Route
Bristol Virginia East Ridge Bus Route
Bristol Virginia Exit 7 Bus Route
Bristol Tennessee Penn-Hickory Bus Route
Bristol Tennessee Southside Bus Route
Bristol Tennessee Hospital Bus Route
Bristol, Virginia
Bristol, Tennessee

Map 7-4


Abingdon, Virginia
Transit Routes
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Abingdon Public Transit
Abingdon, Virginia
N

Map 7-5

District Three Public Transit. The District Three Public Transit provides public transit services in Virginia for the counties of Bland, Carroll, Grayson, Smyth, Washington, and Wythe as well as the Towns of Abingdon, Marion, Wytheville, and the City of Galax. District Three Public Transit is operated as a Joint-Exercise of Powers entity by the localities of the Mount Rogers Planning District Commission. For transit services, various parts of each county are scheduled for service on select days of the week. Generally, service is provided on a first-come first-serve basis by reservation, but passengers may meet the vehicle at any scheduled stop along the route. Door-to-Door service is available for individuals with a disability as defined by the Americans with Disabilities Act (ADA) and all District Three vehicles are handicapped accessible. In 2013, District Three Public Transit provided 176,179 passenger trips district-wide.

District Three Public Transit also provides a weekly route from Bristol to Roanoke and Salem, Virginia. Various pick-up/drop-off locations are designated in the City of Bristol and Washington, Smyth, and Wythe counties along the Interstate 81 corridor.

NET Trans. The First Tennessee Human Resource Agency operates the rural public transportation service, NET Trans, in the Tennessee counties of Carter, Greene, Hancock, Hawkins, Johnson, Sullivan, Unicoi and Washington. The service provides door-to-door transportation on a first-come first-serve basis. While available to the general public in rural Northeast Tennessee, NET Trans provides specialized transportation for the physically challenged and the elderly. NET Trans provided 157,441 trips district-wide in 2015.

In addition to general public transportation, NET Trans operates the Access to Jobs Program to provide transportation to and from work for eligible clients. The service is designed for rural citizens to access employment centers, including child care centers, and can accommodate shift work and weekend schedules.

Section 5310 and Other Providers. Section 5310 refers to the FTA Transportation for Elderly Persons and Persons with Disabilities program. The program provides funding, typically to non-profits, to purchase vehicles for the specific purpose of assisting them with providing transportation services meeting the special needs of elderly persons and persons with disabilities for whom typical mass transportation services are unavailable, insufficient, or inappropriate. Individual medical or social service providers throughout the Metropolitan Planning Area contribute a valuable transportation service to persons who are unable to drive.

Passenger Rail Service. There is currently no passenger railroad service in the Bristol Study Area, apart from an occasional excursion trains. The closest Amtrak stations are Hinton, West Virginia, and Lynchburg, Virginia; however, the Virginia Department of Rail and Public Transportation is in the process of extending Amtrak service to Roanoke by 2017, with future service to Bristol in the planning stages.

Private Bus Lines. Greyhound Bus is the only provider of intercity bus service in the study area, providing bus connections to Johnson City, Kingsport, Abingdon, and points beyond. The Greyhound bus station is located on Shelby Street in Bristol, Tennessee, just a few feet from the Downtown Transit Center utilized by Bristol Tennessee Transit and Bristol Virginia Transit. Other private bus firms in the area provide charter services.

Taxicab Services. Several private firms provide taxicab and delivery service throughout the study area.

OPPORTUNITIES

Fixed-Route Services. The Metropolitan Planning Area for the MPO continues to grow and change while public transportation agencies in the region have struggled to match that growth and change. Much of the growth in Tennessee is westward in the Highway 11W and Highway 394 areas, while much of the Virginia growth has been along Lee Highway Exit 5 and Exit 7 area in Bristol, Virginia and the Exit 19 area of Abingdon and Washington County, Virginia. Much of this growth has occurred beyond the areas served by transit. When new developments were constructed, the urban fixed-route systems have extended service outward from the central business district to serve those needs when feasible; however, the potential for system growth to reach new outlying trip generators will be a continuing issue without additional capital and operating funding to provide service expansions.

Unknown at the date of this plan is the Urbanized Area FTA Section 5307 funding soon to be available to Abingdon, Virginia as a result of the 2010 Census as well as any subsequent public transit services provided. Coordination between the Town of Abingdon, District Three Public Transit, and the Virginia Department of Rail and Public Transportation will be required to develop specific recommendations and planning studies for public transportation within the Town of Abingdon. The implications of FTA Section 5307 funding for the Town of Abingdon requires further consideration and analysis beyond the scope of this document.

Demand-Response and Rural Transit Services. Most of the passengers representing demand-response and specialized transportation within the MPO's service area are senior citizens, disabled persons, or individuals with no other transportation alternatives. This service is absolutely essential for access to health care, nutrition sites, grocery shopping, and basic community services for persons who cannot access traditional fixed-route transit. While the rural transportation agencies focus services on residents that have no other source of transportation for medical and essential errands, their services are also available to the general public. The rural transit providers are facing new problems as travel needs in the rural areas become more diffuse. Improvements in health care and other community services for senior citizens, the disabled and the general public are generating new travel needs for the people who rely on rural transit for their basic mobility needs.

While these agencies provide public transportation for multi-county regions in northeast Tennessee and southwest Virginia, service availability for regional destinations has been very limited, with the exception of the District Three New Freedom Program. It should be noted that rural providers utilizing FTA Section 5311 funding are restricted from providing service when a trip origination and destination are within an urbanized area. As a result, Section 5311 funding requirements prohibit NET Trans from providing a feeder service between the Tri-Cities (Bristol, Kingsport, and Johnson City). However, optional funding sources for this service needs to be investigated to bridge this transportation gap as well as establishing service between Bristol, Virginia and the Town of Abingdon.

Coordinated Human Services Plan. Coordination between transit systems, service providers, and other human services agencies is essential in planning an efficient system that focuses services on the population in need of transit. Recognizing this need, the federal government established the requirement for a locally developed coordinated public transit-human services plan for areas to be eligible to receive FTA Section 5310 funding (Enhanced Mobility for Seniors and Individuals with Disabilities Program). The First Tennessee Human Resource Agency and Mount Rogers Planning District Commission have both developed a Coordinated Human Service Plan for their respective transit service areas. Each plan provides an assessment of available services, an assessment of transportation needs, strategies to address identified gaps, and priorities for implementation.

The Tennessee Department of Transportation is currently funding a regional Coordinated Human Services Plan for all the cities/counties in upper East Tennessee; however, the plan is in the initial phase of development.

Passenger Rail Service. The 2013 Tennessee Rail Plan identified the Bristol-Knoxville-Chattanooga rail corridor in the short list of potential intercity passenger rail for Tennessee. This corridor has even greater potential given Virginia's extension of Amtrak service to Roanoke and consideration of future service to Bristol. The ridership projections for the Chattanooga-Knoxville-Bristol corridor could have a significant impact on the cost-to-benefit ratio with connection to Virginia's extension of Amtrak service to Bristol. The 2015 Tennessee Rail Plan, currently under development, provides the opportunity for a multi-state effort, including Georgia, to connect the major population centers of Atlanta and Washington DC, and points beyond.

A new passenger rail service can only be instituted if there is demonstrable ridership to financially support system operations and to justify the infrastructure and rolling stock that would be required. It is important to note that investment in passenger rail can only be justified if freight movements are the primary purpose for the rail infrastructure enhancements.

PROGRAMMED AND PLANNED PROJECTS

It is anticipated that the cost of providing transit services will continue to grow. The major potentials for cost increases for operations and maintenance in the foreseeable future are due to national trend issues, such as insurance and fuel costs. Transit projects identified in the *Bristol Tennessee/Virginia Urban Area Long-Range Transportation Plan Year 2040* represent local transit agencies maintaining the existing system with no major service additions at this time. The decision to modify either fixed-route or paratransit services to serve currently un-served trip generators will ultimately be made by the local jurisdiction providing the service. Specific recommendations for transit service changes have not been identified in this plan, but could be included as feasibility studies are developed and projects implemented.

Due to the existing level of service remaining consistent, it is anticipated that capital expenditures in the near future will be for the replacement of rolling stock on a typical vehicle replacement cycle. Typically, vehicles are programmed for replacement using a normal vehicle replacement cycle of 4-5 years for vans and 7-10 years for buses. Although no major new facilities are identified for the life of this plan, it can be expected that some maintenance of

existing facilities would be required in the outlying years. The number of vehicles and estimated capital costs needed to provide the current level of service are shown in Table 7-4 for local transit agencies. Costs are based on current procurement standards with a 3.6 percent inflation rate projected for future expenditures. Table 7-4 also includes operating and maintenance costs based on a no growth scenario and a 3.6 percent annual inflation rate.

Table 7-4
Public Transportation
Operating and Capital Needs 2016-2040

Bristol Tennessee Transit

MPO Project #	Capital	#	2016-2020	#	2021-2030	#	2031-2040	TOTAL
BTT-1	O & M	n/a	$ 3,362,263	n/a	$ 8,416,390	n/a	$ 11,310,925	$ 23,089,578
BTT-2	Vehicles	10	$ 769,371	15	$ 1,263,817	15	$ 1,759,498	$ 3,792,686
BTT-3	Other Capital	n/a	$ 26,000	n/a	$ 65,696	n/a	$ 93,569	$ 185,265
Total			$ 4,157,634		$ 9,745,903		$ 13,163,992	$ 27,067,529

Bristol Virginia Transit

MPO Project #	Capital	#	2016-2020	#	2021-2030	#	2031-2040	TOTAL
BVT-1	O & M	n/a	$ 2,962,631	n/a	$ 7,416,028	n/a	$ 9,966,523	$ 20,345,182
BVT-2	Vehicles	5	$ 270,323	11	$ 790,076	11	$ 1,132,416	$ 2,192,815
BVT-3	Other Capital	n/a	$ 27,798	n/a	$ 72,768	n/a	$ 103,643	$ 204,209
Total			$ 3,260,752		$ 8,278,872		$ 11,202,582	$ 22,742,206

NET Trans (District-wide)

MPO Project #	Capital	#	2016-2020	#	2021-2030	#	2031-2040	TOTAL
NET-1	O & M	n/a	$ 21,819,600	n/a	$ 54,618,615	n/a	$ 73,402,854	$ 149,841,069
NET-2	Vehicles	88	$ 3,836,920	176	$ 10,043,994	176	$ 14,305,532	$ 28,186,446
NET-3	Other Capital	n/a	$ 406,563	n/a	$ 1,064,271	n/a	$ 1,515,828	$ 2,986,662
Total	Total		$ 26,063,083		$ 65,726,880		$ 89,224,214	$ 181,014,177

District Three (District-wide)

MPO Project #	Capital	#	2016-2020	#	2021-2030	#	2031-2040	TOTAL
D3-1	O & M	n/a	$ 10,807,992	n/a	$ 27,054,462	n/a	$ 36,358,934	$ 74,221,388
D3-2	Vehicles	35	$ 2,598,901	68	$ 6,790,768	55	$ 7,828,481	$ 17,218,150
D3-3	Other Capital	n/a	$ 195,500	n/a	$ 511,765	n/a	$ 728,890	$ 1,436,155
Total	Total		$ 13,602,393		$ 34,356,995		$ 44,916,305	$ 92,875,693

On various levels, investigations should be made to expand or realign transit service for either fixed-route or paratransit service, or both. There exists a potential for extension of service to outlying trip generators, especially the need for intercity services on a regional level. In addition, expanded hours of transit service for the evening hours and weekends have been an indentified need. The implications of extended transit service requires further consideration beyond the scope of this document because of the individual issues raised for each service expansion. Such issues include service demand only at shift-change times for basic industries; the need to develop strategies for outlying service expansion or realignment while maintaining system-wide pulse scheduling (perhaps through alternate-pulse service); and location of some trip generators outside of the jurisdictions that help to fund the service.

Future planning strategies for public transportation should include the role of transit in the concept of livable communities. Transit-oriented development provides mixed-use development within walking distance of public transportation and is a key element of livable and sustainable communities. Opportunities for transit to be incorporated in transportation and land use planning will provide local agencies additional tools to improve access to housing, jobs, commercial, and social activities. The integration of other transit planning methods, such as mixed-use, open-space, and transit-oriented developments, are all strategies for public transportation to assist in reducing sprawl, reduce automobile travel, and to help create healthier communities.

PART C: PEDESTRIAN AND BICYCLE ELEMENT

Typically designed for both bicycles and pedestrians, urban trails are a growing trend in communities around the country not only as a form of alternative transportation, but for promoting healthy lifestyles. Creating a regional pedestrian/bicycle system can supplement the typical transportation system when residential areas are connected to major trip generators. These types of linkages can reduce vehicle trips, improve air quality, provide mobility options, and improve public health.

A major obstacle to bicycle and pedestrian transportation has been current land use and development patterns. Major roads usually do not have facilities adequate for bicycle use and destinations in commercial developments are often separated from neighborhoods by long distances. Even where residential development is adjacent to activity centers, the lack of connectivity can make that area inaccessible and encourage driving. Many communities in the MPO's Metropolitan Planning Area have begun to assess these impediments by developing greenways and trail plans, and conducting pedestrian safety studies.

Transportation and Public Health. Public health considerations are increasingly being recognized in the transportation planning process. Where transportation infrastructure is designed to accommodate and encourage non-motorized transportation it can have positive effect on public health. According to the 2015 County Health Rankings, 30 to 33 percent of adults in the MPO Region are obese. Activities like walking and bicycling can help prevent weight gain and lower the risks of obesity, diabetes, and heart disease.

Incorporating public health into the metropolitan transportation planning process can include various degrees of strategies from transportation policy considerations to support activities, such as partnerships with public health agencies, schools and community organization. The Bristol Tennessee/Virginia Urban Area Metropolitan Planning Organization has identified several areas to support the link between public health and transportation planning.

- Promote planning and funding opportunities for <u>active transportation</u> that encourages walking or bicycling.
- Develop <u>partnerships</u> with local organizations with a health-related mission.
- <u>Education and awareness</u> that transportation programs and projects that provide public health benefits can also support other MPO goals such as safety, environmental sustainability and mobility options.

State Pedestrian/Bicycle Policy. Based on the Federal Highway Administration's policy statement that calls for bicycle and pedestrian facilities on all new roadways, both the Tennessee and Virginia Departments have developed policies for integrating bicycle and pedestrian accommodations. The state policy documents provide procedures for incorporating bicycle and pedestrian accommodations in the construction, reconstruction, operation and maintenance of the state's transportation network. An accommodation is defined as any facility, design feature, operations change, or maintenance activity that improves the environment in which bicyclists and pedestrians travel. Examples of such accommodations include the provisions of bicycle lanes, sidewalks, signage, and the addition of paved shoulders. Exceptions to the policies include facilities where bicyclists and pedestrians are prohibited by

law, where safety would be compromised, where cost for bicycle and pedestrian facilities is excessively disproportionate to the need and probable use (costs associated with ADA requirement is not an exception), or where there is a demonstrated lack of need due to low population density.

Local Pedestrian/Bicycle Planning. The comprehensive plans for both Sullivan County, Tennessee and Washington County, Virginia include policy level recommendations for bicycle and pedestrian facilities. Given the relatively low density of county land use patterns, most pedestrian specific projects include trail systems such as the Virginia Creeper Trail, Overmountain Victory Trail, and Appalachian Trail.

The City of Bristol, Tennessee completed the City's *Bicycle and Pedestrian Plan* in 2009 to identify a potential network of facilities within the community. The primary focus of the plan was to establish a comprehensive city-wide network of routes that would connect various land uses and landmarks of interests. The City is currently in the process of developing a greenways master plan; however, this plan is in the initial phase of development.

The Town of Abingdon completed the 2002 *Pedestrian Safety and Movement Study* to improve pedestrian continuity, control vehicular patterns, and decrease conflicts between pedestrians and motorist in the downtown area. In addition, the Comprehensive Plan for Abingdon includes a recommended trails and greenway system that was identified in the *Abingdon Open Space, Parks, and Greenways Plan*.

The *Overmountain Victory National Historic Trail Plan* for Sullivan County proposes development of 22 miles of trail within the county as part of the National Trails system administered by the National Park Service. To be certified, the trail location must be within one-half mile of either side of the actual historic route of the Overmountain Victory Trail. A Master Plan for the OVT from Abingdon, Virginia to Sycamore Shoals (Elizabethton, Tennessee) is currently being considered by the Nation Park Service in partnership with local jurisdictions along the route.

The *Beaches to Bluegrass Trail Master Plan* was jointly developed by VDOT and the Virginia Department of Conservation and Recreation. The plan recommends a trail corridor from Virginia Beach to the Cumberland Gap and identifies existing trails, planned trails, and gap sections. As proposed the trail traverses the MPO's Metropolitan Planning Area.

Objectives of local MPO jurisdictions comprehensive plans should be followed as much as possible as many call for improved pedestrian facilities. Although local community plans address needs for bicycle and pedestrian facilities, currently no local subdivision regulations require the development of pedestrian facilities for new residential or commercial construction.

EXISTING CONDITIONS

Sidewalks. All of the incorporated cities/towns in the Bristol planning area (both Bristols and Abingdon) contain sidewalks in parts of the central cities, as well as in the unincorporated community of Blountville. For the most part, sidewalks are confined to the central business district, older residential districts, and near schools. Beyond these areas, sidewalks are sparse and generally lack connectivity. Within Sullivan and Washington counties, sidewalks are limited to specific areas such as schools, courthouses, and public buildings.

Pedestrian Signals. Pedestrian signals are an important consideration in urban areas to provide guidance regarding the permitted signal interval to cross a street and to prohibit pedestrian crossings when conflicting traffic may impact pedestrian safety. Major trends that influence the use of pedestrian signals include the aging population, the desire to make communities more livable and walkable, and the number of pedestrian injuries or fatalities.

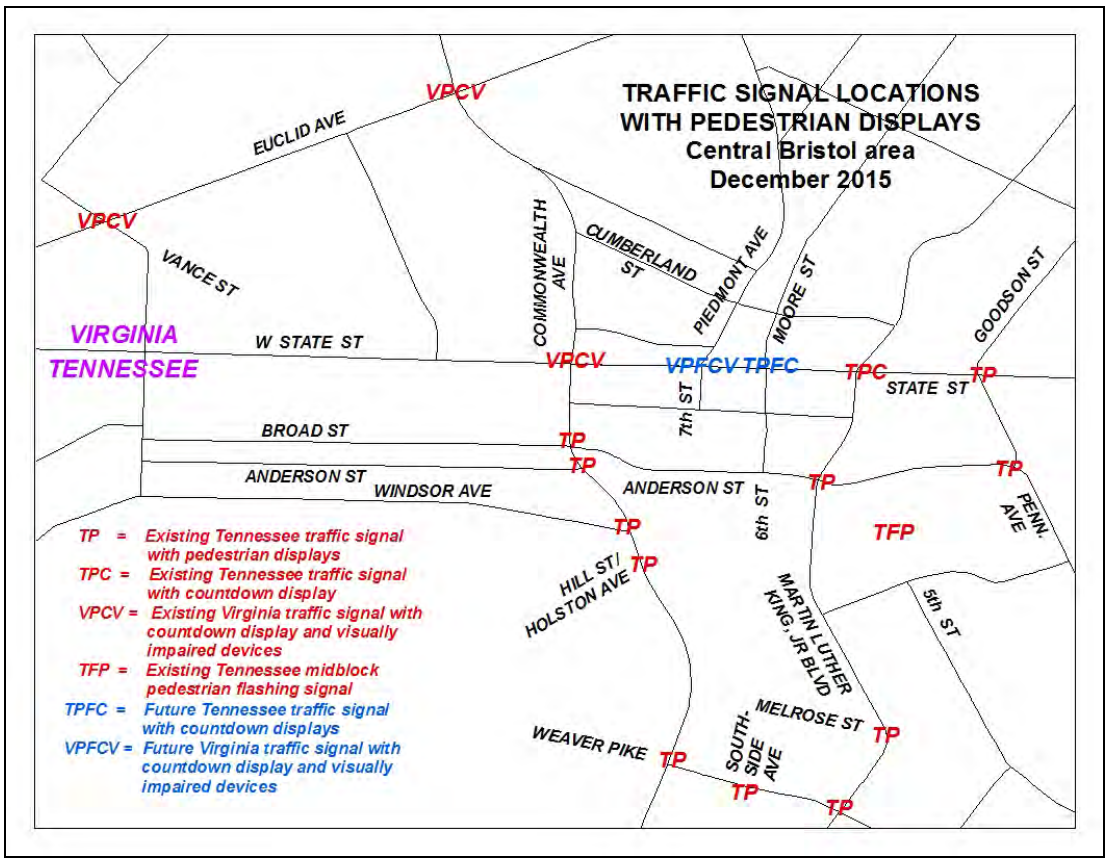
Twenty pedestrian signals are located within the Metropolitan Planning Area which are concentrated in the cities of Bristol Tennessee and Bristol, Virginia (Map 7-6) as well as the Town of Abingdon, Virginia (Map 7-7). Only two of these signals feature LEDs and countdown displays that meet the latest MUTCD standards; however, plans are on-going to upgrade other locations to meet the current MUTCD standard including two pedestrian signals which are in the design phase for Bristol, Virginia

Bicycle Routes and Greenways. There are several dedicated bicycle/walking trails in the Bristol Study Area. The first ones in place were within the Sugar Hollow and Steele Creek Parks in Virginia and Tennessee, respectively. The Virginia Creeper Trail was completed in 1984 and represents a premier 34 mile hiking and mountain biking trails beginning in Abingdon Virginia, and ultimately ending near the North Carolina State Line. The City of Bristol, Tennessee has installed the Wes Davis Greenway between Anderson Street and Melrose Street along the ex-Virginia and Southwestern Railway right-of-way, and the Mark Vance Memorial Greenway bicycle/walking trail connecting the Wes Davis Greenway and downtown area to Steele Creek Park in western Bristol. Bristol, Virginia has several blocks of an urban trail in downtown along Beaver Creek, which is the first phase of a citywide trail system designated in the City's comprehensive plan. In addition Abingdon, Virginia has two certified sections of the Overmountain Victory Trail consisting of 0.75 trail miles at the Historic Muster Grounds and the 1.0 mile Wolf Creek Trail.

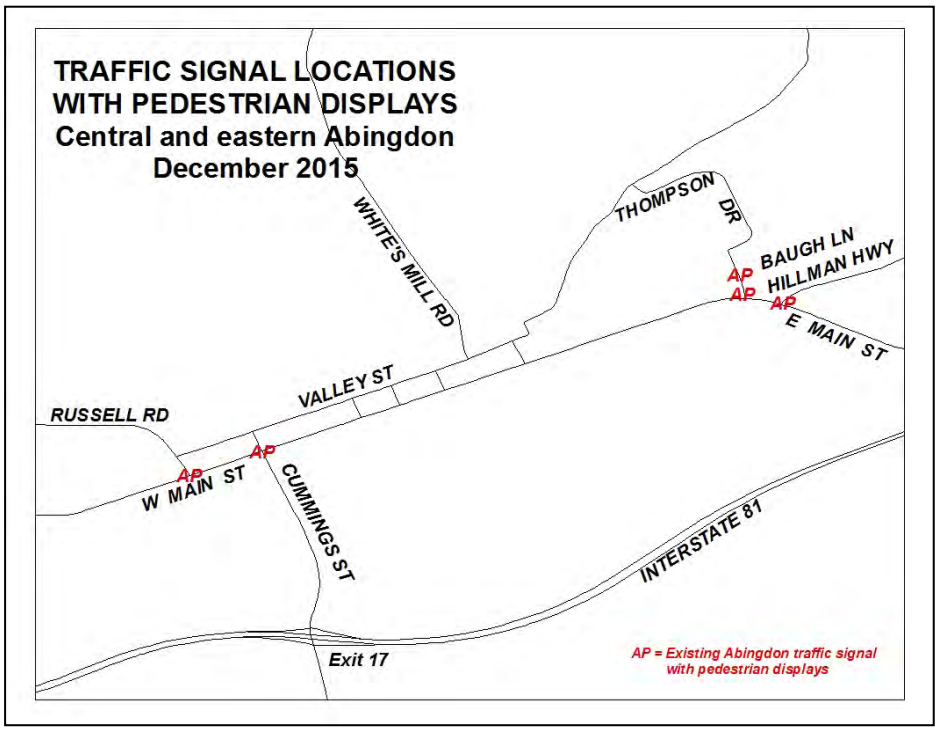
Bristol, Tennessee has bicycle route signage installed for those routes identified in the 2009 Bicycle and Pedestrian Plan for which no additional pavement construction was necessary. Likewise, Tennessee and Virginia both have State designated bicycle routes along major roadways, but these also take the form of signage and pavement markings along routes rather than separate facilities.

PROGRAMMED AND PLANNED PROJECTS

One of the goals of the MPO is promote livable communities to improve the quality of life in the Bristol metropolitan area by providing safe pedestrian and bicycling facilities as alternative forms of transportation. This will benefit our communities, commerce, tourism and the general public by promoting physical fitness and energy conservation. To assist in achieving this goal, the MPO encourages the incorporation of pedestrian and bicycle facilities and accommodations during reconstruction and/or new construction, based on current state policy.


TRAFFIC SIGNAL LOCATIONS
WITH PEDESTRIAN DISPLAYS
Central Bristol area
December 2015
EUCLID AVE
VPCV
VPCV
VANCE ST
VIRGINIA
TENNESSEE
W STATE ST
COMMONWEALTH AVE
CUMBERLAND ST
PIEDMONT AVE
MOORE ST
GOODSON ST
VPCV
VPFCV TPFC
TPC
TP
STATE ST
7th ST
BROAD ST
TP
TP
ANDERSON ST
WINDSOR AVE
ANDERSON ST
TP
TP
PENN. AVE
6th ST
TP
TFP
HILL ST/ HOLSTON AVE
TP
MARTIN LUTHER KING, JR BLVD
5th ST
MELROSE ST
TP
WEAVER PIKE
TP
SOUTH-SIDE AVE
TP
TP
TP = Existing Tennessee traffic signal with pedestrian displays
TPC = Existing Tennessee traffic signal with countdown display
VPCV = Existing Virginia traffic signal with countdown display and visually impaired devices
TFP = Existing Tennessee midblock pedestrian flashing signal
TPFC = Future Tennessee traffic signal with countdown displays
VPFCV = Future Virginia traffic signal with countdown display and visually impaired devices

Map 7-6


TRAFFIC SIGNAL LOCATIONS
WITH PEDESTRIAN DISPLAYS
Central and eastern Abingdon
December 2015
WHITE'S MILL RD
THOMPSON DR
AP
AP
BAUGH LN
HILLMAN HWY
AP
E MAIN ST
VALLEY ST
RUSSELL RD
AP
AP
W MAIN ST
CUMMINGS ST
INTERSTATE 81
Exit 17
AP = Existing Abingdon traffic signal with pedestrian displays

Map 7-7

Both Bristol, Virginia, and Bristol, Tennessee, and the Town of Abingdon, Virginia plan to continue their current program of sidewalk repair, sidewalk reconstruction and expansion, and upgrades to pedestrian traffic signal displays. New roads should be constructed with adequate pedestrian facilities and proposed development plans should be reviewed to encourage sidewalks and pedestrian facilities. Landscaping standards should be consistent with local government policies and adequate sight distance should be maintained for pedestrian safety. All sidewalks must comply with federal, state and local laws concerning accessibility by persons with a disability. In addition to sidewalk maintenance, local community trails should receive routine maintenance to keep them clear and safe for pedestrian use.

As a follow-up to the last long-range transportation plan, several pedestrian projects have recently been completed. These include the pedestrian improvements along Highway 11E adjacent Bristol Motor Speedway; the Safe Routes to School sidewalk construction in the Bristol, Tennessee Fairmount neighborhood; the pedestrian safety improvement at the Barter Theatre in Abingdon, Virginia; the Solar Hill Historic District sidewalk reconstruction in Bristol, Virginia; and the recent pedestrian traffic signal pushbuttons and displays, and sidewalk construction at various locations within the City.

The following projects to improve bicycling and pedestrian conditions have been envisioned but are not yet funded.

- A proposed network of bicycle/pedestrian routes for the City of Bristol, Virginia. This would include sections along the railroad, connections to Sugar Hollow Park and the industrial areas in northeastern Bristol and the downtown area, and connections to the Bristol, Tennessee bicycle/pedestrian network discussed below.
- Proposed additional bicycle/pedestrian routes to enhance the existing network of routes in Bristol, Tennessee. Such extensions of the system include routes eastward to connect to Holston View School and the Bristol Country Club, a route near the regional medical center at Exit 74, and sidewalks along Bluff City Highway and sections of Virginia Avenue. Several of these routes will not be constructed until shoulder widening takes place on several selected thoroughfares.
- In Blountville, Tennessee, sidewalk construction and pedestrian enhancements are proposed along SR 126 (also known as The Great Stage Road) in the Blountville Historic District as well as Franklin Drive to connect residential areas to the schools.
- In Abingdon, Virginia bike lanes and sidewalks are recommended connecting the Farmers Market to the Veterans Memorial Park, Depot Square to the William King Regional Arts Center, and Dubose-Foster Fields with Sinking Creek Cemetery, and designated connections to schools.
- Part of the four-state Overmountain Victory National Historic Trail passes through eastern Sullivan County, Tennessee just east of the current Bristol corporate limits, and the Holston Valley area of Washington County, Virginia to its northern terminus in Abingdon. As designated by the National Park Service, one of the goals is to see the construction of the trail along its original historic path. In Sullivan County the Patriots Trail would be a branch of the Overmountain Victory Trail and is located between Bluff City and Sullivan East High School along Pleasant Grove Road.
- In Sullivan County, Tennessee, a greenway is proposed along Reedy Creek from the existing Kingsport Greenbelt to the Exit 74 area of Bristol, Tennessee and ultimately to Steele Creek Park. This regional trail is currently conceptual in design and alignment.