Virginia's continued investment in its transportation system is vital to the safe and efficient movement of people and goods and to the entire Commonwealth's economic well-being. Every element of Virginia's economy relies on the transportation system in order to function and thrive. Today, decision-makers face unprecedented challenges in funding the operation, upkeep, and expansion of the transportation system. As demonstrated in Chapters 2 and 3, the forecast growth in population and employment combined with the current state of the transportation network and VTrans2035 vision, sets the stage for the development of a range of transportation improvement recommendations. Virginians want a quality transportation system that provides a good quality of life and economic prosperity. Fundamentally, it must be safe, reliable, and seamless. Progressively, it will use state-of-the-practice technology to increase public communication, safety and effectiveness across all transportation modes.[23]

To achieve these goals, and the goals of VTrans2035, Virginia must be proactive by identifying innovative, forward-thinking solutions for the future of transportation throughout the Commonwealth. This chapter includes an overview of the methodologies used in developing the recommendations for each of the modal elements.

Chapter 4: Developing the Recommendations

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PUBLIC TRANSPORTATION

Recommendations for the public transportation element are compiled from several different planning documents from DRPT:

- Statewide Public Transportation Plan Capacity Expansion Report
- Statewide Public Transportation Plan Corridors of Statewide Significance Report
- DRPT Statewide Intelligent Transportation Systems Strategic Plan
- Transportation Demand Management Plans
- Statewide Human Service Transportation Plan

All of these documents can be found on DRPT's website at www.drpt. virginia.gov.

DRPT staff obtained review comments from transit agencies, TDM agencies and PDCs pertaining to the recommendations from these plans. DRPT, in collaboration with VDOT, presented the transit, TDM, ITS and human services transportation recommendations to the MPOs and other stakeholders via a webinar in June, 2009. Members of the public provided feedback on the recommendations through a series of public meetings, held in various locations throughout Virginia in coordination with the VTrans2035 public outreach effort.

CAPACITY EXPANSION

In order to keep up with the existing and anticipated future demand for public transportation, investment in expanding transit capacity will be necessary to manage urban congestion, provide a viable mobility option in small cities and suburbs, and provide transportation for those who cannot drive. The Statewide Public Transportation Plan's Capacity Expansion Report identifies areas and recommendations to keep up with existing and anticipated future transit demand based on:

- Population and employment growth
- Transit Development Plans
- Regional Transit Studies
- Metropolitan Planning Organizations Long Range Transportation Plans
- Planning District Commission Coordinated Human Service Transportation Plans

INTELLIGENT TRANSPORTATION SYSTEMS

ITS improvements encompass a wide range of advanced communications and electronic technologies to make transit systems more flexible, efficient and responsive to customer needs. Transit planners can use ITS-based information to identify emerging needs for service and fine-tune existing routes to run more smoothly and quickly. The ITS Strategic Plan presents a coordinated approach for ITS deployment across the state based on customer needs. Recommendations from the ITS Strategic Plan include technologies for transit operations, customer amenities, service planning, fare collection, security, and maintenance.

TRANSPORTATION DEMAND MANAGEMENT

TDM focuses on the provision of commuter services, strategies and policies aimed at reducing the tendency to drive alone. The successful implementation of these strategies results in a more efficient use of road space by fewer vehicles, a reduction in rush hour traffic by shifting some trips to off-peak hours, and the elimination of some trips altogether with teleworking.

HUMAN SERVICES TRANSPORTATION

Human services transportation fills critical mobility gaps for Virginia residents who live outside public transit service areas, need to access jobs or services outside public transit service hours, or need more personal or specialized services to travel. Human service agencies are specifically designed to

meet the mobility needs of older adults, people with disabilities and people with lower incomes.

The recommendations from the Statewide Human Services Transportation Plan are not specific to different regions in Virginia. Rather, the plan identifies an array of possible initiatives and a mobility management strategy, all of which are valid throughout Virginia, with actions at the state, regional and local levels.

Ultimately, the goals identified in VTrans2035 set the foundation for the future of transportation in Virginia. The recommendations for public transportation investments identified in the VSTP support the VTrans2035 goals (Table 6) to further the vision for Virginia's transportation system.

LAND USE

The Commonwealth recognizes the economic, environmental, health and social benefits of compact and walkable communities that support transit. It has also recognized the various costs of dispersed land use patterns, which support only very limited public transportation services and result in auto-dependent lifestyles. The rising cost of finite fossil fuel, congested roadways and longer commutes have contributed to growing demand for local community planning models that emphasize the link between compact, mixed-use, land development patterns and efficient transportation options. The success of local public transportation services depends on this link and DRPT has been playing an increasing role in promoting it through its various programs.

Table 6: Public Transit Investments Compared to VTrans2035 Goals

Public Transportation Investment	VTrans2035 Goals						
	Safety and Security	System Maintenance and Preservation	Mobility, Connectivity and Accessibility	Economic Vitality	Environmental Stewardship	Coordination of Transp. and Land Use	Program Delivery
State of Good Repair	X	X	X				
Meeting Future Demand (Capacity Expansion)			X	X	X	X	
Major Capital Projects		X	X	X		X	
Transportation Demand Management			X	X	X	X	
Intelligent Transportation Systems	X	X	X				X
Coordinated Human Services Transportation			X				X

- Land use considerations are an important component of DRPT's Transit Service Design Guidelines, adopted in November 2008. DRPT developed the guidelines to aid its procedures for evaluating applications for new transit service. The guidelines encourage local transit providers to consider factors such as household and employment density, station area characteristics, and development trends while planning their transit services. In accordance with the principles set forth by the guidelines, transit providers and local governments are increasingly coordinating their planning efforts.
- DRPT has invested in planning for transit-oriented development along with improvements in rail passenger service and stations in the I-95/I-64 rail corridor. Station area planning has been conducted in communities such as Ashland and Newport News. Although the focus of the project has been on intercity rail stations, these areas would serve as nodes for local mass transit networks. In the future, these rail stations and their surrounding communities may support new and expanded transit networks.
- DRPT has helped coordinate land use planning with local and regional transit planning initiatives. DRPT is working in cooperation with Hampton Roads Transit (HRT) and the Williamsburg Area Transit Authority (WATA) on Phase 2 of the regional Hampton Roads Transit Vision Plan, the first phase of which was completed in April 2009. Phase 2 will continue the planning process from Phase 1 by evaluating the transit corridor proposals, analyzing future land use patterns along the corridors given market expectations and making recommendations for policies or strategies to guide coordinated short and long-term transit and land use planning. In this manner, the Phase 2 study works closely with Hampton Roads local governments to strengthen the Phase 1 recommendations by tying them more closely to land use policies and development trends.

RAIL

Rail recommendations are sorted by VSTP Region and are organized into the following categories for each of the regional subsections. Recommendations are developed for 10 categories:

- Class I and Shortline Railroad Improvements, including the Norfolk Southern Heartland and CSX National Gateway Corridors
- Rail Improvements to Virginia Ports
- Passenger Rail Improvements for VRE and Amtrak
- Southeast High-Speed Rail

All recommended improvements address one or more of the following:

- Alleviating highway congestion, reducing energy demands and reducing pollutants by reducing passenger car and truck freight traffic
- Increasing freight capacity throughout the Commonwealth to support greater demand for freight rail shipping, growth in the coal industry and improved capacity at Virginia's ports
- Improving passenger rail by enhancing system performance and adding capacity
- Providing the foundation for a six-year funding plan, which supports the long-range vision for rail in Virginia through 2035

FREIGHT

Recommendations specific to freight rail are addressed under the rail recommendations. Trucking and other highway-related freight needs and recommendations are based on highway improvements and are included with the recommendations for the highway element sorted by VSTP Region. Freight recommendations were formulated by analyzing the multimodal interaction and movement of both truck and rail freight. Two basic strategies were employed to form recommendations - data analysis and public outreach. In particular:

- The Virginia State Model (VSM) was updated to consider freight mode choice effects by utilizing truck network and auto travel demand information as well as a freight rail network analysis. Analysis addressing the Virginia truck network, truck travel patterns, the national and Virginia freight rail network, and freight rail travel patterns allowed for the investigation of the interaction of truck and rail freight, as well as the possibility of diversions of freight from one mode to another.

- Benefit/cost analysis was also conducted to ensure a proper return on investment since the consideration of economic impacts was deemed vital to formulating the appropriate recommendations. The cost/benefit analysis included the estimation of direct transportation effects, such as travel times and system performance; estimation of monetary impacts, such as value of time savings, accident reduction and cost savings; estimation of economic impacts, such as jobs and income; and a capital and operation life-cycle cost analysis.

After draft findings and recommendations were formulated and analyzed, agency, public, and stakeholder outreach was utilized to finalize recommendations. Outreach efforts included regional public meetings to gain feedback from the general public and regional planning staff interested in freight activities. Also, various agencies and stakeholders were consulted. Example agencies and stakeholders include; state and federal transportation, economic development and environmental agencies; major county and city government staff members; Virginia's MPOs and PDCs; and various educational and research institutes.

BICYCLE AND PEDESTRIAN

The CTB adopted the Policy for Integrating Bicycle and Pedestrian Accommodations (hereafter called the Policy) in 2004. In order to further integrate the Policy in daily VDOT business practices, a three-tiered approach is being implemented. VDOT is first completing the State Bicycle Plan, which will be designed to improve the implementation of the bicycle element of the Policy. Subsequently, a State Pedestrian Plan and a State Bicycle and Pedestrian Policy Implementation plan will be completed. The recommendations from the State Bicycle Plan are not specific to any one region of the state, but focus on building and enhancing VDOT's bicycle policies across the Commonwealth.

The State Bicycle Plan will establish means to continue integrating the Policy, as it relates to bicycling. Additionally, it will establish means to enable VDOT to continue to serve in a coordinating role with other agencies and organizations throughout Virginia that are involved in promoting safe bicycling. The State Bike Plan provides the following guiding recommendations to enhance the implementation and integration of non-motorized modes of transportation throughout the state:

- Clarify policies with regard to bicycle accommodations
- Provide staff training and guidance to integrate the Policy requirements in projects and programs
- Improve outreach and coordination on bicycle issues
- Measure and evaluate progress

HIGHWAY

Development of highway recommendations for the SMS consists of five steps:

1. VDOT first performed a complete roadway inventory update for those routes on the SMS. This update included verifying the existing roadway geometry (number of lanes, presence of curb and gutter, presence of sidewalks, etc.) and operational characteristics (location of signals, speed limits, directionality, etc.), as well as updating available traffic data for the roadways.

2. Once the SMS roadway inventory was updated, VDOT analyzed the roadways for deficiencies in capacity and safety. Recommendations were developed to address safety issues at locations with high crash rates or high numbers of fatalities, as well as where congestion issues were identified.

3. The draft list of recommendations underwent a review by VDOT staff, as well as by MPOs and PDCs throughout the state, and comments and suggested changes were incorporated into the recommendations where applicable.

4. The recommendations then underwent an evaluation using information on infrastructure condition, which included deficient pavement and structures based on the following criteria:

   - Deficient pavement was defined using the Critical Condition Index or CCI which categorizes pavement condition into pavement index values. Based on this review, recommendations were grouped into five ranges corresponding to condition categories: excellent, good, fair, poor, and very poor. These categories in turn correspond to a likelihood of corrective action.
   - Deficient structures were defined using the National Bridge Inspection Standards. The condition of different parts of a bridge is rated on a scale of 0 to 9 (with 9 being "excellent" and zero being "failed"). A structurally deficient bridge is one for which the deck (riding surface), the superstructure (supports immediately beneath the driving surface) or the substructure (foundation and supporting posts and piers) is rated in condition 4 or less.

Steps in identifying deficiencies on the SMS network:
- Perform a level of service analysis based on methodology established by the Transportation Research Board's Highway Capacity Manual to identify capacity deficiencies for the plan years 2007 and 2035. Capacity deficiencies were defined as LOS D or worse for rural areas, and LOS E or worse for urban areas.
- Examine crash density along corridors and at intersections. Focused on locations that ranked in the top 25% of crash density.
- Review Constrained Long Range Plans (CLRP) as well as transit studies completed by Richmond, Fredericksburg and Hampton Roads MPOs for proposed park and ride lot locations. Incorporated recommendations into Surface Transportation Plan
- Identify opportunities for operational or low cost improvements where facilities were approaching capacity, using VDOT's STARS program.
- Review CLRPs and available regional bike/ped studies to identify bike/ped recommendations on the SMS network.
- Coordinate with VDOT Operations and Securities Division to identify locations appropriate for operational or ITS solutions.

5. Finally, each of the identified highway recommendations underwent an environmental review. The potential for each of the recommendations having environmental impacts was based on the number of potential environmental issues identified in this analysis. Environmental issues analyzed included:

   - Threatened and endangered species
   - Wetlands
   - Agricultural and forestal districts
   - Conservation districts
   - Virginia Outdoor Foundation easements
   - Historic properties

The final recommendations for the highway element also include:

Park and Ride: Park and Ride recommendations have been mapped for each of the regions and are included on each of the regional maps found in each subsection of Chapter 6. An independent Park and Ride study will be conducted in the near future to provide further detail for recommendations identified in the VSTP and develop new locations for potential Park and Ride facilities.

Recommended Improvements to Existing Highway Facilities: Major improvements (e.g. widening, realignment) are highlighted for some of the more regionally significant projects on the VSTP Summary Map. A complete listing of all road improvement recommendations is included within Chapter 6.

It is important to note that the highway recommendations represent a needs assessment of identified deficiencies on the Statewide Mobility System network as required by state legislation. § 33.1-23.03 of the Code of Virginia requires the state to "conduct a comprehensive review of statewide transportation needs in a Statewide Transportation Plan setting forth assessment of capacity needs for all corridors of development areas." While the highway recommendations do provide a suggested build solution to these deficiencies, there is no assumption that all projects identified will be constructed. There are insufficient funds to complete every recommended solution contained in the plan, and solutions must be prioritized and approved by the CTB, local jurisdictions, and MPOs in metropolitan areas before becoming projects. It is anticipated that the identification of these deficiencies will encourage all stakeholders involved to develop coordinated, innovative solutions beyond those provided herein.

Recommendations for Construction of New Roadways:
Recommended new roadways are included along with their typical section (number of lanes). Alignments depicted are for planning purposes only.

Other Recommended Highway Improvements: Other recommended highway improvements include spot improvements such as turn lanes, access management, pedestrian accommodations, pavement markings, interchange reconstruction, etc.

Intelligent Transportation Systems: ITS recommendations have been mapped for each. Potential ITS recommendations for the Commonwealth are comprised of the following:

- **Integrated Corridor Management (ICM):** Integrated Corridor Management is the coordination of individual network operations between parallel facilities that creates an interconnected system capable of cross network travel management. The key to managing corridors effectively is achieving integration among the operations of different networks in the corridor rather than focusing on the optimization of individual networks. A coordinated effort between networks along a corridor can effectively manage the total capacity of a corridor in a way that will result in reduced congestion and increased trip reliability.
- **Active Traffic Management (ATM):** This has been effectively used for years in Europe, and includes strategies such as queue warning, junction control, speed harmonization, hard shoulder usage, and dynamic re-routing. All of these strategies are focused on using real-time data from the road network to immediately adjust conditions so as to reduce incidents and use the existing capacity as effectively as possible.
- **Traveler Information:** Real-time information provided to travelers. Applications include electronic signs warning of accidents, congestion, or hazardous driving conditions.
- **Commercial Vehicle Operations (CVO):** CVO is an ITS application for freight trucks. Trucks are equipped with applications such as a navigation system, dashboard computer and digital communications equipment. CVO can improve monitoring, tracking, and timing of freight traffic.
- **Traffic Detection and Monitoring:** Traffic detection helps provide accurate, complete and timely traffic data, which is critical to the effective management of the transportation network. Examples of detection and monitoring devices include video surveillance, loop sensors and speed monitoring radars.

- **Shoulder as Travel Lane/Shoulder Lane Control Systems (SLCS):** Wide shoulders can be used as travel lanes by re-striping the facility and making some roadside improvements for safety reasons. This modification can potentially increase the facility's capacity.
- **High Occupancy Toll (HOT) Lanes:** HOT lanes are tolled lanes that operate alongside existing highway lanes to provide users with a faster and more reliable travel option. Buses, carpools (HOV-3), motorcycles and emergency vehicles will have free access to HOT lanes. Drivers with fewer than three occupants can choose to pay to access the lanes. Tolls for the HOT lanes will change according to traffic conditions to regulate demand for the lanes and keep them congestion free, even during peak hours.
- **Transit Signal Priority (TSP):** TSP uses an installed device on transit vehicles that sends optical or sonic pulses to communicate with traffic signals. Traffic signal priority is used to combat roadway congestion and increase the speed of on road transit options. Traffic signal receivers detect an approaching transit vehicle and can prolong green lights or decrease the cycle time of red lights, giving the transit vehicle priority.

RELATIONSHIP TO VTRANS2035 GOALS

The highway recommendations identified in each of the following regional subsections directly support the goals of VTrans2035. The relationship between individual recommendations and specific goals is identified in the recommendation tables and supporting narrative. Not all VTrans2035 goals are tied to specific recommended improvements. For the more programmatic VTrans2035 goals of Coordinating Transportation and Land Use, Program Delivery, and Environmental Stewardship, VDOT addresses compliance using a number of approaches:

Land Use
Improving the coordination between transportation and land-use planning is essential for ensuring mobility throughout the Commonwealth. VDOT is working with various stakeholders to develop regulations to improve the coordination between transportation and land use planning in Virginia. Through these regulations and requirements, VDOT strives to provide a balanced and efficient transportation system for citizens of the Commonwealth.

Traffic Impact Analysis Regulations: This regulation directs localities to submit a traffic impact analysis to VDOT for review and comment. The regulation applies to development proposals that would significantly impact the state transportation system, and impacts local government comprehensive plans/plan amendments and traffic impact analyses for certain rezoning applications, site plans, and subdivision plats.

Access Management Regulations and Standards: The main goal of access management is to preserve and improve the efficient operation of state highways through the control of access points. The 2007 General Assembly enacted legislation (Chapter 274) to require VDOT to implement the regulations and the design standards in phases according to a highway's functional classification.

Subdivision Street Acceptance Regulations: Recently, the number of streets being accepted into the system and the levels of congestion have increased while transportation funding has decreased, resulting in a situation where existing policy must be revisited.

Urban Development Areas: This regulation requires that high growth localities establish areas appropriate for high density growth. The urban development area must incorporate principles of new urbanism and traditional neighborhood development.

The most significant aspect of the revised regulation is that it introduces a change in public policy regarding the design and function a street must meet in order to be added to the state system. In essence, the regulation revises the public-private partnership between the Commonwealth and the development community.

Program Delivery

VDOT has maintained a quarterly report card since 2003 on performance on the core business outcomes of construction and maintenance contracts. Depicting contracts completed on time and on budget, it provides a snapshot of how well current projects are meeting their schedules and budgets. The public is able to see current performance via VDOT's public website that includes the "Dashboard." VDOT continues to set annual performance targets for construction, maintenance, safety, finance, and congestion.

Environmental Stewardship

Linking Planning and National Environmental Policy Act (NEPA):

Developing a better link between the transportation planning and environmental review processes for transportation projects has long been a goal of transportation agencies. Despite the fact that highway and public transportation projects must flow from metropolitan and statewide transportation plans, studies performed and decisions reached as part of transportation planning traditionally have not been used in conducting environmental analyses under NEPA.

Federal and state transportation agencies are now working to ensure that statewide and metropolitan transportation planning is the foundation for highway and transit project decisions. Performing a "planning level" environmental analysis on transportation projects identified in a long-range plan, such as the VSTP, is one tool used by professionals in linking Planning and NEPA. The results of this analysis are included in the listing of highway recommendations found in Chapter 6.