ANNUAL REPORT
On the Condition of and Investment Needed to Maintain and Operate the Existing Surface Transportation Infrastructure for FY 2013 and FY 2014

Pursuant to:

Chapters 36 and 152 of the

2011 Acts of Assembly of the Virginia General Assembly

Virginia Department of Transportation

1401 East Broad Street

Richmond, Virginia 23219

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Executive Summary

The Code of Virginia requires VDOT to report by November 30th of each year on the condition of and investment needed to maintain and operate the existing surface transportation infrastructure and the standards on which those needs are based and the priorities for the system.

This is the third report VDOT has completed following the change to the Code of Virginia in 2007. Seventy-five percent of the needs identified in the 2007 assessment and 79 percent in 2009 were based on actual or extrapolated asset inventories, unit cost of work, and repair decision trees that generate recommendations based on the physical condition of assets or frequency of work standards and expected service life of assets. For this assessment 93 percent of the needs reported are based on this approach. The remaining seven percent is based on expenditure information from previous fiscal years.

A well maintained and operated transportation network is critical to the economic vitality of our state and to the creation and retention of jobs for the citizens of Virginia. This report details the investments needed over the next biennium to ensure that network continues to be well maintained and operated.

VDOT classifies maintenance and operations as one of two categories: investment or service. Investments include work that impacts the physical condition of assets, including pavements, bridges, tunnels, guardrail, lights, pavement markings, signs, signals, and technology assets because these are considered to be of such critical safety and operational importance. Services include emergency and incident response activities and ordinary maintenance such as cleaning ditches, washing bridge decks, patching pot holes, and debris removal. Services also include services such as traffic operations, Safety Service Patrol, tunnel operations, ferry and moveable bridge services, safety studies, signal timing optimization, equipment management, and management and direction.

The needs document is not to be confused with a budget request. Determining all conditions and investments needed to maintain and operate the system is an assessment process. This document will be used to develop annual budget priorities and the budget recommendations that are approved by the Commonwealth Transportation Board (CTB), given financial constraints.

Priorities used in the development of the budget are set annually as the budget documents are prepared each spring for adoption by the CTB. The FY 2012 programmatic priorities adopted are as follows:

- Ensure services funding (including emergency response) is no less than FY 2011 level.
- Restore funding for Safety Service Patrols and rest areas to FY2009 levels to reduce congestion reduction and provide for the safety of the traveling public.

- Fund interstate and primary pavement investment at level estimated to achieve and maintain performance target of 82 percent;
- Increase funds for the secondary system pavements.
- Fund bridge maintenance needs to support the attainment of the bridge sufficiency target.
- Close the gap between needs and budget for tunnel investment.
- Maintain safety features such as pavement markings and other safety assets.
- Use the data from the latest asset management needs assessment to insure each district receives its share of budget based on asset inventory condition targets and these priorities.

Some significant differences in this assessment compared to the last one are:

- The pavement analysis takes into account the contribution of ongoing and scheduled work in both the maintenance and construction programs that will be completed through FY 2012. For example, the American Recovery and Reinvestment Act (ARRA) of more than $100 million in pavement reconstruction projects directly contribute to improving pavements and help to reduce pavement needs in the future. The pavement needs analysis takes this work into account by assuming those pavement sections are in the condition they will be after the project is completed.
- Funds required to reconstruct enough structurally deficient bridges to meet the performance target (92 percent of bridge in non-structurally deficient condition) have been assessed and are reported for the first time.
- Funds required to meet bridge replacement and pavement reconstruction needs are included in the summary tables and also broken out to show the amount that should be funded in the Six-Year Improvement Program (SYIP), separately from the Maintenance and Operations Program.
- Major pavement and bridge projects that are in the SYIP and scheduled for the FY 2013-2014 biennium are shown. They contribute to meeting the pavement and bridge performance goals but are not sufficient to meet all pavement reconstruction and bridge replacement needs.
- For the first time, a statewide performance target for secondary road pavements to be at a 65% sufficiency is recommended to be set to be achieved by 2013. This target is the basis for secondary system pavement investment needs identified in this report.
- Planned preventative maintenance needs for bridges and large culverts have been modeled for the first time. Previously those needs were based on historic expenditures.

- Due to the significant snow storms in 2010 and 2011, record amounts of spending occurred for snow related emergencies that required funds to be diverted from other identified maintenance work scheduled in those years.

- Mowing, Safety Service Patrol, and rest areas needs indentified reflect a return to service levels that existed before the last assessment.

The key findings for the biennium needs are as follows:

- For the FY 2013-2014 biennium, total maintenance and operations needs, exclusive of major reconstruction of pavements and bridges which should be considered in the SYIP, are $3,795.7 million, as shown in Table ES- 1. In terms of real (FY 2013) dollars, this is a one percent decrease compared to the 2009 assessment.

- Pavement and bridge reconstruction needs total $1,093.4 million ($177 million for pavement reconstruction and $916.4 million for bridge replacement) for the biennium. When these needs are included, the total maintenance and reconstruction needs for the biennium are $4,889.1 million.

- Funding for the work needed to maintain and operate the existing system in FY 2013 and 2014, including major reconstruction of pavements and bridges, comes from both the Highway Maintenance and Operations Program and the Six-Year Improvement Program. Approximately $302 million in pavement projects and $469 million in bridge replacement and rehabilitation projects in the SYIP are scheduled to be completed during the FY 2013-2014 biennium. Although each of these projects is not necessarily designed to address specific pavement and bridge deficiencies (the sum of funding on these projects in the SYIP does not offset an equivalent amount of maintenance and operations need), they will contribute to reaching the performance targets for bridges and pavements.

- The Six-Year Maintenance and Operations Plan allocates $1,440 million in FY 2013 and $1,496 million in FY 2014. This is $467 million (in FY 2013) and $393 million (in FY2014) less than the $1,907 million and $1,889 million needed (once pavement and bridge reconstruction is removed from the needs) to meet performance targets and deliver services.

- The next pavement condition assessment (scheduled for early 2012) is expected to show that interstate pavement will have reached the target of 82 percent in fair or better condition as a result of work completed during the 2011 paving season. With ongoing and future paving work scheduled to be complete by the end of 2012, the condition assessment scheduled for early 2013 is expected to show that 82 percent of primary system pavements are in fair or better condition. Secondary pavements are currently at 64.2 percent sufficiency and the needs are set at 65% sufficiency statewide.

- The recently acquired pavement management system, which is used to model pavement performance and generate treatment recommendations, is generating substantial

benefits. Over time, applying the right treatment at the right time reduces the rate of pavement deterioration and reduces the future cost of maintaining performance targets. The improvements in pavements over the last two cycles are showing good results.

- The assessment used a target of 92 percent of bridges and large culverts not structurally deficient. Current conditions are 91.7 percent. An assessment of ongoing work scheduled to be completed by the end of FY 2012 indicates bridges should reach the performance target of 92 percent not structurally deficient by the end of FY 2012. The extent to which bridge replacement projects are identified and funded in the SYIP will determine whether VDOT is able to maintain this target.

- Tunnel investment needs are $56.2 million for FY 2013 and 2014, which include critical replacement projects addressing major risk areas such as fire safety, accident mitigation, systems, structural, and severe weather areas. VDOT is transferring responsibility for the maintenance and operation of the Elizabeth River Tunnels in Hampton Roads to the Elizabeth River Consortium in FY 2013. Thus, tunnel needs were reduced to take this transfer of responsibility into account. However, the agreement requires VDOT to provide $9 million per year over the next five years toward the cost of the project. This $9 million per year is included in tunnel needs.

- Investment needs for traffic and safety assets, including signs, signals, guardrail, pavement marking, and lighting total $561.7 million for the biennium.

- Investment needs for transportation technology, which includes maintenance and replacement needs for traffic sensors, cameras, TOC operating systems, overhead and portable message boards, total $73.1 million

- Funds needed to provide emergency and incident management services total $437.4 million. Emergency response for snow and Ice response is 314.8 million. This includes Safety Service Patrol, incident response, TOC operations, snow and ice removal, and management of technology assets.

- Funds needed to provide roadway services, including pot hole patching, bridge deck cleaning, tunnel tile cleaning, and other ordinary maintenance, total $390.7 million,

- Funds needed to provide roadside services, including drainage management, vegetation management, and sound barrier management total $356.4 million

- Funds needed to provide traffic and safety services, including guardrail, signal, sign, lighting, and pavement marking management, as well as traffic engineering services total $212.9 million.

- Funds needed to provide facility and other services, including equipment management, ferry management, rest area and wayside management, sidewalk and trail management, permitting, and management and direction total $416.0 million.

- Maintenance payments to localities for FY 2011 totaled $338.8 million. In FY 2012, the total allocation for these payments is $352.3 million. The assessment conducted for this report does not include needs for locally maintained roads.

Table ES- 1 FY 2013 and 2014 Needs by Category and Service Area (Millions)

Investment		FY 13-14 M&O Needs	FY 13-14 SYIP Funds Needed for Pavement & Bridge Reconstruction	FY 13-14 Six-Year M & O Program Budget	Pavement & Bridge Replacement/ Rehabilitation Projects in the FY 13-14 SYIP
Road Surface	Interstate	$132.2	$86.1		
	Primary	403.4	90.9		
	Secondary	431.6	0.0		
	Sub-Total	**$967.2**	**$177.0**		**$301.6**
Bridges	Interstate	116.1	344.4		
	Primary	134.8	355.6		
	Secondary	73.2	216.4		
	Sub-Total	**$324.1**	**$916.4**		**$468.9**
Tunnels		56.2	0.0		
Traffic and Safety		561.7	0.0		
Emergency and Incident Management		73.1	0.0		
	Investment Total	**$1,982.3**	**$1,093.4**		**$770.5**
Services					
Facility and Other		416.0	0.0		
Roadway		390.7	0.0		
Roadside		356.4	0.0		
Emergency and Incident Management		437.4	0.0		
Traffic and Safety		212.9	0.0		
	Services Total	**$1,813.4**	**$0.0**		
	Grand Total	**$3,795.7**	**$1,093.4**	**$2,936.0**	**$770.5**

Totals may not match sum of parts due to rounding.

In summary, this report on the biennial needs of the condition and investment to maintain and operate the existing surface transportation infrastructure for FY 2013 and 2014 is $3,795.7. In real dollar terms, the assessment for the upcoming biennium is lower than the previous assessment by one percent. The improving conditions for Interstate and Primary pavements demonstrate that the asset management approach to maintenance is having a positive effect on pavement conditions. Both Interstate and Primary pavements are expected to reach their targets or stay at their 82% sufficiency rate over the upcoming biennium. The needs for critical emergency response to weather conditions such as snow and ice and to incident clearance continue to be priorities as a part of VDOT's public safety mission. The report also identifies funding needed for the complex industrial facilities in our tunnels to keep them safe and secure, to maintain and improve key safety and traffic management assets, and to provide improved traffic information to assist motorist in congested areas.

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Report On the Condition of and Investment Needed to Maintain and Operate the Existing Surface Transportation Infrastructure for FY 2013 and FY 2014

Overview

The report covers Code of Virginia statutory requirements, trends and factors affecting maintenance and operations, biennial asset investment needs, biennial maintenance and operations service needs, and local performance ratings. The report is based on the latest information available on asset inventory, condition, and methods used to assess needs. Subsequent report sections present information related to the Highway Maintenance and Operations Fund (HMOF), Transportation Trust Fund (Construction Fund) and the crossover of funds from the Construction Fund to the HMOF that has been occurring since 2002. Also included is a section of the performance of locally maintained roads and bridges.

The appendices provide specific language from the *Code of Virginia* pertaining to the statutory requirements for this report, details of models used to assess signals and technology assets, and the specific assessment of each asset investment and services category.

Statutory Requirements

Prior to 2011, VDOT was required to submit a report by September 30th of each odd numbered year on the condition of and investment needed to maintain and operate the existing surface transportation infrastructure over the upcoming biennium. Changes to the Code of Virginia now require the Virginia Department of Transportation (VDOT) to:

Section 33.1-13.03 of the *Code of Virginia* requires VDOT to report by November 30 of each year on the condition of and needs for maintaining and operating the existing surface transportation infrastructure based on an asset management methodology.

Section 33.1-41.1 of the *Code of Virginia* pertains to payments to localities, and includes requirements for reporting expenditures of funds received as well as performance on local roads.

Section 33.1-23.02 of the *Code of Virginia* addresses the definition of maintenance, operations, and asset management; as well as requirements to develop asset management practices in the operation and maintenance of the state system of highways. In addition, this section of the *Code* defines requirements for VDOT to report its performance targets and outcomes for the upcoming biennium by June 30 of even numbered years, and to report on the Department's actual performance for the preceding biennium no later than September 30 of even numbered years. The legislation also requires VDOT to advise the Commonwealth Transportation Board (CTB) as to the methodology used to determine its maintenance needs.

The full text of referenced sections of the *Code of Virginia* is shown in appendix A.

This report is the third legislative needs report since 2007 and the sixth needs analysis that has impacted VDOT's maintenance and operations budget. While the frequency of reporting has increased, the report continues to provide a two year (biennial) view of maintenance and operations needs for the existing surface transportation infrastructure. This annual report provides updates on the condition and performance of the VDOT maintained portion of the Commonwealth's transportation infrastructure, as well as new information on the condition of locally maintained roads and bridges.

Importance of the Transportation System in Virginia

With more than eight million people living and working in Virginia and millions more tourist and business travelers, the transportation system is critical to support all the travel needs of the public and to ensure a thriving economy that produces jobs for all Virginians. A safe, reliable, well maintained transportation system supports the Commonwealth's commerce, and its communities and citizens. The surface transportation system has a direct impact on the health and vitality of the state's economy and quality of life. Additionally, a well maintained and operated transportation system ensures safe travel conditions, decreases wear and tear on vehicles, and reduces travel delay.

Virginia's strategic location on the Mid-Atlantic Coast and its investment in transportation facilities are important factors that have helped Virginia to be recognized as "The Best State for Business" by many organizations over the last several years, including Forbes and CNBC.

Centrally located on the U.S. East Coast, our integrated transportation system of highways, railroads, airports and seaports ensures that Virginia businesses can reach all their markets, world-wide. Agriculture, banking, tourism and technology are just a few of the many business sectors that rely on transportation. In 2010, the tourism industry in Virginia generated $18.9 billion in revenue, providing $1.3 billion in state and local taxes and supporting more than 200,000 jobs.

With over 57,900 centerline miles of highways Virginia owns the third largest system behind Texas and North Carolina. VDOT maintains more than 126,000 lane miles of road, including six major interstate routes: I-95, I-85, I-81, I-77, I-66 and I-64.

A roadway network is the vital system that links all the other modes together to support commerce and communities of all kinds. Below are just a few of the other modal facilities that rely on good roads:

- There are 11 commercial airports serving Virginia, including two of the nation's busiest: Washington Dulles International and Ronald Reagan Washington National Airports.
- The Port of Virginia offers one of the largest intermodal networks on the East Coast, handling 1.895 million Twenty-Foot Equivalent Units in 2010, and moving more than 28 percent of its total business by rail. Due to natural harbor depth and Suez-class cranes, the Port of Virginia is the only East Coast location capable of handling post-Panamax vessels as first port of call.
- Two of the nation's largest railroads operate in Virginia: CSX Corporation and Norfolk Southern Corporation, which is headquartered in Norfolk.
- The Virginia Inland Port in Front Royal serves as an intermodal collection point for containers from West Virginia, Ohio, Pennsylvania, Northern Virginia and elsewhere.

- The Port of Richmond is a multi-modal freight and distribution center located on the James River, adjacent to I-95, offering monthly service to Canada, Iceland, the Mediterranean, South America, Mexico and the Caribbean.
- Virginia offers six foreign trade zones designed to encourage businesses to participate in international trade by effectively eliminating or reducing customs duties. Also, numerous subzones are provided and additional ones can be designated to enhance the trade capabilities of specific companies.
- Sixty public transit operators, 54 human service operators and 18 commuter assistance agencies carry Virginians to work every day on the road network.
- Three of the 75 largest transit agencies in the country operate here. Metrorail is the nation's second most heavily-used rail transit system, with more than 700,000 average weekday passenger trips. The Virginia Railway Express commuter rail system is one of the fastest-growing commuter rail services in America.

CNBC has ranked Virginia America's 2011 Top State for Business. The review, in its fifth year, ranks states according to 10 broad categories, including the cost of doing business, the strength of the economy, the cost of living and business friendliness. Not only did the Commonwealth win the highest ranking this year, but Virginia also received the highest point total in the history of the rankings, finishing in the top-half of every category ranked. One of these categories is infrastructure and transportation. This was the fourth highest rating Virginia received. Virginia was listed as the tenth best state in terms of infrastructure and transportation. Since the rankings began, Virginia has remained a top state, claiming the number one spot in both 2007 and 2009, while receiving second in 2008 and 2010.

Virginia also continued to receive recognition as a leading state in the Forbes.com Best State for Business review. The review examines multiple objective measurements, including business cost, regulatory climate, quality of the workforce, and economic growth. Virginia took the top spot in 2006, 2007, 2008, and 2009 and ranked second overall in 2010. Once again, the connection between a well-maintained and operated transportation network is an underlying asset that helps contribute to the strong business climate in Virginia, helps to keep jobs in Virginia and attracts the creation of new jobs.

Trends and Key Factors Affecting Maintenance and Operations Work Activities

This section discusses the trends and key factors affecting maintenance and operations work activities, including growth of the VDOT maintained network; growth in highway system usage; economic issues; and emerging issues in technology, policy, and VDOT's customer profile.

System Growth

As of 2010, the most recent year for which data is available, the VDOT maintained network contained 58,252 centerline miles or 126,530 lane miles of interstate, primary, secondary, and frontage roads, making it the third largest state maintained highway system in the country. Figure 1 and Table 1 show annual growth and rates of growth of the VDOT maintained network over the last 35 years. The size of the network has grown each year over this period, although areas of greatest growth have shifted from the interstate system, which saw tremendous growth in the 1970s and 1980s, to the primary and secondary systems which continue to increase in size. Overall, the network has grown more than 14 percent in the last 35 years.

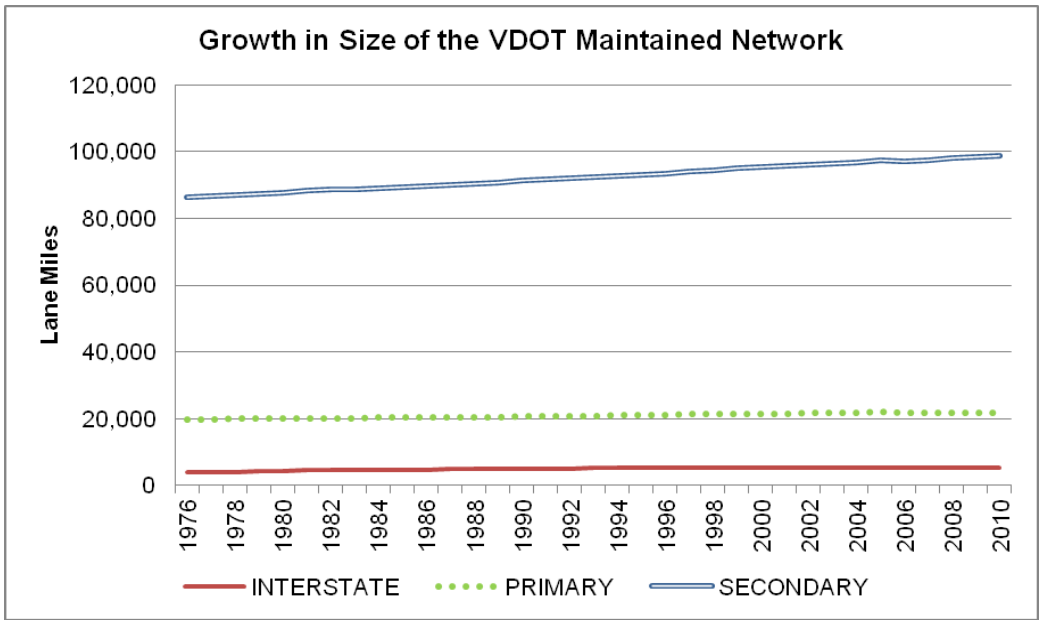


Figure 1 VDOT Maintained Lane Miles from 1975 to 2010

Table 1 VDOT Maintained Network Lane Mileage from 1975 to 2010

	Interstate	% Change	Primary	% Change	Secondary & Frontage	% Change	Total	% Change
Lane Miles 1975	3,763		19,726		86,688		110,177	
Lane Miles Added and Percent Change								
1975-1985	923	24.5%	567	2.9%	3,361	3.9%	4,850	4.4%
1985-1995	500	13.3%	848	4.3%	3,818	4.4%	5,166	4.7%
1995-2005	189	5.0%	814	4.1%	4,378	5.1%	5,381	4.9%
2005-2010	25	0.7%	-281	-1.4%	1211	1.4%	956	0.9%
1975-2010	1,637	43.5%	1,948	9.9%	12,768	14.7%	16,353	14.8%
2010	5,400		21,674		99,456		126,530	

While the overall rate of growth of the VDOT maintained network has decreased in recent years, the network continues to grow by approximately 200 lane miles per year, even after accounting for the transfer of responsibility for maintenance to localities as part of the Suffolk City devolution, the effects of which can be seen in 2006 in Figure 2. The network's growth is largely due to secondary subdivision lane miles built by developers being added to the system.

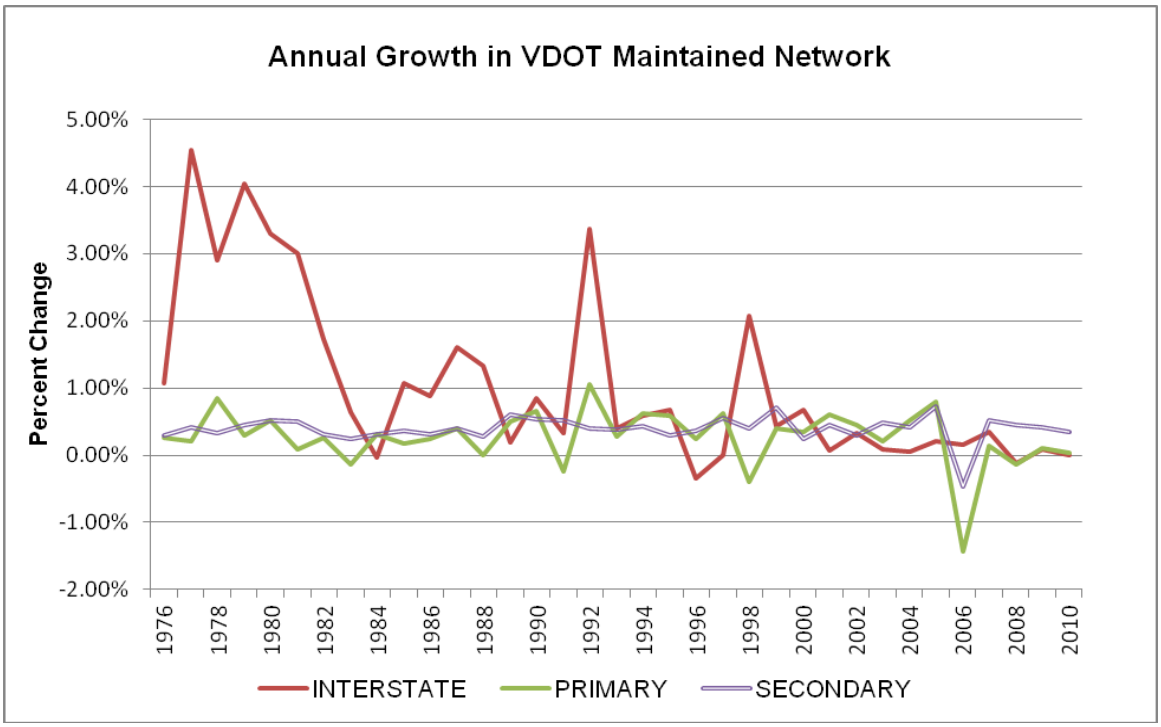


Figure 2 Annual Percent Change in Size of VDOT Maintained Network by System

Growth in System Usage

The rate of increase in usage of the system has far outpaced the size of the system. Figure 3 and Table 2 show statewide annual vehicle miles traveled (VMT) by system from 1960 to 2010. The data clearly show the most significant increase in VMT on the interstate system, corresponding to the initial construction and subsequent expansion of the interstate system. The primary system experienced the second greatest increase in VMT, followed by the secondary system, and lastly, the non-VDOT maintained system which consists primarily of urban streets.

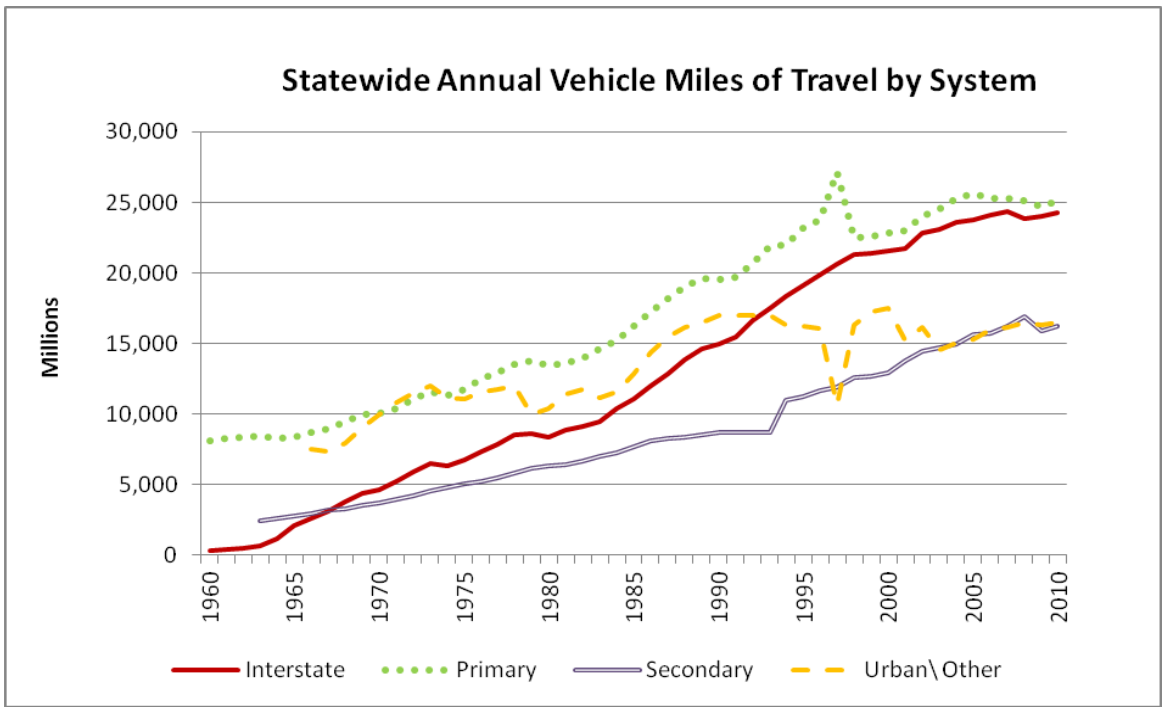


Figure 3 Annual Vehicle Miles of Travel by System

The data also show that in the last five to 10 years, while VMT continues to grow its increase has slowed dramatically. In fact, VMT on the interstate and primary systems decreased slightly between 2007 and 2008 by 2.2 percent and 0.9 percent respectively. The rate of growth in VMT on the secondary system is unchanged over the same 10 year period.

Table 2 Growth in Vehicle Miles of Travel Statewide by System

	All Systems Statewide		Total VDOT System		Interstate System		Primary System		Secondary System		Non-VDOT System	
	Change	% Change	Change	% Change	Change	% Change	Change	% Change	Change	% Change	Change	% Change
1960-1970	6,665	30.6%	9,992	118.1%	4,351	1310.5%	1,930	23.7%	1,242	48.1%	2,471	33.0%
1970-1980	10,113	35.6%	9,688	52.5%	3,695	78.9%	3,392	33.7%	2,601	70.1%	425	4.3%
1980-1990	21,646	56.2%	15,054	53.5%	6,568	78.4%	6,088	45.3%	2,398	38.0%	6,592	63.5%
1990-2000	14,623	24.3%	14,077	32.6%	6,598	44.2%	3,272	16.7%	4,207	48.3%	546	3.2%
2000-2010	7,349	9.8%	8,362	14.6%	2,717	12.6%	2,305	10.1%	3,341	25.9%	-1,014	-5.8%

Economic Trends

Patterns of change in highway utilization are highly correlated with changes in economic activity, as can be seen from Figure 4. Periods of economic growth tend to correspond to periods with increased VMT. Likewise, periods of decreased economic activity correspond with slower growth in VMT. As pavement and bridge deterioration rates are a function of VMT, especially truck traffic, in addition to weather and other factors, a reduction in VMT means pavements and bridges are not expected to deteriorate quite as rapidly as they would under higher traffic volume.

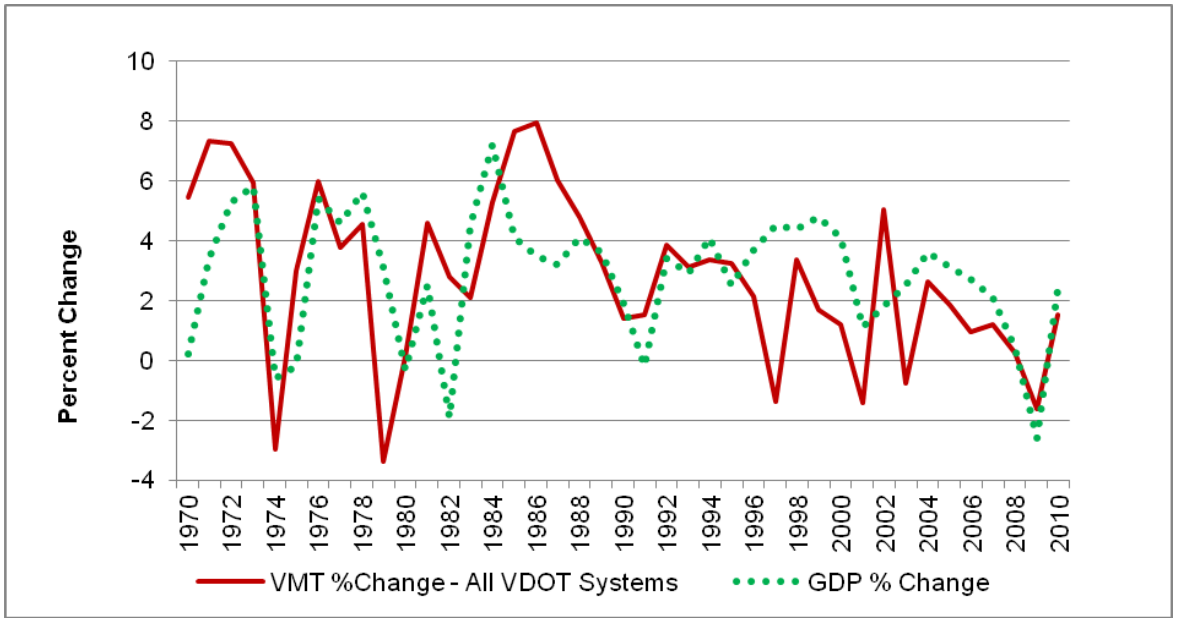


Figure 4 Relationship Between GDP and VMT

Trends in the Cost of Street and Highway Construction and Maintenance

One factor contributing to VDOT's ability to provide adequate funding for highway maintenance and operations is the reduction in the buying power as measured by changes in multiple highway construction price indices over the last several years as shown in Figure 5. Seven years ago, $10 million would have purchased 282 lane miles of pavement overlays; today, $10 million dollars purchases 157 lane miles of pavement overlays. (Note: the Bureau of Labor Statistics discontinued the Producer Price Index for Highway and Street Construction in 2010)

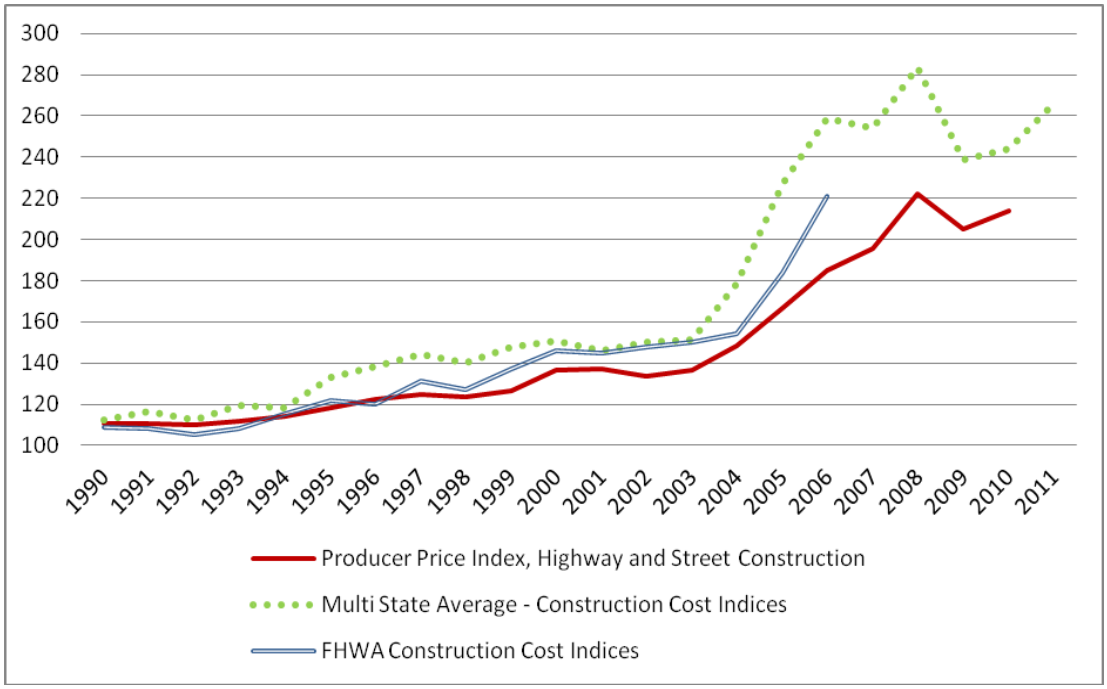


Figure 5 Comparison of Construction Price Indices

The rising cost of construction is also a contributing factor to the slowing rate of growth in the size of the state system of highways. Leading up to 2004, construction prices were rising at a rate of two to three percent each year. However from 2004 to 2008, highway construction costs began to rise dramatically, reaching 17 to 23 percent each year.

With the current instability of many sectors in the economy, construction price indices have dropped and fluctuated considerably since 2008, but the general trend seems to be up slightly again. The impact of price increases over the last decade is that each year the same amount of funding purchases less maintenance and construction than it did the year before.

Construction price indices are weighted heavily by asphalt, which is influenced by crude oil prices. Construction cost indices peaked in 2008, around the same time crude oil prices peaked just under $100 per barrel. From 2008 to 2009, crude oil prices plummeted to under $62 per barrel, but have rebounded to the $90 per barrel range in the fall of 2011.The Energy Information Administration forecasts oil prices to remain in the $90 to $95 per barrel range through 2016. Likewise, the construction price indices should also remain relatively steady through most of 2012.

Emerging Issues facing Maintenance and Operation of the Highway System

Age of the System

- 11,315 (54 percent) of all bridge structures in Virginia are 40 years old or order.
- Most of the interstate and primary lane miles were constructed over 30 years ago.
- Three of VDOT's nine tunnel tubes are 40 years old or older. Three others are over 30 years old.
- Approximately 3,500 miles of existing guardrail (over 50 percent) was constructed based on previous standards and is not compliant with current FHWA / AASHTO standards.
- Many of the safety assets, including signing, lighting, dynamic message signs, roadway cameras and the hardware and software that support the technology in use today are past their current life cycles.

Technology

- New vehicle technologies such as hybrids and electric cars and trucks are changing the composition of the vehicle fleet. As the proportion of vehicles with these technologies grows, fuel tax revenues per vehicle mile of travel will decrease, impacting the availability of funds to address maintenance and operations needs.
- In-vehicle communications technologies will help improve safety and provide new traveler accessories and features. Future vehicle and roadside technologies will make it possible in the foreseeable future to measure VMT, regardless of the energy source of the vehicles.
- New technologies and changes in tax policy (i.e. tolling I-95) may affect driving behavior or travel demand which could influence funds available for maintenance and operations.

Transportation, Energy and Environmental Policy

- Global oil production is likely to peak in the next decade or so. Consequently, gasoline and diesel prices will trend upward and volatility will likely get worse as supplies begin to diminish and disruptions become more common. Impacts to highway maintenance and operations include shifts in mode preferences affecting system utilization and volatility in fuel tax revenues to fund maintenance and operations.
- The U.S. is considering legislation to help reduce greenhouse gas emissions and other contributors to global warming. Federal legislation may include some form of mobile source carbon reduction policy (for example, a cap and trade program or carbon tax) similar to policies enacted in other countries. This could have an impact on the price of fuel and new vehicles, which may lead to changes in utilization of the state highways and investment needs for maintenance and operations.
- Current investments in rail and transit will impact future needs for additional roadway capacity improvements helping to reduce VMT, and hence the rate of deterioration on roads and bridges.
- Future air and fuel quality regulations will affect vehicle and fuel prices, and may result in greater operations investment needs to address congestion and mobile source contributors to air quality non-attainment.
- Compliance with new federal mandates and standards (the 2009 MUTCD and 2010 AASHTO structural support standards for highway signs, luminaries and traffic signals)

requires significant investment in traffic and safety asset upgrades over the next 10 years.

Customer Profile

- Population growth – Virginia's population is growing at a rate of more than one percent annually. More people of driving age means more drivers on the road (Figure 6).
- Economic prosperity – as the economy recovers, VMT will likely increase because increases in per capita disposable income tend to result in increased per capita travel demand.
- As oil prices increase, customers will be more likely to purchase fuel efficient vehicles, further eroding revenues.
- As the cost of transportation increases, more multi-modal trips will be made.
- An aging population requiring improvements in signage, pavement marking and other assets for safety reasons.
- Increased use of technology providing alternatives to business travel may decrease some travel demand.
- As changes in land use development encourage more compact development, travel demands and travel patterns will change.

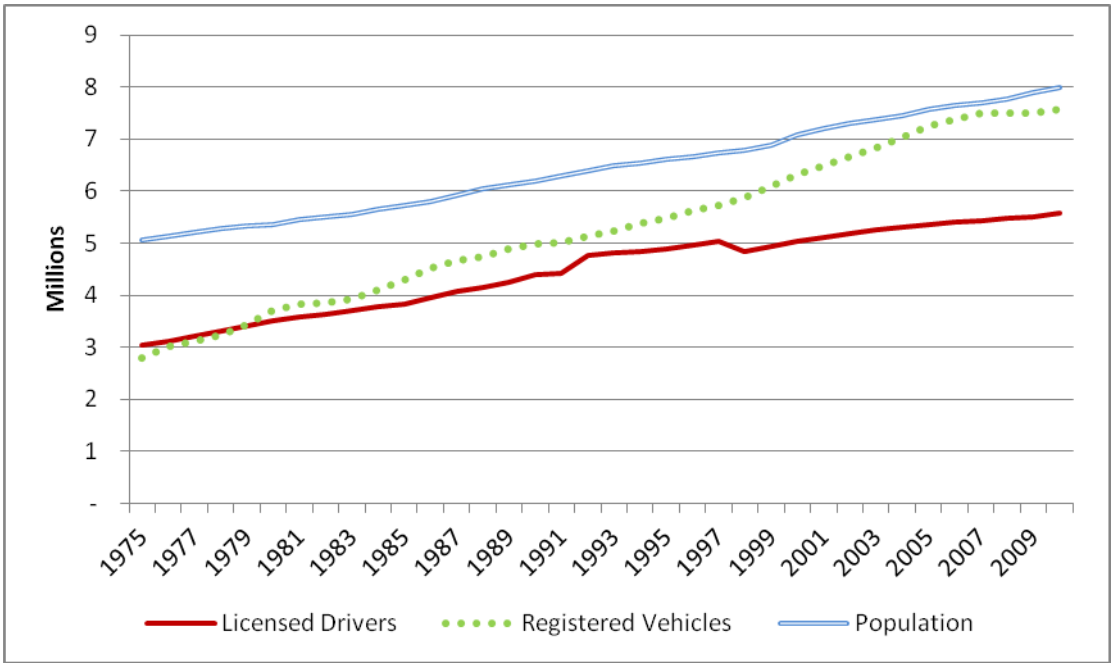


Figure 6 Virginia Motor Vehicle Statistics, DMV

Previous Allocations to Maintenance and Operations

Allocations to the Maintenance and Operations Program rose steadily over the period from 1978 to 2002, even when adjusted for inflation as shown in Figure 7. However, while the nominal value of allocations to the Maintenance and Operations Program has continued to increase sharply since 2002, the real dollar value actually fell between 2002 and 2008, and only rose again in 2009. The real value of the Maintenance and Operations Program allocation grew 4.3 percent per year from 1986 to 2002, but grew only 0.8 percent per year between 2002 and 2009. The net effect is that since 2002, funding to the Maintenance and Operations Program has not been sufficient to keep pace with the rising cost of maintenance and operations work.

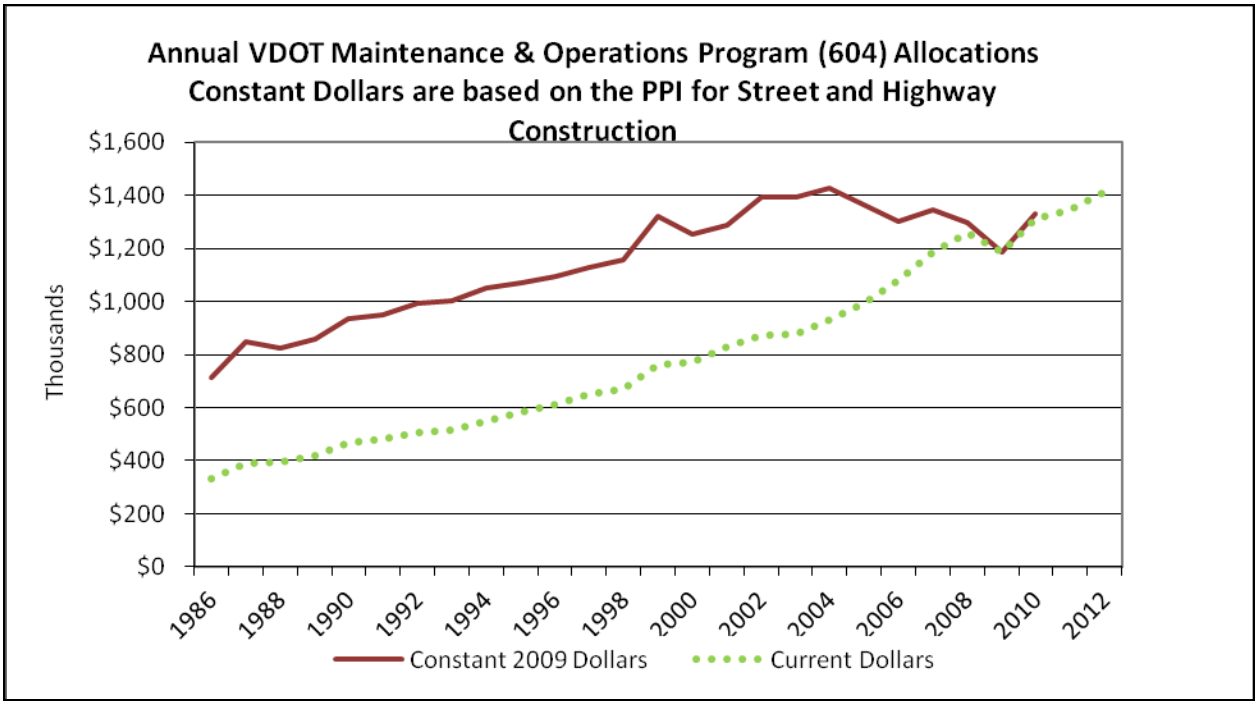


Figure 7 Annual Program Allocation Shown in Current and Constant* (2009) Dollars

*Constant dollars based on Producer Price (PPI) Highway and Street Construction Index, which was retired in June 2010.

Assessment Methods

The purpose of this report is to assess the current condition of Virginia's existing surface transportation network and the funds needed in FY 2013 and FY 2014 to improve or maintain conditions. While the information in this report will be useful in making decisions about future resource allocations for the Maintenance and Operations Program, the report is not a budget request and does not replace the Six-Year Maintenance and Operations Plan VDOT submits to

the Commonwealth Transportation Board for review and approval by June 30th of each year. In order to provide a more complete assessment, all work needed to meet performance targets and provide service is included regardless of which program they are delivered through. The report breaks out the portion of needs that should be programmed in the SYIP and provides an estimate of construction projects already scheduled for the FY 2013-2014 biennium that address some of those needs. The report notes that projects currently in the SYIP scheduled for FY 2013-2014 will offset some, but not all work required to achieve and maintain the performance targets for bridges and pavements.

Since 2007, the Code of Virginia has required this report, with this being the third report on the condition of and investment needed to maintain and operate the existing surface transportation infrastructure. In 2010, the Auditor of Public Accounts (APA) published a special report entitled *Review of Transportation's Asset Management System and Maintenance Funding Practices.* The APA found the agency's methods, data and systems to be "capable of providing an accurate, independent, consistent assessment of the state's infrastructure maintenance needs." The audit further reported that the "analysis of asset condition assessments provides an accurate picture of total funds needed to meet the commonwealth's highway system maintenance needs every year. (VDOT) uses average cost data from its Transport system, a database of historical infrastructure construction and maintenance cost, to determine the cost of maintenance needed based on (VDOT's) established performance goals."

In response to legislation requiring VDOT to adopt asset management principles in determining the funding required to maintain and operate the existing transportation infrastructure, the quantity and quality of data available to assess the size and condition of asset inventories, estimate deterioration, record work accomplishments, quantify unit costs, and develop models to assess needs has improved significantly. In the two years since the 2009 assessment was completed, two pavement condition assessments have been conducted. For pavements, which are the largest single expense to the maintenance and operations program, 100 percent of the interstate and primary systems and roughly 20 percent of the secondary system are assessed every year. Over the last five years, approximately 90 percent of secondary system pavements have been assessed.

Seventy five percent of the 2007 and 80 percent of the 2009 assessment were based on actual or extrapolated asset inventories, unit cost of work, and repair decision trees that generate recommendations based on the physical condition of assets or frequency of work standards and expected service life of assets. For this assessment 93 percent of the needs reported are based on this approach. The remaining seven percent is based on expenditure information from previous fiscal years.

Each reporting period has included an incremental improvement of inventory information, a review of the service life of assets, and updated unit costs for maintaining assets and providing services. As new information becomes available, factors used in the assessment are adjusted. For example, the sign replacement cost increased as a result of more accurate analysis of current field practice. This increased the cost of sign maintenance. However, the sign inventory decreased as a result of a more complete inventory assessment. Additionally, a management

decision was made to maintain the same life cycle of 25 years in the previous assessment rather than setting it at the best practice life cycle of 15 years and further increasing the needs. Each asset was reviewed to determine incremental improvements. As better information on these aspects of inventory and services become available, decision makers are able to determine what adequate levels of performance and funding should be.

The figures in this report are all reported in “current year” values, meaning the needs for each year are adjusted for inflation based on forecast annual inflation rates provided by the Department of Taxation. Needs in FY 2011 dollars were inflated by 3.7 percent to yield FY 2012 needs. Those figures were inflated another 2.4 percent to derive FY 2013 needs, and another 3.1 percent to derive FY 2014 needs.

The framework adopted by the agency two years ago establishes priorities for the delivery of maintenance and operations. This allows VDOT to more clearly show the relationship between investment needs and service activities, providing greater accountability. Each maintenance and operations activity tracked by the agency has been classified as a component of one of five major service areas, shown in Figure 8, and further classified as either “investment” or “service”. The five service areas are:

- Emergency and Incident Management
- Roadway
- Traffic and Safety
- Roadside
- Facility and Other

Priorities used in the development of the budget are set annually as the budget documents are prepared each spring for adoption by the CTB. The FY 2012 programmatic priorities adopted are as follows:

- Ensure services funding (including emergency response) is no less than FY 2011 level
- Restore funding for Safety Service Patrols and rest areas to FY2009 levels to reduce congestion reduction and provide for the safety of the traveling public.
- Fund interstate and primary pavement investment at level estimated to achieve and maintain performance target of 82 percent.
- Increase funds for the secondary system pavements.
- Fund bridge maintenance needs to support the attainment of the bridge sufficiency target.
- Close the gap between needs and budget for tunnel investment.
- Maintain safety features such as pavement markings and other safety.
- Use the data from the latest asset management needs assessment to insure each district receives its share of budget based on asset inventory condition targets and these priorities.

Specifically, pavements, bridges, tunnels, signals, pavement markings, signs, markers, messages, guardrail, and technology assets are considered to be of such critical safety and operational importance that rehabilitation, major repair, and preventive maintenance activities impacting their condition are classified as “investments” and shown as one category. Investment activities are designed to change the physical condition of the assets and to preserve and extend its useful life. Investment includes those activities required to meet performance targets for these assets. The biennial assessment identifies $1.010 billion and $0.972 billion in investment related needs for FY 2013 and FY 2014, as shown in Table 3 below.

The remaining maintenance and operations “services,” comprising ordinary and preventive maintenance work, such as cleaning ditches, washing bridge decks, patching pot-holes, debris removal, snow and ice removal, emergency response, incident management, mowing, and equipment management, is the second category of needs. Services also include maintaining rest areas, operating ferries, tunnels and moveable bridges, managing traffic, traffic signal optimization, providing traveler information, and Safety Service Patrols.

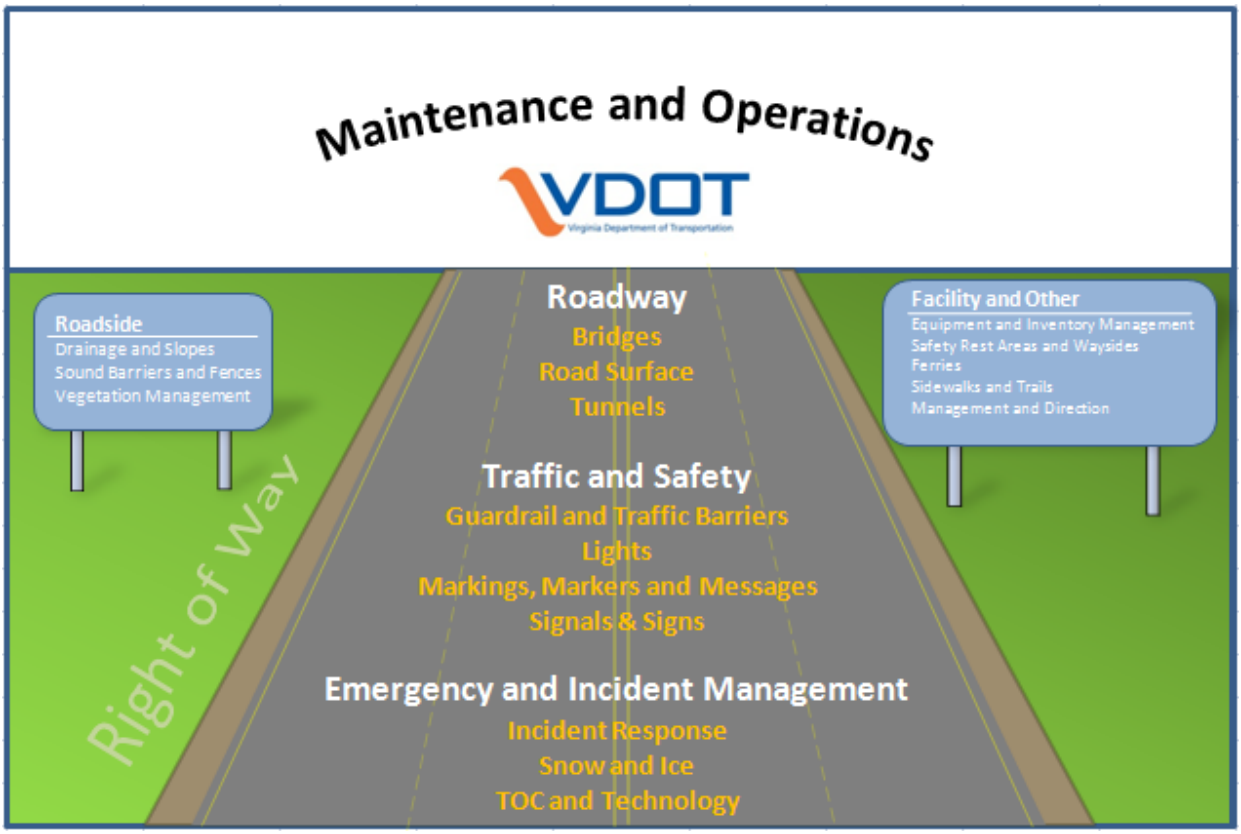


Figure 8 Maintenance and Operations Program Service Areas and Service Groups

Summary Results

Some significant differences in this report compared to the 2009 report are:

- The pavement analysis takes into account the contribution of ongoing and scheduled work in both the maintenance and construction programs that will be completed through FY 2012. For example, the American Recovery and Reinvestment Act (ARRA) of more than $100 million in pavement reconstruction projects directly contribute to improving pavements and help to reduce pavement needs in the future. The pavement needs analysis takes this work into account by assuming those pavement sections are in the condition they will be after the project is completed.

- Bridge replacement needs, required to meet the performance target (92 percent of bridge in non-structurally deficient condition) have been assessed and are reported for the first time.

- Funds required to meet bridge replacement and pavement reconstruction needs are broken out in summary tables to show the amount that should be funded from construction funds in the SYIP, separately from the Maintenance and Operations Program.

- Major pavement and bridge projects that are in the SYIP and scheduled for the FY 2013-2014 biennium are shown. They contribute to meeting the pavement and bridge performance goals but are not sufficient to meet all pavement reconstruction and bridge replacement needs.

- For the first time, a statewide performance target for secondary road pavements to be at a 65% sufficiency is recommended to be set to be achieved by 2013. This target is the basis for secondary system pavement investment needs identified in this report.

- Planned preventative maintenance needs for bridges and large culverts have been modeled for the first time. Previously those needs were based on historic expenditures.

- Due to the significant snow storms in 2010 and 2011, record amounts of spending occurred for snow related emergencies that required funds to be diverted from other identified maintenance work scheduled in those years.

- Mowing, Safety Service Patrol, and rest areas needs indentified reflect a return to service levels that existed before the last assessment.

Maintenance and operations needs (excluding pavement and bridge reconstruction needs) for the biennium are estimated to be $3.796 billion, or $1,907 billion and $1,889 billion for FY 2013 and FY 2014 respectively as shown in Table 3. Needs for FY 2012 (also with pavement reconstruction needs removed) are included for reference. The real dollar value (in FY 2013

dollars) of funding required to meet performance targets and deliver services in the FY 2013-2014 biennium decreased about one percent since the FY 2011-2012 biennium.

Adopting an asset management approach at VDOT is making a positive difference. Needs did not grow but declined, even with increases in unit prices and the size of the asset inventory. It is expected that pavement and bridge targets will be met by the end of the upcoming biennium. Increased emphasis in preventative maintenance of bridges is expected to reduce future bridge needs considerably. Increased emphasis in maintenance of tunnel and other operational assets is expected to improve the condition of those assets as well.

Table 3 Detailed Needs for FY 2013 and 2014 by Category and Service Area ($Millions)

Investment		FY 2012 Needs	FY 2013 Needs	FY 2014 Needs
Road Surface*	Interstate	$69.70	$86.50	$45.70
	Primary	198.1	228.8	174.6
	Secondary	386.2	212.5	219.1
	Sub-Total	654	527.8	439.4
Bridges	Interstate	41.4	60.2	56
	Primary	57.9	52.9	81.8
	Secondary	28.7	36.8	36.4
	Sub-Total	128	149.9	174.2
Tunnels		36	22.5	33.7
Traffic and Safety		205.7	279.7	282
Emergency and Incident Management		21.2	30.3	42.8
	Investment Total	1,044.90	1,010.20	972.1
Services				
Facility and Other		215.5	205.7	210.3
Roadway		132.2	196.4	194.3
Roadside		153.2	175.5	180.9
Emergency and Incident Management		154.4	215.3	222.1
Traffic and Safety		92.7	103.8	109.1
	Services Total	748.00	896.80	916.70
	Grand Total	$1,792.90	$1,907.00	$1,888.80

* Road surface needs DO NOT Include pavement or bridge reconstruction needs for FY12, FY13 & FY14.
Totals may not match sum of parts due to rounding.

Table 4 shows the biennial needs broken out by district and program. As shown in Table 5, the gap between HMO funding needed to reach and maintain performance targets in FY 2012, 2013, and 2014, and the FY 2012-2017 Six-Year Maintenance and Operations Program budget amounts for these years are decreasing each of the next two years. The gap between the program budget and the FY 2013 and FY 2014 needs is approximately $860 million.

Table 4 Biennial Needs by District and Program (Millions)

District	Interstate	Primary	Secondary	Operations	Management and Direction	Total
Bristol	$70.6	138.6	166.4	9.8	12.0	$397.4
Salem	50.8	145.2	182.2	11.9	19.1	409.2
Lynchburg	0.0	81.1	100.0	6.8	13.5	201.4
Richmond	142.0	233.2	183.1	15.1	17.1	590.5
Hampton Roads	231.9	140.6	51.5	37.0	13.0	474.1
Fredericksburg	29.5	104.3	113.5	9.4	12.1	268.7
Culpeper	21.1	62.1	107.0	8.2	10.6	209.0
Staunton	72.6	88.1	94.2	9.7	12.3	276.8
Northern Virginia	135.5	178.1	271.8	42.6	21.3	649.3
Central Office	69.8	16.5	19.2	194.9	18.9	319.3
Statewide Total	$823.9	1,187.6	1,288.9	345.4	150.0	$3,795.6

Table 5 Comparison of Six-Year Maintenance and Operations Program Budget and Biennial Needs (Millions)

Fiscal Year	Six-Year M&O Program Budget	Assessed Needs	Difference
2012	$1,413	$1,899	($486)
2013	$1,440	$1,907	($467)
2014	$1,496	$1,889	($393)

Pavement reconstruction and bridge replacement needs total $1.093 billion over the biennium. These needs are shown separately in Table 6 as they are typically funded using construction funds in the SYIP, not the Maintenance and Operations Program. Pavement and bridge reconstruction is part of the normal life cycle of assets and must be addressed in order to reach and maintain performance targets.

Table 6 Pavement and Bridge Reconstruction Needs ($Millions)

Investment		FY 2011 Needs	FY 2012 Needs	Biennium Total	FY 2013 Needs	FY 2014 Needs	Biennium Total
Road Surface	Interstate	$53.8	$45.4	$99.2	$28.2	$57.9	$86.1
	Primary	64.6	60.9	125.5	42.1	48.8	90.9
	Secondary	0.0	0.0	0.0	0.0	0.0	0.0
	Sub-Total	$118.4	$106.3	$224.7	$70.4	$106.7	$177.1
Bridges*	Interstate				$169.3	$175.0	$344.4
	Primary				178.1	177.5	355.6
	Secondary				106.2	110.2	216.4
	Sub-Total				453.6	462.8	916.4
	Grand Total				$524.00	$569.50	$1,093.50

*Bridge reconstruction needs were not reported for FY 2011 or FY 2012

Major construction funded pavement and bridge projects in the SYIP and scheduled for completion during the FY 2013-2014 biennium are shown in Table 7. They contribute to meeting the pavement and bridge performance goals but are not sufficient to meet all pavement reconstruction and bridge replacement needs. Note that not every paving project in the SYIP addresses identified pavement deficiencies.

Table 7 Value of Pavement Major Rehabilitation and Bridge Replacement Projects in the SYIP (Millions)

Project Type	Completion Year FY 2013	FY 2014	Total
Pavement Major Rehabilitation	$65.0	$236.6	$301.6
Bridge Replacement	147.0	321.9	468.9
Total	$212.0	$558.5	$770.5

VDOT has maintained the same performance measures and targets for pavement and bridges for several years. For bridges, the goal is to have no less than 92 percent of bridges in each district across the interstate, primary and secondary systems in structurally sufficient (not structurally deficient) condition. In the analysis for this report, three separate targets were used: no more than three percent of bridges on the interstate system, six percent of bridges on the primary system and 11 percent of bridges on the secondary system in structurally deficient condition.

The number of structurally deficient bridges and culverts has been decreasing over the last three years (see Figure 9) and is expected to reach the statewide goal by the end of FY 2012.

However, as Figure 10 shows, 11,327 bridges and culverts are more than 40 years old or older and will soon reach or have exceeded their 50 year design life. Bridges and culverts will require a total of $1,377 million investment (including replacement activities) over the FY 2013-2014 biennium in order to maintain the target of 92 percent of bridges in each district in non-structurally deficient condition.

There are currently 1,728 structurally deficient bridges and large culverts in Virginia, 1,581 that are maintained by VDOT. For most of these structures, full replacement is a more economic alternative than continued maintenance and is the only way to attain the performance target set by the agency for bridges and large culverts. Hence, replacement needs, which account for $916.4 million of biennial bridge needs, are discussed for the first time in this report. In addition, VDOT has undertaken an effort to formally model planned preventative maintenance of bridges which is known to slow deterioration and extend service life, lowering the life cycle cost of these major assets. Planned preventative maintenance accounts for $88.4 million of the total bridge needs over the biennium.

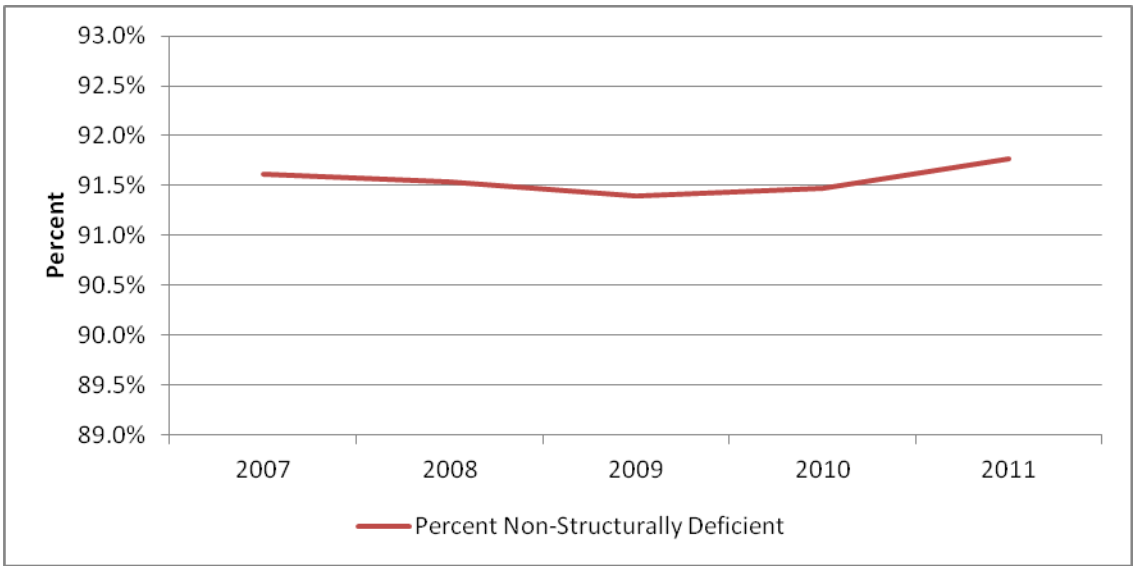


Figure 9 Statewide Percent of Bridges Non-Structurally Deficient

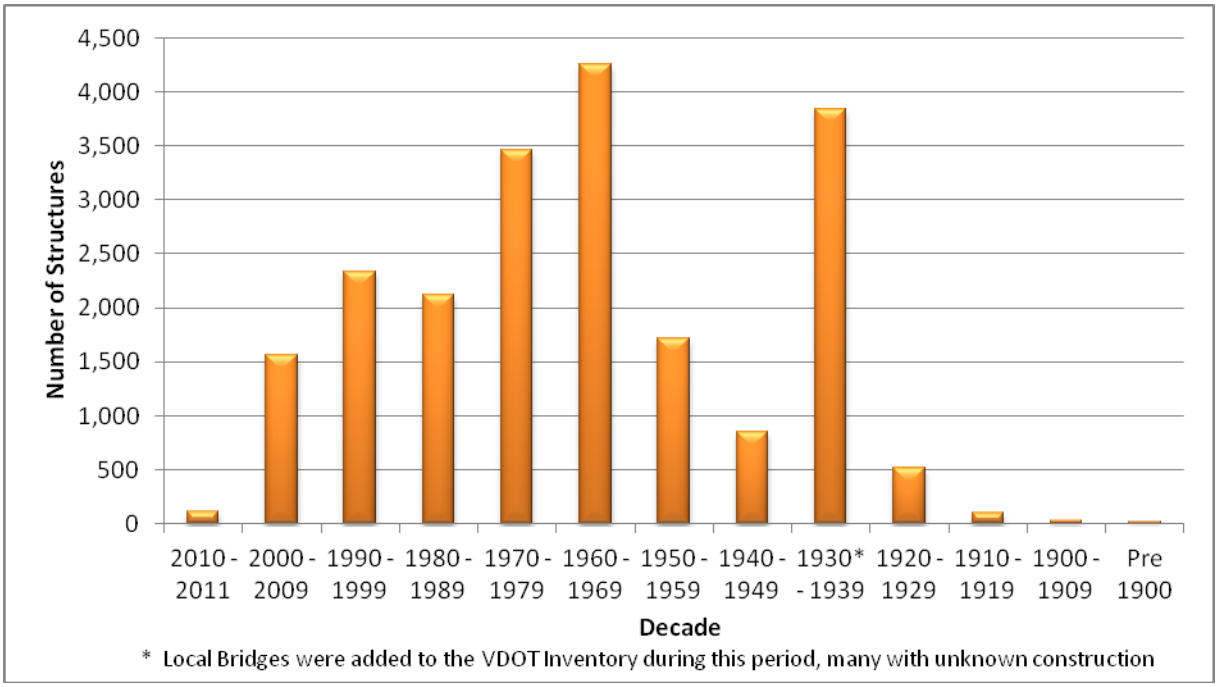
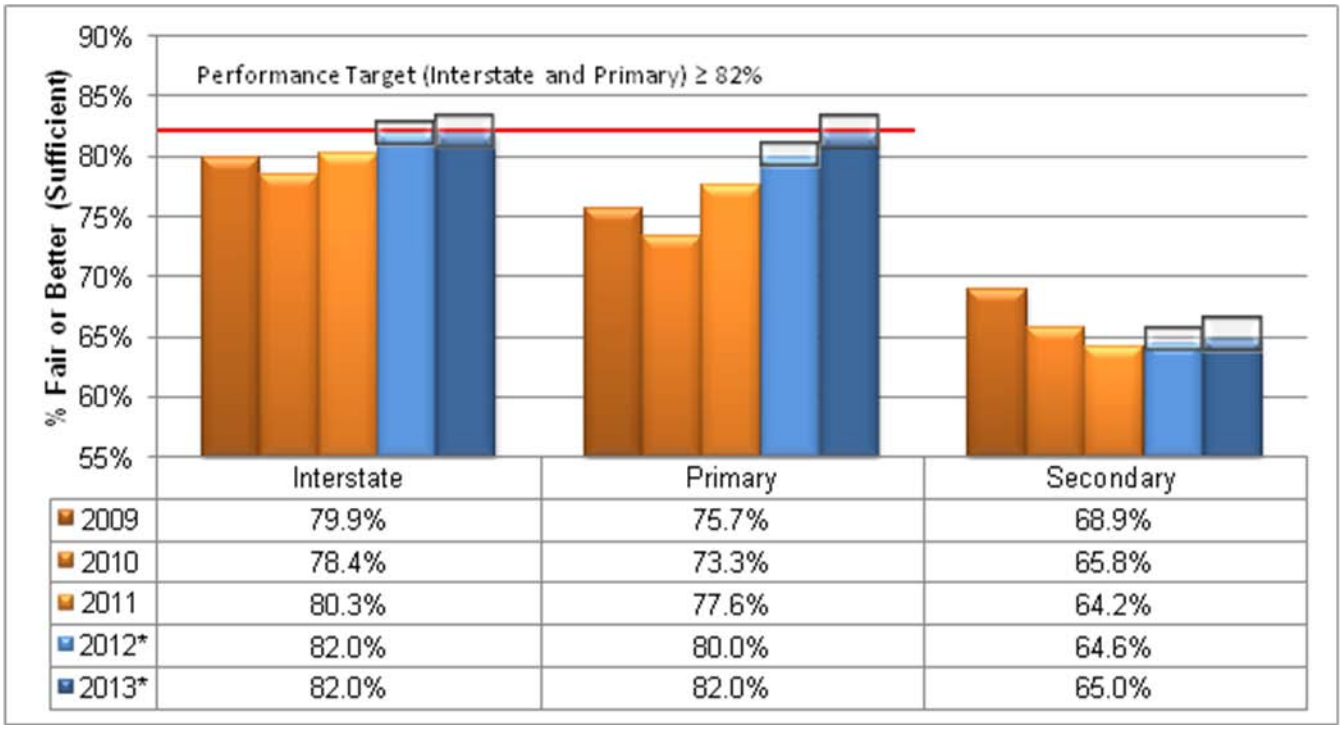


Figure 10 Age Distribution of Structures

For pavements, VDOT's goal is to have no less than 82 percent of interstate and primary system pavements in fair or better condition in each district, and to have no less than 85 percent of interstate and primary system pavements in each district with fair or better ride quality (< 140 on the International Roughness Index). In addition, two other measures and targets were used to constrain pavement needs on the interstate and primary system; 1) the average critical condition index in each district must not drop below its current level, and 2) no more than 10 percent of lane miles in each district should be in a condition requiring reconstruction. These constraints help keep the distribution of pavement conditions in a manageable range so a large portion of the network does not require major rehabilitation or reconstruction over a short period of time in order to maintain the performance target. VDOT's goal for secondary pavements is to maintain the current condition of 64% being sufficient and not allow conditions to worsen.

As shown in Figure 11, interstate and primary system pavement conditions improved slightly from 78.4 percent of interstate and 73.3 percent of primary system pavements in fair or better condition in 2010, to 80.3 percent of interstate and 77.6 percent of primary system pavements in fair or better condition in 2011. Secondary system pavement conditions deteriorated from 65.8 percent in fair or better condition in 2010 to 64.2 percent in 2011. Conditions on all systems are expected to show improvement after the 2011 and 2012 paving seasons as an extraordinary amount of paving contracts are underway or scheduled to be underway in the fourth quarter of FY 2012. The needs assessment also takes into account ongoing and planned SYIP funded work that should be completed prior to the next biennium. This includes more than $100 million in ARRA funds used specifically to address some of the significant reconstruction needs of pavements.



	Interstate	Primary	Secondary
2009	79.9%	75.7%	68.9%
2010	78.4%	73.3%	65.8%
2011	80.3%	77.6%	64.2%
2012*	82.0%	80.0%	64.6%
2013*	82.0%	82.0%	65.0%

*Estimated Figures, square shading shows margin of error.

Figure 11 Percent of Lane Miles in Sufficient Condition by System

Interstate and primary system pavements will require an investment of $724.2 million to meet performance targets during FY 2013 for interstates and FY 2014 for the primary system. This figure includes pavement reconstruction. Secondary system pavements will require $590.3 million over the FY 2013-2014 biennium to reach 65 percent in fair or better condition statewide. To improve the interstate, primary, and secondary systems by one percent from their current condition requires approximately $6.5, $13.8, and $30 million, respectively, in additional funding.

A new pavement management system implemented two years ago and better location-referencing enabled this year's assessment to include better information about planned maintenance and rehabilitation work on the interstate and primary system. This provides a more realistic predicted condition of the network in contrast to the network level approach used in the FY 2011-2012 analysis. The use of data on planned work for FY 2013-2014 shows an increase in interstate asphalt pavement needs and a decrease in interstate concrete pavement needs as compared to the FY 2011-2012 analysis. The analysis of primary system pavement shows that planned work in FY 2012 will improve conditions, but more work is needed to reach and maintain the target over the FY 2013 and 2014 biennium.

The decrease in needs for secondary pavements and secondary paved shoulders compared to the analysis for FY 2011 and FY 2012 result from two factors: a decrease in the prices of the asphalt materials as determined from the latest bid-tabs, and a downward revision of the deterioration rates based on the observed network performance in recent years.

While interstate and primary pavement conditions improved slightly in 2010, additional funding is needed to reach the performance targets for FY 2013 and FY 2014. Secondary system pavements require significant additional investment to achieve 65 percent of lane miles in fair or better condition statewide. The condition of bridges and structures can continue to meet performance targets based on current funding. Other assets related to traffic safety and technology cannot meet performance standards at current and proposed funding levels as shown in the Six-Year Maintenance and Operations Budget Program as adopted by the Commonwealth Transportation Board in June 2011. Service levels may not be sustained at the current levels, depending on future weather events and other emergency response duties VDOT is called upon to perform.

In response to legislation passed in 2004 requiring VDOT to adopt asset management principles in determining the funding required to maintain and operate the existing transportation infrastructure, the quantity and quality of data available to assess the size and condition of asset inventories, estimate deterioration, track and quantify work, and develop models to assess needs has improved significantly. Seventy five percent of the needs identified in the 2007 assessment and 79 percent in 2009 were based on actual or estimated asset inventories, unit costs of work, and repair decision trees that generate recommendations based on the physical condition of assets, frequency of work standards and expected service life of assets, or similar analytical approach. For this 2011 assessment, ninety-three percent of the reported needs are based on this approach. The remainder are based on expenditure information from previous fiscal years

The gap between HMO funding needed to reach and maintain performance targets in FY 2012, 2013, and 2014, and the FY 2012-2017 Six-Year Maintenance and Operations Program budget amounts for these years are decreasing each of the next two years. The gap between the program budget and the FY 2013 and FY 2014 needs is approximately $860 million.

The investment needs identified for the Maintenance and Operations Program for the 2013 and 2014 biennium are $3.796. This represents work that should be funded through the Highway Maintenance and Operations funding. When the reconstruction of pavement and bridge work is added to the total needs required to support the attainment of the performance targets in those areas, the needs for a total asset management approach for the biennium are estimated to be $4.889 billion, or $2.431 billion and $2.458 billion for FY 2013 and FY 2014, compared to $3.784 billion for the previous biennium, or $1.885 billion and $1.899 billion for FY 2011 and FY 2012 respectively. Those needs should be addressed through the SYIP. Pavement reconstruction and bridge replacement needs account for $1.093 billion of the total biennial needs. As shown earlier in the report, much of this work is currently funded in the SYIP.

The “Crossover” Issue

History

One of the significant actions taken by the 1986 General Assembly Special Session on Transportation was the establishment of two funds to finance transportation in Virginia. Prior to 1986, VDOT operated out of a single major fund, the Highway Maintenance and Construction Fund. In 1986, a split occurred; The Highway Maintenance Operating Fund (HMOF) was created with its own dedicated revenues sources for the purpose of supporting highway maintenance, operations and agency administration. The Transportation Trust Fund (TTF) was created to provide dedicated funding to highway construction, transit, ports and aviation. Of the total revenues in the TTF, 78.9 percent are dedicated to the Construction Fund (TTF-C).The remaining TTF funds are dedicated to the other modes by statute.

The HMOF and the TTF-C receive dedicated state revenues to address their respective funding needs. Revenues of the HMOF in excess of the fund’s needs were expected to flow to the construction share of the TTF-C. However, over time, these excess revenues dwindled and the HMOF’s dedicated revenues became insufficient to provide for the needs of the fund. With the requirement for funding maintenance first, this required the reverse flow to occur – the transfer of revenues dedicated to the construction share of the TTF to the HMOF. This practice is known as “crossover.”

Excess or surplus revenues from the HMOF flowed to the construction share of the TTF until FY 2002. The flow reversed in that year when funds from the highway construction fund of the TTF was transferred to the HMOF to cover its program costs. Figure 12 shows the transfers over the years and illustrates the following:

- Between FY 1988 and FY 2001, $910 million was transferred from the HMOF to the construction share of the TTF
- Between FY 2002 and FY 2017, it is projected that a total of $5.7 billion will be transferred from the construction share of the TTF to the HMOF

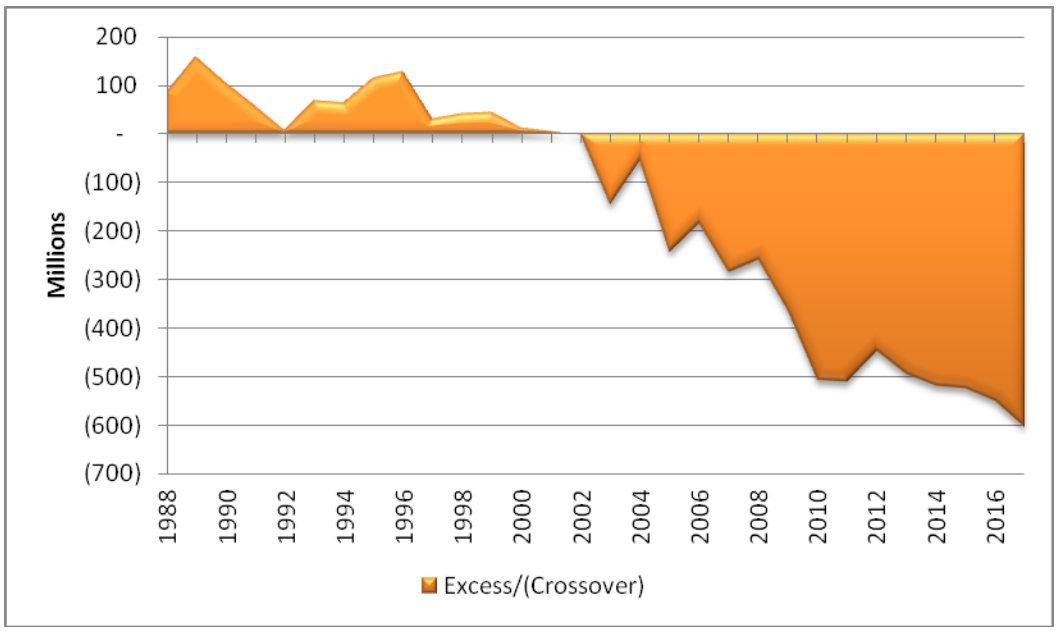


Figure 12 Excess/(Crossover) of Funds, Highway Maintenance and Operations Fund

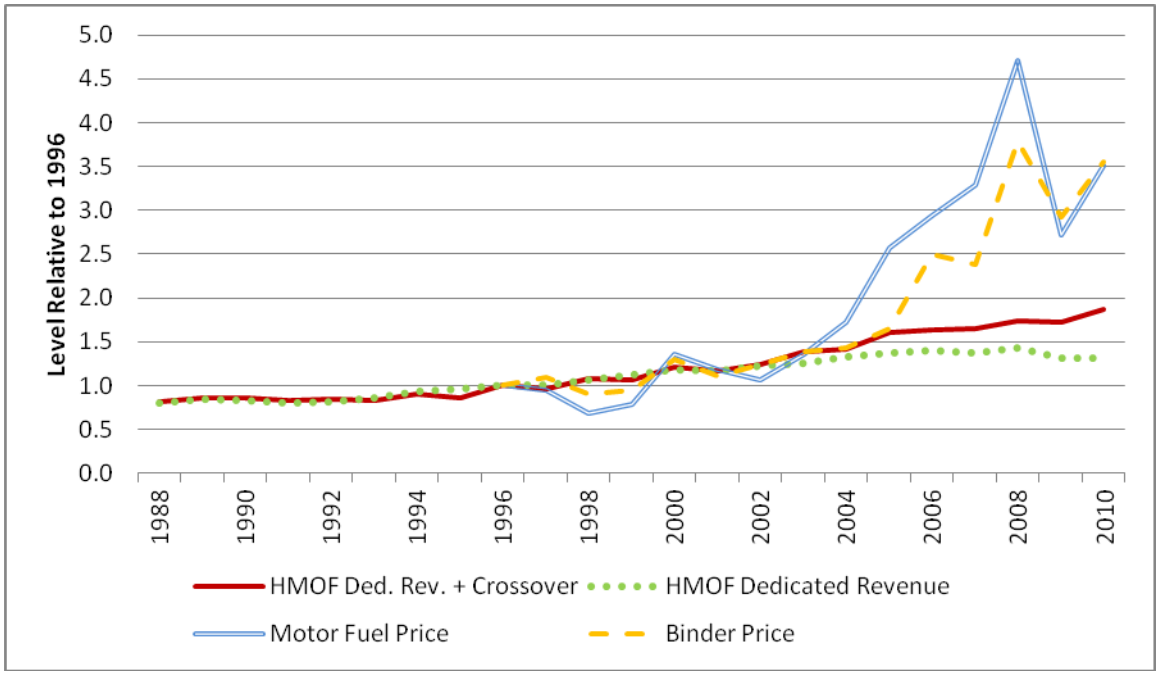
In addition to these amounts, federal funds that were previously used for construction have also been used to support the highway maintenance program since FY 2006. Between FY 2006 and FY 2017, an estimated $2.3 billion of federal funds will be used to support the maintenance program.

The Problem

Crossover is indicative of the lack of necessary dedicated HMOF revenue to maintain the existing state highway system and the city and local streets. The result is decreased funding in the construction share of the TTF for investment in system capacity, safety improvements, congestion reduction, and major reconstruction of bridges and aging pavements.

Factors Influencing Crossover

The HMOF revenues are heavily dependent on per gallon motor fuels excise taxes and other revenues that have not kept pace with the price increases key materials, such as asphalt and motor fuel, necessary to deliver maintenance (see Figure 13).



Source: VCTIR Director Dr. Jose Gomez, Presentation to Commonwealth Transportation Board, September 2011

Figure 13 HMOF Growth Compared to Real Increase in Prices of Asphalt Binder and Motor Fuel

The chart above compares the growth rates of the HMOF revenues to Motor Fuels prices and to Asphalt. Since 2004, the gaps between the rates of growth are dramatic, with the growth in prices far exceeding the growth in revenues.

Why Crossover is Necessary

The HMOF dedicated revenues are made up of a variety of revenues including the motor fuels tax, the motor vehicles sales and use tax, motor vehicle licenses, and other revenues. The motor fuels tax provides the majority of the revenues to the fund. With the greatly increasing efficiency of vehicles to use less and less gasoline, revenues can be expected to continue to stagnate and decline over time as newer vehicles enter the market.

Virginia's highway system is also aging, requiring increasing maintenance resources to maintain a steady state of repair for pavements. For example:

- 1,029 lane miles of interstate roads are in deficient condition
- 4,749 lane miles of primary roads are in deficient condition,
- 28,903 lane miles of secondary roads are in deficient condition (36 percent)
- In 2010, almost 1,800 structures were structurally deficient and by the end of 2011, approximately 1,700 will remain in need of major rehabilitation or replacement
- Approximately 4,600 structures are in danger of becoming structurally deficient in the next 5 years

An increase in public expectations and demands regarding snow removal and ice control, emergency response during major weather events, incident response, mowing and other roadway services contributes to the growing maintenance needs.

Growth in VMT and congestion call for increased resources for safety, congestion management, traveler information, and other system operations services and technologies that were not anticipated or funded in 1986, when HMOF revenue streams were established. Since 2002, annual VMT has increased 1.8 billion miles.

Additionally, since 2002, an additional 2,500 lane miles of roadway have been added to the system. These factors cause more wear and tear on the system and increase the cost of traffic control for maintenance activities. As illustrated in Figure 14, both lane miles and VMT have grown since 2002, while the value of the revenues has dropped to less than 80 percent.

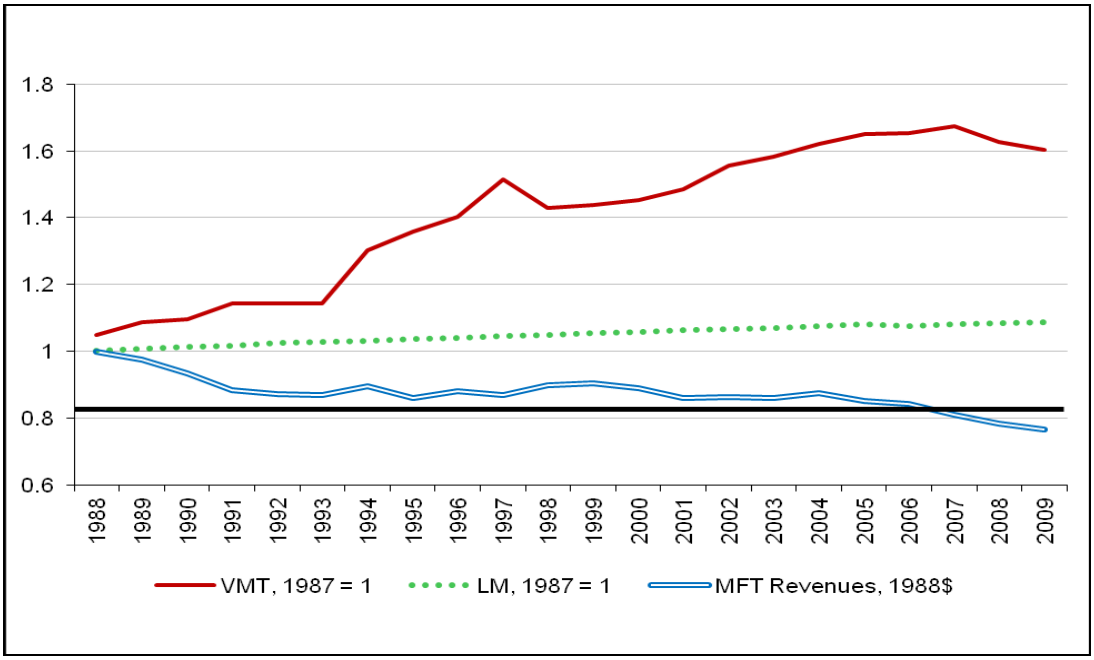


Figure 14 Growth Indices for VMT and Lane-Miles on VDOT System, Motor Fuel Tax Revenues in HMOF+TTF (CPI 1988$), 1987-2009

How does Crossover Affect Virginia's Transportation Future?

Although Virginia has key transportation elements in place, continued transfers from construction to HMOF is a real and dangerous threat:

- In 2011, state fund crossover transfers to the HMOF ($511 million) equaled about 83 percent of the total dedicated 1986 Special Session revenues for highway construction.
- Crossover transfers are from state revenues since most maintenance work does not qualify for federal funding.

- Crossover has rendered Virginia's construction program primarily a Federal Aid and bond financed program.

Crossover transfers from construction will continue to increase as the cost to maintain the system increase and as the system continues to age. It will necessitate that increasing amounts of federal funds be transferred as well. By 2017, the combined state crossover and federal transfer is estimated to be almost $900 million.

Crossover is indicative of a two-sided problem:

- The lack of necessary revenue to maintain the existing state highway system and city and local streets.
- Moving revenue from one fund to another results in decreased funding for investment in system capacity, safety improvements, congestion reduction and major reconstruction of bridges and aging pavements.

This two-sided problem boils down to whether or not Virginia will build on the positive elements in its transportation future to maintain and provide the transportation infrastructure that is vital to continue to be a strong attractor of businesses and jobs for the near and long term future

Even with substantial transfers from the TTF-C to the HMOF, data on the asset conditions documented here reveal a large number of bridges are in danger of being structurally deficient and secondary system pavements are deteriorating at an extremely high rate.

The Solution

In order to stop the crossover of funds from the construction share of the TTF, it is necessary to identify options to provide long term, sustainable revenue sources for the HMOF.

One-time infusions can address specific needs but do not provide a permanent solution. Streamlining and implementation of performance audit recommendations have eliminated the low-hanging fruit. Options to eliminate crossover must either provide additional revenue or reduce programmatic needs of the HMOF or a combination of the two. The focus needs to be on revenue enhancements and cost reductions through policy changes. There are no silver bullets – the choices are not easy and will result in reduced services and/or increased taxes or fees.

Performance of Locally Maintained Roads and Bridges

In 2004, the General Assembly modified Sections 33.1-23.5:1 and 33.1-41.1 of the Code of Virginia pertaining to local payment programs. The changes included additional financial accountability and essential performance measurements for localities receiving payments for maintenance and construction activities. The department collaborated with a group of local government stakeholders, the Virginia First Cities Coalition, and the Virginia Municipal League to establish a program that met the intent of this legislation utilizing available reporting mechanisms and nationally recognized performance measurement methodologies.

The local assistance division published “Local Performance and Accountability for Transportation Funding” in April of 2007. The report covered financial accountability and performance measurement on bridges and pavements for localities receiving payments for maintenance and construction activities. This is the third report in response to that process requiring biennial performance reporting.

Bridge Performance

VDOT displays bridge conditions in “real time” on the maintenance dashboard for localities that have bridge inspection data. The dashboard presents bridge ratings in the form of green (non-deficient), yellow (functionally obsolete) or red (structurally deficient).

The current performance rating now considers bridges with a GCR of four or less (red on the dashboard) as structurally deficient. Bridges are considered structurally deficient if they have been restricted to light vehicles, are closed to traffic, or require rehabilitation. Structurally deficient means there are elements of the bridge that need to be monitored and/or repaired.

The goal is to have no more than eight percent of Virginia bridges and culverts to be rated as structurally deficient (so the combination of yellow and green should be 92 percent or greater). As of June 30, 2011, the inspections revealed that 8.18 percent of the bridges on the locally maintained system need to be monitored and/or repaired. A total of 1,271 bridges were inspected, representing 69 municipalities and two counties. This information was collected from VDOT’s Dashboard. These results are shown in Figure 15.

Locality	R	Y	G	Total	Deficient	Locality	R	Y	G	Total	Deficient
Abingdon	0	1	9	10	0%	Luray	1	5	3	9	11.1%
Alexandria	0	5	14	19	0%	Lynchburg	8	17	43	68	11.8%
Arlington County	0	9	13	22	0%	Manassas	0	0	12	12	0%
Ashland	0	0	1	1	0%	Manassas Park	0	0	1	1	0%
Bedford	1	0	3	4	25%	Marion	3	6	2	11	27.3%
Big Stone Gap	1	2	3	6	16.7%	Martinsville	0	1	9	10	0%
Blacksburg	0	0	4	4	0%	Narrows	0	0	2	2	0%
Blackstone	1	0	0	1	100%	Newport News	1	7	33	41	2.4%
Bluefield	2	2	8	12	16.7%	Norfolk	2	14	22	38	5.3%
Bristol	7	3	23	33	21.2%	Norton	2	2	8	12	16.7%
Buena Vista	0	2	16	18	0%	Orange	0	1	5	6	0%
Charlottesville	4	2	10	16	25%	Petersburg	0	8	21	29	0%
Chesapeake	9	19	54	82	11%	Portsmouth	0	2	3	5	0%
Christiansburg	0	2	5	7	0%	Pulaski	2	4	12	18	11.1%
Clifton Forge	1	1	5	7	14.3%	Purcellville	0	0	2	2	0%
Colonial Heights	0	1	6	7	0%	Radford	0	0	2	2	0%
Covington	0	0	7	7	0%	Richlands	3	1	6	10	30%
Culpeper	0	2	5	7	0%	Richmond	9	13	55	77	11.7%
Danville	0	10	30	40	0%	Roanoke	3	30	52	85	3.5%
Elkton	0	0	1	1	0%	Rocky Mount	1	1	1	3	33.3%
Emporia	1	1	4	6	16.7%	Salem	3	4	13	20	15%
Fairfax	0	1	5	6	0%	Saltville	1	0	3	4	25%
Farmville	0	0	4	4	0%	South Boston	3	0	5	8	37.5%
Fredericksburg	3	1	9	13	23.1%	Staunton	0	0	18	18	0%
Front Royal	1	2	8	11	9.1%	Suffolk	9	14	96	119	7.6%
Galax	0	3	2	5	0%	Tazewell	6	0	6	12	50%
Grottoes	0	0	2	2	0%	Vienna	0	1	5	6	0%
Hampton	2	11	22	35	5.7%	Vinton	0	1	1	2	0%
Harrisonburg	0	6	23	29	0%	Virginia Beach	4	15	60	79	5.1%
Henrico County	2	7	54	63	3.2%	Warrenton	0	0	3	3	0%
Herndon	0	0	6	6	0%	Waynesboro	4	4	10	18	22.2%
Hopewell	1	0	2	3	33.3%	Williamsburg	0	2	3	5	0%
Lebanon	0	2	6	8	0%	Winchester	0	0	7	7	0%
Leesburg	0	5	14	19	0%	Wise	0	0	1	1	0%
Lexington	2	3	3	8	25%	Woodstock	0	0	4	4	0%
						Wytheville	1	0	1	2	50%
TOTAL RED	104										
TOTAL YELLOW		256									
TOTAL GREEN			911								
Total Local Bridges Inspected				**1271**							
Local Bridge System Deficiency Rating					**8.18%**						

Figure 15 Locality Bridge Deficiency Rating as of June 30, 2011

Pavement Performance

The Highway Performance Monitoring System (HPMS) is a highway information system utilized by the FHWA that includes data on the extent, condition, performance, use, and operating characteristics of the Nation's highways. The HPMS includes information on pavement condition for sample segments based on International Roughness Index (IRI), which is the worldwide standard for measuring pavement smoothness established by the World Bank.

Based on federal pavement rating criteria, pavements have a good ride quality if the IRI is less than 100. As the IRI increases, the ride quality decreases. Pavements with an IRI between 100 and 170 are considered fair. Local pavements with an IRI of 170 or greater are considered to be poor quality. This report uses the same criteria for pavement performance as the 2007 report.

The IRI ratings for this report are based on samples collected for the HPMS data during 2011 (Figure 16). That data was collected in 50 localities representing 60 percent of those localities maintaining their own transportation systems. The sampled routes represent approximately 5 percent of the lane miles currently maintained by those local governments. The data included in this sample implies that 28 percent of locally maintained pavements are deemed as having poor quality based on pavement roughness (having an IRI of 170 or greater).

Although, this information is beneficial, it is not compatible with VDOT's own pavement performance measurement system and does not provide for a direct correlation in reporting performance. Until a more global measure of pavement performance is developed, the IRI data from HPMS will be used as an interim indicator of pavement performance for localities. Meanwhile, data from the HPMS will be reported but a specific performance target will not be established.

	Samples				Samples		
Locality	**Total**	**Deficient**	**%Deficient**	**Locality**	**Total**	**Deficient**	**%Deficient**
Abingdon	10	0	0%	Luray			
Alexandria	2	2	100%	Lynchburg	30	19	63%
Altavista				Manassas	6	0	0%
Arlington				Manassas Park	1	1	100%
Ashland				Marion			
Bedford	13	2	15%	Martinsville	8	3	38%
Big Stone Gap	3	2	67%	Narrows			
Blacksburg				Newport News	72	20	28%
Blackstone				Norfolk	26	15	58%
Bluefield				Norton	1	0	0%
Bridgewater	2	1	50%	Orange			
Bristol	35	16	46%	Pearisburg			
Buena Vista	6	1	17%	Petersburg	25	15	60%
Charlottesville	54	11	20%	Poquoson			
Chase City				Portsmouth	3	3	100%
Chesapeake	39	15	38%	Pulaski	20	8	40%
Chincoteaque				Purcellville			
Christiansburg	6	2	33%	Radford	39	30	77%
Clifton Forge	4	4	100%	Richlands			
Colonial Heights	7	1	14%	Richmond	26	20	77%
Covington	3	0	0%	Roanoke	46	6	13%
Culpeper	6	3	50%	Rocky Mount			
Danville	35	6	17%	Salem	15	4	27%
Dumfries				Saltville			
Elkton				Smithfield			
Emporia				South Boston	2	0	0%
Fairfax				South Hill			
Falls Church	1	0	0%	Staunton	7	1	14%
Farmville	38	17	45%	Strasburg			
Franklin	5	1	20%	Suffolk	337	21	6%
Fredericksburg	8	7	88%	Tazewell			
Front Royal	12	10	83%	Vienna			
Galax	6	1	17%	Vinton			
Grottoes				Virginia Beach	18	6	33%
Hampton	45	7	16%	Warrenton	7	3	43%
Harrisonburg	8	1	13%	Waynesboro	6	2	33%
Henrico				Williamsburg	2	0	0%
Herndon				Winchester	9	6	67%
Hopewell	8	6	75%	Wise			
Lebanon	4	2	50%	Woodstock			
Leesburg	4	0	0%	Wytheville	3	0	0%
Lexington	8	3	38%				
Pink represent localities with no samples				50 Localities with ratings			
				STATEWIDE	**1081**	**304**	**28%**

Figure 16 Pavement Sample Summary (HPMS) - 2011

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Appendix A – Code of Virginia Statutory Requirements

Statutory Requirements for Reporting on the Condition of Roads and Maintenance Needs

§ 33.1-13.03. Annual report by the Virginia Department of Transportation.

The Commissioner of Highways shall annually report in writing to the Governor and General Assembly, no later than November 30 each year, on (i) the condition and performance of the existing transportation infrastructure, using an asset management methodology and generally accepted engineering principles and business practices to identify and prioritize maintenance and operations needs and to identify performance standards to be used to determine those needs, and funding required to meet those needs, (ii) the Department's strategies for improving safety and security, increasing efficiency in agency programs and projects, and collaborating with the private sector and local government in the delivery of services, (iii) the operating and financial activities of the Department including, but not limited to, the construction and maintenance programs, transportation costs and revenue, and federal allocations, and (iv) other such matters of importance to transportation in the Commonwealth.

*St*atutory Requirements for Reporting of Performance on Local Roads

§ 33.1-41.1. Payments to cities and certain towns for maintenance of certain highways.

The Commissioner of Highways, subject to the approval of the Commonwealth Transportation Board, shall make payments for maintenance, construction, or reconstruction of highways, as hereinafter provided, to all cities and towns eligible for allocation of construction funds for urban highways under § 33.1-23.3. Such payments, however, shall only be made if those highways functionally classified as principal and minor arterial roads are maintained to a standard satisfactory to the Department of Transportation. Whenever any city or town qualifies under this section for allocation of funds, such qualification shall continue to apply to such city or town regardless of any subsequent change in population and shall cease to apply only when so specifically provided by an act of the General Assembly. All allocations made prior to July 1, 2001, to cities and towns meeting the criteria of the foregoing provisions of this section are hereby confirmed.

No payments shall be made to any such city or town unless the portion of the highway for which such payment is made either (a) has (i) an unrestricted right-of-way at least 50 feet wide and (ii) a hard-surface width of at least 30 feet; or (b) has (i) an unrestricted right-of-way at least 80 feet wide, (ii) a hard-surface width of at least 24 feet, and (iii) approved engineering plans for the ultimate construction of an additional hard-surface width of at least 24 feet within the same right-

of-way; or (c) (i) is a cul-de-sac, (ii) has an unrestricted right-of-way at least 40 feet wide, and (iii) has a turnaround that meets applicable standards set by the Department of Transportation; or (d) either (i) has been paved and has constituted part of the primary or secondary system of state highways prior to annexation or incorporation or (ii) has constituted part of the secondary system of state highways prior to annexation or incorporation and is paved to a minimum width of 16 feet subsequent to such annexation or incorporation and with the further exception of streets or portions thereof which have previously been maintained under the provisions of § 33.1-79 or § 33.1-82; or (e) was eligible for and receiving such payments under the laws of the Commonwealth in effect on June 30, 1985; or (f) is a street established prior to July 1, 1950, which has an unrestricted right-of-way width of not less than 30 feet and a hard-surface width of not less than 16 feet; or (g) is a street functionally classified as a local street and constructed on or after January 1, 1996, which at the time of approval by the city or town met the criteria for pavement width and right-of-way of the then-current edition of the subdivision street requirements manual for secondary roads of the Department of Transportation (24 VAC 30-90-10 et seq.); (h) is a street previously eligible to receive street payments that is located in the City of Norfolk and the City of Richmond and is closed to public travel, pursuant to legislation enacted by the governing body of the city in which it is located, for public safety reasons, within the boundaries of a publicly funded housing development owned and operated by the local housing authority; or (i) is a local street, otherwise eligible, containing one or more physical protuberances placed within the right-of-way for the purpose of controlling the speed of traffic.

However, the Commissioner may waive the requirements as to hard-surface pavement or right-of-way width for highways where the width modification is at the request of the local governing body and is to protect the quality of the affected local government's drinking water supply or, for highways constructed on or after July 1, 1994, to accommodate some other special circumstance where such action would not compromise the health, safety, or welfare of the public. The modification is subject to such conditions as the Commissioner may prescribe.

For the purpose of calculating allocations and making payments under this section, the Department shall divide affected highways into two categories, which shall be distinct from but based on functional classifications established by the Federal Highway Administration: (i) principal and minor arterial roads and (ii) collector roads and local streets. Payments made to affected localities shall be based on the number of moving-lane-miles of highways or portions thereof available to peak-hour traffic in that locality.

The Department of Transportation shall recommend to the Commonwealth Transportation Board an annual rate per category to be computed using the base rate of growth planned for the Department's Highway Maintenance and Operations program. The Board shall establish the annual rates of such payments as part of its allocation for such purpose, and the Department of Transportation shall use those rates to calculate and put into effect annual changes in each qualifying city's or town's payment under this section.

The payments by the Department shall be paid in equal sums in each quarter of the fiscal year, and payments shall not exceed the allocation of the Board.

The chief administrative officer of the city or town receiving this fund shall make annual categorical reports of expenditures to the Department, in such form as the Board shall prescribe, accounting for all expenditures, certifying that none of the money received has been expended for other than maintenance, construction or reconstruction of the streets, and reporting on their performance as specified in subdivision B 3 of § 33.1-23.02. Such reports shall be included in the scope of the annual audit of each municipality conducted by independent certified public accountants.

Statutory Definitions for Maintenance, Operations, and Asset Management

§ 33.1-23.02. Definition of the terms "maintenance" and "asset management.".

A. For the purpose of this title, unless otherwise explicitly provided, the term "maintenance" shall include (i) ordinary maintenance, (ii) maintenance replacement, (iii) operations that include, but are not limited to, traffic signal synchronization, incident management, other intelligent transportation system functions, and (iv) any other categories of maintenance which may be designated by the Commissioner.

B. 1. For the purposes of this title, unless otherwise explicitly provided, the term "asset management" shall mean a systematic process of operating and maintaining the state system of highways by combining engineering practices and analysis with sound business practices and economic theory to achieve cost-effective outcomes.

2. The Department shall develop asset management practices in the operation and maintenance of the state system of highways.

3. The Commissioner shall advise the Board, on or before June 30 of even-numbered years, of performance targets and outcomes that are expected to be achieved, based upon the funding identified for maintenance, over the biennium beginning July 1 of that year. In addition, not later than September 30 of even-numbered years, the Commissioner shall advise the Board on the Department's accomplishments relative to the expected outcomes and budget expenditures for the biennium ending June 30 of that year and also advise the Board as to the methodology used to determine maintenance needs and the justification as to the maintenance funding by source.

Appendix B – Maintenance and Operations Detailed Needs Assessments

Virginia is experiencing the effects of growing traffic (VMT) and an aging transportation infrastructure. The challenge of preserving and operating the state's transportation system is exacerbated by decreasing tax revenues associated with current economic conditions. VDOT's operating framework establishes priorities and identifies performance standards for the delivery of maintenance and operations services within five major service areas, as shown in Figure 8. The framework also allows VDOT to more clearly show the relationship between investment needs and planned activities, thus providing greater accountability. All maintenance and operations activities tracked by the agency have been classified as one of five service areas, and further classified as either "asset investments" or "services". This framework is based on the following priorities:

- The safety of the traveling public is VDOT's first priority.
- The second priority in all maintenance and operations work is on those activities that contribute to the preservation of the roadway.
- Aesthetics, upgrades and other activities not directly contributing to the preservation of the roadway or to specific safety hazards will be addressed only after the first two priorities have been addressed.

Asset Investments

Pavements, bridges, tunnels, guardrail, lights, pavement markings, markers, messages, signals, signs, and technology assets are considered to be of such critical safety and operational importance that activities such as replacement, rehabilitation, major repairs, and preventive maintenance impacting their physical condition and consistent, reliable operation are classified as "asset investments". For example, performing a pavement mill and overlay, repairing bridge decks, upgrading guardrail and replacing traffic signals are considered asset investments.

Investment activities performed on these assets are required to change the physical condition of the asset, to keep them in good operating condition, to preserve and extend useful life, not simply to clean or repair a broken part. For this analysis the reconstruction needs for pavements are not included since those projects are typically funded in the SYIP.

Estimated investment needs for the FY 2013-2014 biennium are shown in Table 8.

Table 8 Estimated Maintenance Asset Investment Needs for the Biennium FY 2013 – 2014

		FY 2013 $Million	FY 2014 $Million
Road Surface	Interstate	$86.5	$45.7
	Primary	228.8	174.6
	Secondary	212.5	219.1
	Sub-Total	$527.8	$439.4
Bridges	Interstate	60.2	56.0
	Primary	52.9	81.8
	Secondary	36.8	36.4
	Sub-Total	$149.9	$174.2
Tunnels	Interstate	21.9	33.7
	Primary	0.6	0.0
	Sub-Total	$22.5	$33.7
Traffic and Safety	Interstate	82.8	70.0
	Primary	123.2	133.6
	Secondary	73.7	78.3
	Sub-Total	$279.7	$282.0
Emergency and Incident Management	Interstate	24.2	36.5
	Primary	5.7	6.1
	Secondary	0.3	0.2
	Sub-Total	$30.3	$42.8
	Asset Investment Total	$1,010.2	$972.1

Road Surface

Road surface includes flexible and rigid pavements as well as rumble strips, a safety feature typically associated with paved shoulders and in some cases, roadway centerlines. The maintenance investment needs for road surface are included in Table 9 below.

Table 9 Biennial Maintenance Road Surface Investment Needs

Pavement		FY 2013 $Million	FY 2014 $Million
	Interstate	$84.3	$43.4
	Primary	228.0	173.8
	Secondary	212.3	218.9
	Total	$524.6	$436.1

Pavement Inventory

VDOT maintains more than 126,500 lane miles of interstate, primary, and secondary system roadways. Table 10 shows the distribution of roads by system and by construction district.

Table 10 VDOT Maintained Lane Miles of Roadway by District (2010)

District	Interstate	Primary	Paved Secondary	Unpaved Secondary	Frontage	Total
Bristol	533	2,949	8,507	3,803	112	15,904
Salem	490	2,660	11,462	3,254	107	17,973
Lynchburg	-	2,807	9,977	2,402	38	15,224
Richmond	1,319	3,418	12,336	1,489	76	18,637
Hampton Roads	873	1,770	6,560	556	92	9,850
Fredericksburg	281	2,185	8,371	835	24	11,695
Culpeper	279	1,851	6,166	2,067	52	10,415
Staunton	942	2,474	7,690	2,841	75	14,023
Northern Virginia	685	1,561	9,739	745	79	12,808
Statewide Total	5,400	21,674	80,809	17,992	655	126,530

Pavement Performance Measures and Targets

Performance measures and targets are shown in Table 11 for interstate and primary system. For interstate and primary systems the performance measures for pavement are the percent of pavements in fair or better condition, and percent of pavements with fair or better ride quality. The target is to have 82 percent of interstate and primary system pavements in fair or better condition, and 85 percent of interstate and primary system pavements with fair or better ride quality. These targets were set in 2004 and reflected current conditions at that time. For the secondary system a goal of achieving 65 percent of secondary system pavements in fair or better condition statewide was used as the basis for this needs assessment. Currently, 64.2 percent of secondary system pavements are in fair or better condition.

Table 11 Pavement Performance Measures, Targets and Current Performance

Measure	**Target**	**Current Performance**
Percent of interstate and primary system pavements in fair or better condition (CCI ≥ 60)	≥ 82%	80% interstate 78% primary
Percent of interstate and primary system pavements with fair or better ride quality (IRI ≥ 140)	≥ 85%	93% interstate 88% primary
Percent of secondary system pavements in fair or better condition (CCI ≥ 60)	≥ 65%	64.2%

A digital pavement condition assessment is conducted each year on 100 percent of interstate and primary pavements and on a statistically representative sample of 20 percent to 25 percent of secondary system pavements in every county in the state (except Arlington and Henrico). After five years using this technology, nearly 90 percent of secondary system pavements have now been assessed. Assessment of the remainder of secondary system pavements should be completed by 2012. Pavement condition data are collected using vehicles outfitted with state of

the practice equipment to measure roughness, rutting, cracking, and other physical distresses. The data are summarized into a numerical index called Critical Condition Index (CCI) that ranges from 0 to 100, where 100 represents the best condition (i.e., no distresses at all on pavement surface). Pavements with a CCI below 60 are considered to be in deficient condition, which means that they are candidates for some type of heavier maintenance activity.

Pavement ride quality is measured by the International Roughness Index (IRI), a measure of road roughness and proposed as an international standard by the World Bank. A pavement section with an IRI value less than 140 is termed to have a fair or better ride quality for Interstate and Primary pavements. The current performance target for pavement ride quality is that no less than 85 percent of the Interstate and Primary pavements will have fair or better ride quality.

Pavement Conditions

Figure 11 shows statewide interstate, primary and secondary system pavement conditions from 2009 to 2011. The 2011 pavement condition survey found that 80.3 percent of interstate, 77.6 percent of primary, and 64.2 percent of secondary pavements are sufficient statewide (meaning that the pavements are in fair or better condition, defined as having a CCI of > 60). This is less than the established performance target of at least 82 percent of interstate and primary system pavements in fair or better (sufficient) condition statewide. The 2011 pavement condition survey was conducted in the spring of 2011; hence, the pavement maintenance and rehabilitation work completed during the summer of 2011 is not reflected in the condition ratings. Based on forecast future conditions, interstate and primary system pavements are expected to reach their performance targets by the end of the 2011 and 2012 paving seasons, respectively.

For pavements still needing to be addressed, Table 12 shows percent deficient pavements in each district by system.

Table 12 Pavement Condition by District and System in 2011

	Interstate		Primary		Secondary	
District	**Deficient Lane Miles**	**% Deficient**	**Deficient Lane Miles**	**% Deficient**	**Deficient Lane Miles***	**% Deficient***
Bristol	115.0	21.4%	541.6	18.8%	649.5	36.6%
Salem	83.6	17.0%	609.5	23.8%	648.3	41.0%
Lynchburg			314.0	11.4%	428.3	27.3%
Richmond	341.7	26.5%	908.0	27.7%	921.5	33.3%
Hampton Roads	180.1	23.5%	325.7	18.9%	336.9	21.6%
Fredericksburg	19.4	7.0%	669.2	31.2%	809.7	37.4%
Culpeper	31.7	11.4%	195.7	10.8%	318.0	34.9%
Staunton	72.7	7.7%	525.5	21.4%	283.7	24.1%
Northern Virginia	185.2	28.8%	660.0	41.7%	1261.8	54.7%
Statewide	1029.3	19.7%	4749.1	22.4%	5657.6	35.8%

*Condition survey was performed on approximately 20 percent of the hard-surfaced secondary pavement network with sample pavement sections from every county

Another measure of pavement quality is ride quality, defined as pavement with an IRI of 140 or less. Statewide, 92.7 percent of interstate and 87.8 percent of primary pavements were rated to have a fair or better ride quality based on the last condition evaluation performed in 2011. Table 13 shows the percent of each district's network with fair or better ride quality by system.

Table 13 Percent of District Network with Fair or Better Ride Quality in 2011

District	Interstate	Primary
Bristol	98.9%	78.6%
Salem	98.0%	90.7%
Lynchburg	NA	95.3%
Richmond	90.5%	85.6%
Hampton Roads	80.4%	89.6%
Fredericksburg	99.5%	90.4%
Culpeper	97.9%	97.7%
Staunton	98.3%	88.6%
Northern Virginia	88.6%	71.8%
Statewide	92.7%	87.8%

Pavement Investment Needs

Pavement investment needs are determined based on the current condition of each section of pavement, cost of the treatment that provides the highest benefit/cost ratio for that section of pavement, and the least cost set of treatments across all pavement sections that will meet the following constraints set for each district:

- At least 82 percent of interstate system pavements in each district have CCI ≥ 60 by end of FY 2012 and that for primary system by the end of FY 2013, respectively
- Maintain current percent of sufficient pavements in districts where more than 82 percent of interstate and primary system pavements are in sufficient condition (CCI ≥ 60: based on the 2011 condition assessment)
- No more than 10 percent of district interstate and primary system pavements in a condition state that requires reconstruction
- Maintain the current average CCI for interstate and primary system pavement in each district

Table 14 shows the maintenance investment required to reach and maintain pavement performance targets on the interstate and primary system for FY 2013 and 2014, and to improve secondary system pavements to 65 percent in sufficient condition.

Table 14 Biennial Maintenance Pavement Investment Needs by System

Pavement		FY 2013 $Million	FY 2014 $Million
	Interstate	$84.3	$43.4
	Primary	228.0	173.8
	Secondary	212.3	218.9
	Total	$524.6	$436.1

Interstate and primary system pavements will require an investment from Maintenance and Operations funds of $312.3million in FY 2013, and $217.2 million in FY 2014 to meet and maintain pavement performance targets. Current FY 2012 funding for the interstate and primary system pavements is approximately $261.1. To increase the pavement conditions on the interstate and primary one percentage point to 83 percent sufficiency statewide would cost $6.5 million and $13.8 million respectively.

Investment needs for secondary system hard surfaced pavements are estimated based on cyclical needs of maintenance activities using a life cycle cost analysis approach and a statewide performance target of 65 percent of lane miles in sufficient condition statewide. This is a slight increase over the current statewide rate of 64.2. The same procedure is adopted for paved shoulders. If this performance level were to be funded, the secondary system pavements would require an estimated $431.2 million investment over the FY 2013-2014 biennium in order to maintain current conditions in each district. To increase the pavement condition statewide to 66 percent sufficiency rate would cost approximately another $30 million. The size of this number is largely due to the size of the secondary system.

A new pavement management system implemented two years ago provides better location-referencing, which enabled this year's assessment to include better information about planned maintenance and rehabilitation work on the interstate and primary system. This provides a more realistic predicted condition of the network in contrast to the network level approach used in the FY 2011-2012 analysis. The use of planned work data for the 2013-2014 analysis shows an increase in interstate asphalt pavement needs and a decrease in interstate concrete pavement needs as compared to the 2011-2012 analysis. The decrease in concrete pavements is due to the extensive repairs completed over the last two years. The analysis of primary system pavement shows that planned work in FY 2012 will improve conditions, but more work is needed to reach and maintain the target over the FY 2013 and 2014 biennium.

The decrease in the needs for secondary pavements and secondary paved shoulders compared to the analysis for FY 2011 and 2012 result from two factors: a decrease in the prices of the asphalt materials as determined from the latest bid-tabs, and a downward revision of the deterioration rates based on the observed network performance in recent years.

Pavement needs are also shown by activity in Table 15 below. Preventative maintenance activities include crack sealing and slurry seal. Corrective maintenance activities include partial

depth patching and ≤ 2" overlay. Restorative maintenance activities include full depth patching and ≤ 4" overlay and major rehabilitation/reconstruction activities including break and seat reconstruction.

At some point in their life cycle all pavements and bridges must be replaced in order to continue providing service and to contribute to reaching the performance targets set by the agency. Bridge replacement and pavement major rehabilitation/reconstruction are considered capital improvement activities which are addressed through the Six-Year Improvement Program. The pavement major rehabilitation/reconstruction needs shown below are not included in totals shown in other tables throughout this report.

Table 15 Pavement Investment Needs by Maintenance and Construction Activities

Pavement		FY 2013 $Million	FY 2014 $Million
	Preventative Maintenance	$23.5	$9.6
	Corrective Maintenance	349.5	345.0
	Restorative Maintenance	151.5	81.6
	Major Rehabilitation/Reconstruction[1]	70.4	106.7
	Total	$594.9	$542.8

Rumble Strips

VDOT maintains 2,887 miles of edge line rumble strips and is gradually expanding the application of centerline rumble strips to improve road safety. The FY 2013-FY 2014 needs for rumble strips are based on funding needed to replace existing inventory of edge line rumble strips on a paving cycle (once every 12 years), to reseal edge line rumble strips on a three year cycle, and to install new centerline rumble strips on 25 percent of qualified highways each year.

Table 16 provides VDOT's inventory of edge line rumble strips. Table 17 provides the estimated mileages of new centerline rumble strips to be installed each year. Table 18 presents the investments required to fulfill rumble strip needs by roadway system.

[1] Pavement major rehabilitation/reconstruction needs will be addressed through the construction program.

Table 16 Miles of Edge Line Rumble Strip Inventory by District

District	Interstate	Primary	Secondary	Total
Bristol	424	8	-	432
Salem	307	14	-	321
Lynchburg	-	73	-	73
Richmond	544	88	-	633
Hampton Roads	159	49	-	208
Fredericksburg	171	-	-	171
Culpeper	237	0	-	237
Staunton	761	0	-	762
Northern Virginia	41	9	-	49
Total:	2,644	242	-	2,887

Table 17 Miles of New Centerline Rumble Strips Estimated to be Installed Each Year

District	Interstate	Primary	Secondary	Total
Bristol	-	62	10	72
Salem	-	67	21	89
Lynchburg	-	87	14	101
Richmond	-	72	16	88
Hampton Roads	-	66	33	99
Fredericksburg	-	64	24	88
Culpeper	-	56	9	65
Staunton	-	50	21	70
Northern Virginia	-	9	21	30
Total:	-	534	168	702

Table 18 Rumble Strip Investment Needs by System

Rumble Strips		**FY 2013 $Million**	**FY 2014 $Million**
	Interstate	$2.2	$2.3
	Primary	0.8	0.8
	Secondary	0.2	0.2
	Total	$3.2	$3.3

Bridges

Bridge Inventory

There are 20,850 bridges and large culverts in Virginia, 19,381 of which are maintained by VDOT. Of these, 13,206 (10,169 bridges and 3,037 culverts) are part of the National Bridge Inventory (NBI). A culvert with a total opening greater than 36 square feet is defined as large; culverts with smaller openings are not included in Virginia's bridge inventory.

Table 19 And Table 20 provide information on the distribution of bridges and large culverts in Virginia by roadway system and by construction district.

Table 19 Number of Bridges and Large Culverts in Virginia as of June 17, 2011

Funding System	VDOT			Non-VDOT			All (VDOT and Non-VDOT)		
	Bridge	Culvert	Total	Bridge	Culvert	Total	Bridge	Culvert	Total
Interstate	1,367	1,021	2,388	2	0	2	1,369	1,021	2,390
Primary	3,004	2,172	5,176	399	120	519	3,403	2,292	5,695
Secondary	7,437	4,330	11,767	85	45	130	7,522	4,375	11,897
Urban	40	3	43	525	258	783	565	261	826
Other*	1	6	7	21	14	35	22	20	42
Total	11,849	7,532	19,381	1,032	437	1,469	12,881	7,969	20,850

*Includes privately owned/maintained structures such as the Chesapeake Bay Bridge-Tunnel

Table 20 VDOT Maintained Bridges and Large Culvers by District and System

District	Interstate	Primary	Secondary	Urban	Total
Bristol	216	906	2,041	0	3,163
Salem	217	736	1,920	5	2,878
Lynchburg	0	602	1,385	0	1,987
Richmond	525	714	1,126	23	2,386
Hampton Roads	456	291	509	6	1,262
Fredericksburg	79	246	472	0	797
Culpeper	122	481	1,039	2	1,644
Staunton	430	783	2,140	7	3,360
Northern Virginia	343	417	1,135	7	1,902
Total	2,388	5,176	11,767	50	19,381

Bridge Performance Measure, Target and Current Condition

In accordance with the Code of Federal Regulations, VDOT inspects bridges and culverts that are part of the NBI, which includes structures on public roadways exceeding 20 feet in length. NBI structures receive detailed inspections at regular intervals not exceeding 24 months. In addition to the federal inventory and inspection requirements, VDOT also inventories and inspects bridges measuring 20 feet or less in length and large culverts having an opening of 36 square feet or greater. These are the only structures not in the NBI. The non-NBI bridges are inspected at intervals not exceeding 24 months, and the non-NBI culverts are inspected at intervals not exceeding 48 months. Inspectors use condition ratings to describe each existing, in-place structure as compared to its as-built condition. These condition ratings are based on the Federal Highway Administration's (FHWA) criteria.

VDOT uses FHWA's criteria for identifying deficient or functionally obsolete structures, as defined below:

- Structurally Deficient (SD)- a structure is defined as SD if it has deficient components (deck, superstructure, substructure) that require the structure to be monitored and/or repaired or if it lacks adequate strength or waterway clearance. When one or more of a structure's major components have a General Condition Rating (GCR) of four (4) or less it becomes an SD structure. A "GCR" is a nationally established numerical grading system with values that range from zero (failed condition) to nine (excellent condition). GCRs are assigned to each major component of each structure during regular inspections and are reported in the inspection reports.
- Functionally Obsolete – a bridge is defined as functionally obsolete if the deck geometry, lane configuration, load carrying capacity, clearances, or approach roadway alignment do not meet today's standards.
- Sufficiency Rating - a formula developed by FHWA to rank structures and allocate federal bridge rehabilitation funds. A sufficiency rating of a structure varies from zero (poor) to 100 (very good). The formula considers a bridge's structural adequacy, functional obsolescence, level of service and importance for public use.

VDOT has set a single system-wide performance measure, as indicated in Table 21. The statewide performance measure of 92 percent of bridges that are not structurally deficient is based on sub-targets of 97 percent of the interstate structure, 94 percent of the primary structure and 89 percent of the secondary structures. The effectiveness of the actions used to extend bridge life can only be measured over a long duration, but the goal of the agency is to significantly slow the deterioration curve. The needs stated in this report are those required to meet this performance measure.

Table 21 Bridge Performance Measure, Target, and Current Performance Measure

Percent of bridges in fair or better condition (not structurally deficient)	Target	Current Performance
Across All Systems	92 %	91.8 %
Interstate	97 %	96.6%
Primary	94 %	94.3%
Secondary	89 %	89.6%

Bridge Conditions

Currently, 11,315 (54.3 percent) of all structures (bridges and large culverts) in Virginia are 40 years old or older. Figure 10 shows the number of structures built in each decade. Table 22 presents the inventory of structurally deficient bridges and large culverts in Virginia by district.

Table 22 Virginia's Inventory of Structurally Deficient Bridges and Large Culverts by System as of June 20, 2011[1]

District	Interstate	Primary	Secondary	Urban	Other	Total
Bristol	13	66	244	19	0	342
Salem	15	49	296	6	0	366
Lynchburg	-	30	120	9	0	159
Richmond	32	59	147	15	0	253
Hampton Roads	4	29	42	16	0	91
Fredericksburg	2	24	45	1	0	72
Culpeper	1	16	102	2	0	121
Staunton	7	40	208	4	0	259
Northern Virginia	6	11	48	-	0	65
Total	80	324	1,252	72	0	1,728

[1]Includes 147 Structures (primarily in urban and other) that are not maintained by VDOT. There are approximately 330 Bridges currently in the 6 year plan.

Figure 17 below shows the distribution of structures by their sufficiency rating and the number recommended for replacement or rehabilitation. Structurally deficient or functionally obsolete structures with sufficiency ratings between 50 and 80 are eligible for federal bridge rehabilitation funds. Structurally deficient or functionally obsolete structures with sufficiency ratings below 50 are eligible for either federal bridge replacement or rehabilitation funds.

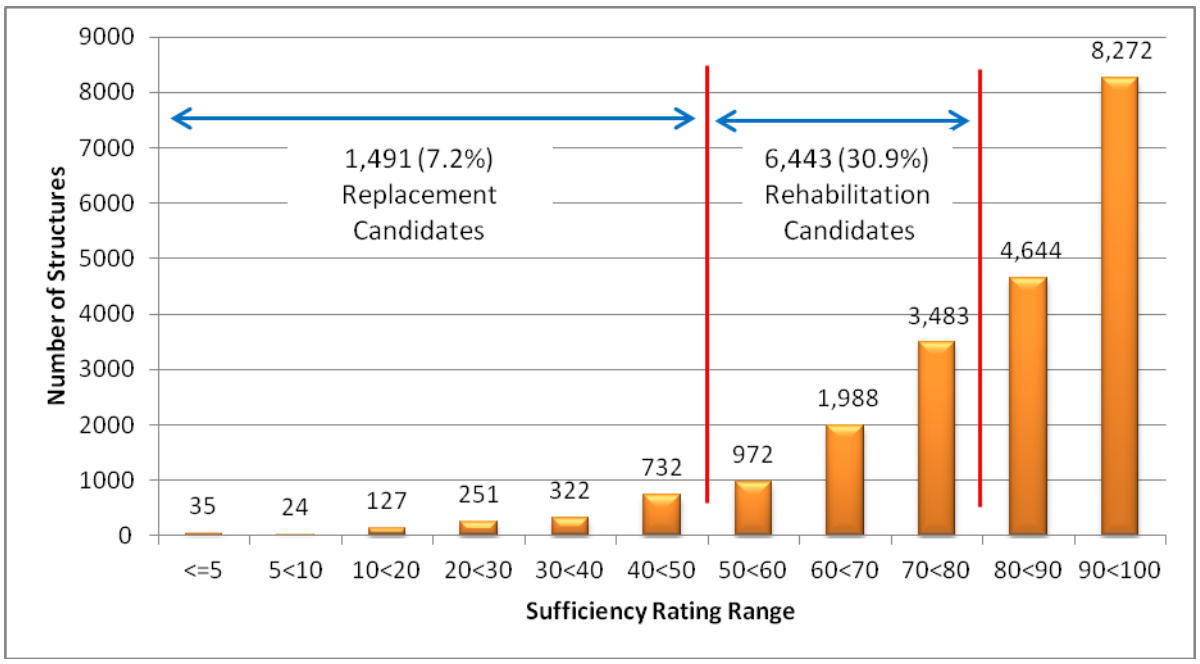

Figure 17 Bridge and Culvert Sufficiency Rating Ranges

Bridge Investment Needs

The number of structurally deficient bridges and large culverts has reversed the increasing trend of previous years and has been decreasing over the last three years (Figure 9). However, as Figure 10 shows, a large number of bridges are more than 50 years in age and present an ever increasing maintenance need over the next several years. Many of the older bridges have already reached the end of their useful life and need to be replaced.

Bridges will require a total of $1,207.6 million in maintenance and replacement investment activities over the FY 2013-2014 biennium in order to maintain the target of 92 percent of bridges and culverts in each district that are not structurally deficient. By far the largest component of this is $916.4 million needed to replace bridges and large culverts at the end of their useful life. This should be funded and delivered through the Six-Year Improvement Program (SYIP). The remaining $291.3 million which would be addressed through the Maintenance and Operations Program includes $88.4 million for preventative maintenance, $188.2 for corrective maintenance, and $14.6 million for major rehabilitation.

There are three categories of statewide bridge investment needs:

- Planned Preventive Maintenance
- Restorative Maintenance
- Major Rehabilitation and Total Bridge Replacement

In the past, VDOT did not report the total replacement needs for bridges and large culverts as they are typically addressed through the construction program. However, bridge replacement is a natural part of the asset cycle and must be performed to replace the asset at the end of its useful life and to maintain bridge performance goals. Bridge replacement needs, which account for $916.4 million of the total bridge needs, are reported here for the first time to reflect the totals needs to be commitment to incrementally replace aging bridges maintaining the target over time. The report presumes that a 10 year plan for replacing approximately $450 million annually. The funds for these projects typically come from the SYIP.

In addition, VDOT is initiating a focused program on planned preventative maintenance of bridges to slow deterioration and extend the useful life of all bridges. Planned preventative maintenance investment needs account for $88.4 million of the total bridge needs over the FY 2013-2014 biennium.

Planned Preventive Maintenance

Planned preventive maintenance (PPM) is a general term for maintenance tasks that prolong the life of a structure. Examples of planned preventive maintenance tasks include thin-bonded deck overlays and spot or zone painting. Ideally, these tasks should be performed at regularly scheduled intervals. This work is generally performed on bridges with good condition ratings and is an important investment in the longevity of existing structures. Certain planned preventive maintenance activities are eligible for federal funding.

Planned preventative maintenance is now a major emphasis for VDOT's bridge maintenance program, as it has been shown that these activities are highly cost-effective. Virginia's experience with PPM activities such as epoxy overlays and joint replacements has shown that the lives of bridges can in some cases be doubled when a PPM program is properly implemented. In a study performed by the Transportation Research Board of the National Academies (Transportation Research Record: Journal of the Transportation Research Board, No. 1795), it was determined that for every dollar spent on PPM programs, $4 to $10 are saved in rehabilitation programs. Additionally, a new emphasis is being placed on PPM by national bodies such as the Federal Highway Administration and AASHTO's Subcommittee on Maintenance, which recently endorsed a definition of bridge preservation that included a strong emphasis on PPM

The goal of the PPM program is to slow the rate of deterioration of structure elements that currently have general condition ratings of six or better[2]. The PPM program extends the average duration over which a bridge element remains in a particular condition by slowing the rate at which bridge elements change from one condition state to lower condition states. The effectiveness of preventative maintenance activities will be assessed by comparing existing deterioration rates to those experienced over time. The specific goal of the planned preventive maintenance program is to decrease the average number of bridge elements that fall from a

[2] See FHWA's condition rating introduction on p. 46.

general condition rating of six to a lower number in any given year by ten percent. Over the long-term, this program lowers the cost of reaching and maintaining performance goals for bridges and large culverts. Table 23 provides a summary of the biennial investment required to meet the PPM investment needs on VDOT maintained structures and bridges.

Table 23 Biennial Planned Preventive Maintenance Investment Needs for Bridges & Culverts

Bridges and Culverts - Planned Preventative Maintenance		FY 2013 $Million	FY 2014 $Million
	Interstate	$18.0	$15.9
	Primary	12.4	20.9
	Secondary	9.7	11.5
	Total	$40.1	$48.3

Restorative Maintenance

Restorative maintenance includes tasks performed to repair damaged bridge elements and thereby restore their condition. These work items include: deck patching, substructure concrete repair (patching), joint repair or replacement, rigid concrete deck overlays and bearing repair. These tasks are performed on an as-needed basis. Certain restorative maintenance activities are eligible for federal funding under the preventive maintenance and system preservation provisions of the Highway Bridge Program. These activities are outlined in a letter from FHWA to VDOT dated May 21, 2010.

Table 24 summarizes the investment required to restore bridge elements to a higher condition state. This work is designated as restorative maintenance.

Table 24 Biennial Restorative Maintenance Repair Investment Needs for Bridges & Culverts

Bridges - Restorative Maintenance		FY 2013 $Million	FY 2014 $Million
	Interstate	$39.8	$34.2
	Primary	28.3	46.1
	Secondary	23.1	16.6
	Total	$91.3	$97.0

The restorative maintenance needs have been developed to account for the continuing deterioration of existing structures over the next biennium. It should be noted that in addition to projects using maintenance and bridge replacement funds, the SYIP has approximately $467 million in bridge projects currently underway and $39 million in bridge projects to be advertised in the next year that are funded through sources not related to maintenance, such as ARRA, Surface Transportation Program (STP) and Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFTEA-LU). These projects, which include replacement of the Gilmerton Bridge, the Huguenot Bridge and the I-95 bridge replacement project in Richmond,

have the effect of reducing the state-wide restorative maintenance needs. The restorative maintenance needs stated above represent a significant increase from those in the previous biennial needs report. There are three primary reasons for the increase:

- The total maintenance bridge program has been severely underfunded for the past several years. Unaddressed restorative maintenance needs tend to accumulate, as new deterioration gets added to previous deterioration.
- The inventory of aging bridges and culverts is growing and deteriorating at an increasing rate. A large number of highway structures have exceeded or are close to exceeding their original design life. Bridges designed prior to 2007 had an anticipated service life of 50 years, and 58% of the current inventory is greater than or equal to 40 years in age (compared to 55% just one year ago). The problem is particularly pronounced on the interstate bridges, where many of the original structures built in the 1950s and 1960s are reaching or exceeding the age of 50.
- Unit prices used in the modeling needs for bridges and large culverts are derived from prices paid on recent contracts. Average unit prices have increased approximately nine percent between 2010 and 2011.

Major Rehabilitation and Total Replacement

Structures in the major rehabilitation and replacement category have deteriorated to such an extent that restorative maintenance is no longer feasible. These structures have been designated as structurally deficient, and in many cases they are also functionally obsolete. Economic and functional considerations require that these structures be replaced in whole or in part. A partial replacement is considered rehabilitation and could include replacement of both the superstructure and deck in addition to major repair of substructure elements such as piers and abutments. Major rehabilitation needs are shown in Table 25.

Table 25 Bridge Major Rehabilitation Needs

Bridges – Major Rehabilitation	FY 2013 $Million	FY 2014 $Million
Interstate	$0.3	$0.4
Primary	0.8	1.1
Secondary	3.9	8.2
Total	$5.0	$9.7

Bridge replacement needs are great and the funding required to meet these needs is commensurately large. To replace every structurally deficient bridge VDOT maintains would require almost $5 billion. These needs are proposed to be addressed over a 10-year period by systematically programming the replacement of aging, structurally deficient bridges in the SYIP. For the FY 2013 - 2014 biennium, bridge total replacement needs are $916.4 million**.** Table 26 represents the bridge replacement needs. Currently, the SYIP includes $469 million in bridge replacement projects scheduled for completion in FY 2013 and FY 2014.

Table 26 Bridge Replacement Needs

Bridges – Full Replacement	FY 2013 $Million	FY 2014 $Million
Interstate	$169.3	$175.0
Primary	178.1	177.5
Secondary	106.2	110.2
Total	$453.6	$462.8

Movable Bridges (Mechanical Mechanisms)

Investment activities for the mechanism(s) which operate movable bridges involve some preventative maintenance tasks as well as component repair, restoration and/or replacement. Table 27 shows these needs.

Table 27 Movable Bridge (Mechanical Mechanisms)

Movable Bridge (Mechanical Mechanisms)	FY 2013 $Million	FY 2014 $Million
Interstate	$2.1	$5.5
Primary	11.4	13.7
Secondary	0.1	0.1
Total	$13.6	$19.3

Tunnels

Inventory

Tunnels are complex assets with large industrial mechanical systems and components for power, ventilation, lighting, fire suppression, drainage, communications, and operations. VDOT operates seven tunnel facilities - four river tunnels, two mountain tunnels, and one urban tunnel. This report is the first time needs have been assessed for the urban tunnel. Table 28 presents the age, location, and traffic volume data for each tunnel (tube) facility. The Hampton Roads Bridge and Downtown Elizabeth River tunnels each have tubes that were built at different times.

Table 28 Average Daily Traffic Volume at Each Tunnel

Tunnel	Age (Years)	Location	Route	ADT (# of vehicles)
Hampton Roads Bridge Tunnel (HRBT)	54, 35	Hampton	I-64	87,000
Elizabeth River Midtown Tunnel (ERT-MT)	49	Norfolk	Rt. 58	35,000
Elizabeth River Downtown Tunnel (ERT-DT)	59, 24	Norfolk	I-264	90,000
Monitor-Merrimac Memorial Bridge Tunnel (MMMBT)	19	Hampton	I-664	59,000
Big Walker Mountain Tunnel (BWMT)	39	Bland County	I-77	27,000
East River Mountain Tunnel (ERMT)	37	Bland County	I-77	29,000
Rosslyn Urban Tunnel (RUT)	27	Arlington	I-66	70,000

[1] Average Daily Traffic Volume. Traffic volumes rounded to the nearest 1,000 vehicles per day

Tunnel Conditions

Ongoing tunnel inspections are conducted at all facilities by a special tunnel inspection team within VDOT to assess conditions and recommend maintenance repairs, reconditioning, and replacements of the various systems and components required to be kept in good operating condition and to maintain the security of these facilities. Also, consultant services have been used to assess conditions for each of the systems within the tunnels and make recommendations for work needed.

Tunnel Investment Needs

The above mentioned tunnel inspection reports have identified approximately $56.2 million in preventative maintenance, maintenance repair, and replacement work. This work is needed to replace aging systems and bring VDOT's tunnels into compliance with National Fire Protection Association (NFPA) Standard 502 which addresses fire protection and fire life safety requirements for road tunnels, bridges, and other limited access highways. Included in the needs are major communication systems rehabilitation and replacement projects such as replacement of a 30+ year old traffic control system and replacement of a communications plant and CCTV cable. Also included is the replacement of critical systems such as electrical circuits, ventilation, and exhaust and fire suppression systems including water lines, pumps, and hydrants; electrical switchgear replacement, and repair to joints and heat tapes. The work is being planned and scheduled over the next six years. The investment needs for tunnels shown in Table 29 below incorporate work planned for FY 2013 and FY 2014.

Table 29 Bienniel Investment Needs for Tunnels

Tunnels		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$21.9	$33.7
	Primary	0.6	0.0
	Total	$22.5	$33.7

Traffic and Safety Asset Investments

Traffic and safety asset investments include major repair and replacement of signs, pavement markings, markers and messages, guardrail and traffic barriers, signals, and lights. The biennial investment needs for traffic and safety assets are $279.7 million in FY 2013 and $282.0 million in FY 2014 as shown in Table 30. Needs for individual traffic and safety assets are presented below.

Table 30 Biennial Investment Needs for Traffic and Safety Assets

Traffic and Safety Assets		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$82.8	$70.0
	Primary	123.2	133.6
	Secondary	73.7	78.3
	Total	$279.7	$282.0

Signs

The assessment for signs includes ground mounted signs, overhead signs, parapet mounted signs, road edge delineators, object marking delineators, Integrated Directional Signing Program (IDSP), and a new sign condition inspection program. Investment activities for signs include the replacement of ground mounted signs, overhead signs and parapet mounted signs. Service needs to repair sign panels, reset sign posts, maintain delineators, and to sustain the IDSP and condition assessment programs are presented in the service section of this report.

Standard traffic signs are regulated in size, color, shape, and message by the federal government, and conform to FHWA's Manual on Uniform Traffic Control Devices (MUTCD). VDOT signs are typically made of 0.100 gauge aluminum, covered with reflective sheeting, and containing either a silk-screened or pressed on reflective message or image. VDOT uses more than 10,000 standard and custom signs on the roadway ranging from deer crossing to speed limit signs. VDOT considers the sign supports to be part of the sign assembly. Sign supports can be overhead structures or posts made of either metal or wood.

Sign Inventory

For this needs assessment, inventory data comes from video data collected as part of the 2008 through 2010 pavement condition assessment. Coverage includes 100 percent of the interstate and primary systems and approximately 65 percent of the secondary system. The sample from the secondary system was extrapolated to provide an estimate of the entire secondary system sign inventory.

Current information on sign inventory is shown in Table 31. The inventory count reflects regulatory, warning, other MUTCD sign, and overhead sign panels. IDSP signs, which are

managed under a separate self-funded program, are not included in this table. Signs are not distributed evenly by system as can be seen when compared to the distribution of lane miles shown in Table 10. Although the interstate accounts for just over four percent of total lane miles, six percent of all signs are on the interstate. The primary system accounts for just over 17 percent of total lane miles, but has 41 percent of all signs. The secondary system, which accounts for 79 percent of all lane miles, has the lowest density of signs at 53 percent.

Table 31 Estimated VDOT Sign Inventory by System

District	Interstate	Primary	Secondary	Total
Bristol	4,992	30,519	30,607	66,118
Salem	5,119	37,179	47,701	89,999
Lynchburg		37,783	25,589	63,372
Richmond	8,575	33,261	40,210	82,046
Hampton Roads	6,937	23,012	17,284	47,233
Fredericksburg	1,893	28,470	27,888	58,251
Culpeper	1,921	26,725	33,007	61,653
Staunton	7,636	29,868	37,639	75,143
Northern Virginia	5,463	23,105	92,700	121,268
Total	42,536	269,922	352,624	665,082

Sign Condition

Condition information for ground mounted signs was last collected by the 2007 random condition survey. That assessment indicated that 92.2 percent, 94.8 percent, and 93.6 percent of signs on the interstate, primary and secondary systems, respectively, were in conditions that required no repair or replacement.

Sign maintenance is generally performed by VDOT with the exception of ordinary repairs to signs on the interstate system, which are performed by interstate maintenance contractors.

Sign Investment Needs

Sign investment and service needs are assessed based on inventory of signs, unit costs of maintenance activities, as well as expected service life and frequency of maintenance activities (e.g., for damaged sign replacement, post resetting, and condition assessment needs). Parapet mounted sign needs are based on engineering estimates of contract based design, construction, engineering analysis, and consulting overhead costs, Needs for delineators and IDSP are based on historical expenditures.

Biennial investment needs for signs are shown in Table 32. The amounts reflect funding required to (1) replace ground mounted sign panels at a 25-year lifecycle (or replace 26,182 sign panels each year), (2) replace overhead sign panels at a 20-year lifecycle (or replace 527 overhead sign panels each year), (3) replace overhead sign structures at a 50-year lifecycle (or

replace 108 overhead sign structures each year), (4) replace damaged ground mounted sign panels at the damage rates of 4.1 percent or about 1,600 signs annually on interstate system, 1 percent or about 2,650 signs annually on primary system, and 1.3 percent or about 4,550 signs annually on secondary system. The damage rates were determined through the 2007 random condition assessment, and (5) to remove 281 identified parapet mounted signs, design and construct replacement signs. The lifecycle, activity frequency and unit cost assumptions applied in the needs analysis are based on industry standards, VDOT maintenance records, recent contracts, funding constraints, and VDOT subject matter expertise.

Table 32 Biennial Investment Needs for Signs

Signs		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$32.4	$18.2
	Primary	19.8	24.2
	Secondary	16.0	19.0
	Total	$68.2	$61.4

Markings, Markers and Messages

Pavement markings, markers and messages are commonly grouped together for VDOT reports; however the approach to determining needs for each of these assets is different. The biennial investment needs for this grouping of assets is shown in Table 33. Further detail for each asset grouping follows.

Table 33 Biennial Investment Needs for Pavement Markings, Markers, and Messages

Markings, Markers and Messages		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$21.5	$22.2
	Primary	43.8	45.2
	Secondary	23.8	24.5
	Total	$89.1	$91.8

Pavement Marking

Pavement markings are non-durable (latex paint) or durable (epoxy, thermoplastic, or tape) lines which demark lanes of traffic from one another, or the edge of the traveling roadway from the shoulder. Pavement marking lines can be of varying widths and color. Width and design type of markings for traffic lanes is dictated by MUTCD, and includes “solid”, “skip”, “double solid” or “passing zone” (solid/skip).

Typically, durable markings (epoxy, thermoplastic, or tape) are applied to high volume interstate and primary roads, with latex paint applied predominantly on primary and secondary roads.

VDOT is responsible for all pavement marking application and maintenance. Most pavement marking is associated with plant mix pavement schedule contracts, since all pavement markings must be replaced when pavement is surfaced.

Pavement Marking Inventory

Estimates of pavement marking inventory and condition in the 2007 biennial needs report were based on extrapolated data from the 2007 random condition survey. No new inventory data has been collected for pavement marking. However, an approximation of VDOT's pavement marking inventory can be derived using pavement inventory and VDOT policies regarding different types and quantities of pavement markings to be applied based on different roadway features such as roadway systems, number of lanes and shoulders, existence of ramps and passing zones, and types of centerline division. This approach was first applied in the 2009 needs assessment and was applied again in the 2011 needs assessment. The 2011 derived pavement marking inventory is shown in Table 34. There are estimated to be over 66,700 miles of pavement markings on VDOT maintained roads, distributed by system.

Table 34 Miles of Pavement Marking by District and System

District	Interstate	Primary	Secondary	Total
Bristol	605	5,043	2,532	8,180
Salem	577	4,288	6,735	11,599
Lynchburg	0	4,416	2,684	7,100
Richmond	1,432	5,204	4,116	10,752
Hampton Roads	953	2,832	183	3,968
Fredericksburg	251	3,251	1,958	5,460
Culpeper	328	3,069	2,784	6,181
Staunton	1,115	4,276	2,621	8,012
Northern Virginia	696	2,122	2,618	5,436
Total	5,956	34,502	26,231	66,689

Pavement Marking Condition

Condition information was not available for this needs assessment.

Pavement Marking Investment Needs

Investment needs to maintain and replace pavement marking, shown in Table 35, are based on an estimated marking inventory, information on paving cycles, marking life cycles, and unit costs for each type of pavement marking material. For example, the paving cycle on interstate pavements is approximately 12 years. Interstate pavement requires six inch tape to be applied when the pavement is resurfaced (embedded in the new pavement). Tape lasts approximately

six years, after which thermoplastic or epoxy marking, which each last about three years, should be applied in year six and again in year nine. Hence, each year, the equivalent of one-twelfth of the interstate network can be expected to require pavement marking equal to the cost of tape plus two times the cost of thermoplastic or epoxy. Similar policy based assumptions for the primary and secondary systems were applied to derive investment needs for pavement marking on non-interstate roadways.

Table 35 Biennial Investment Needs for Pavement Markings

Pavement Markings		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	19.1	19.7
	Primary	37.6	38.7
	Secondary	18.8	19.3
	Total	75.4	77.8

Pavement Markers

Pavement Marker Inventory

Pavement markers are small reflective devices typically adhered to the road surface to identify centerlines, edge lines, and other road elements or features. For this needs assessment, a statewide inventory of pavement markers was estimated using a similar approach as used for pavement markings. Estimates of the inventory, shown in Table 36, are based on the lane miles of pavement and policies guiding where markers should be used.

Table 36 Estimated Pavement Marker Inventory by District and System

District	Interstate	Primary	Secondary	Total
Bristol	18,561	39,040	156	57,757
Salem	17,051	51,838	1,218	70,107
Lynchburg	-	47,024	315	47,339
Richmond	53,382	74,310	9,817	137,509
Hampton Roads	36,877	41,720	1,190	79,787
Fredericksburg	12,394	49,274	3,820	65,488
Culpeper	9,215	26,497	2,166	37,878
Staunton	31,183	35,438	995	67,616
Northern Virginia	30,534	51,838	65,861	148,233
Total	209,197	416,979	85,538	711,714

Pavement Marker Conditions

Where recommended, markers are replaced each time the pavement is resurfaced. Depending on the system, traffic volumes and other factors, pavement is typically resurfaced every nine to 12 years. During the period between each resurfacing, pavement marker lenses should be replaced every three years.

Pavement Marker Investment Needs

The investment needed to maintain and replace pavement markers is based on lens replacement and marker replacement at intervals recommended by best practice policies, that is to replace markers at a 12-year paving cycle, and between resurfacing, replace lenses once every three years. Table 37 shows the pavement marker investment needs for FY 2013 and FY 2014.

Table 37 Biennial Investment Needs for Pavement Markers

Pavement Markers		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$2.2	$2.2
	Primary	4.3	4.5
	Secondary	0.9	0.9
	Total	$7.4	$7.6

Pavement Messages

Pavement messages are words or easily-recognized standard symbols applied to the pavement that complement signs and provide information about regulations, lane or approach designations, warnings, or directions. VDOT is responsible for all pavement message application and maintenance.

Pavement Message Inventory

Based on digital video data collection conducted as part of the 2008 through 2010 pavement condition assessment, there are estimated to be over 110,000 pavement messages on VDOT maintained roads as shown in Table 38. Sixty-six percent of pavement messages are on the secondary system, followed by 31 percent on the primary system. Pavement messages in Northern Virginia and Richmond districts combined represent half (49 percent) of VDOT's pavement message inventory.

Table 38 Estimated Pavement Message Inventory by District and System

District	Interstate	Primary	Secondary	Total
Bristol	740	1,926	2,969	5,635
Salem	621	3,102	4,957	8,680
Lynchburg		1,665	1,927	3,592
Richmond	399	5,865	8,450	14,714
Hampton Roads	912	4,627	3,590	9,129
Fredericksburg	140	3,413	5,016	8,569
Culpeper	119	2,636	7,771	10,526
Staunton	554	3,751	6,147	10,452
Northern Virginia	648	6,739	31,785	39,172
Total	4,133	33,724	72,613	110,470

Pavement Message Condition

Condition information was not available for this needs assessment.

Pavement Message Investment Needs

Pavement Message investment needs are based on unit costs and a six-year life-cycle replacement schedule. Messages, like pavement markings, must be replaced when pavement is resurfaced and at other intervals when materials lose their reflectivity. Like pavement marking, similar business rules were applied to determine when messages should be replaced. Investment needs, shown in Table 39, were derived by applying the six-year lifecycle replacement frequency and unit costs to the inventory data.

Table 39 Biennial Investment Needs for Pavement Messages

Pavement Messages		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$0.2	$0.2
	Primary	1.9	2.0
	Secondary	4.1	4.2
	Total	$6.3	$6.4

Guardrail and Traffic Barriers

Guardrail and traffic barriers are installed on the right-of-way to reduce the potential for, and severity of, accidents involving vehicles running off the road. They are designed to gently contain, hold and redirect a vehicle back onto the roadway if it should leave the travel lane. It is an important safety feature of any roadway system and should have minimal deficiencies in order to perform properly.

Guardrail and Traffic Barrier Inventory

Guardrail and traffic barrier inventory data were derived from the 2008 through 2010 pavement condition assessment which cover 100 percent of the interstate and primary systems and approximately 65 percent of the secondary system. The sample from the secondary system was extrapolated to provide an estimate of the entire secondary system guardrail inventory.

There is an estimated 6,532 miles of guardrail and 367 miles of traffic barriers on VDOT maintained roads. Table 40 and Table 41 show VDOT guardrail and traffic barrier inventories distributed by district and system. Federal standards for guardrail have changed several times over the last 40 years and as a result, VDOT has several different types of guardrail on the roadway system, including GR-2, GR-8, GR-3, MB-3, and MB-5.

Table 40 VDOT Guardrail Inventory by System (miles)

District	Interstate	Primary	Secondary	Total
Bristol	168	551	583	1,302
Salem	219	385	319	923
Lynchburg	-	387	159	546
Richmond	366	394	207	967
Hampton Roads	223	146	65	433
Fredericksburg	75	171	91	433
Culpeper	87	222	195	505
Staunton	323	262	289	874
Northern Virginia	323	262	222	645
Total	1,637	2,765	2,131	6,532

Table 41 VDOT Traffic Barrier Inventory by System (miles)

District	Interstate	Primary	Secondary	Total
Bristol	15	8	0	22
Salem	6	9	0	16
Lynchburg	0	2	0	2
Richmond	54	6	1	61
Hampton Roads	94	5	3	102
Fredericksburg	0	3	0	3
Culpeper	2	0	0	2
Staunton	5	0	0	5
Northern Virginia	138	8	7	153
Total	313	42	12	367

Guardrail and Traffic Barrier Conditions

The digital video used to capture inventory data is not adequate to determine condition of guardrail, other than sections with obvious damage. The last statewide condition assessment of guardrail was performed in 2007. That assessment indicated that 98.3 percent, 98.4 percent, and 97.9 percent of guardrail on the interstate, primary and secondary systems respectively were in a condition that required no repair. No condition information is available for traffic barriers.

While the 2007 random condition assessment indicated that less than three percent of guardrail is in need of repair, approximately 50 percent of guardrail is no longer compliant with current National Cooperative Highway Research Program 350 standards. Guardrail may remain in satisfactory condition for many years until it is hit or damaged by storms, erosion or other factors. When damage occurs, replacement of the guardrail and guardrail posts and terminals is usually called for. Non-compliant guardrail is generally replaced as part of paving operations, particularly if the project uses federal funds.

Guardrail and Traffic Barrier Investment Needs

Biennial needs for guardrail and guardrail terminals include funding required for (1) replacement of assets at a 36-year life cycle (or replacement of 190 miles of guardrail and 3,700 ends each year), (2) spot repairs of guardrails at the damage rates of 1.47 percent, 1.58 percent, and 2.46 percent on interstate, primary and secondary systems respectively as estimated from the 2007 random condition assessment (equivalent to replacement of 126 miles of guardrail each year), (3) spot repairs of guardrail terminals at one percent, two percent, and six percent on interstate, primary, and secondary systems respectively as estimated from the 2007 random condition assessment (equivalent to replacement of 4,150 ends annually), (4) upgrade of non-compliant assets at a one percent annual rate (or upgrade of 65 miles of guardrails and 1,342 ends each year) , and (5) condition assessment on the assets at a five-year cycle.

Guardrail and terminal investment needs include life cycle replacement and non-compliant upgrade needs. They are shown in Table 42. The remaining categories as well as traffic barrier needs (determined based on historical expenditures) are considered service needs and will be discussed later in the service section of the report.

Table 42 Biennial Investment Needs for Guardrail and Guardrail Terminals

Guardrail and Terminals		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$14.2	$14.7
	Primary	26.7	27.5
	Secondary	19.8	20.4
	Total	$60.7	$62.5

Signal Systems

Signal systems include signalized intersections and flashers. Table 43 summarizes VDOT's inventory of 3,244 signal systems by district and system, including 2,834 signalized intersections and 410 flashers. Each signalized intersection or flasher may have a number of components, including but not limited to (1) structure components such as mast arms, span wires, poles, and foundations, (2) hardware components such as signal heads, controllers, cabinets, modems, and/or priority control devices; (3) detection components such as loop detectors, cameras, camera processors, and/or priority control detectors; and (4) many other devices or software systems standard to a signal system such as malfunction management units, controller systems, uninterruptible power systems, battery packs, Ethernet switches, audible pedestrian push buttons. The VDOT maintained signal inventory grows at a rate of approximately 100 new signalized intersections and flashers each year.

Table 43 VDOT Statewide Signalized intersection and Flasher Inventory

District	Interstate	Primary	Secondary	Total
Bristol	6	111	-	117
Salem	4	183	12	199
Lynchburg	-	122	11	133
Richmond	17	441	92	550
Hampton Roads	1	185	33	219
Fredericksburg	2	243	69	314
Culpeper	4	151	24	179
Staunton	29	190	20	239
Northern Virginia	1	453	840	1,294
Total	64	2,079	1,101	3,244

Signal System Condition

Signal systems are electronic devices and hence, are susceptible to damage and deterioration caused by exposure to moisture, dirt, and extreme temperatures. Condition data on the statewide inventory of signal systems was not available for this needs assessment.

Signal System Investment Needs

Signal system investment needs are assessed through an analytical model developed in 2009 for determining needs based on current and projected future inventory counts, their major components, expected service lives of assets and their major components, recommended schedules for preventative maintenance and life-cycle replacement of components or entire assets, unit costs for each type of work, and the frequency of work required. The reported signal investment and service needs include preventive maintenance, repair, replacement, and operating needs. Also included is funding required for signal optimization, and payments to

Arlington County, Virginia for the maintenance of 128 VDOT owned signals located in Arlington. This section focuses on repair and replacement needs, which are considered investment needs. Needs for the remaining activities are considered service needs and will be discussed later in the service section of this report.

Biennial investment needs for signal systems are shown in Table 44. Investment activities include repair and replacement required to restore a damaged or deteriorated asset to its design, functionality, and capability. Repair actions are normally triggered by trouble calls regarding signal malfunction. Needs for repairs are calculated as the product of repair frequencies, repair unit costs, and inventory counts. Repair frequencies are derived from work histories showing the number of repairs performed on each signal annually. Repair unit costs take into account average repair duration, as well as labor, material, equipment, and traffic control costs.

Maintenance replacement refers to the replacement or complete restoration of assets that cannot be repaired. Replacement needs are determined using a life cycle approach: first, the expected service life of signal components are estimated; then, where age data is available (e.g., in Northern Virginia District), replacement needs are scheduled out according to component ages relative to their expected service lives; where age data is not available, replacement needs are annualized based on expected service life. Service life estimates take into account manufacture or industry recommended device lives, field knowledge on actual devices' service lengths, and judgment on reasonably achievable replacement cycles under a budget constrained environment. Although, expected service lives vary by signal component, most non-structure components have a service length of between five and 15 years.

Table 44 Biennial Investment Needs for Signals

Signals		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$1.2	$1.1
	Primary	30.2	34.0
	Secondary	13.7	13.9
	Total	$45.1	$49.0

Lights

Light Inventory

Highway lighting consists of the optical system-lamp, ballast, photocell or photoelectric control, structural system-mounting brackets, pole, mast arm, transformer base and foundation, supporting electrical equipment-service cabinet, junction box, conduit and wiring. VDOT owns conventional, high mast, and sign lights, that are located on the right of way. Table 45 summarizes VDOT's inventory of lights by district and system.

Table 45 VDOT Statewide Lighting Inventory

District	Interstate	Primary	Secondary	Total
Bristol	167	-	-	167
Salem	728	608	25	1,361
Lynchburg	-	303	-	303
Richmond	1,551	1,103	-	2,654
Hampton Roads	6,129	1,007	-	7,136
Fredericksburg	2,495	510	10	3,015
Culpeper	27	-	60	87
Staunton	133	110	-	243
Northern Virginia	14,073	6,298	1,229	21,600
Total	25,303	9,939	1,324	36,566

Light Condition

Condition information was not available for this needs assessment.

Light Needs

Biennial needs for lights include structure repair, relamping, life cycle replacement, underground utility line replacement, and utility payments. Needs are based on inventory counts provided by field staff, expected service life of lighting components, estimated re-lamping frequencies, estimated structure repair requirements, energy cost expenditures, and recent unit cost data on replacement of underground utility line.

Investment needs for lights are shown in Table 46. Investment activities include repair and replacement required to restore a damaged or deteriorated light to design, functionality, and capability specifications. Specifically, re-lamping needs were estimated based on a five year lamp replacement cycle (or replacement of about 7,300 lamps each year) as estimated through a 2008 risk based pilot study; life cycle replacement needs assume a 35 year life cycle for conventional and high mast lights and a five year life cycle for sign lights, which is equivalent to an annual replacement of about 500 conventional lights, 30 high mast lights, and 3,650 sign lights. Needs for underground utility line replacement are based on the cost of ongoing field utility line replacement projects.

Table 46 Biennial Investment Needs for Lights

Lights		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$13.5	$13.9
	Primary	2.7	2.8
	Secondary	0.5	0.5
	Total	16.7	17.2

Traffic Operation Center (TOC) and Technology Asset Investments

TOC and Technology Asset Inventory

TOC and technology assets include Intelligent Transportation System (ITS) assets, such as cameras, traffic sensors, dynamic message signs (DMS), high occupancy vehicle (HOV) gates, communications infrastructure (such as agency-owned copper, coaxial, Ethernet, and fiber optic cables, and associated conduit systems) and telecommunications hardware (such as agency-owned communications equipments such as modem, routers, network switches, and media converters). Technology assets are used extensively by VDOT's five traffic operations centers (TOCs) to monitor traffic conditions and manage traffic flow and incidents. Available inventory for technology assets is provided in Table 47.

Table 47 Statewide Inventory of Technology Assets

Asset	Interstate	Primary	Secondary	Total
Lane Use Signals	29	-	-	29
Ramp Meters	24	-	-	24
Traffic Sensors	2,815	-	-	2,815
Cameras	574	67	-	641
Dynamic Message Signs	350	135	11	496
Portable Message Signs	72	7	-	79
Weather Sensors	60	21	-	81
Variable Speed Limit Sign	55	-	-	55
HOV Gates	167	-	-	167
Highway Advisory Radio	18	2	-	20

TOC and Technology Asset Conditions

TOC and technology assets are electronic devices and hence, are susceptible to damage and deterioration caused by exposure to moisture, dirt, and extreme temperatures. Condition data on these assets was not available for this needs assessment.

TOC and Technology Asset Investment Needs

Biennial needs for most of the technology assets are assessed through analytical models, which determine needs based on current and projected future inventory counts, expected service life of assets and/or their major components, recommended schedules for preventative maintenance, and life-cycle replacement of components or entire assets, unit costs for each type of work, and the frequency of work. Biennial needs for variable speed limit signs are determined based on historical expenditure. Needs for fog detection systems, communications infrastructure and telecommunications hardware are determined primarily based on regional ITS maintenance contracts.

The reported investment and service needs for technology assets include preventive maintenance, repair, replacement and operating needs. Also included is funding required for field operation support, TOC operations, ITS program development activities, and an ITS system engineering program. This section focuses on technology assets repair and replacement needs, which are considered investment needs. Needs for the remaining activities and programs are considered service needs and will be presented in the service section of the report.

Biennial investment needs for technology assets are shown in Table 48. Investment activities include repair and replacement required to restore a damaged or deteriorated asset to design, functionality, and capability. Repair actions are normally triggered by trouble calls regarding asset malfunction. Repair needs are calculated as the product of repair frequencies, repair unit costs, and inventory counts. Repair frequencies are derived from work histories, contract or field practice based estimates. Repair unit costs take into account labor, equipment, material costs, as well as traffic control costs.

Replacement maintenance refers to the replacement or complete restoration of assets that cannot be repaired. Replacement needs are determined using a life cycle approach: first the expected service life of an asset or its major components is estimated; then, where age data is available (e.g., for assets DMS and cameras), replacement needs are scheduled out according to assets' ages relative to their expected service lives; where age data is not available, replacement needs are annualized based on assets' expected service lives. Service life estimates take into account manufacture or industry recommended device lives, and field knowledge on actual devices' service lengths. Although expected service lives vary by assets, their components, most of them and their components have a useful life of between four and 25 years.

Table 48 Biennial Investment Needs for TOC and Technology Assets

TOC and Technology		FY 2013 ($Millions)	FY 2014 ($Millions)
	Interstate	$24.2	$36.5
	Primary	5.7	6.1
	Secondary	0.3	0.2
	Total	$30.3	$42.8

Maintenance and Operations Services

Funds needed to deliver maintenance and operations services over the biennium total $1.813 billion or approximately 48 percent of the total biennial needs. Developing, improving, and refining definitions of service operations has been an on-going effort since 2009, which involved extensive research and engagement of many subject matter experts from across the agency.

Each maintenance and operations activity tracked by the agency has been classified as a component of one of five major service areas, shown in Figure 8, and further classified as either "investment" or "service" based on the nature of the activity. Within the five service areas are "service groups" which are further delineations of each service area. Table 49 below shows the biennial service needs for all service areas and service groups. Further detail on each service group follows.

Maintenance and operations "services" include:

- Ordinary maintenance of pavements, bridges, tunnels, signs, guardrail and traffic barriers, signals, lighting, and TOC and technology assets. Ordinary maintenance performed on them include activities such as asphalt patching, cleaning, debris and liter pick up, flushing, inspection, and utility payments
- All maintenance work on other assets
- All operational and administrative services such as snow and ice removal, Safety Service Patrol and other emergency and safety response services, 511 and other traveler information services, ferry service, traffic operations, facility operations, signal timing optimization, traffic engineering studies, planning and preliminary engineering for maintenance and operations, traffic count program, land use permits, and program management and direction

As of April 2010, 100 percent of ordinary maintenance on VDOT maintained interstate is outsourced. Statewide, there are thirteen Turnkey Asset Maintenance Services (TAMS) Contracts covering over 6,500 lane miles. In general, these contracts provide maintenance services for the repair or replacement of roadway assets, vegetation management, emergency and incident response, and snow and ice control services. In a few cases, snow and ice control are handled under a separate contract. The value for TAMS contracts statewide is approximately $86 million for FY 2013 and approximately $87 million for FY 2014.

Table 49 Biennial Service Needs for Service Areas and Service Groups

Service Area	Service Group	FY 2013 $Million	FY 2014 $Million
Emergency and Incident Management	Incident Response	$6.6	$6.8
	Snow and Ice	155.0	159.8
	TOC and Technology	53.7	55.4
	Sub-Total	$215.3	$222.1
Traffic and Safety	Guardrail and Traffic Barriers	26.8	27.6
	Lights	2.8	2.9
	Miscellaneous Traffic and Safety	33.5	35.0
	Signals	31.6	34.1
	Signs	9.2	9.4
	Sub-Total	$103.8	$109.1
Roadway	Bridges	88.1	85.2
	Road Surface	88.2	90.9
	Tunnels	20.1	18.1
	Sub-Total	$196.4	$194.3
Roadside	Drainage and Slopes	98.6	101.6
	Sound Barriers and Fences	2.1	2.2
	Vegetation management	74.8	77.1
	Sub-Total	$175.5	$180.9
Facility and Other	Equipment and Inventory Management	70.3	72.2
	Ferries	12.1	12.5
	Management and Direction	73.7	76.3
	Miscellaneous Facility and Other	6.4	6.6
	Permitting	9.0	9.3
	Safety Rest Areas and Waysides	31.2	30.3
	Sidewalks and Trails	3.0	3.1
	Sub-Total	205.7	210.3
	Grand Total	$896.8	$916.6

Emergency and Incident Management

Emergency and incident management includes incident response, snow and ice control, traffic management and traveler information services, and ordinary maintenance services for technology assets.

Many of VDOT services are provided by contractors, including ordinary maintenance on the interstate. However, the Commonwealth has determined that VDOT plays a critical emergency response role and should maintain a minimum level of emergency response capability across the state with people, equipment and materials. Hence, VDOT has made a strategic decision to maintain a minimum number of employees who can provide emergency response services during severe weather and other events. When not performing emergency response, these employees are performing maintenance and operations duties.

Table 50 below shows biennial service needs for emergency and incident management.

Table 50 Biennial Service Needs for Emergency and Incident Management

Emergency and Incident Management	FY 2013 ($Millions)	FY 2014 ($Millions)
Incident Response	$6.6	$6.8
Snow and Ice	155.0	159.8
TOC and Technology	53.7	55.4
Total	$215.3	$222.1

Incident Response

Incident response services include disaster support such as coordination of operations, clearance, removal, and/or disposal of downed trees, mud and silt, traffic control for emergency response, and support for unplanned and unexpected events and incidents which impede the flow of traffic. This service group also includes incident management operations, which includes all non-federal incident management activities, including state or contractor labor & support services. Also included is VDOT's Customer Service Call Center which takes citizen calls and answers transportation questions 24 hours a day, seven days a week. The call center is located in Salem with a satellite office in Northern Virginia.

Timeliness of response and hours of service are the most important factors to consider in delivering this service. Biennial needs for incident response are based on the staffing, equipment, and support needed to operate those services at their current level.

Snow and Ice

One of the most important services VDOT provides is snow and ice control. Winter storms can create dangerous driving conditions, leave people stranded, and bring economic activity to a standstill. The service standards for snow and ice control focus on planning, pre-treating, and returning roads to bare pavement as soon as possible. Snow and ice control are delivered through a combination of maintenance contractors on the interstate, and VDOT staff or other contractors on the primary and secondary systems. Biennial service needs for snow and ice control were determined based on expenditures from fiscal years 2009 and 2011. Fiscal year 2010 was excluded due to the abnormally severe winter. After the winter in FY 2008, VDOT instituted revised processes and procedures for emergency events, including a formalized duty officer structure, expanding the anti-icing program, and establishing formal snow mobilization plans. As a result, expenditure data prior to FY 2009 were not applicable.

TOC and Technology

TOC and technology services includes the operation of the five Traffic Operations Centers (TOC) as well as the services they provide, Safety Service Patrol (SSP), technology assets, program development, planning, engineering, and field support for ITS projects and new technologies. These centers are key emergency response hubs directing and coordinating not only traffic flows, crash scene clearance, but also the removal of vehicles broken down on the roadway. They are also command centers during winter weather and other emergency events.

VDOT's TOCs are high-tech communication hubs managing some of the nation's busiest roadways. Controllers at the TOCs oversee hundreds of miles of roads utilizing extensive networks of technology. The TOCs use weather and environmental sensors to monitor rain, snow and ice conditions, traffic cameras and sensors to monitor traffic and to alert operators of conditions indicating a possible crash, and dynamic message signs and highway advisory radios (HAR) to alert the public of traffic conditions. The TOCs also provide traffic and road condition information to the emergency operations center in Richmond, radio stations, and the 511 telephone and web services. In addition to congestion mitigation, incident management and traffic planning efforts, the TOCs also play an integral role during hurricane and other emergency evacuations.

Currently, VDOT has two Advanced Traffic Management Systems. These are mission critical systems that control all field devices, monitor traffic, and operate gates and lane control signals. Four of the five TOCs (Northern Virginia, Richmond, Salem and Staunton) are on one software platform and the fifth center (Hampton Roads) is on another. Having two software platforms introduces increased costs for software maintenance and makes center to center interoperability more difficult. Salem and Staunton TOCs are fully interoperable. Northern Virginia has a stand-alone backup system in the event of a failure. A planning effort is underway to determine statewide system requirements and development of a procurement strategy to move all TOCs to

a single software platform. The effort will also include assessing the required financial investment to move to a single platform.

Biennial needs for the TOCs are based on the value of current contracts, basic operations costs, and on planned system repairs for FY 2013 and FY 2014.

VDOT contracts for SSPs along urban interstates in Northern Virginia, Fredericksburg and Hampton Roads and are planning on expanding service to the Richmond and Roanoke area to 2009 service levels. Interstate maintenance contractors provide similar incident response type services on interstates not covered by SSPs. VDOT maintenance crews provide these services on all other VDOT maintained roads. The function of SSPs is to reduce delays caused by non-recurring congestion, particularly crashes and breakdowns on the interstate. For every minute of delay it takes four minutes for the traffic to return to normal operating speeds. SSPs are mobile units specifically operated in high congestion corridors to employ “quick clearance” techniques and return traffic to normal operation. They also serve motorists who break down and need assistance. Moving vehicles as quickly as possible reduces rubbernecking and secondary crashes.

Technology assets include traffic cameras, dynamic message signs, variable speed limit signs, HOV gates, fog detection systems, traffic sensors, ramp meters, telecommunications hardware, communications infrastructure, road weather information systems (RWIS), and highway advisory radio. Maintenance services for technology assets are preventative in nature and typically do not extend the life of the asset.

Biennial needs for technology asset maintenance services, mainly including ordinary maintenance and operating activities, are assessed through analytical models that use current and future inventory counts, expected service life of assets and their major components, unit costs for each type of work and component, and the frequency of work required. The model takes into account factors such as maintenance of traffic, preventative maintenance schedules and frequency of unexpected maintenance calls.

Roadway

Roadway services consist of road surface management, bridge management, and tunnel management and include ordinary maintenance activities on road surfaces, bridges and tunnels. Biennial service needs for road surfaces, bridges and tunnels shown in Table 51 are based on the current inventory of assets, the unit cost of each activity, the frequency of performing each activity needed, and in some cases, known project work to upgrade systems and/or components. Also included are bridge safety inspections and tunnel and movable bridge operations.

Table 51 Biennial Service Needs for for Roadway

Roadway		FY 2013 ($Millions)	FY 2014 ($Millions)
	Bridges	$88.1	$85.2
	Road Surface	88.2	90.9
	Tunnels	20.1	18.1
	Total	$196.4	$194.3

Bridges

Bridge services include bridge inspections, ordinary maintenance, and movable bridge operations. Ordinary bridge maintenance activities include deck sweeping, concrete deck washing, cleaning, and vegetation and debris removal. Like planned preventative maintenance, ordinary maintenance is generally performed on bridges with good condition ratings, however, ordinary maintenance activities do not extend asset service life.

Bridge inspections are conducted in accordance with the National Bridge Inspection Standards. Needs for bridge inspection services are based on average unit costs from current contracts and state forces and the required number of inspections. Needs for moveable bridge operations are based on the value of current contracts for those services. An inventory of state maintained movable bridges is shown in Table 52.

Table 52 State Maintained Moveable Bridges

Bridge	Location	Route
Gwynn's Island Bridge	Mathews	Route 223/633
Eltham Bridge	King William County	Route 30/33
Benjamin Harrison Bridge	Prince George County	Route 156
Berkley Bridge	Norfolk	Interstate 264
High Rise Bridge	Chesapeake	I-64
James River Bridge	Newport News/ Isle of Wight (Suffolk)	U.S. Route 17
Coleman Bridge	Yorktown/ Gloucester	U.S. Route 17

Road Surface

Road surface services include ordinary maintenance activities performed on pavement and bike lanes, such as asphalt pot-hole repair and debris removal on hard-surfaced pavements. In addition, it includes activities such as machining, grading, shaping, and dust control on unpaved roads and unpaved shoulders. Quickly responding to pot-holes on pavements is critical to reduce vehicle damage and potential safety concerns. Road surface services also include payments made to railroad companies for the maintenance of automatically operated gates,

signals, and other automatic crossing warning devices in pursuant to 56-406.2, Code of Virginia, 1950, as amended.

Biennial service needs for bike lanes, payments to railroads, and for hard surfaced primary and secondary system roads are based on expenditures from FY 2011. On the interstate, road surface services are delivered by maintenance contractors. Needs for non hard-surfaced pavements and unpaved shoulders are estimated using the inventory lane-miles and the costs for typical maintenance activities required on a cyclical basis.

Tunnels

VDOT operates and maintains seven tunnel facilities throughout the state as shown in Table 28.

Tunnel service needs include tunnel management services for the seven state maintained facilities, including those activities required to operate the river and mountain tunnels 24 hours a day, seven days a week, as well as the cost of utilities. Tunnel needs are based on current contracts for tunnel operations services.

In June 2011, VDOT and Elizabeth River Crossings LLC (ERC) reached agreement on the major business points for the Elizabeth River Downtown Tunnel/Midtown Tunnel/Martin Luther King Extension Project. As part of this PPTA (Public Private Transportation Act) project, the maintenance and operation of the two Elizabeth River Tunnels will be turned over to ERC sometime in the fall of 2012. In accordance with this plan, VDOT has included maintenance and operations needs for the Elizabeth River Tunnels only through the second quarter of FY 2013. Also included in the needs are $9 million in annual payments from VDOT to ERC as part of the PPTA agreement. The Commonwealth (VDOT) will provide between $45 and $48 million to ERC for taking over the maintenance and operation as well as offsetting the initial cost of the ERT project. These payments are included in the FY 2013 and FY 2014 tunnel service needs.

Traffic and Safety

Traffic and safety services include ordinary maintenance on signs, signals, guardrail and traffic barriers, lighting, and miscellaneous traffic and safety service such as traffic count program, traffic engineering studies, and traffic engineering structure inspection. Biennial service needs for traffic and safety service area are shown in Table 53.

Table 53 Biennial Service Needs for Traffic and Safety

Traffic and Safety	FY 2013 ($Millions)	FY 2014 ($Millions)
Guardrail and Traffic Barriers	$26.8	$27.6
Lights	2.8	2.9
Signals	31.6	34.1
Signs	9.2	9.4
Miscellaneous Traffic and Safety	33.5	35.0
Total	$103.8	$109.1

Guardrail and Traffic Barriers, Lights, Signals, and Sign Service Groups

The guardrail and traffic barrier service group includes ordinary maintenance on guardrail, end treatments, impact attenuators, truck ramps, and traffic barriers. The lights service group includes service on highway lighting asset. The signal service group includes service on traffic signal asset, school crossing signal asset, as well as traffic signal optimization, and signal system planning and engineering programs. Finally, the sign service group includes maintenance services on ground mounted signs, overhead signs, road edge delineators, object marking delineators and the Integrated Directional Signing Program.

Maintenance services on these assets include ordinary maintenance such as cleaning and debris removal, and preventative maintenance, as well as asset operating activities such as lighting utilities and signal operations. These types of maintenance services are generally performed by VDOT with the exception of ordinary repairs to signs, signals, guardrails, traffic barriers on the interstate system, which are performed by TAMS contractors. Biennial needs for maintenance services on highway lighting, signals, signs, guardrail, and end treatments are based on four things: the estimated inventory of each asset type on each roadway system, the expected useful life of each asset type, the unit cost of each maintenance activity, and the frequency of maintenance needed. For all other traffic and safety assets, biennial maintenance service needs used expenditures from FY 2011 to develop the service needs.

Needs for signing programs and signal timing operations are modeled using a different approach. The integrated directional signing program promotes and regulates the use of signs for travel services and attractions. It is fee based and self funded. Signal timing operations covers the periodic review and updating of traffic signal timing schedules to reflect changes in traffic patterns, with the goal of minimizing delay and optimizing throughput.

Miscellaneous Traffic and Safety Services

Other traffic and safety services include the traffic count program, traffic engineering studies, and traffic engineering structure inspection. The focus of the traffic counts program is to collect,

analyze and prepare information for VDOT's annual submission to the Federal Highway Administration, although the data is used for many other purposes. VDOT also receives frequent external requests for traffic data. Other traffic engineering services include safety studies, signal warrants, speed zone studies, work zone analysis and planning, and special studies. Biennial needs for miscellaneous traffic and safety services are based on estimated staffing levels to sustain each program and the estimated staffing costs.

Roadside

Roadside services include drainage and slopes, vegetation management, sound barriers and fences. Table 54 shows biennial service needs for roadside.

Table 54 Biennial Service Needs for Roadside

Roadside		FY 2013 ($Millions)	FY 2014 ($Millions)
	Drainage and Slopes	$98.6	$101.6
	Vegetation Management	74.8	77.1
	Sound Barriers and Fences	2.1	2.2
	Sub-Total	$175.5	$180.9

Drainage and Slopes

Drainage management includes all maintenance activities performed on drainage assets such as ditches, pipes, curb and gutter, slopes, rock slide protection, retaining walls, and storm water basins. These assets work as a system to move water off of and way from pavements and bridges where it can contribute to more rapid deterioration of those assets. The size, capacity and configuration of drainage assets such as pipes and ditches are specified to accommodate water equivalent to 50 year storm events. Table 55 through Table 59 show the current estimated inventory of drainage and slope assets on VDOT maintained roads. Biennial needs for cross pipes, ditches, drop inlets, and curb & gutter are based on estimated inventory, unit cost of maintenance, and work frequencies. Needs for drainage and slopes assets for which inventory data is not available are based on FY 2011 expenditures.

Table 55 Estimated Statewide Paved Ditch Inventory (miles)

District	Interstate	Primary	Secondary	Total
Bristol	73	55	43	171
Salem	48	95	112	256
Lynchburg	-	89	49	137
Richmond	100	94	325	519
Hampton Roads	21	17	113	151
Fredericksburg	6	59	84	149
Culpeper	34	31	88	154
Staunton	94	49	43	186
Northern Virginia	10	18	153	180
Total	386	508	1,010	1,903

Table 56 Estimated Statewide Unpaved Ditch Inventory (miles)

District	Interstate	Primary	Secondary	Total
Bristol	151	199	1,485	1,835
Salem	178	386	1,875	2,439
Lynchburg	-	445	2,368	2,813
Richmond	311	723	5,557	6,591
Hampton Roads	122	593	4,348	5,062
Fredericksburg	44	511	5,847	6,402
Culpeper	114	274	3,809	4,196
Staunton	341	299	3,427	4,066
Northern Virginia	40	222	1,602	1,864
Total	1,299	3,652	30,317	35,268

Table 57 Estimated Statewide Curb and Gutter Inventory (miles)

District	Interstate	Primary	Secondary	Total
Bristol	24	103	87	215
Salem	5	136	447	587
Lynchburg	-	135	92	226
Richmond	72	298	1,091	1,461
Hampton Roads	68	124	405	597
Fredericksburg	1	131	193	326
Culpeper	3	50	253	306
Staunton	4	128	304	436
Northern Virginia	68	291	5,989	6,347
Total	245	1,395	8,861	10,501

Table **58 Estimated Statewide Cross Pipe Inventory (each)**

District	Interstate	Primary	Secondary	Total
Bristol	851	11,630	54,167	66,648
Salem	1,008	7,253	47,759	56,021
Lynchburg	0	8,181	29,719	37,900
Richmond	2,268	7,392	32,953	42,613
Hampton Roads	1,023	3,131	12,778	16,932
Fredericksburg	343	4,709	18,628	23,681
Culpeper	456	4,987	21,973	27,416
Staunton	2,097	8,261	40,067	50,426
Northern Virginia	352	1,827	14,172	16,351
Total	8,399	57,371	272,216	337,985

Table 59 Estimated Statewide Drop Inlet Inventory (each)

District	Interstate	Primary	Secondary	Total
Bristol	717	3,393	1,968	6,078
Salem	658	3,944	6,374	10,976
Lynchburg		3,033	1,407	4,440
Richmond	1,873	6,514	13,771	22,158
Hampton Roads	4,210	2,784	6,548	13,542
Fredericksburg	74	2,569	3,467	6,110
Culpeper	178	1,296	4,354	5,828
Staunton	1,347	2,096	5,270	8,713
Northern Virginia	2,702	6,542	90,299	99,543
Total	11,759	32,171	133,459	177,389

Vegetation Management

Vegetation management services are concerned with roadside aesthetics and appearance, but the priority is on maintaining sight distances that enable safe travel. Table 60 and Table 61 below show estimated inventories of the most prominent types of vegetation. Inventories for brush and trees are assumed to be a percentage of shoulder miles, not the entire length of the shoulder. Needs for vegetation management services are based on unit costs of work, frequencies of work, and the estimated inventories for turf, brush and trees. VDOT does not routinely remove trees as standard practice. Tree removal typically only happens when safety is at stake regarding sight distance and/or blockage of the travel way. For this reason, needs for tree removals are based on FY 2011 expenditures. Expenditures are also used to determine needs for ornamental plants. Wildflower needs are supported by revenues generated from license plate sales. Their needs are based on their FY 2012 budgets.

Table 60 Estimated Statewide Turf Inventory (acres)

District	Interstate	Primary	Secondary	Total
Bristol	1,320	3,165	14,583	19,068
Salem	953	3,157	18,385	22,495
Lynchburg	0	5,029	14,722	19,751
Richmond	2,508	5,559	16,727	24,794
Hampton Roads	1,533	3,072	11,010	15,615
Fredericksburg	425	3,390	10,517	14,332
Culpeper	644	2,529	9,429	12,602
Staunton	2,402	2,534	12,519	17,455
Northern Virginia	989	1,268	11,116	13,373
Total	10,774	29,703	119,008	159,485

Table 61 Estimated Statewide Brush & Tree Inventory (shoulder miles)

District	Interstate	Primary	Secondary	Total
Bristol	587	2,814	12,914	16,315
Salem	424	2,378	16,342	19,144
Lynchburg	0	3,040	13,086	16,126
Richmond	1,115	3,366	14,868	19,349
Hampton Roads	681	1,794	9,787	12,262
Fredericksburg	189	2,124	9,348	11,661
Culpeper	286	1,833	8,381	10,500
Staunton	1,068	2,253	11,129	14,450
Northern Virginia	439	1,004	9,881	11,324
Total	4,789	20,606	105,736	131,131

Work frequencies or cycles vary depending on the type of vegetation as well as the roadway system. Work frequencies are included in Table 62 below:

Table 62 Annual Vegetation Work Frequencies By Asset/Activity

Asset	Activity	Interstate	Primary	Secondary*	Subdivision Secondary**
Turf	Mowing	3 cycles	3 cycles	2 cycles	2 cycles
Turf	Pesticide Spraying	1 cycle	1 cycle	None	none
Brush	Pesticide Spraying	1 cycle	1 cycle	20%(5-yr cycle)	1% bsd on complaints
Trees	Pruning	1 cycle	1 cycle	20%(5-yr cycle)	1% bsd on complaints

* Secondary Routes: 600 to 999

**Subdivision Secondary Routes : >=1000

Sound Barriers and Fences

Sound barrier and fence management includes all maintenance activities associated with sound walls, fences and other barriers to noise, people or animals. Sound walls are constructed of a variety of materials from wood, to masonry and metal that deteriorate at different rates and have different needs. The current inventory of sound walls is shown in Table 63. Estimates on the miles of fencing are not available. Biennial needs for sound walls are based on current inventory, unit cost of maintenance and the estimates for the frequency of maintenance needed. Otherwise, biennial needs for barrier management are based on FY 2011 expenditures.

Table 63 Statewide Sound Wall Inventory (miles)

District	Interstate	Primary	Secondary	Total
Bristol	1.5	0.1	-	1.6
Salem	2.1	0.7	0.01	2.7
Lynchburg	-	1.2	-	1.2
Richmond	5.4	6.4	0.5	12.3
Hampton Roads	27.4	6.0	1.1	34.5
Fredericksburg	-	0.4	0.1	0.5
Culpeper	-	0.6	-	0.6
Northern Virginia	26.3	12.1	2.9	41.3
Total	62.8	27.4	4.6	94.7

Other Roadside Services

Wildlife management and dead animal removal are part of the drainage and slopes service group. Biennial needs for these services are based on the historical expenditures for delivering these services.

Special Facilities and Other

This service area includes equipment and inventory management, ferries, safety rest areas and waysides, sidewalks and trails, permitting, and other management services. Physical plant and capital building needs are not a part of this needs report because they are a part of VDOT's capital outlay and administrative budget. Biennial service needs for special facilities and other are shown in Table 64.

Table 64 Biennial Service Needs for Special Facilities and Other

Special Facilities and Other	FY 2013 ($Millions)	FY 2014 ($Millions)
Equipment and Inventory Management	$70.3	$72.2
Ferries	12.1	12.5
Management and Direction	73.7	76.3
Miscellaneous Facility and Other	6.4	6.6
Permitting	9.0	9.3
Safety Rest Areas and Waysides	31.2	30.3
Sidewalks and Trails	3.0	3.1
Sub-Total	$205.7	$210.3

Equipment and Inventory Management

VDOT owns and maintains over 31,400 pieces of equipment with an original purchase value of $508 million. The equipment ranges from bulldozers and motor graders to chainsaws and weed eaters, and is maintained in 42 VDOT repair shops all over the state. Large equipment is issued and charged (rented) to districts at rates that allocate the cost of the program to where the equipment is used. There are currently 7,453 rental equipment units.

The biennial needs for fleet equipment management assume:

- The fleet of rental equipment will remain at approximately 7,500 units for FY13 and FY14
- Replacement needs as a percentage of the overall inventory will remain constant at 13.4 percent per annum
- Depreciation dollars will rise slightly in FY 2013 and FY 2014 as the overall fleet age stabilizes
- Mean unit replacement cost for FY2013 and FY2014 is $78,024, a 25 percent increase over the previous needs assessment. This is due to stronger EPA standards resulting in cost increases on new diesel trucks.
- VDOT has and continues to use B20 blended biodiesel fuel (B20 equals 80 percent regular diesel fuel plus 20 percent B100 biodiesel) in the Hampton Roads district as part of its strategy to meet requirements of the Energy Policy Act (EPACT)of 1992 as amended:
    - VDOT has found that using biodiesel is a practical and cost-effective method of earning EPACT fleet credits, when needed, to meet regulations.
    - VDOT uses B20 seasonally from April through September each year and typically consumes approximately 60,000 gallons per year.

Ferries

VDOT operates three ferry services, utilizing six ferry boats. Table 65 provides information on the carrying capacity and the age of each ferry boat. Biennial needs for ferry services are based on current expenditures to deliver services at current levels. No replacement ferry needs are included in this report. Replacement of *The Virginia,* the oldest vessel in VDOT's inventory, is a capital outlay project funded through the Six-Year Improvement Program. It is scheduled to be delivered in FY 2015.

Table 65 Summary of VDOT Ferry Boats

Vessel	Year Built	Capacity	Ferry Service
Virginia	1936	28 cars	Jamestown-Scotland Ferry
Surry	1979	50 cars	Jamestown-Scotland Ferry
Williamsburg	1983	50 cars	Jamestown-Scotland Ferry
Pocahontas	1995	70 cars	Jamestown-Scotland Ferry
Northumberland	2010	2-4 cars*	Sunnybank Ferry
Lancaster	2010	2-4 cars*	Merry Point Ferry

*6 passenger maximum

Safety Rest Areas and Waysides

Safety rest areas provide traveler services and short-term car and truck parking for drivers to rest. These facilities include buildings, shelters, tables, water/waste water treatment systems, HVAC systems, parking lots, ramps, curb and gutter, lighting, fencing, and landscaping. VDOT owns 43 safety rest areas, 11 of which also serve as welcome centers. Waysides are simple pull-overs along the road offering picnic tables, parking, and trash receptacles. No inventory is tracked for these locations.

Needs for the rest areas assume VDOT will continue to operate 43 facilities, providing property management and administration, and utilities. There are also needs included to improve safety rest area access ramps to meet current design standards, improve compliance with ADA regulations, and to re-pave and maintain safety rest area pavements. Recently a contract to develop sponsorship and advertising revenues to help offset future operating cost was signed. It is expected that the revenue generated will take some months to start and that it may only be up to $1million in its second year. Also, VDOT has entered into a Memorandum of Understanding with the Department of Correction on the possible use of inmates to perform work at the rest areas. The details of this initiative for when inmates will be used are still under development.

Sidewalk and Trail Management

VDOT maintains and extensive network of sidewalks and bike/pedestrian trails. Sidewalk and trail management includes all maintenance activities associated with these assets. Sidewalk needs are based on inventory, unit costs and frequency of work for the most common work activities. Biennial needs for trail management services are based on FY 2011 expenditures.

Permitting

Permitting needs include the cost of staff devoted to the review of subdivisions, street entrances, and road acceptance activities.

Management and Direction

Management and Direction includes all activities in the central office, and the field, related to employee training; program management, oversight, and administration; systems development, requirements gathering, data analysis, and user coordination. In general it includes the salaries of district and central office managers and their support staff of engineers, analysts, researchers, and administrators.

Miscellaneous Facility and Other

Miscellaneous facility and other includes all services not directly associated with other service groups. Examples of other services include data collection, bus stop shelters, DEQ compliance, outdoor advertising and regulation, parking lots and decks, maintenance and operations research, smart road maintenance and toll collection facilities. Biennial needs for these services are based on FY 2011 expenditures.