2018 APPROPRIATIONS ACT, ITEM 450,H.
**EXECUTIVE SUMMARY**

This report addresses the requirements of Chapter 2 of the 2018 General Assembly Item 450, H. (as detailed below), which requires the Commonwealth Transportation Board (“the Board”) to develop a report that addresses the following topics regarding Virginia’s large and unique bridge and tunnel structures:

- The overall condition and funding needs;
- Recommendations addressing funding within the State of Good Repair (SGR) Program; and
- Other options as identified

*Budget Language - Chapter 2, 2018 Appropriation Act, Item 450*

H. The Commonwealth Transportation Board shall, no later than December 1, 2018, review and report to the Chairmen of the House and Senate Committees on Transportation, the Joint Transportation Accountability Commission, the House Committee on Appropriations and the Senate Committees on Finance, on the overall condition and funding needs of large and unique bridge and tunnel structures in the Commonwealth. As part of the review, the Board shall make recommendations addressing funding of such projects within the State of Good Repair program. In developing these recommendations the Board shall assess the impact of establishing a set aside from the State of Good Repair funding pot, limited use of the provisions of § 33.2-369 B., Code of Virginia, which allows for the waiving of district minimum caps in a single year, or such other options as they might identify.

For over a decade, the Virginia Department of Transportation (VDOT) has used an asset management approach to (i) manage the Highway Maintenance and Operations Program, (ii) allocate funds to assets (e.g. pavements) and services (e.g. snow removal) and (iii) provide historical and projected performance on pavements and bridges. As part of its ongoing asset management approach, VDOT identified a group of structures that, if allowed to deteriorate to poor condition or fail, would pose significant risks to the efficient movement of people and goods. These structures have been assigned the term “VITAL” Infrastructure (Very Large, Indispensable, Transportation Asset List) which includes tunnels, movable bridges, and large complex fixed-span structures. As of the fall of 2018, 25 structures throughout the Commonwealth met this definition. These 25 structures were built as recently as one year ago to as far back as 80 years ago. As new infrastructure is added to the highway system, such as the Hampton Roads Bridge Tunnel (HRBT) expansion currently under procurement, the list will continue to grow.

Photographs and informational highlights of the individual VITAL Infrastructure identified by VDOT are shown in Appendix A.

VDOT developed the VITAL Infrastructure 30-Year Plan (the Plan), using an asset management approach, which focuses on timely rehabilitation and preservation actions to maintain the structures in fair
or good condition. However, when VITAL Infrastructure deteriorates to the point where rehabilitation is no longer cost-effective, the Plan includes the replacement cost for the specified structures. The total estimated cost of the Plan, over 30 years, is $3.6 billion in 2018 dollars. Included within the Plan are the needs for the Hampton Roads Bridge Tunnel (HRBT) trestles and the High Rise Bridge that are planned to be replaced as part of existing projects. These structures are included in the Plan in case unforeseen circumstances should arise that would preclude these structures from being addressed. The following table summarizes the Plan needs for the next 30 years in 2018 dollars in 10 year increments.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Year 1 - Year 10 (in millions)</th>
<th>Year 11 - Year 20 (in millions)</th>
<th>Year 21 - Year 30 (in millions)</th>
<th>2018 Amount (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movable Bridges</td>
<td>$227</td>
<td>$195</td>
<td>$305</td>
<td>$727</td>
</tr>
<tr>
<td>Tunnels</td>
<td>299</td>
<td>297</td>
<td>455</td>
<td>1,051</td>
</tr>
<tr>
<td>Large Complex Fixed-Span Structures</td>
<td>786</td>
<td>672</td>
<td>391</td>
<td>1,849</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 1,313</strong></td>
<td><strong>$ 1,164</strong></td>
<td><strong>$ 1,152</strong></td>
<td><strong>$3,628</strong></td>
</tr>
</tbody>
</table>

Note: The HRBT trestles and High Rise Bridge are currently included in the VITAL Infrastructure Plan.

In 2015, the General Assembly established new funding allocation processes and programs. One program, the State of Good Repair (SGR) Program was dedicated for pavement and bridge rehabilitation around the Commonwealth. Current forecasted SGR Program allocations for FY 2019 through FY 2024 total $1.3 billion. Of this $1.3 billion, $328 million is available for allocation to pavements rated Poor and below and $961 million is available for allocation to bridges that are considered structurally deficient or Poor.

As previously stated, the total amount projected for the SGR Program from FY 2019 - FY 2024 is $1.3 billion. The VITAL Infrastructure need for this same period is $1 billion (starting with Year 1 through Year 6 in Appendix B). If the SGR Program were to be used to fully fund the VITAL Infrastructure capital investment needs, the amount of funding remaining for deteriorated pavements and bridges would be only $300 million in total over the same six-year period.

The purpose of the SGR Program is to fund pavement and bridges rated Poor or less that are maintained by VDOT and localities through an asset management approach. VITAL Infrastructure is largely excluded from the SGR Program because (i) tunnels are not part of the SGR Program definition in the Code of Virginia and (ii) VDOT strives to maintain VITAL Infrastructure to a sufficient level where its rating would not qualify for the SGR Program. By analyzing the impact of funding VITAL Infrastructure funding needs from the SGR Program, the analysis shows legislative changes would be required to make the VITAL Infrastructure eligible in the SGR Program. In addition, addressing the VITAL Infrastructure needs would consume a majority of the SGR Program funding.
VDOT’s Maintenance and Operations Program supports the ordinary maintenance and operations of these structures and of all other existing highway assets in the Commonwealth under VDOT management. The Maintenance and Operations Program is also used to fund emergency and major rehabilitations/repairs for the VITAL Infrastructure, which diverts funding from planned operations and maintenance activities, requiring VDOT to regularly reprioritize spending. The Maintenance and Operations Program funds services such as paving, safety service patrols, snow and ice removal, and other emergency and incident management activities. The current funding projections reflect the Maintenance and Operations Program will increase annually by the rate of inflation. VDOT’s asset management focus and investment has emphasized bridges and pavements. This emphasis has impacted the ability to fund other assets, including VITAL Infrastructure.

The Budget Language asked the Board to assess the impact of funding the VITAL Infrastructure through the SGR Program. The magnitude of the need when examined on its own would effectively deplete the SGR Program and nearly eliminate the ability of the SGR Program to address deteriorated pavements and deficient bridges. Instead of presenting this impact and outlook with a singular focus on VITAL Infrastructure asset management, VDOT is requesting additional time to examine a comprehensive approach to integrating pavements, bridges, and VITAL Infrastructure into the existing maintenance and construction programs and determining the resulting impacts. Assessing the impact of funding VITAL Infrastructure independently will not provide a clear view of the true impacts of a VITAL Infrastructure program that is effectively woven into the various transportation programs in a programmatic manner.

**Conclusion**

The report identifies the 25 structures that comprise the VITAL Infrastructure, and their conditions, and presents a 30-Year Plan. These structures were identified to proactively plan for their rehabilitation and replacement, many of which are approaching the latter years of their service life. Given the magnitude of the identified needs, it is clear that the Plan funding needs would impact the SGR Program and turn the ability of the SGR Program to accomplish its intended purpose. VITAL Infrastructure needs cannot be viewed and addressed as a standalone issue. Those needs should be intertwined into VDOT’s existing programs. Additional due diligence is needed to further examine the whole lifecycle management of the assets before providing additional recommendations. In lieu of offering a recommendation to address the funding of VITAL Infrastructure at this time, it is proposed that a comprehensive review of all existing resources available to address VDOT’s needs be undertaken.

As part of this additional effort, VDOT is committed to reviewing its current Maintenance and Operations Program funding strategies, performance metrics and priorities and evaluating its investment in existing assets and services. A VITAL Infrastructure program should be integrated into the overall asset management strategy to maximize investments in the highway network. To accomplish this more comprehensive analysis and to explore additional potential funding options, it is recommended that this report serve as an introduction to a more comprehensive report, Part 2 VITAL Infrastructure Report, with a target completion of December 2019.

The Part 2 VITAL Infrastructure Report will summarize VDOT’s review of its program needs and impact of performance measures within current funding constraints. The review will take a comprehensive, programmatic, long-term approach to optimizing the conditions and performance of the roadway network. Specifically, the comprehensive VITAL Infrastructure report will:
• Refine and prioritize the VITAL Infrastructure needs
• Provide further details on why a dedicated program is needed to support the VITAL Infrastructure
• Examine VDOT’s current investment strategy and present a more comprehensive approach to funding needs in the Highway Maintenance and Operations Program, the State of Good Repair Program and VITAL Infrastructure collectively. A balanced approach will more efficiently use the available resources to address capital and maintenance needs.
• Provide a clear, proactive and sustainable approach to addressing the VITAL Infrastructure needs as part of a comprehensive lifecycle management process
• Recommend a funding plan for VITAL Infrastructure considering all transportation needs and funding sources, identifying the respective pros and cons.

Virginia Department of Transportation

OVERVIEW

This report addresses one component of Virginia’s highway network - large and unique bridge and tunnel structures: tunnels, movable bridges and large complex fixed-span structures or “VITAL” Infrastructure. VDOT maintains the third largest highway network in the United States, behind Texas and North Carolina. VDOT bears the financial responsibility for the majority of the Commonwealth’s highway network. Cities in Virginia and two counties (Arlington and Henrico) maintain their own local roads, and a portion of VDOT’s budget provides financial assistance to these localities for this purpose. Virginia’s highway network includes more than 128,000 lane miles, over 19,000 structures, 7 tunnels, and 3 ferry systems. From its existing Maintenance and Operations Program budget, VDOT (i) maintains pavements and bridges, signs, signals, ferries; (ii) operates traffic operations centers and performs snow and ice removal and (iii) funds a variety of other services to keep the highway infrastructure safe for the traveling public and in the best possible condition within funding constraints.

VDOT is a national leader in the use and implementation of an asset management approach for the Commonwealth’s surface transportation infrastructure. For over 10 years, VDOT has reported annually on the condition of its pavements and bridges and has established performance benchmarks. Internal investment decisions have emphasized improving the condition of pavements and bridges statewide while keeping the VITAL Infrastructure somewhat segregated from an asset management approach. Now, VDOT is reevaluating its asset management investment strategy and investigate potential efficiencies.

VDOT identified certain assets that were not just pavement or traditional structures. Rather, these 25 assets, which include electrical and mechanical components that are integral to their function, require a different asset management strategy. In addition, because of their operational complexity and impact, these assets should be maintained in fair condition and not allowed to become deficient. These 25 assets are known as VITAL Infrastructure and each is described in detail in Appendix A. VDOT has further analyzed the VITAL Infrastructure needs and developed a 30-year Plan to address these needs. The Plan, in the chart below, totals $3.6 billion in 2018 dollars.
### VITAL Infrastructure 30-Year Plan

#### 10 Year Increments

<table>
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Note: The HRBT trestles and High Rise Bridge are currently included in the VITAL Infrastructure Plan.

The needs were developed using an agency-wide, methodical approach intended to maximize spending efficiencies by optimizing the timing and scope of proposed treatments. If these structures are allowed to deteriorate to poor condition or fail, the risk to the movement of people and goods is high. VITAL Infrastructure has one or more of the following characteristics:

- Failure Risk
- Complexity
- High cost of maintenance and operation and/or replacement
- Importance
  - Long detours
  - High traffic
  - Economic significance (shipping and vehicular)
  - Access to critical facilities (military and ports)

VDOT’s VITAL Infrastructure includes three distinct types of structures (see below pictures):

1. **Tunnels**: VDOT maintains five tunnels, and two additional tunnels are maintained by a concessionaire. Tunnels are categorized as underwater, mountain, or urban.
2. **Movable Bridges** (bridges that open to allow maritime traffic): VDOT maintains and operates eight movable bridges. Each has a unique movable section. They include swinging spans, bascules (draw bridges), and/or vertical lifts.
3. **Large Complex Fixed-Span Structures**: These structures possess one or more of the following characteristics: Unusual size, complexity, importance, fracture-critical elements.
All tunnels and movable bridges were included in the list because they are highly complex and have specialty parts (see pictures below) that in the event of failure will require months to procure. Some parts have procurement times of over two years. The remaining structures were selected because of their economic impact, length, traffic volumes, length of detour, construction type and maintenance needs.

**RISK AND THE NEED FOR RESILIENCY**

Risk is one of the common elements for all VITAL Infrastructure. It is important to note that many of the structures (all movable bridges and Norris Bridge) on the list are “fracture-critical”. A fracture-critical bridge has a steel member whose failure could cause a portion of or the entire bridge to collapse. Two of the most notable domestic bridge failures in recent years occurred on aging, fracture-critical bridges: I-35W in Minnesota (2007) and the Skagit River Bridge in Washington (2013) (see picture below). Such structures pose risks not only for safety but also for economic impact.
As shown in the following conceptual graph, risk avoidance becomes exponentially more expensive as it approaches zero.

Potential for operational failures presents another significant element of risk for VITAL Infrastructure. These risks are particularly pronounced for tunnels and movable structures. When operational failures occur, they can present life safety risks while adversely affecting motorists who must navigate the extensive detours required by even a short-term disruption to the roadway network. Unfortunately, the risks posed by movable bridges affect both maritime and vehicular traffic, since a movable bridge could fail to operate in either the “open” or “closed” position. Virginia’s movable bridges cross waterways that are used by commercial vessels to gain access to the Port of Virginia’s Richmond Terminal (James River Bridge and Benjamin Harrison Bridge), as well as naval vessels that require access to the Naval facilities such as the Naval Weapons Station (Coleman Bridge).

The graph below provides a conceptual illustration of the operational risks to tunnels and movable bridges as they age. The operational risks increase exponentially with time and reach a level whereby operations cannot be sustained unless major components are addressed systematically.
The operational risks to these structures are real, as it has occurred with greater frequency in recent years. Three examples of incidents illustrate some of the potential problems facing VITAL Infrastructure:

1. **Control System Failure at the James River Bridge (July 2018).** The James River Bridge, a moveable bridge, experienced a failure of the control cards for the thyristor motor drive systems that allow the bridge to open and shut, resulting in the inability to open the bridge to maritime traffic. Additionally, the tachometer that allows the bridge to remain level during opening and closing failed. The simultaneous failure of both the primary and alternate control systems caused a complete shutdown of shipping traffic to the Port of Richmond Terminal. Parts for the antiquated control system are no longer readily available and must be custom-ordered with an extended lead-time for replacement. While VDOT keeps spare parts on hand, the fragility of these systems makes it difficult to predict the causes of the next system failure.

2. **Fire in the East River Tunnel (July 2014).** A tractor-trailer travelling through the tunnel overheated and caught fire, shutting down all lanes of traffic on I-77 for 16 hours, requiring trucks and autos to take a 13-mile detour through steep, winding mountain secondary roads. Unfortunately, there was no dedicated fire brigade available at the time, so assistance was required from nearby municipalities in West Virginia and Virginia.

3. **Tanker Impact on Benjamin Harrison Bridge (1977).** In February 1977, a tanker collided with the Benjamin Harrison Bridge. About 350 feet of the trestle was destroyed, one section falling into the river and the other landing on the deck of the ship. In March 1977, the north tower section of the bridge collapsed. The tower failure damaged the wiring, which lead to an explosion and fire in an oil drum near the bridge tender's house. While this event was not in the recent past, it does illustrate the vulnerability of the VITAL Infrastructure bridges to vessel impact. The relatively new structure (10 years old at the time) required reconstruction after the impact (see photo below).

Additional electrical and mechanical failures have occurred at the 80-year-old Gwynn’s Island Bridge and the now 50-year old Benjamin Harrison Bridge, causing marine and/or vehicular traffic interruptions. If a similar event were to occur on the Berkley Bridge, which opens on average twice per day to serve marine traffic while carrying more than 110,000 vehicles per day, the impacts would be severe. The Berkley
Bridge is in critical need of rehabilitation to greatly reduce operational risk. This rehabilitation is needed to address deficiencies in the bridge’s mechanical, electrical, and power supply systems.

By rehabilitating our tunnels and movable bridges in a timely manner, Virginia will build resiliency into high-risk, critical elements of the transportation network.

CURRENT APPROACH

As previously stated, VDOT’s Maintenance and Operations Program funds are necessary for the ordinary maintenance and operations of the VITAL Infrastructure. Ordinary maintenance and operations of the structures include inspection of components (e.g. drive gears), sweeping for debris and contaminants, painting to slow deterioration, etc. However, the investment mechanism and prioritization of the major repairs and replacements have not been identified. This report described earlier how the VITAL Infrastructure are assets and, as with any asset, preventative maintenance and, at some point replacement, is required. For example, an individual must periodically perform preventive maintenance on their automobile, such as an oil change; however, once a vehicle’s repair costs begin exceeding the value of the automobile, the vehicle will likely be replaced. Similarly, VDOT makes every attempt to maximize the life of all assets it maintains while ensuring safety is not compromised. While VDOT performs ordinary maintenance and operations on VITAL Infrastructure, the Department has not been able to tactically, systematically, or proactively address major repairs and replacements.

The major funding sources (the Construction Program and the Maintenance and Operations Program) that are available for addressing projects of this magnitude are not an appropriate fit for this type of work. However, when emergencies (e.g. mechanical components stuck in open/closed position) occur, VDOT re-prioritizes other work and funding in order to ensure the VITAL Infrastructure is functioning and safe for the traveling public. Planned maintenance is then sacrificed and deferred to a later date.

Along with examples of emergency repairs to VITAL Infrastructure previously referenced, recent examples of how VDOT is proactively managing the ordinary maintenance and operations of VITAL Infrastructure assets include:

- **Norris Bridge painting and overlay project** - To preserve the steel beams and slow the process of deterioration, VDOT painted the Norris Bridge with zinc-based paint. In conjunction with the bridge painting, VDOT undertook a pavement overlay project to increase the service life of the deck by 20 years.
• Monitor Merrimac Memorial Bridge Tunnel waterproofing project - The expansion joints connecting the concrete sections in the approach portion of the Monitor Merrimac Memorial Bridge tunnel have been leaking, and a project is currently underway to address the leakage and keep the sections water tight.

• Hampton Roads District tunnels ventilation refurbishment project - Tunnels require a ventilation system for air quality within the facility. To extend the service life of the ventilation systems in several Hampton Roads tunnels, VDOT refurbished the tunnels’ ventilation systems.

VDOT maximizes the use of its current resources (e.g. funding and labor force) to assist in the continued operations of the VITAL Infrastructure. Nevertheless, any structure nearing the end of its service life will eventually need to be replaced and consideration for the necessary resources must be prioritized and planned.

VITAL STRUCTURES NEEDS

The VITAL Infrastructure Plan identified a focused strategy for addressing the major repairs, rehabilitation, and replacement requirements and is segmented into three ten-year increments. The Plan funding needs total $3.6 billion with $1.3 billion identified in the first 10 years. The 30-year horizon was selected to correspond with a window in which deterioration can be reasonably predicted. The Plan is based on realistic expectations for an adequate level of service for the structures. The Plan also represents a long-term asset management investment strategy, in that it proposes appropriate interventions at the time when they can have maximum effect for reducing life-cycle costs. The consequences of inaction or delay for the majority of the work will have the dual effect of increasing long-term (life-cycle) costs and increasing operational and safety risks.

While this report addresses VDOT-maintained structures, it is important to note that there are several other structures owned by localities and other jurisdictions that meet the criteria used to identify VDOT’s VITAL Infrastructure. They are maintained by localities or jointly maintained by Virginia and Maryland. They include:

• Woodrow Wilson Bridge: Owned/Operated by Maryland
• American Legion Bridge (I-495 over the Potomac River): Owned by Maryland
• Harry Nice Bridge (Rt. 301 over the Potomac River): Owned by Maryland
• Lesner Bridge (post-tensioned, segmental concrete – complex structure): Owned by Virginia Beach
• Three movable bridges in the City of Chesapeake
  ○ Gilmerton Bridge
  ○ Centerville Turnpike Bridge
  ○ Great Bridge Bridge

In the past, Virginia has participated in funding for these structures, and in the future, these other entities may request funding for replacements.

VDOT is providing the bridge program as an example. While other examples exist, VDOT used the bridge program as the 25 VITAL Infrastructure includes eight movable bridges and ten large complex fixed-span bridges. Maintaining bridges and pavements at a reasonable condition level is a nationally
recognized issue affecting all state departments of transportation and is the greatest challenge facing Virginia’s highway structures. For example, the average age of Virginia’s bridges is 49 years old with many constructed with a service life of 50 years. In practice, VDOT works to extend their service life including the use of new technologies and efficiencies so that replacement is not required until later in the lifecycle while keeping safety in mind.

To provide some context of the aging bridge problem (including the 18 VITAL bridges), if Virginia were to replace all 50-year service life bridges when they reach age 70, the cost over the next 50 years would exceed $65 billion in 2018 dollars (through 2067). The following graph displays average annual funding requirements by decade for VDOT maintained structures, including the 18 VITAL bridges.

The following graph shows the bridge inventory with the number of structures built by decade:

Timely execution of major repairs and rehabilitation is the best asset management strategy for extending the service life of an asset including the VITAL assets. While rehabilitation does not fully restore a bridge or tunnel, it can extend service life well beyond that anticipated at the time of construction.

One of the most significant reasons for considering the funding for VITAL Infrastructure separately is to allow for planning and funding of rehabilitation efforts so that they can be performed at the appropriate time. The positive effects of timely intervention are displayed in the graph below, which shows how a structure’s service life (the example is for an Interstate bridge) can be extended significantly at a lower
cost. It is important to remember that in addition to the “traditional” service life issues of a bridge and tunnel, VITAL Infrastructure have electrical and mechanical components that must also be managed.

A specific example of a bridge where timely intervention extended service life at a low cost is on the 52 year-old bridge carrying I-64 over Dunlop Creek in the Staunton District. While the example is a bridge, VDOT performs similar efficiencies on other assets (e.g. pavements and tunnels). The bridge was originally built in 1966 and received a significant preservation in 1978.

- VDOT’s 2016 rehabilitation cost (deck, joints, bearings and substructure) $2.5 million, extending the anticipated service life by 40 years
- Forty years from 2016, this bridge can be rehabilitated again at a similar cost, with an anticipated service life extension of an additional 30 years
- Had the rehabilitation not taken place, the bridge would have required replacement in 20 years (at age 70) at a cost of $35 million (in 2016 dollars)

While rehabilitation is a key component of asset management, once a structure reaches the end of its service life, replacement, rather than rehabilitation, is usually the most cost-effective action. As in the
case of a personal automobile, structures eventually reach a point where it is more cost-effective to replace than to continue funding escalating repair costs. This is the case for several of the VITAL Infrastructure that will need to be replaced during the Plan as shown in Appendix B.

Wherever possible, the same approach, used for the Dunlop Creek bridge, can and should be used on the VITAL Infrastructure. Some of the VITAL Infrastructure are relatively new and will have minimal long-term needs if they are proactively addressed with the appropriate preservation treatment at the appropriate time. These newer, lower-need structures were included in as VITAL Infrastructure so that they will receive the planning and attention needed to receive timely, cost-effective actions and thereby reduce future deterioration rates. This is asset management in action.

A significant number of the structures in the VITAL Infrastructure have now reached the point on the life-cycle deterioration curve where their replacement will be required within the 30 year Plan. The replacements are part of the Plan funding needs. Appendix B outlines the strategies for the VITAL Infrastructure.

The Gwynn’s Island Bridge provides an example of a bridge for which replacement is the most cost-effective investment. Since its original construction 80 years ago, this bridge has received multiple preservation and rehabilitation treatments, including repairs to pivot gears, electrical systems and motors, structural repairs, and painting. However, despite these efforts, the regular repair costs have grown so great that the bridge is now at the point where replacement is more economical than repair.

The creation of the VITAL Infrastructure list allows VDOT to track, monitor, and treat these important, expensive assets in the most appropriate manner, whether the facility is in the early or later portion of its service life.

The chart below illustrates the Plan’s balanced approach to the management of these assets, rehabilitating where appropriate, and replacing when necessary.

<p>| Percentage of Needs for VITAL Infrastructure by Structure Type and Required Action |
|-----------------------------------------------|----------------|----------------|----------------|----------------|</p>
<table>
<thead>
<tr>
<th>Required Action</th>
<th>Tunnels</th>
<th>Movable Bridges</th>
<th>Large Complex Fixed-Span Bridges</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitation</td>
<td>29%</td>
<td>13%</td>
<td>24%</td>
<td>65%</td>
</tr>
<tr>
<td>Replacement*</td>
<td>0%</td>
<td>7%</td>
<td>28%</td>
<td>35%</td>
</tr>
<tr>
<td>Total</td>
<td>29%</td>
<td>20%</td>
<td>51%</td>
<td>100%</td>
</tr>
</tbody>
</table>

As part of the Plan, VDOT intends to standardize electrical service systems for all movable bridges to the maximum extent possible. Electrical service and controls are the most failure-prone components of movable bridges, and by modernizing these bridge elements, VDOT can maintain interchangeable spare parts for the bridge components that are most susceptible to breakdown.
When replacements are required, VDOT will deploy advanced technologies and material improvements that result in anticipated service lives of 75 years and lower annual maintenance costs. While the following are examples of new technologies and materials deployed in the bridge program, VDOT has other asset examples (e.g. tunnels – jet engines used in the ventilation systems). Virginia’s culture of innovation has resulted in significant improvements to the bridge program, and some of the most notable advances implemented on new bridges are listed below:

2. Corrosion-resistant reinforcement (2009)
3. Jointless bridges (2011)
5. Latex modified concrete overlays (the addition of hydrodemolition to milling) (2015)

**Funding**

Many of the VITAL Infrastructure assets were built as toll facilities or with toll funding. Others were constructed with dedicated federal bridge funding or federal earmarks. Today, federal earmarks do not exist and federal funding formulas have changed. In addition, VDOT has different funding programs and formulas. The largest fund sources include the State of Good Repair Program, the High Priority and District Grant Program funds distributed through SMART SCALE, and the Maintenance and Operations Program. The following provides more details on the funding sources available.

**State of Good Repair Program** - The SGR Program (§ 33.2-369 of the Code of Virginia) provides funding for the reconstruction and rehabilitation of deteriorated pavements on the interstate, primary and primary extensions (both VDOT and locally maintained/owned), as well as the replacement and/or rehabilitation of structurally deficient or “Poor” (federal and VDOT definition) bridges on all systems. Secondary system pavements can be funded under certain conditions.

Funding available for the SGR Program is distributed under § 33.2-358 of the Code of Virginia, which sets aside 45 percent of construction funds for the SGR Program beginning in FY 2021. The 2016 and 2017 Appropriations Acts provided funding to the SGR Program prior to FY 2021, with all nine VDOT districts receiving annual allocations based on the calculated pavement and bridge needs for VDOT and localities. A minimum allocation of 5.5 percent and a maximum allocation of 17.5 percent for the SGR Program distribution to each district is established in the Code of Virginia.

The Commonwealth Transportation Board may approve annually two “exceptions” or waivers to the SGR Program funding distribution. The first exception waives the funding cap/maximum share in order to provide funds for an urgent pavement or bridge project resulting from extraordinary circumstances. The second waiver allows the Board to reserve 20 percent of funds for use by the nine districts on secondary pavements if VDOT does not meet secondary pavement statewide performance targets.

VITAL Infrastructure would not typically qualify for the SGR Program. First, VDOT makes every effort to maintain its bridges including movable components categorized as VITAL Infrastructure above a rating of structurally deficient. Second, tunnels are not included as an eligible asset for SGR Program funding.
SMART SCALE (High Priority and District Grant Programs) - The SMART SCALE selection formula emphasizes projects that provide significant improvements to relieve congestion, improve safety or help the environment in relation to cost. Capital repairs to VITAL Infrastructure do not generally ease congestion or greatly improve safety or the environment, so they will rarely score well in the SMART SCALE process thereby becoming eligible to receive either High Priority and/or District Grant Program funds.

To be eligible for SMART SCALE scoring, projects must first demonstrate that they meet a capacity need on a corridor of statewide significance, regional network, or urban development area. Projects that are determined to meet a such a need are evaluated based on 5 factors: Safety, Congestion, Accessibility, Land Use, Economic Development and Environment. Consideration for funding through SMART SCALE must be submitted by an eligible entity: regional planning body (MPO, PDC), locality, or public transit provider. VDOT cannot submit applications. Each eligible entity has a cap on the number of applications that can be submitted in a given round and VITAL Infrastructure replacements are unlikely to rise above other local or regional priorities for submission.

Funding distributed through the SMART SCALE process is approximately $800M for the next round, split equally between the Construction District Grant Program and the High Priority Projects Program. Each district receives a portion of the Construction District Grant Program based on population, VMT, lane miles, and land area. The average amount available to each district in the next round is less than $45 million. The typical replacement costs of VITAL Infrastructure makes it cost prohibitive to rely on this funding. SMART SCALE process allocates funds available in the last two years of the Six-Year Improvement Program, which creates a delay in starting projects selected for funding. For example, SMART SCALE Round 3 project selections will be made in June 2019, but projects will be unable to begin before July 2023 unless other financial resources are committed to the project.

Maintenance and Operations Program - Each fiscal year, VDOT suballocates Maintenance and Operations Program funds for the ordinary maintenance and operating costs of the VITAL Infrastructure. However, funding more costly needs, such as the rehabilitation, reconstruction and/or replacement, will strain the Maintenance and Operations Program that is used for all other highway infrastructure maintenance and services such as pavement and bridge maintenance, emergencies such as snow and ice, and other services such as Safety Service Patrols.

Condition

VDOT’s VITAL Infrastructure detailed in the Appendix A were built between one year to eighty years ago with conditions that range from good to poor in 2018. The VITAL Infrastructure Plan funding needs have been developed and total $3.6 billion in 2018 dollars. The VITAL Infrastructure Plan considers the structures along with any components for the movable bridges and tunnels. The needs were developed by knowledgeable stewards of the structures using long-term projections.

Practices in Other States

Maintenance, repair and/or replacement of highway infrastructure is a reinvestment issue facing many states. To finance the reinvestment in strategic transportation infrastructure assets, states are using options such as:

- Public-Private Partnerships
○ Package a group of transportation assets, such as bridges, for a concessionaire to repair or replace and then maintain for an extended period of time, at an established payment amount (availability payments, not tolls) and time interval (e.g. annually).
  ■ Availability payments “are contractually contained within a P3 procurement, they are likely to be added to a sponsoring government’s debt statement”\(^1\); therefore, they are considered debt and part of a state’s debt capacity.

○ State DOT retains ownership of the asset, but places the burden of repair or replacement and on-going maintenance on a concessionaire for a set period of time.
  ● Increasing existing transportation infrastructure revenue sources to target needed infrastructure reinvestment (i.e. increase the gas tax every year for a set period of time)
  ● Establishing new sources of revenue targeted for transportation infrastructure reinvestment (e.g. Alternative Fuel Motor Vehicle Annual Registration Fee, “truck only” toll lanes (electronic tolls) or a Heavy Vehicle Impact Fee)

Specific examples are included in the Appendix C.

**State of Good Repair Program and Other Options**

**State of Good Repair Program - Requires changes to the *Code of Virginia***

The use of SGR Program funding for VITAL Infrastructure requires the following legislative changes to amend §33.2-369 of the *Code of Virginia* in order for SGR Program funds to be used for VITAL Infrastructure. The *Code of Virginia* could be revised to include under the SGR Program:

● Tunnel structures and all tunnel components
● Bridge structures, all bridge components including movable bridge components, considered structurally deficient
● Bridges (structure and components) that are not rated structurally deficient
● Allowance of continuous annual funding and not one time funding for urgent pavement and/or bridge project as stated in the *Code of Virginia*

**State of Good Repair Program Funding**

The current funding in the SGR Program from FY 2019 - FY 2024 is $1.3 billion while the VITAL Infrastructure needs, if viewed independently, for the same time period (as shown in Appendix B) is $1 billion. If the SGR Program funds were applied towards the VITAL Infrastructure Plan, the amount of funding remaining for deteriorated pavements and bridges throughout the Commonwealth is expected to be $300 million over the six years.

The VITAL Infrastructure funding needs would deplete funding for the intended purpose of the SGR Program, namely deteriorated pavements and bridges (or the worst rated assets). This action would essentially remove funding for necessary work on Virginia’s pavements and bridges.

\(^1\)Connecting P3s, Bond Ratings, and Debt Calculation, Government Finance Review, December 2015
http://www.gfoa.org/sites/default/files/1215GFR08.pdf
Other Options and Next Steps

Following the request made by the General Assembly during the 2018 session, an analysis of the VITAL Infrastructure and their funding needs was initiated. After assessing the needs and evaluating the VITAL Infrastructure Plan, it has been determined that VDOT should review its current funding strategies, performance metrics and priorities and evaluate its investment in existing assets and services prior to making funding recommendations on VITAL Infrastructure. A VITAL Infrastructure program should be integrated into the overall asset management strategy to maximize investments in the highway network. To accomplish this more comprehensive analysis and to explore additional potential funding options, this report is being provided as an introduction to a more comprehensive report with a target completion of December 2019.

Summary

This effort had a short delivery time frame for completion and was required to address specific, legislatively-mandated questions. The results of the efforts to date have revealed that a broad-based approach is required to evaluate the impacts of integrating an asset management strategy for the VITAL Infrastructure into the Department’s existing programs. This will include examining the prioritization of funding based on current and projected performance of highway assets, including VITAL Infrastructure. A follow-up report to the General Assembly is proposed for submission in December 2019. The review will take a comprehensive, programmatic, long-term approach to optimizing the conditions and performance of the roadway network. More specifically, the comprehensive VITAL Infrastructure report will:

- Refine and prioritize the VITAL Infrastructure needs
- Provide further details on why a dedicated program is needed to support the VITAL Infrastructure
- Examine and present a comprehensive approach in VDOT’s current investment strategy to include the VITAL Infrastructure
- Present a follow-up report in December 2019

After review of the SGR Program and VITAL Infrastructure needs, funding VITAL Infrastructure needs through the SGR Program would severely impact the intent of the SGR Program. The approach to addressing and funding VITAL Infrastructure needs should be intertwined into VDOT’s existing programs to maximize investment. A more comprehensive review and investigation will assist VDOT in presenting a sustainable approach.