2018 APPROPRIATIONS ACT, ITEM 450,H.

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VIRGINIA DEPARTMENT OF TRANSPORTATION
VITAL INFRASTRUCTURE

VITAL INFRASTRUCTURE REPORT
BUDGET 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** (**V**ery Large, **I**ndispensable, **T**ransportation **A**sset **L**ist) 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.

VITAL Infrastructure 30-Year Plan 10 Year Increments (in millions)				
Categories	**Year 1 - Year 10**	**Year 11 - Year 20**	**Year 21 - Year 30**	**2018 Amount (in millions)**
Movable Bridges	**$227**	**$195**	**$305**	**$727**
Tunnels	**299**	**297**	**455**	**1,051**
Large Complex Fixed-Span Structures	**786**	**672**	**391**	**1,849**
Total	**$ 1,313**	**$ 1,164**	**$ 1,152**	**$3,628**

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 inturn 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 (in millions)				
Categories	**Year 1 - Year 10**	**Year 11 - Year 20**	**Year 21 - Year 30**	**2018 Amount (in millions)**
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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.

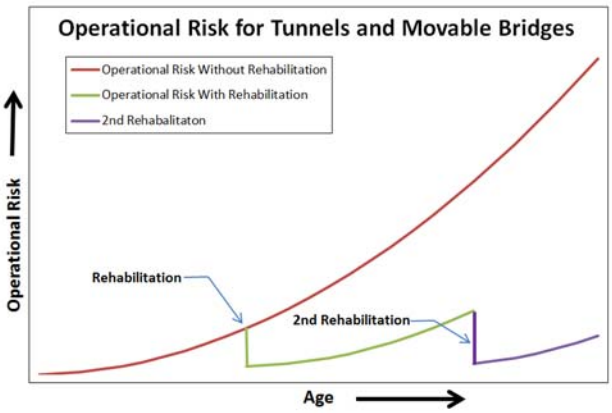
I-35W in Minnesota

Skagit River Bridge

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.



Aging Generator at Gwynn's Island Bridge

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 thyrister 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.

East River Tunnel Fire - July 2104

1977 Tanker Impact to Benjamin Harrison Bridge

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 Programr 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:

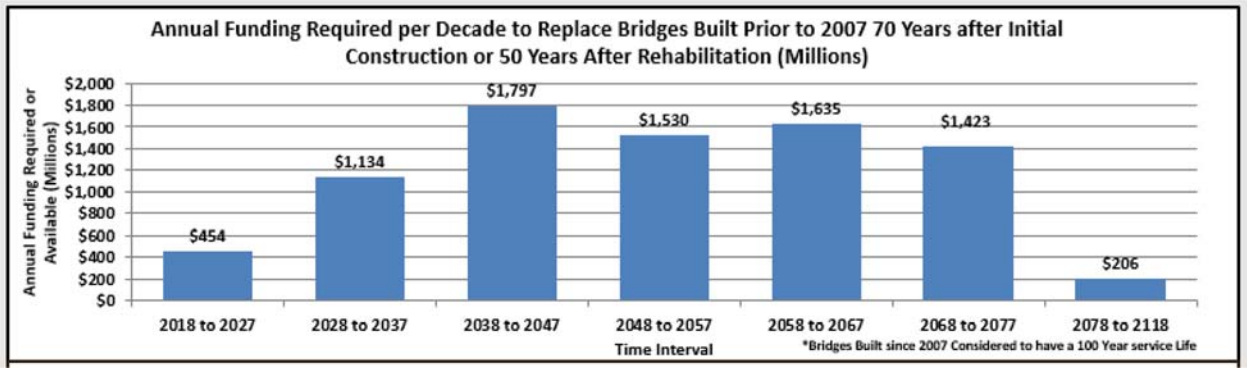
- Woodrow Wilson Bridge: Owned/Operated by Maryland
- American Legion Bridge (I-495 over the Potomac River): Owned by Maryland
- Harry Nice Bridge (Rt. 301 over the Potomac River): Owned by Maryland
- Lesner Bridge (post-tensioned, segmental concrete – complex structure): Owned by Virginia Beach
- Three 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.

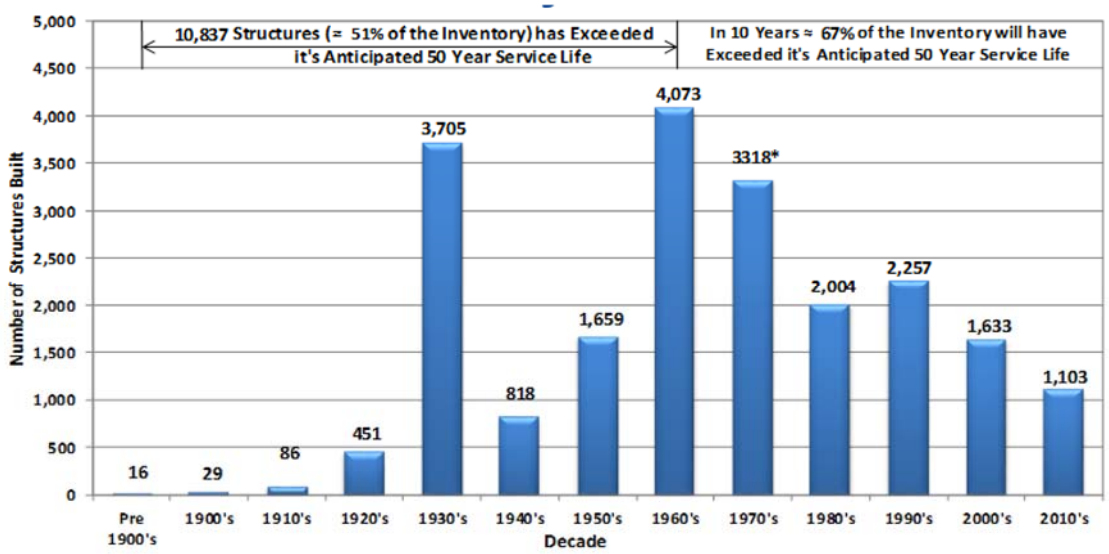
VDOT is providing the bridge program as an example. While other examples exist, VDOT used the bridge program as the 25 VITAL Infrastructure includes eight movable bridges and ten large complex fixed-span bridges. Maintaining bridges and pavements at a reasonable condition level is a nationally

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.



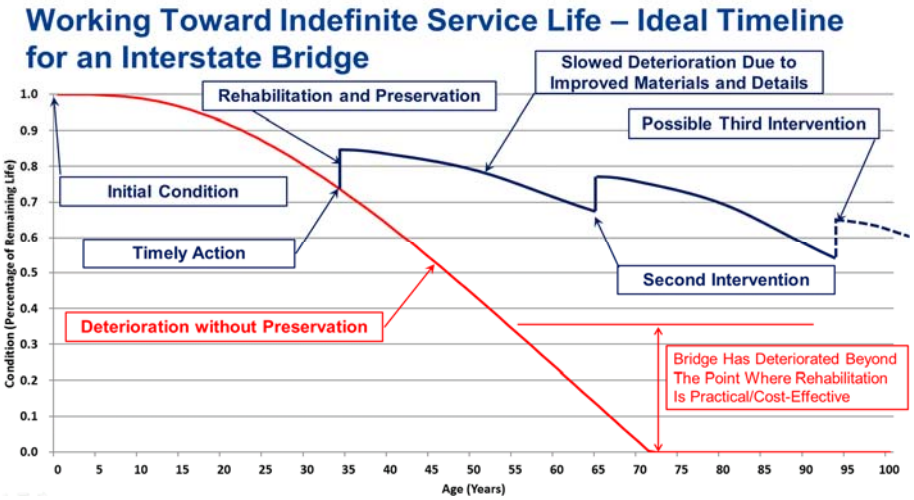
The following graph shows the bridge inventory with the number of structures built by decade:



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.

Percentage of Needs for VITAL Infrastructure by Structure Type and Required Action

Required Action	Tunnels	Movable Bridges	Large Complex Fixed-Span Bridges	Total
Rehabilitation	29%	13%	24%	**65%**
Replacement*	0%	7%	28%	**35%**
Total	**29%**	**20%**	**51%**	**100%**

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:

1. High performance concrete (2003)
2. Corrosion-resistant reinforcement (2009)
3. Jointless bridges (2011)
4. Low-shrinkage, low-cracking, concrete in decks (2015)
5. Latex modified concrete overlays (the addition of hydrodemolition to milling) (2015)
6. Carbon fiber and stainless steel prestressing strands in prestressed concrete piles (2017)

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.

APPENDIX A: VITAL INFRASTRUCTURE LIST

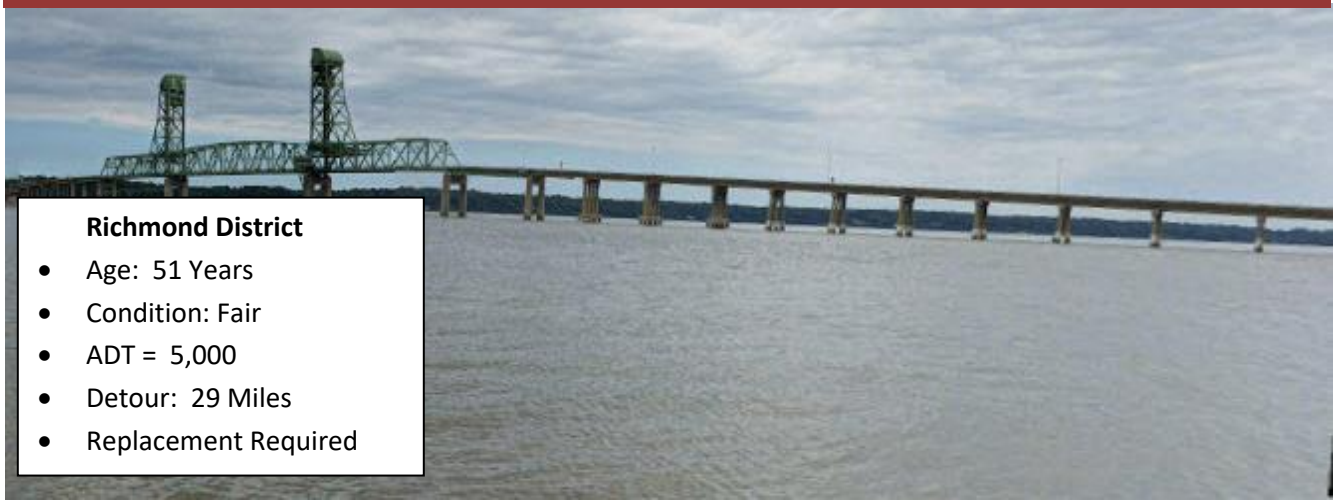
VDOT's VITAL Infrastructure: Condition, Age and Type of Structure

Type	No.	Structure	Age	Route Carried	Feature Intersected	Condition
Movables	1	Benjamin Harrison	51	Rt. 156	James River	Fair
	2	Chincoteague	8	Rt. 175	Black Narrows Channel	Fair
	3	High Rise	49	I-64	Elizabeth River	Fair
	4	Berkley	64 & 28	I-264	Elizabeth River	Fair
	5	Coleman	66	Rt. 17	York River	Fair
	6	James River Bridge	38	Rt. 17	James River	Fair
	7	Eltham	11	Rt. 33	Pamunkey River	Fair
	8	Gwynn's Island	80	Rt. 223	Milford Haven	Fair
Tunnels	9	Big Walker Tunnel	46	I-77	Appalachian Mountains	Fair
	10	East River Tunnel	44	I-77	Appalachian Mountains	Fair
	11	Tunnels of Hampton Roads Bridge Tunnel	60 & 44	I-64	Hampton Roads	Fair
	12	Tunnel of Monitor Merrimac Memorial Bridge Tunnel	26	I-664	James River	Fair
	13	Elizabeth River Midtown Tunnel	2 & 56	Rt. 58	South Branch Elizabeth River	Good
	14	Elizabeth River Downtown Tunnel	32 & 66	I-264	South Branch Elizabeth River	Good
	15	Rosslyn Tunnel	35	I-66	Gateway Park & Ft. Meyer Dr.	Fair
Large and Complex	16	460 Connector	1	Rt. 460	Grassy Creek	Good
	17	Smart Road Bridge	17	SMART Hwy	Wilson Creek	Good
	18	Varina-Enon	28	I-295	James River	Fair
	19	895/Pocahontas Parkway	16	895	James River	Good
	20	HRBT Approaches	60 & 44	I-64	Hampton Roads	3-Fair, 1-Poor
	21	Willoughby Bay	46	I-64	Willoughby Bay	Fair
	22	MMMBT Approaches	26	I-664	James River	Fair
	23	James River Bridge Approaches	38	Rt. 17	James River	Fair
	24	High Rise Bridge Approaches	49	I-64	Elizabeth River	Fair
	25	Norris Bridge	61	Rt. 3	Rappahanock River	Fair

NOTE: VITAL Infrastructure listed above are numbered to correspond with each facility's picture. The numbering is not a ranking.

Movable Bridges

Benjamin Harrison Bridge: Route 156 over James River (#1)



Richmond District

- Age: 51 Years
- Condition: Fair
- ADT = 5,000
- Detour: 29 Miles
- Replacement Required

Chincoteague Bridge: Route 175 over Black Narrows Channel (#2)

Hampton Roads District

- Age: 8 Years
- Condition: Fair
- Detour: None Available
- Bascule Bridge

High Rise Bridge: I-64 over Elizabeth River
Movable Portion (#3), Large and Fixed Span (#24)

Hampton Roads District

- Age: 49 Years
- Condition: Fair
- ADT = 89,000
- Detour: 27 miles

Berkley Bridge: I-264 over Elizabeth River (#4)

Hampton Roads District

- Age: 64 (WB) and 28 (EB)
- Condition: Fair
- ADT = 97,000
- Detour: 5 Miles
- Double Leaf Bascule Bridge

Coleman Bridge: Route 17 over York River (#5)

Hampton Roads District

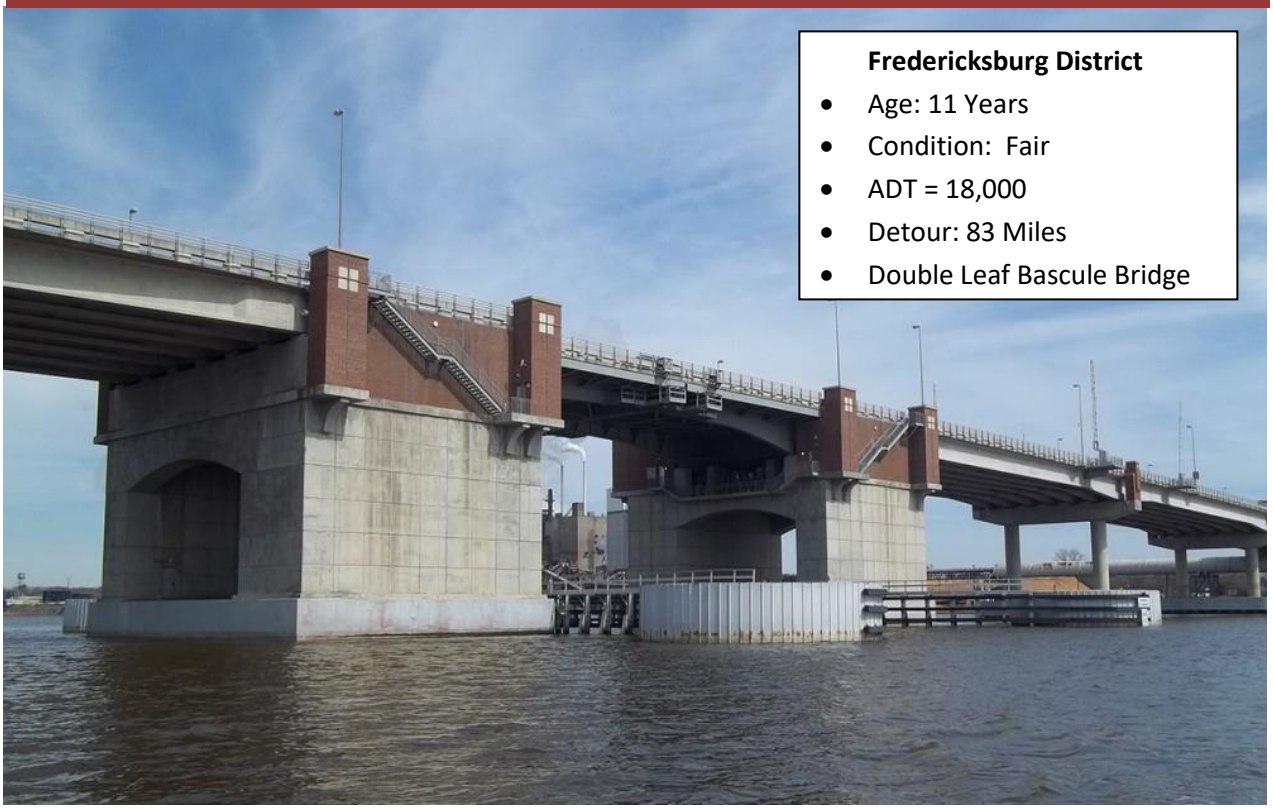
- Age: 66 Years (rehabilitated 22 years ago)
- Condition: Fair
- Detour: 76 Miles
- Longest Swing Bridge in America

James River Bridge: Route-17 over James River Movable (#6), Large and Complex (#23)

Hampton Roads District

- 38 Years
- Condition: Fair
- ADT = 28,000
- Detour: 25 Miles
- Length: 4.4 Miles

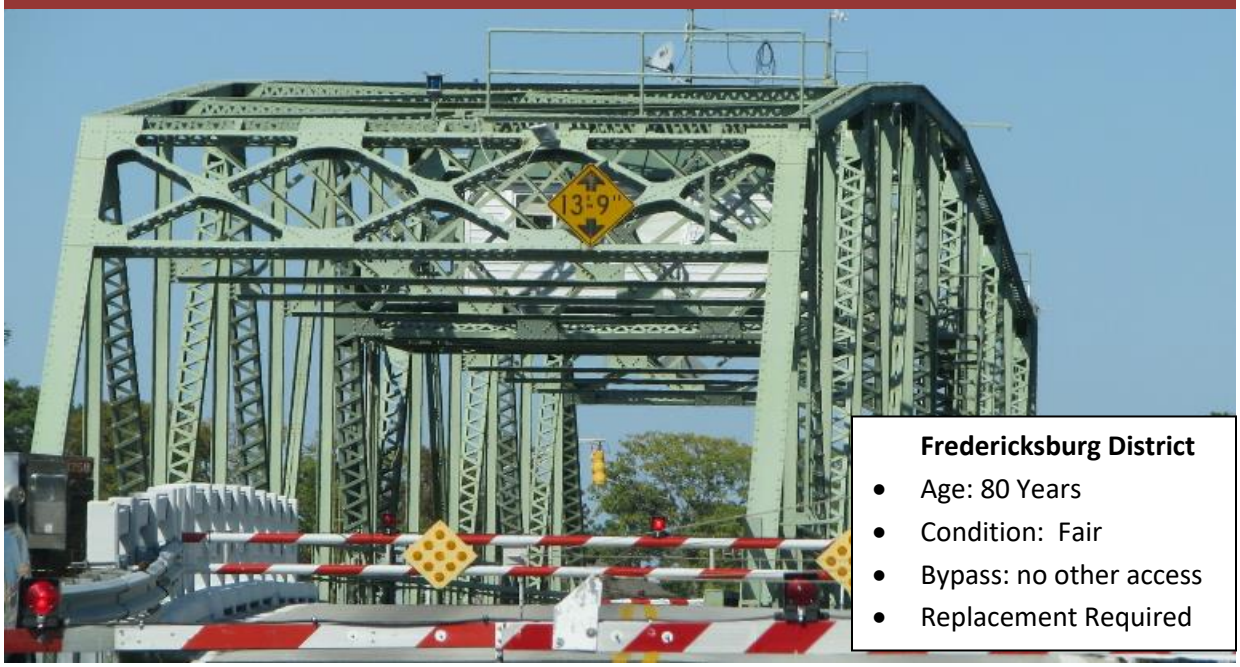
Eltham Bridge: Route 33 over Pamunkey River (#7)



Fredericksburg District

- Age: 11 Years
- Condition: Fair
- ADT = 18,000
- Detour: 83 Miles
- Double Leaf Bascule Bridge

Gwynn's Island Bridge: Route 223 over Milford Haven (#8)

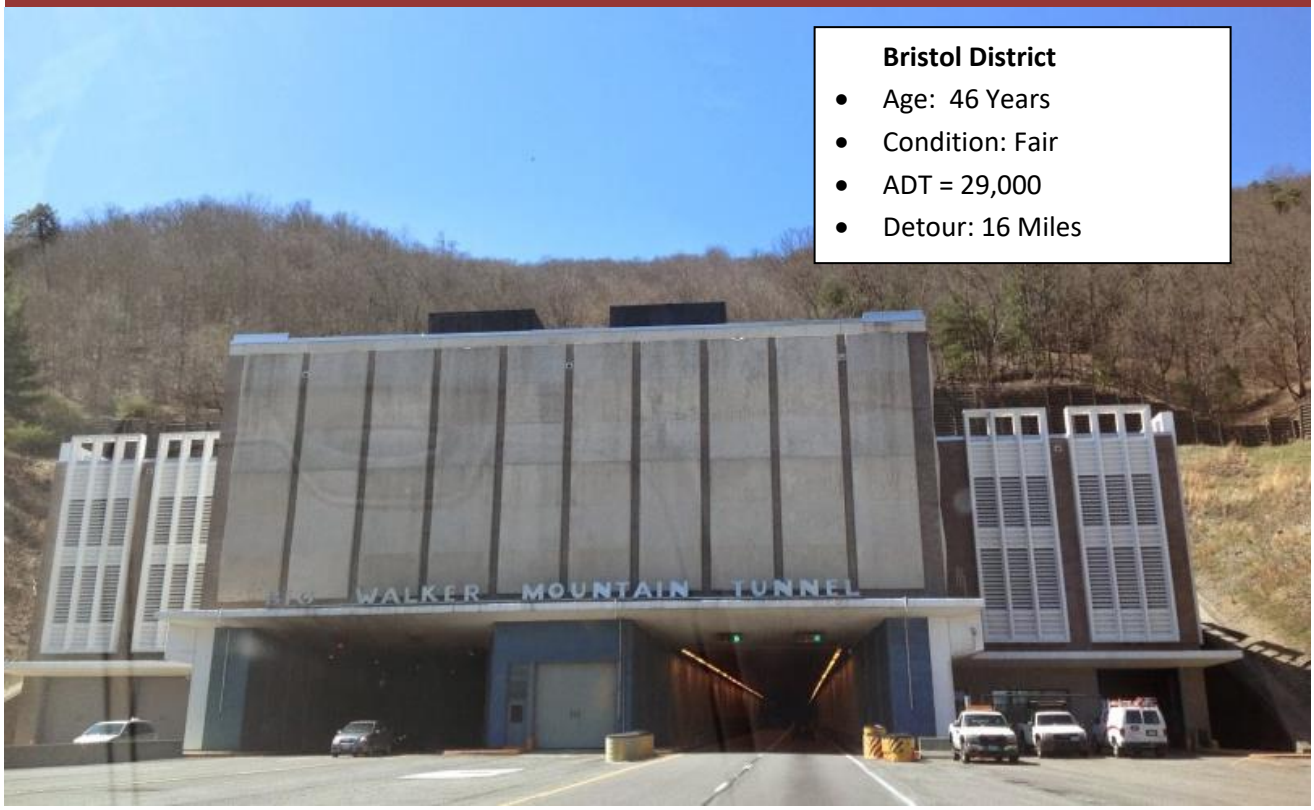


Fredericksburg District

- Age: 80 Years
- Condition: Fair
- Bypass: no other access
- Replacement Required

Mountain Tunnels

Big Walker Mountain Tunnel: I-77 through Appalachians (#9)



Bristol District

- Age: 46 Years
- Condition: Fair
- ADT = 29,000
- Detour: 16 Miles

East River Mountain Tunnel: I-77 through Appalachians (#10)

Bristol District

- Age: 44 Years
- Condition: Fair
- ADT = 29,000
- Detour: 13 Miles

Tunnels with Associated with Approach Bridges

Hampton Roads Bridge-Tunnel (#11) and Approach Bridges (#20): I-64 over/under James River

Hampton Roads District

- Age of Original Structures: 60 Years
- Age of Parallel Structures: 44 Years
- Approach Bridge Conditions: 3 are Fair and one is Poor
- Tunnel Condition:
- ADT = 43,000
- Detour: 47 Miles
- Replacement Required for Approach Bridges

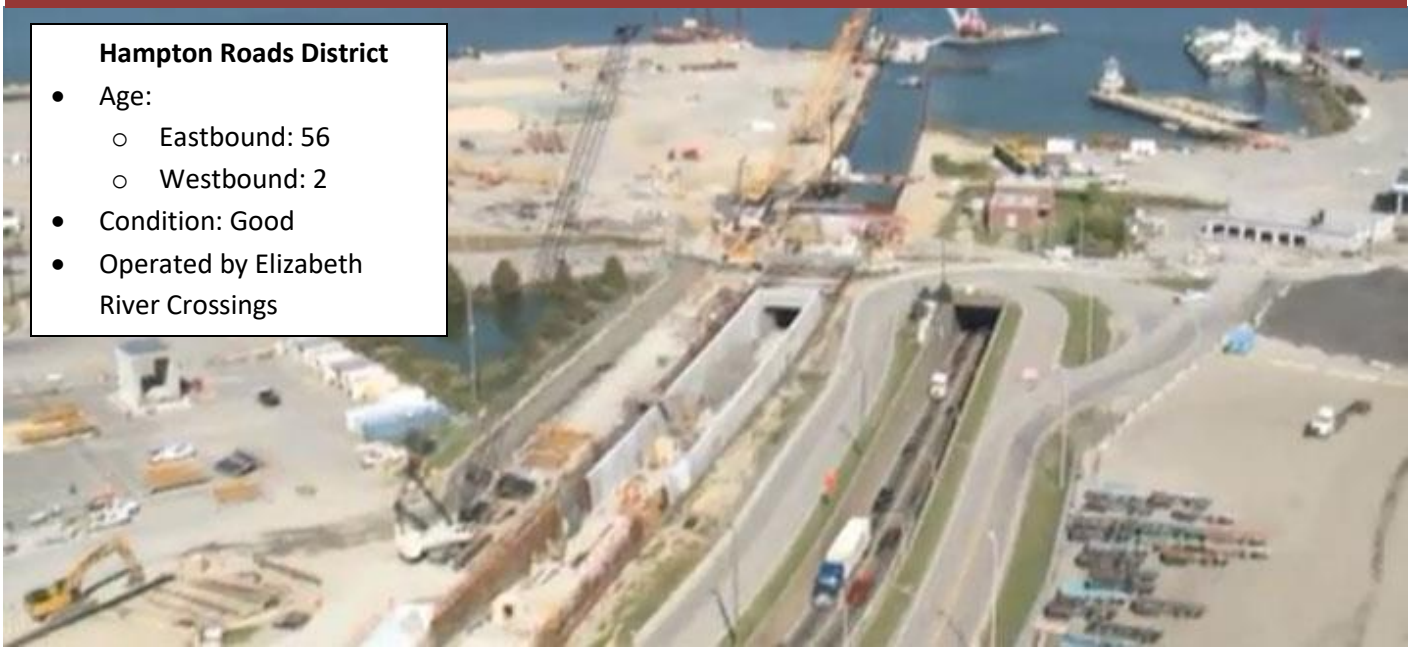
Monitor Merrimac Memorial Bridge-Tunnel (#12) & Approach Bridge (#22) I-664 over/under James River

Hampton Roads District

- Age: 26 Years
- Tunnel Condition: Fair
- Approach Bridge Condition: Fair
- ADT = 62,000
- Detour: 27 Miles

Urban Tunnels

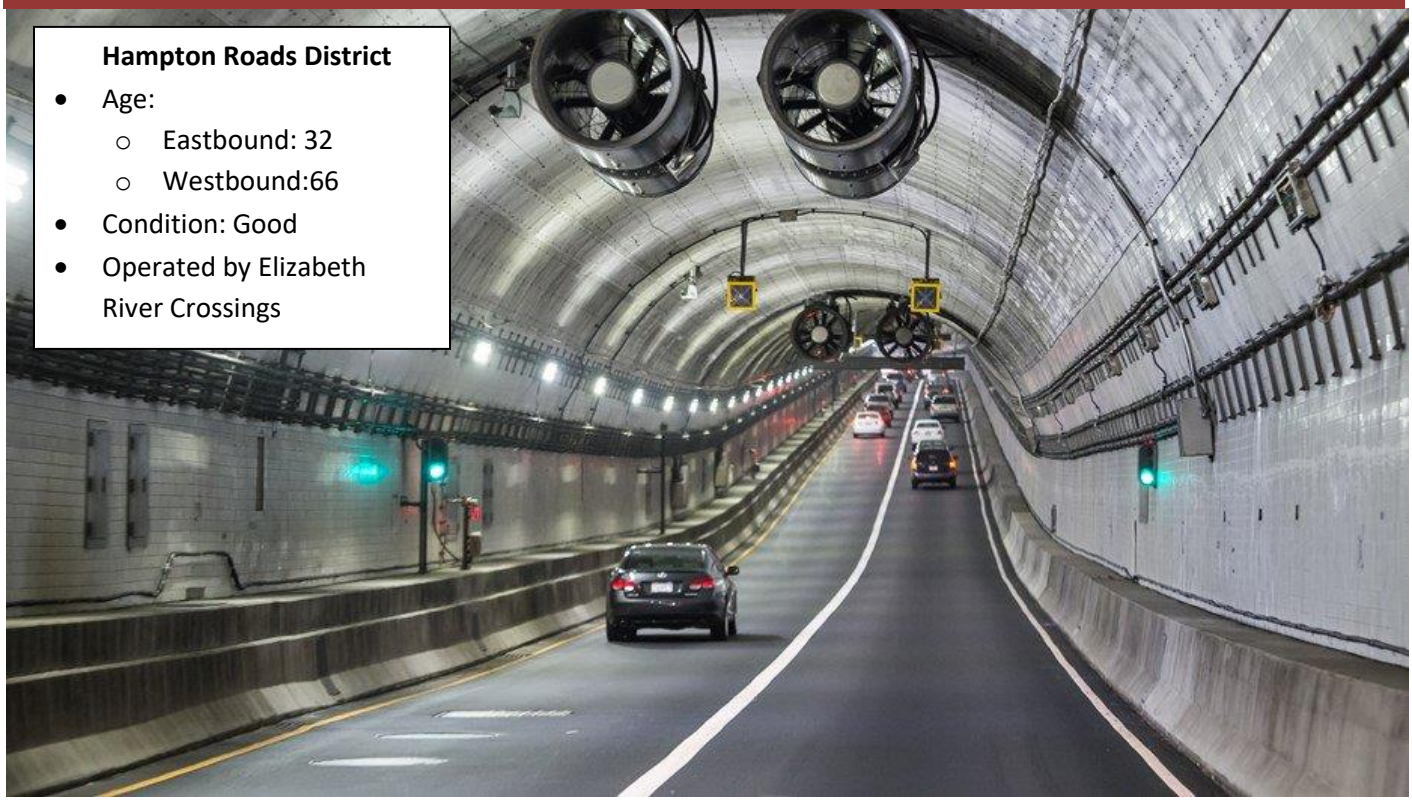
Midtown Tunnel: Rt. 58 under Elizabeth River (#13)



Hampton Roads District

- Age:
  - Eastbound: 56
  - Westbound: 2
- Condition: Good
- Operated by Elizabeth River Crossings

Downtown Tunnel: I-264 under Elizabeth River (#14)



Hampton Roads District

- Age:
  - Eastbound: 32
  - Westbound:66
- Condition: Good
- Operated by Elizabeth River Crossings

Rosslyn Tunnel: I-66 under Gateway Park & Fort Meyer Drive (#15)

Northern Virginia District

- Age: 35
- Condition: Fair
- ADT = 96,000
- Detour: 13 Miles

Large and Complex Structures

Route 460 over Grassy Creek (#16)

Bristol District

- Age: 1 Year
- Condition: Good
- Segmental Construction

SMART Road Bridge (#17)

Salem District

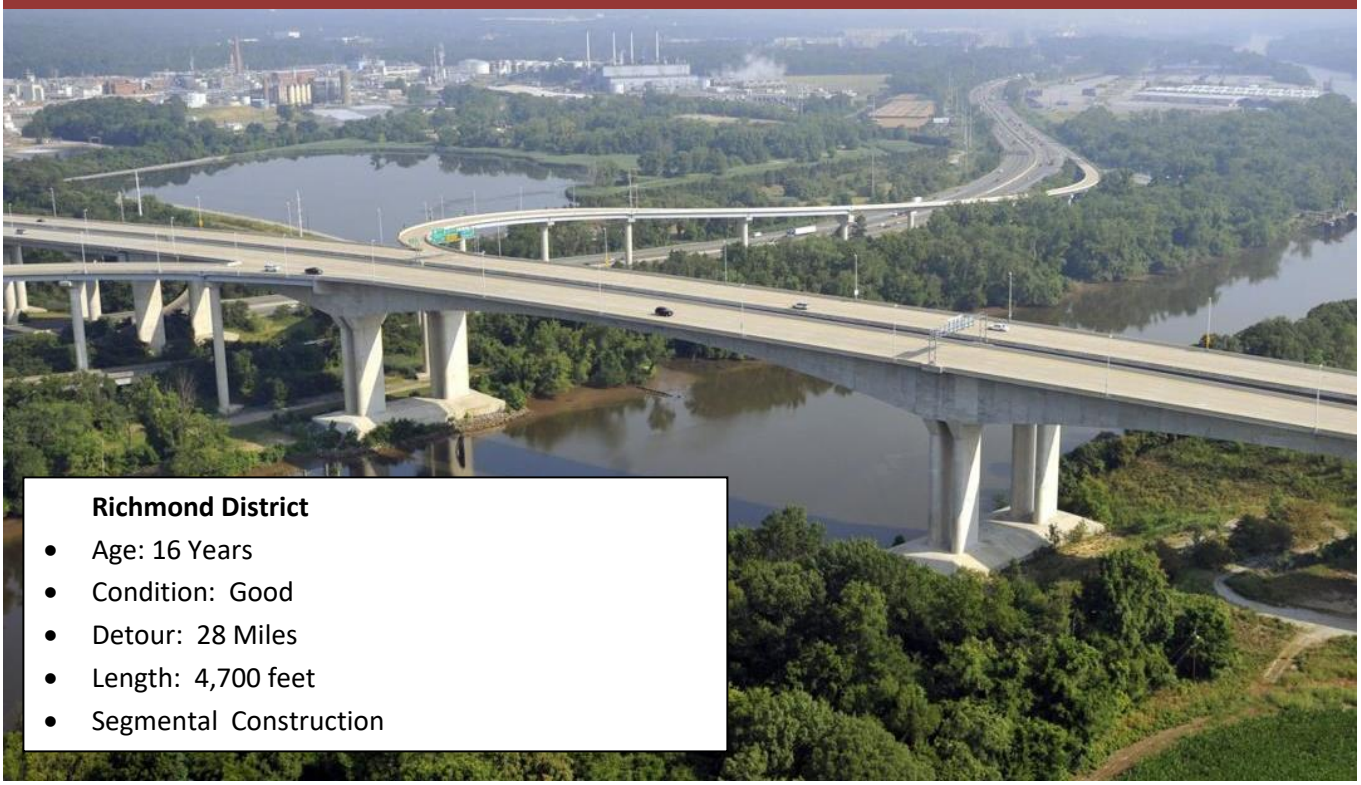
- Age: 17 Years
- Condition: Good
- Segmental Construction

Varina-Enon Bridge: I-295 over James River (#18)

Richmond District

- Age: 28 Years
- Condition: Fair
- ADT = 36,000
- Detour: 25 miles
- Cable-Stayed Bridge

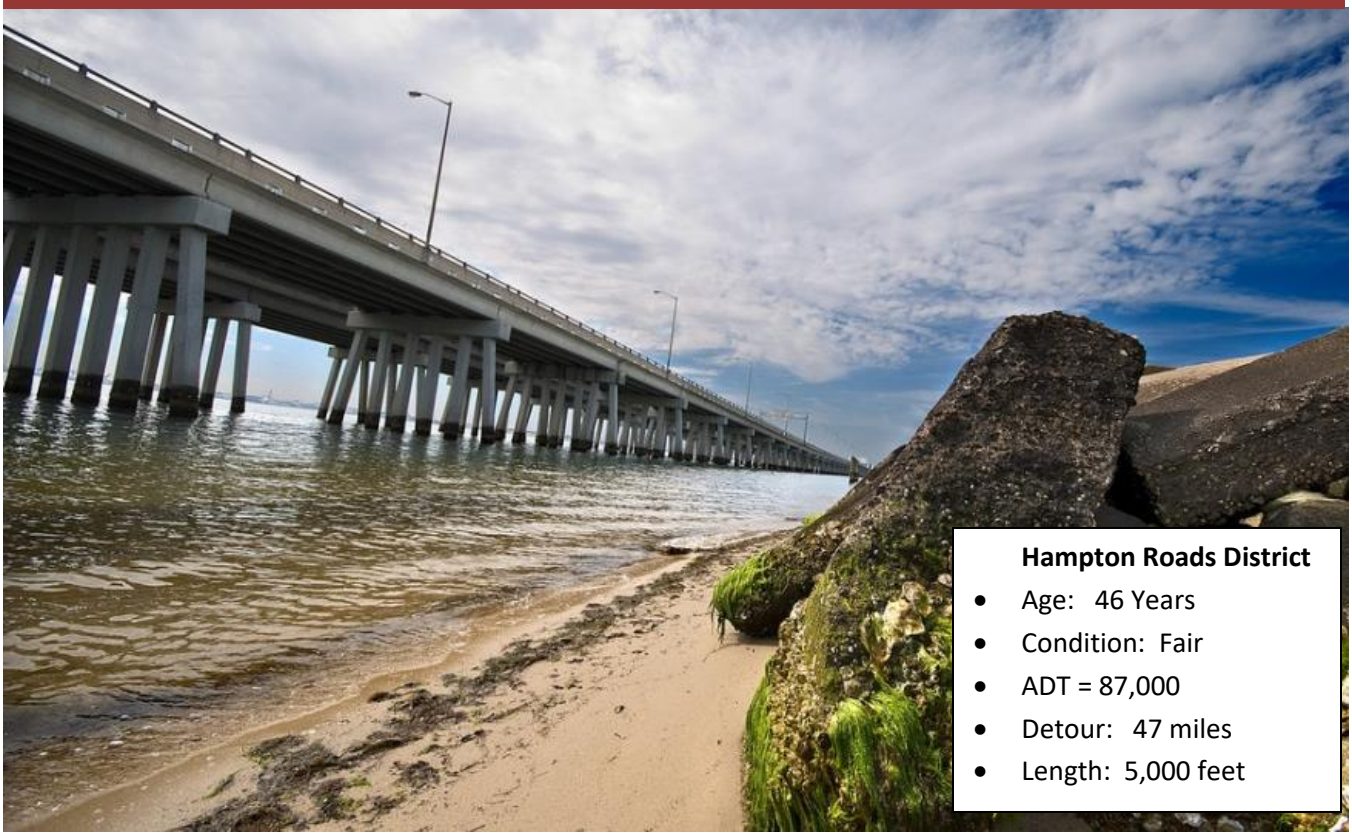
Pocahontas Parkway: 895 over James River (#19)



Richmond District

- Age: 16 Years
- Condition: Good
- Detour: 28 Miles
- Length: 4,700 feet
- Segmental Construction

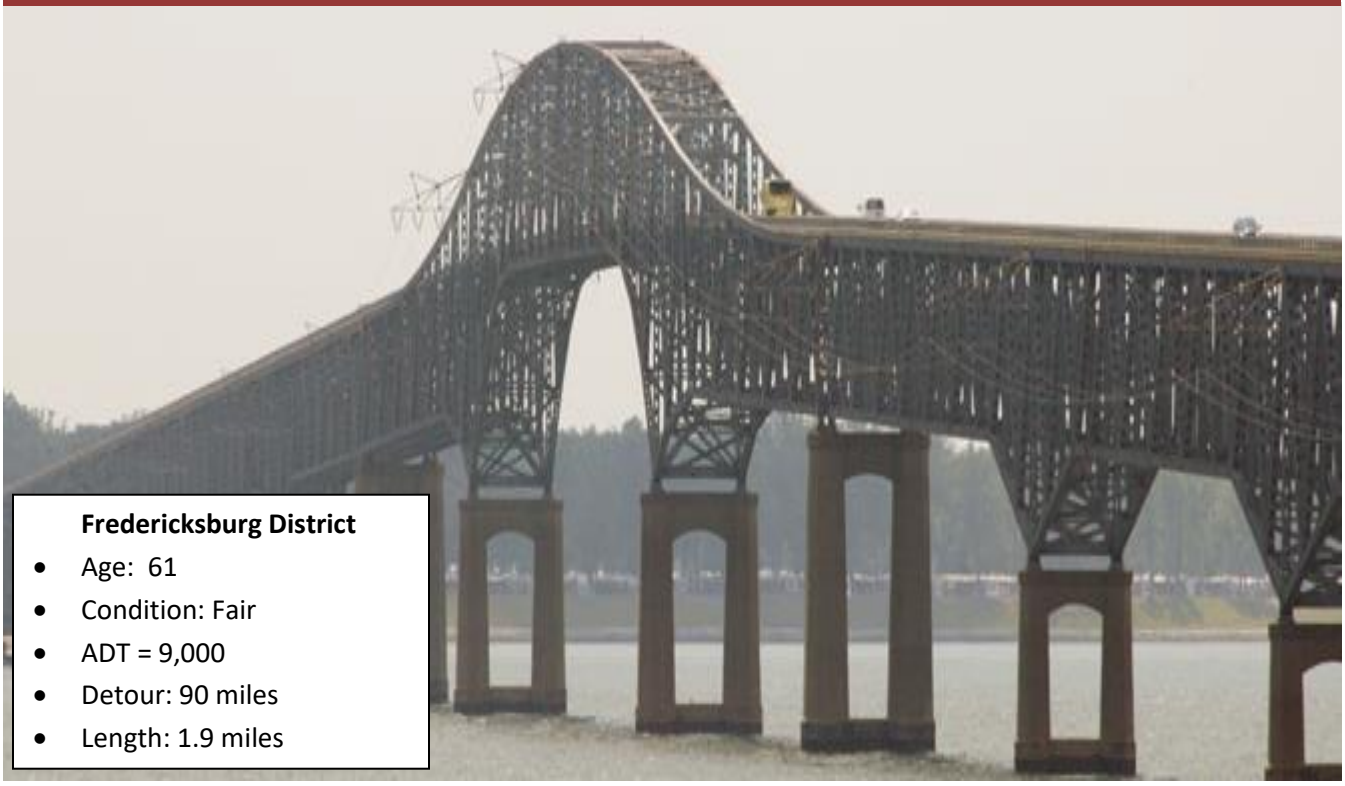
I-64 over Willoughby Bay (#21)



Hampton Roads District

- Age: 46 Years
- Condition: Fair
- ADT = 87,000
- Detour: 47 miles
- Length: 5,000 feet

Norris Bridge: Route 3 over Rappahannock River (#25)



Fredericksburg District

- Age: 61
- Condition: Fair
- ADT = 9,000
- Detour: 90 miles
- Length: 1.9 miles

APPENDIX B:
VITAL INFRASTRUCTURE 30-YEAR PLAN

VITAL INFRASTRUCTURE 30-YEAR PLAN

Type	Number	Bridge	Annual Need for Major Projects, Not Including Normal and Ordinary Maintenance and Operation ($Millions) - 2018 Dollars - With Contingency																												30 Year Major Project Totals	
			First Ten Years										Second Ten Years										Third Ten Years										Total	Group Total
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Movable	1	Benjamin Harrison	5	18									16	4	13	12	5	5	0	0	0	0	17	23	69	46	27	0	0	0	0	0	259	727
			Generator, Wire Rope, Fender										Fender, Gates	Replace Deck	Span Locks, CCTV, Machinery		Mechanical						Replacement											
	2	Chincoteague	0	0	0	0	0	0	0	0	0	0	4	1	2	0	0	0	2	0	0	0	0	0	0	0	0	6	9	8	0	0	32	
													Superstructure, Rehab Span Locks, Replace Deck						Motor									Mechanical & Electrical						
	3	High Rise	1	1	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	
			Structure, Generator, Electrical			Repl. Deck & Gates							Replacement of Movable Portion- See Large/Complex Bridge for Replacement Cost																						
	4	Berkley	12	36	24	22	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	14	14	13	0	0	0	0	0	0	0	143	
			Full Mechanical & Electrical Rehabilitation																Deck Rehab.				Fender Repair											
	5	Gwynn's Island	5	4	0	0	0	0	5	0	0	0	0	0	0	6	18	24	23	0	0	0	0	0	0	0	0	0	0	0	0	0	84	
			Machinery Rehab, Struct Repairs						Electrical							Replacement																		
	6	Coleman	1	1	1	5	0	0	0	0	0	0	11.5	11.5	11.5	0	1	1	0	0	2	1	0	0	0	5	5	2	0	0	0	0	59	
			Balance Wheel & Center Pivot Rehab			Elect.							Fender Rehabilitation				Overhaul Hydraulics				Lock Rehab					Mechanical and Electrical								
	7	James River Bridge	2	13	17	17	14	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	8	12	12	0	0	0	0	0	0	0	106	
			Temp Drive	Mechanical & Electrical Rehab																Deck Rehabilitation			Superstructure Rehabilitation											
	8	Eltham	1	1	5	5	5	0	0	0	0	0		0	0	0	0	1	1	1	0	0	0	0	0	0	0	5	5	5	0		34	
			Conduit Repair		Acoustic Monitoring & Corrosion Protection													Span Lock Rehab & Motor Replacement										Post-Tensioning Repair						
Tunnels	9	Big Walker	0	0	0	0	18	20	10	9	7	13	20	15	15	15	0	0	0	0	0	0	2	8	3	1	8	5	16	11	3	3	199	1051
							Fire Suppression, Emergency Ventilation		Structural Repairs, Lighting, Traffic Control, Emergency Ventilation, SCADA, Control Systems				Ventilation Rehab, Structural Repairs, Fire Apparatus, Electrical System Rehabilitation										Fire Protection Rehab, SCADA Upgrades, Lighting Replacement, Structural Repairs											
	10	East River	0	0	0	0	14	17	0	0	0	0	12	14	8	15	8	6	7	12	6	0	25	9	3	1	8	5	19	12	4	3	205	
							Fire Suppression						Ventilation Rehab, Structural Repairs, Fire Apparatus, Electrical System Rehabilitation, Structural Repairs, Lighting, Traffic Control, Emergency Ventilation, SCADA, Control Systems										Fire Protection Rehab, SCADA Upgrades, Lighting Replacement, Structural Repairs											
	11	HRBT	2	20	33	22	9	7	10	9	2	1	1	0	0	1	6	9	4	3	0	0	12	10	9	0	2	12	34	36	37	18	309	
			Communications	Electrical, Mechanical, Fire Detection, Plumbing			Facilities, Structure and Security		Traffic Control System		Waterway & Navigation		Waterway & Nav			Communications	Electrical, Mechanical, Fire Detection, Plumbing		Security				Facilities & Traffic Control			Communications	Electrical, Mechanical, Fire Detection, Plumbing, Security & Facilities				Traffic System		
	12	MMMBT	2	0	0	0	17	19	12	13	1	1	28	50	40	1	0	0	0	0	0	0	10	15	23	2	3	9	22	19	9	19	314	
			Communications				Facilities, Structure and Security		Traffic Control System		Waterway & Navigation		Electrical, Mechanical, Fire Detection, Plumbing			Communications							Facilities & Traffic Control, Electrical, Mechanical, Fire Detection, Plumbing, Security			Communications	Electrical, Mechanical, Fire Detection, Plumbing, Security & Facilities				Traffic System		
	13	Elizabeth River Midtown																															0	
	14	Elizabeth River Downtown																															0	
	15	Rosslyn	0	0	0	1	5	4	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	4	1	0	1	3	0	0	0	0	25	
						Communications, Mechanical, Drainage, Elect Rehab, Ceiling Removal										Mech & Facilities							Struct., Fire Prot., Electrical & Mech Systems				Facilities, Comm. & Security						
Large and Complex	16	460 Connector	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	6	1849
			Health Monitoring																	Concrete Overlay										Deck Rehab			
	17	Smart Road Bridge	0	1	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	12	
			Health Monitoring																									Deck Rehab					
	18	Varina-Enon	6	6	20	30	5	10	12	12	10	0	0	5	10	10	0	0	0	0	0	0	0	5	6	3	0	0	0	0	0	0	149	
			Deck Rehabilitation		Pylon Repair			Tendon Regrouting & Replacement						Tendon Regrouting and Replacement										Deck Rehabilitation										
	19	Pocahontas Parkway																															0	
	20	HRBT Approaches	3	3	3	104	117	118	117	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	476	
			Girder Strengthening			Replacement $456M										Waterproofing									Deck Repair								
	21	I-64 over Willoughby Bay	0	0	0	35	42	42	28	0	0	0	8	8	6	0	4	4	0	0	0	0	0	34	42	42	42	0	0	0	0	0	337	
						Rehabilitation $147M							Concrete Super & Sub Repairs				Waterproofing						Rehabilitation											
	22	MMMBT Approaches	3	4	3	0	0	0	0	0	0	0	9	9	11	9	33	11	0	0	0	0	0	0	0	4	7	4	0	3	3	3	118	
			Waterproofing										Pile Jackets			Superstructure Repairs										Deck Rehab				Pile Jackets			
	23	James River Bridge Approaches	0	0	0	0	0	0	0	0	0	0	16	18	22	14	0	0	0	0	0	0	12	12	18	18	13	0	0	0	0	0	143	
													Girder and Substructure Rehabilitation										Deck and Superstructure Rehabilitation											
	24	High Rise Bridge Approaches	0	0	7	12	7	0	0	0	0	0	45	97	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	260	
					Superstructure Repairs								Replacement - Cost Includes Movable Portion																						
	25	Norris Bridge	0	6	6	7	7	0	0	0	0	0	0	0	0	0	0	0	0	18	78	118	75	33	0	0	0	0	0	0	0	0	348	
				Superstructure Repairs																			Replacement											
		Annual Total	43	116	120	262	264	236	194	43	20	16	169	237	235	87	79	61	41	43	90	122	177	179	201	124	116	47	105	95	62	46	3,628	
		Ten Year Total	1313										1164										1152											

APPENDIX C: PRACTICES IN OTHER STATES

Practices in Other States

Pennsylvania Department of Transportation (PennDOT)

BACKGROUND

Pennsylvania's population of state-owned bridges is among the largest and oldest in the nation. In 2014, PennDOT prioritized transportation investments to repair and replace structurally deficient bridges. PennDOT developed a program in 2015 called the Rapid Bridge Replacement Project (RBRP) under a public-private partnership to help address the state's nearly 4,200 structurally deficient bridges. The $889 million Rapid Bridge Replacement (RBR) Project is a key component to obtaining the goal of replacing structurally deficient bridges.

PROGRAM / PROJECT SUMMARY

To identify bridges for inclusion in the RBRP, of the state's 4,200 structurally deficient bridges PennDOT scanned 2,000 bridges within its inventory and identified 900 bridges, which it ranked and prioritized for replacement. PennDOT reviewed the bridge inventory for projects that would have minimal right-of-way, environmental and utility concerns. In addition, PennDOT reviewed for "shovel ready" bridge work to begin construction in 2015 and 2016. The selected group of bridges (558) included within the project are relatively small; many single span, two-lane structures, of similar characteristics.

How does RBRP work? With the RBRP, PennDOT makes availability payments, not tolls, to the concessionaire with a concession term of 28.5 years (42 months construction/25 years for maintenance responsibility for each bridge). The P3 includes 558 bridges with an average cost of $2.1 million and an average age of 50 years.

Through the RBRP, PennDOT will replace 558 structurally deficient bridges around the state while minimizing impacts to the traveling public. The RBRP is unique because it is the first of its kind in the nation to bundle the replacement of hundreds of bridges in a public-private partnership (P3) agreement. No other P3 project in the country has embarked on a multi-asset, multi-location undertaking of this magnitude.

OUTCOMES

PennDOT implemented the RBRP to affect their performance. The results of implementing the RBRP is an improvement in the number of structurally deficient bridges, decreasing from 24.4% structurally deficient in 2014 to 18.3% structurally deficient in 2018.

https://www.penndot.gov/ProjectAndPrograms/p3forpa/Documents/Rapid%20Bridge%20Replace%20Project/General%20FAQ%27s%20(Updated%20Nov.%2016,%202015).pdf

South Carolina Department of Transportation (SCDOT) – 10 Year Plan

BACKGROUND

In 2017, South Carolina's General Assembly passed into law a fuel tax increase directing funds to the Infrastructure Maintenance Trust Fund (IMTF). The fund is reserved for repairs, maintenance and improvements to the existing highway system.

PROGRAM / PROJECT SUMMARY

South Carolina's DOT (SCDOT) developed a strategy for use of the IMTF funds - 10 Year Plan - with four main areas: safety, paving, bridge replacements and interstate widening.

The gas tax increase will increase steadily for six years, beginning with a bump of 2 cents per gallon each year to reach 12 cents per gallon. The increase is the first state gas tax increase in South Carolina since 1987.

OUTCOMES
SCDOT estimates funding will add $600 million per year over time, to reach $800 million per year by about 2023. At that point, resurfacing projects would receive the bulk of the funds at $407 million yearly, followed by interstate widenings, bridge (465 structures) and safety.

https://www.dot.state.sc.us/projects/ten-year-plan.aspx
https://www.equipmentworld.com/s-carolina-sets-out-10-year-transportation-plan-through-increased-funding/

Georgia Department of Transportation (GDOT) - 2015 Transportation Funding Act

BACKGROUND
The 2015 Georgia (GA) state legislature passed Georgia's Transportation Funding Act (TFA), which is a dedicated transportation fund to improve transportation throughout Georgia and to aid in business investment and development. The shipment of goods from locations within GA equates to approximately $790 billion annually, demonstrating how important the state's network of roads and bridges are to Georgia's economy. Georgia's expansion of economic development opportunities relies on the quality of the state's transportation systems. Companies looking to locate or expand seek regional options where congestion is mitigated, roads are maintained and multi-modal options are viable.
By passing the TFA, state legislatures estimate an infusion of $830 million to $1 billion in revenues annually for investing in the maintenance and enhancement of GA transportation infrastructure.

PROGRAM / PROJECT SUMMARY
The additional revenue source for the TFA funding are as follows:

- Motor fuel tax on distributors
  - $0.067 increase in gasoline tax
  - $0.077 increase in diesel fuel
  - Tax on gasoline and diesel fuel are indexed annually for increased vehicle fuel efficiency
  - Taxes on gasoline and diesel fuel were adjusted for increases in the Consumer Price Index (CPI) from 2016 through 2018
- $200/$300 Alternative Fuel Motor Vehicle Annual Registration Fee for non-commercial and commercial vehicles
- Hotel/Motel Nightly Fee: $5 per night lodging fee. (excludes extended stay occupants)
- Heavy Vehicle Annual Impact Fee:
  - $50 for vehicles 15,500 lbs. to 26,000 lbs.
  - $100 for vehicles greater than 26,001 lbs.

The TFA includes 11 megaprojects that will create additional capacity, relieving traffic congestion and expand travel options. In addition to new construction, TFA will allow GDOT to address critical infrastructure needs such as pothole repair, striping, guardrail repair, resurfacing of state routes and interstates, bridge replacements and maintenance, safety improvement projects and local maintenance and improvement funding.

OUTCOMES
The GDOT estimates that between 2016 and 2020 an average of 232 bridges will be repaired, replaced or reconstructed as a result of TFA funding. In addition, it will allow GDOT to reduce the share of state-maintained roads in poor or bad condition and to reduce the state-maintained roads in bad or poor condition from 13% in 2016 to 0% in 2019. Unfortunately, TFA funding is not sufficient to prevent state-maintained roads currently in excellent or good condition from declining, falling from 49 percent in 2016 to 15 percent in 2024.

Overall, the TFA has fueled improvement in Georgia's transportation infrastructure; more work is required to keep up with the expected growth projected for the state and its economy.

(reference: LEGISLATIVE COMMITTEE April 15, 2015 LEGISLATIVE SESSION WRAP-UP- slide presentation at http://www.dot.ga.gov/AboutGeorgia/Board/Presentations/2015LegislativeSessionWrapUp.pdf#search=HB%20170) and http://www.dot.ga.gov/InvestSmart/TransportationFundingAct/Documents/General/WhatIsTFA.pdf

Rhode Island - RI Bridge Replacement, Reconstruction, and Maintenance Fund Act / "RhodeWorks"

BACKGROUND

In 2016, the Rhode Island General Assembly approved legislation (The Rhode Island Bridge Replacement, Reconstruction, and Maintenance Fund Act or "RhodeWorks") to invest significant funding into transportation infrastructure such as bridges and improve the economic attractiveness of the state. At that time, when reviewing the condition of bridges within Rhode Island and comparing to the other 49 states, Rhode Island's bridges ranked 50th out of 50 states when comparing bridge inventory conditions. Legislators passed RhodeWorks to improve the quality of life for its residents, promote economic growth by attracting new businesses to their state and increase jobs.

PROGRAM / PROJECT SUMMARY

RhodeWorks, a 10-year, $4.7 billion investment program, allows the Rhode Island Department of Transportation (RIDOT) to establish and collect tolls on large commercial trucks traveling on Rhode Island bridges. The revenue source is generated through "truck only" toll lanes (electronic tolling) along specified routes in Rhode Island and prohibits assessing a user fee on cars or smaller trucks.
In addition to collecting tolls from commercial vehicles through "truck only" toll lanes, RhodeWorks allows for:

- refinancing and restructuring of existing GARVEE bonds,
- issuance of new GARVEE bonds, not to exceed $300.0 million

OUTCOMES

The purpose of RhodeWorks is to improve RI's transportation infrastructure and make RI an attractive place for businesses, and ultimately increase jobs and improve RI's economy. RhodeWorks establishes a source of revenue generated from "truck only" toll lanes (electronic tolls) that provides funding for transportation infrastructure. With this funding stream, RIDOT targets needed repairs to approximately 150 structurally deficient bridges and to approximately 500 additional bridges to prevent them from falling into a structurally deficient status. The ultimate goal is to have 90% or more of RIDOT's bridge inventory rated as structurally sufficient by 2025.
http://www.rilegislature.gov/mwg-internal/de5fs23hu73ds/progress?id=jv27NTevNTTtUR6wAHtkJUXPqCprJWWXOIZpSbzyZa8, or
https://www.ri.gov/press/view/29697
http://www.dot.ri.gov/rhodeworks/

New Jersey Turnpike Authority

BACKGROUND

New Jersey legislators created the New Jersey Turnpike Authority (NJTA) in 1948 to manage the construction of the New Jersey Turnpike and then, subsequently, its operations, maintenance, repair

and/or replacement. Upon completion of construction, the New Jersey Turnpike opened to traffic on November 30, 1951. Construction of the Garden State Parkway (GSP) began in 1946 after passage of New Jersey's Parkway and Freeway Act. The GSP was started as part of the state highway system and was initially funded with annual highway appropriations In May 2003; the New Jersey Turnpike Authority Act was amended to consolidate the management and operation of both the New Jersey Turnpike and the Garden State Parkway under the control of the NJTA.

PROGRAM / PROJECT SUMMARY

The New Jersey Turnpike Authority, a State of New Jersey agency, owns, operates and maintains the New Jersey Turnpike and the Garden State Parkway. The New Jersey Turnpike is a limited access toll road that serves as part of the Interstate 95 corridor and consists of 122-mile mainline and two extensions. The Garden State Parkway is a 173-mile limited access toll facility. The New Jersey Turnpike Authority has payment requirements to the State of New Jersey. The payments include state's Transportation Trust Fund ($22M annual payment), Feeder Road Maintenance Agreement ($4.5M) and State Transportation Projects ($166.5M). The payments to the State of New Jersey are subordinate to debt service payments to bondholders.

Using their ability to increase tolls to fund debt service, in 2008, the Board of Commissions for the NJTA approved a 10 year, $7 billion Capital Improvement Program to undertake major maintenance to stretches of the NJ Turnpike and GSP and add capacity.

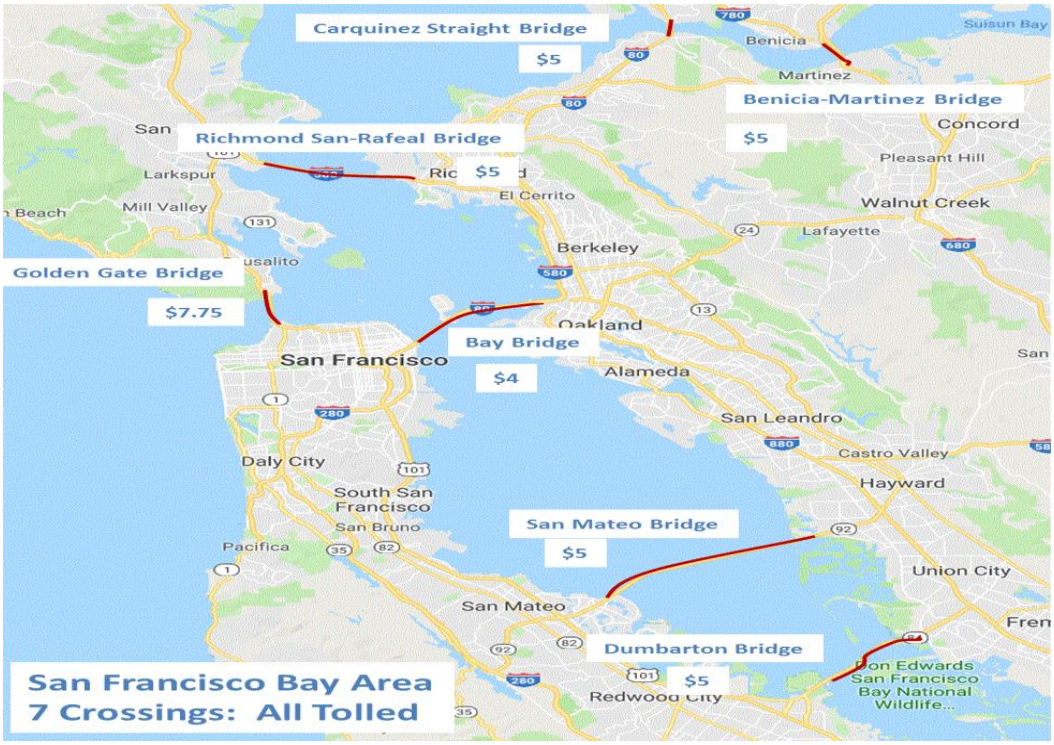
OUTCOMES

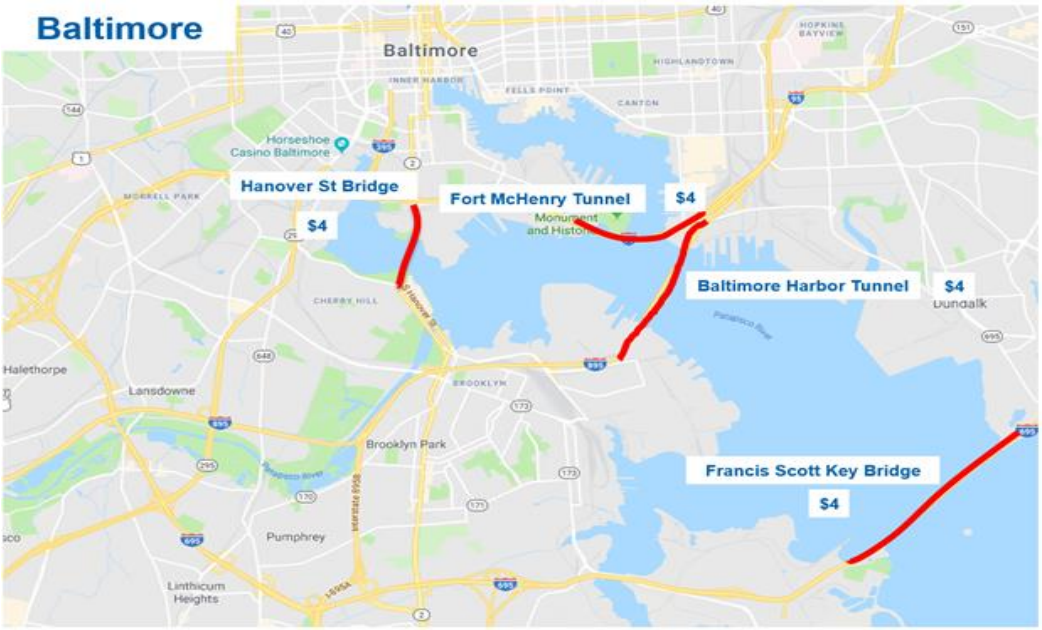
When the federal interstate program was established, these two roadways were grandfather allowing toll collection to continue. The New Jersey Turnpike and the Garden State Parkway using its ability to increase tolls, NJTA included in its Capital Improvement Program a 10 year plan that widens stretches of the NJ Turnpike and Garden State Parkway, improve interchanges, bridges and launch new transportation technologies to improve operations. An increase in tolling fee structures are funding the Program.

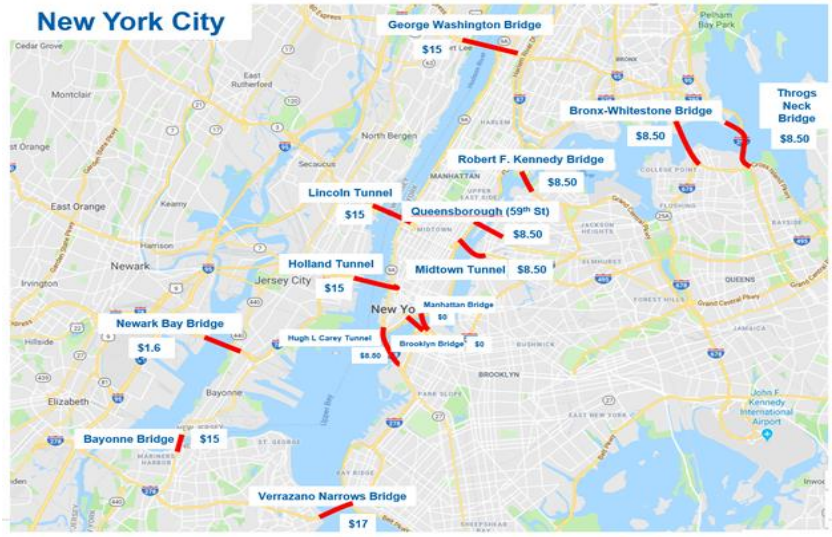
https://www.njta.com/media/1661/fin_ann_bdg_2017.pdf
https://www.njta.com/media/3511/2018-capital-project-investment-plan.pdf
https://www.state.nj.us/transportation/publicat/pdf/History/historydriscoll.pdf
https://www.njtvonline.org/news/video/where-does-your-toll-money-go/
https://en.wikipedia.org/wiki/New_Jersey_Turnpike_Authority
https://www.njta.com/media/1661/fin_ann_bdg_2017.pdf

Other Region Practices within States - California, Maryland, New York

As displayed in the maps below, facility tolls are the predominant method for funding large and complex structures.


Carquinez Straight Bridge
$5
Benicia
Martinez
Benicia-Martinez Bridge
$5
Richmond San-Rafeal Bridge
$5
Golden Gate Bridge
$7.75
Bay Bridge
$4
San Francisco
Oakland
Alameda
San Leandro
Berkeley
El Cerrito
Walnut Creek
Lafayette
Pleasant Hill
Concord
Larkspur
Mill Valley
Daly City
South San Francisco
San Bruno
Pacifica
San Mateo Bridge
$5
San Mateo
Union City
Dumbarton Bridge
$5
Redwood City
San Francisco Bay Area
7 Crossings: All Tolled


Baltimore
Baltimore
Horseshoe Casino Baltimore
Hanover St Bridge
$4
Fort McHenry Tunnel
$4
Baltimore Harbor Tunnel
$4
Francis Scott Key Bridge
$4
Halethorpe
Lansdowne
Brooklyn Park
Pumphrey
Linthicum Heights



In most of these states, separate toll authorities have been created for the collection of tolls and maintenance and operation of the facilities. Virginia has had success with this model, as there are currently two toll authorities that operate in the state:

- Chesapeake Bay Bridge Tunnel Authority (CBBTA)
- Richmond Metropolitan Toll Authority (RMTA)

For any toll road, operations and maintenance are expected to be funded *first* with debt service next. In addition, major maintenance, replacement and repair are also to be funded from existing toll revenues or toll increase. RMTA for example is currently undertaking a major rehabilitation of its bridges and pavements. After these are funded, new capacity can be funded. CBBTA is undertaking the new tube following this process.