KEEPING MARYLAND MOBILE:

Progress and Challenges in Providing an Efficient, Safe and Well-Maintained Transportation System

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TRIP
a national transportation research group
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Founded in 1971, TRIP ® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.

Executive Summary

Eight years after the nation suffered a significant economic downturn, Maryland's economy continues to rebound. The rate of economic growth in Maryland, which will be greatly impacted by the reliability and condition of the state's transportation system, continues to have a significant impact on quality of life in the Free State.

An efficient, safe and well-maintained transportation system provides economic and social benefits by affording individuals access to employment, housing, healthcare, education, goods and services, recreation, entertainment, family, and social activities. It also provides businesses with access to suppliers, markets and employees, all critical to a business' level of productivity and ability to expand. Reduced accessibility and mobility - as a result of traffic congestion, a lack of adequate capacity, or deteriorated roads, highways, bridges and transit facilities - diminishes a region's quality of life by reducing economic productivity and limiting opportunities for economic, health or social transactions and activities.

With the state's population and employment continuing to grow, Maryland must continue to improve its transportation system to foster economic growth and keep and attract business. In addition to economic growth, transportation improvements are needed to ensure safe, reliable mobility. Meeting Maryland's need to further modernize its transportation system will require significant local, state and federal funding.

Maryland has undertaken a sustained commitment to upgrade the condition and efficiency of its roads, highways, bridges, transit systems and pedestrian and bicycling facilities. The Maryland General Assembly's approval of the Transportation Infrastructure Investment Act of 2013 has allowed the state to significantly boost its investment in Maryland's transportation system.

In December 2015 the president signed into law a long-term federal surface transportation program that includes modest funding increases and allows state and local governments to plan and finance projects with greater certainty through 2020.

This significant boost in state transportation funding, as well as the modest increase in federal surface transportation funding, is supporting increased investment in road, highway and bridge repairs in Maryland and allowing the state to move forward with numerous projects to expand the capacity and/or efficient operations of its transportation system. This increase in transportation capacity and efficient operations will further economic development opportunities and improve quality of life.

Population and economic growth have placed increased demands on Maryland's major roads and highways, leading to mounting wear and tear on the transportation system.

- From 2000 to 2015, Maryland's population increased by 13 percent, from approximately 5.3 million residents to approximately 6 million.

- Maryland's population is projected to increase to approximately 6.9 million in 2040, with the state expected to add an additional 800,000 jobs between 2010 and 2040.

- Vehicle miles traveled (VMT) in Maryland increased 12 percent from 2000 to 2014 – from 50.1 billion VMT in 2000 to 56.4 billion VMT in 2014.

- Vehicle miles of travel in Maryland in 2015 were 2 percent higher than in 2014.
- From 2000 to 2014, Maryland's gross state product (GSP), a measure of the state's economic output, increased by 31 percent, when adjusted for inflation.
- Based on population and other lifestyle trends, TRIP estimates that travel on Maryland's roads and highways will increase by another 20 percent by 2030.

Traffic congestion places a significant burden on Marylanders, including lost time, reduced economic productivity and wasted fuel. Maryland's roadways are among the most congested in the nation.

- Congestion on Maryland's roads and highways results in 195 million hours of delay annually and the consumption of an extra 85 million gallons of fuel, resulting in an annual cost in lost time and wasted fuel of $4.1 billion.

- The share of Maryland's freeways and expressways that experience heavy to severe congestion is increasing. In 2014, 16 percent of the state's freeways and expressways experienced heavy to severe congestion during the morning peak commuting hours while 24 percent experienced heavy to severe congestion during the afternoon peak commuting hours. This is up from 16 and 22 percent, respectively, in 2013.

- Two of the nation's 25 most congested urban areas are located in or include parts of Maryland. The Washington, DC metro area, which includes suburbs in Maryland and Virginia, is ranked first nationally in the cost of traffic congestion per commuter, with congestion costing $1,834 per commuter and causing 82 hours of delay annually. The Baltimore urban area ranked 25th in the cost of traffic congestion per commuter at $1,115, with the average Baltimore motorist losing 47 hours annually.

- The Maryland State Highway Administration identified the top 30 traffic bottleneck locations in Maryland in 2014 by ranking segments of roadway based on the duration, intensity, frequency and average queue length of congestion. The following chart details the top 30 roadway bottlenecks in Maryland in 2014.

Maryland's Top 30 Bottleneck Locations - 2014					
Rank	**Location**	**Route**	**Direction**	**Average Duration (Minutes)**	**Average Max Length (Miles)**
1	I-495 IL @ I-270 Spur	I-495	Inner Loop	168.75	12.3
2	I-95 OL @ Greenbelt Metro Dr/Exit 24	I-95	Outer Loop	125.5	19.46
3	I-95 N @ MD-100/Exit 43	I-95	Northbound	120	9.41
4	I-270 Spur S @ I-270	I-270	Southbound	111	10.78
5	MD-295 N @ I-195	MD-295	Northbound	138.5	13.21
6	MD-295 N @ MD-175	MD-295	Northbound	150.5	8.66
7	I-695 OL @ Edmondson Ave/Exit 14	I-695	Outer Loop	121.5	8.82
8	I-695 IL @ I-795/Exit 19	I-695	Inner Loop	122.25	8.68
9	I-695 IL @ MD-147/Harford Rd/Exit 31	I-695	Inner Loop	159.25	10.43
10	MD-295 N @ MD-197/EXIT 111	MD-295	Northbound	169.75	6.33
11	I-695 IL @ MD-41/Perring Pkwy/Exit 30	I-695	Inner Loop	107.25	7.59
12	I-95 OL @ US-50/Exit 19	I-95	Outer Loop	107.75	5.7
13	I-270 Local N @ MD 124	I-270	Northbound	126.5	4.17
14	I-95 S @ I-495/Exit 27-25	I-95	Southbound	92	5.43
15	I-95 IL @ MD-214/ Exit 15	I-95	Inner Loop	101.75	5.15
16	MD-295 S @ MD-1931	MD-295	Southbound	94.5	7.76
17	MD-295 S @ Powder Mill Rd1	MD-295	Southbound	97.5	5.12
18	I-695 IL @ I-83/MD-25/Exit 23	I-695	Inner Loop	86.5	6.6
19	I-695 OL @ US-40/Exit 15	I-695	Outer Loop	82.5	6.68
20	I-270 N @ MD-80/Exit 26	I-270	Northbound	85.25	8.02
21	I-95 IL @ MD-4/Pennsylvania Ave/Exit 11	I-95	Inner Loop	105.25	7.25
22	MD-295 N @ MD-1001	MD 295	Northbound	87	6.11
23	I-495 IL @ MD-97/Georgie Ave/Exit 31	I-495	Outer Loop	100.75	3.5
24	I-270 S @ MD-109/Exit 22	I-270	Southbound	78.5	4.15
25	I-270 N @ MD-109/Exit 22	I-270	Northbound	96.75	8.67
26	I-495 CCW @ MD-185/Connecticut Ave/Exit 33	I-495	Outer Loop	122.25	5.48
27	MD-295 N @ Powder Mill Rd1	MD-295	Northbound	85	3.16
28	I-270 N @ I-70/US-40	I-270	Northbound	68.75	8.06
29	I-270 Local S @ I-270	I-270	Southbound	82.5	4.53
30	I-695 IL @ MD 26	I-695	Inner Loop	107.75	6.24

Since the Maryland General Assembly's passage of the Transportation Infrastructure Investment Act of 2013 the state has been able to increase investment in repairing roads, highways and bridges and move forward with numerous transportation projects to improve mobility in Maryland.

- Since passage of the Transportation Infrastructure Investment Act of 2013, the average annual highway investment in Maryland by the State Highway Administration increased by 85 percent from an average of $810 million annually from 2010 to 2012 to an average of $1.5 billion annually from 2016 to 2018.
- The share of state-maintained roads and highways in Maryland in poor or mediocre condition decreased from 30 percent in 2012 (13 percent rated poor and 17 percent rated in mediocre condition) to 24 percent in 2014 (10 percent rated poor and 14 percent rated in mediocre condition).
- The number of state-maintained bridges in Maryland rated structurally deficient has been reduced from 97 in 2012 to 69 in 2015.

- Since 2013, Maryland has been able to complete a number of highway projects to increase the capacity of many of the state's most heavily traveled routes. The following table provides information on some of the key congestion relief projects completed in Maryland since 2013.

Major Maryland Congestion Relief Projects Completed Since 2013	
Facility/Route	Improvement
InterCounty Connector (ICC)	Construction of the final section of the ICC from 1-95 to US 1
I-95 Express Toll Lanes	Construction of two additional barrier-separated toll lanes on approximately eight miles from just south of I-895 to north of MD 43
I-695/Wilkens Avenue	Reconstruction and Widening
MD 32/Linden Church Road	Interchange construction
MD 175@Rockenbach Rd & Disney Rd.	Widening MD 175 to four lanes and adding turn lanes
I 695 @ MD 144 (Frederick Rd.)	Relocation of ramp from I-695 northbound to MD 144 and new left turn laneds added along MD 144
I 70 @ South Street/Monocacy Blvd.	Widening I 70 to six lanes
US 40 @ MD 715	Widening US 40 eastbound to MD 715 southbound ramp to mulitiple lanes, widening the MD 715 bridge over US 40 and widening MD 715 to six lanes south of the interchange
US 40 @ MD 7/MD 159	Widening of the MD 7 approach to US 40 to provide for an additional left turn lane to US 40 eastbound and a separate right turn lane.
MD 30/MD 91	Construction of second through lane on MD 30 and an exclusive left turn lane on MD 91
MD 27/Sweepstakes Rd./Marlboro Dr.	Construction of separate northbound right turn lane
MD 108/Bowie Mill Road	Traffic signal and left turn lane added on Bowie Mill Road
US 40/MD 63	Added northbound and southbound turn lanes
MD 145 @ MD 146	Construction of a second MD 146 northbound and MD 145 eastbound through lanes
MD 197 @ Powder Mill Rd./American Hol	Widening of MD 197 to provide an eastbound right and left turn lane and a westbound left turn lane
US 50 @ Seahawk Rd./MD 452	Added a second left turn lane from US 50 westbound to Seahawk Road southbound

- Maryland has also made significant progress since 2013 in improving the efficiency of its transportation system and expanding facilities for non-motorized transportation. These mobility improvements include:

- ✓ Expanding the state's highway service patrols serving the Baltimore, Washington, Frederick and Annapolis areas to 24 hours a day seven days a week in 2014, which resulted in the patrols responding to 23,000 incidents and assisting nearly 37,000 stranded motorists in 2014.

- ✓ Improving driver information services, including upgrading the state's 511 traveler information service and expanding the state's travel time information, with nearly 100 message signs in operation throughout the state.

- ✓ Improving signal timing on 225 traffic signals.

- ✓ Installing 11 miles of new sidewalks and 13 miles of marked bicycle lanes.

Nearly a quarter – 23 percent -- of locally and state-maintained bridges in Maryland show significant deterioration or do not meet current design standards, often because of narrow lanes, inadequate clearances or poor alignment with the adjoining roadway.

- Six percent of Maryland's locally and state-maintained bridges are structurally deficient. A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Structurally deficient bridges are often posted for lower weight or closed to traffic, restricting or redirecting large vehicles, including commercial trucks and emergency services vehicles.

- A bridge is considered structurally deficient if: 1) any of its significant load carrying elements are found to be in a poor condition due to deterioration and/or damage; 2) it has a low weight restriction; or 3) the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point that roadway flooding causes intolerable traffic interruptions.

- Seventeen percent of Maryland's locally and state-maintained bridges are functionally obsolete. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

Improving safety features on the state's roads and highways would likely result in a decrease in traffic fatalities and serious crashes.

- Between 2010 and 2014, 2,404 people were killed in traffic crashes in Maryland, an average of 481 fatalities per year.

- Maryland's overall traffic fatality rate of 0.78 fatalities per 100 million vehicle miles of travel in 2014 is lower than the national average of 1.08.

- The traffic fatality rate on Maryland's non-Interstate rural roads in 2014 was approximately three times higher than on all other roads and highways in the state – 1.84 fatalities per 100 million vehicle miles of travel compared to 0.61, compared to a national average of 2.14 and 0.77, respectively.

- Several factors are associated with vehicle crashes that result in fatalities, including driver behavior, vehicle characteristics and roadway features.

- Where appropriate, highway improvements can reduce traffic fatalities and crashes while improving traffic flow to help relieve congestion. Such improvements include removing or shielding obstacles; adding or improving medians; improved lighting; adding rumble strips, wider lanes, wider and paved shoulders; upgrading roads from two lanes to four lanes; and better road markings and traffic signals.

- Investments in rural traffic safety have been found to result in significant reductions in serious traffic crashes. A 2012 report by the Texas Transportation Institute (TTI) found that improvements completed recently by the Texas Department of Transportation that widened lanes, improved shoulders and made other safety improvements on 1,159 miles of rural state roadways resulted in 133 fewer fatalities on these roads in the first three years after the improvements were completed (as compared to the three years prior). TTI estimates that the improvements on these roads are likely to save 880 lives over the next 20 years.

The efficiency of Maryland's transportation system, particularly its highways, is critical to the state's economy. Businesses are increasingly reliant on an efficient and reliable transportation system to move products and services. A key component in business efficiency and success is the level and ease of access to customers, markets, materials and workers.

- Annually, $445 billion in goods are shipped to and from sites in Maryland, with 75 percent of the freight tonnage being shipped by trucks.
- Businesses have responded to improved communications and greater competition by moving from a push-style distribution system, which relies on low-cost movement of bulk commodities and large-scale warehousing, to a pull-style distribution system, which relies on smaller, more strategic and time-sensitive movement of goods.

- Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system.

- Highway accessibility was ranked the number two site selection factor behind only the availability of skilled labor in a 2013 survey of corporate executives by Area Development Magazine.

- The Federal Highway Administration estimates that each dollar spent on road, highway and bridge improvements results in an average benefit of $5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.

According to a 2012 national report, improved access as a result of capacity expansions provides numerous regional economic benefits. Those benefits include higher employment rates, higher land value, additional tax revenue, increased intensity of economic activity, increased land prices and additional construction as a result of the intensified use.

- The report, "Interactions Between Transportation Capacity, Economic Systems and Land Use," prepared by the Strategic Highway Research Program for the Transportation Research Board, reviewed 100 projects, costing a minimum of $10 million, which expanded transportation capacity either to relieve congestion or enhance access.

- The projects analyzed in the report were completed no later than 2005 and included a wide variety of urban and rural projects, including the expansion or addition of major highways, beltways, connectors, bypasses, bridges, interchanges, industrial access roads, intermodal freight terminals and intermodal passenger terminals.

- The expanded capacity provided by the projects resulted in improved access, which resulted in reduced travel-related costs, faster and more reliable travel, greater travel speeds, improved reliability, and increased travel volume.

- The report found that improved transportation access benefits a region by: enhancing the desirability of an area for living, working or recreating, thus increasing its land value; increasing building construction in a region due to increased desirability for homes and businesses; increasing employment as a result of increased private and commercial land use; and increasing tax revenue as a result of increased property taxes, increased employment and increased consumption, which increases sales tax collection.

- The report found that benefits of a transportation capacity expansion unfolded over several years and that the extent of the benefits were impacted by other factors including: the presence of complementary infrastructure such as water, sewer and telecommunications; local land use policy; the local economic and business climate; and whether the expanded capacity was integrated with other public investment and development efforts.

- For every $1 million spent on urban highway or intermodal expansion, the report estimated that an average of 7.2 local, long-term jobs were created at nearby locations as a result of improved access. An additional 4.4 jobs were created outside the local area, including businesses that supplied local businesses or otherwise benefited from the increased regional economic activity.

- For every $1 million spent on rural highway or intermodal expansion, the report estimated that an average of 2.9 local, long-term jobs were created at nearby locations as a result of improved access. An additional 1.6 jobs were created outside the local area, including businesses that supplied local businesses or otherwise benefited from the increased regional economic activity.

- The report found that highway and intermodal capacity projects in urban areas created a greater number of long-term jobs than in rural areas, largely due to the more robust economic environment and greater density in urban communities.

The recently approved five-year federal surface transportation program includes modest funding increases and provides states with greater funding certainty, but falls far short of providing the level of funding needed to meet the nation's highway and transit needs. The bill does not include a long-term and sustainable revenue source.

- Signed into law in December 2015, the Fixing America's Surface Transportation (FAST Act), provides modest increases in federal highway and transit spending, allows states greater long-term funding certainty and streamlines the federal project approval process. But the FAST Act does not provide adequate funding to meet the nation's need for highway and transit improvements and does not include a long-term and sustainable funding source.

- The five-year, $305 billion FAST Act will provide a boost of approximately15 percent in highway funding and an 18 percent boost in transit funding over the duration of the program, which expires in 2020.

- In addition to federal motor fuel tax revenues, the FAST Act will also be funded by $70 billion in U.S. general funds, which will rely on offsets from several unrelated federal programs including the Strategic Petroleum Reserve, the Federal Reserve and U.S. Customs.

- According to the 2015 AASHTO Transportation Bottom Line Report a significant boost in investment in the nation's roads, highways, bridges and public transit systems is needed to improve their condition and to meet the nation's transportation needs.

- AASHTO's report found that annual investment in the nation's roads, highways and bridges needs to increase 36 percent, from $88 billion to $120 billion, to improve conditions and meet the nation's mobility needs, based on an annual one percent rate of vehicle travel growth. Investment in the nation's public transit system needs to increase from $17 billion to $43 billion.

- AASHTO's Bottom Line Report found that if the national rate of vehicle travel increased by 1.4 percent per year, the needed annual investment in the nation's roads, highways and bridges would need to increase by 64 percent to $144 billion. If vehicle travel grows by 1.6 percent annually the needed annual investment in the nation's roads, highways and bridges would need to increase by 77 percent to $156 billion.

Sources of information for this report include the Federal Highway Administration (FHWA), the Maryland State Highway Administration (SHA), the Bureau of Transportation Statistics (BTS), the U. S. Census Bureau, the Congressional Budget Office (CBO), the Texas Transportation Institute (TTI), the American Association of State Highway and Transportation Officials (AASHTO) and the National Highway Traffic Safety Administration (NHTSA). All data used in the report are the most recent available.

Introduction

Maryland's transportation system provides vital links for the state's residents, visitors and businesses, providing daily access to homes, jobs, schools, shopping, natural resources and recreation. To foster quality of life and to support a economic competitiveness in the Free State, it is critical that Maryland's roads, highways, bridges, transit systems and bicycle and pedestrian facilities continue to be improved and modernized.

Largely through funding provided by the Transportation Infrastructure Investment Act of 2013, Maryland has undertaken a sustained commitment to upgrade the condition and efficiency of its roads, highways and bridges and modernize its transportation network. The resulting improvements in Maryland's network of roads, bridges, public transit and other transportation facilities will allow for the creation of jobs, the preservation of the state's transportation network, and the promotion of economic growth.

Maryland has made significant progress in recent years, but challenges remain in relieving traffic congestion, improving travel efficiency, enhancing road and bridge conditions and improving traffic safety, while continuing to modernize the transportation system in order to further economic growth and quality of life.

As Maryland faces the challenge of making further progress in preserving, modernizing and improving its transportation system, the future level of federal, state and local funding will be a critical factor in whether the state's residents, businesses and visitors reap the benefit of a well-maintained, efficient and safe transportation system.

This report examines the condition, use and safety of Maryland's roads, highways and bridges as well as recent improvements in the state's transportation system. Sources of

information for this report include the Federal Highway Administration (FHWA), the Maryland State Highway Administration (SHA), the U. S. Census Bureau, the Texas Transportation Institute (TTI), the Congressional Budget Office (CBO), the Bureau of Transportation Statistics (BTS), the American Association of State Highway and Transportation Officials (AASHTO) and the National Highway Traffic Safety Administration (NHTSA).

Population, Travel and Economic Trends

Maryland residents and businesses require a high level of personal and commercial mobility. Population and economic growth results in an increased demand for mobility and an increase in vehicle miles of travel. To foster quality of life and continued economic development in Maryland, it will be critical that the state provide a safe and modern transportation system that can accommodate future growth in population, tourism, recreation and vehicle travel.

Maryland's population grew to approximately six million in 2015, a 13 percent increase since 2000, when the state's population was approximately 5.3 million.[1] Maryland's population is projected to increase to approximately 6.9 million in 2040, with the state expected to add an additional 800,000 jobs between 2010 and 2040.[2] From 2000 to 2014, Maryland's gross domestic product, a measure of the state's economic output, increased by 31 percent, when adjusted for inflation.[3]

Population and economic growth in Maryland have resulted in an increase in vehicle travel in the state. From 2000 to 2014, annual vehicle miles of travel in Maryland increased by 12 percent, from 50.1 billion miles traveled annually to 56.4 billion miles traveled annually.[4]

Vehicle miles of travel in Maryland in 2015 were 2 percent higher than in 2014.[5] Based on population and other lifestyle trends, TRIP estimates that travel on Maryland's roads and highways will increase by another 20 percent by 2030.[6]

Road Conditions

The life cycle of Maryland's roads is greatly affected by the state's ability to perform timely maintenance and upgrades to ensure that road and highway surfaces last as long as possible.

Pavement failure is caused by a combination of traffic, moisture and climate. Moisture often works its way into road surfaces and the materials that form the road's foundation. Road surfaces at intersections are even more prone to deterioration because the slow-moving or standing loads occurring at these sites subject the pavement to higher levels of stress. It is critical that roads are fixed before they require major repairs because reconstructing roads costs approximately four times more than resurfacing them.[7] As roads and highways continue to age, they will reach a point of deterioration where routine paving and maintenance will not be adequate to keep pavement surfaces in good condition and costly reconstruction of the roadway and its underlying surfaces will become necessary.

The share of state-maintained roads and highways in Maryland with deficient pavements has decreased in recent years as a result of increased investment in pavement rehabilitation.

Nearly one third – 30 percent – of state-maintained roads and highways in Maryland had pavements rated deficient in 2012, with 13 percent rated in poor condition and 17 percent rated in mediocre condition.[8] By 2014, the share of the state's roads and highways rated deficient had

decreased to 24 percent with 10 percent of Maryland's state-maintained roads and highways rated in poor condition and 14 percent rated in mediocre condition.[9]

Roads rated in poor condition may show signs of deterioration, including rutting, cracks and potholes. In some cases, poor or mediocre roads can be resurfaced, but often are too deteriorated and must be reconstructed.

Bridge Conditions

Nearly a quarter – 23 percent -- of locally and state-maintained bridges in Maryland show significant deterioration or do not meet current design standards, often because of narrow lanes, inadequate clearances or poor alignment with the adjoining roadway. This includes all bridges that are 20 feet or more in length.

Six percent of Maryland's locally and state-maintained bridges are structurally deficient.[10] A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Structurally deficient bridges are often posted for lower weight or closed to traffic, restricting or redirecting large vehicles, including commercial trucks and emergency services vehicles.

A bridge is considered structurally deficient if: 1) any of its significant load carrying elements are found to be in a poor condition due to deterioration and/or damage; 2) it has a low weight restriction; or 3) the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point that roadway flooding causes intolerable traffic interruptions.

The structurally deficient rating, which is a result of an in-depth hands-on bridge inspection, is an early warning sign for engineers to use to prioritize funding and to initiate repairs or to begin the process to rehabilitate or replace the bridge. The rating applies to three main elements of a bridge: 1) the deck (riding surface); 2) the superstructure (main supporting element of the deck, usually beams, girders, trusses, etc.); and 3) the substructure (supports that hold up the superstructure and deck, usually abutments and piers). These elements are rated on a scale from zero (closed to traffic) to nine (relatively new). If any of the three elements is rated as a four or less, the bridge is categorized as structurally deficient by federal standards. This does not mean that the bridge is unsafe. If a bridge becomes unsafe, it will be closed.

Seventeen percent of Maryland's locally and state-maintained bridges are functionally obsolete.[11] Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

The number of state-maintained bridges in Maryland rated structurally deficient has been reduced from 97 in 2012 to 69 in 2015.[12]

The service life of bridges can be extended by performing routine maintenance and minor rehabilitation, such as resurfacing decks, painting surfaces, ensuring that a facility has good drainage and replacing deteriorating components. But most bridges will eventually require more costly reconstruction or major rehabilitation to remain operable.

Traffic Safety

A total of 2,404 people were killed in motor vehicle crashes in Maryland from 2010 through 2014, an average of 481 fatalities per year.[13]

Chart 1. Maryland Traffic fatalities 2010 – 2014.

Year	*Fatalities*
2010	496
2011	488
2012	511
2013	466
2014	443
Total	**2,404**

Source: National Highway Traffic Safety Administration

Maryland's overall traffic fatality rate of 0.78 fatalities per 100 million vehicle miles of travel in 2014 is lower than the national average of 1.08 fatalities per 100 million vehicle miles of travel.[14] The traffic fatality rate on Maryland's non-Interstate rural roads in 2014 was approximately three times higher than on all other roads and highways in the state – 1.84 fatalities per 100 million vehicle miles of travel versus 0.61, which is lower than the national average of 2.14 and 0.77, respectively.[15]

Three major factors are associated with fatal vehicle crashes: driver behavior, vehicle characteristics and roadway features. Roadway features that impact safety include the number of lanes, lane widths, lighting, lane markings, rumble strips, shoulders, guard rails, other shielding devices, median barriers and intersection design.

Improving safety on Maryland's roadways can be achieved through further improvements in vehicle safety; improvements in driver, pedestrian, and bicyclist behavior; and a variety of improvements in roadway safety features.

The severity of serious traffic crashes could be reduced through roadway improvements such as adding turn lanes, removing or shielding obstacles, adding or improving medians, widening lanes, widening and paving shoulders, improving intersection layout, and providing better road markings and upgrading or installing traffic signals where appropriate.

Roads with poor geometry, with insufficient clear distances, without turn lanes, inadequate shoulders for the posted speed limits, or poorly laid out intersections or interchanges, pose greater risks to motorists, pedestrians and bicyclists.

Investments in rural traffic safety have been found to result in significant reductions in serious traffic crashes. A 2012 report by the Texas Transportation Institute (TTI) found that improvements completed recently by the Texas Department of Transportation that widened lanes, improved shoulders and made other safety improvements on 1,159 miles of rural state roadways resulted in 133 fewer fatalities on these roads in the first three years after the improvements were completed (as compared to the three years prior). TTI estimates that the improvements on these roads are likely to save 880 lives over the next 20 years.[16]

Traffic Congestion in Maryland

Increasing levels of traffic congestion cause significant delays in Maryland, particularly in larger urban areas, choking commuting and commerce. Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to the consumer.

Congestion on Maryland's roads and highways results in 195 million hours of delay annually and the consumption of an extra 85 million gallons of fuel, which results in an annual cost in lost time and wasted fuel of $4.1 billion.[17]

The share of Maryland's freeways and expressways that experience heavy to severe congestion is increasing. In 2014, 16 percent of the state's freeways and expressways experienced heavy to severe congestion during the morning peak commuting hours, while 24

percent experienced heavy to severe congestion during the afternoon peak commuting hours. [18] This was an increase from 16 and 22 percent, respectively, in 2013.[19] Almost all of the Maryland freeway and expressway portions experiencing heavy to severe congestion are in the Washington, DC or Baltimore metro areas.

Two of the nation's 25 most congested urban areas are located in or include parts of Maryland. The Washington, DC metro area, which includes suburbs in Maryland and Virginia, is ranked first nationally in the cost of traffic congestion per commuter, with congestion costing $1,834 per commuter and causing 82 hours of delay annually. [20] At $1,115, the Baltimore urban area ranked 25th in the most cost of traffic congestion per commuter. The average Baltimore motorist loses 47 hours annually due to traffic congestion.[21]

Increasing levels of congestion add significant costs to consumers, transportation companies, manufacturers, distributors and wholesalers. The increased levels of congestion can reduce the attractiveness of a location to a company considering expansion or relocation. Congestion costs can also increase overall operating costs for trucking and shipping companies, leading to revenue losses, lower pay for employees, and higher consumer costs.

When traffic congestion on a roadway segment slows traffic to less than 60 percent of free-flow speeds for a period greater than five minutes, the congestion can impact adjacent roadway segments, creating a bottleneck. The Maryland State Highway Administration identified the top 30 traffic bottleneck locations in Maryland in 2014 by ranking roadway segments based on the duration, intensity, frequency and average queue length of congestion. The following chart details the top 30 roadway bottlenecks in Maryland in 2014.

Chart 2. Maryland's Top 30 Roadway Bottlenecks 2014.

Maryland's Top 30 Bottleneck Locations - 2014					
Rank	**Location**	**Route**	**Direction**	**Average Duration (Minutes)**	**Average Max Length (Miles)**
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2	I-95 OL @ Greenbelt Metro Dr/Exit 24	I-95	Outer Loop	125.5	19.46
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13	I-270 Local N @ MD 124	I-270	Northbound	126.5	4.17
14	I-95 S @ I-495/Exit 27-25	I-95	Southbound	92	5.43
15	I-95 IL @ MD-214/ Exit 15	I-95	Inner Loop	101.75	5.15
16	MD-295 S @ MD-1931	MD-295	Southbound	94.5	7.76
17	MD-295 S @ Powder Mill Rd1	MD-295	Southbound	97.5	5.12
18	I-695 IL @ I-83/MD-25/Exit 23	I-695	Inner Loop	86.5	6.6
19	I-695 OL @ US-40/Exit 15	I-695	Outer Loop	82.5	6.68
20	I-270 N @ MD-80/Exit 26	I-270	Northbound	85.25	8.02
21	I-95 IL @ MD-4/Pennsylvania Ave/Exit 11	I-95	Inner Loop	105.25	7.25
22	MD-295 N @ MD-1001	MD 295	Northbound	87	6.11
23	I-495 IL @ MD-97/Georgie Ave/Exit 31	I-495	Outer Loop	100.75	3.5
24	I-270 S @ MD-109/Exit 22	I-270	Southbound	78.5	4.15
25	I-270 N @ MD-109/Exit 22	I-270	Northbound	96.75	8.67
26	I-495 CCW @ MD-185/Connecticut Ave/Exit 33	I-495	Outer Loop	122.25	5.48
27	MD-295 N @ Powder Mill Rd1	MD-295	Northbound	85	3.16
28	I-270 N @ I-70/US-40	I-270	Northbound	68.75	8.06
29	I-270 Local S @ I-270	I-270	Southbound	82.5	4.53
30	I-695 IL @ MD 26	I-695	Inner Loop	107.75	6.24

Source: Maryland State Highway Administration

Importance of Transportation to Economic Growth

Local, regional and state economic performance is improved when a region's surface transportation system is expanded or repaired. This improvement comes as a result of the initial job creation and increased employment created over the long-term because of improved access, reduced transport costs and improved safety. Highway accessibility was ranked the number two site selection factor behind only the availability of skilled labor in a 2013 survey of corporate executives by Area Development Magazine.[22]

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and e-commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Highways are vitally important to continued economic development in Maryland, particularly to the state's tourism, agriculture, energy and manufacturing sectors. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

Annually, $445 billion in goods are shipped to and from sites in Maryland, with 75 percent of the freight tonnage being shipped by trucks.[23]

The cost of road and bridge improvements is more than offset by the reduction of user costs associated with driving on rough roads, the improvement in business productivity, the reduction in delays and the improvement in traffic safety. The Federal Highway Administration estimates that each dollar spent on road, highway and bridge improvements results in an average benefit of $5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.[24]

Transportation Funding in Maryland

Investment in Maryland's roads, highways and bridges is funded by local, state and federal governments. The Maryland General Assembly's passage of the Transportation Infrastructure Investment Act of 2013 helped the state increase investment in repairing roads and bridges and move forward with numerous transportation projects to improve mobility in Maryland.

Since passage of the Transportation Infrastructure Investment Act of 2013, the average annual highway investment in Maryland by the State Highway Administration increased by 85 percent from an average of $810 million annually between 2010 to 2012 to an average of $1.5 billion annually from 2016 to 2018.[25]

Improving Mobility in Maryland

In addition to accelerating the repair of roads, highways and bridges, the state's additional transportation investment since 2013 has allowed Maryland to proceed with numerous

transportation improvements to relieve traffic congestion by increasing the capacity and the efficiency of the state's transportation system.

Maryland has been able to complete, has underway, or has programmed over the next few years a number of transportation projects to increase the capacity of many of the state's most heavily traveled routes. The following table provides information on some of the key congestion relief projects completed in Maryland since 2013.

Chart 3. Major Maryland Congestion Relief Projects Completed Since 2013.

Major Maryland Congestion Relief Projects Completed Since 2013	
Facility/Route	Improvement
InterCounty Connector (ICC)	Construction of the final section of the ICC from 1-95 to US 1
I-95 Express Toll Lanes	Construction of two additional barrier-separated toll lanes on approximately eight miles from just south of I-895 to north of MD 43
I-695/Wilkens Avenue	Reconstruction and Widening
MD 32/Linden Church Road	Interchange construction
MD 175@Rockenbach Rd & Disney Rd.	Widening MD 175 to four lanes and adding turn lanes
I 695 @ MD 144 (Frederick Rd.)	Relocation of ramp from I-695 northbound to MD 144 and new left turn laneds added along MD 144
I 70 @ South Street/Monocacy Blvd.	Widening I 70 to six lanes
US 40 @ MD 715	Widening US 40 eastbound to MD 715 southbound ramp to mulitiple lanes, widening the MD 715 bridge over US 40 and widening MD 715 to six lanes south of the interchange
US 40 @ MD 7/MD 159	Widening of the MD 7 approach to US 40 to provide for an additional left turn lane to US 40 eastbound and a separate right turn lane.
MD 30/MD 91	Construction of second through lane on MD 30 and an exclusive left turn lane on MD 91
MD 27/Sweepstakes Rd./Marlboro Dr.	Construction of separate northbound right turn lane
MD 108/Bowie Mill Road	Traffic signal and left turn lane added on Bowie Mill Road
US 40/MD 63	Added northbound and southbound turn lanes
MD 145 @ MD 146	Construction of a second MD 146 northbound and MD 145 eastbound through lanes
MD 197 @ Powder Mill Rd./American Hol	Widening of MD 197 to provide an eastbound right and left turn lane and a westbound left turn lane
US 50 @ Seahawk Rd./MD 452	Added a second left turn lane from US 50 westbound to Seahawk Road southbound

Source: Maryland State Highway Administration.

Maryland has also made significant progress recently in improving mobility in the state by expanding facilities for non-motorized transportation as well as improving the efficiency of its roads and highways. These mobility improvements in 2014 include:

- ✓ Expanding the state's highway service patrols serving the Baltimore, Washington, Frederick and Annapolis areas to 24 hours-a-day, seven days a week in 2014. This expansion resulted in the patrols responding to 23,000 incidents and assisting nearly 37,000 stranded motorists in 2014.[26]
- ✓ Improving driver information services, including upgrading the state's 511 traveler information service and expanded the state's travel time information, with nearly 100 message signs in operation throughout the state.[27]
- ✓ Improving signal timing on 225 traffic signals.[28]
- ✓ Installing 11 miles of new sidewalks and 13 miles of marked bicycle lanes.[29]

Study on Impact of U.S. Highway Capacity Additions

A national report that studied the economic results of 100 highway capacity expansion projects provides significant new insights into how enhancing regional mobility provides long-term economic benefits. The 2012 report, "Interactions Between Transportation Capacity, Economic Systems and Land Use," was prepared by the Strategic Highway Research Program for the Transportation Research Board, which is a program of the National Academy of Sciences. The report reviewed 100 projects, costing a minimum of $10 million, which expanded transportation capacity either to relieve congestion or enhance access.

The projects were carefully selected to ensure a wide range of project types and land use settings. The projects, completed no later than 2005, included a wide variety of urban and rural projects, including the provision or expansion of intercity highways, local access roads, interchanges, bridges, bypasses and intermodal facilities. The projects expanded or added major highways, beltways, connectors, bypasses, bridges, interchanges, industrial access roads, intermodal freight terminals and intermodal passenger terminals. The expanded capacity provided by the projects resulted in improved access, which resulted in reduced travel-related costs, faster and more reliable travel, greater travel speeds, improved reliability and increased travel volume.

The report found that the improved access as a result of capacity expansions provided numerous regional economic benefits, including increased employment, increased land value, increased tax revenue, increased intensity of economic activity, increased land prices and additional construction as a result of the intensified use.[30]

The report further noted that improved transportation access benefits a region by: enhancing the desirability of an area for living, working or recreating, thus increasing its land value; increasing building construction in a region due to increased desirability for homes and businesses; increasing employment as a result of increased private and commercial land use; and increasing tax revenue as a result of increased property taxes, increased employment and increased consumption, which increases sales tax collection.[31]

According to the report, "transportation projects lead to multifaceted forms of economic development impact, which may include effects on employment, income, land use, property values or business construction."[32]

The benefits of a transportation capacity expansion unfolded over several years and that the extent of the benefits were impacted by other factors, including: the presence of complimentary infrastructure such as water, sewer and telecommunications; local land use policy; the local economic and business climate; and whether the expanded capacity was integrated with other public investment and development efforts. “In some cases, an area with a higher growth trend may tend to be better positioned to take advantage of new highway connections or capacity,” the report found.[33]

The report provided estimates on the average number of long-term jobs created as a result of increased transportation capacity, both within the local area and also outside of the immediate area of the improved access. For every $1 million spent on increased transportation capacity, the report estimated that an average of seven local, long-term jobs were created at nearby locations as a result of improved access. An additional 4.2 jobs outside the local area were created, including businesses that supplied local businesses or otherwise benefited from the increased regional economic activity.[34]

Highway and other intermodal capacity projects in urban areas created a greater number of long-term jobs than in rural areas, largely due to the more robust economic environment and greater density in urban communities.[35] Every $1 million spent on urban highway or intermodal expansion projects was found to result in an additional 7.2 local long-term jobs and an additional 4.4 non-local, long-term jobs, while every $1 million spent on rural highway or intermodal expansion projects was found to result in an additional 2.9 local, long-term jobs and an additional 1.6 non-local, long-term jobs.[36]

Federal Transportation Funding in Maryland

Federal funds for highway and transit improvements in Maryland are provided through the federal Highway Trust Fund (HTF), which raises revenue through federal user fees, including an 18.4 cents-per-gallon tax on gasoline and a 24.4 cents-per-gallon tax on diesel fuel. Since 2008, revenue into the federal Highway Trust Fund has been inadequate to support legislatively set funding levels. As a result, Congress has transferred approximately $53 billion in general funds and an additional $2 billion from a related trust fund into the federal Highway Trust Fund.[37]

Signed into law in December 2015, the Fixing America's Surface Transportation (FAST) Act, provides modest increases in federal highway and transit spending. The five-year bill also provides states with greater funding certainty and streamlines the federal project approval process. But, the FAST Act does not provide adequate funding to meet the nation's need for highway and transit improvements and does not include a long-term and sustainable funding source.

Nationally, the five-year, $305 billion FAST Act will provide a boost of approximately 15 percent in highway funding and an 18 percent boost in transit funding over the duration of the program, which expires in 2020.[38]

In addition to federal motor fuel tax revenues, the FAST Act will also be funded by $70 billion in U.S. general funds, which will rely on offsets from several unrelated federal programs including the Strategic Petroleum Reserve, the Federal Reserve and U.S. Customs.

According to the 2015 AASHTO Transportation Bottom Line Report, a significant boost in investment in the nation's roads, highways, bridges and public transit systems is needed to

improve their condition and to meet the nation's transportation needs. The AASHTO report found that annual investment in the nation's roads, highways and bridges needs to increase by 36 percent, from $88 billion to $120 billion to improve conditions and meet the nation's mobility needs.[39]. Investment in the nation's public transit system needs to increase from $17 billion to $43 billion.[40] .

AASHTO's 2015 Bottom Line Report found that if the rate of vehicle travel increased by 1.4 percent per year, the needed annual investment in the nation's roads, highways and bridges would need to increase by 64 percent, to $144 billion. If vehicle travel grows by 1.6 percent annually the needed annual investment in the nation's roads, highways and bridges would need to increase by 77 percent, to $156 billion.[41]

Conclusion

Since approval of the Transportation Infrastructure Investment Act of 2013, Maryland has committed itself to modernizing its transportation system, which is the backbone of the state's economy and plays a critical role in the daily lives of its residents, businesses and visitors.

Today, Marylanders are benefiting from this commitment to an improved transportation system in the form of improved roads, highways and bridges conditions, efficiency and safety, and improvements to the state's public transit system, as well as additional sidewalks and bike facilities. Maryland has a transportation program in place to ensure future progress in the condition, reliability and safety of its transportation system. But, with future federal funding increasing only modestly and no long-term sustainable source of federal transportation funding identified, Maryland's leaders need to maintain their current level of commitment to supporting a

strong state transportation program into the future to provide a safe, well-maintained and efficient transportation system in the Free State.

# # #

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