MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

2024

MARYLAND STATE HIGHWAY MOBILITY REPORT

2024

MARYLAND STATE HIGHWAY MOBILITY REPORT

Thirteenth Edition

AUTHORS

Tom Costello, L'Kiesha Markley, Kaveh Farokhi Sadabadi, Rana Shams, Lisa Shemer, Matthew Wolniak

CONTENT CONTRIBUTORS/REVIEWERS

Joseph Abujana, Stacy Beckett, Keith Belcher, Patrick Boyle, John Concannon, Sepideh Eshragh, Austin Foster, Mark Franz, Sarah Gary, Luis Gonzalez, Scott Holcomb, Toria Lassiter, Chris Leight, Ally Loverde, Clyde Munz, Ben Myrick, Abhay Nigam (AC), Michael Osborne, Tara Penders, Jason Pollock, Molly Porter, Tina Sanders, David Schrank, Derrick Sexton, Matt Snare, Michael Stewart, Rachel Thomas, Hope Vorhees, Alex Walinskas

MESSAGE FROM THE ADMINISTRATOR

Maryland citizens rely on a safe and reliable transportation network that provides mobility choices and multimodal connectivity. Our highway system supports the safe and efficient movement of people and goods, facilitating freight movement, transit services, airport facilities, sidewalks, bicycle lanes and motor vehicle travel.

To improve travel reliability and minimize travel delays for road users, transit providers and freight operators, the Maryland State Highway Administration (SHA) incorporates a data driven decision making approach utilizing both Big Data and time proven methods to evaluate travel trends and behaviors. This analysis allows SHA to prioritize needs to address changes that impact travel patterns across the transportation network, including traffic diversions, peak period impacts, increases in travel time, reductions in system connectivity and accessibility, and multi-modal transportation across the entire state.

A major resource to address existing needs and proactively plan is SHA's annual mobility report that analyzes performance and mobility. Our most recent edition, the 2024 Maryland Mobility Report provides an in-depth overview of Maryland transportation trends over the past year (2023) with comparisons to previous years. The report also provides an overview of significant accomplishments over the past year and outlines remaining challenges that still need to be addressed. The accomplishments in 2023 include:

- CHART emergency response technicians responded to over 70,000 incidents and disabled vehicles saving an estimated $2.3 billion in reduced congestion costs and crashes.
- SHA constructed approximately seven miles of new sidewalks and reconstructed five miles of sidewalks.
- Bicyclists were able to cycle on an additional 85 miles of directional bike lanes.
- Seven capital projects were completed that included intersection improvements, multi-modal enhancements and freeway/expressway upgrades to improve mobility.
- The timing on eleven signal systems was upgraded resulting in motorists saving approximately $34 million from reduced congestion and delay.

Some continuing transportation mobility challenges that Maryland faces include:

- Vehicle Miles Travelled (VMT) on Maryland roadways has increased from 56.78 billion in 2022 to 57.54 billion in 2023. This was a 1.3% increase in one year.
- Congestion costs on Maryland roadways are estimated to cost Marylanders $5.35 billion annually with freight operations accounting for over $440 million of this amount in 2023. Congestion costs rose by 1% over 2022.
- Local planning and zoning practices lack transportation planning, ordinances, and/or development impact fees and excise taxes to support ongoing and historical growth and defray costs for necessary public transportation facilities and services to mitigate development impacts to state roads.
- Motorists along sections of I-495 and I-695 routinely experience peak period travel times greater than three times the rate of non-peak periods.
- Park and ride lot occupancy continues to be about half of the usage in 2019, while truck parking is a significant challenge for communities.

Putting people first, SHA is working every day to provide the best customer experience for all road users. The data and findings in the 2024 Maryland Mobility Report will serve as a great resource as we continue to develop strategic approaches to address transportation challenges in Maryland.

William Pines PE, PMP, CCM

MDOT SHA Administrator

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EXECUTIVE SUMMARY

The ability to travel throughout Maryland requires a multimodal transportation system that facilitates the movement of people and goods through seamless connections that enable the necessary trip. To support this need, the Maryland State Highway Administration (SHA) maintains and operates a network of roadways, sidewalks, bike lanes and shared use paths. Maintaining and expanding this system requires an understanding of the current conditions and travel patterns to strategically allocate resources. Ensuring the network is safe and well-maintained encourages its use and supports efficient movement across the state. Facilities in poor shape are less likely to be used, which in turn impacts mobility and increases congestion.

At the same time, travel patterns change every day. A new job, a different place to live or different appointments can modify pedestrian, bicycle, and automobile volumes as well as the type of facilities that are needed for users to reach their destinations. In addition, events such as the loss of the I-695 connection over the Patapsco River require SHA to remain flexible and make adjustments to projects, programs, and policies to better meet the changing needs of its citizens and the traveling public. This flexibility allows SHA to establish short and long-term strategies to adapt to change, develop system improvements, and enhance organizational excellence.

SHA continues to use a performance-based approach to monitor and address critical and shifting mobility trends. These shifts create a need for progressive, cost-effective and context sensitive approaches in operations, engineering, and design to ensure a transportation system that is safe, equitable and sustainable. At the same time, it is of paramount importance to minimize delays in implementing infrastructure improvements and maintaining the system.

The 2024 Maryland Mobility Report summarizes our performance, successes, opportunities, and future strategies based on the events that transpired, data collected, and lessons learned over the 2023 calendar year.

YEARLY PERFORMANCE COMPARISON			
METRIC	2023	2022	2021
Traffic volumes	57.5 billion VMT	56.8 billion VMT	56.6 billion VMT
Interstates carrying over 200,000 vehicles per day	4 interstates	4 interstates	4 interstates
Total mileage on freeway system experiencing heavy to severe congestion	143 miles AM 252 miles PM	118 miles AM 232 miles PM	51 miles AM 164 miles PM
Statewide congestion costs	$5.67 billion	$5.29 billion	$4.48 billion
CHART incidents and stranded motorists	70,000 responses	76,000 responses	66,000 responses
New sidewalks	7 miles in 11 counties	7 miles in 13 counties	8 miles in 14 counties
Capacity improvement projects completed	7 capacity improvement projects	11 capacity improvement projects	12 capacity improvement projects
Signal systems improved	11 systems improved	15 systems improved	7 systems improved

CONGESTION AND RELIABILITY TRENDS

The challenge of effectively moving people and goods throughout the state becomes more difficult due to changing patterns such as back to work trends, rise in e-commerce and disruptions to the transportation network. To ensure funding and personnel resources are addressing the proper areas, it is important to first understand congestion trends and how they affect travelers and freight movement in terms of cost, time, and efficiency. This includes both recurring congestion along over-capacity roadway sections and non-recurring congestion due to incidents or events. The following summarizes the mobility and reliability trends on the Maryland multi-modal system in 2023.

Vehicle Miles Traveled (VMT)[1]:

- The VMT along Maryland roadways increased by 1.3% to 57.5 billion in 2023 from 56.8 billion in 2022. This increase occurred in both urban and rural areas.
- MDOT facility roadways are the most used in the state accounting for 72% of the VMT.
- Countywide VMT increased in 21 of the 23 counties and Baltimore City. The remaining two counties stayed approximately the same. The greatest increases occurred in Montgomery, Frederick, and Baltimore Counties.

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Annual Average Daily Traffic (AADT)[2]:

The highest daily volume locations for freeway/expressway and arterial roadway sections include:

HIGHEST ANNUAL AVERAGE DAILY TRAFFIC (AADT) FREEWAY/EXPRESSWAY SECTIONS

ROUTE	LIMITS	2023 AADT (veh/day)
I-95/I-495	Virginia State Line (Woodrow Wilson Bridge)	243,000
I-495	Virginia State Line (American Legion Bridge) to I-270 West Spur	213,000-229,000
I-270	I-270 Split to MD 124	186,000-225,000
I-95/I-495	MD 5 to MD 201	193,000-219,000
I-495	I-270 East Spur to US 1	196,000-218,000

HIGHEST ANNUAL AVERAGE DAILY TRAFFIC (AADT) ARTERIAL SECTIONS

ROUTE	LIMITS	2023 AADT (veh/day)
MD 5	US 301 to MD 223	67,000 – 83,000
MD 210	Old Fort Rd to I-95/I-495	61,000-81,000
MD 3	Prince George's County Line to I-97	70,000-80,000
US 301/MD 5	MD 5 (South) to MD 5 (North)	76,000
MD 650	Adelphi Rd to Lockwood Dr	56,000-72,000

1 - See definition pg. 14
2 - See definition pg. 13

FREEWAYS

Traffic congestion for the poorest levels (heavy and severe) increased statewide by 2% in the AM peak hour and PM peak hour from 2022 to 2023. This amounts to 9% AM and 16% PM of the network statewide. These levels occurred for 143 miles of the freeway/expressway system in the AM peak hour and 252 miles in the PM peak hour of the 1,626 miles analyzed. This was an increase of approximately 25 miles and 20 miles respectively in the AM and PM peak hour.

The locations with higher volumes and greater VMT on the freeway/expressway system experienced greater congestion. In 2023, 18% of the AM peak hour and 29% of the PM peak hour statewide VMT occurred in congested conditions. These values were 15% and 26% in the AM and PM peak hours, respectively, in 2022.

MAJOR ARTERIALS

Along major arterial roadways, motorists experienced heavy to severe congestion in the AM peak hour on 123 miles or 21% of the system. This was an increase of 19 miles and by 4% from 2022 to 2023. The percentage of major arterial miles that drivers experienced heavy to severe congestion in the PM peak hour increased from 39% (230 miles) to 41% (240 miles) of the major arterial system in 2023.

COST OF CONGESTION

Congestion along roadways cost motorists approximately $5.35 billion in 2023 which is an increase of $60 million or over 1% from 2022. This cost includes delays experienced by motorists and truck drivers and wasted fuel. The majority of the cost associated with congestion is incurred by drivers along arterial roadways, amounting to approximately 73% of the total.

INTERSECTIONS

Traffic data analysis at intersections that have been counted in the last five years showed that 20 state highway intersections operated at a failing level of service (LOS F)[3], including four intersections that failed during both the AM and PM peak hours. The MD 202 at Brightseat Rd intersection also failed during a football game at Northwest Stadium.

3 - See definition see pg. 48

MOST CONGESTED LOCATIONS

The most congested freeway/expressway (three to eight miles) and arterial (two to five miles) corridor sections for weekday AM and PM peak hours (in descending order) are as follows:

2023 MOST CONGESTED FREEWAY/EXPRESSWAY SECTIONS (AVERAGE WEEKDAY)[4]	
AM PEAK HOUR (8-9 AM)	PM PEAK HOUR (5-6 PM)
I-495 Outer Loop – I-95 to US 29	I-695 Inner Loop – MD 139 to Providence Rd
I-695 Outer Loop – MD 43 to Cromwell Bridge Rd	I-495 Inner Loop – MD 355 to MD 97
I-270 West Spur Southbound – I-270 Split to I-495	I-495 Inner Loop – Virginia State Line to I-270 West Spur
I-95/I-495 Local Inner Loop – MD 414 to I-295	MD 295 Southbound – MD 175 to MD 198
I-495 Outer Loop – MD 187 to MD 190	I-695 Inner Loop – US 1 to MD 144
I-97 Southbound – Benfield Blvd to MD 178 Off Ramp	I-95/I-495 Inner Loop – US 1 to MD 144
I-695 Inner Loop – MD 129 to I-83 South	MD 295 Northbound – MD 450 to I-95/I-495
US 50 Westbound – MD 410 to MD 295	I-95/I-495 Outer Loop – MD 450 to MD 201
I-270 Southbound – MD 121 to MD 118	I-495 Outer Loop – I-270 West Spur to Clara Barton Pkwy
I-95/I-495 Mainline Inner Loop – I-95/I-495 Local Lane Split to Virginia State Line	I-270 Mainline Northbound – MD 198 to MD 175
I-695 Outer Loop – I-795 to I-70	MD 295 Northbound – Explorer Rd (NASA Entrance) to MD 197
I-95/I-495 Inner Loop – I-95 to MD 201	I-95/I-495 Inner Loop – MD 202 to Ritchie-Marlboro Rd
MD 295 Southbound – Arundel Mills Blvd to MD 197	I-695 Outer Loop – US 1 to MD 295
I-270 Mainline Southbound – I-370 to MD 28	MD 295 Northbound – MD 198 to MD 175
MD 32 Westbound – MD 170 to MD 198	I-270 Northbound – MD 121 to MD 109

2023 MOST CONGESTED ARTERIAL SECTIONS (AVERAGE WEEKDAY)[4]	
AM PEAK HOUR (8-9 AM)	PM PEAK HOUR (5-6 PM)
US 29 Southbound – MD 650 to I-495	MD 210 Southbound – MD 414 Ramps to Old Fort Rd/ Oxen Hill Rd
MD 5 Northbound – MD 381 to Burch Hill/Earnshaw Rd	MD 3 Southbound – I-97 to St Stephen's Church Rd
MD 185 Southbound – I-495 to MD 191	US 301 Southbound – MD 381 to McKendree Rd/ Cedarville Rd
MD 210 Northbound – Livingston Rd/ Swan Creek Rd to Palmer Rd	MD 3 Northbound – MD 450 to MD 424
MD 3 Southbound – Anne Arundel County Line to Belair Dr	MD 5 Southbound – MD 223 to Burch Hill Rd/Earnshaw Rd
MD 97 Southbound – MD 586 to 16th St/MD 390	MD 2 Northbound – College Parkway to Robinson Rd
MD 355 Southbound – I-495 to MD 410	MD 355 Northbound – MD 191 to Cedar Ln
MD 2 Southbound – MD 648/Whites Rd to College Parkway	MD 185 Northbound – Washington D.C. Line to Jones Bridge Rd
MD 212 Westbound – Beltsville Dr to Riggs Rd	MD 178 Northbound – Old Generals Highway to I-97
MD 189 Southbound – Wootton Pkwy to Glen Rd	MD 28 Eastbound – MD 586 to Bel Pre Rd
MD 28 Westbound – MD 97 to Baltimore Rd	MD 5 Southbound – Burch Hill/Earnshaw Rd to US 301
MD 2 Southbound – College Parkway to US 50	MD 45 Southbound – Ridgely Rd to Joppa Rd
MD 3 Southbound – St. Stephens Church Rd to MD 424	MD 97 Northbound – 16th St/MD 390 to MD 586
MD 2 Northbound – College Parkway to MD 648/ Whites Rd	MD 2 Southbound – MD 665 to MD 253
MD 424 Southbound – MD 3 to MD 450	MD 140 Eastbound – McDonough Rd to Sudbrook Ln

4 - See mapping pg. 25, 27, 29 and 31 for locations

In addition to morning and afternoon congestion, several areas experience poor operations on summer weekends as motorists travel to the Atlantic Ocean, mountains, or along the I-95 corridor. For the Friday 4-5 PM, Saturday 1-2 PM, and Sunday 2-3 PM hours, the following locations were identified as some of the most congested freeway or arterial sections that only occur on a summer weekend:

- I-70 WB from South St to MD 180
- US 50 EB from US 13 to Walston Switch Rd
- US 50/US 301 WB from Chester Station Ln to Chesapeake Bay Bridge
- US 50 EB from MD 589 to MD 528
- US 50/US 301 EB from Buschs Frontage Rd to Chesapeake Bay Bridge
- US 50/US 301 WB from Wye Mills Rd to US 301

CONGESTION REDUCTION ACCOMPLISHMENTS

To improve mobility and reliability, SHA has established policies, administered programs, and constructed projects throughout the state. The benefits of these actions include additional facilities for pedestrians and bicyclists, delay reductions, improved travel time, safety improvements, decreased fuel consumption, and decreased emissions for all multi-modal system users. These have provided approximately $2.3 billion in estimated annual user cost savings.

CHART

Emergency response technicians in the Coordinated Highways Action Response Team (CHART) program cleared almost 30,000 incidents and assisted more than 40,000 stranded motorists on Maryland roadways. This is accomplished through more than 40 full-time emergency traffic patrols that operate 24 hours a day, seven days a week. Incident duration has been reduced to 25.4 minutes thereby significantly decreasing delays and safety risks for motorists. CHART services delivered a record annual benefit of $2.23 billion in 2023.

SIGNAL SYSTEMS

In 2023, SHA upgraded traffic signal timings for 102 signals in 11 systems to improve travel time. The retiming of these signals reduced delay by over 730,000 hours and provided an annual user savings of $34 million. SMART/ Adaptive signal systems that allow for real-time adjustments to signal timings continued to provide benefits on twenty of SHA's most congested corridors throughout the state.

CAPITAL PROJECTS

There were six intersections and one freeway/expressway capital project completed to relieve congestion, improve safety, and enhance multi-modal traffic operations. These projects were:

- MD 43 at Honeygo Blvd in Baltimore County
- US 1 at Clarke Blvd in Baltimore County
- MD 4 at W Harmony Rd in Calvert County
- MD 140 at Mayberry Rd in Carroll County
- US 15 from Willow Rd to Monocacy Blvd in Frederick County
- MD 108 at Centennial Ln in Howard County
- MD 5 at Abell St/Moakley St in St. Mary's County

These capital projects resulted in $4 million in annual user savings.

2023 ANNUAL USER SAVINGS DUE TO MDOT CONGESTION MANAGEMENT	
CHART	$2,230 million
Traffic Signal Timing Improvements[1]	$34 million
Capital Projects[1]	$4 million
Park and Ride Program	$42 million
TOTAL	$2,310 million

[1]-Projects completed in 2023

MAJOR MOBILITY IMPROVEMENT PROJECTS UNDER CONSTRUCTION OR RECENTLY COMPLETED
I-695 TSMO Widening
I-95 Express Toll Lanes from MD 43 to North of MD 24
MD 97 Brookeville Bypass
MD 175 from Sellner Road to McCarron Court Widening

HIGHLIGHTED IMPROVED MOBILITY ACCOMPLISHMENTS

- More than 7 miles of new sidewalks were constructed in 11 Counties. In addition, 5 miles of sidewalks were reconstructed.
- Approximately 72% of all sidewalks are ADA-compliant in 2023.
- Statewide, marked bike facilities increased by approximately 85 directional miles through SHA efforts.
- Drivers are afforded the opportunity to park at 105 SHA and MDTA park and ride lots located in 21 counties. Surveys of the lots showed that on an average weekday approximately 3,400 motorists use SHA or MDTA lots to connect to transit or ride with other commuters. These commuter connections provide an annual user savings of approximately $42 million.
- In 2023, on average, 25,000 vehicles per day used the I-95 express toll lanes with over 2,000 motorists using them in one hour in one direction.
- Traffic volumes grew by approximately 9% on the Intercounty Connector (MD 200) Managed Facility AADT between I-370 and I-95. This amounts to approximately 58,500 vehicles per day in 2023 which is the highest ever volume.

FREIGHT MOVEMENT

- SHA ensures safety of freight operations through technology such as virtual weigh stations (VWS). There are 20 VWS statewide. In 2023, VWS were commissioned at two new locations along US 301 Thomas "Mac" Middleton Bridge, and two sites were decommissioned at MD 32 and US 50 westbound at the Chesapeake Bay Bridge, bringing the statewide total to 20 operational sites. Additionally, an evaluation is underway to construct the first high-speed direct enforcement VWS site along I-83 near Middleton Road with USDOT using license plate recognition technology.
- The National Highway Freight Network through the FAST ACT Freight Formula Fund allows for support for the reconstruction of crucial locations along designated truck routes. Bridge reconstruction is a major emphasis in the use of these funds, including ongoing projects at I-695 at Putty Hill Road and I-70 over Crystal Falls Drive.
- Safety improvements were constructed at two at-grade railroad crossings. This included Cash Valley Road in Allegany County and Devilbiss Bridge Road in Frederick County. In addition, MDOT continued to manage the Maryland Operation Lifesaver Program that provides free rail safety education to reduce injuries and fatalities at train crossings.

TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS (TSMO)

- Established the Maryland State Police Traffic Incident Management (TIM) unit and created a CHART law enforcement liaison group to coordinate ongoing events and traffic incident management.
- Received a $12 million Advanced Transportation Technology and Innovation (ATTAIN) grant award to dynamically manage traffic along the US 50 corridor between the Baltimore-Washington metropolitan area and Atlantic Ocean resort areas.
- Developed draft traffic incident timing plans for TSMO System 1, including Active Traffic Management (ATM) strategies along multiple routes (I-70, US 29, US 40, and MD 99).
- Continued construction of the I-695 part-time shoulder use project.

MARYLAND
MOBILITY STATISTICS

I-495 AT US 29

INTRODUCTION

The Maryland State Highway Administration (SHA) is working to achieve its goal of providing a safe, well-maintained and reliable highway system that enables mobility choices for all customers and supports Maryland's communities, economy, and environment. This mission is highlighted in their efforts to improve transportation equity, so that all citizens have the ability to access jobs, goods, and services, and in general, people are provided with the mobility and safety to move from place to place. To evaluate these efforts, SHA conducts an annual comprehensive review of performance to determine mobility trends and program efficiency.

The 2024 Maryland Mobility Report summarizes results and accomplishments during the 2023 calendar year. This annual report reviews Maryland's mobility strategies, projects, programs, and initiatives using a goal-oriented, performance-based approach that focuses on:

- What is happening?
- What is SHA doing?
- What are the outcomes?

The Maryland Mobility Report demonstrates:

- SHA's commitment to provide for the safe, efficient, and reliable movement of people, goods, and services
- The need to monitor existing trends to be able to react to the changes using a data driven approach
- The procedures used to identify successes, challenges, and strategies to improve transportation services

The Maryland Mobility Report highlights include:

- Traffic volume trends
- Pedestrian and bicycle projects and programs
- Roadway and freight characteristics
- Most congested freeway/expressway and arterial sections during a normal weekday and summer weekend
- Freeway/expressway and arterial performance year-to-year comparisons
- Projects completed in 2023 and their benefits
- Past projects and the benefits they provide
- Programs to address mobility and their results

The development of the 13th Edition of Maryland Mobility Report is a joint effort led by the SHA's Office of Planning and Preliminary Engineering (SHA OPPE). Support is provided through numerous other SHA offices, Maryland Department of Transportation (MDOT) agencies, and counties.

TRANSPORTATION INFRASTRUCTURE

Maryland is home to almost 6.2 million people. The residents plus visitors need to move about the state efficiently and Maryland has a wide range of transportation options to choose from. These methods include traveling by rail, bus, bicycles, walking, scooters, airplanes, boats, and vehicles to access places from urban areas to rural farming communities. Citizens and visitors can reach the destinations that Maryland is famous for, ranging from beach activities in Ocean City to the National Aquarium and stadiums in Baltimore City to skiing and hiking in the Appalachian Mountains. This network exists not only for the movement of people, but also to provide access to goods and services, vital to the economy. This successful multi-modal infrastructure network provides safe and effective access and mobility for all types of transportation users through:

- Rail service is provided through the subway system, commuter rail, light rail and heavy rail. Light/heavy rail services are operated by the Maryland Transit Administration (MTA) and the Washington Metropolitan Area Transit Authority (WMATA). Regional train service is provided by Amtrak in the Northeast Corridor. The MARC commuter rail system provides service along the Brunswick, Penn, and Camden lines from Aberdeen to Baltimore, Washington, and Frederick.
- Buses are operated by the MTA, WMATA and local transit operators. These include express service between counites, regular routes through corridors and local on-demand offerings.
- Pedestrian and bicycle facilities are provided through sidewalks, on-street bike lanes, and off-road trails. Notable trails include the Chesapeake and Ohio Canal Towpath, the Capital Crescent Trail, the Ben Cardin C&D Trail, and the East Coast Greenway.
- Air travel is approaching all-time record volumes led by the state's primary location at Baltimore-Washington Thurgood Marshall International Airport (BWI). In 2023, there were 26.2 million passenger arrivals and departures, a 15% increase over 2022. In addition, there were approximately 539 million pounds of cargo transported.
- Water cargo is handled mainly through the Helen Delich Bentley Port of Baltimore. This amounts to a record 52.3 million tons of foreign cargo valued at over $80 million. The port also handles more automobiles and light trucks than any other US port.
- There are approximately 4.5 million Maryland drivers that use over 31,000 miles of roadway.

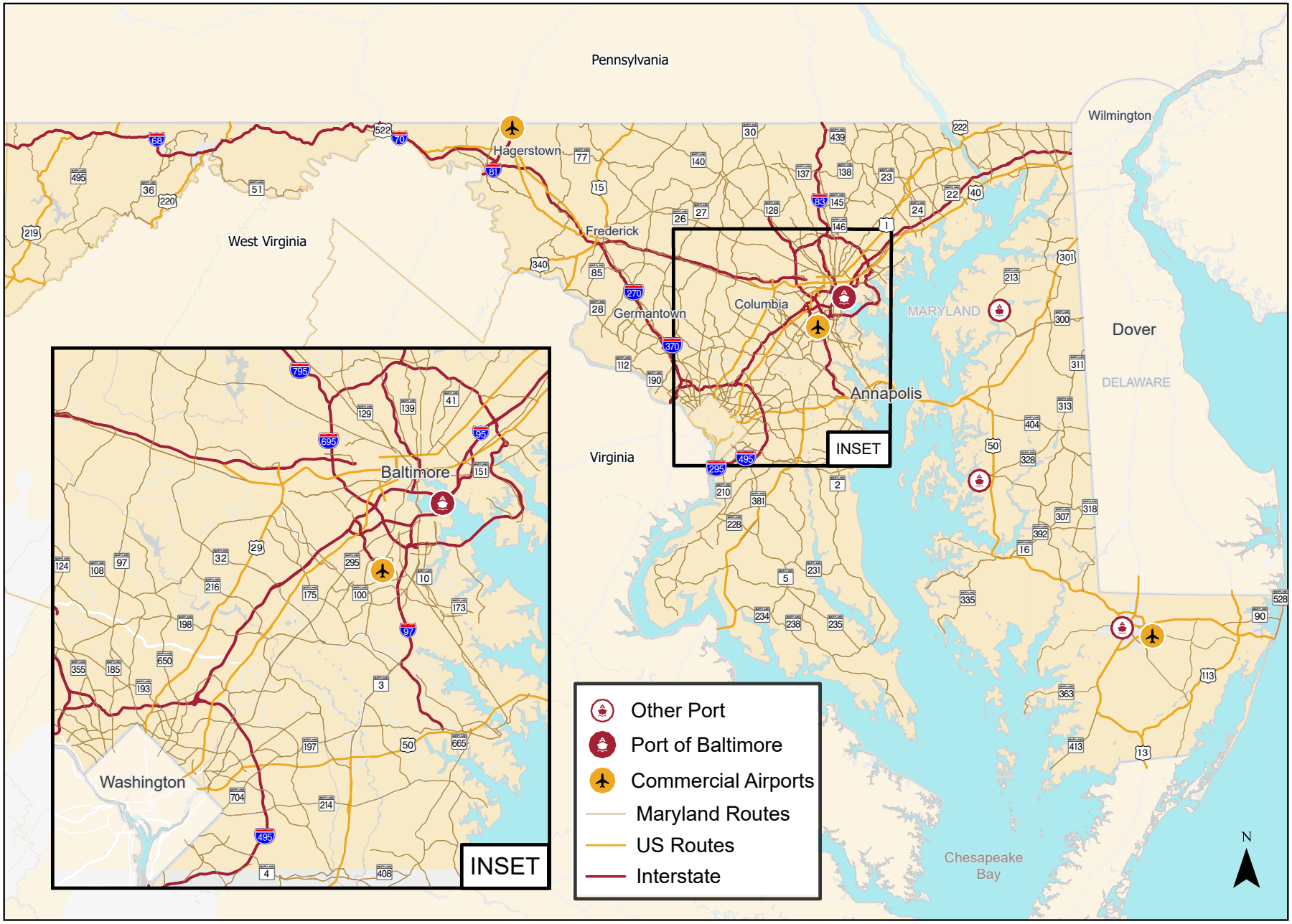
ROADWAYS

Marylanders travel along a system of roadways ranging from two-lane low-volume residential streets to high-volume 12-lane freeways. Roadways are classified based on the function they serve in moving vehicles throughout a network of highways. This classification system identifies a road's primary use, ranging from freeways/expressways to local streets **(Table 1)**.

Table 1

ROADWAY FUNCTIONAL CLASSIFICATION	
CLASSIFICATION	FUNCTION
Freeways/Expressways	Controlled access facilities with limited points of ingress/egress. These facilities are designed for long-distance travel at higher speeds.
Arterials	Next highest functioning roads normally with traffic signals. These roadways serve as interconnections between major corridors and are used for long-distance trips.
Collectors	Gather traffic from local roads and funnels to an arterial system. Serves as a connection to adjacent land uses and traffic circulation.
Locals	Provide direct access to adjacent land use and does not carry through traffic.

Figure 1 - Maryland Statewide Infrastructure



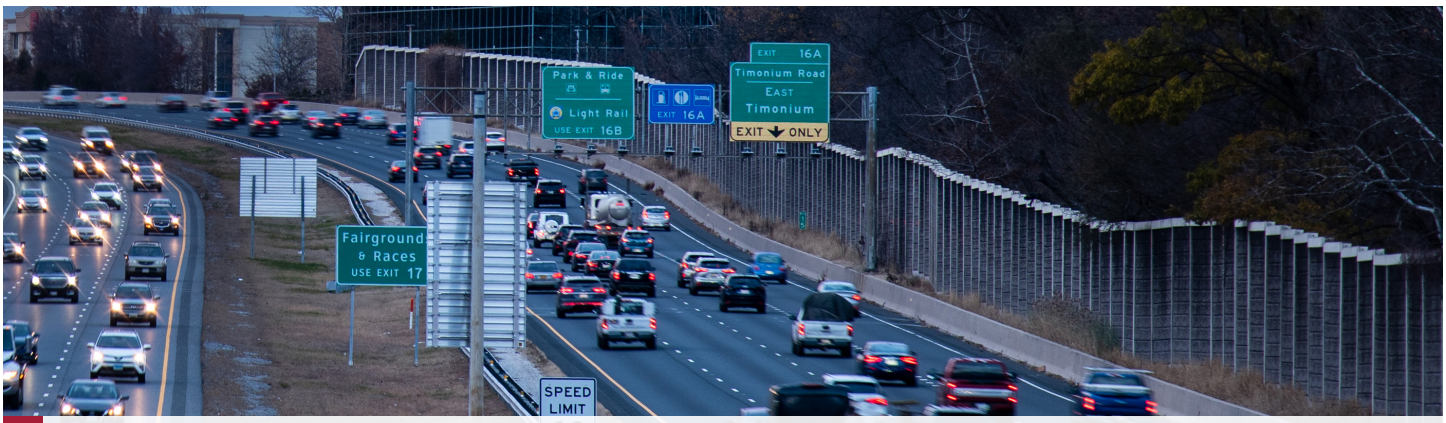
In Maryland, most of the roadways are owned and operated by cities, counties, towns, and other public and private agencies. Although, the most major of these facilities are owned and operated by MDOT. This includes interstates, US routes, and numbered Maryland routes, except interstate routes through Baltimore City and portions maintained by the Maryland Transportation Authority (MDTA), including all toll facilities. These facilities have the highest average number of lanes per mile **(Table 2)**. Typically, the highest average number of lanes per mile correlates to the highest traffic volumes and the most congestion.

Table 2

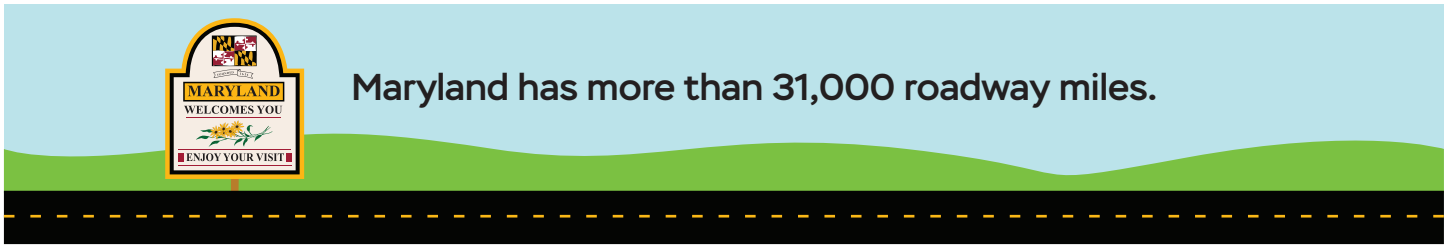
MILEAGE STATISTICS					
ROAD TYPE	ROADWAY MILES	PERCENTAGE OF ROADWAY MILES	MAINLINE LANE MILES[1]	AVERAGE NUMBER OF LANES/MILE	OWNERSHIP
Interstate Routes	486	2%	2,846	5.86	SHA, MDTA, Baltimore City
US Routes	760	2%	2,712	3.57	SHA, MDTA, Baltimore City
Maryland Routes	4,224	13%	10,616	2.51	SHA, MDTA, Baltimore City
Other Roadways	26,134	83%	53,520	2.05	Counties, Municipalities

[1] - *Mainline Lane Miles = Roadway Miles x Number of Lanes*

Note: Does not include ramp and service road mileage



I-83 AT SEMINARY RD



Maryland has more than 31,000 roadway miles.

MAJOR STRUCTURES – BRIDGES AND TUNNELS

Major structures are very recognizable to the public as ways to cross the Chesapeake Bay, Susquehanna River, Potomac River and Patapsco River. The newest of these is the four-lane Harry W. Nice Memorial/Senator Thomas "Mac" Middleton Bridge (Nice/Middleton Bridge) over the Potomac River between Charles County and Virginia.

There are over 5,000 bridges over waterways, roads, and railroads, in the state with most owned by MDOT SHA (**Table 3 and Figure 2**). In addition, there are two tunnels in Maryland operated by MDTA: the eight-lane, 1.4-mile Fort McHenry Tunnel that allows I-95 traffic to pass under the Patapsco River and the four-lane, 1.4-mile-long I-895 Harbor Tunnel which operates parallel to the Fort McHenry Tunnel.

MARYLAND'S SIGNIFICANT BRIDGES AND TUNNELS

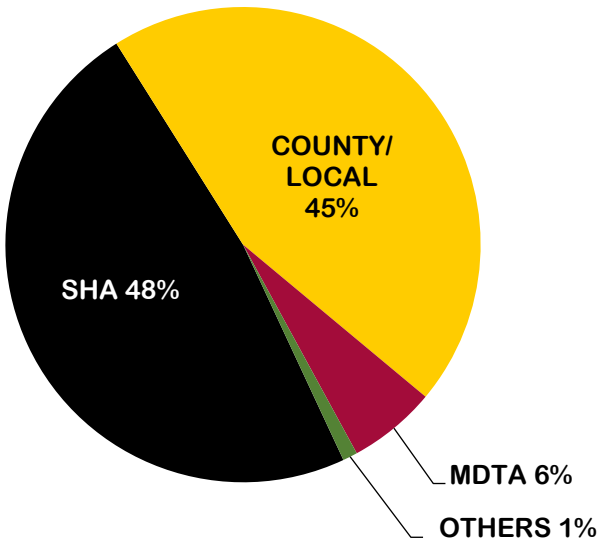
- American Legion Bridge (I-495)
- Fort McHenry Tunnel (I-95)
- Harbor Tunnel (I-895)
- Nice/Middleton Bridge (US 301)
- Hatem Bridge (US 40)
- Key Bridge (I-695)
- Thomas Johnson Memorial Bridge (MD 4)
- Tydings Memorial Bridge (I-95)
- William Preston Lane Memorial (Bay) Bridge (US 50/301)
- Woodrow Wilson Memorial Bridge (I-95/I-495)

Table 3

MARYLAND BRIDGES BY OWNERSHIP	
OWNER	**NUMBER OF BRIDGES**
SHA	2,572
County/Local	2,436
MDTA	360
Other Agencies (Federal, Railroad, Other State Agencies)	27
TOTAL	**5,395**

Figure 2

BRIDGE OWNERSHIP BY AGENCY



TRAFFIC VOLUMES-ANNUAL AVERAGE DAILY TRAFFIC (AADT)

Different roadways serve different purposes and therefore the number of motorists that drive on them varies greatly. Maryland SHA determines traffic volumes along these roads with a traffic data collection program that involves both permanent count stations and triannual counts at thousands of locations. These triannual counts are collected using equipment and personnel to collect data on the numerous sections of roadway. Annual average daily traffic measures the volume of traffic for the year, divided by the number of days in a year. The highest sections occur along freeways in Montgomery and Prince George's Counties with several over 220,000 vehicles per day (**Table 4**).

Table 4

HIGHEST ANNUAL AVERAGE DAILY TRAFFIC (AADT) VOLUMES (VEHICLES PER DAY)	
FREEWAY SECTION	2023 AADT
I-95 @ Virginia State Line (Woodrow Wilson Bridge)	243,200
I-495 @ Virginia State Line (American Legion Bridge)	229,400
I- 495 W of I-270 West Spur	228,800
I-270 S of I-370	224,600
I-95 W of US 1	222,600
ARTERIAL SECTION	2023 AADT
MD 5 S of MD 223	82,500
MD 3 N of Prince George's County Line	79,600
US 301/ MD 5 N of Charles County Line	76,300
MD 3 S of Waugh Chapel Rd/Riedel Rd	72,700
MD 650 S of I-495	71,500
MDTA TOLL FACILITY CROSSINGS	2023 AADT
I-95 Ft. McHenry Tunnel	121,300
I-95 Tydings Bridge	87,300
I-895 Harbor Tunnel	80,200
US 50/US 301 Bay Bridge	75,300

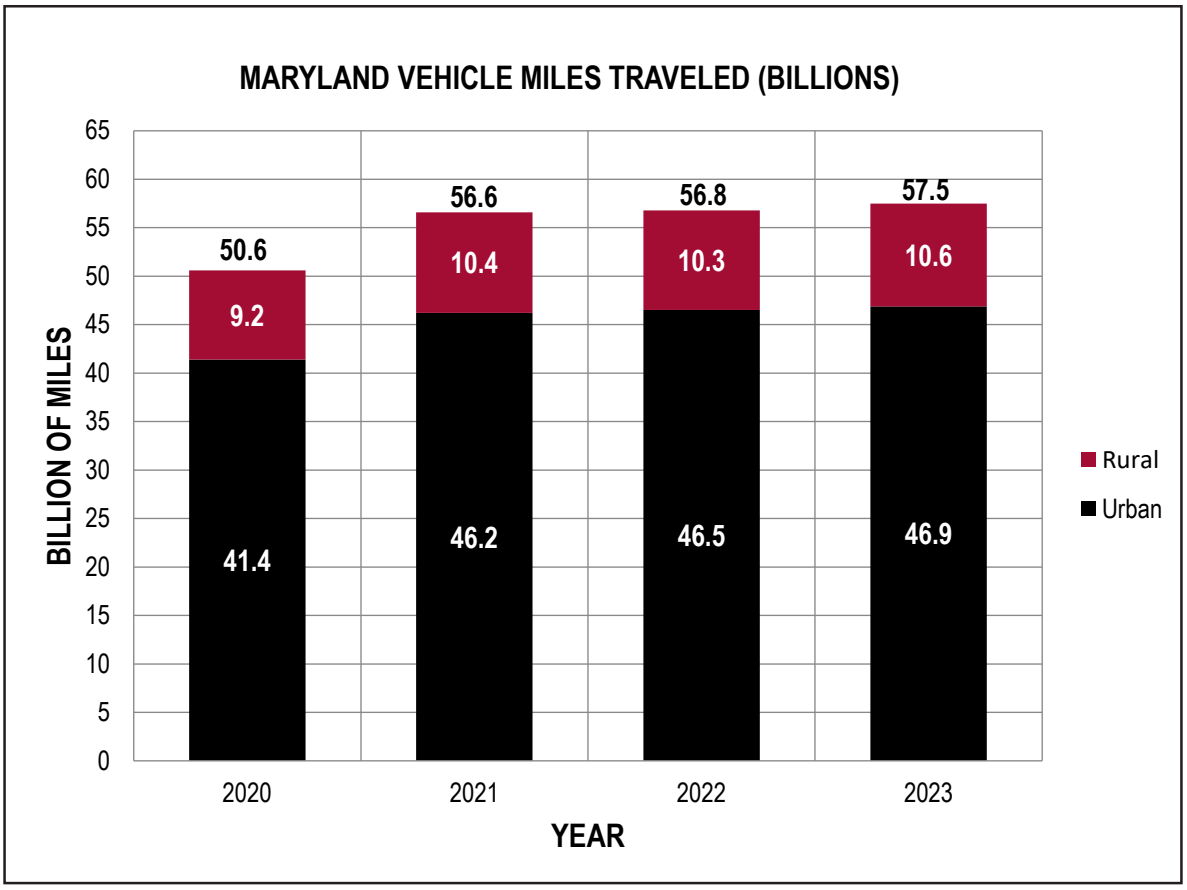
VEHICLE MILES TRAVELED – TOTAL/URBAN/RURAL

The monitoring of traffic volumes assists SHA in identifying annual variations in travel and where increases in volumes are occurring. These trends can provide understanding ranging from growth areas where infrastructure improvements may be needed to statewide trends such as the amount of less travel that occurred during he pandemic. One of the best metrics for assessing this relationship is known as Vehicle Miles Traveled (VMT), which indicates the overall use of roadways. VMT is determined by taking the number of vehicles and multiplying it by the distance traversed along the section of the roadway. The state calculates VMT on local, state, US, and interstate roadways. The measurement of VMT is an effective method for tracking the growth and demands of the roadway network.

The number of VMT in 2023 increased by 1.3% to 57.5 billion. Travel grew in both urban and rural areas with urban areas growing by a larger volume (**Figure 3**). Urban areas are defined by the federal urban boundaries through the census. The VMT is still slightly below the all-time high of 60.1 billion in 2019.

Figure 3

MARYLAND VEHICLE MILES TRAVELED (BILLIONS)



VEHICLE MILES TRAVELED - BY AGENCY OWNERSHIP AND FACILITY TYPE

Roadways are mostly owned by local public agencies. Most of these roadways are two lanes and usually have lower volumes. The most used roadways are operated by the SHA and MDTA. These roadways account for 72% of VMT, despite SHA and MDTA facilities only accounting for 17% of roadway miles (**Table 5 and Figure 4**). The highest number of VMT occurs on Maryland and interstate routes each year with over 17 billion miles travelled on each type (**Table 6 and Figure 5**). The VMT percentages by agency and roadway classification have stayed approximately the same from 2023 to 2024.

Table 5

2023 VMT BY AGENCY	
AGENCY	VMT (BILLIONS)
SHA	37.70
County/Local/Others	16.29
MDTA	3.55

Figure 4

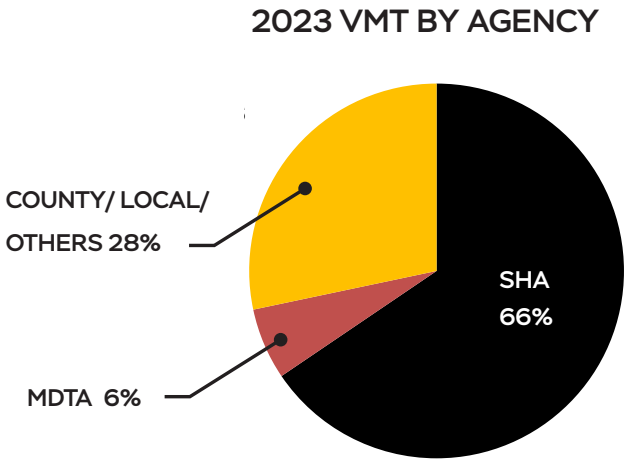
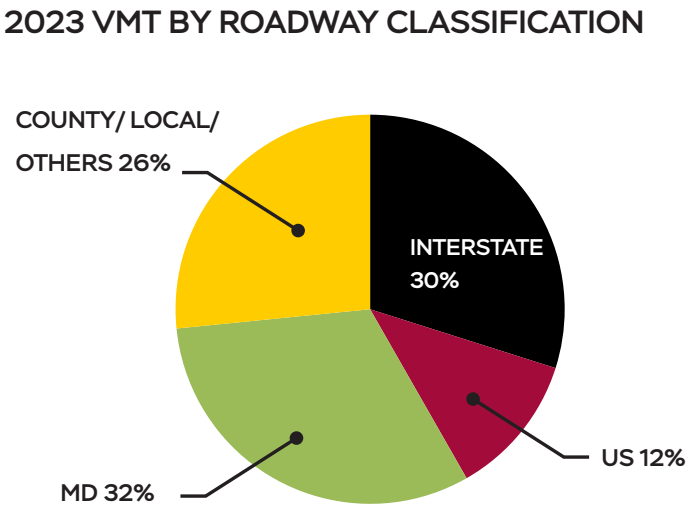


Table 6

2023 VMT BY ROADWAY CLASSIFICATION	
ROADWAY DESIGNATION	VMT (BILLIONS)
Maryland Routes	18.23
Interstate Routes	17.20
County/Local/Others	15.29
US Routes	6.82

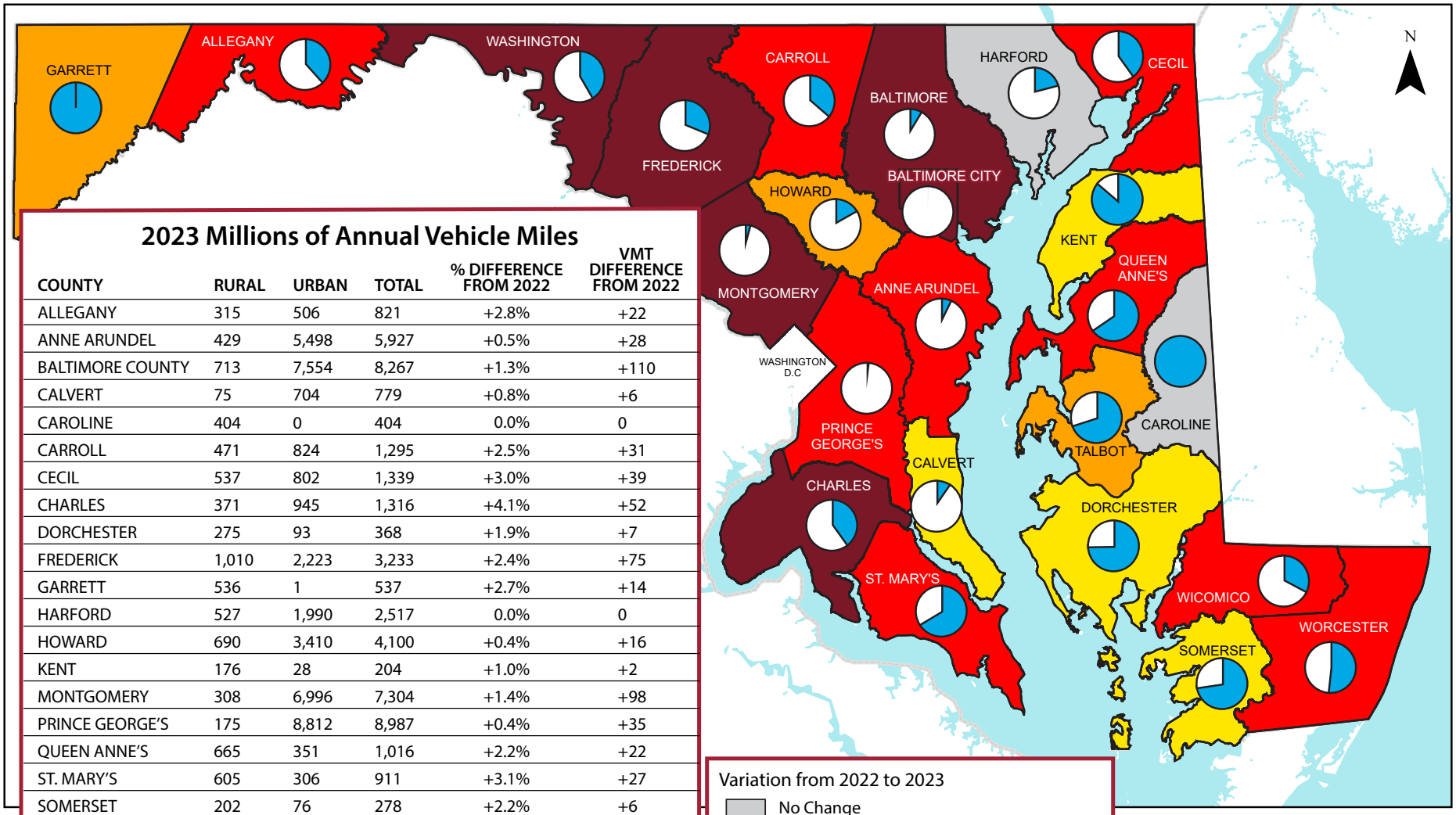
Figure 5



VEHICLE MILES TRAVELED – BY COUNTY

All counties in Maryland either remained flat or showed an increase in the number of VMT for all roads in the county. The highest mileage increases occurred in the urban areas of Montgomery and Baltimore County while Caroline and Harford Counties remained flat. Percentage-wise, Charles and St Mary's Counties grew by over 3%, which was the largest percent increase. Nine other counties increased by between 2% and 3% (**Figure 6**).

Figure 6 – Vehicle Miles of Travel by County



2023 Millions of Annual Vehicle Miles

COUNTY	RURAL	URBAN	TOTAL	% DIFFERENCE FROM 2022	VMT DIFFERENCE FROM 2022
ALLEGANY	315	506	821	+2.8%	+22
ANNE ARUNDEL	429	5,498	5,927	+0.5%	+28
BALTIMORE COUNTY	713	7,554	8,267	+1.3%	+110
CALVERT	75	704	779	+0.8%	+6
CAROLINE	404	0	404	0.0%	0
CARROLL	471	824	1,295	+2.5%	+31
CECIL	537	802	1,339	+3.0%	+39
CHARLES	371	945	1,316	+4.1%	+52
DORCHESTER	275	93	368	+1.9%	+7
FREDERICK	1,010	2,223	3,233	+2.4%	+75
GARRETT	536	1	537	+2.7%	+14
HARFORD	527	1,990	2,517	0.0%	0
HOWARD	690	3,410	4,100	+0.4%	+16
KENT	176	28	204	+1.0%	+2
MONTGOMERY	308	6,996	7,304	+1.4%	+98
PRINCE GEORGE'S	175	8,812	8,987	+0.4%	+35
QUEEN ANNE'S	665	351	1,016	+2.2%	+22
ST. MARY'S	605	306	911	+3.1%	+27
SOMERSET	202	76	278	+2.2%	+6
TALBOT	451	193	644	+1.6%	+10
WASHINGTON	877	1,227	2,104	+2.8%	+57
WICOMICO	329	674	1,003	+2.7%	+26
WORCHESTER	442	431	893	+2.5%	+22
BALTIMORE CITY	2	3,288	3,290	+1.5%	+48
TOTAL	**10,605**	**46,932**	**57,537**	**+1.3%**	**+753**

CONGESTION **TRENDS**

Congestion and the ease of mobility are influenced by various factors. These factors are broken down into two categories. The first type, recurring congestion, is the normal traffic congestion that occurs every day, especially during the AM and PM peak periods. Recurring congestion can also occur in other time periods, such as Fridays, Saturdays, and Sundays during the summer when motorists either traveling to the Atlantic Ocean or returning encounter delays. This type of congestion is influenced by high automobile and truck volumes, narrow lane and shoulder widths, and roadway geometrics. Freeway/expressway operations are also influenced by areas where traffic enters and exits the roadway. On arterials roadways, delays occur mostly at traffic signals. Other factors include variations in speeds, and different geometrics such as shoulder widths and lane widths, which impact congestion. The second type of congestion is non-recurring congestion. The sources of non-recurring congestion include crashes, vehicle breakdowns, work zones, major sporting events, inclement weather, or other unique occurrences, and inclement weather, which can cause motorists to experience slowing or stop-and-go traffic conditions.

Previously, traffic congestion and operations were measured through theoretical methods such as those included in the Highway Capacity Manual. Although this is still utilized, especially for future analysis, new methods have been developed over the last twenty years. This includes real-time vehicle probe data that allow for a bigger data set and therefore, a more accurate picture of mobility and congestion over the entire year. Probes are vehicles equipped with global positioning system (GPS) elements such as navigation devices that transmit real-time speed data. Vehicle probe speed datasets are available from a variety of sources on a minute-by-minute basis. The data is provided to SHA by INRIX, a company that collects traffic speed data from an estimated one hundred million probe vehicles nationwide, including commercial vehicle fleets. The University of Maryland Center for Advanced Transportation Technology (UMD CATT) uses vehicle probe speed data and traffic volume data to develop metrics for measuring congestion (**Figure 7**).

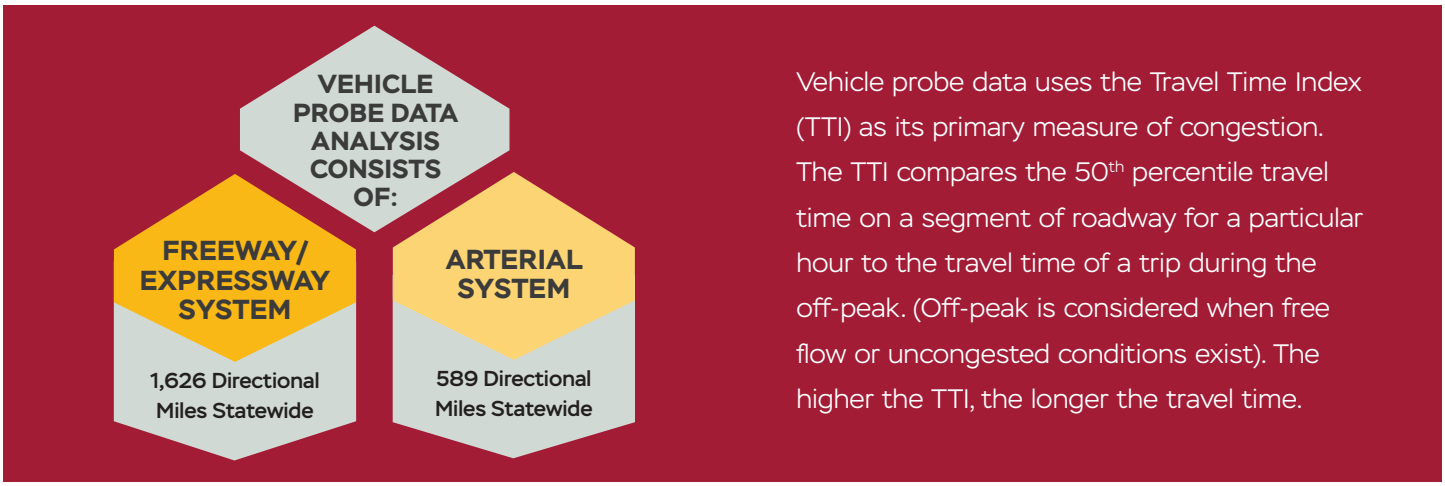
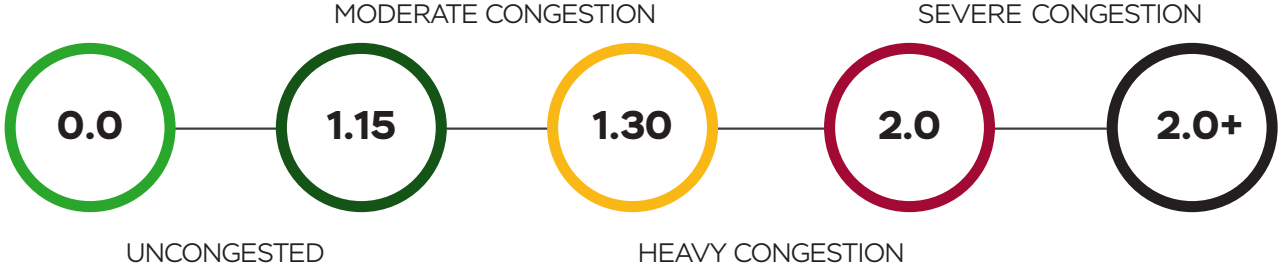


Figure 7

MEASUREMENT OF CONGESTION WITH THE TRAVEL TIME INDEX



CONGESTION MEASURES

A comparison is made on an annual basis to evaluate the increases or decreases that occur at the highest levels of congestion statewide in Maryland. This set of metrics for freeways/expressways includes the number and percent of roadway miles that operate with heavy to severe congestion and the percentage of peak hour VMT impacted (**Table 7**). The VMT impact is calculated by the number of motorists that experienced heavy to severe congestion conditions, along with the distance they traveled during the peak hour. For the major arterial system, the number of roadway miles and the percentage of roadway miles is compared. All metrics show that the levels of congestion have increased in 2023.

Table 7

STATEWIDE FREEWAY/EXPRESSWAY SYSTEM (1626 MILES) (AVERAGE WEEKDAY AM/PM PEAK HOUR HEAVY TO SEVERE CONGESTION SUMMARY)								
HEAVY TO SEVERE CONGESTION	2021		2022		2023		CHANGE FROM 2022 TO 2023	
	AM	PM	AM	PM	AM	PM	AM	PM
Roadway Miles	51	164	118	232	143	252	+25	+20
Percent of Roadway Miles	3	10	7	14	9	16	+2	+2
Percent of Peak Hour VMT Impacted	6	19	15	26	18	29	+3	+3

Table 8

STATEWIDE MAJOR ARTERIAL SYSTEM (589 MILES) (AVERAGE WEEKDAY AM/PM PEAK HOUR HEAVY TO SEVERE CONGESTION SUMMARY)								
HEAVY TO SEVERE CONGESTION	2021		2022		2023		CHANGE FROM 2022 TO 2023	
	AM	PM	AM	PM	AM	PM	AM	PM
Roadway Miles	57	203	104	230	123	240	+19	+10
Percent of Roadway Miles	10	34	17	39	21	41	+4	+2

The TTI analysis was developed into statewide congestion maps for the average weekday AM and PM peak hour and for summer weekends. Summer weekends were included to reflect areas that experience much greater congestion during that time such as routes to the Atlantic Ocean. The weekend congestion trend maps were developed for the hours of 4-5 PM Friday, 1-2 PM Saturday, and 2-3 PM Sunday. The congestion trend maps are outlined in the following figures:

- AM Peak Hour 8-9 AM – Figure 8
- PM Peak Hour 5-6 PM – Figure 9
- Friday Summer 4-5 PM – Figure 10
- Saturday Summer 1-2 PM – Figure 11
- Sunday Summer 2-3 PM – Figure 12

Figure 8 – Maryland Congestion Map: 2023 AM Peak Hour (8-9) AM (Tuesday - Thursday)

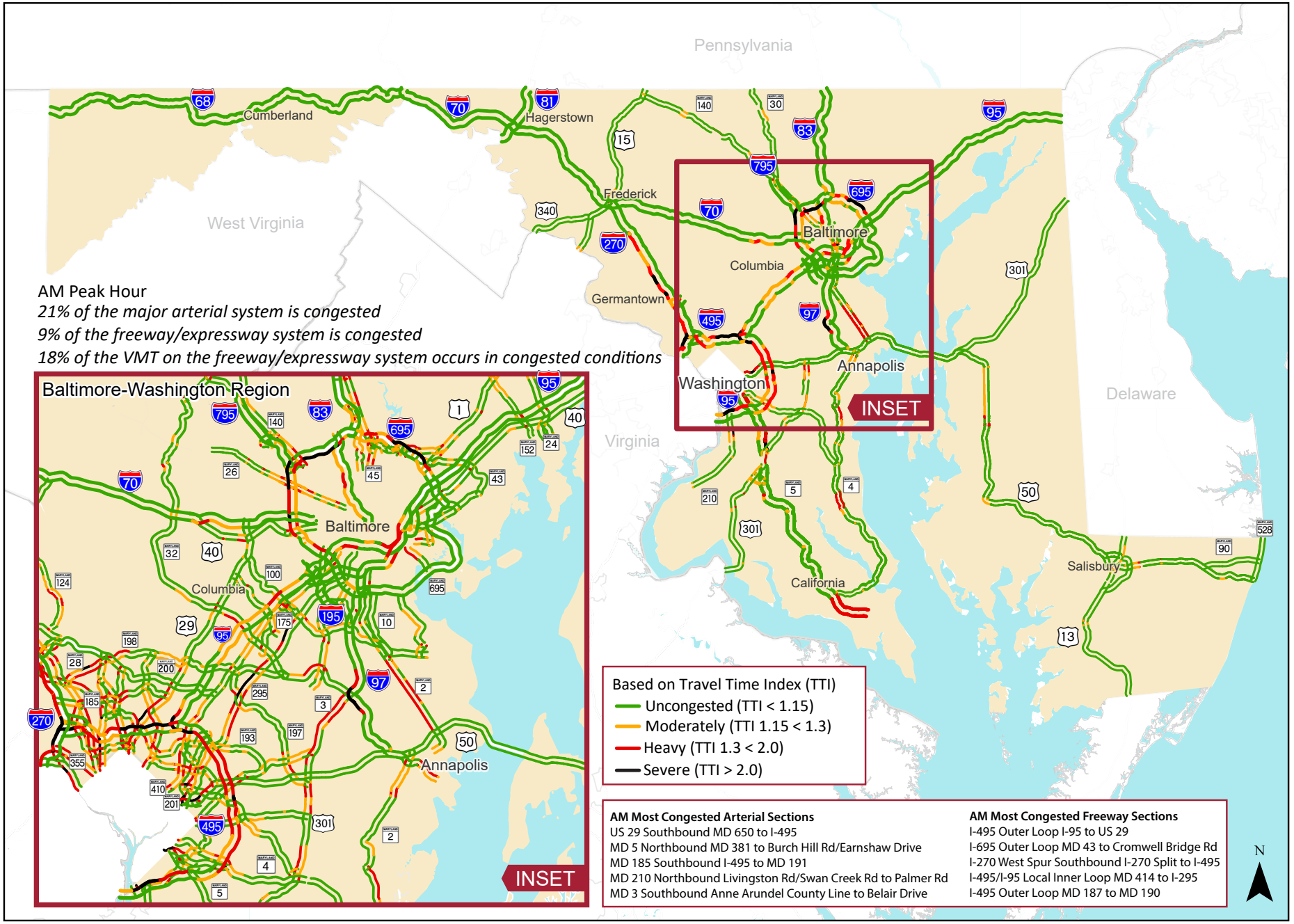


Figure 9 - Maryland Congestion Map: 2023 PM Peak Hour (5-6) PM (Tuesday - Thursday)

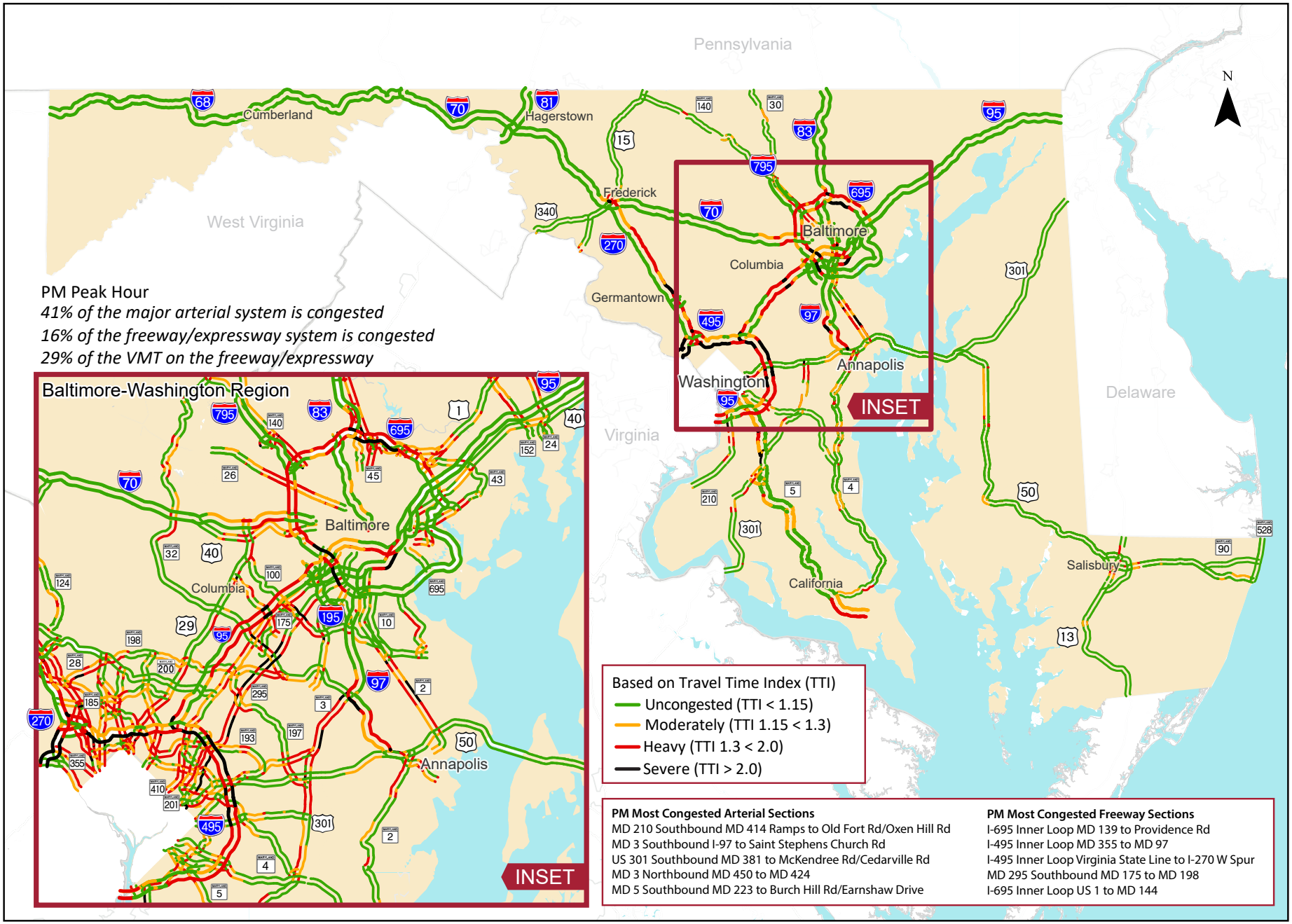


Figure 10 - Maryland Congestion Map: 2023 Friday Summer Hour (4-5) PM

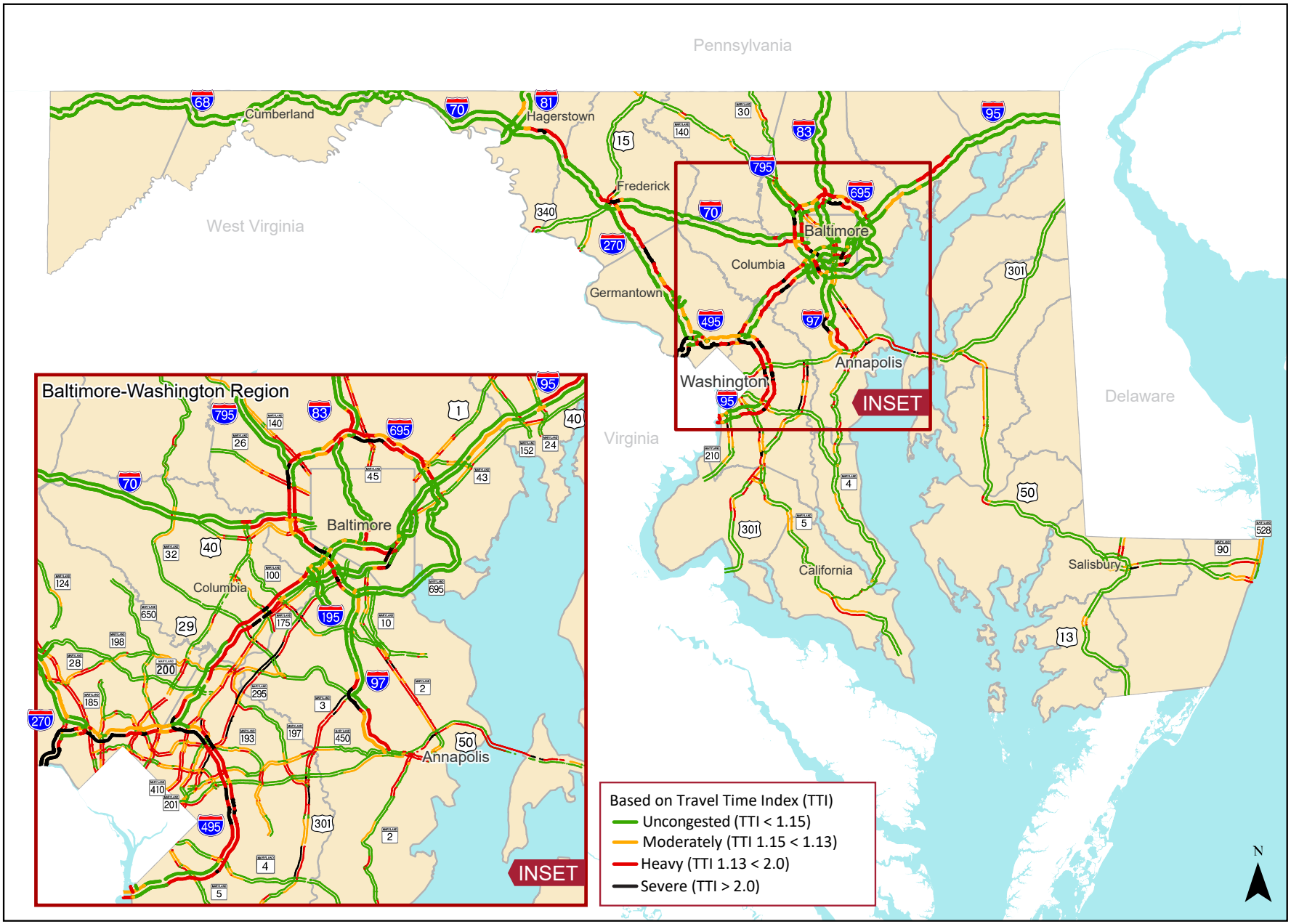


Figure 11 - Maryland Congestion Map: 2023 Saturday Summer Hour (1-2) PM

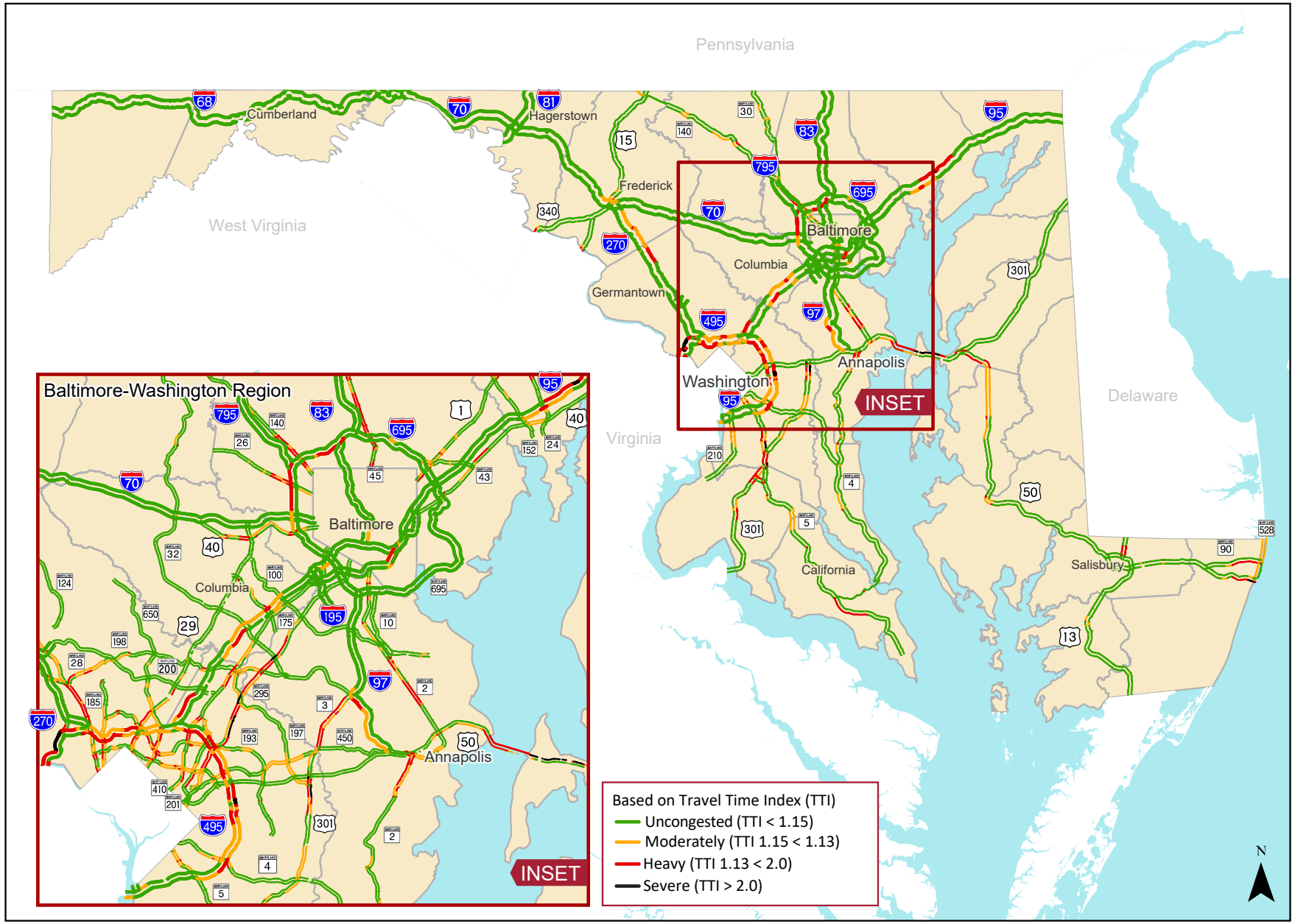
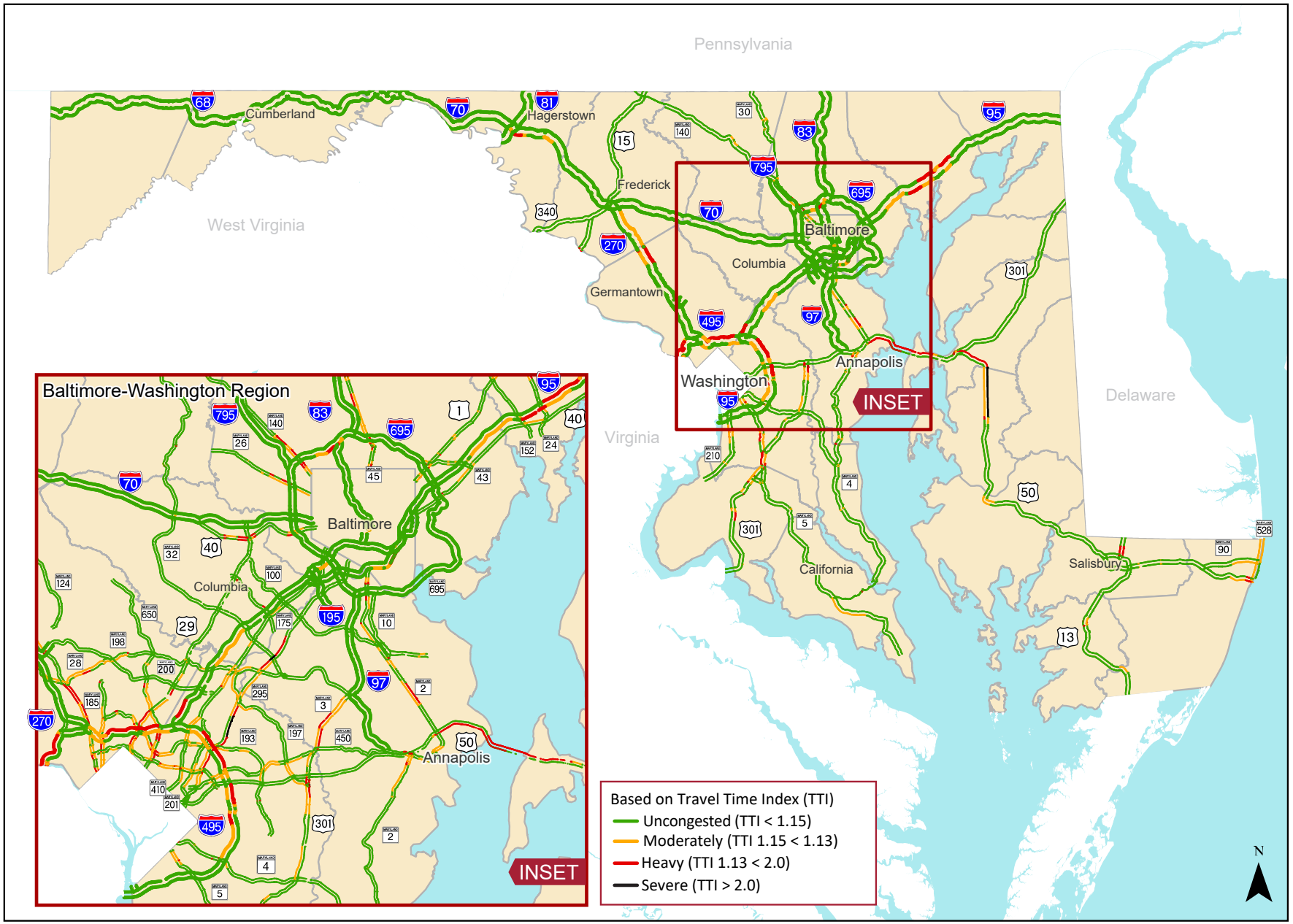


Figure 12 - Maryland Congestion Map: 2023 Sunday Summer Hour (2-3) PM



TOP 15 CONGESTED CORRIDOR SECTIONS

The INRIX probe data is established between logical termini. This equates to segments that can range from less than 0.1 miles in urban areas to over 10 miles in rural areas. Motorists normally do not perceive congestion in small portions of a roadway but in longer sections. Therefore, the individual segments were combined to develop the top fifteen most congested freeways/expressway corridors and arterial sections for the AM and PM peak hours. Freeway/expressway corridors range from three to eight miles long or include the entire length of a freeway (I-370) or spur (I-270 East or West Spur), while arterial corridors range from two to five miles long. The top fifteen most congested locations during the AM and PM peak hours are shown in **Tables 9 through 12**.

- Freeway/Expressway Sections AM Peak Hour – Table 9, Figure 13
- Freeway/Expressway Sections PM Peak Hour – Table 10, Figure 14
- Arterial Sections AM Peak Hour – Table 11, Figure 15
- Arterial Sections PM Peak Hour – Table 12, Figure 16

Most Congested Weighted Average = (Individual Segment TTI x Section Length)/Total Section Length

Table 9

2023 MOST CONGESTED FREEWAY/EXPRESSWAY SECTIONS – AM PEAK HOUR

AM RANK	ROUTE/DIRECTION	LIMITS	MILEAGE	COUNTY	TTI
1	I-495 Outer Loop	I-95 to US 29	3.42	Montgomery/ Prince George's	4.18
2	I-695 Outer Loop	MD 43 to Cromwell Bridge Rd	3.07	Baltimore	2.94
3	I-270 West Spur Southbound	I-270 Split to I-495	1.95	Montgomery	2.93
4	I-95/I-495 Local Inner Loop	MD 414 to I-295	3.38	Prince George's	2.35
5	I-495 Outer Loop	MD 187 to MD 190	3.11	Montgomery	2.30
6	I-97 Southbound	Benfield Blvd to MD 178 Off Ramp	3.60	Anne Arundel	2.26
7	I-695 Inner Loop	MD 129 to I-83 Southbound Ramp	3.51	Baltimore	2.14
8	US 50 Westbound	MD 410 to MD 295	3.25	Prince George's	2.12
9	I-270 Southbound	MD 121 to MD 118	3.95	Montgomery	2.11
10	I-95/I-495 Mainline Inner Loop	I-95/I-495 Local Lane Split to Virginia State Line	3.61	Prince George's	2.10
11	I-695 Outer Loop	I-795 to I-70	5.51	Baltimore	2.10
12	I-95/I-495 Inner Loop	I-95 to MD 201	3.23	Prince George's	1.95
13	MD 295 Southbound	Arundel Mills Blvd to MD 197	7.93	Anne Arundel	1.73
14	I-270 Mainline Southbound	I-370 to MD 28	3.20	Montgomery	1.57
15	MD 32 Westbound	MD 170 to MD 198	3.31	Anne Arundel	1.50

Figure 13 – Maryland's Most Congested Freeway Corridor Sections: 2023 AM Peak Hour (8-9)

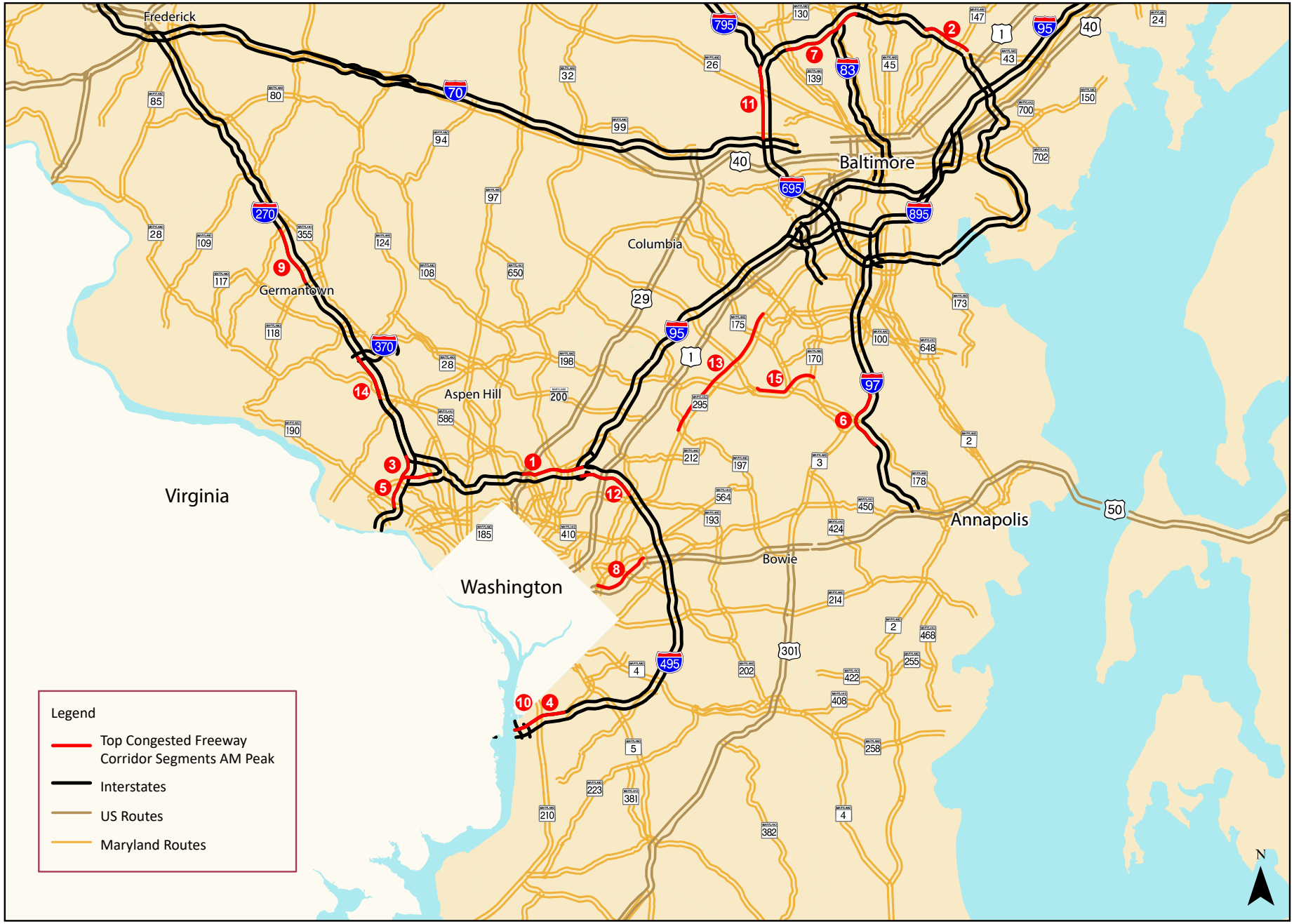


Table 10

2023 MOST CONGESTED FREEWAY/EXPRESSWAY SECTIONS – PM PEAK HOUR					
PM RANK	ROUTE/DIRECTION	LIMITS	MILEAGE	COUNTY	TTI
1	I-695 Inner Loop	MD 139 to Providence Rd	3.02	Baltimore	3.56
2	I-495 Inner Loop	MD 355 to MD 97	3.44	Montgomery	3.48
3	I-495 Inner Loop	Virginia State Line to I-270 West Spur	3.74	Montgomery	2.86
4	MD 295 Southbound	MD 175 to MD 198	3.56	Anne Arundel	2.79
5	I-695 Inner Loop	US 1 to MD 144	3.22	Baltimore	2.77
6	I-95/I-495 Inner Loop	I-95 to MD 201	3.23	Prince George's	2.69
7	MD 295 Northbound	MD 450 to I-95/I-495	3.56	Prince George's	2.55
8	I-95/I-495 Outer Loop	MD 450 to MD 201	3.85	Prince George's	2.44
9	I-495 Outer Loop	I-270 West Spur to Clara Barton Parkway	3.08	Montgomery	2.38
10	I-270 Mainline Northbound	MD 117 to Middlebrook Rd	3.21	Montgomery	2.32
11	MD 295 Northbound	Explorer Rd (NASA Entrance) to MD 197	3.25	Prince George's	2.25
12	I-95/I-495 Inner Loop	MD 202 to Ritchie- Marlboro Rd	3.36	Prince George's	2.23
13	I-695 Outer Loop	US 1 to MD 295	3.30	Baltimore/ Anne Arundel	2.10
14	MD 295 Northbound	MD 198 to MD 175	3.41	Prince George's/ Anne Arundel	2.10
15	I-270 Northbound	MD 121 to MD 109	3.91	Montgomery	2.00

Figure 14 – Maryland's Most Congested Freeway Corridor Sections: 2023 PM Peak Hour (5-6)

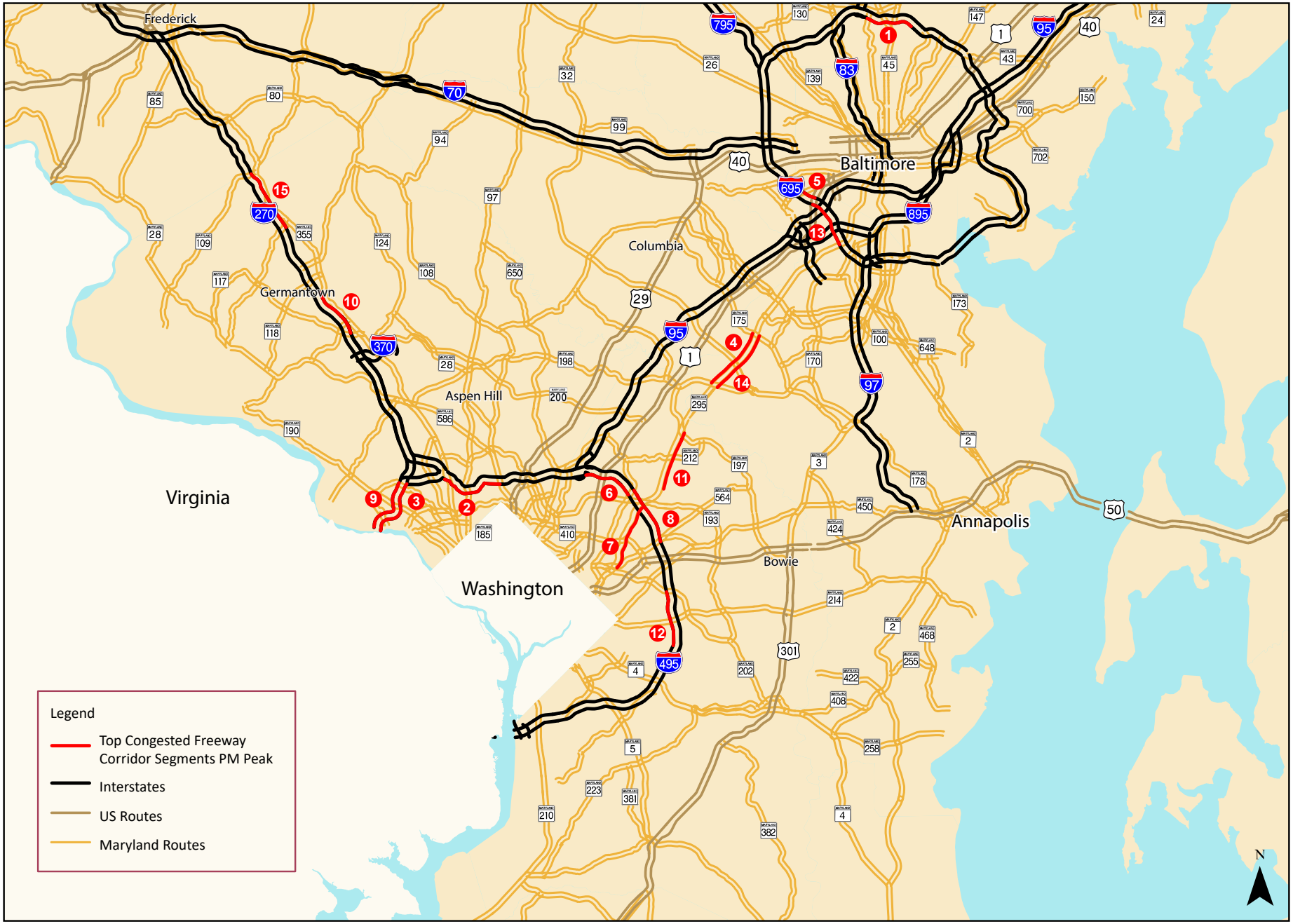


Table 11

2023 MOST CONGESTED ARTERIAL SECTIONS – AM PEAK HOUR					
AM RANK	ROUTE/DIRECTION	LIMITS	MILEAGE	COUNTY	TTI
1	US 29 Southbound	MD 650 to I-495	2.10	Montgomery	2.25
2	MD 5 Northbound	MD 381 to Burch Hill Rd/Earnshaw Dr	2.02	Prince George's	2.07
3	MD 185 Southbound	I-495 to MD 191	2.08	Montgomery	1.92
4	MD 210 Northbound	Livingston Rd/Swan Creek Rd to Palmer Rd	2.82	Prince George's	1.80
5	MD 3 Southbound	Anne Arundel County Line to Belair Dr	2.16	Prince George's	1.70
6	MD 97 Southbound	MD 586 to 16th St/MD 390	2.03	Montgomery	1.69
7	MD 355 Southbound	I-495 to MD 410	2.48	Montgomery	1.67
8	MD 2 Southbound	MD 648/Whites Rd to College Parkway	2.95	Anne Arundel	1.63
9	MD 212 Westbound	Beltsville Dr to Riggs Rd	2.11	Prince George's	1.62
10	MD 189 Southbound	Wootton Parkway to Glen Rd	2.08	Montgomery	1.62
11	MD 28 Westbound	MD 97 to Baltimore Rd	2.27	Montgomery	1.58
12	MD 2 Southbound	College Pkwy to US 50	2.82	Anne Arundel	1.57
13	MD 3 Southbound	St. Stephens Church Rd to MD 424	2.21	Anne Arundel	1.56
14	MD 2 Northbound	College Pkwy to MD 648/Whites Rd	2.41	Anne Arundel	1.49
15	MD 424 Southbound	MD 3 to MD 450	2.34	Anne Arundel	1.47

Figure 15 – Maryland's Most Congested Arterial Corridor Sections: 2023 AM Peak Hour (8-9)

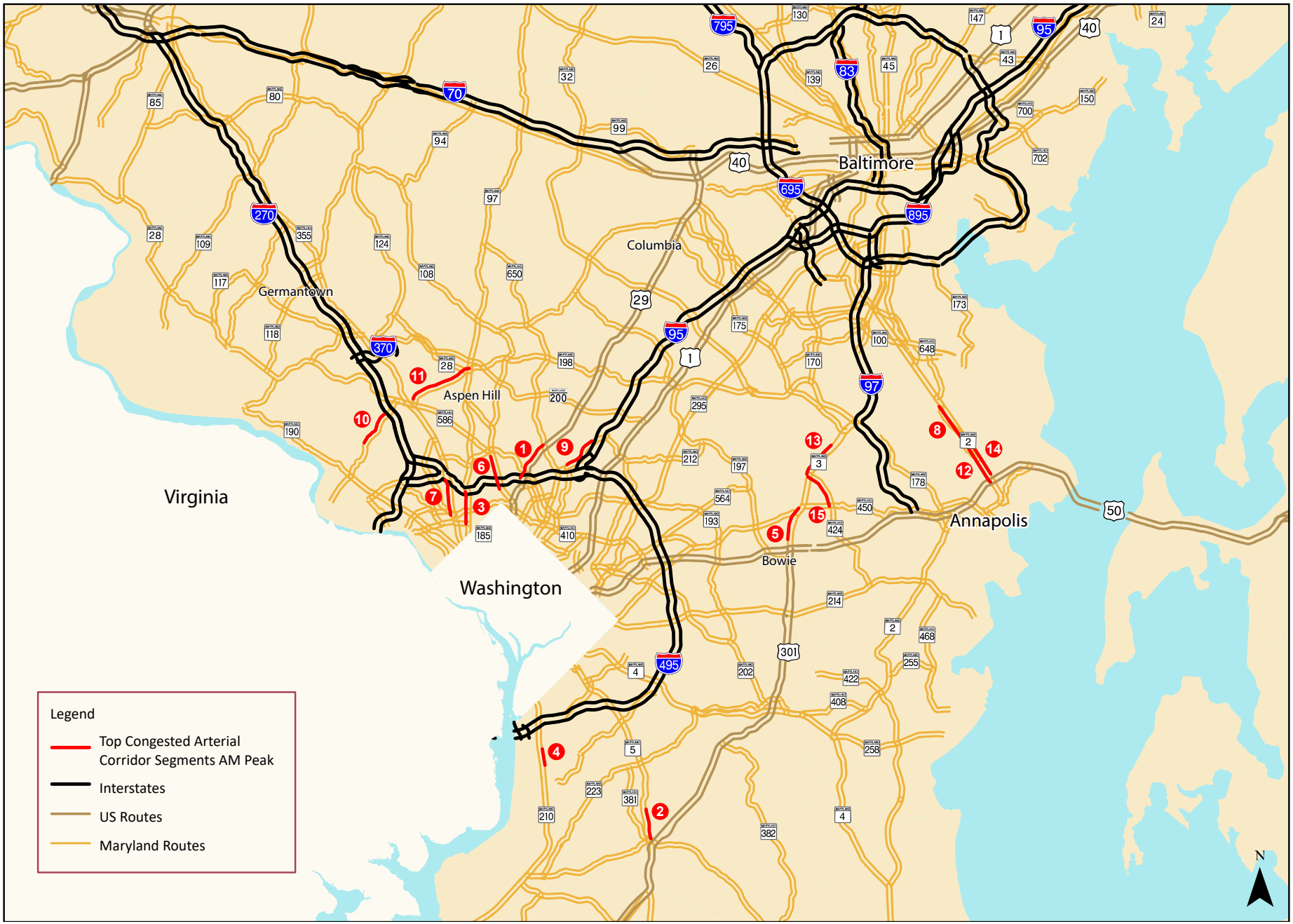
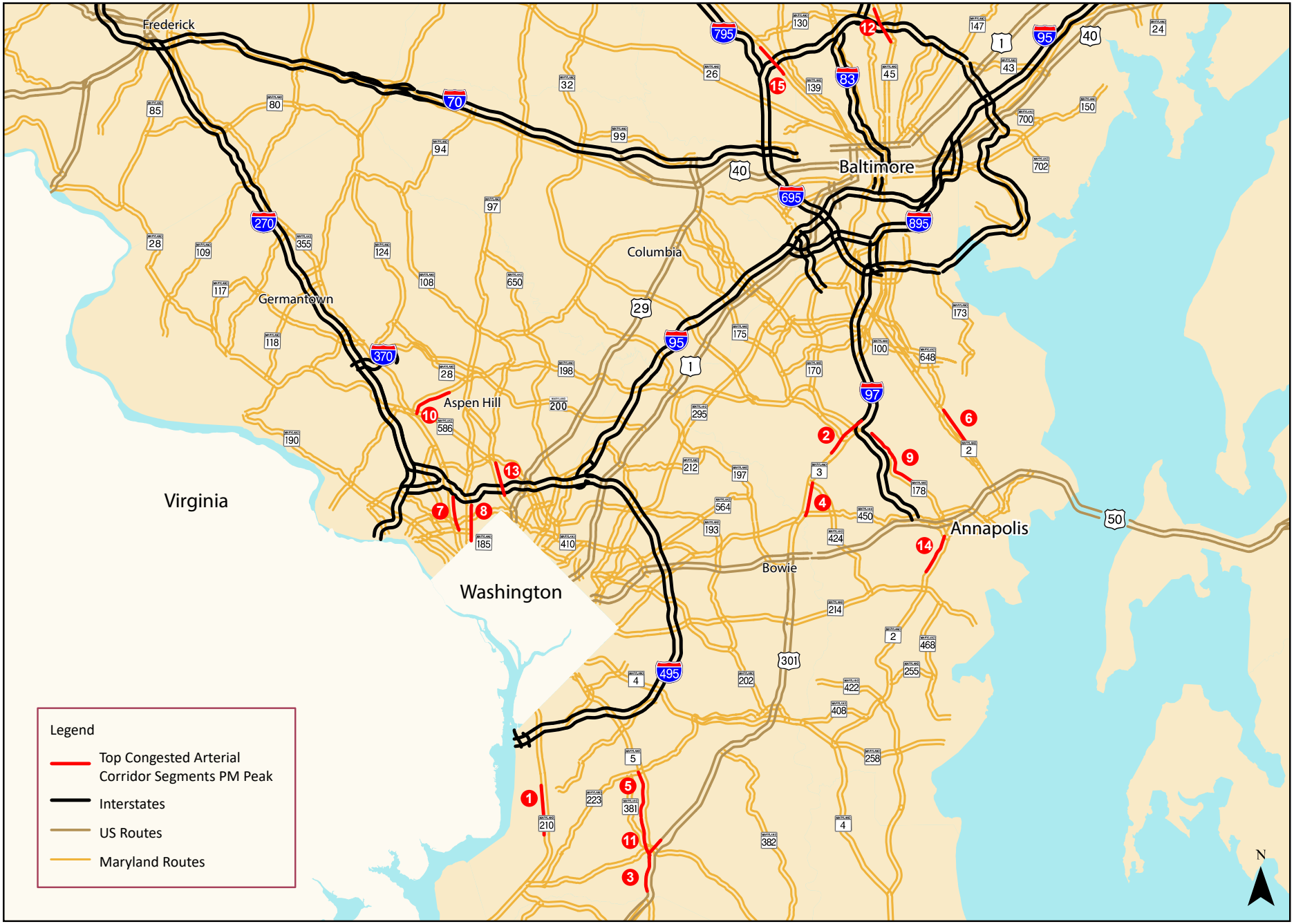


Table 12

2023 MOST CONGESTED ARTERIAL SECTIONS – PM PEAK HOUR					
PM RANK	ROUTE/DIRECTION	LIMITS	MILEAGE	COUNTY	TTI
1	MD 210 Southbound	MD 414 Ramps to Old Fort Rd/ Oxen Hill Rd	2.70	Prince George's	2.85
2	MD 3 Southbound	I-97 to St. Stephens Church Rd	2.36	Anne Arundel	2.24
3	US 301 Southbound	MD 381 to McKendree Rd/ Cedarville Rd	2.52	Prince George's	2.21
4	MD 3 Northbound	MD 450 to MD 424	2.01	Anne Arundel	2.17
5	MD 5 Southbound	MD 223 to Burch Hill Rd/Earnshaw Dr	3.19	Prince George's	2.15
6	MD 2 Northbound	College Parkway to Robinson Rd	2.41	Anne Arundel	2.03
7	MD 355 Northbound	MD 191 to Cedar Lane	2.07	Montgomery	2.02
8	MD 185 Northbound	Washington D.C. Line to Jones Bridge Rd	2.20	Montgomery	2.00
9	MD 178 Northbound	Old Generals Highway to I-97	2.78	Anne Arundel	1.99
10	MD 28 Eastbound	MD 586 to Bel Pre Rd	2.61	Montgomery	1.89
11	MD 5 Southbound	Burch Hill Rd/Earnshaw Dr to US 301	2.80	Prince George's	1.81
12	MD 45 Southbound	Ridgely Rd to Joppa Rd	2.21	Baltimore	1.80
13	MD 97 Northbound	16th St/MD 390 to MD 586	2.10	Montgomery	1.79
14	MD 2 Southbound	MD 665 to MD 253	2.61	Anne Arundel	1.74
15	MD 140 Eastbound	McDonough Rd to Sudbrook Ln	2.13	Baltimore	1.71

Figure 16 – Maryland's Most Congested Arterial Corridor Sections: 2023 PM Peak Hour (5-6)



SUMMER WEEKEND CONGESTION

During the summer, many more people take vacations and children are off from school. These events offer a time to travel, which is especially true on the weekends with the number of destinations Maryland has to offer. From the Atlantic Ocean beaches and numerous waterways on the Eastern Shore to the mountains in western Maryland, there is something for everyone outdoors. This shift contributes to a change in travel patterns. Travelers take more long-distance trips along routes leading to these locations during the summer months. Longer trips lead to different congestion patterns during the summer as compared to the rest of the year. Summer weekend analysis was performed to identify those patterns.

Since travel patterns are different in areas that might not experience congestion during the weekday peak hours but would on a summer weekend, analysis was performed during three different time frames in the summer months. This was done to determine which locations experience the most congestion in the summer months for the periods of 4-5 PM on Friday, 1-2 PM on Saturday, and 2-3 PM on Sunday based on TTI data. The highest locations for congestion were throughout the state during those time periods (**Table 13 and Figure 17**). The analysis identified that the Eastern Shore and sections of I-70 in Frederick County experienced more congestion on the weekends than on the weekdays, particularly in areas that normally experience minimal weekday congestion (**Table 14 and Figure 18**). The rankings represent the most congested sections of roadway for those time periods.

Table 13

2023 MOST CONGESTED SUMMER-WEEKEND FREEWAY AND ARTERIAL LOCATIONS						
FACILITY	DAY	ROUTE/DIRECTION	LIMITS	MILEAGE	COUNTY	TTI
Freeway	Friday	I-495 Outer Loop	MD 187 to Clara Barton Parkway	3.9	Montgomery	3.9
Arterial	Friday	US 301 SB	MD 381 to McKendree Rd/Cedarville Rd	2.5	Prince George's	2.6
Freeway	Saturday	US 50/US 301 WB	Chester Station Ln to Chesapeake Bay Bridge	3.3	Queen Anne's	2.6
Arterial	Saturday	MD 5 NB	US 301 to Burch Hill Rd/ Earnshaw Dr	2.2	Prince George's	2.1
Freeway	Sunday	MD 295 NB	Explorer Rd to MD 197	3.3	Prince George's	2.5
Arterial	Sunday	US 301 SB	MD 381 to Cedarville/ McKendree Road	2.5	Prince George's	1.7

Figure 17 – 2023 Most Congested Summer Weekend Freeway and Arterial Locations

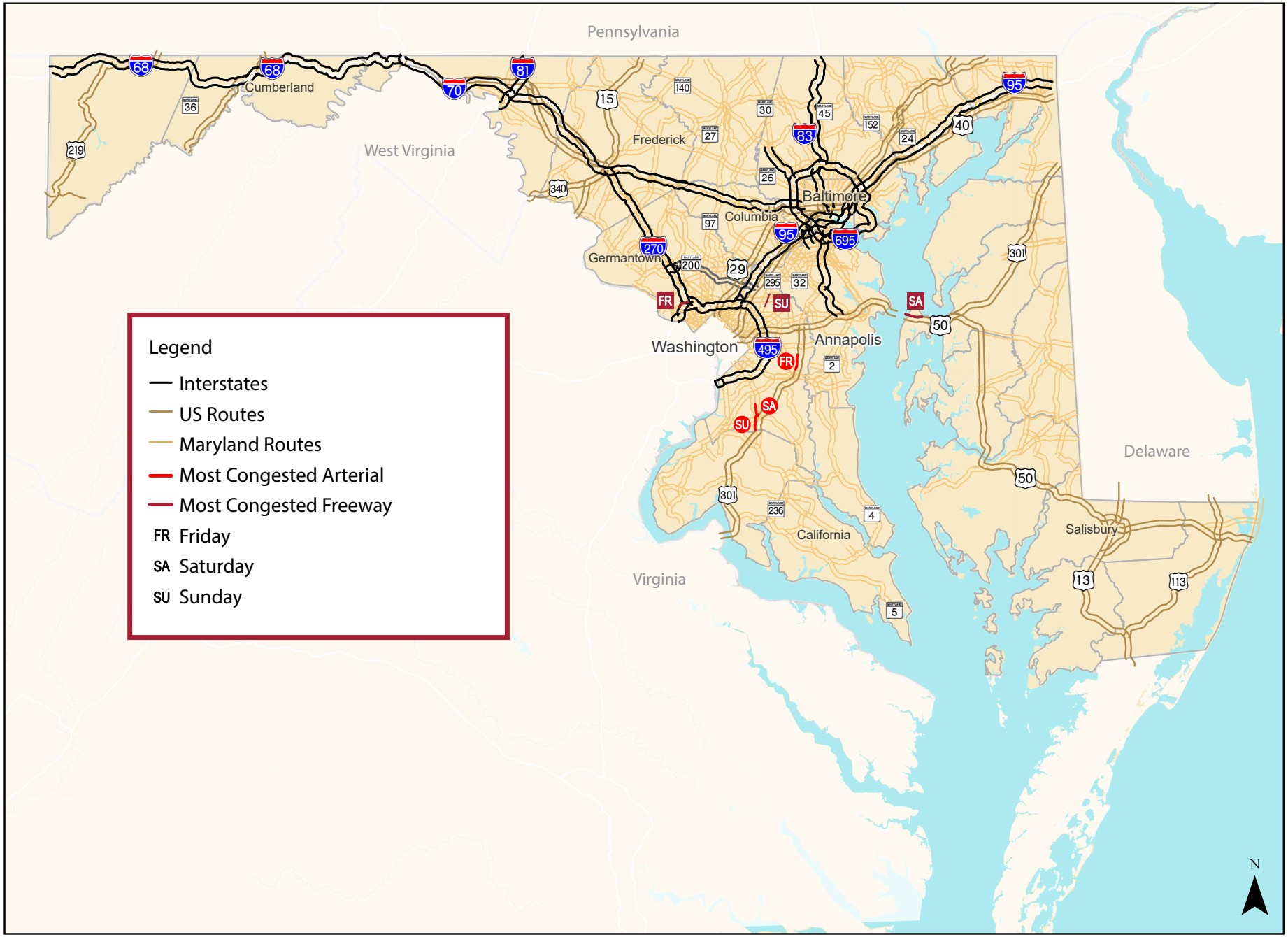
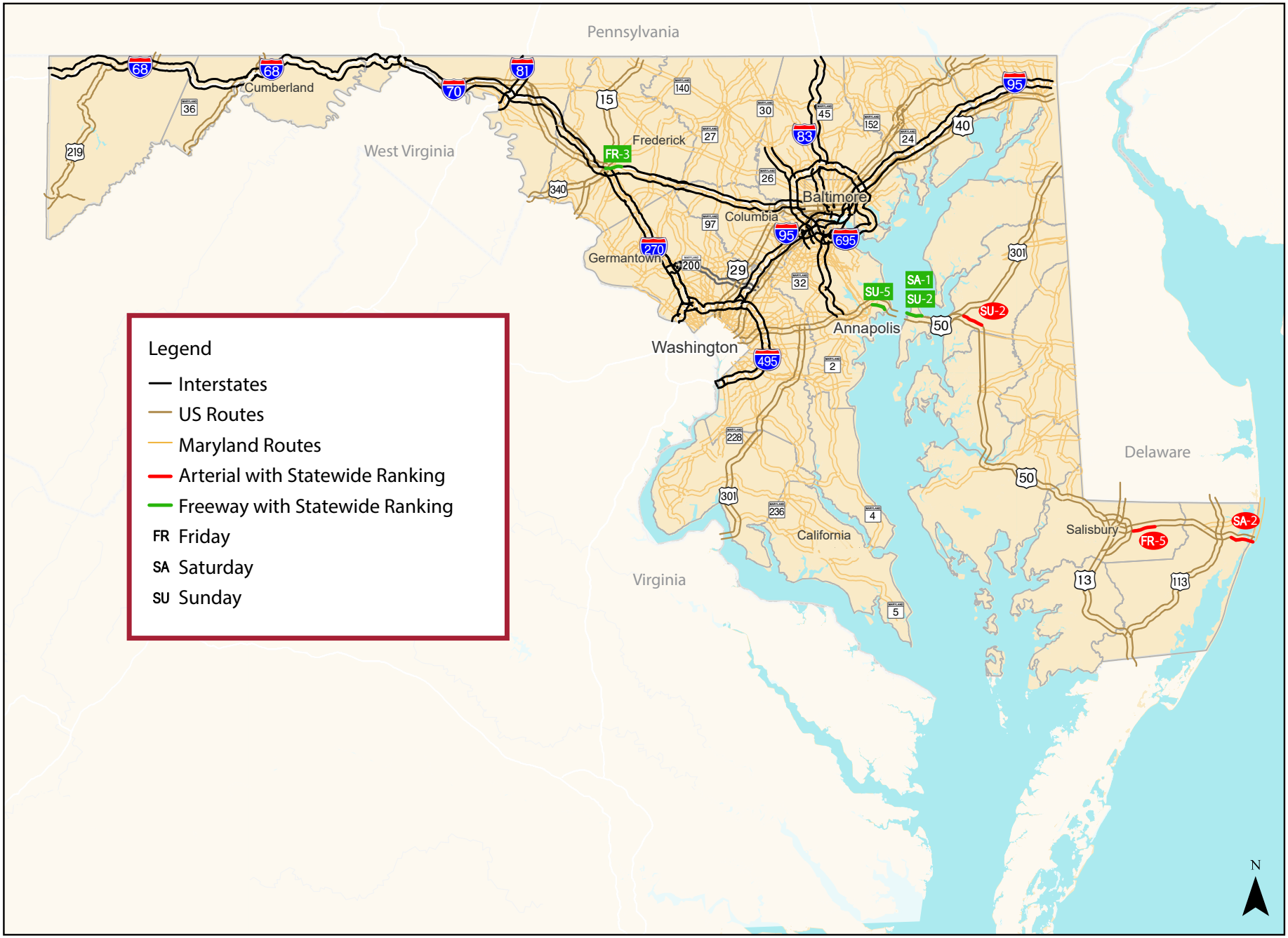


Table 14

2023 MOST CONGESTED SUMMER-WEEKEND FREEWAY/ARTERIAL LOCATIONS (THAT NORMALLY EXPERIENCE MINIMAL CONGESTION ON WEEKDAYS)						
STATEWIDE RANK/FACILITY	DAY	ROUTE/DIRECTION	LIMITS	MILEAGE	COUNTY	TTI
3/Freeway	Friday	I-70 WB	South St to MD 180	3.1	Frederick	3.4
5/Arterial	Friday	US 50 EB	US 13 to Walston Switch Rd	2.1	Wicomico	1.8
1 / Freeway	Saturday	US 50/US 301 WB	Chester Station Ln to Chesapeake Bay Bridge	3.2	Queen Anne's	2.6
2/ Arterial	Saturday	US 50 EB	MD 589 to MD 528	4.6	Worcester	2.0
2/ Freeway	Sunday	US 50/ US 301 WB	Chester Station Ln to Chesapeake Bay Bridge	3.2	Queen Annes	1.7
5/ Freeway	Sunday	US 50/US 301 EB	Buschs Frontage Rd to Chesapeake Bay Bridge	3.1	Anne Arundel	1.6
2/ Arterial	Sunday	US 50 WB	Wye Mills Rd to US 301	5.9	Queen Anne's	1.6

Figure 18 – 2023 Most Congested Summer Weekend Locations with Minimal Weekday Congestion



DAILY CONGESTION

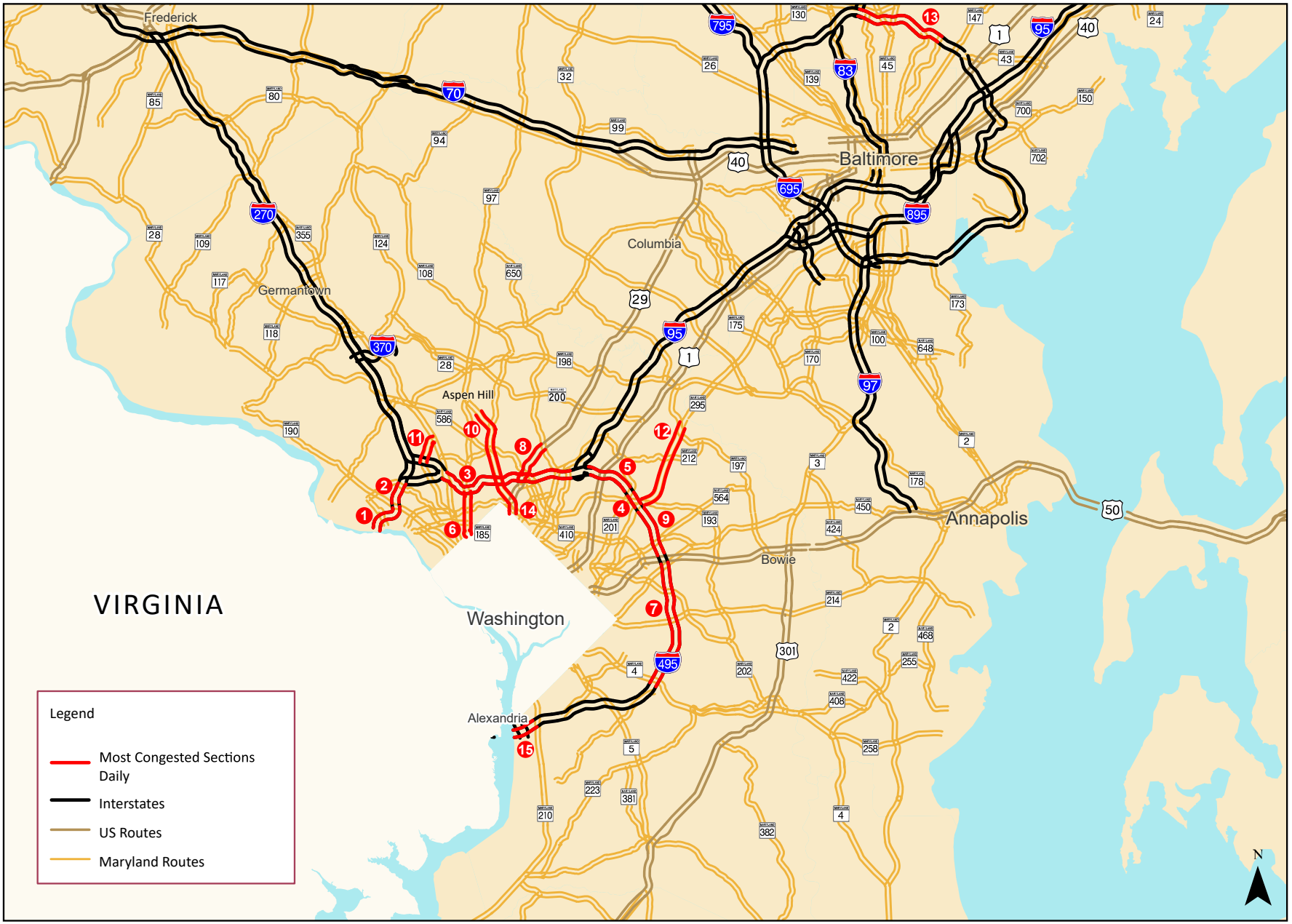
Traffic congestion fluctuates throughout the day. Many roadways experience congestion in the morning peak in one direction and the afternoon peak in the other direction. On other roadways, both directions of travel can be slow during multiple hours of the day. To evaluate daily congestion, SHA is using the Maryland Roadway Performance Tool (MRPT). This tool provides standard measures of congestion metrics such as TTI along with other variables. These other variables include person-hours of delay, person-hours of delay per mile, congestion costs, congested carbon dioxide (CO_2), and normal CO_2 values. The MRPT divides the freeways and arterials into segments and uses the same data relating to speeds along freeways and arterials for the TTI and PTI values.

The MRPT evaluates both directions of travel for the entire day while other congestion analysis identified the range of congestion based on AM and PM peak hour congestion by direction through the use of TTI values. Both are valuable to understanding the level of delays that are occurring and their location. The congested roadways information provided by MRPT is based on the average person-hours of delay per mile. The calculation considers the number of vehicles on the roadway and people in those vehicles along with the delay they experience on that section of roadway. These values were developed to determine the worst locations for delay throughout the day on the State roadway system. The worst locations for congestion based on the average person hours of delay per mile are centered on I-95/I-495 Capital Beltway and mostly along roadways in Prince George's and Montgomery Counties (**Table 15 and Figure 19**).

Table 15

2023 MOST CONGESTED SECTIONS – DAILY TRAFFIC				
MRPT RANK	ROUTE	LIMITS	COUNTY	PERSON HOURS OF DELAY/MILE
1	I-495	Virginia State Line to MD 190	Montgomery	872,249
2	I-495	MD 190 to I-270 West Spur	Montgomery	680,852
3	I-495	MD 355 to I-95	Montgomery	630,188
4	I-95/I-495	MD 295 to MD 201	Prince George's	597,688
5	I-95/I-495	MD 201 to I-95	Prince George's	433,528
6	MD 185	Grafton St to I-495	Montgomery	430,269
7	I-95/I-495	Suitland Pkwy to US 50	Prince George's	371,124
8	US 29	I-495 to MD 650	Montgomery	357,008
9	I-95/I-495	US 50 to MD 295	Prince George's	353,938
10	MD 97	I-495 to Randolph Rd	Montgomery	341,058
11	MD 187	I-270 to MD 355	Montgomery	318,822
12	MD 295	I-95/I-495 to MD 197	Prince George's	318,109
13	I-695	I-83 to MD 41	Baltimore	314,626
14	MD 97	DC Line to I-495	Montgomery	311,548
15	I-95/I-495	DC Line to MD 210	Prince George's	308,886

Figure 19 – Maryland's Most Congested Sections – Daily Traffic: 2023



COST OF CONGESTION

Everyone values their time spent with family and friends, enjoying recreational activities, or just relaxing. They do not prefer to be caught in traffic congestion. The time spent waiting in traffic by motorists or truck drivers has a cost associated with it. For example, congestion may cause late deliveries, require companies to pay employees for overtime or result in a person failing to make an event or missing a plane. The statewide cost of congestion has been developed based on the MRPT (**Table 16**) which considers all state and major local roadways. This takes into account congestion over the entire day. Overall, the annual statewide cost of congestion has increased from 2023 to 2024 by 1% The change in congestion costs was propelled by the increases in inflation and traffic volumes especially along the interstate roadways along with more congestion being experienced by trucking operations.

Table 16

TOTAL COST OF CONGESTION STATEWIDE ($ MILLIONS)[1]				
Facility Type	2021	2022	2023	CHANGE FROM 2022 TO 2023
Interstate	$570	$743	$913	+170
Other Freeways/ Expressways	$382	$448	$508	+60
Arterials	$3,529	$4,095	$3,925	-170
TOTAL	$4,481	$5,286	$5,346	+60

1 - Revised methodology based on the Maryland Reporting Performance Tool

I-97 SOUTH OF MD 178

FREEWAY/EXPRESSWAY AND MAJOR ARTERIAL CORRIDOR SUMMARY

Most congestion occurs on the highest functioning roadways with the greatest volumes. This would include freeways/expressways and major arterial roadways. Freeways/expressways are also termed controlled access facilities. Controlled access facilities allow ingress and egress almost exclusively at interchanges and allow for the greatest capacity to convey vehicles. Major arterials are the next highest classification of roadways after freeways/expressways. These roadways typically have multiple lanes with traffic signals and carry a large volume of traffic.

Analysis was performed to determine the various levels of congestion on the freeway/expressway system and the most congested arterial corridors statewide. The number and percentage of miles for each level of congestion were determined for the AM peak hour (8-9 AM) and the PM peak hour (5-6 PM) (**Figures 20 and 21**).

Throughout the state, there was an increase in congestion for both the freeway/expressway and arterial systems from 2022 to 2023. Highlights include:

- The largest change occurred in the PM peak hour along the freeway/expressway system which saw an increase of 24 miles of severe (highest level TTI >2.0) congestion. There are now 67 miles of freeways/expressways operating with severe congestion.
- In the AM peak hour, the number of freeways/expressways miles that operated under severe congestion doubled from 21 to 42 miles.
- Along arterials there was an increase in the number of miles of heavy congestion by 32 in the AM peak hour and 10 in the PM peak hour.
- Severe congestion along arterials was slightly lower in the AM peak hour (15 miles to 12 miles) and flat in the PM peak hour (28 miles).

Figure 20

NUMBER OF CONGESTED MILES

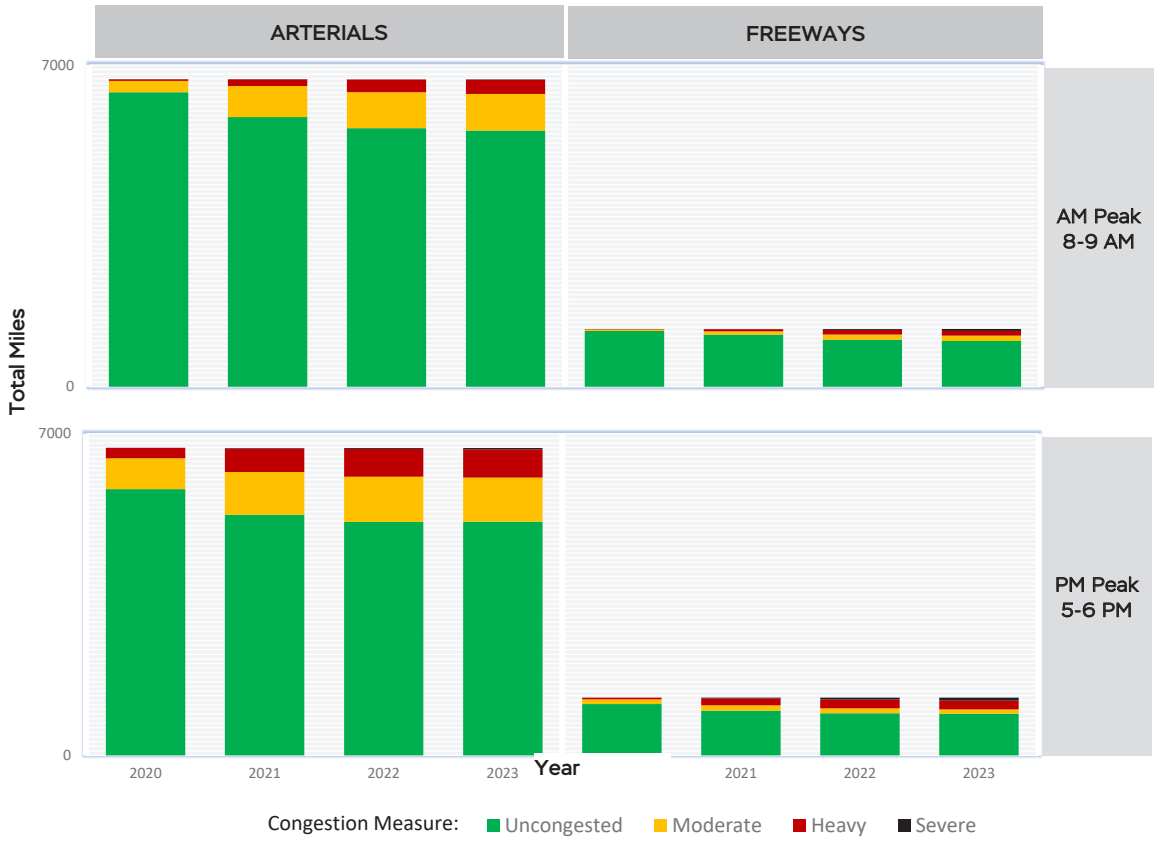
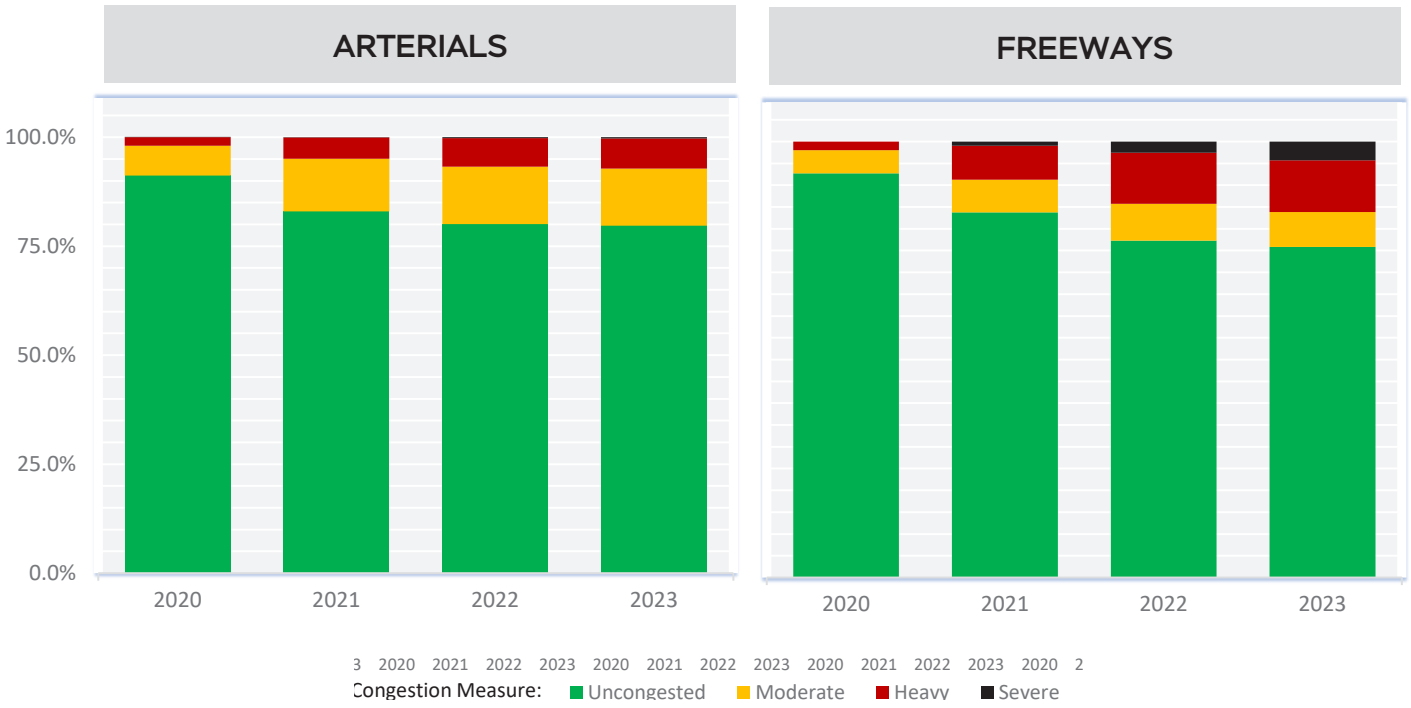


Figure 21

PERCENT OF CONGESTED MILEAGE FREEWAYS AND ARTERIALS



Each of Maryland's freeways and expressways was analyzed to determine the number of miles that were recorded in the four levels of congestion (**Figure 22**).

The major changes that occurred between 2022 and 2023 included:

- On certain freeways/expressways the level of congestion increased from heavy to severe in relative proportion. For example, I-495, in 2023 has eight fewer miles of heavy congestion but eight more miles of severe congestion in the PM peak hour.
- In addition to I-495, the largest change in severe congestion occurred on MD 295 in the PM peak hour with an additional five miles at that level.
- Facilities that experienced more than a three-mile increase in severe congestion include I-495, I-695, and MD 295 in the AM peak hour and I-270, I-495, and MD 295 in the PM peak hour.
- Heavy congestion along I-70 was found to be three miles less in the AM peak hour.

Figure 22

FREEWAY CONGESTION SUMMARY

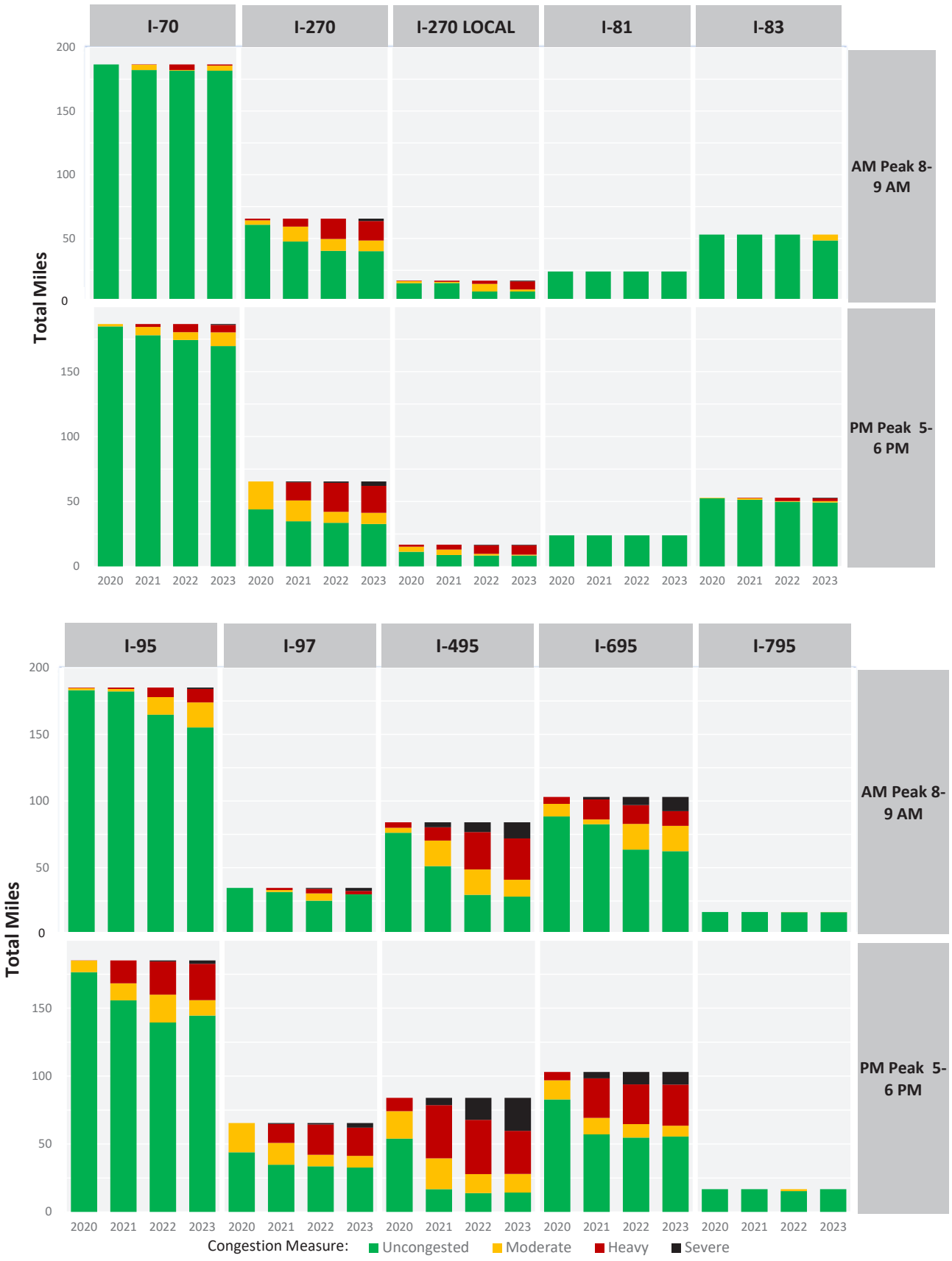
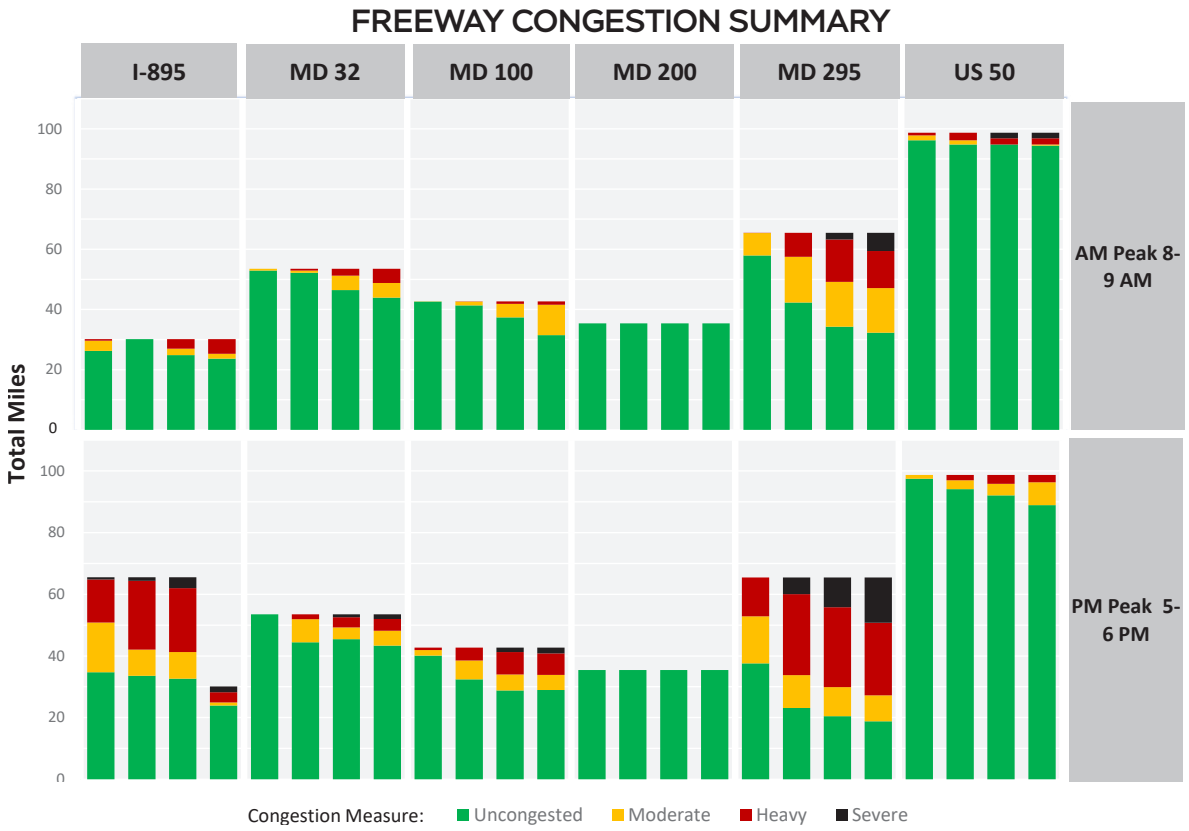


Figure 22 (Continued)



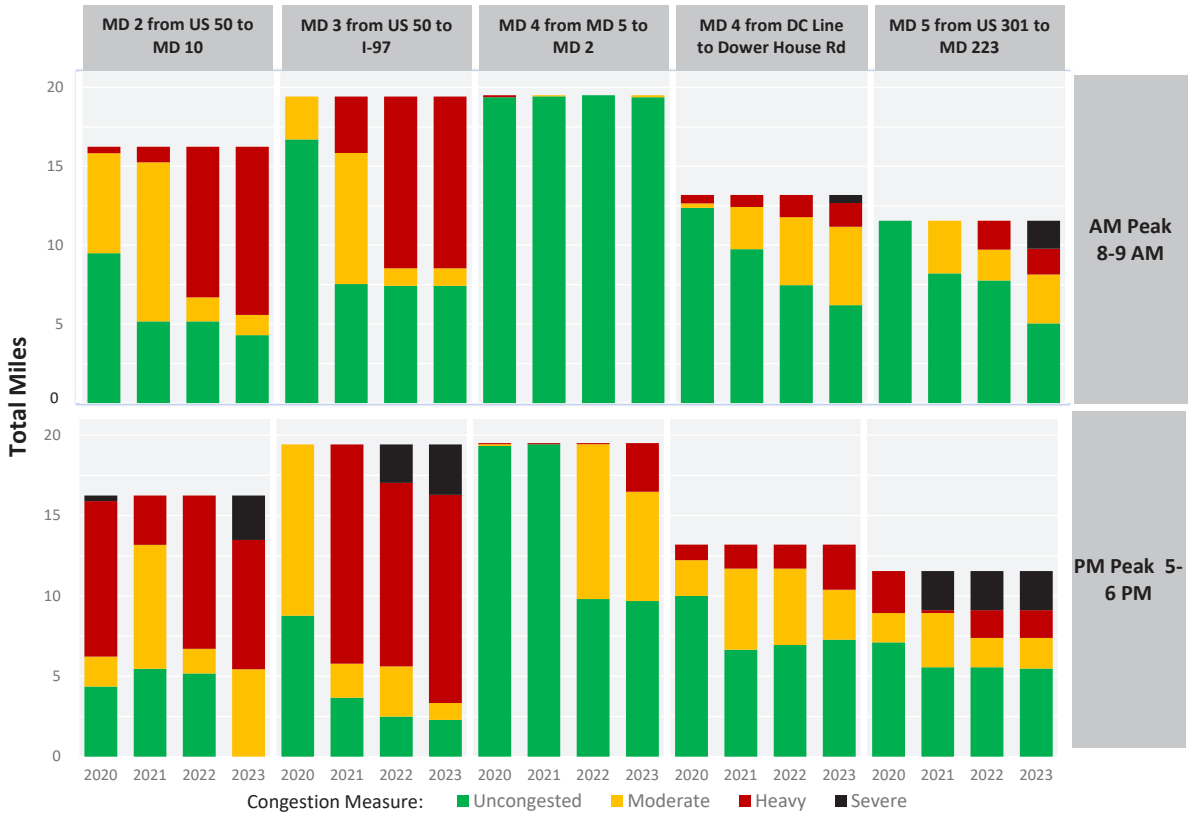
Thirty-five major arterial corridors were identified that experience the most congestion either statewide or in that particular area. These corridors were selected based on observed traffic operations, traffic volumes, regional significance, and data availability to analyze in further detail. The TTI values were used to determine the number of miles that each arterial operated in uncongested, moderate, heavy, and severe congestion. The last four years were used as a comparison for traffic operations. The results showed that in half of the corridors, motorists would experience an increase in congestion. In about 35% of the corridors in the AM peak hour and 20% in the PM peak hour, motorists experienced the same level of congestion; while in the remaining corridors, motorists faced fewer delays. (**Figure 23**). Other changes between 2022 and 2023 for the thirty-five arterial corridors included:

- The most improved corridors included MD 140 from MD 97 to the Baltimore City Line in the AM peak hour and MD 410 from MD 355 to US 29 in the PM peak hour.
- The largest increase in the number of severely congested miles was along MD 2 from US 50 to MD 10 in the PM peak hour with almost three additional miles.
- Both MD 97 from the Washington, DC Line to MD 108 and MD 650 from the Washington, DC Line to US 29 motorists experienced the largest increase in heavy congestion in the AM peak hour by three additional miles.

The overall operation of all freeways/expressways and arterials during the AM and PM peak hours is identified on the Statewide Congestion Maps (**Figures 9-10**). The Maryland Mobility Report Supplement Chapter A provides additional in-depth information about the mobility performance of these corridors including the greatest improvement/ reduction in operational measures over the past year, a detailed analysis of the number of miles operating at each level of congestion, and average daily traffic. Additional information on intersection operations and transit ridership is included in Chapter A.

Figure 23

ARTERIAL CONGESTION SUMMARY



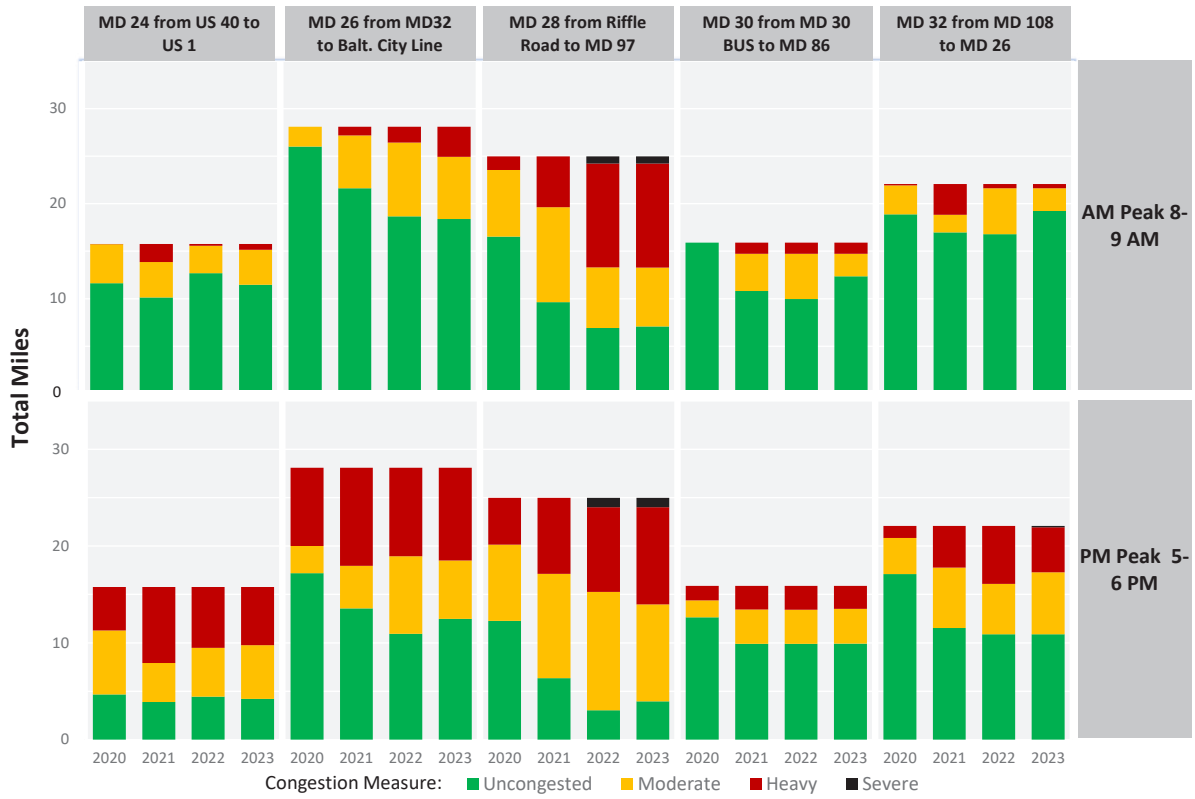
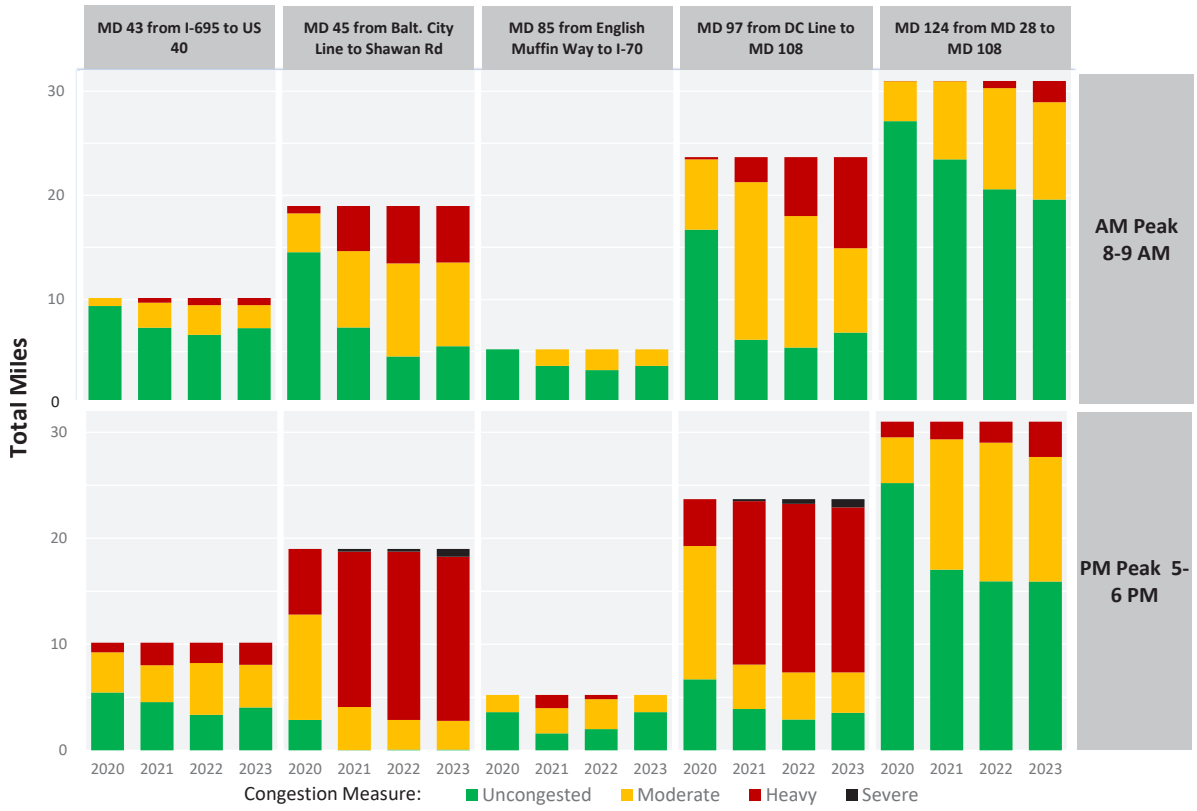


Figure 23 (Continued)

ARTERIAL CONGESTION SUMMARY



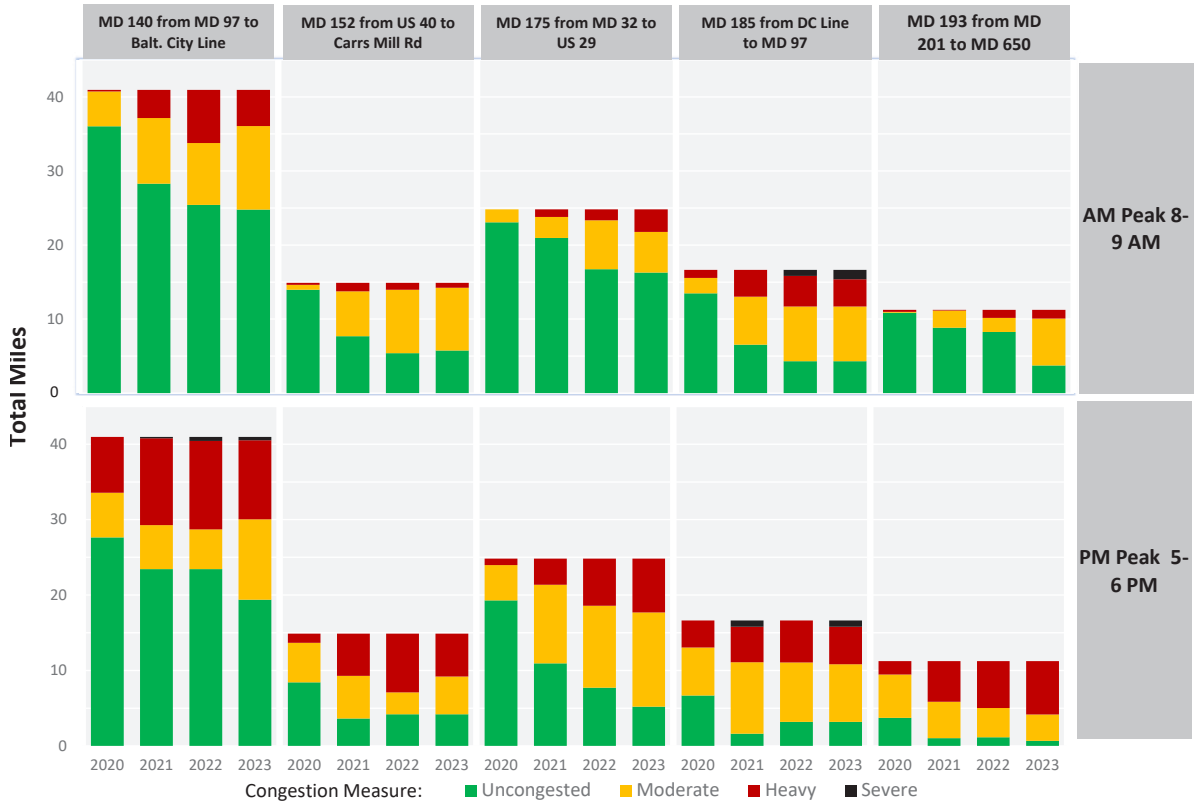
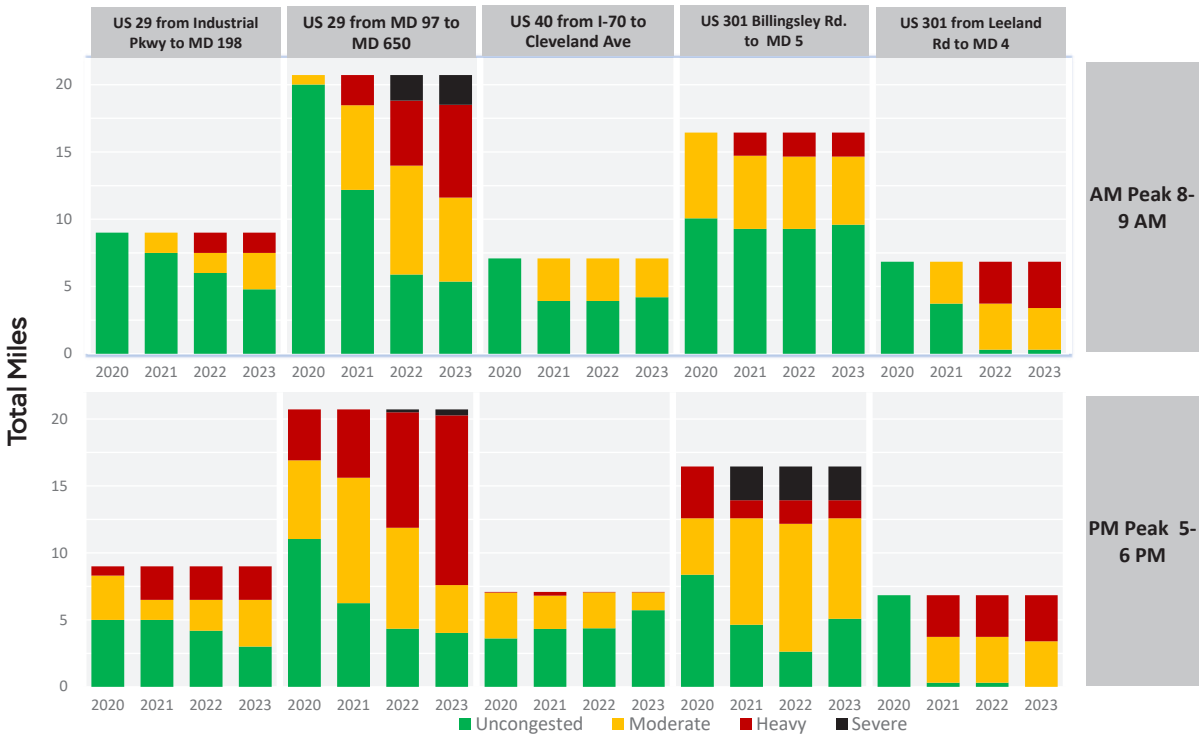


Figure 23 (Continued)

ARTERIAL CONGESTION SUMMARY

Figure 23 (Continued)

ARTERIAL CONGESTION SUMMARY



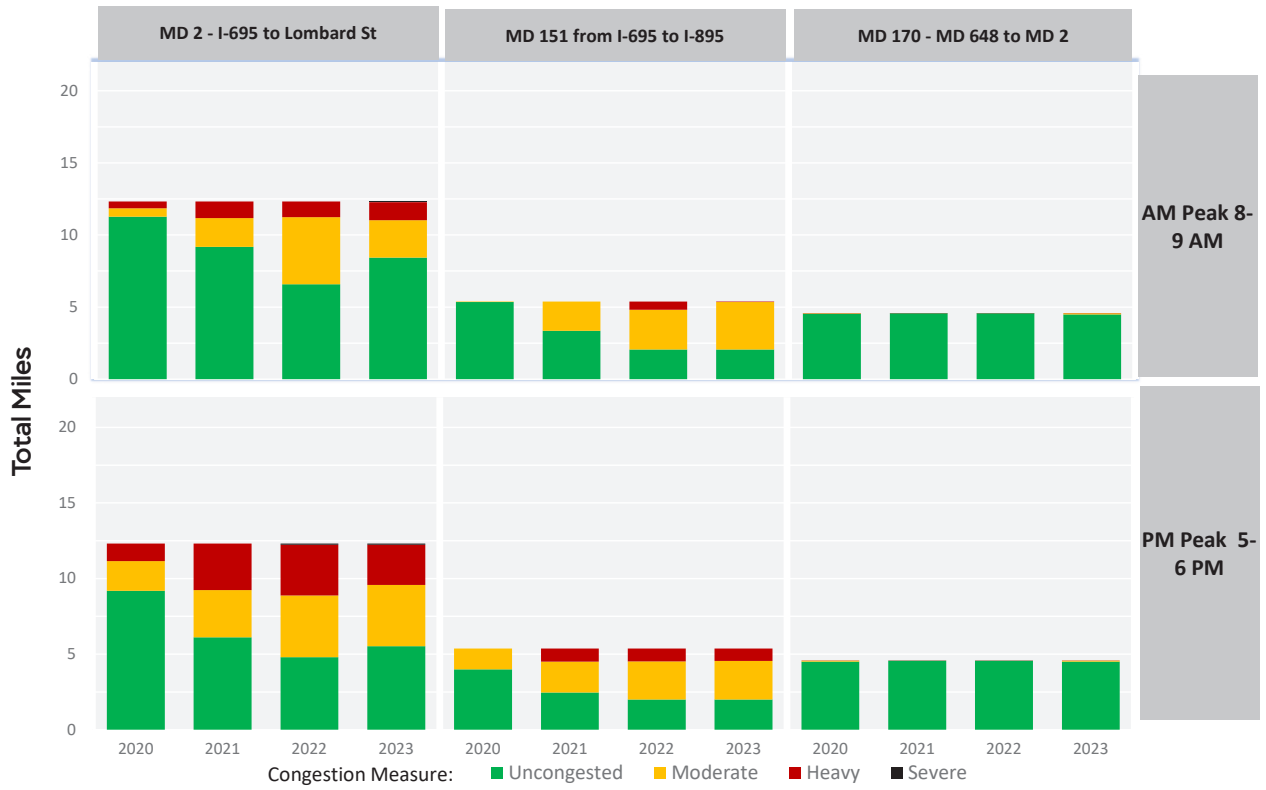
The events of March 2024 has caused I-695 traffic to be rerouted throughout the Baltimore region. This is impacting travel times and causing increased delays for motorists on freeways/ expressways like I-895 and I-95 through the Harbor and Fort McHenry tunnels, MD 295 in Baltimore City, and I-395, along with several arterial roadways. To evaluate the level of increased congestion that is occurring along those roadways, additional arterial corridors were evaluated. This included:

- MD 2 – I-695 to Lombard St
- MD 151 – I-695 to I-895
- MD 170 – MD 648 to MD 2
- MD 295 – I-695 to I-95
- MD 648 – I-695 to MD 295
- US 1 Alt – I-695 to I-95
- US 40 – I-695 (East) to I-695 (West)
- I-395
- Eastern Ave – I-695 to President St
- Shell Rd – I-895 to E Patapsco Ave

While this Maryland Mobility Report does not capture the consequences of the loss of the I-695 connection over the Patapsco River, these corridors were included to be used as a basis for the 2025 report which will identify these impacts. Traffic operations at the various levels of congestion are shown for these corridors (**Figure 24**).

Figure 24

BASE DATA FOR ARTERIAL CORRIDORS IMPACTED BY LOSS OF THE I-695 CONNECTION OVER THE PATAPSCO RIVER



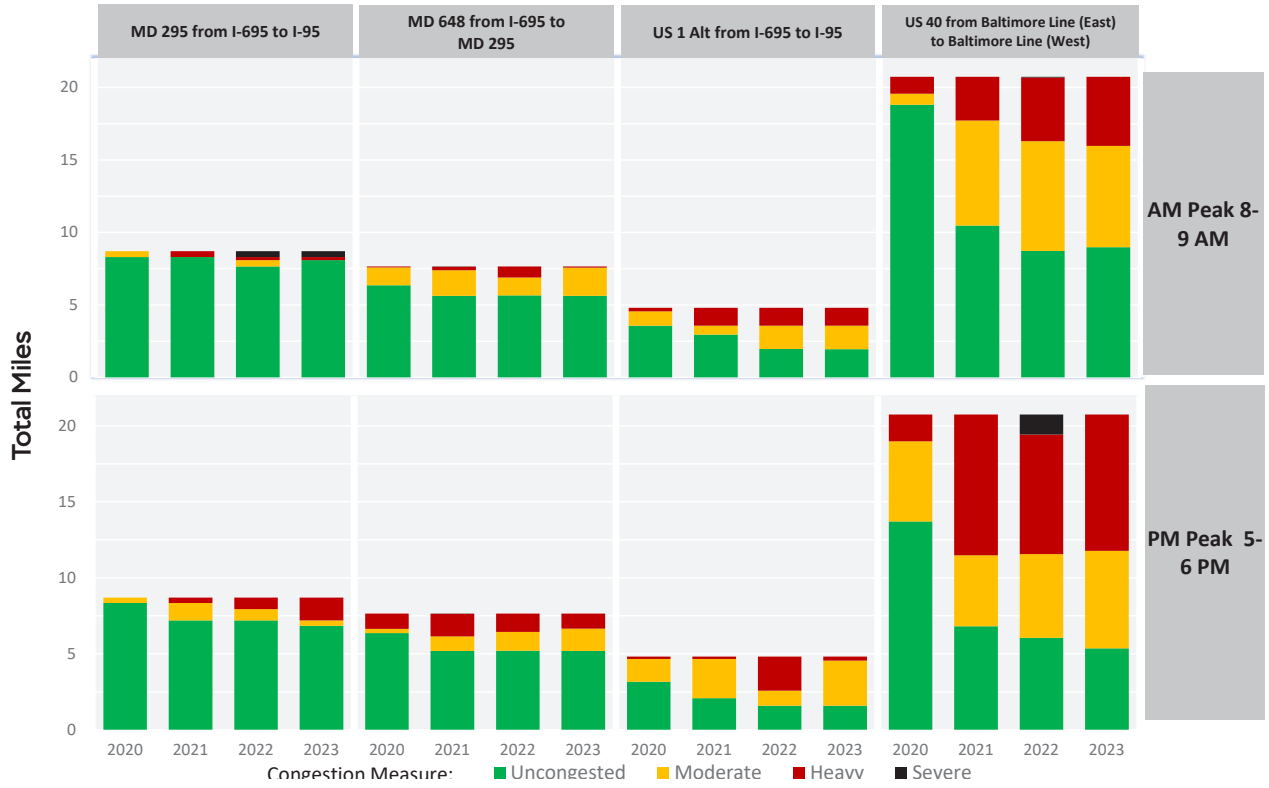
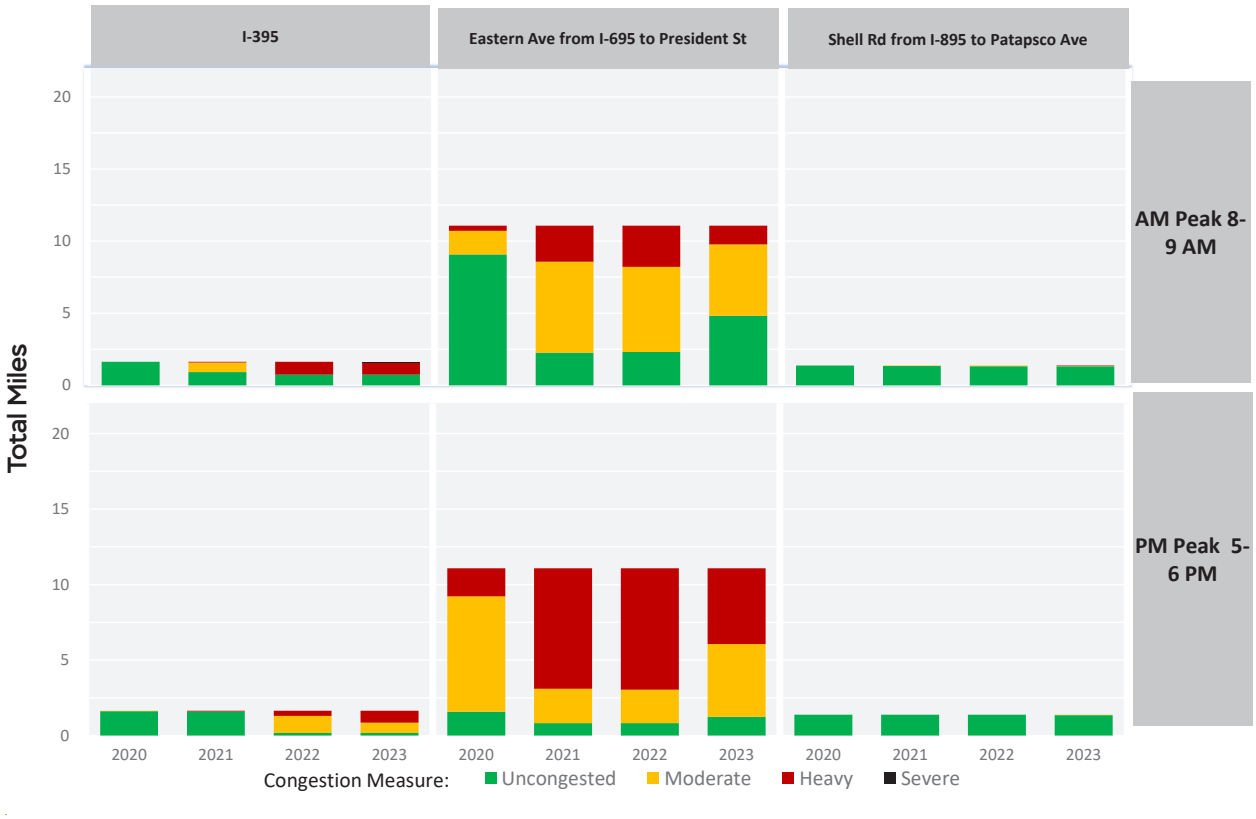


Figure 24 (Continued)



MAJOR PAST PROJECT BENEFITS

Completed major construction projects reduce congestion by providing motorists with less delay and improved operations. These projects include the widening of freeways/expressways and arterial roadways to better meet the demands of the traveling public. The benefits these projects provide are not limited to the immediate time after the construction is complete. Often the context has been that traffic will grow back on these roadways and the widening does not reduce delay. The use of vehicle probe data allows for an evaluation between traffic operations before the projects were constructed with 2023 data to determine the benefits, they provide over a longer time frame. The before and 2023 travel times were compared based on the TTI. These projects provide a travel time savings of up to 40%, and that includes projects that were completed over 10 years ago. (**Table 17**).

Table 17

PAST PROJECT BENEFITS							
ROUTE/PEAK HOUR/DIRECTION	LIMITS	ANALYSIS LENGTH (MILES)	COUNTY	PRECONSTR. YEAR	PRECONSTR. TTI	2023 TTI	% REDUCTION IN DELAY
MD 295/AM/SB	I-695 to W. Nursery Road	1.1	Anne Arundel	2011	1.45	1.06	27%
MD 295/PM/NB	I-195 to W. Nursery Road	1.8	Anne Arundel	2011	1.73	1.12	35%
US 50/PM/EB	MD 450 to MD 2	2.7	Anne Arundel	2017	2.08	1.22	42%
MD 175/AM/NB	Mapes Road to Disney Road	2.7	Anne Arundel	2015	1.28	1.15	10%
MD 175/AM/SB	Mapes Road to Disney Road	2.3	Anne Arundel	2015	1.19	1.17	2%
MD 175/PM/NB	Mapes Road to Disney Road	2.7	Anne Arundel	2015	1.35	1.20	11%
MD 175/PM/SB	Mapes Road to Disney Road	2.3	Anne Arundel	2015	1.49	1.29	13%
I-95/AM/SB	MD 43 to S of I-695	3.7	Baltimore	2011	1.75	1.05	40%
I-95/PM/NB	US 40 to MD 43	6.2	Baltimore	2011	1.32	1.07	19%
I-695/Inner Loop/ PM	I-895 to I-95	1.6	Baltimore	2011	1.32	1.19	9%
I-695/Inner Loop/ PM	MD 41 to MD 147	1.8	Baltimore	2011	1.49	1.40	6%

ROUTE/PEAK HOUR/DIRECTION	LIMITS	LENGTH (MILES)	COUNTY	PRECONSTR. YEAR	PRECONSTR. TTI	2023 TTI	% REDUCTION IN DELAY
I-695/Outer Loop/ AM	US 40 to MD 372	1.7	Baltimore	2013	1.81	1.17	35%
I-695/Outer Loop/ PM	US 40 to MD 372	1.7	Baltimore	2013	1.31	1.09	17%
I-95/AM/SB	I-895 to Fort McHenry Tunnel	4.3	Baltimore City	2017	2.02	1.30	36%
I-95/PM/NB	Fort McHenry Tunnel to I-895	4.1	Baltimore City	2017	1.19	1.02	14%
MD 32/AM/SB	MD 108 to I-70	10.0	Howard	2011	1.37	1.03	25%
MD 32/PM/NB	MD 108 to I-70	10.3	Howard	2011	1.49	1.14	24%
US 29/NB/PM	S of MD 32 to N of Broken Land Parkway	5.2	Howard	2011	1.97	1.51	23%
MD 5/AM/NB	Auth Way to I-95/I-495	2.5	Prince George's	2012	1.25	1.13	9%
MD 5/AM/SB	Auth Way to I-95/I-495	2.3	Prince George's	2012	1.14	1.09	4%
MD 5/PM/NB	Auth Way to I-95/I-495	2.5	Prince George's	2012	1.17	1.11	5%
I-95/AM/SB	S of MD 200 to S of MD 212	1.9	Prince George's	2011	1.73	1.17	33%
MD 404/Sat. Mid-day Summer/EB	Holly Road to US 50	11.3	Queen Anne's, Talbot, Caroline	2014	1.28	1.00	22%

I-270 is one of the most traveled interstates in Maryland operating from I-70 in Frederick City to I-495 in Montgomery County. This corridor has a history of being beset by recurring and non-recurring congestion and delays. To address the more than 200,000 vehicles per day that use this corridor, SHA implemented the I-270 Innovative Congestion Management (ICM) project. This approach included ramp metering and discrete geometric improvements to improve safety and reliability and provide for adaptability to future improvements from MD 80 in Frederick County to I-495.

A comparison was performed between the travel times on I-270 before construction of the ICM project (year 2017) and in 2023 along the corridor (Table 18) using the travel time index. Despite not all signals currently being activated, this comparison showed a travel time savings of up to nine minutes. Additional savings will be available once the full project is completed and activated.

Table 18
I-270 TRAVEL TIME BASED ON TTI

DIRECTION/TIME PERIOD	TRAVEL TIME BEFORE CONSTRUCTION[1] (MINUTES)	TRAVEL TIME AFTER CONSTRUCTION (MINUTES)	CHANGE IN TRAVEL TIME (MINUTES)
Southbound Mainline Lanes/AM Peak Hour	67	62	- 5
Southbound Local Lanes/ AM Peak Hour	20	14	-6
Northbound Mainline Lanes/PM Peak Hour	66	57	-9
Northbound Local Lanes/ PM Peak Hour	29	25	-4

[1] - 2017

I-270 RAMP METERING

INTERSECTIONS

On arterial and collector roadways, the major point of congestion is usually at signalized intersections. These locations require that both the mainline and side street traffic receive a percentage of the green time. This delays motorists from a few seconds to minutes. The longer the delays at these locations, the greater the possibility of crashes. The worst operating intersection locations force motorists to wait for multiple cycles before passing through on the green indication.

Traffic data is collected at selected intersections through cameras. This allows SHA to evaluate traffic operations to identify the level of congestion that is occurring. Intersection operations are graded from the level of service (LOS) 'A' to 'F,' with 'A' being the best and 'F' being the worst **(Table 19)**. For the purpose of this report, an intersection analysis was performed using the critical lane analysis technique. The critical lane analysis technique evaluates the volumes of the highest conflicting movements and the number of lanes.

Table 19

INTERSECTION LEVEL OF SERVICE DEFINITION	
LEVEL OF SERVICE	DESCRIPTION
A	Minimal delays
B	Low level of delay and queuing
C	Delays and queues are constant
D	Moderate delays and queues but motorists clear in one green indication
E	Long queues and delays with some motorists having to wait more than one green indication
F	Most motorists must wait more than one green indication

At LOS F intersections, a more in-depth method to quantify how poorly traffic is operating is used. This is the volume/capacity ratio which represents the critical lane volume, divided by the theoretical capacity of the intersection, which is 1,600.

Traffic count data analysis for intersections with data collected in the past five years showed that 20 locations operated in the AM peak hour or PM peak hour at LOS F **(Tables 20 and 21)**. Four of these locations failed in both the AM and PM peak hours (yellow highlighted locations). Furthermore, MD 202 at Brightseat Road/MD 202E failed on a fall weekend due to a football game at Northwest Stadium. Location maps of these failing intersections are included in the Maryland Mobility Report Supplement.

Table 20

LOS "F" INTERSECTIONS AM PEAK HOUR COUNTED IN THE LAST FIVE YEARS		
INTERSECTION	COUNTY	VOLUME/CAPACITY (SORTED HIGHEST TO LOWEST)
MD 133 at MD 129/Old Court Rd	Baltimore	1.48
MD 4 at MD 337/ Presidential Pkwy	Prince George's	1.37
US 29 at Rivers Edge Rd	Howard	1.22
MD 210 at Livingston Rd/Palmer Rd	Prince George's	1.16
MD 4 at MD 235	St. Mary's	1.16
MD 4 at Dower House Rd	Prince George's	1.15
MD 108 at Old Baltimore Rd	Montgomery	1.04
MD 85 at I-270 SB Ramp 8	Frederick	1.02
MD 124 at Warfield Rd	Montgomery	1.02
MD 355 at MD 911/Wootton Pkwy	Montgomery	1.01

Table 1

LOS "F" INTERSECTIONS PM PEAK HOUR COUNTED IN THE LAST FIVE YEARS		
INTERSECTION	COUNTY	VOLUME/CAPACITY (SORTED HIGHEST TO LOWEST)
MD 133 at MD 129/Old Court Rd	Baltimore	1.63
MD 4 at MD 235	St. Mary's	1.38
US 301 at Cedarville Rd/ McKendree Rd	Prince George's	1.19
MD 4 at FDR Blvd	St. Mary's	1.17
MD 500 at Eastern Ave	Prince George's	1.14
MD 119 at Sam Eig Highway	Montgomery	1.09
MD 4 at MD 337/Presidential Pkwy	Prince George's	1.08
MD 3 (SB) at MD 175	Anne Arundel	1.07
MD 414 at I-95/I-495 SB Ramp 2	Prince George's	1.07
MD 3 (NB) at Riedel Rd	Anne Arundel	1.05
MD 4 at Patuxent Blvd	St Mary's	1.04
MD 85 at I-270 SB Ramp 8	Frederick	1.03
MD 5 at MD 458/Iverson St	Prince George's	1.02
US 301 at Chadds Ford Dr/Timothy Branch Dr	Prince George's	1.01

RELIABILITY **TRENDS**

Motorists recognize when they make a trip the travel time may vary from day to day, and a small variation does not bother the motorist. It is when the travel time fluctuates greatly that a motorist, whether a truck driver or a transit rider, becomes more disturbed. This variability traveling between the same two points demonstrates a level of unreliability of the roadway. Travel time changes due to many factors and motorists adjust their departure times to make sure they make their destination on time. Unreliability is often caused by specific events such as incidents, vehicular breakdowns, crashes, weather, or lane reductions through work zones. Travelers must add a buffer of additional time to ensure they arrive at their destination on time.

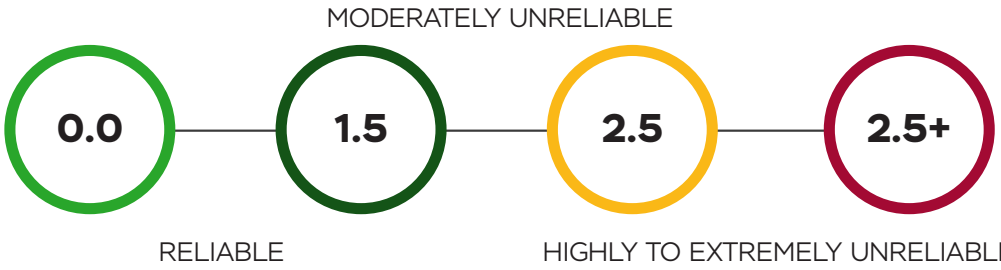
Providing a reliable transportation system by delivering programs and projects benefits all system users. System unreliability results in added costs for all travelers. By SHA improving reliability, this can allow travelers to better plan their trips and daily schedules. The importance of a trip's reliability and the cost associated with it varies by purpose and type to that motorist. For example, to catch a flight, to have a freight delivery occur on time, or just to be able to attend a child's event may have variable cost implications for that person or business. The more consistent that travel times are, the better for all travelers.

Travel time reliability is measured by the Planning Time Index (PTI). The calculation of this metric varies throughout the country. This ranges in value from the 80th to the 95th percentile travel time. SHA uses the 95th percentile travel time for PTI values along a section of roadway, which is generalized as the travel time it would take if an incident or major event occurred. For example, a PTI of 3.0 means that if it takes five minutes to travel on a section of roadway in free-flow conditions, a motorist should allow fifteen minutes to ensure a 95% chance of on-time arrival. The lower the value, the more reliable the trip. Conversely, the higher the PTI value, the longer a trip could take. There are three levels of reliability: reliable, moderately reliable, and highly to extremely unreliable (**Figure 25**).

The weekday AM peak hour (8-9 AM) and the PM peak hour (5-6 PM) are used to develop statewide reliability mapping and identify how roadways are operating during peak congestion days of the year. These are shown as follows:

Figure 25

METRIC: MEASUREMENT OF RELIABILITY (PLANNING TIME INDEX)



- AM peak hour – Figure 26
- PM peak hour – Figure 27

Figure 26 – Maryland Reliability Map: 2023 AM Peak Hour (8-9) AM

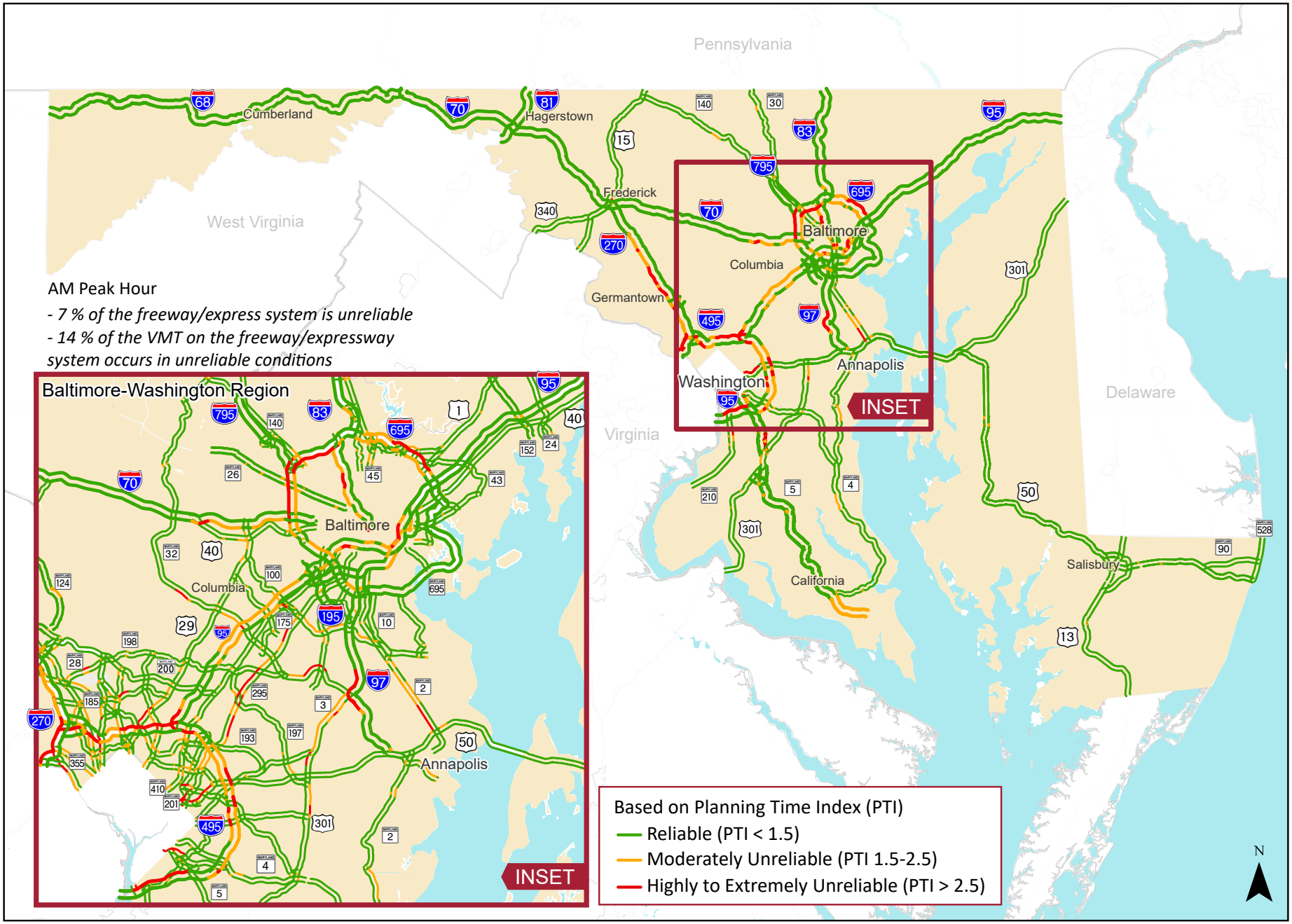
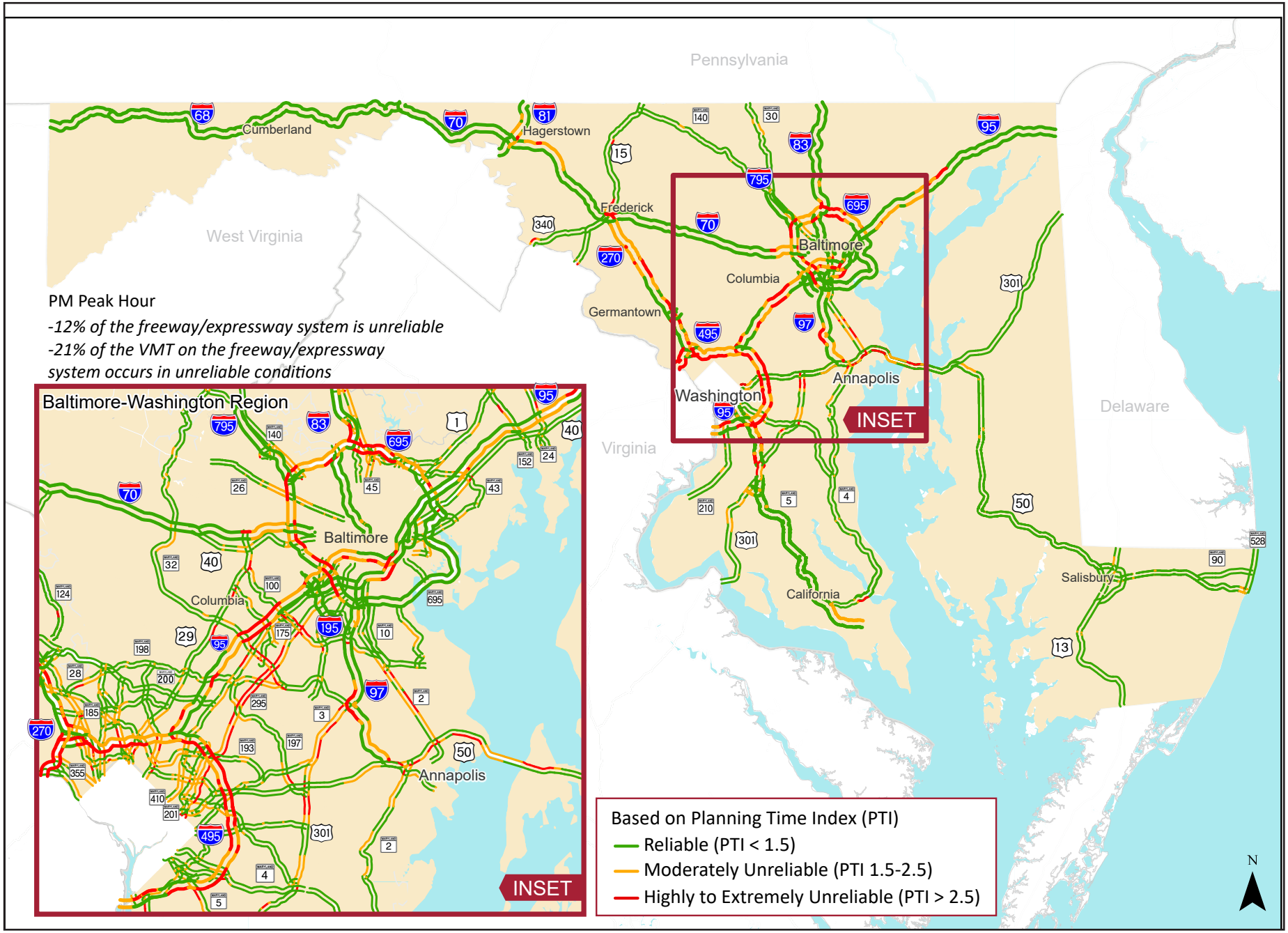


Figure 27 – Maryland Reliability Map: 2023 PM Peak Hour (5-6) PM



RELIABILITY MEASURES ON THE MARYLAND FREEWAY/ EXPRESSWAY SYSTEM

A yearly comparison is performed on Maryland's freeway/expressway system for three measures associated with reliability. These three measures are (1) the number of freeway/expressway miles that are highly to extremely unreliable, (2) the percent of the total freeway/expressway system that is highly to extremely unreliable, and (3) the percent of the peak hour VMT that is impacted by highly to extremely unreliable conditions.

The most unreliable sections of roadway (PTI > 2.5) are termed highly to extremely unreliable conditions. There was an increase in the number of roadway miles and percent of VMT impacted by the worst conditions in the AM and PM peak hours on Maryland's freeway/expressway system from 2022 to 2023 (**Table 22**).

Table 22

STATEWIDE FREEWAY/EXPRESSWAY SYSTEM (1626 MILES) (AVERAGE WEEKDAY AM/PM PEAK HOUR RELIABILITY SUMMARY)								
HEAVY TO EXTREMELY UNRELIABLE CONDITIONS	2021		2022		2023		CHANGE FROM 2022 TO 2023	
	AM	PM	AM	PM	AM	PM	AM	PM
Number of Roadway Miles	40	133	79	161	115	190	+36	+29
Percent of Roadway Miles	3	8	5	10	7	12	+2	+2
Percent of Peak Hour VMT Impacted	5	14	10	17	14	21	+4	+4

Congestion and reliability are normally closely related. Motorists caught in the highest levels of congestion on an average day will most likely see their travel time increase significantly on the extreme days. These roadways also tend also to be the locations that experience the highest levels of unreliability, but there are exceptions. These locations are often influenced by the congestion that is occurring downstream of these sections, or experience issues due to strong peaking characteristics such as motorists traveling to vacation destinations.

An evaluation was performed comparing reliability (PTI) values with congestion (TTI) values for freeways/ expressways. The sections that have the largest difference (PTI value-TTI value) in the AM peak hour are:

- MD 295 Southbound from MD 202 to Washington, DC Line
- I-495 Outer Loop from I-95 to MD 193
- US 50 Westbound from MD 410 to MD 295
- I-695 Outer Loop from MD 140 to MD 26
- I-695 Outer Loop from I-95 to MD 147

The largest difference between the PTI value for reliability and the TTI value for congestion in the PM peak hour on freeways/expressways include:

- US 50/US 301 Eastbound from MD 179 to Oceanic Dr
- I-495 Outer Loop from MD 187 to MD 190
- MD 295 Southbound from MD 175 to MD 32
- US 50/ US 301 Westbound from Castle Marina Rd to MD 8
- I-270 West Spur Southbound from I-270 Split to I-495

1,511 Miles in the AM peak hour and 1,436 miles in the PM peak hour operate with Moderate to Reliable Conditions.

TRUCK DATA AND TRENDS

The need for an efficient supply chain has never been so important in the state and the country. The successful movement of freight and goods is vital to the economy and the welfare of the citizens who more than ever directly receive goods from the manufacturer/warehouse. To ensure an efficient supply chain, there needs to be a well-connected and maintained network of highways, intermodal connections to ports, user-friendly airports, rail terminals, and first/last mile routes accessible to manufacturers and distributors.

Most freight is moved along the roadway system, especially SHA and MDTA roadways. Maryland roadways are used as both an origin/destination for goods throughout the state and for long-distance trucks traveling along the entire eastern seaboard and to and from the interior of the country. This includes significant roadways such as I-95, I-81, I-70, I-68, I-83, US 50, and US 301 which are critical freight corridors supporting national freight flows.

To evaluate truck freight movement, SHA monitors this through various data platforms. This includes identifying the number and locations of trucks that are using each roadway. One of the methods used is through conducting traffic data collection both through permanent count stations and on a three-year cycle to identify the number of trucks that use a particular roadway. Among all the major interstate routes in Maryland, I-95 contains the highest volume of trucks in a particular section (**Table 23 and Figure 28**). Trucks make up over 25% of the total traffic volume along several roadways with at least 1,000 ADT (**Table 24 and Figure 28**).

Table 23

HIGHEST TRUCK VOLUMES (includes all types of trucks)		
RANK	LOCATION	AVERAGE DAILY TRUCK VOLUME[1]
1	I-95 North of I-695	23,500
2	I-81 North of I-70	21,400
3	I-95 South of MD 212	19,800
4	I-95 South of MD 103	19,700
5	I-95 South of Baltimore City Line	19,600

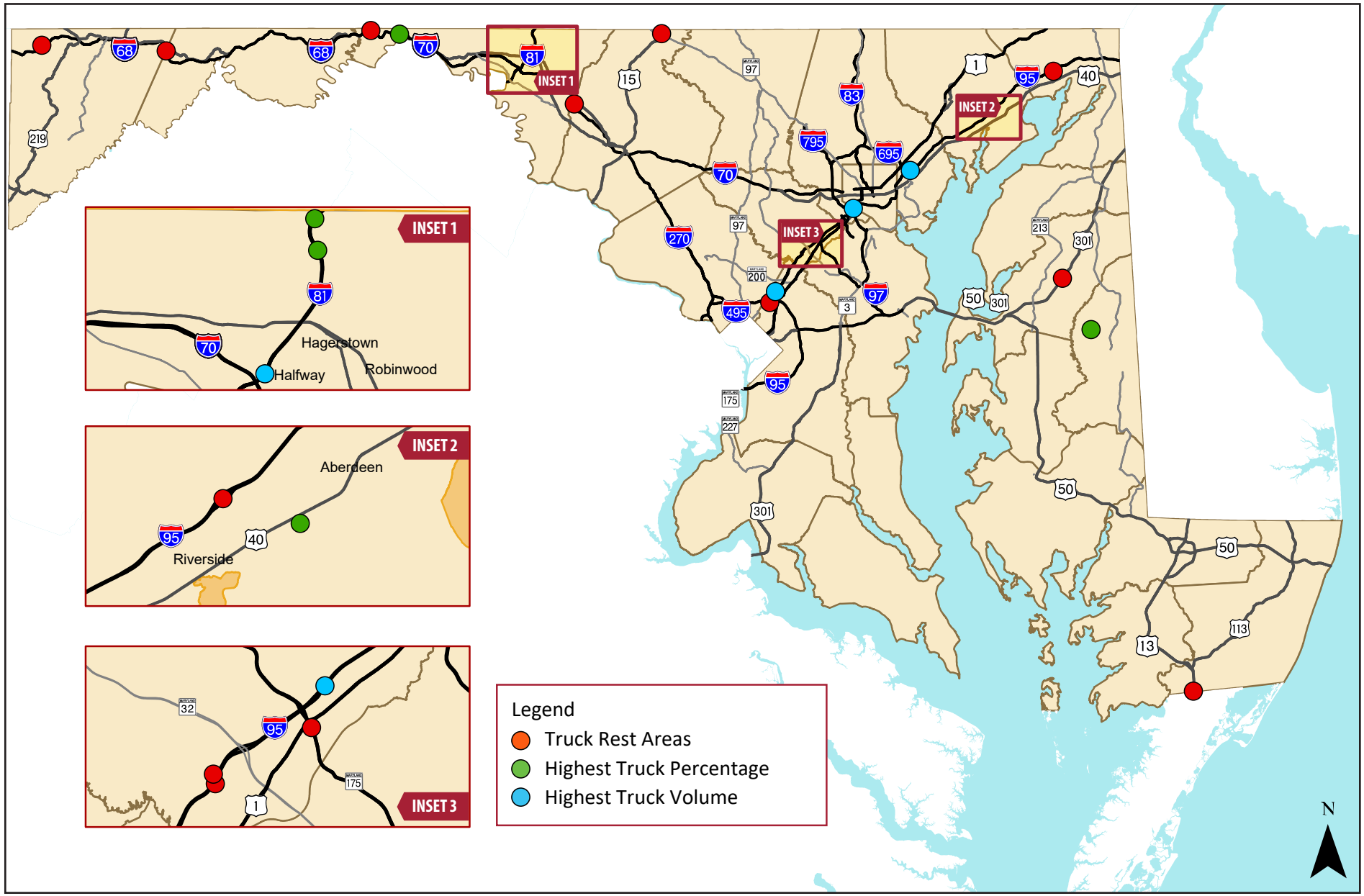
Table 24

HIGHEST TRUCK PERCENTAGE LOCATIONS (includes all types of trucks)		
RANK	LOCATION	TRUCK %
1	I-81 South of Pennsylvania Line	30%
2	MD 159 South of US 40	30%
3	I-81 South of Showalter Rd	29%
4	MD 312 North of MD 480	26%
5	US 522 North of I-70	25%

1 - Includes all types of trucks

Over 10,000 tractor-trailers use I-81 and I-95 daily in certain areas.

Figure 28 – Truck Volumes and Rest Areas



OVERNIGHT TRUCK PARKING

The lack of available truck parking was listed in the top 5 challenges and industry concerns in a recent survey among truck drivers. Even with the economic impacts and supply chain disruptions, the lack of truck parking remains a critical factor for truck drivers who must meet rest requirements to be compliant with federal safety regulations. Areas along the I-95 corridor experience significant parking shortages, especially in major metropolitan areas like the Baltimore-Washington region. To address the lack of truck parking, solutions need to be multi-faceted and require public and private collaborative efforts. Maryland currently has a total of approximately 600 publicly supplied spaces and over 2,300 private parking spaces. The approximately 2,900 parking spaces cannot meet the demand.

Federal surface transportation law prioritizes truck parking, and states are considered important stakeholders and champions in developing solutions. In 2012, the Moving Ahead for Progress in the 21st Century Act (MAP-21) required the U.S. Department of Transportation to study truck parking (Jason's Law[1]) by:

- Surveying states' capabilities to provide adequate truck parking
- Assessing commercial vehicle traffic volumes in each state
- Developing a system of metrics to assess truck parking

The initial Jason's Law[1] report developed by the Federal Highway Administration (FHWA) found that truck parking is a problem every day in every state and at all times of the day, month, and year. This work helped establish the National Coalition for Truck Parking: a group of public and private stakeholders formed to generate truck parking ideas and solutions. It also helped pave the way for the Fixing America's Surface Transportation (FAST) Act in 2015, which included a freight formula fund and made truck parking an eligible use of those funds by state departments of transportation. The 2019 update to Jason's Law revealed that the shortage continues to create challenges within the industry. These issues persist and Maryland experiences various influxes of truck activity resulting in on-going truck parking shortages.

In 2020, MDOT released an annual statewide Truck Parking Study, which found clusters of need throughout the state and low parking availability using a combination of INRIX data and Trucker Path app which is used by truckers for navigation and trip services. The study identified the top locations where clusters of truck parking exceeded capacity. The top five spots were located in areas where truck parking existed, but not enough spaces were available (**Table 25 and Figure 28**).

Table 25

HIGH DEMAND TRUCK PARKING LOCATIONS		
RANK	LOCATION	COUNTY
1	I-95 Welcome Center	Howard
2	I-70 South Mountain Welcome Center	Frederick
3	I-95/I-495 Weigh Station	Prince George's
4	US 1/MD 175	Howard
5	I-95 Maryland House Travel Plaza	Harford

[1] – *Jason's Law was established to provide a national priority to the shortage of long-term parking for commercial motor vehicles.*

With the increase in e-commerce, the need for truck parking spaces was emphasized as more commercial vehicles were observed parking along shoulders on the local and state roadway networks. Efforts to identify feasible short-term parking relief at select park and ride lots within the Baltimore region are underway. A Statewide Truck Parking Survey will be conducted in 2024/2025 to capture the most recent truck parking trends considering recent events.

Coordination with local jurisdictions and other efforts are underway to address truck parking shortages. The first method is using data in smarter ways to develop performance visualization information that illustrates the problem and helps engage stakeholders to develop solutions. SHA continues to use the information to monitor parking needs to identify capacity and operational strategies. This includes advancing capacity at select locations throughout the state and evaluating existing SHA properties that could support truck parking opportunities. In addition, coordination is taking place with other MDOT agencies, local governments, and the private sector on parking opportunities. Finally, SHA is investing in a shared freight data platform and truck information systems that can assist with disseminating truck parking availability information.

The strategy to address truck parking efforts is based on obtaining the data and making it easily accessible to the public to help them make informed decisions. SHA has developed the Truck Parking Tool, a first-of-its-kind resource that is a platform that identifies the demand and supply of parking in Maryland. This provides a view of parking demand statewide by showing parking based on INRIX Trips data by duration throughout the state, as well as the capacity (supply) at state-owned lots. On state-owned lots, the tool shows a capacity ratio and a ratio of trucks having to park on ramps and shoulders, which usually is an indication the lot is full. This information helps to understand the time of day, week, and year when capacity constraints exist and provides context for identifying solutions. SHA is working to establish, pilot, and implement a freight traveler and truck parking information system. This will alert and direct drivers to available parking and distribute existing available data to the freight community. The use of the Truck Parking Tool is demonstrated for the highly traveled I-70/I-81 corridors (**Figure 29**).

Figure 29

TRUCK PARKING VISUALIZATION TOOL - WASHINGTON COUNTY

WORST CONGESTION BOTTLENECKS

Truck drivers prefer to limit the amount of time they drive in the peak periods but often still face congestion due to non-recurring events or needing to get to a destination in time for delivery near the most highly traveled time. Most of this congestion occurs along the freeway/expressway and the arterial system. Identifying the highest congestion locations allows for various programs and projects to be developed in coordination with federal funding to address these mobility issues. SHA is identifying these locations through the MRPT. This identifies the top bottlenecks based on delay per mile, weighed by truck volume, and normalized by roadway length (in miles). The MRPT tool uses INRIX data conflated to Maryland's Highway Performance Monitoring System (HPMS) GIS for performance analytics.

The top five freight congestion locations include:

- I-495 Inner Loop at I-270 Spur
- I-95 SB at MD 24
- I-270 SB at MD 109
- I-270 NB at MD 109
- US 50/US 301 EB at Bay Bridge

MARYLAND FREIGHT CONGESTION COSTS

Congestion can impact truck drivers' arrival at their destinations. This is notably important when drivers are picking up or delivering goods to their endpoint such as a warehouse. They may miss their pick-up time and be forced to wait an additional day. Freight operators experience congestion costs at a higher level than other motorists. This includes truck driver delays, truck cargo delays, and additional fuel costs. These costs are calculated at the roadway segment level and account for the price of diesel fuel, value of commercial vehicle time, and delay experienced between congested and uncongested conditions for all Maryland interstates, other freeways/expressways, and arterial roadways. The MRPT was used to determine the cost experienced by truckers moving goods in 2023. The cost experienced by freight operations increased by approximately 8% over 2022 (**Table 26 and Figure 30**).

Table 26

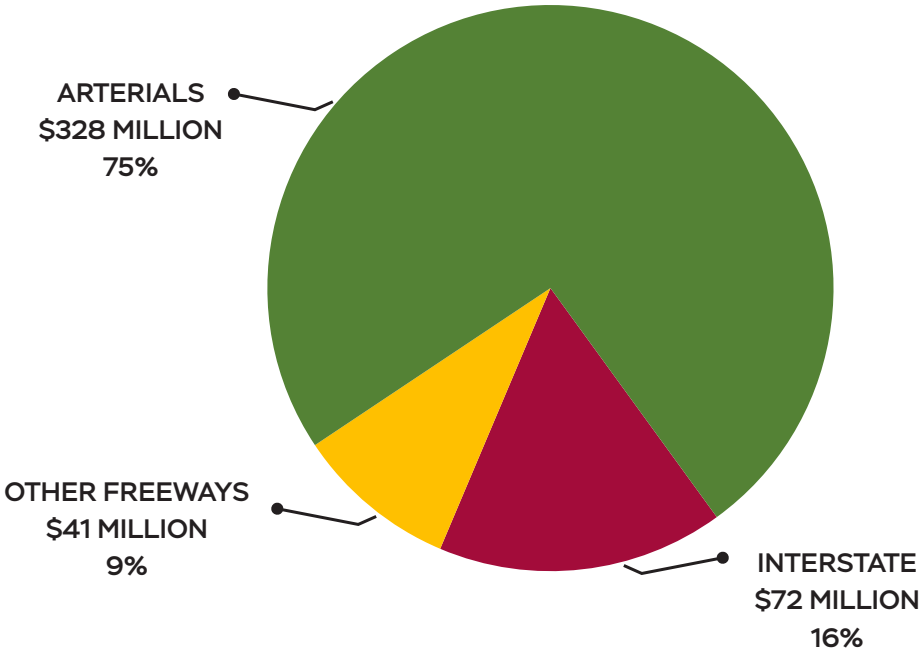
2023 FREIGHT CONGESTION STATEWIDE ($ MILLIONS)[1]				
FACILITY TYPE	2021	2022	2023	CHANGE FROM 2022 TO 2023
Interstate	$43	$56	$72	+16
Other Freeways/ Expressways	$29	$34	$41	+7
Arterials	$278	$320	$328	+8
TOTAL	$350	$410	$441	+31

1 - Revised methodology based on the Maryland Reporting Performance Tool

Congestion costs climbed to over $440 million for truck operations along roadways in Maryland.

Figure 30

2023 FREIGHT CONGESTION COST ON MARYLAND'S SYSTEM



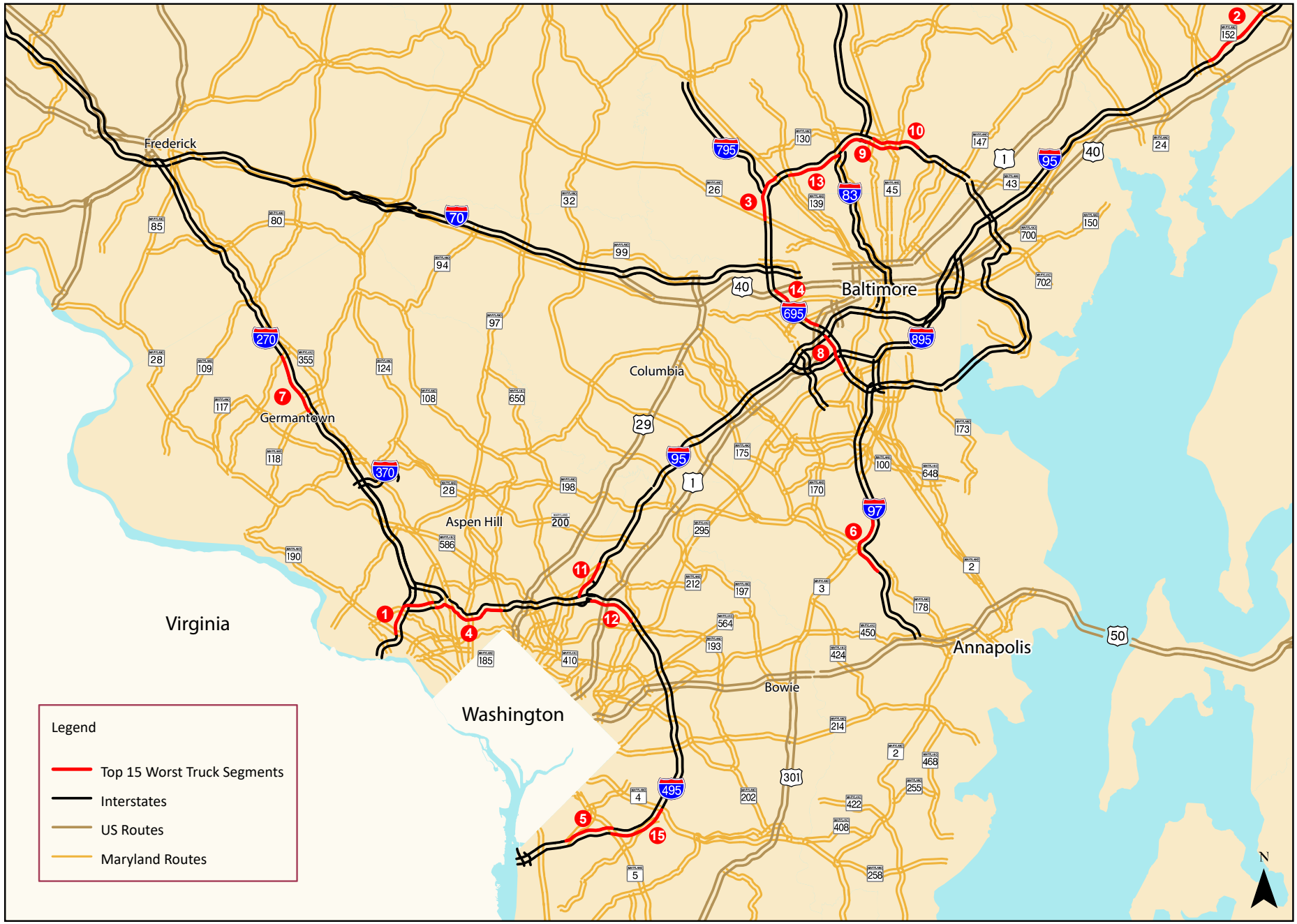
TRUCK TRAVEL TIME RELIABILITY INDEX

The movement of goods is critical to businesses and citizens. When freight operations are slowed by congestion this has an impact on several aspects such as supplies not arriving on time, spoilage of goods, or additional costs companies must endure due to longer delivery times. To monitor this, the Federal Highway Administration (FHWA) requires that a freight performance metric be used to evaluate truck operations. The Truck Travel Time Reliability (TTTR) Index represents the 95th percentile travel time divided by the 50th percentile travel time for each segment. The TTTR is calculated for five time periods—the maximum value determines the final system performance. The five time periods are the AM peak period, midday peak period, PM peak period, overnight, and weekends. Each TTTR value is combined in three-to-eight-mile segments or complete sections of freeways to develop the limits of the most unreliable corridors for trucks on freeways/expressways (**Table 27 and Figure 31**). The higher the TTTR value, the worse the operations are in that segment.

Table 27

2023 TOP 15 WORST CORRIDORS FOR FREEWAY/EXPRESSWAY TRUCK TRAVEL					
RANK	ROUTE/DIRECTION	LIMITS	COUNTY	MILEAGE	TTTR MAX VALUE
1	I-495 Outer Loop	MD 187 to MD 190	Montgomery	3.2	5.3
2	I-95 Southbound	MD 22 to MD 543	Harford	4.1	3.9
3	I-695 Outer Loop	MD 140 to MD 26	Baltimore	3.2	3.9
4	I-495 Inner Loop	MD 187 to MD 97	Montgomery	4.9	3.8
5	I-95/I-495 Inner Loop	MD 5 to MD 414	Prince George's	3.4	3.7
6	I-97 Southbound	Benfield Blvd to MD 178 Southbound Ramp	Anne Arundel	3.4	3.6
7	I-270 Southbound	MD 121 to MD 118	Montgomery	3.5	3.4
8	I-695 Outer Loop	US 1 to MD 295	Baltimore	3.3	3.2
9	I-695 Inner Loop	MD 25/I-83 (Jones Falls Expressway) to MD 146	Baltimore	3.3	3.2
10	I-695 Outer Loop	Providence Rd to MD 139	Baltimore	3.1	3.2
11	I-95 Southbound	MD 212 to I-495	Prince George's	3.4	3.1
12	I-95/I-495 Inner Loop	I-95 to MD 201	Prince George's	3.2	3.0
13	I-695 Inner Loop	MD 129 to I-83 Southbound Ramp (Jones Falls Expressway)	Baltimore	3.6	2.9
14	I-695 Inner Loop	US 1 to US 40 (SW)	Baltimore	3.4	2.9
15	I-95/I-495 Outer Loop	MD 5 to MD 4	Prince George's	4.3	2.8

Figure 31 – Maryland's Worst Corridors for Truck Travel: 2023



SHA MOBILITY PROJECTS

MD 108 AT CENTENNIAL LANE/BEAVERBROOK ROAD

CAPITAL PROJECTS

MDOT publishes the Consolidated Transportation Program (CTP) annually to identify various projects to improve the transportation network. Through working with the counties and based on funding, MDOT identifies projects using a performance-based approach to planning, designing, and constructing. These projects assist in relieving congestion and improving safety. There are numerous solutions to address roadway issues that lead to congestion. These solutions include transportation management and operations (TSMO), adaptive signals, and capital projects to improve roadways.

Capital projects are one of SHA's most recognizable and effective ways to address congestion and reliability issues. Project types range from capacity improvements such as constructing interchanges, providing turn lanes at intersections, and implementing roundabouts. They also can include enhancing pedestrian and bicycle networks such as adding sidewalks and bike lanes.

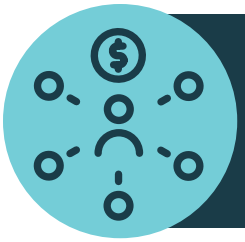
In 2023, SHA completed seven capital projects to relieve congestion, improve safety, and enhance multi-modal traffic operations. These capital projects provided a substantial benefit to Marylanders. SHA evaluated each capital project, and the benefits are summarized below **(Table 26)**.

Table 26

2023 CAPITAL IMPROVEMENT PROJECTS OPENING YEAR BENEFITS[1]

COUNTY	ROUTE	LIMITS	CONGESTION & FUEL SAVINGS	SAFETY SAVINGS	ANNUAL COST SAVINGS
			$ (Thousands)		
Baltimore	MD 43	Honeygo Blvd	$113	$624	$737
Baltimore	US 1	Clarke Blvd	$103	$1,360	$1,606
Calvert	MD 4	W Harmony Rd	$102	$100	$202
Carroll	MD 140	Mayberry Rd	$19	$143	$162
Frederick	US 15	Willow Rd to Monocacy Blvd	$52	$5	$57
Howard	MD 108	Centennial Lane	$62	$199	$261
St Mary's	MD 5	Abell St/Moakley St	$88	$578	$666
Total			**$681**	**$3,008**	**$3,689**

1 - For more details, see Mobility Report Supplement.



Capital Improvement projects provided approximately $3.7 billion in annual user cost savings during the opening year, which equates to more than $50 million per project, on average.

PEDESTRIAN PROJECTS

Walking provides health and environmental benefits by improving cardiovascular health and reducing auto trips. However, pedestrians are some of the most vulnerable transportation system users. Providing a network of sidewalks and trails is very important to improve pedestrian safety and promote walking. SHA often constructs various improvements as part of a dedicated pedestrian project or as a comprehensive roadway improvement project.

SHA funds and constructs various facilities to improve pedestrian safety and mobility. These improvements include upgrading sidewalks in poor condition, filling in sidewalk gaps, adding off-road trails, implementing signals (countdown, pedestrian hybrid beacon), enhancing crosswalks, reducing automobile turning radiuses to lower speeds, relocating bus stops, and upgrading ADA-compliant facilities such as ramps and audible pedestrian signals. These vulnerable users accounted for over 150 fatalities in 2023, approximately a 20% increase from 2022. To improve safety, Maryland constructed new sidewalks in 11 counties in 2023 **(Table 27)**. The Maryland Mobility Report Supplement depicts the location of the new sidewalks.

Table 27

2023 NEW SIDEWALK LOCATIONS		
COUNTY	ROUTE	LIMITS
Anne Arundel	MD 2	Georgia Ave to J.B.A. Chevrolet/Kia
Anne Arundel	MD 2	at MD 270
Anne Arundel	MD 2	at The Sheridan at Severna Park
Anne Arundel	MD 3 Spur	at Holston Rd
Anne Arundel	MD 3	10th Ave to 6th Ave
Anne Arundel	MD 270	at MD 3
Anne Arundel	MD 450	Waveland Farms Ln to Brices Ln
Anne Arundel	Old Mill Bottom Rd	at The Element at Mill Creek
Anne Arundel	Sandy Farm Rd	at Erin Michele Pkwy
Baltimore	MD 26	The Greens at Liberty Rd to Deer Park Rd
Baltimore	MD 150	at Tidewater Ln
Baltimore	MD 151	at Wharf Rd Ramps
Baltimore	Ingleside Ave	at I-695
Baltimore	Wharf Rd	at Warehouse Rd
Carroll	MD 140	at N Center St
Carroll	MD 140	at Englar Rd
Charles	US 301	Hawthorne Rd to Oriole Ln
Frederick	MD 85	at I-270

Frederick	MD 85	at Westview Promenade
Frederick	MD 140	at Rutter's
Frederick	MD 355	at Greenridge Dr
Frederick	MD 478	at Milton E. Frech Jr. Operations Center
Harford	MD 22	John Carroll High School to Lee Way
Harford	US 1	at Pine Rd
Howard	MD 216	S. Maple Lawn Dr to Old Columbia Rd
Howard	US 1	Assateague Dr to Cedar Ave
Howard	US 1	Guilford Ave to Ridgelys Run Rd
Montgomery	MD 115	at Emory Ln
Montgomery	MD 119	Muddy Branch Rd to Decoverly Dr
Montgomery	MD 182	at Greenery Ln
Montgomery	Carroll Ave	Merrimac Dr to MD 193
Prince George's	US 1	Howard Ave to Ryder Truck Sales
Prince George's	Livingston Rd	Carey Branch Dr to Murray Hill Rd
Prince George's	Powder Mill Rd	Ash Rd to US 1
St Mary's	MD 5	Abell St/Moakley St to Clarks Rest Rd
St Mary's	MD 5	at Hayden Ln
St Mary's	MD 5	Point Lookout Park Office to Lake Conoy
St Mary's	MD 5	Trinity Church Rd to St. Mary's College North Field Trail
St Mary's	MD 235	at Wildewood Blvd/Oak Crest Dr
Worcester	MD 346	Barrett Rd to I.G. Burton Chevrolet
Worcester	MD 589	at Atlantic General Pediatrics

SHA constructed over seven miles of new sidewalks and reconstructed more than five miles of sidewalks. Almost 72% of existing sidewalks along Maryland Routes are ADA-compliant.

BICYCLE PROJECTS

Bicyclists range from daily commuters who use on-street networks to recreational riders such as families who enjoy off-road trails. Providing adequate infrastructure for both types of bicyclists means fewer vehicles on the road, which, in turn, improves air quality and provides transportation equity and health benefits for the citizens of Maryland by encouraging an active lifestyle. One of the many methods SHA uses to expand bicycle access is providing facilities as part of roadway projects and through separately funded initiatives.

Funding for these projects comes from various sources, from money set aside for bicycle facilities to financing for resurfacing, maintenance, safety, and capacity improvement projects.

DID YOU KNOW?

The MDOT follows a complete street policy to support these initiatives. The policy strives to improve bicycle safety and accessibility.

The projects include upgrades to bicycle facilities such as shared bike lanes, on-street bike lanes, signing, pavement markings, and accommodation improvements at intersections. Standalone bicycle facilities (such as separated bike paths) are also part of the bicycle projects. The table includes a sample of some bicycle facility upgrades and the types of improvements **(Table 28)**.

Table 28

2023 SELECTED BIKE FACILITY UPGRADE LOCATIONS			
COUNTY	ROUTE	LIMITS	IMPROVEMENT
Baltimore	MD 147	Joppa Rd	Remarked to provide shoulders and added “Share the Road” signs
Baltimore	US 40	Gunpowder Falls and Little Gunpowder Falls Bridges	Ten-foot shoulders
Carroll	MD 140	Mayberry Rd	Shoulders for continuous bicycle use
Howard	US 1	Guilford Road	Shared-use path along southbound US 1 for 1,100 ft
Prince George’s	MD 212A	Pine Street to US 1	New bike lanes
Prince George’s	US 1	Charles Armentrout Dr to Farragut St	Shared-use path and bicycle signal
Prince George’s	MD 500	Queen’s Chapel Rd to MD 208	Bicycle-compatible lanes and shoulders
St Mary’s	MD 5	Abell Street and Moakley Street	Bicycle-compatible shoulders in each direction

There was an 85-mile increase in directional miles for marked bicycle facilities in 2023.

FREIGHT PROJECTS

Freight projects must consider the mobility needs of truckers while also providing safe interaction with other facility users, including motorists, bicyclists, and pedestrians. There are two classifications of freight projects. The first category addresses roadway projects that enhance overall mobility and provide improvements for freight operators. The second category, systematic efficiency, encompasses projects directly associated with improving trucking operations.

The SHA Motor Carrier Division (MCD) coordinates activities to keep freight moving and truckers traveling safely. This group is responsible for several ongoing freight projects. The "Maryland One Permit System" allows the state to process applications more effectively for overweight/over-dimensional cargo. The system provides automatic issuance of applications for loads meeting pre-determined thresholds whose routes pass analysis. The system performs data analysis on various parameters, including route, dimensions, weight, and starting and ending points, to show multiple patterns in cargo movement in and through Maryland.

MCD emphasizes ensuring that the automated hauling permit system distributes permits. This system now auto-issues approximately 90% of all permits for loads up to 200,000 lbs., 14 feet wide, 14.6 feet high, and 120 feet long if the route analysis passes. Of these requests, the system issues 97% of all permits within two hours or less and 99% within two days or less. Megaload permits (up to 1,000,000 lbs.) require coordination between multiple agencies and take longer to process.

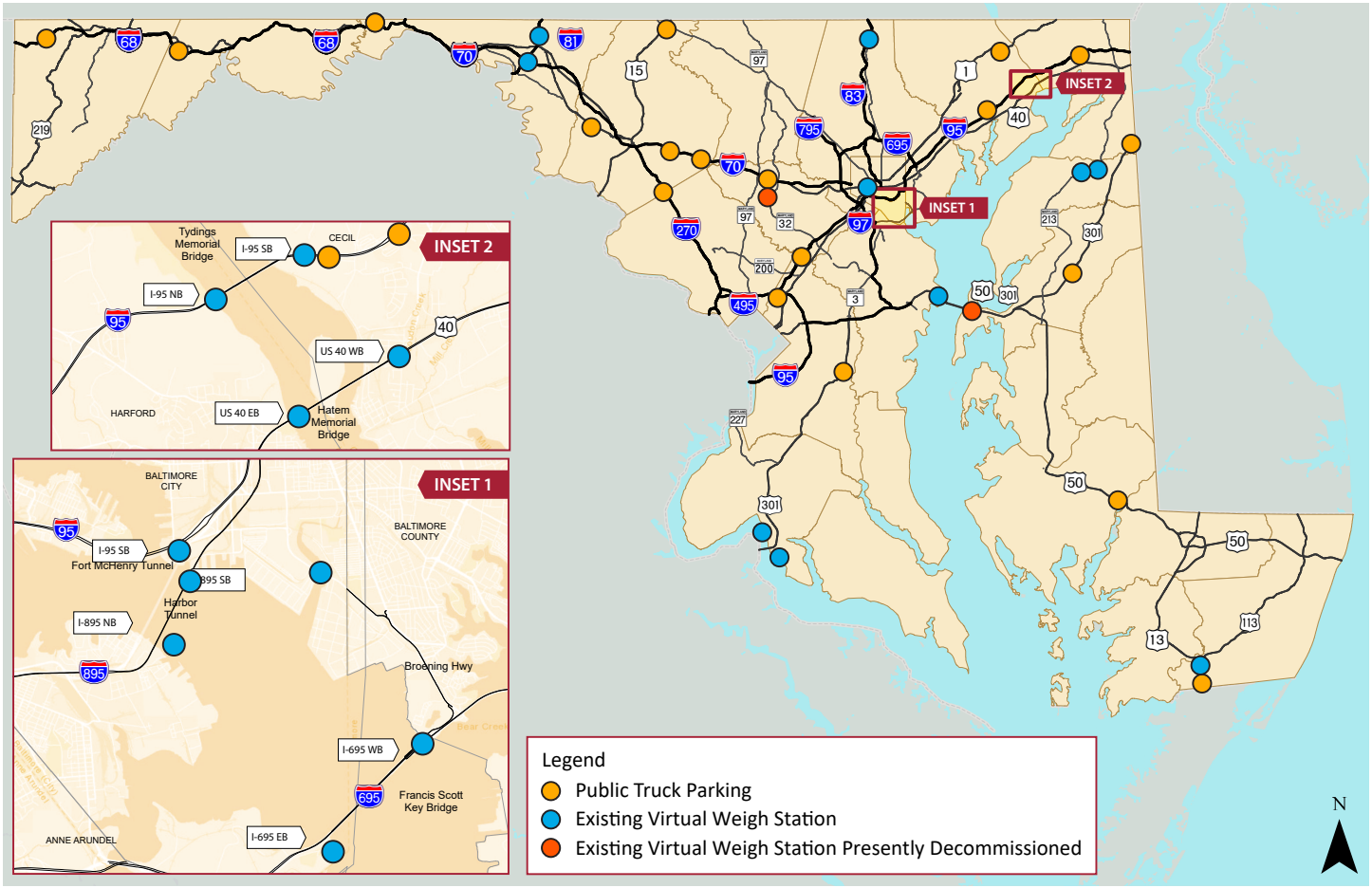
Presently, the SHA Motor Carrier Division is working on several enhancements including:

- County Roads - Adding County Road bridge data and restrictions and automating the process of county approvals.
- Drivewyze - Messaging will be added through Drivewyze app to allow truck drivers to bypass weigh stations if they are in compliance with safety regulations.
- Enhanced Driving Directions - Enhanced driving directions such as turn-by-turn directions and in-line bridge restrictions. An app that will provide speaking directions is being tested.
- Escort Queue - Providing transparency across agencies regarding escorting of oversize/overweight trucks.
- Permit Harmonization - Completed harmonizing permit labels and locating updated data.
- Port Night Order Queue - Enhances customer experience when scheduling access to the Port of Baltimore at night. Customers are currently required to call within a limited window. This queue will be available 24-7, and when testing is complete, Port personnel will ultimately access approval electronically.
- QR Code Enhancement - Allows permittee to activate permits before travel, enabling MCD to track time of day and day of week travels of oversized and overweight loads.
- Route Authorization - Adding as a requirement to blanket permits to enhance the ability to capture freight numerical data for actual trucks traveling on roads versus general statewide information, which is in testing.
- Work Zone Data - Incorporating work zone information into Maryland One.

In addition to enforcement, a series of virtual weigh stations (VWS) have been established along major trucking routes in Maryland to ensure that commercial vehicle operators adhere to regulations. These VWS use a system of sensors and cameras to record commercial motor vehicles traveling at highway speed. The VWS can record speed, height, weight, and every axle without requiring a vehicle to stop. This system improves mobility and limits damage to roads and bridges by eliminating overweight trucks on the road. There are currently 20 active VWS sites. Two new sites became operational in 2023 at the US 301 Thomas "Mac" Middleton Bridge. The state decommissioned the MD 32 site in Howard County and the US 50 westbound site at the Bay Bridge **(Figure 34).**

One significant advancement that Maryland has been at the forefront of is related to high-speed enforcement of trucking. Maryland is the first state nationwide to be International Organization of Legal Metrology (OIML) F5 certified to use this technology. The state accomplishes this enforcement using KiDigital traffic weigh-in-motion (WIM) and tire anomaly sensors. In addition, an evaluation is underway to construct the first high-speed direct enforcement VWS site along I-83 near Middletown Road with USDOT using license plate recognition technology. This endeavor will involve creating a new class of WIM standard (WIM Class E) and will be the basis for the test site on I-83.

Figure 34
PUBLIC TRUCK PARKING AND VIRTUAL WEIGH STATION LOCATIONS



Truck drivers must observe regulations on the number of hours they drive and the length of time they must rest. These regulations are challenging to manage in urban areas with limited truck parking like Baltimore and Washington, D.C.. Safety is another concern for truck drivers and other network users. Truck parking at rest areas and welcome centers provide safe, off-road locations **(Figure 34)** to reduce potential crashes between moving vehicles and parked trucks. Trucks parked along shoulders or entrance/exit ramps create a safety hazard for other drivers. Unfortunately, identifying locations for new or expanded truck parking can be difficult. Truck drivers prefer to stop near their destination, often near populated urban areas. These locations have limited right-of-way, environmental constraints, and public sensitivity to many trucks parking near residential areas, making expanding or constructing new locations problematic.

SHA is addressing truck parking through two methods. One method is expanding existing facilities. Expansion is not limited to state-owned locations. It also includes working with local governments and private entities throughout the state to find ways to increase truck parking. The other method is improving driver information to notify truckers of the location of available spaces. SHA's Truck Parking Visualization Tool can provide information to the driver. This tool includes state-owned lots, the capacity of each lot, a capacity ratio, and the ratio of trucks parking on shoulders, indicating the lot is full. SHA is working to establish, pilot, and implement a freight traveler and truck parking information system to alert drivers to available parking and push existing data to the freight community.

OVERNIGHT TRUCK PARKING EXPANSION

I-70 South Mountain Welcome Center Frederick County – 25 added spaces under design

I-70 WELCOME CENTER

RAILROAD GRADE CROSSING PROJECTS

There are many locations in Maryland where trains and motorists interact. Trains take a long time to come to a complete stop. Therefore, SHA must provide motorists with warnings at these locations. Each year, SHA includes safety improvements for locations with at-grade railroad crossings to eliminate hazards or improve traffic control devices. These improvements include installing new flashing light signals (with or without gates), updating the components at existing active warning devices, and improving crossing surfaces. SHA completed two projects in 2023, and several others are progressing into design. The projects completed to improve at-grade crossings include:

- Cash Valley Road – Allegany County
- Devilbiss Bridge Road – Frederick County

MDOT also manages the Maryland Operation Lifesaver Program that focuses on rail safety education. For additional information, visit www.oli.org.

DEVILBISS BRIDGE RD

DEVELOPER PROJECTS

MDOT is committed to fostering strategic growth and development that drives a vibrant economy and creates jobs opportunities for Marylanders. To ensure this growth is sustainable, development must be well planned and managed to protect public safety and prevent unmitigated degradation of the highway system for all roadway users and communities. When permissible, SHA works to offset traffic impacts triggered by developments using constructive improvements throughout the development area; however, Maryland's current framework for addressing development impact is inconsistent across jurisdictions. Based on the report by the Department of Legislative Services (DLS) to the Maryland General Assembly (MGA), 14 of 23 counties have an Adequate Public Facilities Ordinance (APFO), and only 15 of 23 counties utilize impact fees or excise tax structures to help subsidize costs to support public facilities. Multiple local jurisdictions lack any requirements at all, and those that do, vary widely in approach. These inconsistencies often lead to incremental and unmanaged impacts to State roads and have contributed to a significant backlog of statewide unfunded transportation needs. This leads to increasing requests for MDOT to fund improvements related to both ongoing and historical development impacts. While MDOT will continue to prioritize and support projects that promote economic growth, as funding allows, we also encourage all local jurisdictions to adopt best practices in planning, zoning and financial tools to ensure that development-related transportation impacts are properly mitigated at the time of the development.

Within this broader framework, developers play a key role in mitigating the traffic impacts associated with new development to ensure that added demand does not negatively affect roadway operations or safety. Developers are often required to fund improvements that can reduce or eliminate operational and safety issues, such as traffic from turn lanes extending into through lanes. These improvements could include intersection modifications, new traffic signals, pedestrian, bicycle, and transit enhancements, interchange improvements, and access improvements such as acceleration and deceleration lanes (**Table 29**). These upgrades are typically accomplished through a joint permitting process, ensuring that development-related impacts are addressed in coordination with state and local transportation agencies.

Table 29

2023 SELECTED DEVELOPER IMPROVEMENT PROJECTS			
COUNTY	ROUTE	LIMITS	IMPROVEMENT
Calvert	MD 402	Wilson Road	Added lane along Wilson Road to provide a separate left, through and right
Frederick	I-70 EB	MD 144FA	New ramp
Harford	MD 543	Creswell Road	Provided continuous auxiliary lane from development access to SB I-95 Ramp
Somerset	US 13	MD 822	Provided new traffic signal, sidewalks, and pedestrian facilities
Washington	MD 65	Rench Road	Widened MD 65 to add a northbound left turn lane south of the Rench Road intersection and added a 500' center turn lane to the north
Washington	I-70	MD 632	Widened the off-ramp to add a right turn lane

MDOT PROGRAMS TO IMPROVE **MOBILITY 2023 RESULTS**

US 50/US 301 CHESAPEAKE BAY BRIDGE

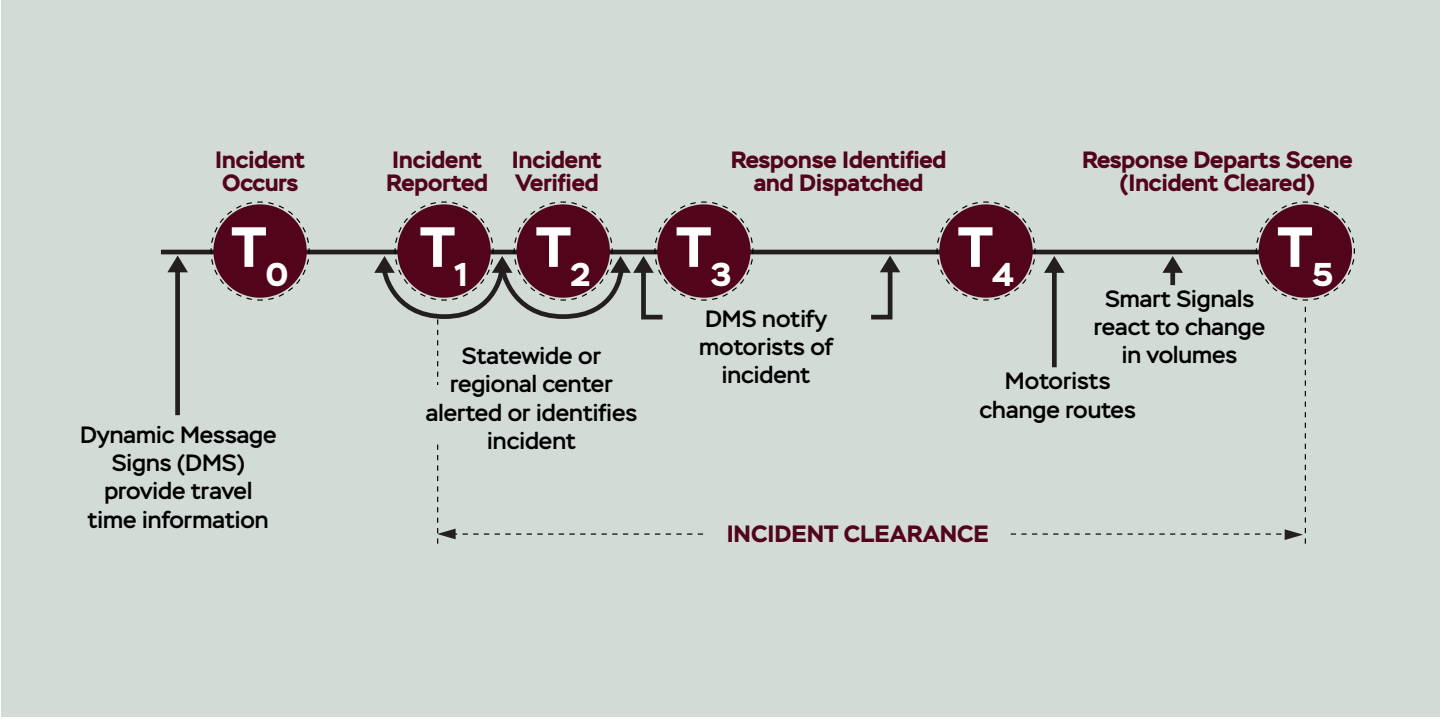
COORDINATED HIGHWAYS ACTION RESPONSE TEAM (CHART)

Improving mobility is not limited to the recurring congestion that is most often seen in the AM and PM peak periods. A secondary, but just as important aspect, are delays caused by incidents or other events such as vehicle breakdowns, work zones, or poor weather are also important to mitigate. These non-recurring congestion events affect the mobility, safety, and reliability of the roadway system.

SHA aims to improve safety and mitigate both non-recurring and recurring congestion. This goal is often accomplished through capital projects, which are vital to improving mobility. However, SHA has also established programs to help improve traffic flow and reduce congestion. These programs incorporate methods such as reducing demand on a specific roadway and using TSMO solutions to make better use of existing pavement and providing on-road services.

The major method that Maryland uses to mitigate non-recurring congestion is the Coordinated Highways Action Response Team (CHART). This goal is accomplished through a multi-agency effort using advanced traffic management systems (ATMS), service patrols, communications, systems integration, and incident response. The CHART program finds primary incidents quickly, alerting emergency personnel and minimizing the time motorists spend in congestion, thereby saving them time and money. The improved response time reduces the potential for secondary collisions which in turn lowers the cost impact of these incidents. The typical approach of CHART incident management is shown below.

CHART INCIDENT MANAGEMENT PROCESS



CHART's core functions to address non-recurring congestion are:

- Communications
- Emergency and weather operations
- Incident management
- Traffic and roadway monitoring
- Traffic management
- Traveler information

The resources dedicated to traffic management include:

- Clear the Road Policy
- Emergency response units
- Freeway incident traffic management plans and response trailers
- Information exchange network clearinghouse
- Intelligent transportation systems (ITS) equipment
- Traffic incident management training for first responders and partner agencies

The key to CHART's ability to respond is a distinct set of data that is collected to evaluate how the roadway system is operating. This data is collected from a variety of ITS equipment, strategically placed throughout the state. Travel time information is made available based on the analysis of INRIX probe speed data, and it is displayed on more than 200 dynamic message signs (DMS). The Maryland 511 Travel Information Service continues to supply useful, quality, and prompt travel information.

CHART can access:

- 1000+ Closed-circuit television (CCTV) cameras statewide (200+ SHA controlled)
- 300+ Speed detectors
- 400+ DMS
- 50+ Roadway weather information systems (RWIS)
- 10+ Traveler advisory radios
- 15+ Variable toll rate signs

Data from these devices is coordinated through the Statewide Operations Center in Hanover, along with three strategically located traffic operations centers in Frederick, College Park, and Essex.

The public faces of this program are the Emergency Response Technicians (ERTs). These personnel aid drivers when their vehicles become disabled or after a crash. These ERTs are assigned to high-volume and high-incident routes to boost the efficiency of the emergency response program. Areas served by ERTs include:

- Baltimore, the National Capital Region, Annapolis, and Frederick (Full-time 24/7 Patrols)
- Eastern Shore (Summer)

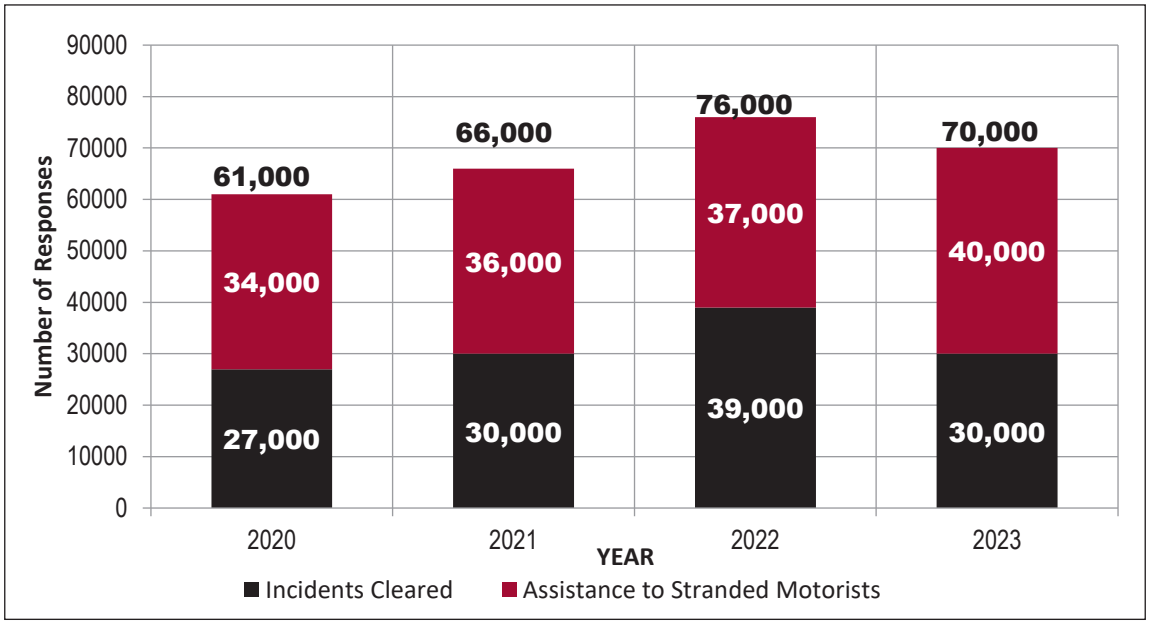
There are more than 40 full-time emergency traffic patrols that operate 24 hours a day, seven days a week.

I-97 SOUTHBOUND

In 2023, ERTs made more than 70,000 service calls to address motorists' and emergency response agency needs along state roads. These calls included responding to approximately 30,000 incidents along Maryland roadways and more than 40,000 service calls for aid to motorists **(Figure 35)**. ERT services include changing flat tires, supplying hotshots, and delivering fuel. The number of service calls responded to was among the highest ever in a single year.

Figure 35

EMERGENCY RESPONSE TECHNICIAN RESPONSES



Secondary incidents are a major concern to SHA. These incidents are a result of traffic being stopped or moving slowly due to the original incident and motorists either rear-ending or sideswiping other vehicles. Reducing the incident clearance time translates into reduced delays, improved safety, and user cost savings. In the past year, through CHARTs efforts, incident duration has been reduced to 25.4 minutes (**Figure 36**). This has significantly decreasing delays (by over 42 million vehicle hours) versus without CHART support and reduced safety risks for motorists **(Figure 37)**.

Figure 36

AVERAGE INCIDENT DURATION

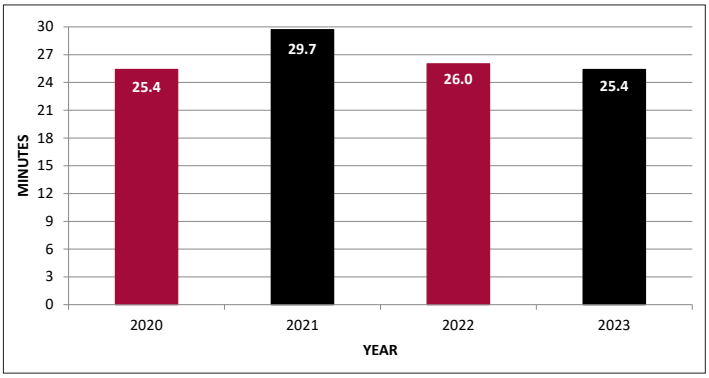
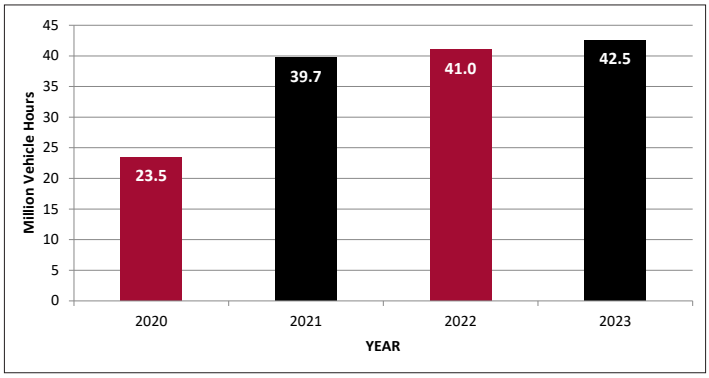


Figure 37

CHART REDUCTION IN DELAY GRAPH



The time saved through reductions in delay translates into savings in annual user costs for Maryland travelers, amounting to $2.23 billion in 2023 **(Figure 38)**. Annual user cost savings include savings in fuel and emissions.

Figure 38

CHART ANNUAL USER COST SAVINGS

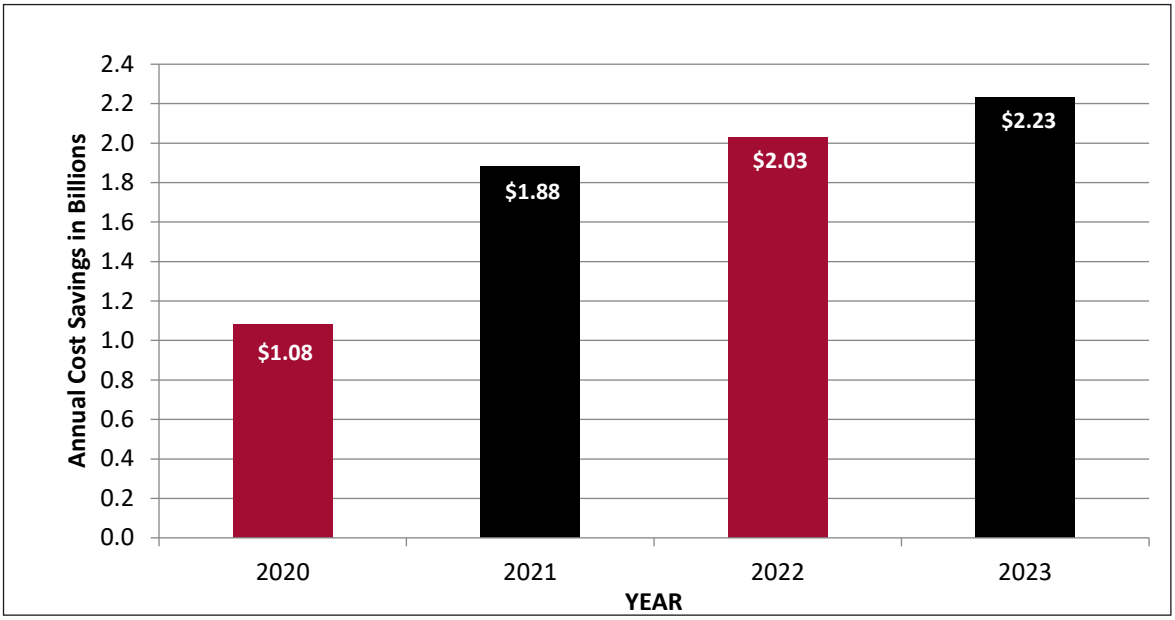


CHART services delivered a record annual benefit of $2.23 billion and ERTs responded to over 70,000 service calls.

SIGNAL OPERATIONS

Intersections are regulated by different traffic control devices such as stop signs, yield signs, roundabouts, and traffic signals. Signals are normally installed along arterial, collector, and local roadways to facilitate traffic flow and provide a safe means for motorists to move through these conflict points. However, if they are poorly timed, motorists may take risks such as running the red indication which can lead to crashes. Motorists also become frustrated if they feel they get stopped at every signal, or have to wait through multiple signal cycles. Traffic signal timing improvements are one of the most cost-effective methods to address recurring and non-recurring congestion. Signal timing improvements can reduce the potential for red light running, decrease delays and emissions, and support a more walkable environment.

Traffic signals are used in a variety of locations, from dense urban areas to rural intersections. Signals that are located close together are often grouped into a signal system that allows motorists to progress along an entire corridor more efficiently. Statewide, SHA owns 2,867 signals, with Montgomery County maintaining approximately 595 of those signals (Note: SHA also maintains locally owned signals in certain counties).

The SHA system consists of:

- 2,304 SHA-maintained traffic signals of which 1,615 are coordinated
- 271 Signal systems

Over time, traffic volumes change along main roads and cross streets. This means that traffic signal systems that were functioning well when first implemented may no longer be as efficient. To improve mobility, SHA selects several corridors each year to evaluate signal operations. In 2023, the signal timings for 102 signals in 11 systems were reviewed to improve progression and operations. Other areas addressed as part of signal operation efforts are work zone signals, new signal testing and turn-ons, phase modifications, working with school systems to improve operations at arrivals and dismissals, and integrating INRIX Signal Analytics to address operational issues. The overall improvements for the eleven systems in 2023 were:

- Reduced delay by over 730,000 hours
- Decreased delays along these systems by 12%
- Saved an estimated 260,000 gallons of fuel
- Saved users $34.0 million annually

MD 30 AT BROADBECK RD

The upgrades to six systems resulted in over 25,000 vehicle hours of delay savings each **(Table 30)**.

Table 30

2023 NETWORK DELAY SAVINGS FOR MDOT SHA SIGNAL SYSTEMS UPGRADES				
ROUTE	LIMITS	COUNTY	NO. OF SIGNALS	DELAY SAVINGS (VEH-HRS)
MD 193	Rhode Island Ave to Prospect Hill Rd	Prince George's	28	457,000
MD 197/MD 450	MD 197 – MD 450 to Old Annapolis Rd; MD 450- MD 193 to Racetrack Rd	Prince George's	23	77,000
US 1/MD 24	US 1 – Tollgate Rd to Atwood Rd; MD 24 – Boulton St to Singer Rd	Harford	13	63,975
US 301/MD 6	US 301 – Turkey Hill Rd to MD 6; MD 6 – Washington Ave to Garrett Ave	Charles	9	42,312
MD 175	US 29 NB Ramp to Dobbin Rd	Howard	4	29,962
MD 100	Magothy Bridge Rd to MD 177	Anne Arundel	3	28,750
MD 228	MD 210 to Greenwood Dr	Prince George's	8	23,800
US 1 Alt/MD 450	US 1 Alt.– MD 208 to 41st Ave; MD 450 – US 1 Alt to Bladensburg Elementary	Prince George's	7	9,225
MD 710	MD 10 Ramp to Prospect Hill	Anne Arundel	3	4,038
MD 30 Manchester	MD 27 to York St	Carroll	2	3,188
MD 30 Hampstead	Broadbeck Rd to North Carroll Middle School	Carroll	2	272
	TOTAL		**102**	**730,297**

The following signal system upgrades reduced delay by 10% or more:

- MD 100 – Anne Arundel County (22%)
- MD 193 – Prince George's County (21%)
- MD 30 Manchester – Carroll County (13%)
- MD 450 – Anne Arundel County (10%)

TRANSIT SIGNAL PRIORITY

Transit operators recognize the importance of adhering to schedules and giving passengers confidence that they will reach their destination on time. One way to ensure the punctuality of public transit along congested corridors is to provide a travel time advantage at signalized intersections. Transit signal priority (TSP) allows for buses to gain this time advantage to encourage more riders and improve on-time performance and reliability. TSP extends the green time of the signal if a bus is approaching while it is ready to turn yellow or reduces the wait time if the bus arrives when the signal is red. The following TSP systems are operating:

Ride On extRa service (Montgomery County):

- MD 355 – Lakeforest Mall to Medical Center METRO Station – 30 signals
- Buses operating on the corridor made over 363,000 TSP requests at signalized intersections

Ride On FLASH service (Montgomery County):

- US 29 – Burtonsville to Silver Spring METRO – 15 signals
- There were over 764,000 TSP requests at signalized intersections along the corridor

US 29 RIDE ON FLASH BUS

SMART/ADAPTIVE SIGNAL SYSTEMS

The primary difficulty of improving mobility in a corridor with signalized intersections is that traffic volumes and patterns vary from minute to minute and hour to hour. Signal timings on most corridors are programmed to provide the best progression of traffic along the main road while ensuring that side-street delays are reasonable. Signal timings are typically developed from a snapshot of traffic volumes along a corridor, instead of reacting to traffic trends in real time. This can result in longer delays when traffic is abnormal along a corridor.

SMART signals, also called adaptive signals, are a more advanced technology to improve motorists' progression through signalized intersections. SMART signals use computer software that responds to real-time traffic conditions, effectively deploying delay optimization algorithms to keep traffic moving. These systems maximize the green time for the major roadway while considering the operation of the minor street. The SMART signals are connected at multiple intersections along a major roadway corridor to improve normal traffic flow, and they dynamically respond to non-recurring congestion from special events or incidents. Adaptive signals differ from standard signal timing improvements by allowing for timing modifications to occur instantly as traffic flow changes throughout the network.

Adaptive signal systems have been implemented on twenty of SHA's most congested corridors throughout the state to reduce delays to motorists. A comparison was made of the delay savings these adaptive signal corridors provided by using PTI values **(Table 31)**. For most of the systems, the data compared are from 2023 and the year before the adaptive system was implemented. However, if the system was implemented in 2020-2022 during the pandemic, then 2019 data was used for the base year, as this was the last year before volumes were reduced with work and school from home restrictions.

US 40 BALTIMORE COUNTY ADAPTIVE SIGNAL SYSTEM

Table 31

2023 ADAPTIVE SIGNAL IMPLEMENTATION CORRIDOR BENEFITS				
ROUTE	LIMITS	COUNTY	PEAK HOUR/ DIRECTION	% IMPROVEMENT FROM BEFORE SYSTEM IMPLEMENTATION TO 2023[1]
MD 2/MD 178/ MD 450	MD 2: Forest Dr to MD 450; MD 178/ MD 450: MD 2 to Bestgate Rd	Anne Arundel	AM/WB	Up to 2%
MD 2	Hammond Lane to 11th St	Anne Arundel	AM/NB	Up to 34%
MD 2	Annapolis Harbor Dr to Tarragon Ln	Anne Arundel	PM/NB	Up to 8%
MD 3	MD 450 to St Stephens Church Rd	Anne Arundel	AM/SB	No improvement
MD 7	MD 588 to Rossville Blvd	Baltimore	AM/NB	Up to 32%
MD 26	Kelox Rd to Offut Rd	Baltimore	AM/EB	Up to 2%
MD 45/ Timonium Rd	MD 45: Timonium Rd to Fairgrounds Entrance; Timonium Rd: MD 45 to I-83 Ramp	Baltimore	PM/NB	Up to 2%
MD 139	Kenilworth Ave to I-695 Ramp	Baltimore	PM/SB	Up to 1%
US 40	Nuwood Dr to Coleridge Rd	Baltimore	PM/EB	Up to 33%
US 40	Golden Ring Rd to Rossville Rd	Baltimore	PM/WB	Up to 8%
MD 140/MD 31	MD 140: Market St to MD 31 & WMC Dr to MD 832/ MD 31: Main St to Uniontown Rd	Carroll	PM/WB	Up to 6%
US 301/ MD 228/MD 5	US 301: Chadds Ford Rd to Smallwood Dr; MD 228/MD 5 Business: Western Pkwy to Post Office Rd	Charles	PM/SB	Up to 2%
MD 22	Technology Dr to US 40	Harford	PM/WB	Up to 11%
MD 24	Singer Rd to Boulton St	Harford	PM/EB	Up to 32%
US 1	Montgomery Rd to MD 175	Howard	PM/NB	Up to 34%
US 40	Chatham Center to Normandy Woods Dr	Howard	AM/WB	No Improvement
MD 198	Sweitzer Rd to Old Gunpowder Rd	Prince George's	PM/EB	Up to 23%
MD 202	I-95/I-495 Ramps to Arena Dr	Prince George's	PM/WB	Up to 10%
US 301	Governor Bridge Rd to Pointer Ridge Rd	Prince George's	PM/NB	Up to 11%
US 13	Winner Blvd to Centre Rd	Wicomico	AM/SB	Up to 13%

1 – Represents greatest improvement.

PARK AND RIDE LOTS

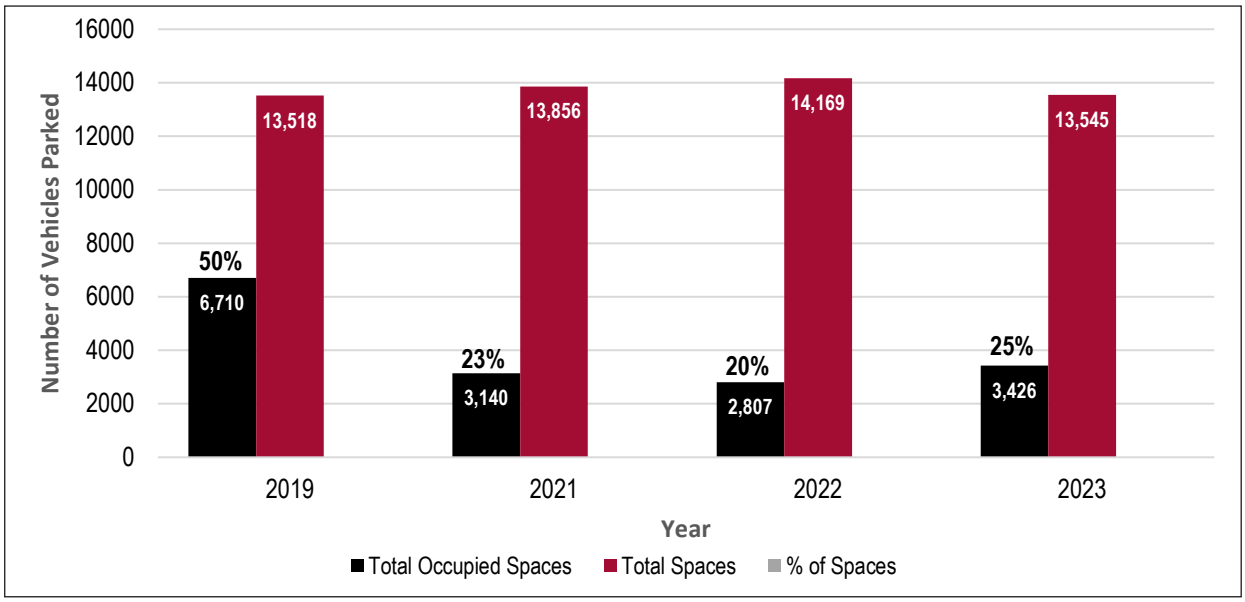
Park and ride lots are placed throughout the state and provide several benefits for safety and mobility. These lots are a fundamental strategy to encourage transit usage and reduce the number of single occupant vehicle trips through ride sharing. In addition, park and ride lots at certain locations allow trucks to park overnight so they are not causing a safety hazard on the road.

Various counties, transit agencies, and the state operate park and ride lots. The largest number of locations are maintained by SHA and the Maryland Transportation Authority (MDTA). This includes 105 park and ride lots in 21 counties including shared lots with the Maryland Transit Administration (MTA). There are over 14,000 spaces at SHA and MDTA lots, which range in size from less than 10 spaces to more than 800. The largest lots are along MD 5 in the Waldorf area of Charles County and along MD 665 at Riva Road in Annapolis.

Each year (except during the pandemic), the SHA conducts a survey of all facilities to assess the number of people parking in the lots. The usage of the park and ride lots is substantially below pre-pandemic levels but has grown in the past year. During the 2023 survey, there were over 3,400 vehicles parked in the lots, which was a more than 600 vehicle increase from 2022 **(Figure 39)**.

Figure 39

MDOT SHA/MDTA PARK AND RIDE LOT SPACES AND OCCUPANCY



Note: Data was not available for the year 2020

The highest volume locations where motorists are parking, and the average number of vehicles parked at those lots are:

- I-270 at MD 124 - Montgomery County (311)
- I-95 at I-495 - Prince George's County (209)
- MD 5 (Mattawoman-Beantown Road) S of US 301 - Charles County (208)
- MD 665 at Riva Road - Anne Arundel County (180)
- MD 210 at MD 373 - Prince George's County (156)
- I-270 at MD 117 - Montgomery County (140)

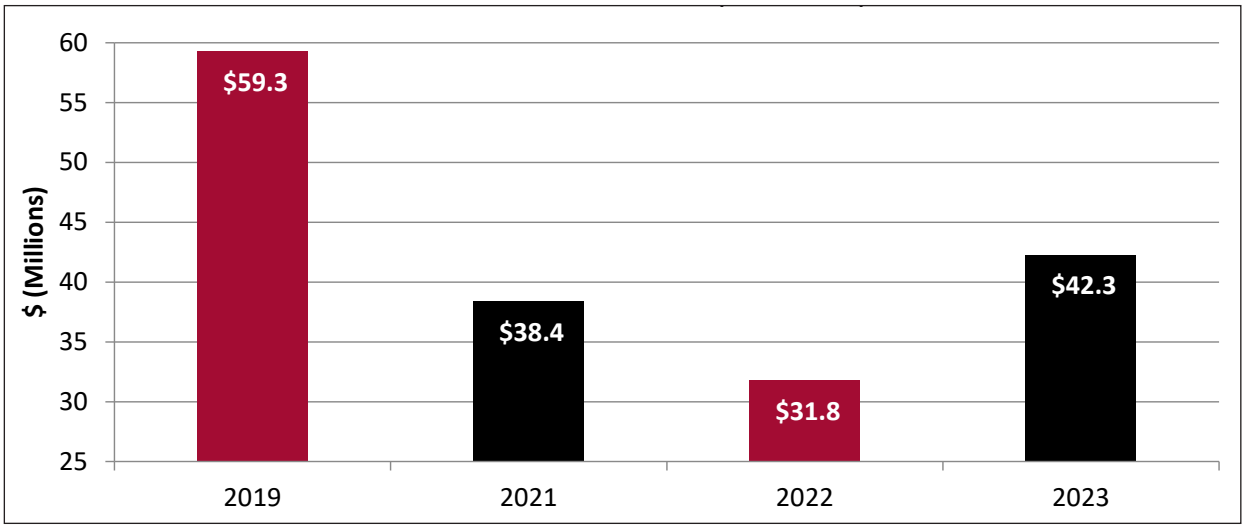
The highest increase in park and ride occupancy from 2022 to 2023 occurred at:

- I-270 at MD 124, Montgomery County (+186)
- MD 5 (Mattawoman-Beantown Rd) S of US 301, Charles County (+154)
- US 50 at MD 424, Anne Arundel County (+92)
- MD 665 at Riva Rd, Anne Arundel County (+68)
- US 50 at MD 8, Queen Anne's County (+44)

There are environmental and economic benefits associated with the use of park and ride lots. VMT is reduced on roadways by combining trips or using transit. This resulted in approximately $42 million in annual cost savings in 2023 **(Figure 40)**. This was a $10 million increase over 2022 resulting from increased usage of the lots.

Figure 40

MDOT SHA/MDTA PARK AND RIDE LOT SAVINGS TO MOTORISTS (MILLIONS)



Note: Data was not available for the year 2020

Two other major agencies that support transit through the use of park and ride lots are the MTA and the Washington Metropolitan Area Transit Authority (WMATA). The MTA provides connections to light rail, MARC, Baltimore METRO, and bus service, while the WMATA lots provide service to the Washington Metrobus and Metrorail systems.

SHA and MDTA park and ride lot usage increased by over 20% in 2023.

HIGH OCCUPANCY VEHICLES (HOV) LANES

High occupancy vehicle (HOV) lanes were one of the first strategies used to reduce single vehicle trips and make more effective use of the roadway. In Maryland, these lanes were first introduced thirty years ago to increase the number of persons traveling at one time (person throughput) along a freeway. HOV lanes encourage carpooling and increase the person throughput of a roadway without expanding the number of lanes. These lanes provide travel time savings to multi-occupant vehicles since motorists in these lanes usually operate at free-flow conditions while the general-purpose lanes (non-HOV lanes) usually experience congestion and lower travel speeds.

HOV lanes are implemented along two corridors located in Montgomery and Prince George's Counties. The location, direction, and operational hours are listed below:

- I-270 Southbound – North of I-370 to North of I-495 (East and West Spurs) [6:00 to 9:00 AM]
- I-270 Northbound – North of I-495 (East and West Spur) to MD 121 [3:30 to 6:30 PM]
- US 50 Eastbound and Westbound – West of US 301 to east of I-95/I-495 [All Day]

The HOV lanes require that at least two or more occupants be present in the vehicles, or that are transit vehicles, motorcycles, or plug-in electric vehicles.

In 2023, multiple surveys were performed to determine the characteristics of the motorists using the lanes. This included HOV lane volumes and the number of stickered electric and plug-in hybrid vehicles **(Table 32)**. In addition, the compliance rate ranges from over 30% to 60% of the users of the HOV lanes.

Table 32

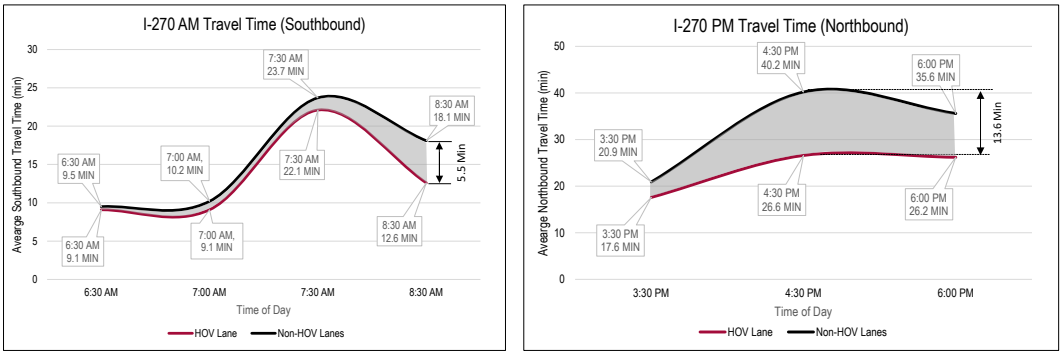
HOV LANE VOLUMES AND ELECTRIC VEHICLE USAGE

Location	HOV Lane Volume		% with HOV Sticker/Electric Vehicle Usage	
	AM	PM	AM	PM
I-270	1,115-1,600	1,125-1,750	3-6	1-6
US 50	300-715	435-875	2	1-2

A travel time survey was performed to determine the amount of time motorists saved by using the HOV lanes versus the non-HOV or general-purpose lanes. Along I-270, this ranged from less than one minute to almost 14 minutes. **(Figure 41)**. The measured travel times along US 50 were simlar between the HOV lane and the general purpose lanes due to limited congestion along this section of roadway. Time savings were approximately one minute in the HOV lane.

Figure 41

I-270 TRAVEL TIME HOV AND NON-HOV LANES



REVERSIBLE LANES

Active traffic demand management (ATDM) involves dynamically managing a roadway by using technology. ATDM strategies include part-time shoulder use, ramp metering, dynamic lane use control, and dynamic lane reversal, more commonly known as reversible lanes.

Generally, reversible lanes are implemented when traffic volumes are high in one direction and much lower in the other direction. Normally this occurs in areas where motorists mostly travel one way in the morning and the opposite direction in the afternoon. This strategy allows for one or more lanes of a roadway to be converted from one direction to the opposite direction to accommodate the increase in peak hour volumes. The lane conversion occurs within defined hours. There are four reversible lane locations along MDOT roadways **(Table 33)**.

Table 33

REVERSIBLE LANE LOCATIONS ALONG MDOT ROADWAYS			
ROUTE	LIMITS	COUNTY	LENGTH (MILES)
US 50/US 301	Chesapeake Bay Bridge	Anne Arundel/Queen Anne's	4.5
MD 177	MD 100 to West of South Carolina Ave	Anne Arundel	1.6
US 29	Sligo Creek Pkwy to MD 97	Montgomery	1.0
MD 97	I-495 to MD 390	Montgomery	0.5

The most recognizable location for reversible lanes is the US 50/US 301 Chesapeake Bay Bridge. Motorists traveling to and from the Eastern Shore are directed in the PM peak hour, Friday evenings and Saturday mornings to the one reversible lane on the westbound bridge. This allows for the two eastbound and three westbound lanes to be converted to three eastbound and two westbound lanes through overhead lane signing. MDTA has recently automated the implementation of the reversible lanes to minimize personnel and improve safety. The three other locations are along commuter routes where the lane(s) are reversed in the AM and PM peak period. The US 29 and MD 97 reversible lane sections are in the Silver Spring area leading into and out of Washington, DC. The MD 177 section is utilized for traffic accessing Gibson Island. Hourly volumes on the reversible lanes range from approximately 200 vehicles to over 1,300 vehicles per lane **(Table 34)**.

Table 34

2023 REVERSIBLE LANE VOLUMES AND NUMBER OF LANES								
LOCATION	VOLUME OF PEAK DIRECTION FOR NON-REVERSIBLE LANES(VEHICLES PER HOUR)		NUMBER OF NON-REVERSIBLE LANES		VOLUME OF PEAK DIRECTION FOR REVERSIBLE LANE(S) (VEHICLES PER HOUR)		NUMBER OF REVERSIBLE LANES	
	AM	PM	AM	PM	AM	PM	AM	PM
US 50/301	N/A	2,750[1]	N/A	2	N/A	1,340[1]	N/A	1
MD 177	810	995	1	1	220	200	1	1
US 29	1,065	920	2	2	865	965	2	2
MD 97	2,415	2,535	3	3	550	520	1	1

1 - Volumes represent Saturday peak hour

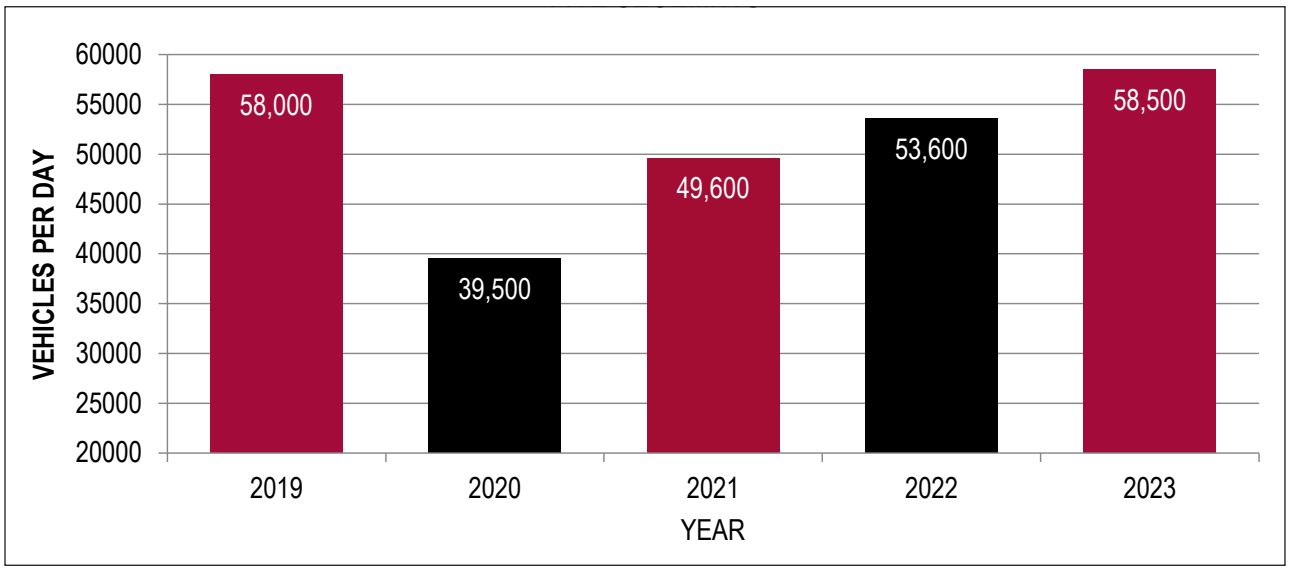
MANAGED LANE FACILITIES AND EXPRESS TOLL LANES

Various strategies are used on Maryland roadways to improve mobility by both SHA and MDTA. MDTA is responsible for all toll facilities including the Chesapeake Bay Bridge (US 50/301), Nice/Middleton Bridge (US 301), Hatem Bridge (US 40), Key Bridge and approaches (MD 695), MD 200, I-895 Harbor Tunnel Thruway including the Harbor Tunnel, and I-95 from the southern limits of the Baltimore City Line to the Delaware Line including the Fort McHenry Tunnel and Tydings Bridge. Along MD 200 and I-95 on the north side of Baltimore City, the MDTA incorporated two approaches for toll pricing to improve traffic flow starting in 2014.

MD 200 (Intercounty Connector) was the first all-electronic toll collection facility in Maryland; tolls are collected at highway speed either with E-ZPass® or through video tolling. Toll rates vary by the time of day with tolls being slightly higher in the AM and PM peak periods. MD 200 extends approximately 19 miles from I-370 in Montgomery County to US 1 in Prince George's County. Traffic volumes on MD 200 between I-370 and I-95 increased from 53,600 vehicles per day in 2022 to 58,500 vehicles per day in 2023, a 9% increase **(Figure 41)**.

Figure 41

MD 200 AVERAGE DAILY TRAFFIC VOLUMES BETWEEN I-370 AND I-95

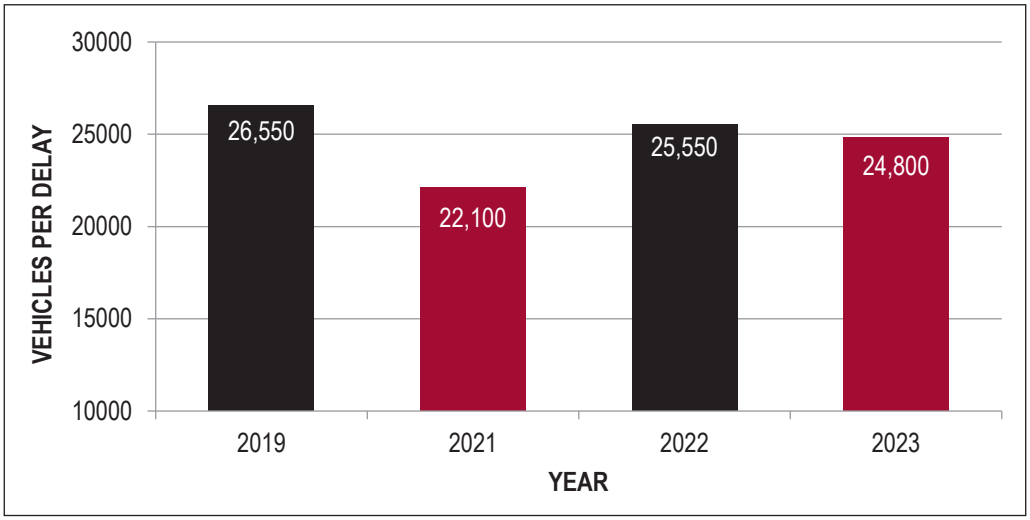


The I-95 project north of Baltimore City allows motorists a choice to use either the four free general-purpose lanes or pay an E-ZPass® toll when they travel in the parallel free flow express toll lanes (ETLs). The ETL and general-purpose lanes are barrier separated. The advantage the ETLs provide is they operate at free flow speed for the freeway without experiencing delays. Tolls vary by the time of day with higher tolls during more congested periods. Transit vehicles may always use the express toll lanes for free. This improves transit time reliability to better meet schedules for routes in the corridor.

In 2023, volume in the ETLs remained relatively sustained in comparison to 2022 levels. Almost 25,000 motorists a day use the ETLs **(Figure 42)**. The success of the first section of the ETLs allows MDTA to expand the limits from I-95 north of MD 43 to south of MD 543 which is presently under construction.

Figure 42

I-95 EXPRESS TOLL LANE AVERAGE DAILY TRAFFIC VOLUMES



Note: Data was not available for 2020

I-95 SOUTHBOUND ETL GENERAL PURPOSE LANES (RIGHT) AND ETLS (LEFT)

Traffic volumes increased by over 9% on MD 200 from 2022. Over 9 million drivers use the ETLs in 2023 with the highest hours having over 2,000 vehicles in one direction.

MOBILITY
INITIATIVES

ELECTRIC VEHICLE CHARGING STATION NEAR BWI AIRPORT

BICYCLE AND PEDESTRIAN

The MDOT aims to provide a safe, comprehensive, integrated, and connected network to accommodate all users. Pedestrians, bicyclists, e-bikers, and scooter operators are all vulnerable roadway users, and one of MDOT's missions is to ensure a well-connected active transportation network. In conjunction with this, safety is essential. This will allow people to shift modes and promote more environmentally friendly means of transportation. SHA has worked toward this goal with the "Context Driven: Access and Mobility for All Users" guide. This guide provides the framework for improving pedestrian and bicycle safety and providing a balanced and sustainable multi-modal transportation system. By implementing principles from this guide, safety, accessibility, and mobility will improve for multi-modal users through innovative treatments and strategic investments framed by complete streets and practical design principles. Additionally, the SHA incorporates bicycle and pedestrian facilities into roadway projects and provides grants to plan, design, and construct bicycle and pedestrian amenities on non-state-owned facilities to improve transportation equity.

PROGRAMS

Expanding facilities for bicyclists and pedestrians is critical to MDOT's Complete Streets Policy. Although MDOT is a leader in implementing these projects, numerous federal and state-funded programs assist in planning, designing, and constructing these projects throughout the state. Applicants for the funding are not limited to state and federal agencies. They can also include counties and private groups advancing pedestrian and bicycle safety and access. The programs range from feasibility studies to construction of sidewalks, trails, protected bike lanes, shoulders, surface upgrades, pedestrian bridges, ADA ramps, and signing and pavement marking upgrades. The programs include enforcement campaigns to increase the prudent use of pedestrian and bicycle facilities and safety education. These programs provide funding for numerous projects: (2024-2029 $ in millions) (Example Project - County):

- Retrofit Bicycle Program ($79.7) (US 1 Rhode Island Trolley Trail – Prince George's)
- Retrofit Sidewalk Program ($156.7) (MD 27 West of MD 140 to Hahn Rd – Carroll)
- ADA Program ($54.5) (MD 33 North of Lee St to South of Spencer Dr – Talbot)
- Recreational Trails Program ($23.9) (Torrey C Brown Trail Bridge rehabilitation – Baltimore)
- Kim Lamphier Bikeways Network Program ($16.0) (New Hampshire Avenue Bikeway – Montgomery)
- Transportation Alternatives Program ($135.4) (Bryon Bridge Access Improvement – Washington)
- Primary / Secondary Program ($1.5) (MD 5 South of Camp Brown Rd to Lake Conoy Causeway – St. Mary's)
- Neighborhood Conservation Program ($32.2) (MD 222 South of High St to Mill St – Cecil)
- Maryland Highway Safety Office Bicycle Programs ($0.8)

Other state grant programs include the Community Legacy Program, Program Open Space, Maryland Heritage Areas Financial Assistance Programs, the Transportation Land Use Connections Program, and Statewide Transit Innovation grants. There are numerous federal grant programs, including BUILD, the Safe Streets and Roadways for All Program, Safe Routes to School, and the Rivers, Trails, and Conservation Assistance Program.

Bicycle and pedestrian project funding for the fiscal years 2024-2029 amounts to approximately $500 million.

1 - Consolidated Transportation Program 2024-2029

BICYCLE AND PEDESTRIAN MASTER PLAN

The MDOT developed the "2050 Maryland Statewide Bicycle and Pedestrian Master Plan," released in January 2024. This plan was an update to the "2040 Maryland Bicycle and Pedestrian Master Plan 2019 Update." This plan outlines the vision to develop a concise, data-driven approach to increase bicycling/pedestrian activity and improve safety. The "2050 Maryland Statewide Bicycle and Pedestrian Master Plan" documents the past five years of progress, state of active transportation, recommendations for policies, programs, and guidance for implementation, as well as goals, objectives, and recommendations.

The plan's primary goals include:

- Address equity needs and provide convenient, safe, reliable, and affordable access to transportation in underserved areas
- Improve safety, especially for vulnerable roadway users
- Encourage mode shift from single-occupant vehicles to active transportation mode

The MDOT will accomplish the plan's goals through a series of programs that will strengthen MDOTs bicycle, micro-mobility, and pedestrian policies, practices, and tools. These programs will also identify gaps in the network, recommend infrastructure, and develop an implementation plan.

The primary objectives in the next five years include:

- Creating Complete Streets grant program for local roads
- Updating SHA's shared use path policy and tracking system to align with local goals, including the creation of an ADA and sidewalk inventory
- Creating a trails team to coordinate planning, design, construction, and maintenance for MDOT, Maryland Department of Natural Resources, and local agencies
- Updating the Statewide Trails Plan
- Providing incentives for local jurisdictions to adopt their own Complete Streets Policy
- Establishing model Complete Streets corridors
- Preparing a bicycle facilities selection guide
- Reviewing capital and maintenance policies and mandates related to sidewalks and shared use paths within SHA rights-of-way
- Developing guidance for best practices to maintain bicycle and pedestrian facilities

Safety is a crucial concern when encouraging and expanding pedestrian and bicycle usage. SHA, through a safe systems approach, continues to improve safety for these vulnerable roadway users. The "2050 Maryland Statewide Bicycle and Pedestrian Master Plan" aligns with the goals of the "Towards Zero Deaths" campaign to enhance safety.

SHA implemented the following in 2023 to promote biking and pedestrian use and improve safety to reduce the number of fatalities and injuries:

- Conducted an analysis of pedestrian access around fixed rail transit stations
- Funded bicycle count programs in Montgomery County and Baltimore City
- Incorporated the Statewide Bicycle Level of Traffic Stress (LTS) analysis into projects
- Developed the Statewide Pedestrian Safety Action Plan (PSAP)
- Performed an analysis to determine recommendations on numerous PSAP corridors
- Continued employing the 2021-2025 Strategic Highway Safety Plan, which included six strategies to improve pedestrian and bicycle safety
- Developed a planning level cost estimating tool for bikeway infrastructure projects
- Incorporated the "Context Driven: Accessibility and Mobility for all Users" guide into projects and developed a web portal, including a statewide progress project map
- Promoted pedestrian and bicycle campaigns such as Be Street Wise and OC Walk Smart
- Reduced speed limits and lane widths on several corridors
- Provided continental crosswalk treatments at various intersections
- Installed geometric improvements such as hardened centerlines, pedestrian median refuge islands, curb extensions, and reduced radiuses for turning vehicles to reduce speeds
- Installed safety improvements, including accessible pedestrian signals, Rectangular Rapid Flashing Beacons (RRFB), countdown signals, lead pedestrian intervals, ADA improvements, lighting enhancements, and signing such as "No Turn on Red" and pavement marking upgrades.
- Encouraged participation in Bike to Work Week in May
- Promoted walking through a month-long list of events and promotions to promote WALKTOBER

TRANSIT-ORIENTED DEVELOPMENT (TOD)

The MDOT works in partnership with state, local, and private partners to support Transit-Oriented Development (TOD) throughout Maryland. TOD generally refers to dense, mixed-use development in the one-half mile radius around a transit station. MDOT actively promotes TOD as an approach to increase transit ridership, reduce VMT, support economic development, and maximize the efficient use of transportation infrastructure. TOD in Maryland boosts transportation infrastructure investments, promotes active and engaged communities, protects environmental and land resources, and supports growth while minimizing traffic congestion.

Legislation established the State Transit-Oriented Development Designation in 2008. Local jurisdictions may apply for State TOD Designation through MDOT's Office of Real Estate and Economic Development (ORED). As of July 31, 2023, the State's Sustainable Growth Subcabinet is responsible for approving or denying applications for TOD Designation.

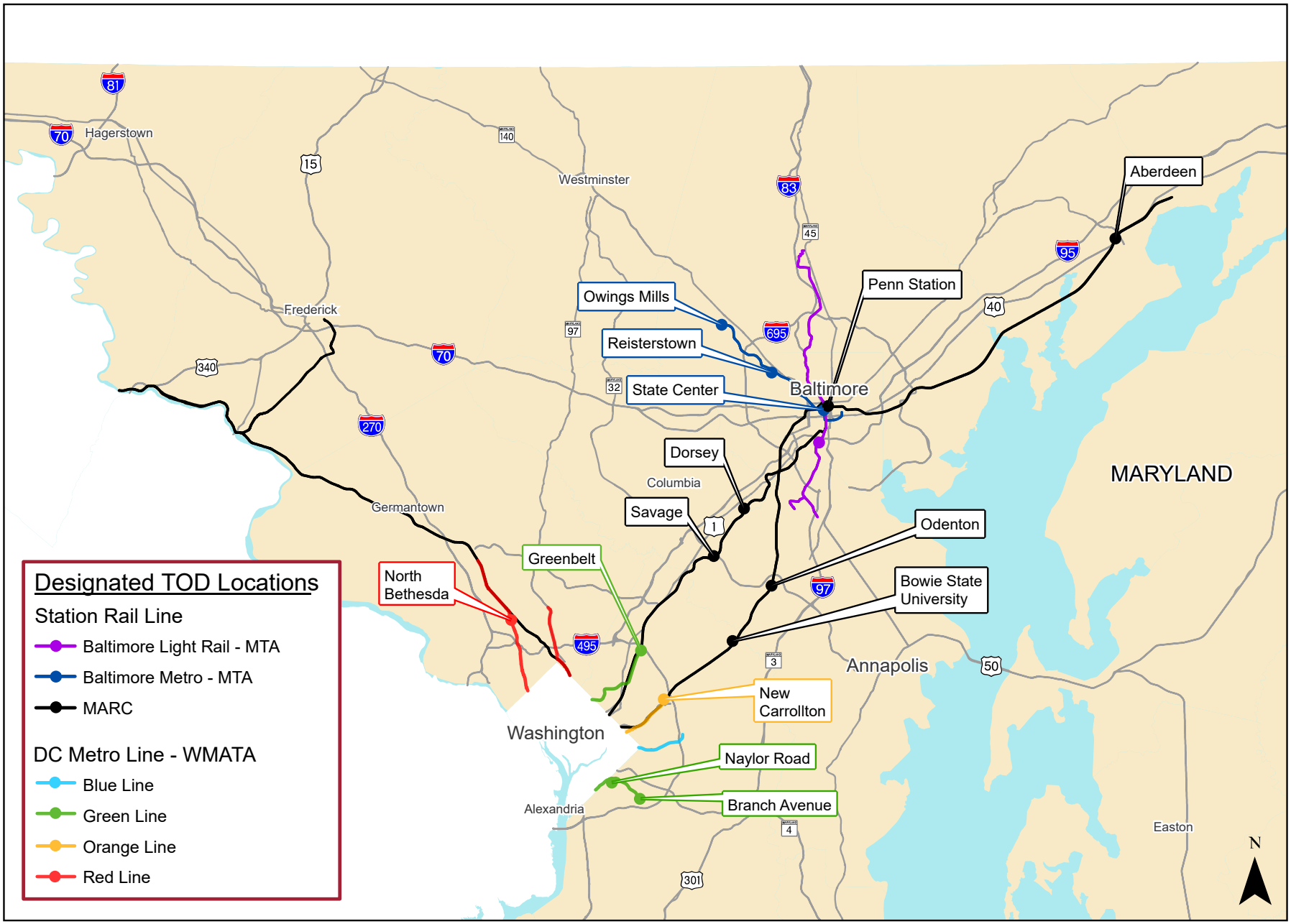
MDOT's Joint Development team focuses on creating TOD on state-owned land in partnership with local jurisdictions and the private sector. In addition to the MTA, the ORED also works with the Washington Metropolitan Area Transit Authority (WMATA) to support their Joint Development portfolio in Maryland.

There are 14 TOD-designated TOD sites where an agreement exists between MDOT and the local jurisdiction for site development (Figure 43). MDOT is working on developing agreements for several other potential TOD sites, including Forest Glen, Capitol Heights, Twinbrook, Downtown Largo, Laurel, Shady Grove, and Westport. ***(Note: Previous editions of the Mobility Report listed these as TOD sites.)*** All of these sites are along fixed rail transit lines of the Baltimore/ Washington region.

LOCATIONS (TRANSIT SERVICE PROVIDED)

- Aberdeen (MARC)
- Owings Mills (Baltimore METRO)
- Reisterstown Plaza (Baltimore METRO)
- State Center (Baltimore METRO)
- Penn Station (MARC and Baltimore Light Rail)
- Savage (MARC)
- Odenton (MARC)
- Bowie State University (MARC)
- Dorsey (MARC)
- North Bethesda (Washington METRO)
- Greenbelt (Washington METRO)
- New Carrollton (Washington METRO)
- Branch Avenue (Washington METRO)
- Naylor Road (Washington METRO)

Figure 43 – Transit-Oriented Development Locations



The development level at the 14 TOD sites varies depending on demand. Specific locations are much more active in ongoing construction, while others are waiting for the right market conditions to be started or expand further. The most active sites include a combination of retail, residential, and offices **(Table 35)**.

Table 35

ACTIVE DEVELOPMENT AT TODs		
TOD LOCATION	MULTI-MODAL CONNECTION	DEVELOPMENT STATUS
Reisterstown Plaza	MTA - Baltimore METRO	Wabash Development Partners is the project's master developer
Penn Station	MARC	1.6 million sf of mixed-use development New station platform for high-speed rail
Savage	MARC	Planning for: Twin tower apartment building, 150 key hotel, restaurants, and a separate parking garage
Bowie State	MARC	Prince George's County has opted to re-issue an RFP for the site in 2024
Odenton	MARC	MDOT is planning on releasing a public solicitation to advance development activity on the state-owned property in 2024
New Carrollton	WMATA-DC METRO	291-unit multi-family residential building is under construction WMATA's new office building opened in 2023. Construction on a 1,900-space garage, along with ground floor retail, is underway
North Bethesda (Formerly White Flint)	WMATA-DC METRO	WMATA advanced work in preparation of a MOU with Montgomery County. This MOU included 2 to 3.7 million sf of development anchored by the University of Maryland's Institute for Health Computing

TODs are served by the Baltimore METRO, Washington METRO, MARC, and Baltimore Light Rail.

FREIGHT

Maryland's transportation network supports regional businesses and jobs through freight movement. Freight movement revolves around emphasizing trucks and their cargo. Trucks carry the highest cargo and freight value in Maryland. Therefore, Maryland must provide an efficient roadway network to be competitive in the global marketplace. Transportation projects that improve freight mobility and safety are critical to the state's economy. The SHA assesses freight performance and its system's needs to identify the most appropriate improvement projects based on probe data from actual trucks and technology resources.

The federal government understands the importance of having freight move safely and efficiently. In order to accomplish this, several actions were implemented to improve freight movement over the past decade, requiring states to plan for freight and focus on critical freight infrastructure. Maryland served as a model for federal requirements as one of the first states to develop a state freight plan and focus on truck parking. The "Moving Ahead for Progress in the 21st Century" (MAP-21) established a freight network and set requirements to measure freight performance. The freight network was enhanced by the "Fixing America's Surface Transportation (FAST) Act" in 2015; following that, the passage of the Infrastructure Investment and Jobs Act (IIJA) increased the nationwide mileage for two of the categories in the national highway freight network in 2021. The categories and mileage in Maryland include:

- Primary highway freight system (PHFS) – The Federal Highway Administration (FHWA) selected approximately 400 miles of interstates, as the primary freight network.
- Other interstates not on the PHFS – Approximately 145 miles of non-PHFS Interstates are part of the NHFN, even though they are not considered primary for freight.
- Critical urban freight corridors (CUFC) – 150 miles of metropolitan planning organization (MPO)-designated urban roadways. (Up from 75 miles)
- Critical rural freight corridors (CRFC) – 300 miles of state-designated roadways. (Up from 150 miles)

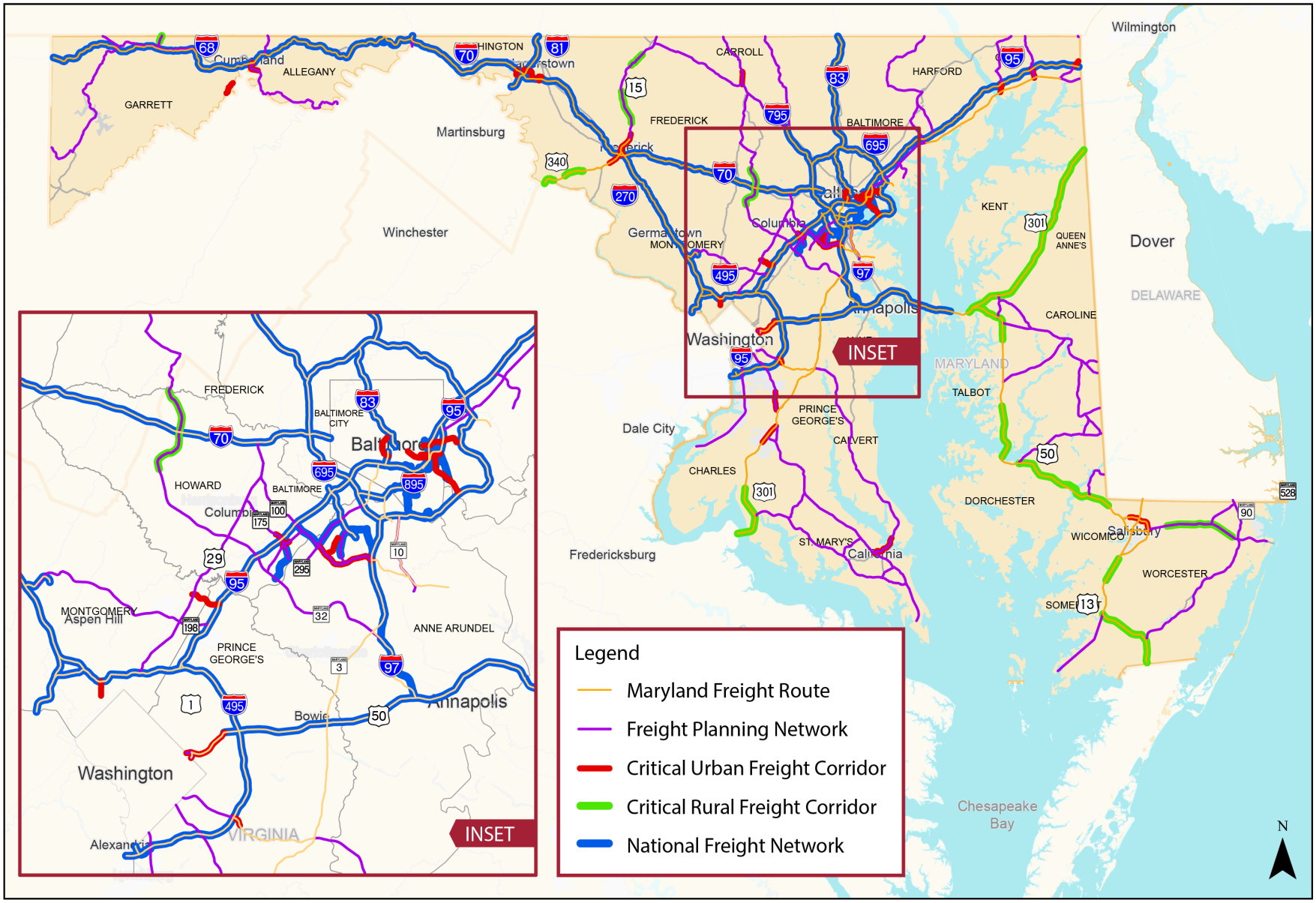
The FHWA determines PHFS and the remaining Interstate locations. States and metropolitan planning organizations (MPOs) determine the CUFC and CRFC designations. The SHA and the state's MPOs developed the CUFC through a joint effort based on a methodology developed by the Metropolitan Washington Council of Governments (MWCOG). Twenty-five miles of the CUFCs occur in the MWCOG and the Baltimore Metropolitan Council MPO areas. The five other MPOs in Maryland split the remaining miles. The CRFCs were selected based on SHA developed criteria. Corridors were selected based on the highest truck volumes and proximity to significant freight facilities.

The additional miles of CUFC and CRFC are currently in the finalization process, and the state and MPOs should finalize approval of the routes. SHA accomplished this using the Maryland Roadway Performance Tool (MRPT) to identify the segments best aligned with the federal CUFC and CRFC criteria, including truck volumes and proximity to freight facilities. SHA has completed the coordination process with the MPOs. These efforts are essential to identify where Maryland can spend NHFP funding from the FHWA.

I-70 Frederick County

Maryland's Highway Freight Networks, consisting of the PHFS, Interstates, CUFCs, CRFCs, and the freight planning network, encompass roadways in all state regions **(Figure 44)**.

Figure 44 – Freight Network



The SHA incorporates planning and construction projects to improve freight performance, such as:

- Highway improvements
- Network maintenance
- Capacity expansion
- Operational projects (IT and TSMO that support safe and efficient movement through information systems)
- Freight planning development
- Freight performance measurement and visualization to support planning and operations
- Safety improvements in coordination with law enforcement
- Investigation of emerging technologies like automated trucking and connected vehicles

FHWA provides freight formula funds that can support capital projects on the defined NHFN. MDOT completed in 2023 or is in the process of completing the following projects to support freight on the NHFN using federal funds:

- Statewide truck stop technology enhancements
- Statewide virtual weigh station database
- Statewide static scale replacements and electronics
- Bridge/roadway improvements, such as the I-70 bridge over Crystal Falls Drive and the reconstruction of the Putty Hill Ave bridge over I-695
- Freight Automated Vehicle (AV) implementation plan

MDOT uses the freight formula program and other resources to support various projects and planning efforts. Projects that were completed or underway in 2023 include:

- Developing data and analytical visualization tools
- Establishing a freight automated vehicle implementation plan
- Developing a freight EV charging pilot
- Assessing Maryland roadways for freight automation opportunities
- Initiating freight data-sharing platforms and traveler information systems
- Deploying innovative technology, including the driveways geofencing application for commercial vehicle pre-clearance at truck weigh and inspection stations
- Developing state freight plan update

Ongoing planning efforts include:

- Implementing the Maryland Statewide Truck Parking Study that evaluates existing parking demand, the system's needs and gaps, and linked challenges and opportunities while also identifying funding and grant options for innovative areas. This includes areas such as public-private partnerships, electric vehicles and connected and automated vehicles
- Creating a TSMO concept of operations for freight movement
- Updating the Maryland Freight Story Map and providing a visual overview of the Strategic Goods Movement Plan
- Using an advanced data viewer for planning purposes
- Coordinating multi-modal freight

TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS (TSMO)

There is limited ability to build your way out of congestion and improve mobility. An alternative is maximizing the full potential use of the facility to minimize roadway widening projects and make the best use of existing funding. This optimization is known as Transportation Systems Management and Operations (TSMO). TSMO incorporates all aspects of a project, from planning and engineering to operations and maintenance, which align with the same goal: improving the transportation system's reliability, safety, and security. SHA's TSMO program manages a 'system of systems' through modern innovative solutions, combining traffic management strategies, technologies, roadway improvements, and partnerships to take advantage of the network, optimize traffic flow, and improve safety.

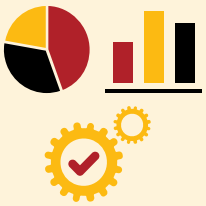
The overall goals of the program are:

GOAL 1

BUSINESS PROCESSES & COLLABORATION

GOAL 2

SYSTEMS & TECHNOLOGY

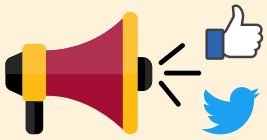


GOAL 3

DATA ANALYSIS & PERFORMANCE MANAGEMENT

GOAL 4

CUSTOMER EXPERIENCE & ENGAGEMENT



TSMO

MARYLAND TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS

SHA uses TSMO strategies to manage the multimodal transportation network and achieve the program's goals.

These strategies include:

Homeland Security Preparedness

Transit Priority/Integration

Connected and Automated Vehicle Technology

Work Zone Management

Emergency Response

Road Weather Management

Traffic Incident Management

Traffic Signal Coordination

Maintenance Fleet Management

Electronic Payment/ Toll Collection

Freeway/Arterial Management

Freight Management

The critical component of TSMO is technology. This technological component involves meeting customers' needs for real-time travel information and reacting quickly to trends and changes in travel patterns.

The data technologies that support TSMO are:

Real Time Applications

Archived Data Applications

Inhouse-tools with support from the University of Maryland CATT Lab

MDOT Common Operating Picture

Motorists now use navigation apps to find the quickest route to their destination. TSMO acts similarly to those apps. Instead of looking at only one corridor, TSMO solutions consider the entire system. For example, if an incident occurs on I-97, TSMO solutions include improving traffic flow on the parallel MD 2 and MD 3 corridors.

SHA established and identified the following priorities to enhance the entire system using TSMO strategies:

- Improving coordination during incident management
- Decreasing incident duration and delay
- Allowing the traveling public to make better informed decisions
- Offering active traffic management and integrated corridor management solutions
- Enhancing coordination between SHA and local signal operators to optimize signal timings
- Managing traffic and increasing safety for work zones and special events

New tasks are completed yearly to further TSMO incorporation into managing the system. The 2023 accomplishments for SHA include:

- Established the Maryland State Police Traffic Incident Management (TIM) unit, which works directly with CHART field patrol units and communicates directly with CHART traffic management centers (TMCs).
- Continued construction of the I-695 part-time shoulder use project.
- Received a $12 million ATTAIN (Advanced Transportation Technology and Innovation) grant award to dynamically manage traffic and focus on improving safety, mobility, travel time reliability, and quality of life in the rural communities along the US 50 corridor between the Baltimore-Washington metropolitan area and Atlantic Ocean resort areas.
- Created the CHART law enforcement liaison group, including law enforcement representatives to coordinate activities such as ongoing events and traffic incident management strategies and training.
- Developed draft traffic incident timing plans for TSMO System 1, including Active Traffic Management (ATM) strategies along multiple routes, including I-70, US 29, US 40, and MD 99. SHA will activate traffic incident timing plans along with Freeway Incident Traffic Management (FITM) plans to optimize vehicle throughput during detours along parallel arterials (e.g. US 40).
- Evaluated various facilities for the possible deployment of a Truck Parking Availability System (TPAS), which will give commercial vehicle operators and dispatchers real-time information on rest area parking space availability while en route to various destinations.
- Developed a pilot project for ramp management along US 50/301 east and west of the Bay Bridge.

MOBILITY ON DEMAND

Travelers in urban areas of Maryland have had a breadth of transportation choices over the last few years. Different mobility-on-demand services have brought this about. These services improve transportation equity by giving people alternatives to access motor vehicles, bicycles, electric bikes, and scooters. Travelers can find most of these services in the Baltimore-Washington region.

These mobility-on-demand services provide opportunities and challenges for the transportation system. One opportunity includes reducing the number of single-vehicle trips in dense areas to improve air quality. One challenge consists of a rise in curbside demand, making it more difficult in urban areas for competing interests vying for the same space. Examples include transit vehicles stopping, motorists parking, and mobility service providers dropping off and picking up customers. The following services exist in Maryland:

- Uber – Ride-sharing service throughout most of Maryland
- Lyft – Ride-sharing service throughout most of Maryland, and scooters in Montgomery and Prince George's Counties
- Zipcar – Ride-sharing vehicles throughout the Baltimore-Washington area
- Lime – Scooters, Bikes, and Mopeds in Baltimore City, Prince George's County, and Montgomery County
- Spin – Electronic scooters and bikes in Howard County, Montgomery County, and Baltimore City
- Capital Bikeshare – Electronic bikes and scooters in Montgomery and Prince George's Counties

MD 3 Business

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MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

WES MOORE
Governor

ARUNA MILLER
Lt. Governor

SAMANTHA J. BIDDLE, AICP
Acting MDOT Transportation Secretary

WILLIAM PINES, PE, PMP, CCM
SHA Administrator

FOR FURTHER INFORMATION, PLEASE CONTACT:

RAY MORAVEC, P.E.
DIRECTOR
Office of Planning
& Preliminary Engineering
707 N. Calvert Street
Baltimore, MD 21202
rmoravec@mdot.maryland.gov

LISA SHEMER, P.E.
DEPUTY DIRECTOR
Office of Planning & Preliminary Engineering
Travel Forecasting & Analysis Division
707 N. Calvert Street
Baltimore, MD 21202
lshemer@mdot.maryland.gov

800-323-MSHA
TTY 800-735-2258

roads.maryland.gov

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alternative formats upon request.