



Appendix D:

Congestion Management



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CONGESTION MANAGEMENT

Congestion management involves applying strategies to improve transportation system performance and reliability. This helps to reduce the adverse impacts of congestion on the movement of people and goods.

A Congestion Management Process is a systematic and regionally accepted approach for managing congestion. Such an approach can provide accurate, up-to-date information on transportation system performance. This enables transportation planners and decision makers to assess alternative strategies for managing congestion that meet state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages.



Congestion Management Process

The Congestion Management Process (CMP), as defined in federal regulations, is intended to serve as a systematic process that provides for safe, effective, and integrated management and operation of the multimodal transportation system. Federal requirements state that the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process. The process includes:

1. Developing regional congestion management objectives
2. Defining the CMP network
3. Developing multimodal performance measures
4. Collecting data and monitoring system performance
5. Analyzing areas of congestion
6. Identifying and applying strategies to implement regional objectives
7. Evaluating the effectiveness of CMP strategies.

Congestion and Air Quality

A CMP is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). In TMAs designated as ozone or carbon monoxide non-attainment areas, the CMP takes on a greater significance. Federal law prohibits projects that result in a significant increase in carrying capacity for single-occupant vehicles (SOVs) from being programmed in these areas unless the project is addressed in the region's CMP.

Flexibility in CMP Approaches

Although a CMP is required in every TMA, federal regulations are not prescriptive regarding the methods and approaches that must be used to implement a CMP. This flexibility has been provided in recognition that different metropolitan areas may face different conditions regarding traffic congestion and may have different approaches for



dealing with congestion. As a result, TMAs across the country have demonstrated compliance with the regulations in different ways.

The flexibility in the development of the CMP allows MPOs to design their own approaches and processes to fit their individual needs. The CMP continuously progresses and adjusts over time as goals and objectives change, new congestion issues arise, new information sources become available, and new strategies are identified and evaluated. As such, the Baltimore region CMP is an ongoing process, with system monitoring as a core activity over the past decade.

The following sections describe the key elements of the regional CMP.

1. Developing Congestion Management Objectives

Congestion management objectives define what the region wants to achieve regarding congestion management. They are an essential part of an objectives-driven, performance-based approach to planning for operations. Congestion management objectives serve as one of the primary points of connection between the CMP and the metropolitan transportation plan (MTP), and serve as a basis for defining the direction of the CMP and its performance measures.

Following is information on how five of the eight *Maximize2045* goals relate either directly or indirectly to the Baltimore region's CMP:

Goal: Improve System Safety

While the emphasis of this goal is to protect the traveling public, reducing the number of crashes will have the secondary effect of easing nonrecurring congestion related to incident delay.

Goal: Improve and Maintain Existing Infrastructure

As with the safety goal, the emphasis of this goal does not directly address congestion management. However, keeping pavement, bridges, signals, and intelligent transportation systems (ITS)

infrastructure in a state of good repair can help to maintain traffic flow and reduce delay. In addition, maintaining and replacing transit vehicles on a timely basis can help to encourage the use of transit as an alternative to single-occupant vehicles. And maintaining sidewalks and bikeways and paths in a state of good repair can encourage travelers to use these modes, which could reduce roadway congestion.

Goal: Improve Accessibility

This involves planning for an integrated transportation system that is accessible, equitable, and reliable for all system users and that provides for improved connectivity among all modes and across interjurisdictional and interregional boundaries. Related strategies that have guided transportation investment decisions in the Baltimore region include expanding transit options and providing facilities to better accommodate bicycles and pedestrians.

Goal: Increase Mobility

This involves integrating transportation system management and operations (TSMO) strategies that improve the performance and reliability of the existing transportation infrastructure to relieve congestion and reduce delay. Improving performance and reliability includes addressing these concerns:

- **Recurring delay** – Dealing with recurring delay can involve applying such approaches as ITS, better signal timing, implementing flextime or telework arrangements at major employment centers, hard shoulder running, and judicious capacity adding projects. Another approach that might be considered in the future is instituting congestion pricing or tolls.
- **Nonrecurring delay** – This involves incident management and providing information on delays related to incidents, construction, special events, or weather to transportation system users.

Goal: Conserve and Enhance the Environment

This involves establishing policies to reduce the use of single-occupant vehicles, thus reducing emissions from mobile sources as well as energy consumption and the use of fossil fuels. It also encompasses conserving and protecting natural and cultural resources. Programs that relate to this goal and its supporting strategies include:

- Rideshare programs
- High-occupancy vehicle (HOV) lanes
- Land use policies promoting responsible growth (discouraging transportation projects that add capacity outside of designated Priority Funding Areas and encouraging the reduction of VMT).

2. Defining the CMP Network

The CMP network involves defining two aspects of the system that will be examined as part of the planning process: (1) the geographic boundaries or area of application and (2) the system components/network of surface transportation facilities.

The primary area covered under the CMP network consists of the jurisdictions under the BRTB's function as the Baltimore region's MPO: Baltimore City, the City of Annapolis, and the counties of Anne Arundel, Baltimore, Carroll, Harford, Howard, and Queen Anne's. The travel demand model also includes and considers the effects of transportation facilities and operations within areas covered by other MPOs (e.g., Washington, DC metropolitan area; southern Pennsylvania; Cecil County, Maryland).

The system components include:

- Highway system (interstates, arterials)
- Transit system (MTA bus, light rail, MARC, local transit service providers)
- Freight routes / intermodal connections (intermodal terminals, airports, etc.)

3. Developing Multimodal Performance Measures

Performance measures are a critical component of the CMP. According to Federal regulation, the CMP shall include "appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods."

Volume-to-Capacity-Based Measures

Measures relying on volume-to-capacity ratios traditionally have been used in CMPs. This is because: (a) data on traffic volumes are usually relatively easy to obtain and often already exist, (b) travel demand models are designed to estimate future volumes on the transportation network, and (c) estimates of capacity can be derived using documents such as the Highway Capacity Manual (HCM). A limitation of volume-to-capacity measures is that they may not be readily understood by the public.

Delay and Travel Time Reliability Measures

BMC staff will produce an annual congestion report that will use performance measures adopted by the BRTB, as required by the FAST Act. These measures are:

1. **Annual hours of peak-hour excessive delay (PHED)**
2. **Level of Travel Time Reliability (LOTTR) – Interstate System:** percentage of person-miles traveled on the Interstate System that are reliable
3. **Level of Travel Time Reliability (LOTTR) – Non-Interstate System:** percentage of person-miles traveled on the non-interstate NHS that are reliable
4. **Truck Travel Time Reliability (TTTR) Index:** ratio of Interstate System mileage indicating reliable truck travel times.

Chapter 5 of this plan includes information on these measures as well as the targets the BRTB adopted to assess system performance.

The PHED measure represents the annual hours of peak-hour excessive delay that occur within an urbanized area on the National Highway System (NHS). By law, the state and the MPO must coordinate to set a single unified set of performance targets for the urbanized area. The threshold for excessive delay is based on the travel time at 20 miles per hour or 60% of the posted speed limit travel time, whichever is greater, and is measured in 15-minute intervals. Peak travel hours are defined as 6-10 a.m. local time on weekday mornings; the weekday afternoon period is 3-7 p.m. or 4-8 p.m. local time, providing flexibility to State DOTs and MPOs. MDOT calculated the PHED values by uploading posted speed limit data on segments of the NHS in the Baltimore urbanized area into a tool in the Regional Integrated Transportation Information System (RITIS).

Level of Travel Time Reliability (LOTTR) compares the time it takes to travel segments of the NHS in congested conditions (as shown by the 80th percentile time) relative to the time it takes to make a trip in “normal” conditions (as shown by the 50th percentile time). If the 80th percentile travel time divided by the 50th percentile travel time is less than 1.5, then travel time is considered to be reliable. As an example,

traffic that takes 45 minutes to travel a segment that in normal conditions takes 30 minutes results in a ratio of 1.5. This measure uses data from FHWA's National Performance Management Research Data Set (NPMRDS) or equivalent. Data are collected in 15-minute segments during all time periods between 6 a.m. and 8 p.m. local time.

The TTTR index compares the time it takes trucks to travel segments of the NHS in congested conditions (as shown by the 95th percentile time) relative to the time it takes to make a trip in “normal” conditions (as shown by the 50th percentile time). The TTTR ratio is generated by dividing the 95th percentile time by the normal time (50th percentile) for each segment. For example, say a truck takes 56 minutes to travel a segment of the NHS that normally takes 30 minutes. This translates into a ratio of 56 minutes / 30 minutes, or 1.87. Reporting for purposes of calculating the TTTR index is divided into five periods: morning peak (6-10 a.m.), midday (10 a.m. - 4 p.m.) and afternoon peak (4-8 p.m.) Mondays through Fridays; weekends (6 a.m. - 8 p.m.); and overnights for all days (8 p.m. - 6 a.m.). The TTTR index is generated by multiplying each segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.



These measures can be translated, using various assumptions, into other measures such as user costs, and can be used in the process of validating travel demand forecasting models.

Variability of Congestion/Reliability

The variability or change in congestion on a day-to-day basis provides a measure of reliability. Recurring congestion is generally predictable, regularly occurring, and typically caused by excess demand compared to the capacity of the system.

On the other hand, nonrecurring congestion—caused by transient events such as traffic incidents, weather conditions, work zones, or special events—results in unreliable travel times. Nonrecurring congestion, and the unreliable travel times that result, are often the most frustrating form of congestion to travelers. Moreover, FHWA has estimated that nonrecurring sources of congestion are responsible for a significant amount of travel delay.

Since the transportation planning models used in metropolitan transportation planning are designed to address recurring congestion issues, many regions have found it challenging to incorporate measures of nonrecurring congestion as part of their CMP. Some MPOs have used crash data as a surrogate measure for nonrecurring congestion under the premise that traffic incidents are directly linked to nonrecurring congestion. Others have begun to gather archived real-time traffic data from operating agencies to examine the variability in traffic volumes, speeds, and/or travel times on a daily basis.

BMC staff is working on developing travel time measures using both traditional sources of data and new technologies that take advantage of operations data such as probes and ITS devices.

4. Collecting Data and Monitoring System Performance

Data collection and system monitoring are needed to provide information to make effective decisions, and are typically an ongoing activity. According to federal regulation, the CMP must include:

establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions.

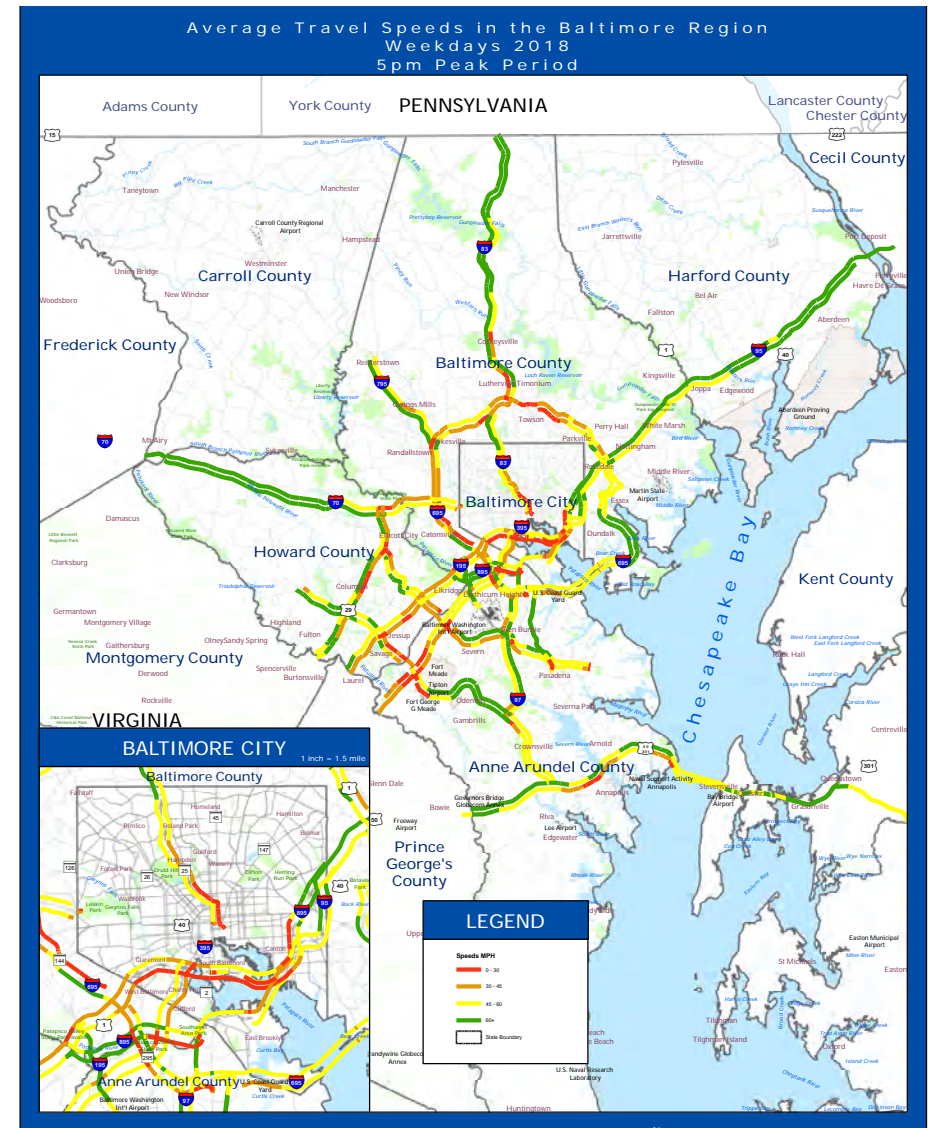
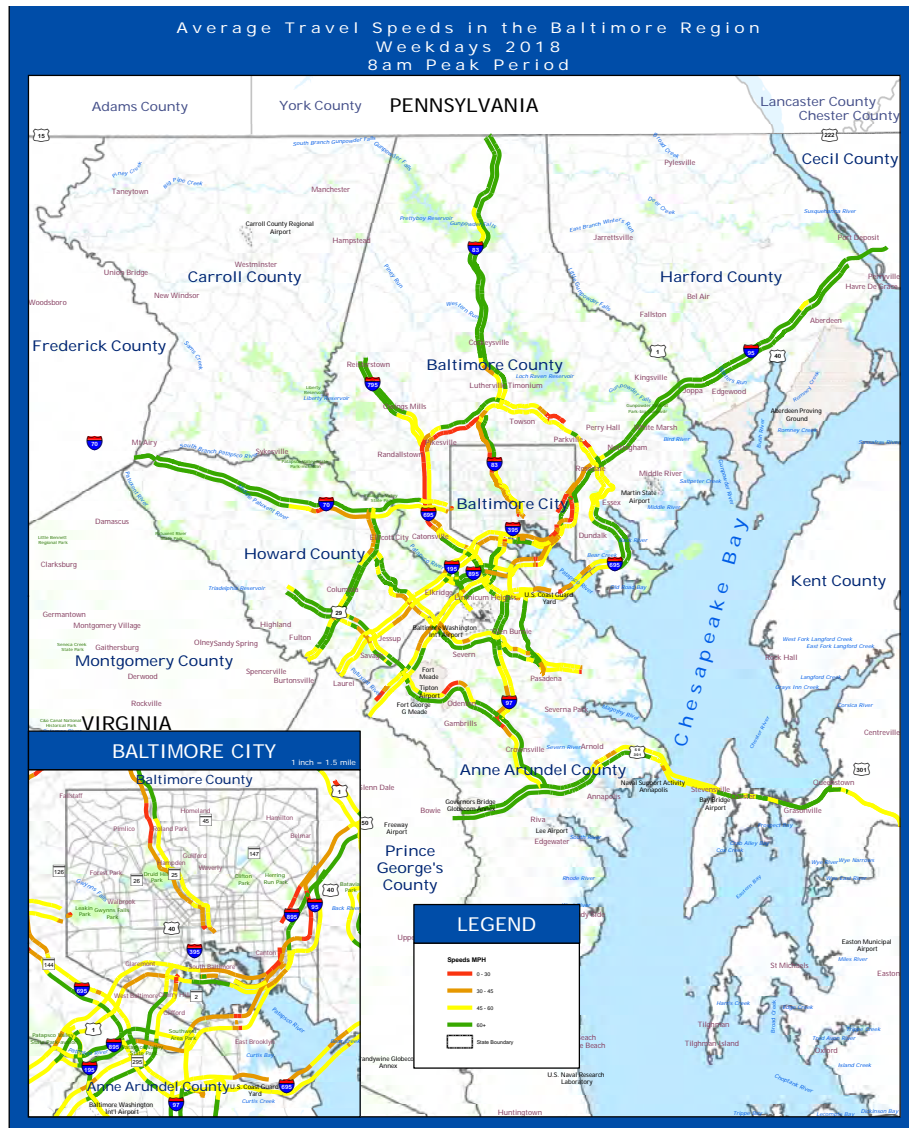
To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and with operations managers in the metropolitan area.

Using Vehicle Probe Data to Monitor Traffic

Since 2013, BMC has been in partnership with the I-95 Corridor Coalition and University of Maryland Center for Advanced Transportation Technology Lab (CATT Lab). This setup enables the agency to have access to continuous (24/7) probe data to monitor traffic conditions throughout the region. Access to the data is through the Probe Data Analytics (PDA) Suite, an online set of tools that can be accessed through a web browser. This eliminates the need for the many hours of processing of raw data that BMC's previous approach (collecting GPS speed data) required.

The PDA Suite began in 2008 with the primary goal of enabling Coalition members to acquire reliable travel time and speed data for their roadways without the need for sensors and other hardware.

The following maps show probe data collected for the a.m. and p.m. peak periods. The first map shows average 2018 travel speeds for the a.m. peak period for freeways and major arterials. The second map shows average 2018 travel speeds for the p.m. peak period for freeways and major arterials.



5. Analyzing Areas of Congestion

Analysis Based on PDA Data – Identifying Traffic Bottlenecks

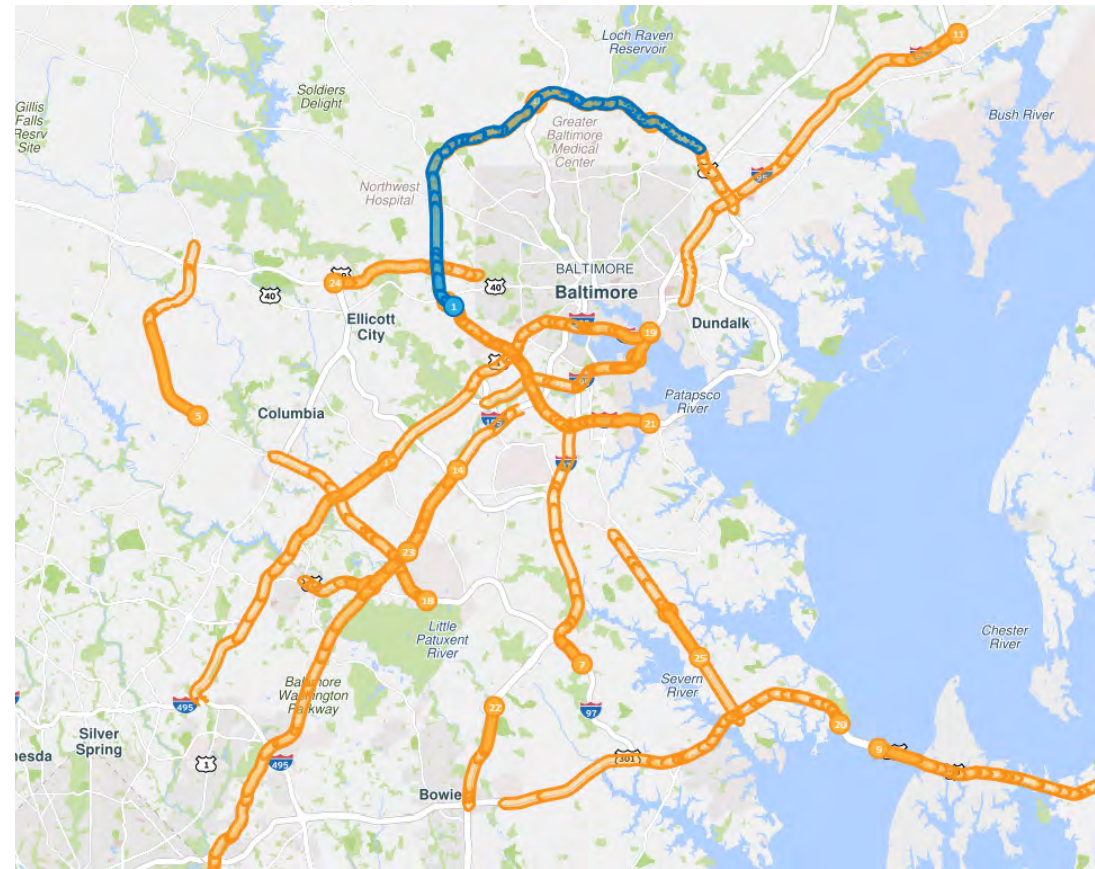
Using probe data from the PDA Suite, beginning in 2013 BMC developed the “Quarterly Congestion Analysis Report” identifying the Top 10 Bottlenecks in the Baltimore Region.

The PDA tool determines bottleneck conditions by comparing the current reported speed to the reference speed for each segment of road. INRIX provides reference speed values for each segment. These represent the 85th percentile observed speed for all time periods, with a maximum value of 65 mph. If the reported speed falls below 60 percent of the reference, the road segment is flagged as a potential bottleneck. If the reported speed stays below 60 percent for five minutes, the segment is confirmed as a bottleneck location. Adjacent road segments meeting this condition are joined together to form the bottleneck queue. When reported speeds on every segment associated with a bottleneck queue have returned to values greater than 60 percent of their reference values and have remained that way for 10 minutes, the bottleneck is considered cleared. The process ignores bottlenecks whose total queue length, determined by adding the length of each road segment associated with the bottleneck, is less than 0.3 miles.

The quarterly report identifies the top bottlenecks in the Baltimore region and ranks them by Impact Factor. This is calculated by multiplying the number of times a bottleneck occurred by its average duration by its average length.

Along with the ranking, staff attempts to assess what is causing the congestion and utilizes tools in the PDA Suite to illustrate what is occurring at each location. From the bottleneck report, staff can create specialized maps showing congested locations. Following is an example of such a map, this one showing the top 25 congested locations in 2018 based on PDA data.

Top 25 Congested Locations in 2018 (blue indicates most congested location)



Analysis of Congestion in Selected Corridors

Each year, Maryland's 23 counties and Baltimore City send "priority letters" to MDOT; this is the formal process for local jurisdictions to submit project requests for the state's Consolidated Transportation Program (CTP). These letters list the projects that the jurisdictions consider critical to addressing their transportation needs, which often include alleviating traffic congestion and addressing safety concerns.

Traditionally, priority letter projects are grouped into categories of "highway," "transit," and "bicycle and pedestrian." As noted previously, TSMO is a key tool for addressing both recurring and nonrecurring congestion, and the MDOT SHA TSMO Strategic Plan notes that TSMO will be a critical component of future programs and projects. However, TSMO projects often do not fit neatly into the traditional priority letter project categories or even within one jurisdiction.

BMC staff will work with BRTB and MDOT to develop a process for local jurisdictions to submit TSMO projects in their priority letters. MDOT SHA is embarking on a TSMO stakeholder outreach and education process; staff will participate in this process, as well as investigate other approaches as needed, to ensure all approaches for congestion management are considered.

One way staff could improve the priority letter process and help local jurisdictions address congestion is through conducting corridor studies to identify operational issues in a corridor. BMC technical analysis then could focus on better understanding the extent, duration, and causes of congestion along the corridor and on developing potential operational countermeasures for short-term efficiency and safety. Such analyses would try to capture both recurring and nonrecurring congestion.

Analysis along the selected corridor(s) also could help local jurisdictions better understand the connections among congestion, safety, land use, freight movements, and operations. This process also would establish linkages among local jurisdiction priorities, the long-range transportation plan, and the TIP. Data gathered and analyzed by BMC staff also could provide information for subsequent NEPA analysis.

The CMP consultant activity proposed for FY 2020 includes the development of a template for conducting corridor studies, with the intent that staff would use the template to prepare corridor studies in future years. Staff would coordinate with local and state partners to identify corridors to study.

6. Identifying and Applying Strategies

The CMP must identify and analyze reasonable travel demand reduction and operational management strategies. If the analysis demonstrates that these strategies cannot fully satisfy the need for additional capacity and additional SOV capacity is warranted, then the CMP must identify strategies to manage the SOV facility safely and effectively, along with other travel demand reduction and operational management strategies appropriate for the corridor.

Coordinating with Transportation Systems Management and Operations (TSMO) Activities

As stated in 23 CFR 450.320, "The congestion management process shall be developed, established, and implemented as part of the metropolitan transportation planning process that includes coordination with transportation system management and operations activities." MDOT SHA recently completed an updated TSMO Strategic Plan that states, "... TSMO will drive how we design and implement future programs and projects." The BMC will continue to work closely with its partners on TSMO activities, which are a critical component to addressing congestion.

Maximize2045 Strategies

The BRTB approved the following strategies under the goal of Improve Mobility. These strategies will help the region reduce congestion and improve traffic flow.

- Continue to refine and implement a Congestion Management Process (CMP), incorporating the regional Intelligent Transportation System architecture and transportation systems management and operations strategies.
- Prepare congestion mitigation plans, including the consideration of congestion pricing, for corridors and locations experiencing recurring high congestion levels.
- Balance capacity in the highway, transit, and freight rail systems and pedestrian and bicycle networks, including the consideration of expanded transit service coverage and hours of operation.
- Increase mobility, including traffic and transit incident response and recovery, through traffic and transit system management and operations techniques.
- Improve transportation system reliability by developing better methods of reporting delays and incidents among modal agencies and through broad-based public information distribution for interstate highways, surface streets, and the transit network.

Other strategies that might be considered in the future to help the region ease congestion are:

- Work more closely with other adjacent metropolitan areas to develop interregional approaches to measuring and managing congestion, including performance measures adopted and applied on an interregional basis. As noted previously, the Baltimore region has taken some initial steps in this area by meeting periodically with traffic and operations staff from adjacent MPOs and other state DOTs to discuss interregional approaches to improving mobility and managing congestion.
- Select relatively low-cost, “low-hanging fruit” congestion management projects (“spot” improvements, signal timing) that could be funded with CMAQ or, potentially, PL or STBG funds.

Specific Strategies – Preferred Alternative Projects

BMC staff requested some detailed information from local jurisdictions submitting projects for consideration for *Maximize2045*. Some of this information relates to strategies, either in place or under consideration, that could provide congestion management benefits for each proposed project.

The following tables show the strategies proposed for each project in the Preferred Alternative. These congestion management strategies are based on information provided by the local jurisdictions and operating agencies, as well as staff knowledge of existing operational characteristics along these project corridors.

| Transit Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|--------------------------|---|--|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 1 | MDOT SHA Harford County | MTA Commuter Bus Service | Harford County to Downtown Baltimore and to Harbor East and from Baltimore to APG | Additional MTA commuter bus service from Harford County to downtown Baltimore and Harbor East. Reverse commute route from Baltimore to Aberdeen Proving Ground. Install shelters. Extend U.S. 40 commuter service to connect with Harford Transit. | <ul style="list-style-type: none"> Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |
| 2 | MDOT SHA Harford County | Transit Signal Priority | MD 22 corridor from Harford Mall to Aberdeen train station – 13 miles MD 924 corridor from MacPhail Road to Woodsdale Road – 4 miles | Construct queue jump lanes along MD 22 and MD 924 and install equipment on buses that syncs with traffic signals along these corridors. | <ul style="list-style-type: none"> Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) |

| Transit Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|---|-----------------------------------|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| | MDOT MTA Regional | BaltimoreLink Bus Expansion Program - Phase 1 | | Purchase buses to meet increasing ridership demands that exceed replacement needs. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |
| 3 | MDOT MTA Regional | MARC Service | Northern Virginia to Philadelphia | Fill Northeast Corridor commuter rail gap by providing commuter rail service between Perryville, MD and Newark, DE. Provide additional service to Harford County, including reverse commute, late evening service, and weekend service. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|--|--|--|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 4 | MDOT SHA Anne Arundel County | MD 175 | MD 295 to MD 170 5.2 miles | Widen from 4 to 6 lanes; reconstruct MD 175/MD 295 interchange, improve MD 32 interchange, improve pedestrian/bicycle facilities. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes |
| 5 | MDOT SHA Anne Arundel County | MD 198 | MD 295 to MD 32 2.7 miles | Widen from 2 to 4 lanes and construct a continuous center median; widen ramp at MD 295; provide pedestrian/bicycle facilities within project limits. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Construct new lanes |
| 6 | Baltimore City | Hanover Street Bridge over Middle Branch | Reedbird Avenue to McComas Street 0.5 miles | Replace existing 1916 Hanover Street Bridge over Middle Branch. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|---|--|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 7 | Baltimore City | Howard Street Bridge | W Mt Royal Avenue and North Avenue 0.2 miles | Replace existing bridge, consists of two steel tied arch and six steel girder segments. These span over I-83, John Falls, MTA, Amtrak, CSX, Falls Road, and a fenced-in private lot. Improvements include enhanced bicycle and pedestrian facilities extending to the approaches of both sides of the bridge. No additional traffic capacity changes are being included as part of the project. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |
| 8 | Baltimore City | Martin Luther King Boulevard Re-Visioning | Washington Boulevard to Howard Street 1.5 miles | Roadway reconstruction and construction of "Complete Street" elements. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|--|--|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 9 | Baltimore City | U.S. 40 over Martin Luther King Jr. Boulevard Ramp Removal | N Schroeder Street to N Greene Street 0.5 miles | Remove two U.S. 40 bridges over Martin Luther King Jr. Boulevard, reconnecting N Fremont Avenue where it is currently bisected by U.S. 40. Intersection and streetscape improvements on Martin Luther King Jr. Boulevard. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |
| 10 | MDOT SHA Baltimore County | Broening Highway / I-695 | | Construct full interchange at Exit 44 of I-695 to adequately support redevelopment at Sparrows Point. | <ul style="list-style-type: none"> Add interchange Remove bottleneck |
| 11 | MDOT SHA Baltimore County | I-695 over U.S. 40 Bridge Replacement | I-695 outer loop from 1,400 ft. north of U.S. 40 to end of terminus of U.S. 40 eastbound ramp; I-695 inner loop 1,700 south of U.S. 40 to 2,100 feet north of U.S. 40. | Replace Bridge No. 0312400 on inner and outer loops of I-695 over US 40; reconfigure I-695/US 40 Interchange; widen main line of I-695; add noise and retaining walls. Add fourth lane of traffic over bridge to tie into I-695 – U.S. 40 to MD 144 outer loop widening. Fourth lane will terminate north of U.S. 40. | <ul style="list-style-type: none"> Construct new lanes Remove bottleneck |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|--------------------------|---|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 12 | MDOT SHA Baltimore County | I-695 | I-70 to MD 43 18.941 miles | Create new lane of traffic along inside shoulder of inner and outer loops during peak hours. Ramp metering and reconfiguration of I-695 / I-70 interchange. | <ul style="list-style-type: none"> Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, etc.) |
| 13 | MDOT SHA Baltimore County | MD 7 | Campbell Boulevard to Mohrs Lane 0.4 miles | Capacity, congestion relief and safety (flooding) improvements. Raise existing road and bridge above 100-year floodplain. Provide 6-lane divided section, with 2 through lanes in each direction on MD 7 and double left turns at Mohrs Lane and Campbell Boulevard. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) Construct new lanes |
| 14 | MDOT SHA Baltimore County | MD 7 / MD 43 Interchange | | Upgrade from partial to full interchange, including two new ramps to accommodate full movements at interchange. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) |
| 15 | MDOT SHA Baltimore County | MD 140 | Painters Mill Road to Owings Mills Boulevard 0.4 miles | Widen from 4 to 6 lanes; raised median and outside bicycle lanes. Bicycle and pedestrian improvements are included. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) Construct new lanes |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|-----------------------------|--|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 16 | MDOT SHA Baltimore County | MD 140 - Painters Mill Road | Reisterstown Road and Painters Mill intersection and access roads east and west of Reisterstown Road | Intersection improvements, additional left turn lane, and parallel access roads. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) |
| 17 | Baltimore County | Paper Mill Road Extension | Hunters Run Drive to York at Shawan Road 0.5 miles | Extend Paper Mill Road to intersection of York and Shawan Roads. | <ul style="list-style-type: none"> Extend road to provide additional access point |
| 18 | MDOT SHA Carroll County | MD 31 | Church Street to Coe Drive 1.0 miles | Infrastructure improvements and pavement rehabilitation; streetscaping. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) |
| 19 | MDOT SHA Carroll County | MD 851 | Howard County Line to Springfield Avenue 1.037 miles | Infrastructure improvements and pavement rehabilitation; streetscaping. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|----------------------|---|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 20 | MDOT SHA Harford County | MD 22 | MD 543 to I-95 7.9 miles | Widen existing 2- and 3-lane sections to 4 and 5 lanes; include an HOV lane from Old Post Road to APG gate, bicycle and pedestrian access, and transit queue jump lanes transit priority system where applicable. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes (HOV) Remove bottleneck Add center turn lane |
| 21 | MDOT SHA Harford County | MD 24 (Section G) | 900 feet south of Sharon Road to 1,700 feet north of Ferncliff Lane 1.86 miles | Resurfacing and reconstruction, including slope repair and guardrail replacement | |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|--|---|---|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 22 | MDOT SHA Harford County | MD 152 | U.S. 1 to I-95 6.5 miles | Roadway reconstruction. Capacity improvements, including turn lanes and bicycle and pedestrian access where applicable. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) |
| 23 | Harford County | Perryman East (Road A) | MD 715 to Michaelsville Road 2.0 miles | Construct new 2-lane road in Perryman to handle bulk of the truck traffic accessing distribution centers on the peninsula, including turn lanes and bicycle and pedestrian access. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Construct new lanes Remove bottleneck Construct overpass at congested intersection |
| 24 | Howard County | Broken Land Parkway at Snowden River Parkway | Broken Land Parkway: MD 32 to north of Snowden River Parkway; Snowden River Parkway: east of Minstrel Way to Patuxent Woods Drive 0.25 miles | Capacity, operational, and safety improvements at this signalized intersection as well as access improvements to MD 32 ramps. Includes ADA-compliant pedestrian access as well as bicycle and transit access/mobility improvements. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) Remove bottleneck |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|-----------------------------|--|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 25 | MDOT SHA Howard County | I-70 | U.S. 29 to MD 32 6.0 miles | Widen from 4 to 6 lanes; includes reconstruction of I-70 / Marriottsville Road interchange and upgrading of I-70 / U.S. 29 interchange | <ul style="list-style-type: none"> Construct new lanes Remove bottleneck |
| 26 | MDOT SHA Howard County | I-95 | MD 32 to MD 100 6.0 miles | Create peak hour shoulder use. | <ul style="list-style-type: none"> Traffic Operations Strategies: (i.e., hard shoulder running, etc.) |
| 27 | MDOT SHA Howard County | MD 100 | I-95 to Anne Arundel County line 2.0 miles | Widen MD 100 from 4 to 6 lanes with auxiliary merge/diverge lanes. | <ul style="list-style-type: none"> Construct new lanes |
| 28 | MDOT SHA Howard County | MD 175 / MD 108 Interchange | 0.25 miles to MD 175/ MD 108 intersection from all approaches. Also a direct connection to Columbia Gateway Drive. 0.25 miles | New partial grade separation to allow increased capacity and traffic flow to MD 175 and provide direct access to Gateway Drive and Columbia Gateway employment center. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck Construct overpass at congested intersection |
| 29 | MDOT SHA Howard County | U.S. 29 | Patuxent River Bridge to Seneca Drive 1.7 miles | Widen from 2 to 3 lanes in northbound direction. Includes auxiliary lanes and grade-separated interchange at Rivers Edge community. | <ul style="list-style-type: none"> Construct new lanes |

| Roadway Projects, FY 2024-2034 | | | | | |
|--------------------------------|---------------------------------|--|--|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 30 | MDOT SHA Queen Anne's County | MD 8 / U.S. 50/301 Interchange and Service Roads | Skip Jack Parkway south to Davidson Drive; east to Thompson Creek service road 7.94 miles (Thompson Creek service road) | Widen from 2 to 4 lanes, convert MD 8 overpass to divergent diamond, interchange with U.S. 50/301, and add Thompson Creek and Cox Creek service roads to improve traffic flow, add capacity and allow for alternative routes to services and residential areas. Provide for bike and pedestrian improvements along existing and new routes. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck Construct overpass at congested intersection Add interchange |
| 31 | MDOT SHA Queen Anne's County | MD 18 | Kent Narrows to Bay Bridge – MD 18 and MD 835 on east side of Kent Narrows to MD 18 4.96 miles | Widen from 2 to 4 lanes, including ROW acquisition, utility relocation, new pedestrian improvements, and reconstruction of intersections to improve capacity, safety, and mobility on the only alternative route to U.S. 50/301 on the island. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes |



| Transit Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|---------------------------|--|---|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 32 | Anne Arundel County | U.S. 50 Bus Rapid Transit | Bus Rapid Transit between New Carrollton MARC/Metro station and Parole along U.S. 50 21.0 miles | New Carrollton to Parole | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) |
| 33 | MDOT MTA Harford County | Aberdeen MARC Station | U.S. 40 at MD 132 / Bel Air Road | Transit Oriented Development (TOD); new train station, additional parking, U.S. 40 “Green Boulevard,” and Station Square Plaza - new pedestrian underpass and green, terraced plaza/amphitheater. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Land Uses (i.e., mixed-use development, transit-oriented development, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |

| Transit Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|-----------------------------------|--|--|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 34 | Howard County | Bus Rapid Transit to BWI Airport | Dorsey MARC station to BWI light rail station 9.7 miles | New bus rapid transit service: Dorsey MARC station to Arundel Mills to BWI consolidated rental car facility to BWI light rail station. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |
| 35 | Howard County | U.S. 1 Corridor Bus Rapid Transit | Dorsey MARC to College Park Purple Line Light Rail Station 19.5 miles | Bus Rapid Transit will emulate light rail operations at a lower cost, and is designed to link Howard County commuters from Dorsey MARC to Laurel MARC Station and Laurel and to College Park and Purple Line light rail. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |

| Transit Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 36 | Howard County | U.S. 29 Corridor Bus Rapid Transit | U.S. 29 / U.S. 40 to MD 198 / U.S. 29 (Burtonsville) 16 miles | Bus Rapid Transit (BRT) Ellicott City / Downtown Columbia Transit Center Location (Mall Ring Road) to MD 198 in Montgomery County; Grade-separated facilities in median of U.S. 29. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |
| | MDOT MTA Regional | BaltimoreLink Bus Expansion Program - Phase 2 | | Purchase buses to meet increasing ridership demands that exceed replacement needs. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |

| Transit Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|---|---|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| | MDOT MTA Baltimore City | New MARC Storage and Maintenance Facility | | Provide alternate location to store MARC Penn Line trains following implementation of Amtrak's Penn Station redevelopment plans, which do not accommodate current storage and maintenance at Penn Station. | <ul style="list-style-type: none"> Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |
| 37 | MDOT MTA Baltimore City | Penn-Camden Connector | Penn Line / Riverside Maintenance Yard 2.2 miles | Provide access to Riverside Yard from Penn Line for locomotive repair and maintenance | <ul style="list-style-type: none"> Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) |
| 38 | MDOT MTA Baltimore City | West Baltimore MARC Station Relocation | | Relocate existing West Baltimore MARC Station farther south. This will be consistent with construction of new B&P Tunnel and much needed ADA accessibility improvements. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Land Uses (i.e., mixed-use development, transit-oriented development, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|-------------------------------------|------|---------------------------------------|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 39 | MDOT SHA Anne Arundel County | I-97 | MD 32 to U.S. 50/301 6.5 miles | Add managed lanes (HOV lanes) to address capacity needs. Investigate need for additional interchange access in Crownsville. | <ul style="list-style-type: none"> • Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) • Managing and Pricing Assets (i.e., HOT lanes, parking management, etc.) • Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) • Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) • Construct new lanes (HOV) • Remove bottleneck • Construct overpass at congested intersection |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|-------------------------------------|------|------------------------------------|--|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 40 | MDOT SHA Anne Arundel County | MD 2 | U.S. 50 to I-695 17.0 miles | Widen 4-lane sections to 6 lanes throughout. Roadway improvements, new premium transit service, new sidewalks, and permitting land use densities that support transit in select locations where redevelopment might occur. | <ul style="list-style-type: none"> • Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) • Land Uses (i.e., mixed-use development, transit-oriented development, etc.) • Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) • Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) • Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) • Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) • Construct new lanes • Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|-------------------------------------|------|----------------------------------|--|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 41 | MDOT SHA Anne Arundel County | MD 3 | MD 424 to MD 32 4.0 miles | Widen from 4 to 6 lanes from St Stephen Church Road to MD 175. Upgrade roadway segments, improve bike/pedestrian facilities (especially crossings), and improve intersection operations. | <ul style="list-style-type: none"> • Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) • Managing and Pricing Assets (i.e., HOT lanes, parking management, etc.) • Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) • Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) • Construct new lanes (HOV) • Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 42 | MDOT SHA Anne Arundel County | MD 32 | I-97 to Howard County 11 miles | Widen from 6 to 8 lanes between I-95 and MD-295. Add additional HOV-2 lanes. | <ul style="list-style-type: none"> • Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) • Managing and Pricing Assets (i.e., HOT lanes, parking management, etc.) • Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) • Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) • Construct new lanes (HOV) • Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 43 | MDOT SHA Anne Arundel County | MD 100 | Howard County line to I-97 6.5 miles | Widen from 4 to 6 lanes. Possible inclusion of managed lanes | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Managing and Pricing Assets (i.e., HOT lanes, parking management, etc.) Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) Construct new lanes (HOV) Remove bottleneck |
| 44 | MDOT SHA Anne Arundel County | MD 177 | MD 177 from MD 2 to Lake Shore Drive 7.8 miles | Widen from 2 to 4 lanes. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Remove bottleneck Add center turn lane |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 45 | MDOT SHA Anne Arundel County | MD 214 | MD 424 to Shoreham Beach Road 7.5 miles | Widen from 2 to 4 lanes for most of this corridor (from MD 424 to Selby Boulevard). Bicycle improvements throughout most of the corridor and pedestrian improvements in segments. Traffic signal warrant assessments recommended at MD 214 / Riva Road and MD 214 / Stepneys Lane intersections. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Remove bottleneck Add center turn lane |
| 46 | MDOT SHA Anne Arundel County | MD 295 | MD 100 to I-195 3.27 miles | Widen from 4 to 6 lanes. Includes a new interchange at Hanover Road and an extension of Hanover Road from the CSX railroad tracks to MD 170. | <ul style="list-style-type: none"> Construct new lanes Add interchange |
| 47 | MDOT SHA Anne Arundel County | MD 713 (Ridge Road) | MD 175 to MD 176 2.6 miles | Corridorwide road improvements, including reconstruction and widening, as well as intersection improvements and bike/pedestrian accommodations. Primarily widening MD 713 from 2 to 4 lanes between MD 175 and Stoney Run Drive. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|---------------------|---------------------------|--------------------------|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 48 | Anne Arundel County | MDOT SHA U.S. 50 | I-97 to MD 2 5.5 miles | Widen from 6 to 8 lanes. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Public Transportation – Capacity Strategies (i.e., reserved travel lanes or rights-of-way for transit operators, more frequent service, expanded hours of service, expanded coverage network, etc.) Construct new lanes Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|------------------|--|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 49 | Baltimore City | Baltimore Street | MLK Boulevard to President Street 1.2 miles | Roadway reconstruction using concrete, utility upgrades/ replacements, sidewalk reconstruction, ADA improvements, curb and gutter reconstruction, signal upgrades, pavement markings and signing, stormwater management facilities, landscaping, and streetscaping elements. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) |
| 50 | MDOT SHA Baltimore County | I-795 | Owings Mills Boulevard to Franklin Boulevard 2.63 miles | Widen from 4 to 6 lanes. Construct interchange at Dolfield Boulevard. | <ul style="list-style-type: none"> Construct new lanes Add interchange |
| 51 | MDOT SHA Carroll County | MD 26 | MD 32 to Liberty Reservoir 2.6 miles | Widen from 4 to 6 lanes, including bike and pedestrian facilities. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Construct new lanes |
| 52 | MDOT SHA Carroll County | MD 32 | MD 26 to Howard County line 3.364 miles | Widen from 2 to 4 lanes; addition of pedestrian and bicycle facilities. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Construct new lanes |
| 53 | MDOT SHA Carroll County | MD 97 | MD 140 Overpass to Bachmans Valley Road 4.73 miles | Widen from 2 to 5 lanes, including MD 140 / Meadow Branch Road interchange; construct pedestrian and bicycle facilities. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Construct new lanes Add center turn lane Add interchange |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|-------------------------------|---|--|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 54 | MDOT SHA Carroll County | MD 140 | Market Street to Sullivan Road 2.5 miles | Widen from 6 to 8 lanes. Construct full interchange at MD 97 and Continuous Flow Intersections (CFIs) at Center Street and Englar Road. Construct outside bike lane and sidewalk in both directions. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes |
| 55 | MDOT SHA Carroll County | MD 140 at MD 91 (Gamber Road) | Baltimore County Line to Kays Mill Road 1.85 miles | Divided highway with new interchange at MD 91 and intersection improvements. Add pedestrian and bicycle facilities. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes |
| 56 | Harford County | Abingdon Road | MD 924 to U.S. 40 3.0 miles | Capacity improvements, including turn lanes, bicycle lanes, and sidewalks. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 57 | MDOT SHA Harford County | MD 24 | U.S. 1 Bypass to south of Singer Road 5.5 miles | Widen from 4 to 6 lanes; includes sidewalks and bicycle accommodations where appropriate. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes |
| 58 | MDOT SHA Harford County | MD 24 (Rock Spring Road) | U.S. 1 Bypass to MD 23 1.8 miles | Add travel lane in each direction, including turn lanes and completion of shared-use path from Forest Valley Road to Red Pump Road adjacent to roadway. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck |
| 59 | MDOT SHA Harford County | MD 24 at Singer Road Interchange | | Elevate grade of cross street through movement as well as left turn movements from all directions while allowing MD 24 through and right turn movements as well as side street right turn movements to operate with free-flowing movements (as described in MD 924 study). | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Remove bottleneck Construct overpass at congested intersection |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|---------------------------------|-----------------------------|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 60 | MDOT SHA Harford County | MD 24 at Wheel Road Interchange | | Elevate grade of cross street through movement as well as left turn movements from all directions while allowing MD 24 through and right turn movements as well as side street right turn movements to operate with free-flowing movements (as described in MD 924 study). | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Remove bottleneck Construct overpass at congested intersection |
| 61 | MDOT SHA Harford County | MD 543 | MD 136 to I-95 2.2 miles | Widen from 2 to 4 lanes, including intersection upgrades at MD 136, turn lanes, and bicycle and pedestrian access. Includes capacity upgrades to MD 543 / I-95 interchange. Improvement will fix queuing problems on MD 543 through intersection with MD 7. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck Construct overpass at congested intersection |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 62 | Harford County | Thomas Run Road | MD 22 to West Medical Hall Road 0.8 miles | Streetscape and capacity improvements, including center turn lane, sidewalks, bicycle accessibility, pedestrian-scale lighting with banners, crosswalks, street furniture, and trash receptacles. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Construct new lanes Add center turn lane |
| 63 | MDOT SHA Harford County | U.S. 1 | MD 152 to MD 147 / U.S. 1 Business 1.3 miles | Widen from 4 to 6 lanes, including bicycle and pedestrian accommodations. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck Add center turn lane |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|---------------|---|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 64 | MDOT SHA Harford County | U.S. 1 Bypass | MD 147 / U.S. 1 Business to Hickory Bypass 4.6 miles | Widen from 2 to 4 lanes. Improve U.S. 1 / MD 24 and U.S. 1 / MD 924 interchanges. | <ul style="list-style-type: none"> • Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) • Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) • Construct new lanes • Remove bottleneck • Construct overpass at congested intersection |
| 65 | MDOT SHA Harford County | U.S. 40 | MD 543 to Loflin Road 1.7 miles | Widen from 4 lanes to 6 lanes, including turn lanes and bicycle and pedestrian access. | <ul style="list-style-type: none"> • Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) • Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) • Construct new lanes • Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|-----------------------------|--|---|---|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 66 | MDOT SHA Harford County | U.S. 40 / MD 22 Interchange | 0.4 miles | Capacity and safety improvements. Interchange reconstruction (reconfigure existing partial interchange to full interchange to eliminate left turns along MD 22). Sidewalks, crosswalks, and bicycle facilities where applicable. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Remove bottleneck Construct overpass at congested intersection |
| 67 | MDOT SHA Howard County | MD 32 | Cedar Lane to Anne Arundel County line 8.0 miles | Widen from 4 to 6 lanes (Feasibility and Needs Study required). Increase capacity at grade separations. Study feasibility of future HOV and/or HOT lanes. | <ul style="list-style-type: none"> Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) Construct new lanes Remove bottleneck |
| 68 | MDOT SHA Howard County | MD 32 | MD 32 just north of I-70 to Carroll County line 4.0 miles | Widen from 2 to 4 lanes. Safety, capacity, operational, and access improvements consistent with MD SHA Feasibility Study, MD SHA Access Control Study, and Carroll County proposal for widening MD 32 north of this project's limits. | <ul style="list-style-type: none"> Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 69 | MDOT SHA Howard County | MD 108 | Trotter Road to Guilford Road 1.5 miles | Improvements as articulated in 2014 Clarksville Pike Streetscape Plan and Design Guidelines / Traffic Study. Includes selected road capacity improvements, resulting in a 4-lane section for most of the corridor, but not all, as well as sidewalks, shared-use paths, and traffic signal upgrades. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Construct new lanes Remove bottleneck |
| 70 | MDOT SHA Howard County | MD 175 | Oceano Avenue to Anne Arundel County line 1.6 miles | Widening: going from one travel lane in some areas (both directions) to two travel lanes for entire project. Also, bicycle, transit, and pedestrian improvements consistent with Anne Arundel County widening proposals. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) Construct new lanes |

| Roadway Projects, FY 2035-2045 | | | | | |
|--------------------------------|---------------------------------|-----------------------------|--|--|--|
| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 71 | MDOT SHA Howard County | MD 175 / I-95 Interchange | 1.0 miles | Improvements to interchange, including CD lanes on I-95, consistent with preferred options in MDOT-SHA MD 175 Improvement Study. | <ul style="list-style-type: none"> • Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) • Construct new lanes • Remove bottleneck • Construct overpass at congested intersection |
| 72 | MDOT SHA Howard County | U.S. 1 | Prince George's County line to Baltimore County line 11.0 miles | Widen from 4 to 6 lanes; construct typical section as defined in State/ County MOU for U.S. 1 revitalization | <ul style="list-style-type: none"> • Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) • Construct new lanes |
| 73 | MDOT SHA Howard County | U.S. 1 / MD 175 Interchange | MD 175 0.5 miles | Construct new grade-separated interchange. | <ul style="list-style-type: none"> • Traffic Operations Strategies: (i.e., ramp metering, hard shoulder running, reversible commuter lanes, etc.) • Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) • Traffic Operations Strategies: (i.e., Integrated Corridor Management approach, connected vehicle infrastructure, controlled by traffic management center, traffic incident management, traveler information systems, work zone management, special event (planned and unplanned) coordination, etc.) • Construct overpass at congested intersection |

| Roadway Projects, FY 2035-2045 | | | | | |
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| Map ID | Operating Agency / Jurisdiction | Name | Limits / Length | Description | Likely Congestion Management Strategies |
| 74 | MDOT SHA Howard County | U.S. 1 Revitalization Projects | MD 175 to Whiskey Bottom Rd 4.5 miles | U.S. 1 - MD 175 to Whiskey Bottom Road: widening, pedestrian, bike, transit, streetscape, and access improvements consistent with U.S. 1 Design Manual (to the extent possible); developer participation with SHA coordination and SHA/ County MOU for U.S. 1 revitalization cross section. Breakout project. | <ul style="list-style-type: none"> Promote alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park-and-ride lot, etc.) Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.) Accessibility Strategies (i.e., improvements to bicycle and pedestrian facilities to provide access to transit stops, provisions for bicycles on transit vehicles and at transit stops, etc.) Construct new lanes |

Establishing Implementation Schedules / Identifying Possible Funding Sources

This appendix mentioned MDOT's TSMO activities in a preceding section. These activities will provide schedules and funding sources for specific projects focused on management and operational approaches. In addition, the preceding tables showing Preferred Alternative projects and the periods in which they might be implemented can be the basis for additional planning. TIP projects, which have specific implementation schedules and committed funding, flow from the projects and programs identified in the metropolitan transportation plan. Some of these TIP projects focus on mitigating traffic congestion.

7. Evaluating Effectiveness of CMP Strategies

As noted in the discussions under steps 4 and 5, data from the PDA Suite and analyses using PDA Suite and other data provide information on congestion problem areas. The ongoing program provides BMC staff and other planners with feedback on the performance of the highway system and provides insight for future decisions.

In addition, the FAST Act performance measures and targets aimed at mitigating congestion and improving travel time reliability will provide the BRTB and its partners with a systematic, coordinated approach to monitoring progress and guiding investment decisions.