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maximize2040 * com



Maximize2040 is an initiative of the Baltimore Regional Transportation Board, the metropolitan planning organization for the Baltimore region.

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Summary / Overview



Regional Transportation Plan – Maximize2040

Maximize2040: A Performance-Based Transportation Plan is the long-range transportation plan for the Baltimore region. This region covers Anne Arundel, Baltimore, Carroll, Harford, and Howard counties and Baltimore City. *Maximize2040* covers the period from 2020 through 2040.

Baltimore Regional Transportation Board (BRTB)

Representatives from the jurisdictions noted above—as well as from the City of Annapolis; the Maryland departments of Transportation, the Environment, and Planning; and the Maryland Transit Administration—make up the Baltimore Regional Transportation Board. The BRTB is an 11-member policy board responsible for various transportation planning functions. These include:

- Coordinate federal funding for transportation.
- Conduct transportation planning in cooperation with federal agencies, state agencies, and the operators of publicly owned transit services.
- Ensure that transportation expenditures are based on a continuing, cooperative, and comprehensive (3-C) planning process.
- Provide reasonable opportunity for input from the public and interested parties.

Moving Ahead for Progress in the 21st Century (MAP-21)



MAP-21 is the federal law, enacted in June 2012, that establishes the requirements of, and authorizes the funding for, federal surface transportation programs. MAP-21 provides the framework for Federal Highway Administration and Federal Transit Administration regulations and policies. These regulations and policies guide how federal agencies, states, transit providers, and local jurisdictions plan, fund, and implement projects.

Maximize2040 was developed in accordance with MAP-21 requirements as well as other applicable federal, state, regional, and local regulations and policies.

Chapter 1 of this document provides additional information on the laws, regulations, and policies the BRTB followed in developing this plan.

Appendix A is a glossary of transportation planning terms and concepts.







Regional Goals and Performance Measures

The BRTB has adopted nine regional transportation goals, with supporting performance measures and targets. These goals, measures, and targets will help the BRTB to guide and gauge the effectiveness of transportation investments over the 2020-2040 period.

Chapter 2 provides additional information on the regional goals and performance measures. This chapter also includes a "state-of-the-system" section that shows how the region's transportation systems are performing currently relative to the adopted performance measures. This state-of-the-system information can serve as a baseline for gauging progress in the future.

For more information on specific implementation strategies the BRTB has adopted to support the regional goals, see Appendix D.

Regional Transportation Goals

Improve System Safety

Make conditions safer for pedestrians, bicyclists, transit riders, and motorists.

Improve and Maintain the Existing Infrastructure

Improve the conditions of existing transportation facilities; systematically maintain and replace transportation assets as needed.

Improve Accessibility

Help people of all ages and abilities to access specific destinations.

Increase Mobility

Help people and freight to move reliably and efficiently.

Conserve and Enhance the Environment

Pass on to future generations the healthiest natural and human environments possible.

Improve System Security

Provide a secure traveling environment for everyone; improve the region's ability to respond to natural or man-made disasters.

Promote Prosperity and Economic Opportunity

Support the revitalization of communities, the development of activity centers, and the movement of goods and services.

Foster Participation and Cooperation Among Stakeholders

Enable all interested and affected parties to participate and cooperate to find workable solutions.

Promote Informed Decision Making

Ensure that adopted transportation policies and performance measures guide the regional decision making process.



Summary / Overview

Regional Performance Measures – Emphasis Areas Required by MAP-21

System Safety – Roadways (the following safety measures apply to all public roads)

- Reduce serious injuries per 100 million vehicle miles traveled (VMT) to 3.0 by 2040.
- Reduce fatalities per 100 million VMT to zero by 2040.
- Reduce number of serious injuries to 676 by 2040.
- Reduce number of fatalities to zero by 2040.

System Safety – Transit (the following measure applies to both MTA and local transit agencies)

• Reduce number of preventable crashes per 100,000 revenue vehicle miles to zero by 2040.

System Conditions – Roadways and Bridges

- Maintain portion of state-owned roadway miles with acceptable ride quality at 82% or above.
- Maintain portion of structurally deficient state and local bridges below 5.0%.

System Conditions – Transit

• Maintain average age of MTA and local transit agency bus fleets below 7.0 years.

System Performance – Congestion

 Maintain portion of VMT in congested conditions on stateowned arterials during the evening peak hour (5-6 PM) below 25%.

System Performance – Freight

• Maintain average truck turnaround time at Seagirt Marine Terminal below 58 minutes.

System Performance – Emissions

 Maintain levels of VOC, NOx, PM_{2.5}, and CO emissions at levels less than motor vehicle emission budgets in the State Implementation Plan.

Measures Beyond MAP-21 Requirements – Accessibility

- Increase percentage of urban area state-owned directional roadway miles that have sidewalks (both sides of the roadway) to 25% by 2040.
- Increase bicycle/walk-to-work mode share to 5.0% by 2040.
- Increase average weekday MTA and local agency transit ridership (all modes) to 500,000 by 2040.













Revenue Forecast / Fiscal Constraint

MAP-21 requires regional transportation plans to be fiscally constrained. That is, the total estimated costs of projects and programs cannot exceed forecasted revenue levels.

Forecasted Revenues, 2020-2040

Below is a summary of how much future revenue from public and private sources the region reasonably anticipates will be available for the period from 2020-2040:

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Total revenues:	\$57.646 billion
 Major expansion projects: 	\$15.590 billion
System preservation:	\$12.102 billion
System operations:	\$29.954 billion

Chapter 3 of this document provides additional details on forecasted revenues.

Appendix E includes supplementary material explaining how MDOT arrived at its forecasted revenues as well as additional details on the methodologies used to develop cost estimates.

Note: The development of *Maximize2040* was an 18-month process. One of the early components was the financial forecast. The forecast included an increased state share of funding to cover the cost of a New Starts project (Red Line light rail project) that was in the last regional transportation plan. Late in the process of developing *Maximize2040*, the new administration decided to withdraw the project from the New Starts Program. The state funding set aside for this project will be reallocated to other projects within the state of Maryland but not necessarily within the BRTB's region. The state as a member of the BRTB will continue to work and coordinate with the other BRTB members to address additional monies available to the Baltimore region.

Total Estimated Year of Expenditure (YOE) Costs, Preferred Alternative, 2020-2040

The BRTB, working with local jurisdictions and state agencies, developed a Preferred Alternative for the Baltimore region. This Preferred Alternative consists of funding allocated for operation and maintenance of the existing systems as well as for implementation of major system expansion projects. Below is a summary of the total estimated YOE costs for this Preferred Alternative:

 Total estimated costs: 	\$54.540 billion	
 Major expansion projects: 	\$12.484 billion	(23%)
System preservation:	\$12.102 billion	(22%)
System operations:	\$29.954 billion	(55%)



Summary / Overview

Cost of Major Expansion Projects and Programs

The chart below shows the breakdown of estimated costs for the system expansion projects.



Note: The total of \$12.484 billion allocated to major expansion projects includes both specific projects as well as amounts the BRTB has set aside potentially to implement smaller programs or projects that address multimodal and air quality issues of concern to the region. The amount projected for specific major projects is \$11.888 billion, and the amount projected for small program set-asides is \$620 million. The BRTB has divided this \$620 million total as follows.

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•	Total estimated costs for set-asides:	\$620 million
•	Transportation Emission Reduction Measures (TERMs):	<u>\$285 million</u>
•	Complete Streets / Bicycle-Pedestrian:	\$155 million
•	Ladders of Opportunity ¹ :	\$100 million
•	Transportation System Management and Operations (TSMO):	\$80 million

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Chapter 4 provides additional details about potential strategies and investments that could be funded through these set-asides.

¹ Potential investments that could help the region implement some of the recommendations from The Opportunity Collaborative's *Regional Plan for Sustainable Development*.









Locations of Major Expansion Projects and Programs

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Summary / Overview

Major Expansion Projects and Programs

Following is a summary list of the major surface transportation projects and programs the region can reasonably expect to implement in the period from 2020-2040, given forecasted revenues and estimated costs. Chapter 4 provides additional information about these projects and programs.

Anticipated Transit Projects, FY 2020-2029

Map ID	Project Name	Limits	Description	Estimated Cost (YOE)
	MARC Growth and Investment Phase 1		Improvements to MARC mainline capacity, maintenance facilities, and station areas	\$258,000,000
	MTA Bus Expansion Program Phase 1		Purchase of buses to meet increasing ridership demands (beyond replacement needs), 2020-2029	\$60,000,000
	MTA Commuter Bus Service	Harford County to downtown Baltimore and Harbor East; from Baltimore to Aberdeen Proving Ground (APG)	Additional service to downtown Baltimore / Harbor East; reverse commute from Baltimore to APG; connection of U.S. 40 service with Harford Transit	\$2,000,000
0	Bayview MARC and Intermodal Station	Lombard Street at Bayview Boulevard	New station	\$73,000,000
1	West Baltimore MARC station		Station upgrades	\$64,000,000
2	TrailBlazer Transit Hub	Undefined; general Westminster area	Centrally located facility to enable transfers and travel training for TrailBlazer riders	\$2,000,000
			Anticipated Transit Investments, 2020-2029	\$459,000,000

Anticipated Highway Projects, FY 2020-2029

Map ID	Project Name	Limits	Description	Estimated Cost (YOE)
3	MD 175	Anne Arundel County line to MD 170	Widen from 2 to 3 lanes from Howard County line to MD 295 Widen from 4 to 6 lanes from MD 295 to MD 170	\$274,000,000
4	U.S. 50/301	I-97 to MD 2	Bridge reconstruction/widening; movable barrier on bridge	\$353,000,000
5	Moravia Road	Belair Road to Sinclair Lane	Roadway, curb, and sidewalk rehabilitation; ADA improvements; streetscape elements	\$12,000,000







Map ID	Project Name	Limits	Description	Estimated Cost (YOE)
6	I-83 over Padonia Road		Reconstruct I-83 bridge; pedestrian and bike improvements to Padonia Road	\$12,000,000
7	I-695	I-95 to MD 122	Widen from 6 to 8 lanes	\$456,000,000
8	MD 26	Rolling Road to Courtleigh Drive	Roadway, curb, sidewalk, bicycle, ADA, and pedestrian improvements	\$24,000,000
9	MD 140 / Painters Mill Road	MD 140 / Painters Mill intersection; access roads east and west of MD 140	Intersection improvements, additional left turn lane, and parallel access roads	\$21,000,000
10	MD 140	Garrison View Road to Owings Mills Road	Widen from 4 to 6 lanes; northbound third lane drops north of Owings Mills Boulevard	\$36,000,000
11	MD 26	MD 32 to Reservoir	Widen from 4 to 6 lanes; addition of pedestrian and bicycle facilities	\$91,000,000
12	MD 31 (New Windsor Main Street / High Street)	Church Street to Coe Drive	Infrastructure improvements and pavement rehabilitation	\$15,000,000
13	MD 851 (Sykesville Main Street / Springfield Avenue)	Howard County line to Cooper Drive	Infrastructure improvements and pavement rehabilitation	\$9,000,000
14	MD 24 – Section G	900 feet south of Sharon Road to 1,700 feet north of Ferncliff Lane	Resurfacing and reconstruction, including slope repair and guardrail replacement	\$12,000,000
15	I-70	U.S. 29 to U.S. 40 (near MD 32)	Widen from 4 to 6 lanes; includes reconstruction of I-70 / Marriottsville Road interchange and upgrading of I-70 / U.S. 29 interchange	\$712,000,000
16	Snowden River Parkway	Oakland Mills Road to Broken Land Parkway	Widen from 4 to 6 lanes; includes auxiliary lanes and pedestrian, bicycle, and transit improvements on both sides of road	\$18,000,000
17	U.S. 1 / MD 175 Interchange		Grade separation at U.S. 1 / MD 175 coordinated with I-95 / MD 175 improvements; consistent with SHA's "MD 175 Improvement Study"	\$122,000,000
			Anticipated Roadway Investments, 2020-2029	\$2,167,000000

Anticipated Highway Projects, FY 2020-2029



Summary / Overview

Antic	Anticipated Transit Projects, FY 2030-2040								
Map ID	Project Name	Limits	Description	Estimated Cost (YOE)					
18	U.S. 50 Bus Rapid Transit	Proposed Annapolis- Parole Intermodal Center to Prince George's County line	New bus rapid transit service	\$711,000,000					
19	Bus Rapid Transit to BWI Airport	Dorsey MARC station to BWI light rail station	New bus rapid transit service: Dorsey MARC station to Arundel Mills to BWI consolidated rental car facility to BWI light rail station	\$293,000,000					
20	Green Line	Johns Hopkins Hospital to North Avenue	Extension of Metro line, including two new stations (at Amtrak line and North Avenue)	\$1,692,000,000					
21	Aberdeen MARC Station Transit Oriented Development (TOD)	U.S. 40 at MD 132 / Bel Air Road	New train station, additional parking, U.S. 40 "Green Boulevard," Station Square Plaza	\$70,000,000					
22	U.S. 29 Bus Rapid Transit	U.S. 29 at Mount Hebron to MD 198 / U.S. 29 (Burtonsville)	New bus rapid transit service	\$480,000,000					
	MARC Growth and Investment Phase 2		Improvements to MARC mainline capacity, maintenance facilities, and station areas	\$410,000,000					
	MTA Bus Expansion Program Phase 2		Purchase of buses to meet increasing ridership demands (beyond replacement needs), 2030-2040	\$95,000,000					
			Anticipated Transit Investments, 2030-2040	\$3,751,000,000					

Anticipated Highway Projects, FY 2030-2040

Map ID	Project Name	Limits	Description	Estimated Cost (YOE)
23	MD 100	Howard County line to I-97	Widen from 4 to 6 lanes	\$567,000,000
24	MD 198	MD 295 to MD 32	Widen from 2 to 4 lanes to provide easier access to Ft. Meade and Odenton Town Center	\$302,000,000
25	MD 295	I-195 to MD 100	Widen from 4 to 6 lanes	\$287,000,000







Anticipated	l Highway	Projects, F	Y 2030-2040
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Map ID	Project Name	Limits	Description	Estimated Cost (YOE)
26	MD 713	MD 175 to MD 176	Widen from 2 to 4 lanes: MD 175 to Arundel Mills Boulevard Widen from 4 to 6 lanes: Arundel Mills Boulevard to MD 176	\$166,000,000
27	I-695 / Broening Highway		Full interchange at Exit 44 of I-695 to support redevelopment at Sparrows Point	\$121,000,000
28	I-695	l-95 to l-83	Widen from 6 to 8 lanes; allows for future lanes from I-95 SW to I-95 NE	\$1,043,000,000
29	I-795	Franklin Boulevard to Owings Mills Boulevard	Widen from 4 to 6 lanes, including addition of auxiliary lanes to Owings Mills Boulevard; includes new interchange at Dolfield Boulevard	\$219,000,000
30	MD 32	MD 26 to Howard County line	Widen from 2 to 4 lanes; addition of pedestrian and bicycle facilities	\$189,000,000
31	MD 97 North	MD 140 overpass to Bachmans Valley Road	Widen from 2 to 5 lanes, including interchange at Meadow Branch Road; addition of pedestrian and bicycle facilities	\$181,000,000
32	MD 140 at MD 91	Baltimore County line to Kays Mill Road	Divided highway with new interchange at MD 91 and intersection improvements, addition of pedestrian and bicycle facilities	\$197,000,000
33	MD 140	Market Street to Sullivan Road	Widen from 6 to 8 lanes, full interchange at MD 97 (Malcolm Drive), Continuous Flow Intersection (CFI) at Center Street and Englar Road, addition of pedestrian and bicycle facilities	\$401,000,000
34	MD 22	MD 543 to APG Gate	Widen existing 2- and 3-lane section to 4 and 5 lanes; include HOV lane from Old Post Road to APG gate; bicycle and pedestrian access and transit queue jump lanes where applicable	\$537,000,000
35	MD 24	U.S. 1 Bypass to south of Singer Road	Widen from 4 to 6 lanes; includes sidewalks and bicycle accommodations where appropriate	\$249,000,000
36	U.S. 1	MD 152 to MD 147 / U.S. 1 Business	Widen from 4 to 6 lanes, including bicycle and pedestrian accommodations	\$296,000,000
37	U.S. 1 Bypass	MD 147 / U.S. 1 Business to north of MD 24 / MD 924	Widen from 2 to 4 lanes; improve U.S. 1 / MD 24 and U.S. 1 / MD 924 interchanges	\$127,000,000



Summary / Overview

Antio	Anticipated Highway Projects, FY 2030-2040									
Map ID	Project Name	Limits	Description	Estimated Cost (YOE)						
38	MD 32	MD 108 to I-70	Widen from 2 to 4 lanes; includes new interchanges at Rosemary Lane and MD 144 and upgrades to I-70 interchange	\$355,000,000						
39	MD 32	North of I-70	Widen from 2 to 4 lanes; safety, operational, and access improvements; consistent with Carroll County proposal for widening MD 32 north of this project's limits	\$38,000,000						
40	MD 108	Trotter Road to Guilford Road	Widen roadway where needed/ possible to 4 lanes; includes 8- to 10-foot pedestrian/bicycle pathways and new signalized intersections (including pedestrian actuation)	\$23,000,000						
41	U.S. 1 Typical Section	Montevideo Road north to MD 100	Widen from 4 to 6 lanes; construct typical section as defined in State/ County MOU for U.S. 1 revitalization	\$98,000,000						
42	U.S. 29	Patuxent River Bridge to Seneca Drive	Widen from 4 to 6 lanes; includes auxiliary lanes and grade-separated access to community of Rivers Edge	\$91,000,000						
			Anticipated Roadway Investments, 2030-2040	\$5,487,000000						

Supplementary Material – Where to Find It

Predicting and Preparing for Future Conditions

This document represents the BRTB's attempt to provide a realistic plan for funding future surface transportation systems in the region. This has involved balancing an understanding of current conditions and needs with the recognition that some future conditions and needs may be unpredictable.

Some of the challenges facing this (and other) regions include:

- improving and maintaining existing infrastructure
- connecting people to jobs and other opportunities
- moving goods to promote continued economic growth
- conserving and enhancing environmental resources
- finding the funding to meet transportation needs and aspirations.

Appendix B provides additional details on some of the factors (e.g., projected population and employment growth, environmental issues, etc.) that will affect how the region addresses these challenges. The region must account for these factors in modeling and predicting how major projects might affect transportation systems.







Appendix C goes beyond the traditional modeling-and-predicting process. Appendix C describes the "scenario thinking" activities the region undertook in developing *Maximize2040*. This scenario initiative was an attempt to understand and better prepare for unpredictable, potentially "game-changing" future forces and conditions.

Effects of Projects and Programs

Appendix F gives details about the process the BRTB followed to select major expansion projects for *Maximize2040*. This involved evaluating and scoring candidate projects on the basis of how well they address regional needs and advance national and regional goals and policies.

Appendix G provides information about the technical analyses the BMC staff conducted in developing *Maximize2040*. These analyses help the BRTB to evaluate and understand the potential effects of the major projects and programs of this plan relative to adopted transportation goals, policies, and performance measures.

Congestion Management Process

Appendix H provides information on strategies the region proposes to follow to improve transportation system performance. These strategies represent a systematic Congestion Management Process (CMP). The CMP is a framework that can provide for safe, effective, and integrated management and operation of the multimodal transportation system.

Public/Stakeholder Involvement Process

Appendix I provides details on the approaches and specific steps the BRTB followed in consulting with state and local officials, transit operators, and the public during the development of *Maximize2040*.

Throughout the planning process to develop *Maximize2040*, the BRTB provided members of the public and other stakeholders with opportunities to:

- · provide comments on draft goals and measures
- · give opinions on potentially game-changing future forces and trends
- submit project ideas
- review draft plans
- attend public meetings
- give the BRTB feedback.

Readers who would like to see specific public comments on draft elements of *Maximize2040* can access these comments (compiled in PDF documents) through the BMC website. Links to these documents are included in Appendix I.



Chapter 1: Requirements and Policies



Regional Transportation Plan: What Is the Region Required to Do?

Maximize2040: A Performance-Based Transportation Plan is the long-range transportation plan for the Baltimore region. This region covers Anne Arundel, Baltimore, Carroll, Harford, and Howard counties and Baltimore City.

This chapter provides an overview of the laws, regulations, and policies the region has followed in developing *Maximize2040*.

Requirements under Federal Law

Moving Ahead for Progress in the 21st Century (MAP-21)

* MAP-21 is the federal law that establishes the requirements of, and authorizes the funding for, federal surface transportation programs.

MAP-21, enacted in June 2012, provides the framework for Federal Highway Administration and Federal Transit Administration regulations and policies. These regulations and policies guide how federal agencies, states, transit providers, and local jurisdictions plan, fund, and implement projects. *Maximize2040* was developed in accordance with MAP-21 requirements.

Metropolitan Planning Organization

* MAP-21 requires every urbanized area in the U.S. with a population greater than 50,000 to have a metropolitan planning organization (MPO).

The functions of an MPO include:

- Coordinate federal funding for transportation.
- Conduct transportation planning in cooperation with federal agencies, state agencies, and the operators of publicly owned transit services.
- Ensure that transportation expenditures are based on a continuing, cooperative, and comprehensive (3-C) planning process.
- Provide reasonable opportunity for input from the public and interested parties.







Baltimore Regional Transportation Board (BRTB)

* The Baltimore Regional Transportation Board is the region's federally designated MPO.

The BRTB is an 11-member policy board consisting of the chief elected officials of the region and representatives from state agencies. Members include representatives of:

- the cities of Annapolis and Baltimore
- the counties of Anne Arundel, Baltimore, Carroll, Harford, and Howard
- the Maryland departments of Transportation, the Environment, and Planning
- the Maryland Transit Administration.

Several committees and groups advise the BRTB in specific technical and policy areas. More information on BRTB members, committees, and other advisory groups is shown on the BMC website:

http://www.baltometro.org/about-brtb/brtb-committees.

Regional Plan / Regional Program

* MAP-21 requires each MPO to develop a transportation plan and a Transportation Improvement Program (TIP) for its region.

The BRTB evaluates and selects projects for plans and programs in accordance with regional goals and policies. This is done in consultation with state agencies, transit providers, and local jurisdictions.

Regional Transportation Plan

Baltimore Metropolitan Council

The Baltimore Metropolitan Council (BMC) provides technical staff to assist the BRTB and its advisory committees. BMC staff supports regional planning by providing:

- long- and short-range transportation planning
- demographic and economic analyses
- · travel demand modeling
- air quality modeling
- environmental coordination
- GIS services
- development monitoring (database of building permits)

In addition, the BMC is the host agency for the Regional Information Center, Urban Area Work Group (responsible for coordinating regional emergency preparedness activities), Reservoir Watershed Protection Committee, and Regional Cooperative Purchasing Committee.

Maximize2040 is the long-range transportation plan for the Baltimore region. This plan supersedes the last plan, developed in 2011. *Maximize2040* establishes the region's broad transportation goals and strategies. These goals and strategies will guide transportation investments over the life of the plan (2020-2040).

Maximize2040 contains a list of the major surface transportation projects the region expects to implement in the period from 2020 to 2040. The plan also shows revenues (federal, state, local, other) the region expects to have available for these projects and estimated costs of these projects.

Transportation Improvement Program

The Transportation Improvement Program (TIP) is the short-range programming element of the regional plan. The TIP shows all of the transportation projects with committed federal funding that the region expects to design and/or implement over the next four years. The TIP ensures consistency between plan recommendations and project implementation in the region.



Chapter 1: Requirements and Policies

Planning Factors

* MAP-21 requires the metropolitan planning process to provide for consideration of projects and strategies that will address theses factors:









Fiscal Constraint

* MAP-21 requires regional transportation plans and programs to be fiscally constrained.

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The regional transportation plan must include a financial plan that shows how the region expects to pay for each project and program. Put simply, *Maximize2040* is not a "wish list" of projects.

For *Maximize2040*, the BRTB, in consultation with the Maryland Department of Transportation, has forecasted the amount of funding from public and private sources the region reasonably anticipates will be available for the period from 2020-2040. The total estimated costs of *Maximize2040* projects and programs cannot exceed the total anticipated revenues. Chapter 3 and Appendix E of this document provide additional details on the anticipated revenues for *Maximize2040*.

For the TIP, fiscal constraint means providing for each project (1) budgets showing committed funding and funding sources and (2) realistic implementation schedules based on when funds will be available.



Performance-Based Approach

* Under MAP-21, the transportation planning process for both states and MPOs must "provide for the establishment and use of a performance-based approach to transportation decision making."

Performance Measures and Targets – Highways

MAP-21 requires the U.S. DOT to establish national standards for asset condition and system performance for facilities on the National Highway System (NHS). MAP-21 also continues the Highway Safety Improvement Program established under previous legislation. This program is intended to "achieve a significant reduction in traffic fatalities and serious injuries on all public roads." The performance-based approach found in both the state and the metropolitan planning processes must support MAP-21 national goals (see box on next page).

Each state is required to develop an asset management plan for its NHS facilities and a state highway safety improvement program. This includes a strategic highway safety plan that "identifies and analyzes highway safety problems and opportunities."



Chapter 1: Requirements and Policies

MAP-21 National Performance Goals - Highways

- 1. Safety Achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
- 2. Infrastructure Condition Maintain the highway infrastructure asset system in a state of good repair.
- 3. Congestion Reduction Achieve a significant reduction in congestion on the National Highway System.
- 4. System Reliability Improve the efficiency of the surface transportation system.
- 5. Freight Movement And Economic Vitality Improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- **6. Environmental Sustainability** Enhance the performance of the transportation system while protecting/enhancing the natural environment.
- 7. Reduced Project Delivery Delays Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

The state plans must include strategies that will make progress toward achieving targets for asset condition, system performance, and safety. States establish state performance measures and targets based on the national standards.

MPOs set the regional performance measures and targets, in consultation with states, to use in tracking progress toward attaining critical outcomes for the region.

Performance Measures and Targets – Transit Systems

MAP-21 requires the U.S. DOT to implement a national transit asset management system and a national transit safety program.

The National Transit Asset Management System is a "strategic and systematic process of operating, maintaining, and improving public transportation capital assets effectively through the life cycle of such assets." The foundation of this system is the concept of state of good repair. "State of good repair" includes objective standards for measuring the condition of capital assets.

The purpose of the National Public Transportation Safety Plan is to improve the safety of all public transportation systems. This plan includes:

- safety performance criteria for all modes of public transportation
- minimum safety performance standards for public transportation vehicles used in revenue operations
- a public transportation safety certification training program.

Each direct recipient of federal transit funds (in this region, this is the Maryland Transit Administration) develops its own asset management and safety plans, consistent with the national plans.

MPOs develop regional transit system performance targets for asset management and safety in coordination with transit providers.

Performance Measures and Targets – More Information

Chapter 2 covers the specific regional performance measures and targets set by the BRTB, in accordance with MAP-21.







Air Quality Conformity

* "Conformity" means that the projects in Maximize2040 will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of air quality standards.

National Air Quality Standards

To protect public health, the U.S. Environmental Protection Agency (EPA) sets the national ambient air quality standards (NAAQS) for certain "criteria pollutants." The EPA then determines the areas that do not meet these standards.

* The EPA has determined that the Baltimore region does not meet the national standard for ground-level ozone set in 2008.

As a result, the EPA has classified the region as a "moderate nonattainment" area for ozone. The EPA also has classified the region as a "maintenance" area for fine particulate matter (PM_{2.5}) and carbon monoxide (CO).

State Implementation Plan

The State Implementation Plan (SIP) developed by the Maryland Department of the Environment establishes a plan for how the region will achieve the NAAQS by the required attainment date. The SIP addresses all sources of pollution in the region. For on-road mobile sources of pollution (e.g., cars, trucks, and buses), the SIP establishes motor vehicle emission budgets. The region must show that its transportation plans and programs conform to the air quality goals in the SIP and are within the motor vehicle emission budgets.

* Maximize2040 demonstrates conformity since the projected emissions levels from its proposed projects are less than the emissions "budgets" established in the State Implementation Plan.

See Appendix G for technical details of the air quality conformity analysis performed for *Maximize2040*.

Congestion Management Process

* MAP-21 requires all metropolitan areas with populations greater than 200,000 to have a Congestion Management Process (CMP).

The CMP identifies actions and strategies to reduce traffic congestion and increase mobility. These include:

- · identifying congested locations
- determining the causes of congestion
- evaluating the congestion mitigation potential of different strategies
- evaluating the effects of previously implemented strategies.

Appendix H includes technical details on the region's CMP and how the projects in this plan are consistent with this CMP.



Chapter 1: Requirements and Policies

Consultation with Interested Parties and the Public

* MAP-21 requires MPOs to consult with state and local officials, transit operators, and the public when conducting transportation planning.



MPOs are required to develop a public participation plan that defines a process for providing the public and interested parties with reasonable opportunities to be involved in the planning process. Appendix I includes details about the public engagement process during the development of *Maximize2040*.

MPOs are encouraged to consult or coordinate with planning officials responsible for other types of planning activities affected by transportation. These activities include planned growth, economic development, environmental protection, and freight movement.

MAP-21 also stipulates that the public participation plan consider

the needs of people and groups traditionally underserved by transportation systems, including lowincome and minority households.

Appendix I presents additional details on the BRTB's public participation process and its specific outreach efforts in developing *Maximize2040*.

Title VI of the Civil Rights Act

* Regional plans and programs must comply with Title VI. The intent of this law is to ensure that public funds are not spent in a manner that encourages, subsidizes, perpetuates, or results in discrimination.

Title VI of the Civil Rights Act of 1964 states that no person in the U.S. shall, on the basis of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

Because the BRTB receives federal funding in carrying out the metropolitan planning process, its products (e.g., this regional transportation plan) and programs must comply with Title VI.

Executive Order – Environmental Justice

* Environmental Justice seeks to ensure that the benefits and burdens of transportation investments are shared as equitably as possible among all affected communities.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low Income Populations," addresses this issue. This Executive Order and its accompanying memorandum reinforce the requirements of Title VI that focus federal attention on environmental and human health conditions in minority and low-income communities.







Federal and Regional Policies

While not specifically required by law or regulation, several federal and regional policies have informed the work of the BRTB in developing *Maximize2040*. Examples of these policies follow.

Federal Livability Principles

In June 2009, the U.S. Environmental Protection Agency joined the U.S. DOT and the Department of Housing and Urban Development to form the Interagency Partnership for Sustainable Communities. This partnership developed "livability principles" intended to improve access to affordable housing and transportation alternatives and to reduce costs while protecting the environment, promoting equitable development, and addressing the challenges of climate change. These livability principles inform and support the BRTB's efforts in planning for an equitable and sustainable transportation system.

- 1. Provide more transportation choices. Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health.
- 2. Promote equitable, affordable housing. Expand location- and energy-efficient housing choices for people of all ages, incomes, races, and ethnicities to increase mobility and lower the combined cost of housing and transportation.
- **3. Enhance economic competitiveness**. Improve economic competitiveness through reliable and timely access to employment centers, educational opportunities, services and other basic needs by workers, as well as expanded business access to markets.
- **4. Support existing communities**. Target federal funding toward existing communities—through strategies like transit oriented, mixed-use development, and land recycling—to increase community revitalization and the efficiency of public works investments and safeguard rural landscapes.
- **5.** Coordinate and leverage federal policies and investment. Align federal policies and funding to remove barriers to collaboration, leverage funding, and increase the accountability and effectiveness of all levels of government to plan for future growth, including making smart energy choices such as locally generated renewable energy.
- 6. Value communities and neighborhoods. Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods—rural, urban, or suburban.

U.S. DOT Planning Emphasis Areas

The FHWA and FTA have jointly developed planning emphasis areas (PEAs) to provide additional policy guidance for carrying out metropolitan and state transportation planning. The PEAs are planning topical areas that FHWA and FTA have emphasized as MPOs and state DOTs develop their respective planning work programs. The PEAs reflect a renewed focus on transportation planning and include:

- Transition to **Performance-Based Planning and Programming** relates to a statutory requirement; covered in an earlier section of this chapter.
- Models of Regional Planning Cooperation to promote cooperation and coordination across MPO boundaries and across state boundaries where appropriate to ensure a regional approach to transportation planning.
- Ladders of Opportunity to provide access to essential services as part of the transportation planning process and to identify transportation connectivity gaps in access to essential services.



Chapter 1: Requirements and Policies

As shown in the following sections, the BRTB's approach is consistent with the U.S. DOT's directive to MPOs to encourage incorporation of Planning Emphasis Areas into their work programs.

Models of Regional Planning Cooperation

To improve collaboration and decision-making in transportation planning, the FHWA and FTA are leading an initiative on Regional Models of Cooperation – Multi-jurisdictional Coordination to promote interagency agreements and improved planning processes that cross agency jurisdictional boundaries.

The benefits of regional planning cooperation and multi-jurisdictional planning include, but are not limited to:

- Improved input for transportation decision-making
- · Increased awareness of transportation projects
- Improved public participation
- Reduced project delivery time
- · Flexible and combined funding options
- Improved air quality analysis
- Improved freight movement coordination
- Reduced traffic congestion
- Enhanced economic development
- Improved public-private partnerships
- Increased livability
- Improved safety





The BRTB and the staff of BMC have close working relationships with neighboring MPOs. There are regular contacts between staff at all levels, which enables leveraging of combined resources and promotes consistency in planning.

Over the past few years, staff of the National Capitol Transportation Planning Board (TPB), the Delaware Valley Regional Planning Council (DVRPC, Philadelphia area), the Wilmington Area Planning Council (WILMAPCO), and the York Area Metropolitan Planning Organization (YAMPO) have shared details of work programs with the BRTB.

In addition, on behalf of the BRTB, the BMC participates in the State Transportation Innovation Council. This council works to identify "Every Day Counts" initiatives.







Ladders of Opportunity

"Ladders of Opportunity" is one of the U.S. DOT's Planning Emphasis Areas. Ladders of Opportunity are means to filling transportation connectivity gaps that can limit access to essential services such as housing, employment, health care, and education.

The BRTB's approach is consistent with the U.S. DOT's directive to MPOs to encourage incorporation of Planning Emphasis Areas into their work programs. The coordination of the development of *Maximize2040* with the federal livability principles as well as the work of The Opportunity Collaborative represents an important step in this process.

The Opportunity Collaborative – Regional Plan for Sustainable Development

The Opportunity Collaborative is the consortium responsible for developing Baltimore's *Regional Plan for Sustainable Development* (RPSD) (see *http://www.baltometro.org/our-work/the-opportunity-collaborative* for more information).

The Collaborative is a 25-member coalition consisting of six local governments, the BRTB, three Maryland state agencies, two universities, and local philanthropic and advocacy organizations. Funding for The Collaborative's work is through a Sustainable Communities planning grant from the U.S. Department of Housing and Urban Development (HUD).

The Opportunity Collaborative has developed a comprehensive RPSD that links the region's housing, transportation, and workforce development plans and investments. Developing the RPSD included extensive community education and engagement, citizen leadership development, and sub-grant funding for demonstration projects.

In developing the RPSD and its supporting plans, The Collaborative has followed the federal livability principles, with one important addition:

• **Protect the Chesapeake Bay** by promoting location-efficient and low-impact development in the region, and more specifically by developing a Green and Healthy Neighborhoods program aimed at preserving and rehabilitating existing housing in the region in a "green" manner that considers the water downstream.





Chapter 2: Goals and Performance Measures



Where Do We Want to Go? How Can We Get There?

The BRTB has adopted nine goals, with supporting strategies, performance measures, and performance targets. Together, these goals, strategies, measures, and targets will help the BRTB to guide, and to gauge the effectiveness of, transportation investments over the 2020-2040 period.

In developing goals, strategies, measures, and targets, the BRTB considered:

- federal, state, regional, and local requirements and policies, including MAP-21 (the federal authorizing legislation) and its regulations (described in Chapter 1)
- factors that could affect how the region's transportation systems will perform over the next 25 years (discussed in Appendices B and C)
- comments and recommendations from the public at large and from BRTB advisory groups, including the Public Advisory Committee.

Appendix D lists the specific strategies the BRTB has adopted to advance regional goals and to make progress toward meeting performance targets.

Definitions

- A goal is a broad aspiration or guiding principle for the region (e.g., "Improve system safety").
- A *strategy* is an approach or policy to help the region implement a goal (e.g., "Eliminate hazardous or substandard conditions in high-crash locations and corridors").
- A *performance measure* is a specific metric the region can use to assess progress toward achieving a goal (e.g., "Decrease number of highway fatalities").
- A *performance target* is a specific level to be reached within a certain time frame (e.g., "Decrease number of highway fatalities to zero by 2040").









Regional Transportation Goals

Improve System Safety

Make conditions safer for pedestrians, bicyclists, transit riders, and motorists.

Improve and Maintain the Existing Infrastructure

Improve the conditions of existing transportation facilities; systematically maintain and replace transportation assets as needed.

Improve Accessibility

Help people of all ages and abilities to access specific destinations.

Increase Mobility

Help people and freight to move reliably and efficiently.

Conserve and Enhance the Environment

Pass on to future generations the healthiest natural and human environments possible.

Improve System Security

Provide a secure traveling environment for everyone; improve the region's ability to respond to natural or man-made disasters.

Promote Prosperity and Economic Opportunity

Support the revitalization of communities, the development of activity centers, and the movement of goods and services.

Foster Participation and Cooperation Among Stakeholders

Enable all interested and affected parties to participate and cooperate to find workable solutions.

Promote Informed Decision Making

Ensure that adopted transportation policies and performance measures guide the regional decision making process.



Chapter 2: Goals and Performance Measures

Regional Performance Measures and Targets

Consistent with MAP-21's emphasis on performance-based planning, the BRTB has established several performance measures and targets. These will enable the BRTB to monitor and evaluate, over time, the performance of the region's transportation system relative to the regional goals. Shown below are the adopted measures and targets for the region.

Regional Performance Measures – Emphasis Areas Required by MAP-21

System Safety – Roadways (the following safety measures apply to all public roads)

- Reduce serious injuries¹ per 100 million vehicle miles traveled (VMT) to 3.0 by 2040.
- Reduce fatalities per 100 million VMT to zero by 2040.
- Reduce number of serious injuries to 676 by 2040.
- Reduce number of fatalities to zero by 2040.

System Safety – Transit (the following measure applies to both MTA and local transit agencies)

• Reduce number of preventable crashes² per 100,000 revenue vehicle miles to zero by 2040.

System Conditions – Roadways and Bridges

- Maintain portion of state-owned roadway miles with acceptable ride quality³ at 82% or above.
- Maintain portion of structurally deficient state and local bridges below 5.0%.

System Conditions – Transit

• Maintain average age of MTA and local transit agency bus fleets⁴ below 7.0 years.

System Performance – Congestion

• Maintain portion of VMT in congested conditions⁵ on state-owned arterials during the evening peak hour (5-6 PM) below 25%.

System Performance – Freight

• Maintain average truck turnaround time at Seagirt Marine Terminal below 58 minutes.

System Performance – Emissions

 Maintain levels of VOC, NOx, PM_{2.5}, and CO emissions at levels less than motor vehicle emission budgets in the State Implementation Plan.

- 3 Pavement ride quality is determined by measuring the pavement longitudinal surface profile and calculating International Roughness Index (IRI). The acceptable rate shown is percentage of directional miles with an IRI less than 170 inches per mile in the right wheelpath on state-maintained routes that are at least one mile long.
- 4 Local bus only; excludes commuter bus, express bus, and paratransit vehicles.
- 5 A congested condition exists when the Travel Time Index (TTI) is greater than 1.3. TTI is the average travel time of a trip during peak period divided by travel time during off-peak (free-flow) conditions.





¹ Definition of "serious injury" based on the concept of "suspected serious injury (A)" as identified in the latest edition of the Model Minimum Uniform Crash Criteria (MMUCC), available at http://www.mmucc.us/.

² A preventable crash is one in which a transit vehicle driver does not do everything that could have been done to avoid a crash.



Measures Beyond MAP-21 Requirements – Accessibility

- Increase percentage of urban area⁶ state-owned directional roadway miles that have sidewalks (both sides of the roadway) to 25% by 2040.
- Increase bicycle/walk-to-work mode share⁷ to 5.0% by 2040.
- Increase average weekday MTA and local agency transit ridership (all modes) to 500,000 by 2040.

System Performance Report – State of the System

The following tables show the state of the region's transportation assets and system conditions:

System Safety – Roadways										
	2009	2010	2011	2012	2013	Targets (2040)				
Serious injuries per 100 million VMT	6.52	5.51	5.70	4.70	4.40	3.0				
Fatalities per 100 million VMT	0.96	0.77	0.78	0.88	0.73	0				
Number of serious injuries	1,616	1,381	1,424	1,182	1,098	676				
Number of fatalities	238	193	195	221	184	0				

System Safety – Roadways: Number of Fatalities by Mode										
	2009 2010 2011 2012 2013									
Driver	143	117	127	139	101					
Occupant	33	29	22	40	28					
Pedestrian	58	44	42	39	52					
Bicycle	4	3	3	2	3					

System Safety – Transit: Preventable Crashes per 100,000 Revenue Vehicle Miles									
	2009	2010	2011	2012	2013	Target (2040)			
Total, all modes	3.58	4.07	3.32	4.47	3.07	0			
Local bus	2.41	3.49	2.61	2.43	1.49				
Light rail	0.03	0.13	0.13	0.24	0.03				
Metro (subway)	0.00	0.11	0.10	0.06	0.00				
Paratransit / taxi access	1.14	0.34	0.48	1.74	1.55				

⁶ Urban area as defined by the U.S. Census Bureau.

7 Mode share data from the American Community Survey (U.S. Census).

Chapter 2: Goals and Performance Measures

System Conditions – Roadways and Bridges										
	2010	2011	2012	2013	2014	Targets				
Percentage of state- owned roadway miles with accept- able ride quality	82%	82%	83%	81%	82%	Maintain at 82%				
Percentage of struc- turally deficient state and local bridges	7.3%	6.9%	6.6%	5.9%	5.5%	Maintain below 5.0%				

System Conditions – Transit (MTA and Local Transit Agencies)									
	2009	2010	2011	2012	2013	Target (2040)			
Average age of local bus fleets (years)	5.6	4.6	4.5	4.1	n/a	Maintain below 7.0			

System Performance – Congestion										
	2010	2011	2012	2013	2014	Target				
Percentage of VMT in congested con- ditions on state- owned arterials (PM peak hour)	n/a	24%	26%	25%	25%	Maintain below 25.0%				

System Performance – Freight										
	2010	2011	2012	2013	2014	Target				
Average truck turnaround time at Seagirt Marine Ter- minal (minutes)	56.2	54.8	56.0	54.9	54.3	Maintain below 58.0				









System Performance – Emissions (modeled)													
	2017	2017 Target	2025	2025 Target	2035	2035 Target	2040	2040 Target					
NOx (tons per summer day)	50.7	106.8	25.9	106.8	18.2	106.8	18.2	106.8					
VOC (tons per summer day)	26.5	41.2	18.2	41.2	12.0	41.2	11.6	41.2					
CO (tons per winter day)	381.0	1,689.8	271.1	1,689.8	197.1	1,689.8	194.9	1,689.8					
Direct PM _{2.5} (tons per year)	887	1,218.60	538	1,051.39	448	1,051.39	441	1,051.39					
NOx (tons per year)	19,294	29,892.01	10,002	21,594.96	7,742	21,594.96	7,344	21,594.96					

Accessibility - Pedestrian / Bicycle											
	2009	2010	2011	2012	2013	Targets (2040)					
Percentage of urban area directional roadway miles that have sidewalks	n/a	16.4%	16.5%	16.9%	17.3%	25.0%					
Bicycle/walk-to- work mode share	n/a	2.9%	2.9%	3.0%	n/a	5.0%					






Chapter 2: Goals and Performance Measures

Accessibility – Trar	sit: Average	Weekday Ri	dership (MT	A and Local 1	Transit Agen	cies)
	2009	2010	2011	2012	2013	Target (2040)
Total, all modes	354,193	351,518	377,228	382,903	366,360	500,000

Accessibility – Trar	nsit: Average	Weekday Ri	dership by N	/lode	
	2009	2010	2011	2012	2013
MTA bus (local)	232,945	232,399	241,300	242,730	227,648
MTA bus (commuter)	n/a	n/a	17,104	17,024	16,863
MTA light rail	27,824	26,358	27,582	27,253	27,537
MTA MARC train	32,458	32,604	32,785	33,696	36,685
MTA Metro (subway)	45,564	44,938	48,532	51,018	50,712
MTA mobility / paratransit	3,644	4,032	4,469	5,113	5,586
MTA mobility (taxi)	1,077	808	925	1,044	1,329
Local agencies [* – Carroll County and Annapolis data not available for 2011/2012.]	10,682	10,380	4,531*	5,026*	n/a





Future Performance Monitoring

In cooperation with the Maryland Department of Transportation and its modal agencies, as well as its other state agency partners, the BRTB will continue to monitor the performance of the region's transportation systems throughout the life of this update of the plan. Toward this end, the BRTB has stipulated that BMC staff shall report annually on progress relative to performance measures and targets.

In addition, as the U.S. DOT publishes the remaining final MAP-21 performance measure regulations, the BRTB and BMC staff will reevaluate, as needed, the measures and targets contained within this plan and will determine if any revisions are necessary to remain in compliance with federal requirements.





Chapter 3: Financial Plan



Each metropolitan transportation plan must include a financial plan. In this financial plan, the region demonstrates consistency between (1) reasonably available and projected sources of revenues and (2) the estimated costs of implementing proposed transportation system improvements. This consistency is referred to as "fiscal constraint."

Fiscal Constraint

MAP-21 requires regional transportation plans to be fiscally constrained. That is, the total estimated costs of projects and programs cannot exceed forecasted revenue levels.

For *Maximize2040*, the BRTB, in consultation with the Maryland Department of Transportation, has forecasted the amount of revenues from federal, state, local, and private sources the region reasonably anticipates will be available for the 21-year period from 2020-2040.

Available/Anticipated Revenues

Shown below are revenues (from federal, state, local, and private sources) expected to be available for the 2020-2040 period, broken down by type of investment:

•	Total revenues:	\$57.646 billion
•	Major expansion projects:	<u>\$15.590 billion</u>
•	System preservation:	\$12.102 billion
•	System operations:	\$29.954 billion

The development of *Maximize2040* was an 18-month process. One of the early components was the financial forecast. The forecast included an increased state share of funding to cover the cost of a New Starts project (Red Line light rail project) that was in the last regional transportation plan. Late in the process of developing *Maximize2040*, the new administration decided to withdraw the project from the New Starts Program. The state funding set aside for this project will be reallocated to other projects within the state of Maryland but not necessarily within the BRTB's region. The state as a member of the BRTB will continue to work and coordinate with the other BRTB members to address additional monies available to the Baltimore region.

Definitions – Roadway Projects

System operations (roadways) – Covers the salaries and wages of personnel who maintain and operate highway systems and vehicles.

System preservation (roadways) – Covers capital costs for routine asset management and maintenance activities. These activities include: repaving roadways; repairing bridges; clearing snow and ice; and maintaining roadside lighting, guardrails, and signs.







Definitions – Transit Projects

System operations (transit) – Covers routine maintenance, employee wages, spare parts, and consumables. Note that while routine maintenance is considered a function of system operations, maintenance activities may be paid for with federal capital funds.

System preservation (transit) – Covers planning, design, acquisition/construction, and major asset rehabilitation activities necessary to keep the existing transit system in a State of Good Repair.

System Expansion Funding

The remaining \$15.59 billion will be available to fund *major expansion projects*. Examples of such projects include major new or widened roads, major roadway and bridge rehabilitations, and major new or expanded transit service.

Forecasted Revenues by Year: 2020-2040

The table below shows forecasted revenues by year for system operations, system preservation, and major expansion projects in the region. Consistent with MDOT assumptions, the BRTB has assumed that 41.6% of statewide revenues (federal + state + private funds) will be available for the Baltimore region for the 2020-2040 period.

In addition to revenues expected from federal, state, and private funding sources, the table shows \$150 million from a local source. Anne Arundel County has indicated it will be able to commit this amount toward its major expansion projects. With this local commitment, total projected revenues for major expansion projects are \$15.59 billion.

MDOT Statewide Revenue Projections Baltimore Region Revenue Projections (41.6% of Statewide Totals for Operations and Preservation)						nd Preservation)		
	Operations	Preservation		Operations	Preservation	Major Expansion	Cumulative Expansion	Totals
2020	\$2,217,000,000	\$1,105,000,000	2020	\$922,000,000	\$460,000,000	\$538,000,000	\$538,000,000	
2021	\$2,307,000,000	\$1,129,000,000	2021	\$960,000,000	\$470,000,000	\$559,000,000	\$1,097,000,000	
2022	\$2,441,000,000	\$1,154,000,000	2022	\$1,015,000,000	\$480,000,000	\$565,000,000	\$1,662,000,000	
2023	\$2,539,000,000	\$1,179,000,000	2023	\$1,056,000,000	\$490,000,000	\$585,000,000	\$2,247,000,000	
2024	\$2,641,000,000	\$1,205,000,000	2024	\$1,099,000,000	\$501,000,000	\$537,000,000	\$2,784,000,000	
2025	\$2,745,000,000	\$1,232,000,000	2025	\$1,142,000,000	\$513,000,000	\$561,000,000	\$3,345,000,000	
2026	\$2,855,000,000	\$1,259,000,000	2026	\$1,188,000,000	\$524,000,000	\$587,000,000	\$3,932,000,000	
2027	\$2,968,000,000	\$1,287,000,000	2027	\$1,235,000,000	\$535,000,000	\$613,000,000	\$4,545,000,000	
2028	\$3,086,000,000	\$1,315,000,000	2028	\$1,284,000,000	\$547,000,000	\$640,000,000	\$5,185,000,000	
2029	\$3,207,000,000	\$1,344,000,000	2029	\$1,334,000,000	\$559,000,000	\$670,000,000	\$5,855,000,000	
2030	\$3,334,000,000	\$1,373,000,000	2030	\$1,387,000,000	\$571,000,000	\$699,000,000	\$6,554,000,000	
2031	\$3,465,000,000	\$1,404,000,000	2031	\$1,441,000,000	\$584,000,000	\$731,000,000	\$7,285,000,000	
2032	\$3,604,000,000	\$1,434,000,000	2032	\$1,499,000,000	\$597,000,000	\$763,000,000	\$8,048,000,000	
2033	\$3,748,000,000	\$1,466,000,000	2033	\$1,559,000,000	\$610,000,000	\$796,000,000	\$8,844,000,000	
2034	\$3,897,000,000	\$1,498,000,000	2034	\$1,621,000,000	\$623,000,000	\$831,000,000	\$9,675,000,000	
2035	\$4,061,000,000	\$1,531,000,000	2035	\$1,689,000,000	\$637,000,000	\$864,000,000	\$10,539,000,000	
2036	\$4,224,000,000	\$1,565,000,000	2036	\$1,757,000,000	\$651,000,000	\$901,000,000	\$11,440,000,000	
2037	\$4,394,000,000	\$1,599,000,000	2037	\$1,828,000,000	\$665,000,000	\$936,000,000	\$12,376,000,000	
2038	\$4,571,000,000	\$1,635,000,000	2038	\$1,902,000,000	\$680,000,000	\$979,000,000	\$13,355,000,000	
2039	\$4,755,000,000	\$1,670,000,000	2039	\$1,978,000,000	\$695,000,000	\$1,021,000,000	\$14,376,000,000	
2040	\$4,947,000,000	\$1,707,000,000	2040	\$2,058,000,000	\$710,000,000	\$1,064,000,000	\$15,440,000,000	
	\$72,006,000,000	\$29,091,000,000	Revenues (Fed+State)	\$29,954,000,000	\$12,102,000,000	\$15,440,000,000		\$57,496,000,000
			Revenues (Local)			\$150,000,000		\$150,000,000
			Total Revenues	\$29,954,000,000	\$12,102,000,000	\$15,590,000,000		\$57,646,000,000

Maximize2040: Regional Revenue Forecasts – System Operations, System Preservation, and Major Expansion Projects



System Preservation Costs by Project Type

For this plan update, the federal agencies have requested that the BRTB show a breakdown of the funding projected for system preservation by project type. To comply with this request, SHA and MTA have provided the tables shown on the next page with the funding allocated for system preservation needs by project type.

Fiscal Constraint: Forecasted Revenues vs. System Expansion Costs

Here is a breakdown of forecasted revenues versus total estimated costs for major expansion projects for the 2020-2029 and 2030-2040 periods. This breakdown demonstrates that the region expects to have sufficient funds to pay for the projects in *Maximize2040* in the time periods in which the region expects these projects to be implemented.

Estimated Costs, 2020-2029: <u>\$2,906,000,000</u>

\$3,075,000,000

- Forecasted Revenues, 2030-2040: \$9,585,000,000
 Estimated Costs, 2030-2040: \$9,578,000,000
 - Estimated Costs, 2050-2040: 39,578,000

\$ 7,000,000

Appendix E contains copies of the materials used to determine the funding anticipated to be available for implementing the programs and projects in *Maximize2040*:

- "Financially Constrained Long Range Plan, Year 2010 to 2040 Update for the Baltimore Metropolitan Area," prepared by the Maryland Department of Transportation
- · Letter of commitment of funding from Anne Arundel County











Maximize2040: SHA Reg	ional System P	reservation Br	eakdown			
CHA Cristam Prosoruation	0000	3031-2035	2026-2030	2031-2035	2036-2040	Totale
Pavement: Resurfacing /						-
Rehabilitation	\$91,000,000	\$485,000,000	\$540,000,000	\$602,000,000	\$672,000,000	\$2,390,000,000
Congestion Management	\$11,000,000	\$57,000,000	\$64,000,000	\$71,000,000	\$79,000,000	\$ 282,000,000
Environmental	\$32,000,000	\$171,000,000	\$191,000,000	\$213,000,000	\$237,000,000	\$844,000,000
Safety and Spot Improvements	\$75,000,000	\$399,000,000	\$445,000,000	\$496,000,000	\$553,000,000	\$1,968,000,000
Urban Reconstruction	\$11,000,000	\$57,000,000	\$64,000,000	\$71,000,000	\$79,000,000	\$ 282,000,000
Bridges: Replacement /						
Rehabilitation	\$59,000,000	\$314,000,000	\$350,000,000	\$390,000,000	\$435,000,000	\$1,548,000,000
Enhancements / Alternative						
Transportation	\$5,000,000	\$ 29,000,000	\$32,000,000	\$35,000,000	\$40,000,000	\$141,000,000
Totals	\$284,000,000	\$1,512,000,000	\$1,686,000,000	\$1,878,000,000	\$2,095,000,000	\$7,455,000,000

Maximize2040: MTA	A Regional System Preservatic	on Breakdown						
Base Category	System Preservation Sub-Category	Sum of Percent of Total	2020	2021-2025	2026-2030	2031-2035	2036-2040	Total
Admin/Maint Facilities	Agencywide Admin/Maint Facilities	1.18%	\$ 2,076,800	\$ 11,127,400	12,413,600	\$ 13,806,000 \$	\$ 15,410,800 \$	54,834,600
	Bus Admin/Maint Facilities	7.95%	\$ 13,992,000	\$ 74,968,500	83,634,000	\$ 93,015,000 \$	\$ 103,827,000 \$	369,436,500
	Light Rail Admin/Maint Facilities	0.1196	\$ 193,600	\$ 1,037,300	1,157,200	\$ 1,287,000 \$	\$ 1,436,600 \$	5,111,700
	MARC Admin/Maint Facilities	0.85%	\$ 1,496,000	\$ 8,015,500 \$	8,942,000	\$ 9,945,000 \$	\$ 11,101,000 \$	39,499,500
	Mobility Admin/Maint Facilities	0.44%	\$ 774,400	\$ 4,149,200	4,628,800	\$ 5,148,000 \$	5,746,400 \$	20,446,800
Admin/Maint Facilities Tota			\$ 18,532,800	\$ 99,297,900	110,775,600	\$ 123,201,000 \$	\$ 137,521,800 \$	489,329,100
Environmental	Agencywide Environmental	2.40%	\$ 4,224,000	\$ 22,632,000 \$	25,248,000	\$ 28,080,000 \$	31,344,000 \$	111,528,000
Environmental Total			\$ 4,224,000	\$ 22,632,000 \$	25,248,000	\$ 28,080,000 \$	\$ 31,344,000 \$	111,528,000
Infrastructure	Agencywide Infrastructure	11.30%	\$ 19,888,000	\$ 106,559,000	118,876,000	\$ 132,210,000 \$	\$ 147,578,000 \$	525,111,000
	Light Rail Infrastructure	4.21%	\$ 7,409,600	\$ 002'002'6E \$	44,289,200	\$ 49,257,000 \$	54,982,600 \$	195,638,700
	MARC Infrastructure	10.56%	\$ 18,585,600	\$ 008'085'66 \$	111,091,200	\$ 123,552,000 \$	\$ 137,913,600 \$	490,723,200
	Metro Infrastructure	8.28%	\$ 14,572,800	\$ 78,080,400	87,105,600	\$ 96,876,000 \$	5 108,136,800 \$	384,771,600
Infrastructure Total			\$ 60,456,000	\$ 323,920,500 \$	361,362,000	\$ 401,895,000 \$	\$ 448,611,000 \$	1,596,244,500
IT Systems	Agencywide IT Systems	2.19%	\$ 3,854,400	\$ 20,651,700 \$	23,038,800	\$ 25,623,000 \$	\$ 28,601,400 \$	101,769,300
	ITP IT Systems	0.63%	\$ 1,108,800	\$ 5,940,900	6,627,600	\$ 7,371,000 \$	\$ 8,227,800 \$	29,276,100
IT Systems Total			\$ 4,963,200	\$ 26,592,600 \$	29,666,400	\$ 32,994,000 \$	\$ 36,829,200 \$	131,045,400
Passenger Amenities	Agencywide Passenger Amenities	3.84%	\$ 6,758,400	\$ 36,211,200	40,396,800	\$ 44,928,000 \$	\$ 50,150,400 \$	178,444,800
	MARC Passenger Amenities	2.17%	\$ 3,819,200	\$ 20,463,100 \$	22,828,400	\$ 25,389,000 \$	\$ 28,340,200 \$	100,839,900
	Metro Passenger Amenities	0.23%	\$ 404,800	\$ 2,168,900	2,419,600	\$ 2,691,000 \$	3,003,800 \$	10,688,100
Passenger Amenities Total			\$ 10,982,400	\$ 58,843,200 \$	65,644,800	\$ 73,008,000 \$	\$ 81,494,400 \$	289,972,800
Rolling Stock	Agencywide Rolling Stock	0.32%	\$ 563,200	\$ 3,017,600 \$	3,366,400	\$ 3,744,000 \$	\$ 4,179,200 \$	14,870,400
	Bus Rolling Stock	15.63%	\$ 27,508,800	\$ 147,390,900 \$	164,427,600	\$ 182,871,000 \$	\$ 204,127,800 \$	726,326,100
	Light Rail Rolling Stock	8.17%	\$ 14,379,200	\$ 77,043,100 \$	85,948,400	\$ 62,589,000 \$	\$ 106,700,200 \$	379,659,900
	MARC Rolling Stock	7.25%	\$ 12,760,000	\$ 68,367,500 \$	76,270,000	\$ 84,825,000 \$	\$ 94,685,000 \$	336,907,500
	Metro Rolling Stock	10.52%	\$ 18,515,200	\$ 99,203,600	110,670,400	\$ 123,084,000 \$	5 137,391,200 \$	488,864,400
	Mobility Rolling Stock	1.78%	\$ 3,132,800	\$ 16,785,400	18,725,600	\$ 20,826,000 \$	\$ 23,246,800 \$	82,716,600
Rolling Stock Total			\$ 76,859,200	\$ 411,808,100	459,408,400	\$ 510,939,000 \$	\$ 570,330,200 \$	2,029,344,900
Total			\$ 176,000,000	\$ 943,000,000 \$	1,052,000,000	\$ 1,170,000,000 \$	\$ 1,306,000,000 \$	4,647,000,000
Grand Total		100.00%						





Anticipated Projects and Funding – FY 2020-2040

The Transportation Improvement Program consists of near-term projects with defined scopes, established schedules, and committed funds. In contrast, *Maximize2040* consists of long-term programs and projects with conceptual scopes, potential schedules, and anticipated funding. The TIP covers the period from FY 2016 to 2019, and *Maximize2040* covers the period from FY 2020 to 2040.

Sponsors of *Maximize2040* projects have yet to work out the details of project scopes. Similarly, funds to cover the design, right of way, and construction phases of *Maximize2040* projects and programs have not been committed yet. Such funds would come from forecasted revenues the region reasonably expects to be available for major projects and programs throughout the life of the plan. Project sponsors may or may not be able to commit these anticipated funds to specific projects during the life of the plan. Rather, the programs and projects included in this plan represent the best judgment of the BRTB about what is desirable and possible, given existing conditions and future expectations.

Shown below are revenues (from federal, state, and private sources) the BRTB and the Maryland Department of Transportation anticipate will be available for 2020-2040, by type of investment.

- System operations: \$29.954 billion
- System preservation: \$12.102 billion
- Major expansion projects: \$15.590 billion
- Total revenues: \$57.646 billion

This chapter shows anticipated projects in the third category: major expansion projects. See Chapter 3 and Appendix D for details about revenue forecasts.

Potential Projects Submitted for Maximize2040

Candidate Projects from Local Jurisdictions and State Modal Agencies

The local jurisdictions, in consultation with the Maryland Transit Administration and the Maryland State Highway Administration, submitted 89 projects for consideration for *Maximize2040*. These included 17 transit projects and 72 highway projects. Many of these transit and highway projects include in their scopes improvements to adjoining bicycle and pedestrian facilities.

The specific criteria used to evaluate and rank these projects are included in Appendix F.



maximize2040 Project St	ubmittal	Form		SummityEvan Functions
Contact Information: Project Spancel Octoberanters Contact Nerse Plana Est. E-Mail				Interpretation for the former and the former of the former Stationary of the former Service of the former for the former of the former for the former of the former for the former of the former former of the former of the former former of the former former of the former of the former former of the former of the former of the former former of the former of the former of the former of the former former of the former of the former of the former of th
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Freiject Name	1			
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RoadwayiInterchange Project:		-		
Functional Gess/Fortee	hoadway	www.		
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Criment Ave. Delly Troffic (ADT)				
Transit Project:				
Type of Facility	Typectin	CONSESSOR .		3
Cervient Daily Hidenship	Projected	House pres	r d Operation	0
Cost Information:				
Estimated capital cost sys. of inservation e.s.s.	Estimated	anuni gasse	HIN COSTS (5)	
Was project in last long-sample plan?	· Capitaleo	n of project la	riplanis):	



Suggestions for Major Projects from Members of the Public

In addition, the BRTB solicited ideas for major, long-term projects from the public. This process took place in late 2014. Interested people could submit project ideas on the BMC website through an interactive map or through hard-copy forms. See a description of this process in Appendix I.

Of the more than 1,140 public project ideas submitted by the public, 178 relate to major, long-term projects that potentially could be included in *Maximize2040*. A summary of these major ideas follows:

- 101 suggestions to extend the MARC (commuter rail), Metro (subway), or light rail systems (e.g., recommendations to extend Metro and light rail lines beyond their existing termini: to Columbia, to Harford County, to Dundalk, and to Pennsylvania; also, support for the Red Line project)
- 31 suggestions to construct new or widened roads on the National Highway System (NHS) (e.g., recommendations to widen I-695, construct a new Harford-Baltimore County connector, extend U.S. 29 northward)
- 22 suggestions to construct new or widened non-NHS roads (e.g., widening of MD 97 in Carroll County, MD 543 in Harford County, MD 32 and MD 100 in Howard County)
- 14 suggestions to construct new or upgraded interchanges
- 10 suggestions to provide high-speed rail service to Washington, DC, and/or New York City

BMC staff presented all of the recommendations for major, long-term projects to the Technical Committee that advises the BRTB as well as the BRTB itself for review and consideration. In addition, staff presented a summary of the other submittals (small-scale project ideas and general comments).

Staff also shared all comments related to small-scale, short-term projects, as well as general comments, with the responsible modal agencies and local jurisdictions for review and consideration. The objective of this sharing of public ideas is to make the BRTB members, modal agencies, and local jurisdictions aware of the kinds of issues people are concerned about, as well as the specific projects that submitters believe would address these issues over the short and long terms. Click on the following link for a complete list of ideas (major projects, minor projects, general comments) submitted by the public:

http://www.baltometro.org/phocadownload/Publications/Transportation/Plans/Maximize2040/PublicProjectIdeas.pdf.

Preferred Alternative – Major Expansion Projects, FY 2020-2040

The BRTB, working with local jurisdictions and state agencies, developed a preferred alternative for the Baltimore region. This preferred alternative consists of funding allocated for operation and maintenance of the existing systems as well as major system expansion projects selected by applying the adopted evaluation and scoring criteria, consistent with federal laws and policies and the region's adopted transportation goals.

BMC staff included these projects in the master network of programmed and planned system improvements. Staff analyzed this master network to determine air quality conformity, to predict systemwide travel demand effects, and to evaluate effects on vulnerable populations. Appendix G shows the results of these analyses.

Fiscal Constraint

For the projects and programs in the preferred alternative, the BRTB coordinated with the Maryland Department of Transportation to identify future funding sources the region reasonably anticipates will be available. This is to comply with the requirement for a financially constrained plan.



The following table shows the fiscal constraint breakdown by time period.

Fiscal Constraint of Preferred Alternative Expansion Projects – Anticipated Investments Compared to Forecasted Revenues

2020-2029	Anticipated Investments	Total Forecasted Revenues
Major Transit Projects	\$459,000,000	
Major Roadway Projects	\$2,167,000,000	
Small Program Set-Aside	\$280,000,000	
Total Investments vs. Total Revenues	\$2,906,000,000	\$6,005,000,000
2030-2040	Anticipated Investments	Total Forecasted Revenues
Major Transit Projects	\$3,751,000,000	
Major Roadway Projects	\$5,487,000,000	
Small Program Set-Aside	\$340,000,000	
Total Investments vs. Total Revenues	\$9,578,000,000	\$9,585,000,000
Totals for 2020-2040 Period	Anticipated Investments	Percentage by Category
Totals for 2020-2040 PeriodMajor Transit Projects	Anticipated Investments \$4,210,000,000	Percentage by Category 33.7%
Totals for 2020-2040 PeriodMajor Transit ProjectsMajor Roadway Projects	Anticipated Investments \$4,210,000,000 \$7,654,000,000	Sympletic System 33.7% 61.3%
Totals for 2020-2040 PeriodMajor Transit ProjectsMajor Roadway ProjectsSmall Program Set-Aside:	Anticipated Investments \$4,210,000,000 \$7,654,000,000	Percentage by Category 33.7% 61.3%
Totals for 2020-2040 PeriodMajor Transit ProjectsMajor Roadway Projectssmall Program Set-Aside:Transportation System Management and Operations (TSMO)	Anticipated Investments \$4,210,000,000 \$7,654,000,000 \$80,000,000	Percentage by Category 33.7% 61.3% 0.6%
Totals for 2020-2040 PeriodMajor Transit ProjectsMajor Roadway Projectssmall Program Set-Aside:Transportation System Management and Operations (TSMO)Ladders of Opportunity	Anticipated Investments \$4,210,000,000 \$7,654,000,000 \$80,000,000 \$80,000,000 \$100,000,000	Percentage by Category 33.7% 61.3% 0.6% 0.6%
Totals for 2020-2040 PeriodMajor Transit ProjectsMajor Roadway Projectssmall Program Set-Aside:Transportation System Management and Operations (TSMO)Ladders of OpportunityComplete Streets / Bicycle / Pedestrian	Anticipated Investments \$4,210,000,000 \$7,654,000,000 \$80,000,000 \$80,000,000 \$100,000,000 \$155,000,000	Percentage by Category 33.7% 61.3% 0.6% 0.6% 1.2%
Totals for 2020-2040 PeriodMajor Transit ProjectsMajor Roadway ProjectsSmall Program Set-Aside:Transportation System Management and Operations (TSMO)Ladders of OpportunityComplete Streets / Bicycle / PedestrianTransportation Emission Reduction Measures (TERMs)	Anticipated Investments \$4,210,000,000 \$7,654,000,000 \$80,000,000 \$100,000,000 \$155,000,000 \$285,000,000	Percentage by Category 33.7% 61.3% 0.6% 0.6% 1.2% 2.3%

The development of *Maximize2040* was an 18-month process. One of the early components was the financial forecast. The forecast included an increased state share of funding to cover the cost of a New Starts project (Red Line light rail project) that was in the last regional transportation plan. Late in the process of developing *Maximize2040*, the new administration decided to withdraw the project from the New Starts Program. The state funding set aside for this project will be reallocated to other projects within the state of Maryland but not necessarily within the BRTB's region. The state as a member of the BRTB will continue to work and coordinate with the other BRTB members to address additional monies available to the Baltimore region.









Locations of Major Expansion Projects, FY 2020-2040

4-4

Preferred Alternative – Major Expansion Projects, FY 2020-2040

The following tables show projects in the time periods within which the BRTB anticipates they might be implemented. Sponsors developed estimated year of expenditure (YOE) cost estimates by applying current assumptions about project scopes, future inflation rates, and future conditions. Any of these factors could change over the next four years, by the time of the next update of the regional plan. For this reason, these cost estimates should be considered conceptual in nature.

Anticipated Transit Projects, FY 2020-2029

Map ID	Jurisdiction	Project Name	Limits / Length	Description	Estimated Cost (YOE)	Primary Goal(s) Addressed
	Regional	MARC Growth and Investment Phase 1		Improvements to MARC mainline capacity, maintenance facilities, and station areas	\$258,000,000	Mobility
	Regional	MTA Bus Expansion Program Phase 1		Purchase of buses to meet increasing ridership demands (beyond replacement needs), 2020-2029	\$60,000,000	Accessibility
	Harford County/ Baltimore City	MTA Commuter Bus Service	Harford County to downtown Baltimore and Harbor East; from Baltimore to Aberdeen Proving Ground (APG) 35.7 miles	Additional service to downtown Baltimore / Harbor East; reverse commute from Baltimore to APG; connection of U.S. 40 service with Harford Transit	\$2,000,000	Mobility, Accessibility
0	Baltimore City	Bayview MARC and Intermodal Station	Lombard Street at Bayview Boulevard	New station	\$73,000,000	Mobility, Accessibility
1	Baltimore City	West Baltimore MARC station		Station upgrades	\$64,000,000	Mobility, Accessibility
2	Carroll County	TrailBlazer Transit Hub	Undefined; general Westminster area	Centrally located facility to enable transfers and travel training for TrailBlazer riders	\$2,000,000	Accessibility
				Anticipated Transit Investments, 2020-2029	\$459,000,000	







Antic	ipated Higl	hway Proje	cts, FY 2020	-2029		
Map ID	Jurisdiction	Project Name	Limits / Length	Description	Estimated Cost (YOE)	Primary Goal(s) Addressed
3	Anne Arundel County	MD 175	Howard County line to MD 170 0.8 miles	Widen from 2 to 3 lanes from County line to MD 295; widen from 4 to 6 lanes from MD 295 to MD 170	\$274,000,000	Mobility, Safety
4	Anne Arundel County	U.S. 50/301	I-97 to MD 2 1.4 miles	Bridge reconstruction/ widening; movable barrier on bridge	\$353,000,000	Preservation, Mobility, Safety
5	Baltimore City	Moravia Road	Belair Road to Sinclair Lane 1.0 miles	Roadway, curb, and sidewalk rehabilitation; ADA improvements; streetscape elements	\$12,000,000	Preservation, Accessibility, Safety
6	Baltimore County	I-83 over Padonia Road		Reconstruct I-83 bridge; pedestrian and bike improvements to Padonia Road	\$12,000,000	Preservation, Accessibility, Safety
7	Baltimore County	I-695	I-95 to MD 122 6.1 miles	Widen from 6 to 8 lanes	\$456,000,000	Mobility, Preservation, Safety
8	Baltimore County	MD 26	Rolling Road to Courtleigh Drive 0.5 miles	Roadway, curb, sidewalk, bicycle, ADA, and pedestrian improvements	\$24,000,000	Accessibility, Safety
9	Baltimore County	MD 140 / Painters Mill Road	MD 140 / Painters Mill intersection; access roads east and west of MD 140	Intersection improvements, additional left turn lane, and parallel access roads	\$21,000,000	Mobility, Safety
10	Baltimore County	MD 140	Garrison View Road to Owings Mills Road 0.6 miles	Widen from 4 to 6 lanes; northbound third lane drops north of Owings Mills Boulevard	\$36,000,000	Mobility, Safety



Antic	ipated Higl	nway Proje	cts, FY 2020	-2029		
Map ID	Jurisdiction	Project Name	Limits / Length	Description	Estimated Cost (YOE)	Primary Goal(s) Addressed
11	Carroll County	MD 26	MD 32 to Reservoir 2.5 miles	Widen from 4 to 6 lanes; pedestrian/ bicycle facilities	\$91,000,000	Mobility, Accessibility, Safety
12	Carroll County	MD 31 (New Windsor Main Street / High Street)	Church Street to Coe Drive 1.0 miles	Infrastructure improvements and pavement rehabilitation	\$15,000,000	Preservation, Safety
13	Carroll County	MD 851 (Sykesville Main Street / Springfield Avenue)	Howard County line to Cooper Drive 0.8 miles	Infrastructure improvements and pavement rehabilitation	\$9,000,000	Preservation, Safety
14	Harford County	MD 24 – Section G	900 feet south of Sharon Road to 1,700 feet north of Ferncliff Lane 0.9 miles	Resurfacing and reconstruction, including slope repair and guardrail replacement	\$12,000,000	Preservation, Safety
15	Howard County	I-70	U.S. 29 to U.S. 40 (near MD 32) 6.8 miles	Widen from 4 to 6 lanes; includes reconstruction of I-70 / Marriottsville Road interchange and upgrading of I-70 / U.S. 29 interchange	\$712,000,000	Mobility, Safety
16	Howard County	Snowden River Parkway	Oakland Mills Road to Broken Land Parkway 1.1 miles	Widen from 4 to 6 lanes; includes auxiliary lanes and pedestrian, bicycle, and transit improvements on both sides of road	\$18,000,000	Mobility, Accessibility, Safety
17	Howard County	U.S. 1 / MD 175 Interchange		Grade separation coordinated with I-95 / MD 175 improvements	\$122,000,000	Mobility, Safety
				Anticipated Roadway Investments, 2020-2029	\$2,167,000000	







Anticipated Transit Projects, FY 2030-2040 Primary Мар Project Limits / **Estimated Cost** Goal(s) ID Description Addressed Jurisdiction Name Length (YOE) Regional MARC Growth Improvements to \$410,000,000 Mobility and Investment MARC mainline Phase 2 capacity, maintenance facilities, and station areas Regional MTA Bus Purchase of buses \$95,000,000 Accessibility Expansion to meet increasing Program ridership Phase 2 demands (beyond replacement needs), 2030-2040 18 Anne Arundel U.S. 50 Bus Proposed New bus rapid \$711,000,000 Mobility, County **Rapid Transit** Annapolis-Parole transit service Accessibility Intermodal Center to Prince George's Co. line 17.1 miles 19 Anne Arundel **Bus Rapid Dorsey MARC** New bus rapid \$293,000,000 Mobility, Transit to BWI station to BWI transit service: Accessibility County / Howard County light rail station Dorsey MARC Airport station to Arundel 9.7 miles Mills to BWI consolidated rental car facility to BWI light rail station \$1,692,000,000 Accessibility, 20 **Baltimore City** Green Line Johns Hopkins **Extension of Metro** Hospital to North line, including two Mobility Avenue new stations (at Amtrak line and 1.1 miles North Avenue) Harford County Aberdeen U.S. 40 at MD New train station, \$70,000,000 Mobility, 21 MARC Station 132 / Bel Air Road additional parking, Prosperity Transit-U.S. 40 "Green Oriented Boulevard," Station Development Square Plaza 22 **Howard County** U.S. 29 Bus U.S. 29 at Mount New bus rapid \$480,000,000 Mobility, **Rapid Transit** Hebron to MD transit service Accessibility 198 / U.S. 29 (Burtonsville) 16.0 miles \$3,751,000,000 Anticipated Transit Investments, 2030-2040

Anticipated Highway Projects, FY 2030-2040							
Map ID	Jurisdiction	Project Name	Limits / Length	Description	Estimated Cost (YOE)	Primary Goal(s) Addressed	
23	Anne Arundel County	MD 100	Howard Co. line to I-97 3.0 miles	Widen from 4 to 6 lanes	\$567,000,000	Mobility, Safety	
24	Anne Arundel County	MD 198	MD 295 to MD 32 4.6 miles	Widen from 2 to 4 lanes to provide easier access to Ft. Meade and Odenton Town Center	\$302,000,000	Mobility, Accessibility, Safety	
25	Anne Arundel County	MD 295	I-195 to MD 100 2.9 miles	Widen from 4 to 6 lanes	\$287,000,000	Mobility, Safety	
26	Anne Arundel County	MD 713	MD 175 to MD 176 1.3 miles	Widen from 2 to 4 lanes: MD 175 to Arundel Mills Boulevard Widen from 4 to 6 lanes: Arundel Mills Boulevard to MD 176	\$166,000,000	Mobility, Safety	
27	Baltimore County	l-695 / Broening Highway		Full interchange at Exit 44 of I-695 to support redevelopment at Sparrows Point	\$121,000,000	Mobility, Prosperity, Safety	
28	Baltimore County	I-695	I-95 to I-83 11.3 miles	Widen from 6 to 8 lanes; allows for future lanes from I-95 SW to I-95 NE	\$1,043,000,000	Mobility, Preservation, Safety	
29	Baltimore County	I-795	Franklin Boulevard to Owings Mills Boulevard 2.6 miles	Widen from 4 to 6 lanes, including addition of auxiliary lanes to Owings Mills Boulevard; includes new interchange at Dolfield Boulevard	\$219,000,000	Mobility, Safety	
30	Carroll County	MD 32	MD 26 to Howard County line 3.4 miles	Widen from 2 to 4 lanes; addition of pedestrian and bicycle facilities	\$189,000,000	Mobility, Accessibility, Safety	
31	Carroll County	MD 97 North	MD 140 overpass to Bachmans Valley Road 1.6 miles	Widen from 2 to 5 lanes, including interchange at Meadow Branch Road; addition of pedestrian and bicycle facilities	\$181,000,000	Mobility, Accessibility, Safety	







Antic	Anticipated Highway Projects, FY 2030-2040							
Map ID	Jurisdiction	Project Name	Limits / Length	Description	Estimated Cost (YOE)	Primary Goal(s) Addressed		
32	Carroll County	MD 140 at MD 91	Baltimore County line to Kays Mill Road 2.0 miles	Divided highway with new interchange at MD 91 and intersection improvements, addition of pedestrian and bicycle facilities	\$197,000,000	Mobility, Accessibility, Safety		
33	Carroll County	MD 140	Market Street to Sullivan Road 3.1 miles	Widen from 6 to 8 lanes, full interchange at MD 97 (Malcolm Drive), Continuous Flow Intersection (CFI) at Center Street and Englar Road, addition of pedestrian and bicycle facilities	\$401,000,000	Mobility, Accessibility, Safety		
34	Harford County	MD 22	MD 543 to APG Gate 11.0 miles	Widen existing 2- and 3-lane section to 4 and 5 lanes; include HOV lane from Old Post Road to APG gate; bicycle and pedestrian access and transit queue jump lanes where applicable	\$537,000,000	Mobility, Accessibility, Safety		
35	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	\$249,000,000	Mobility, Accessibility, Safety		
36	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	\$296,000,000	Mobility, Accessibility, Safety		
37	Harford County	U.S. 1 Bypass	MD 147 / U.S. 1 Business to north of MD 24 / MD 924	Widen from 2 to 4 lanes; improve U.S. 1 / MD 24 and U.S. 1 / MD 924 interchanges	\$127,000,000	Mobility, Safety		



Anticipated Highway Projects, FY 2030-2040							
Map ID	Jurisdiction	Project Name	Limits / Length	Description	Estimated Cost (YOE)	Primary Goal(s) Addressed	
38	Howard County	MD 32	MD 108 to I-70 9.0 miles	Widen from 2 to 4 lanes; includes new interchanges at Rosemary Lane and MD 144 and upgrades to I-70 interchange	\$355,000,000	Mobility, Safety	
39	Howard County	MD 32	north of I-70 4.0 miles	Widen from 2 to 4 lanes; safety, operational, and access improvements; consistent with Carroll County proposal for widening MD 32 north of this project's limits	\$38,000,000	Mobility, Safety	
40	Howard County	MD 108	Trotter Road to Guilford Road 1.5 miles	Widen roadway where needed/ possible to 4 lanes; includes 8- to 10- foot pedestrian/ bicycle pathways and new signalized intersections (including pedestrian actuation)	\$23,000,000	Mobility, Accessibility, Safety	
41	Howard County	U.S. 1 Typical Section	Montevideo Road north to MD 100 2.0 miles	Widen from 4 to 6 lanes; construct typical section as defined in State/ County MOU for U.S. 1 revitalization	\$98,000,000	Mobility, Prosperity, Safety	
42	Howard County	U.S. 29	Patuxent River Bridge to Seneca Drive 5.0 miles	Widen from 4 to 6 lanes; includes auxiliary lanes and grade-separated access to community of Rivers Edge	\$91,000,000	Mobility, Safety	
				Anticipated Roadway Investments, 2030-2040	\$5,487,000000		







Small Program Set-Asides – 2020-2040

The BRTB has set aside funds to support various strategies that either increase transportation system efficiency or employ transportation demand management strategies to reduce travel demand of single-occupancy vehicles. Transportation system efficiency strategies rely primarily on managing existing transportation facilities, rather than building new capacity. Transportation Demand Management (TDM) refers to various strategies that change travel behavior (how, when, and where people travel) to increase transportation system efficiency. Together, these types of strategies contribute to cleaner air and a safer transportation system.

Although most individual strategies only affect a small portion of total travel, the cumulative impacts of a wide range of strategies can be significant. There are many different strategies with a variety of impacts. Objectives that can be addressed through this funding include: managing congestion, promoting livability, reducing emissions, providing "Ladders of Opportunity" and other equity-related objectives, and improving safety.

The BRTB has divided the set-aside funding into four categories based on the focus of the strategies:

- Transportation System Management and Operations (TSMO): \$80 million
- Ladders of Opportunity¹:
- Complete Streets / Bicycle-Pedestrian:
- Transportation Emission Reduction Measures (TERMs):

• Total estimated costs for set-asides:

The following sections describe some programs and strategies the region can consider implementing during the life of the plan to address issues of regional concern.





1 Potential investments that could help the region implement some of the recommendations from The Opportunity Collaborative's *Regional Plan for Sustainable Development*.



\$620 million

\$100 million

\$155 million

\$285 million

Transportation System Management and Operations Strategies / Programs

The region has allocated \$80 million to support transportation system management and operations (TSMO) projects. The term TSMO is defined as, "An integrated program to optimize the performance of existing infrastructure through the implementation of systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system." Simply put, this means using technology and enhanced agency coordination to operate the existing transportation system as safely, reliably, and efficiently as possible. Typically, TSMO projects cost less than projects that add capacity, such as construction of a new lane, and they take significantly less time to implement.

A successful means of preserving capacity and improving security, safety, and reliability of the transportation system is through the use of traffic management centers such as Maryland's CHART program or any number of local traffic management centers. Primary functions of such centers include: traffic and roadway monitoring, incident management, traveler information, traffic management, systems integration and communications, and emergency and weather operations.

Taken from the Maryland CHART Strategic Deployment Plan, the activities shown below could apply to either the state or to local jurisdictions.

TSMO Activities

- Visually monitor highway conditions
- · Collect automated traffic data
- Monitor traffic and roadway conditions with greater accuracy, more data, and reduced infrastructure requirements
- · Monitor travel conditions during inclement weather
- Provide resources to operational personnel and expand coordination with public safety agencies to enhance management of incidents and emergencies
- Improve CHART's coordination and communications during the management of incidents and emergencies
- Enhance severe weather and emergency management operations
- Provide more travel condition information through various media sources to traveling public
- Provide more information on travel conditions via deployed highway field infrastructure to traveling public
- Enhance coordination between CHART and Traffic Signal Operations to optimize signal systems timing in response to conditions
- Optimize flow of traffic on access controlled highways
- Improve efficiency of operations at inter-modal transfer points and parking facilities
- Enhance ability to manage traffic and increase safety near and within work zones and event locations
- Enhance and expand transportation security measures to better protect systems and infrastructure against attacks and unauthorized usage
- Increase motorist roadway safety, and deploy systems to enhance safety at highway rail crossings
- Develop additional capabilities within the CHART Operating System Software
- Build infrastructure necessary to expand the CHART Network and facilitate regional connectivity between
 operational facilities and to field devices







Ladders of Opportunity Strategies / Programs

Chapter 1 of this document gives an overview of the work of the Opportunity Collaborative. The Opportunity Collaborative released its comprehensive *Regional Plan for Sustainable Development* (RPSD) in June 2015. The RPSD links the region's housing, transportation, and workforce development plans and investments.

The BRTB has set aside \$100 million to address the job access recommendations from the *Regional Plan for Sustainable Development*. The following recommendations are from the *Regional Plan for Sustainable Development* and also support the Federal Transit Administration program of the same name:

RPSD Goal: Improve Transportation Access to Career, Training, and Education Opportunities

"25 percent of the region's job seekers cite poor transportation choices as a significant barrier to employment in the region. Likewise, inadequate transportation limits housing options for transit-dependent workers. To tackle this issue, The Opportunity Collaborative recommends the following transportation strategies, particularly in areas that lack good access to mid-skilled, family-supporting jobs.

STRATEGY 1: IMPROVE TRANSIT SERVICE TO CONNECT WORKERS WITH JOBS AND TRAINING OPPOR-TUNITIES IN SUBURBAN JOB CENTERS. The region's transit network of local and commuter bus lines, light rail, commuter rail, and subways effectively connect suburban bedroom communities and Baltimore City neighborhoods to the downtown job center. But this system does not adequately serve emerging job centers in outlying areas. To improve worker commutes and maximize the impact of the region's transit system, the Baltimore region should:

- Enhance public transit services that connect low-income neighborhoods and areas of residential growth with job centers. In the long term, the region should plan for and fund a range of transit options that meet the needs of transit-dependent workers. Particular attention should be paid to connecting low-income areas with the region's growing job centers.
- Leverage transportation infrastructure, such as rapid transit services, to revitalize housing, employment, and retail in weak-market areas. To fully capitalize on the value of transportation infrastructure investments and create greater access for transit-dependent households, communities should work to create housing, employment, and retail outlets adjacent to transit stops. High-quality transportation can boost property values, making private investment more viable.

STRATEGY 2: INCREASE TRANSPORTATION OPTIONS TO JOBS AND EDUCATION FOR HOUSEHOLDS. Even with improved transit service, many people throughout the region will have difficulty reaching good jobs that are outside the core service network. New approaches are needed to give lower-income workers more options for commuting, including the following:

• Promote vanpooling, shuttle, and ridesharing programs to and from training centers and jobs. Local governments, employers and other entities should expand ridesharing and vanpooling programs through a coordinated effort. Local jurisdictions can promote the use of the State Highway Administration's park-and-ride lots, which are often near interstates and job centers. Employers can provide these programs and encourage public transportation use through employee benefits, either with or without an employer subsidy. Regional government organizations are well situated to coordinate rideshare programs, and nonprofit social service and faith-based organizations are eligible to receive federal grant funding to operate demand-response transit services in urban and rural areas."



Complete Streets and Bicycle-Pedestrian Strategies / Programs

The BRTB has set aside \$155 million to address Complete Streets and bicycle-pedestrian strategies.

The increased awareness of the needs of all transportation system users is the basis of the "Complete Streets" approach. This approach has done much to address the needs of all users of the surface transportation system. The Complete Streets approach emphasizes planning and design of roadways and adjoining facilities for the safety, accessibility, and mobility of all potential system users: pedestrians, bicyclists, transit riders, and motorists. This includes considering the needs of older people, children, and people with disabilities.

The Complete Streets concept focuses not only on individual roadways but also on changing the decision making and design processes to consider the needs of all users during the planning, design, construction, and operation of all roadways. If done in advance as an integrated best practice and not as an afterthought, a Complete Streets approach can reduce the need for retrofitting and making safety and accessibility improvements after projects are built.

The following list presents some potential investments that follow a Complete Streets approach.

Potential Complete Streets Investments

- Improve sidewalks, crosswalks, paths, and bike lanes.
- Correct specific roadway hazards to non-motorized transport (sometimes called "spot improvement" programs).
- Reduce conflicts between users and maintain cleanliness.
- Accommodate people with disabilities and other special needs.
- Develop pedestrian oriented land use and building design.
- Increase road and path connectivity, with special non-motorized shortcuts, such as paths between cul-desac heads and mid-block pedestrian links.
- Provide street furniture (e.g., benches) and design features (e.g., human-scale street lights).
- Implement traffic calming, traffic speed reductions, road space reallocation.
- Integrate biking and walking facilities with transit.
- Provide bicycle parking.
- Consider public bike systems (PBS), which are automated bicycle rental systems designed to provide efficient mobility for short, utilitarian urban trips.











Transportation Emissions Reduction Measures

The region has allocated \$285 million to support transportation emission reduction measures (TERMs), for air quality purposes. The Baltimore region is an EPA-designated nonattainment area for the ground-level ozone standard. As the metropolitan planning organization for the Baltimore region, the BRTB is required to ensure that transportation planning takes into account air quality through the transportation conformity process (described in Chapter 1.)

There are a variety of TERMs that can help mitigate the effects of pollution from automobiles, trucks, and other mobile sources on air quality. The following list of TERMs includes promising measures that, when implemented together, can reduce emissions of criteria pollutants and greenhouse gases in a meaningful way. This list is separated into three different categories: technologies, capital improvements, and behavioral strategies.

To avoid duplication, this list does not include TERMs that are identified in the lists showing Transportation System Management and Operations strategies, Ladders of Opportunity recommendations, or Complete Streets / bicycle-pedestrian strategies. It also does not include existing transit service or specific new major transit projects; new transit projects are covered in the tables shown in preceding pages.

Transportation Emissions Reduction Strategies						
Technologies	Capital Improvements	Behavioral Strategies				
 Short Term: Fleet bus replacement Truck replacement incentives Incentives/technologies to improve truck fleet efficiency and reduce idling Retrofit highway construction and maintenance equipment Energy-efficient highway construction and maintenance practices Electric vehicle charging infrastructure; promotion of electric vehicles 	 Short-Term Park-and-ride lots Virtual truck weigh stations Long Term: Transit-oriented development; mixed-use land use practices 	 Short-Term Promotion of eco-driving, clean commuting, reduced idling, and teleworking Incentives: Commuter Choice tax benefit program; episodic free transit programs; Guaranteed Ride Home Rideshare coordination 				





Maryland Transportation Authority Projects

The Maryland Transportation Authority (MDTA) is an independent agency responsible for managing, operating, and improving the State's toll facilities. Because MDTA projects are privately funded, they are not included in the listing of projects to be supported with federal funds.

Maximize2040, however, must include these projects because of their effects on air quality conformity and travel demand. The table below shows the MDTA projects anticipated to be implemented by 2040. BMC staff included these projects in the master network of programmed and planned system improvements. Staff analyzed this master network to determine air quality conformity and to predict system-wide travel demand effects. Appendix G shows the results of these analyses.

MDTA Projects, FY 2020-2040						
Year	Jurisdiction	Project Name	Limits	Description	Primary Goal(s) Addressed	
2025	Baltimore County	I-95: Section 100	Interchanges at I-695 and MD 43	Construct ramps	Mobility	
2030	Baltimore City and Baltimore County	I-95: Section 00	Fort McHenry Tunnel to express toll lanes	Reconfigure (restripe) northbound and southbound I-95 to provide four continuous mainline lanes in each direction	Mobility	
2040	Baltimore and Harford counties	I-95: Section 200	North of MD 43 to north of MD 22	Construct express toll lanes, including MD 152, MD 24, MD 543, and MD 22 interchanges	Mobility	









Committed Funding – FY 2016-2019

As noted, Maximize2040 covers the time period from FY 2020 through 2040. As part of a complete picture of planned future transportation investments, the table below shows the major committed projects that either are in progress or in the current adopted TIP, which covers the FY 2016-2019 period.

The TIP is updated annually and is driven by the goals, strategies, and projects in the adopted longrange transportation plan, which is updated every four years. The current TIP update occurred in tandem with the development of *Maximize2040* and was therefore able to integrate many of the principles and requirements embedded in Maximize2040. Staff conducts the conformity analysis for all projects in the TIP and plan by examining the forecasted emissions from predicted travel demand. The TIP and plan both are financially constrained documents.

"Committed" means that a schedule is in place and either (1) sponsors currently are spending funds on these projects (for design, right-of-way acquisition, or construction), or (2) sponsors have identified fund sources and have committed funds to design or build these projects within this time frame.

Existi	Existing and Committed Projects, FY 2016-2019					
Year	Jurisdiction	Sponsor	Project Name	Limits	Description	
2016	Baltimore City	Baltimore City	Boston Street widening / Eaton Street extension	Conkling Street to Haven Street: widening; O'Donnell Street to Boston Street: extension	Widen from 2 to 4 lanes / new 4 lane road	
2017	Anne Arundel County	SHA	MD 175, Annapolis Road widening	Disney Road to Reece Road	Widen from 4 to 6 lanes	
2017	Baltimore City	Baltimore City	Central Ave (Harbor Point) bridge	Lancaster Street to Harbor Point	New bridge; extend Central Avenue into Harbor Point development	
2017	Baltimore County	SHA	MD 140, Reisterstown Road widening	Painters Mill Road to Garrison View Road	Widen from 4 to 6 lanes	
2017	Harford County	SHA	MD 22, Aberdeen Throughway widening	Beards Hill Road to MD 462, Paradise Road	Widen from 4 to 6 lanes	
2017	Harford County	Harford County	Tollgate Road extension	Plumtree Road to Belair South Parkway	New 2 lane road	
2017	Howard County	Howard County	Skylark Boulevard extension	MD 216 to existing Skylark Boulevard with new interchange at MD 216	New 4-lane road	
2018	Baltimore County	Baltimore County	Mohrs Lane bridge	bridge over CSX	Rebuild bridge closed in 2011 (accommodates future Campbell Boulevard)	
2018	Baltimore County	Baltimore County	Rolling Road widening	Windsor Mill Road to MD 26	Widen from 2 to 4 lanes	



Existing and Committed Projects, FY 2016-2019						
Year	Jurisdiction	Sponsor	Project Name	Limits	Description	
2018	Baltimore County	Baltimore County	Security Boulevard extension	extension to Fairbrook Road	New 2-lane road	
2018	Baltimore County	SHA	l-695, Beltway inter- change	US 1 / Leeds Avenue	Replace ramp from Leeds Avenue to I-695 with ramp from US 1 to I-695	
2018	Baltimore County	SHA	I-695 outer loop wid- ening	US 40 to MD 144	Widen from 3 to 4 lanes	
2018	Baltimore County	SHA	I-695, Beltway widening	MD 41 to MD 147	Add one auxiliary lane in each direction	
2019	Harford County	SHA	US 40 / Aberdeen Proving Ground Intersection Improvements	Loflin Road to MD 715	Widen from 4 to 6/8 lanes and improve MD 7 and MD 159 intersections	
2019	Howard County	SHA / Howard County	MD 175 interchange	Blandair Park access road	New interchange at new road into Blandair Park	











Illustrative Projects

Federal regulations for metropolitan transportation planning identify the concept of "illustrative projects" as an element of the planning process. These are projects included in a metropolitan transportation plan for illustrative purposes, meaning that they could be included in the adopted transportation plan if additional funds beyond the reasonably anticipated financial resources identified in the plan were to become available.

There is no requirement to select any project from an illustrative list of projects in a metropolitan plan at some future date, when funding might become available. Nonetheless, illustrative projects can be helpful in guiding transportation and land use planning efforts at both the regional and local levels because they provide a resource from which the BRTB can select regional priorities should additional funding become available.

The table below shows the list of illustrative projects for the Baltimore region:

Illustrative Projects – Transit

Could be Amended into Maximize2040 Should Future Funds Become Available

Project Name	Limits	Description	Jurisdiction
MARC Service	DC to Delaware	Additional service in Harford County, including reverse commute, late night, and weekend.	Harford County / Regional
Bus Rapid Transit	Dorsey MARC Station to College Park MARC Station	Link commuters from Dorsey to Laurel and Laurel to College Park, and future Purple Line	Howard County / Regional

Illustrative Projects – Highway Could be Amended into *Maximize2040* Should Future Funds Become Available

Project Name	Limits	Description	Jurisdiction
I-97	MD 32 to US 50/301	Add toll lanes	Anne Arundel County
MD 3	Prince George's County line to MD 32	Roadway widening	Anne Arundel County
Patapsco Avenue	Gable Avenue to Annapo- lis Road	Road reconstruction with ADA and streetscape components	Baltimore City
MD 7	Campbell Boulevard to Mohrs Lane	Roadway, curb, sidewalk, bicycle, ADA, and pedestrian improvements as part of enhanced streetscap	Baltimore County
MD 140	At Hooks Lane	Left turn lane	Baltimore County
MD 26	MD 32 to MD 97	Widen from 2 to 4 lanes, add pedestrian and bicycle facilities	Carroll County
MD 30 Relocated	Brodbeck Road to MD 86	New 2-lane roadway	Carroll County
MD 140 Relocated	Trevanion Road to MD 140	New 2-lane roadway; add pedestrian and bicycle facilities	Carroll County



Illustrative Projects – Highway Could be Amended into *Maximize2040* Should Future Funds Become Available

Project Name	Limits	Description	Jurisdiction
MD 543	Wheel Road to I-95	Widen from 2 to 4 lanes with bicycle and pedestrian access	Harford County
U.S. 40	MD 543 to Loflin Road	Widen from 4 to 6 lanes with bicycle and pedestrian access	Harford County
U.S. 29	MD 100 to I-70	Widen from 6 to 10 lanes	Howard County
U.S. 29 Pedestrian Bridge	over U.S. 29 (linking downtown Columbia and Oakland Mills)	Improve existing pedestrian bridge: enhance safety features; add transit service	Howard County

"Mega-Regional" Projects

The projects listed below are outside the scope of this regional transportation plan. Currently, these projects are under study, but as of yet they have not progressed to the point where their sponsors have identified funds reasonably anticipated to be available during the 2020-2040 period. Partly for this fiscal constraint reason, the preferred alternative does not include these projects.

Even if these projects were to be funded some time in the future, at least some of the funding would need to come from the Federal Railroad Administration (FRA). The regional long-range transportation plan over which the BRTB has jurisdiction does not cover FRA-funded projects.

Nonetheless, it is good policy for the region to be aware of these projects and to be prepared to determine their potential effects on regional travel demand and regional travel patterns should they progress beyond the study phase.

- B&P Tunnel
- Amtrak / Freight Rail Bridge over the Susquehanna River
- MagLev Train
- Northeast Corridor





Appendix A: Glossary



Americans with Disabilities Act (ADA): Legislation enacted in 1991 to address the needs of disabled individuals in public settings. Sets standards and provides guidelines for accessibility with regard to public facilities (e.g., buildings, transit vehicles) and public rights-of-way (e.g., sidewalks, crosswalks, curb ramps).

Average Daily Traffic (ADT): The average number of vehicles passing a fixed point in a 24-hour time frame.

Baltimore Metropolitan Council (BMC): Non-profit organization established to identify regional interests and to develop collaborative strategies, plans, and programs to improve the quality of life and economic vitality of the Baltimore region. The BMC employs a paid, professional planning staff, which serves as technical staff to the Baltimore Regional Transportation Board (BRTB). Included in the functions of the BMC staff are transportation planning and modeling, air quality conformity analysis and modeling, demographic analysis, GIS mapping, maintenance of the regional building permit database, coordination of the local cooperative purchasing program, administration of the regional rideshare program, and administration of the Regional Information Center in cooperation with the Enoch Pratt Library system.

http://baltometro.org/about-bmc/about-bmc

Baltimore Regional Transportation Board (BRTB): The federally designated Metropolitan Planning Organization (MPO) for the Baltimore region. Consists of an 11-member board representing the cities of Annapolis and Baltimore; the counties of Anne Arundel, Baltimore, Carroll, Harford, and Howard; and the Maryland Department of Transportation, the Maryland Department of the Environment, the Maryland Department of Planning, and the Maryland Transit Administration. As the MPO, the BRTB is responsible for the planning and coordination of federally-funded transportation programs in the region and related short and long-range planning.

http://baltometro.org/about-brtb/brtb-committees/baltimore-regional-transportation-board







Bus Rapid Transit (BRT): Enhanced bus system that generally operates in dedicated bus lanes or other transitways. Intent is to combine the flexibility of buses with the efficiency of rail.

CHART: The Coordinated Highways Action Response Team (CHART) is an areawide congestion management program operated by the Maryland Department of Transportation and the Maryland State Police. It focuses on addressing nonrecurring congestion, such as crashes. Through the Statewide Operations Center and satellite operations centers in the region, roadways are surveyed to identify incidents.

Complete Streets: An approach to roadway design that seeks to provide facilities that are safe and accessible for all users: drivers, transit vehicles and riders, bicyclists, and pedestrians of all ages and abilities.

Conformity: Refers to the region's conformity to air quality standards. Conformity means that the projects in the regional transportation plan and the Transportation Improvement Program (TIP) will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of air quality standards.

Congestion Management Process (CMP): MAP-21 requires each urbanized area with a population of more than 200,000 (known as a Transportation Management Area or TMA; see definition) to manage traffic congestion through a process. This process uses a number of analytic tools to define and identify congestion within a region, corridor, activity center, or project area. The process also involves developing and selecting appropriate operational and travel demand reduction strategies to reduce congestion or to mitigate the effects of congestion.

Consolidated Transportation Program (CTP): The 6-year capital budget for transportation projects in the state of Maryland. Includes projects for the Maryland Department of Transportation and its modal agencies (Maryland Aviation Administration, Maryland Port Administration, Maryland State Highway Administration, Maryland Transit Administration, and Motor Vehicle Administration) as well as related authorities within the department (Maryland Transportation Authority, Washington Metropolitan Area Transit Authority).

Context Sensitive Solutions (CSS): An approach to creating public works projects that meet the needs of users, neighboring communities, and the environment. This approach integrates projects into the setting through careful planning, consideration of different perspectives, and tailoring of designs to particular project circumstances.

Environmental Justice (EJ): Concept established in 1994 through Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." Intent is to ascertain that federally funded transportation projects do not adversely affect minority and low-income populations.

Environmental Protection Agency, U.S. (EPA): Federal agency charged with protecting natural and human environmental resources. Responsible for developing and enforcing standards and regulations to maintain air and water quality, including relevant standards and regulations affecting transportation facilities and programs.

Federal Highway Administration (FHWA): Division of the U.S. Department of Transportation that administers and funds highway planning and programs.



Appendix A: Glossary

Federal Highway Trust Fund: Federal funding for highway and transit systems and facilities is available through this fund (the fund includes a separate Mass Transit Account). Consists of revenues from federal motor fuel taxes (e.g., on gasoline and diesel fuel) and federal excise taxes on such items as tires. In the past, Congress has supplemented the Highway Trust Fund with general funds as needed to meet obligations.

Federal Transit Administration (FTA): Division of the U.S. Department of Transportation that administers and funds transit planning and programs.

Fine Particulate Matter: Also referred to as $PM_{2.5'}$ indicating a size of 2.5 micrometers or smaller. Consists of tiny airborne particles that result from particulate emissions; condensation of sulfates, nitrates, and organics from the gas phase; and coagulation of smaller particles. Fine particulate matter can cause serious health problems at levels near the federal standard. The Baltimore region is now maintaining levels of $PM_{2.5}$ below the federal limit.

Fiscal Constraint: A requirement for both the Regional Transportation Plan and the Transportation Improvement Program (TIP). For the regional plan, fiscal constraint means the total estimated costs of projects and programs cannot exceed forecasted funding levels. For the TIP, fiscal constraint means providing (1) budgets showing committed funding and funding sources for each project and (2) realistic implementation schedules based on when these funds will be available.

Fiscal Year (FY), Federal: Begins October 1 of the preceding year and ends September 30 of the next calendar year. For example, federal FY 2020 begins on October 1, 2019 and ends September 30, 2020.

Fiscal Year (FY), State: Begins July 1 of the preceding year and ends June 30 of the next calendar year.

Goal: Broad aspiration or guiding principle for the region (e.g., "Improve system safety").

Greenhouse Gas Emissions: Greenhouse gas emissions that result from human activity are believed to contribute to global warming, which is the increase in average global temperature. Global warming is a result of an enhanced greenhouse effect, which is a naturally occurring process by which heat from the sun is radiated off the Earth's surface and then is trapped in the earth's atmosphere by greenhouse gases, whereby the Earth's surface temperature increases. A key greenhouse gas is carbon dioxide.

Highway: Term applies to roads, streets, and parkways, and also includes rights-of-way, bridges, railroad crossings, tunnels, drainage structures, signs, guard rails, and protective structures in connection with highways.

Illustrative Projects: Projects included in a metropolitan transportation plan for illustrative purposes, as specified by MAP-21 and federal regulations. These are projects that could be included in the adopted transportation plan if additional resources beyond the reasonable financial resources identified in the plan were to become available. There is no requirement to select any project from an illustrative list of projects in an adopted plan at some future date, when funding might become available.

Intelligent Transportation System (ITS): System that enables the transfer of information relating to traffic and transit system operations and conditions to state and local operations staff and to roadway and transit users. Elements can include dynamic message signs to alert users to changing conditions, closed-circuit television systems that alert state or local operations staff to changing conditions, incident detection and management systems, transit security-related systems, and state or local transportation management centers.







Interagency Partnership for Sustainable Communities: Partnership formed in June 2009, consisting of the U.S. Environmental Protection Agency, U.S. Department of Housing and Urban Development, and U.S. Department of Transportation. This partnership is guided by six livability principles that aim to improve access to affordable housing and transportation alternatives and to reduce costs while protecting the environment, promoting equitable development, and helping to address the challenges of climate change.

Ladders of Opportunity: One of the U.S. DOT's Planning Emphasis Areas. Metropolitan planning organization (MPOs) are encouraged to focus on these areas in conducting metropolitan planning activities. Ladders of Opportunity are means to filling transportation connectivity gaps that can limit access to essential services such as housing, employment, health care, and education.

Livability Principles: Guidelines developed by the Interagency Partnership for Sustainable Communities (consisting of the U.S. DOT, U.S. Environmental Protection Agency, and Department of Housing and Urban Development). The six federal "livability principles" are intended to improve access to affordable housing and transportation alternatives and to reduce costs while protecting the environment, promoting equitable development, and addressing the challenges of climate change.

Level of Service (LOS): Measure of the quality of flow of a transportation facility. Level of service definitions generally describe traffic conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. It is characterized by a letter from A to F, with LOS A being the best operating condition and LOS F being the worst.

Locally Operated Transit Service (LOTS): Transit service from a local provider, offered by some of the counties in the region. Supplements service provided by the Maryland Transit Administration.

Maryland Rail Commuter (MARC) Service: Maryland's commuter rail operation, managed by the Maryland Transit Administration. MARC provides service on three lines, all of which have a terminus at Union Station in Washington, DC. The Camden Line runs to Camden Station in Baltimore City. The Penn Line runs to Penn Station in Baltimore City and on to Perryville in Cecil County. The Brunswick Line runs to Brunswick in Frederick County and on to Martinsburg, West Virginia, with a spur serving Frederick, Maryland.

Maryland Department of Transportation (MDOT): The department charged by Maryland state law with the responsibility for various transportation-related functions. These include construction, operation, and maintenance of highway facilities (through the Maryland State Highway Administration); transit facilities (through the Maryland Transit Administration); port facilities (through the Maryland Port Administration); and aviation facilities (through the Maryland Aviation Administration). The Motor Vehicle Administration, the state agency responsible for administering vehicle licensing and registration, is also under the jurisdiction of MDOT.

Maryland Department of the Environment (MDE): The state environmental protection agency that monitors and enforces the regulations pertaining to air and water quality. Also responsible for developing the State Implementation Plan, motor vehicle air pollutant budgets, and for monitoring how transportation affects air quality.

Maryland Department of Planning (MDP): The state agency charged with developing and coordinating implementation of statewide growth management policies.

Maryland State Highway Administration (SHA): The agency in the Maryland Department of Transportation responsible for construction, operation, and maintenance of most federal and state highway facilities. Primary recipient of surface transportation funds through the Federal Highway Administration.



Appendix A: Glossary

Maryland Transit Administration: The agency in the Maryland Department of Transportation responsible for construction, operation, and maintenance of transit facilities. Federally designated recipient of Federal Transit Administration funds for the Baltimore region.

Maryland Transportation Authority (MDTA): The state agency charged with operating and maintaining the state's toll facilities (highways, bridges, and tunnels).

Maryland Transportation Trust Fund (TTF): Provides the state's portion of funding for constructing, operating, and maintaining state highway, transit, aviation, and port systems and facilities. Consists of revenues from motor fuel taxes, titling taxes and fees, operating revenues, bond proceeds, fund transfers, and funding from the Federal Highway Trust Fund.

Metropolitan Planning Organization (MPO): The organization designated by law with lead responsibility for developing transportation plans and programs in urbanized areas of 50,000 of more in population. The Baltimore Regional Transportation Board (BRTB) is the metropolitan planning organization for the cities of Baltimore and Annapolis and the counties of Anne Arundel, Baltimore, Carroll, Harford, and Howard.

Moving Ahead for Progress in the 21st Century (MAP-21): Legislation enacted by the U.S. Congress reauthorizing and restructuring funding and planning for highway and transit programs. MAP-21 emphasizes performance-based planning and programming. It was signed into law by President Obama on July 6, 2012.

National Highway System (NHS): The National Highway System consists of roadways important to the nation's economy, defense, and mobility. Examples of NHS roadways include interstate highways (e.g., I-95, I-695, etc.), other principal arterials (e.g., U.S. routes such as U.S. 1), highways in the Strate-gic Highway Network (i.e., highways that are important to the U.S.'s strategic defense policy and that provide defense access, continuity, and emergency capabilities for defense purposes), major Strategic Highway Network Connectors (i.e., highways that provide access between major military installations and highways that are part of the Strategic Highway Network), and intermodal connectors (i.e., highways that provide access between major intermodal facilities and the other four NHS subsystems). Note that a specific highway route can be on more than one subsystem. A listing of all official NHS Intermodal Connectors is on the FHWA's web site:

http://www.fhwa.dot.gov/planning/national_highway_system/.

Nonattainment: The U.S. Environmental Protection Agency (EPA) sets national ambient air quality standards, or NAAQS, for certain air pollutants, called "criteria pollutants," to protect public health. The EPA then determines the areas of the country that do not meet the NAAQS. These are designated as nonattainment areas. The EPA has determined that the Baltimore region is a nonattainment area since it does not meet the NAAQS for ground-level ozone pollution.

Opportunity Collaborative: The Opportunity Collaborative is the consortium responsible for developing Baltimore's Regional Plan for Sustainable Development (RPSD). The Collaborative is a 25-member coalition consisting of six local governments, the BRTB, three Maryland state agencies, two universities, and local philanthropic and advocacy organizations. Funding for The Collaborative's work is through a Sustainable Communities planning grant from the U.S. Department of Housing and Urban Development (HUD).

http://www.opportunitycollaborative.org/assets/RPSD_Final_June_2015.pdf?ae56d8







Ozone: Ground-level ozone forms when nitrogen oxides (NOx) and volatile organic compounds (VOCs) undergo a chemical reaction under heat and sunlight. Reductions in NOx and VOCs are necessary for reducing ozone pollution. NOx and VOCs come from a variety of sources, some of which are emissions from cars and trucks. The Baltimore region has been found to be in moderate nonattainment with respect to the air quality standards for ground-level ozone.

Performance Measures / Performance Targets: Performance measures are specific metrics used to assess progress toward achieving goals (e.g., "Decrease number of highway fatalities"). Performance targets are specific levels to be achieved within certain time frames (e.g., "Decrease number of highway fatalities to zero by 2040").

Priority Funding Area (PFA): Concept introduced by the Smart Growth and Neighborhood Conservation – Smart Growth Areas Act, enacted in 1997. Priority Funding Areas are the foundation of Maryland's Smart Growth efforts. The 1997 legislation directs state funding for growth-related infrastructure to Priority Funding Areas, thereby focusing growth in already developed areas. PFAs include municipalities (as they existed on January 1, 1997), Baltimore City, areas inside of the beltways, neighborhoods designated for revitalization by the Department of Housing and Urban Development, Enterprise and Empowerment Zones, and certified heritage areas within county-designated growth areas. Counties are also able, though not required, to designate additional PFAs, known as locally designated PFAs, based on criteria established by the legislation.

Public Participation Plan: MPOs are required to develop a public participation plan that defines a process for providing the public and interested parties with reasonable opportunities to be involved in the metropolitan planning process. The public participation plan must consider the needs of people and groups traditionally underserved by transportation systems, including low-income and minority households.

http://baltometro.org/be-involved/participate/public-participation-plan

Regional Transportation Plan: One of the documents an MPO is legally mandated to produce. *Maxi-mize2040* is the regional transportation plan for the Baltimore region. The plan establishes the region's broad transportation goals and strategies and contains a list of the major surface transportation projects the region expects to implement over the next 20-25 years. Another major component is the financial plan, which shows the revenues (federal, state, local, other) the region expects to have available for these projects and the estimated costs of these projects. By law, this document must be fiscally constrained.

Ridesharing: A program intended to match commuters so that they might share rides to work, thereby reducing the number of cars on the road. MTA administers the rideshare program in the Baltimore region and provides funding support to local rideshare coordinators.

State Implementation Plan (SIP): A required air quality planning document prepared by states and submitted to U.S. EPA for approval. SIPs identify state actions and programs to implement designated responsibilities under the Clean Air Act. In Maryland, the Maryland Department of the Environment develops the SIP.

Strategy: Approach or policy to help the region achieve a goal (e.g., "Eliminate hazardous or substandard conditions in high-crash locations and corridors").



Appendix A: Glossary

Teleworking: Working from a remote location, usually a home office.

Title VI: Title VI of the Civil Rights Act of 1964 states that no person in the U.S. shall, on the basis of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. Because the BRTB receives federal funding in carrying out the metropolitan planning process, its products (e.g., the regional transportation plan and the TIP) and programs must comply with Title VI.

Traffic Analysis Zone (TAZ): Basic unit of geography used to predict travel behavior in the travel demand model. Constructed using census block information.

Transportation Demand Management (TDM): Strategies intended to reduce travel demand (particularly that of single-occupancy private vehicles) or to redistribute this demand. TDM strategies can help relieve traffic congestion and reduce vehicle emissions. Examples include: congestion pricing, incentives to use transit, rideshare programs, flexible work hour programs, etc.

Transportation Emissions Reduction Measures (TERMs): Projects or policies intended to reduce air pollutant emissions from the transportation sector. These could include strategies to reduce travel demand (particularly from single-occupancy private vehicles) or to reduce per-mile emissions. The region has set aside \$285 million in funding to support TERMs.

Transportation Improvement Program (TIP): One of the documents an MPO is legally mandated to produce. This document lists all surface transportation projects with committed funding that are programmed for implementation over the next four years. Generally updated every year in the Baltimore region. Before a project can receive federal funding, it must appear in the TIP. By law, this document must be fiscally constrained.

http://baltometro.org/phocadownload/Publications/Transportation/Plans/TIP/16-19TIP.pdf

Transportation Management Area (TMA): An urbanized area with a population of more than 200,000. Within a TMA, all transportation plans and programs must be based on a continuing and comprehensive planning process carried out by the Metropolitan Planning Organization in cooperation with states and transit operators. In addition, all TMAs must have a Congestion Management Process in place.

Transportation System Management and Operations (TSMO): Integrated program of strategies intended to optimize the performance of existing infrastructure. Through such a program, an agency can implement systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system. Similar to TDM strategies, TSMO strategies can help relieve traffic congestion and reduce vehicle emissions. Examples of TSMO strategies include: bottleneck elimination through channelization, signal system upgrades and coordination, freeway ramp metering, transit scheduling and dispatching improvements, relocation of bus stops, etc.

Travel Demand Model: Software used to predict where people travel (e.g., to work, to home, to other destinations) and how they travel (e.g., by driving, by taking transit, by bicycling, by walking). Uses population and employment forecasts as well as land use data to predict this travel behavior at a regional scale.

Vehicle Miles of Travel (VMT): A standard measure of travel activity. The U.S. Department of Transportation definition is "One vehicle mile of travel is the movement of one privately operated vehicle for one mile, regardless of the number of people in the vehicle."

Vehicle Occupancy Rate (VOR): Persons per passenger vehicle.




Appendix B: Future Conditions and Needs



Regional Growth and the Transportation System

Continued growth in the region depends on strong public infrastructure. This includes a regional transportation system that provides effective, reliable options for everyone.

The regional transportation system influences the location of growth and development. Similarly, the type of growth and location of growth influence travel choices. Recognizing this transportation / land use connection, the BRTB strives to coordinate land use planning and transportation decisions among municipal, county, regional, and state partners.

Population and Employment Growth – Cooperative Forecasting Group

A vital part of this coordination is the work of the Cooperative Forecasting Group (CFG). The CFG consists of representatives of state and local planning agencies. This group develops and maintains population, household, and employment forecasts for the Baltimore metropolitan region.

Round 8A Forecasts

In June 2014, the BRTB endorsed the Round 8A forecasts developed by the CFG. The Round 8A forecasts are updates to the Round 8 cooperative forecasts, which the BRTB endorsed in August 2013.

Population Forecasts – Round 8A								
Jurisdiction	2010	2015	2020	2025	2030	2035	2040	% change: 2010-2040
Anne Arundel	537,656	559,619	580,007	593,595	606,689	618,177	628,048	16.8%
Baltimore City	620,961	636,722	647,282	656,314	667,210	676,726	680,262	9.5%
Baltimore	805,029	823,121	832,393	846,771	858,183	869,523	880,726	9.4%
Carroll	167,134	170,549	175,900	179,437	183,258	186,180	189,574	13.4%
Harford	244,826	251,991	258,668	265,098	273,127	281,029	291,089	18.9%
Howard	287,085	309,043	332,273	346,517	357,094	363,501	366,352	27.6%
Region	2,662,691	2,751,045	2,826,523	2,887,732	2,945,561	2,995,136	3,036,051	14.0%







Household Forecasts – Round 8A								
Jurisdiction	2010	2015	2020	2025	2030	2035	2040	% change: 2010-2040
Anne Arundel	199,378	206,441	213,504	220,565	227,626	234,647	241,542	21.1%
Baltimore City	249,903	256,904	261,374	265,100	269,632	273,496	274,976	10.0%
Baltimore	316,715	321,983	325,447	331,312	335,749	340,162	344,539	8.8%
Carroll	62,406	64,142	66,219	68,025	69,692	71,305	72,853	16.7%
Harford	90,218	94,095	97,892	101,689	105,488	109,298	113,090	25.4%
Howard	104,749	112,173	123,899	130,948	135,517	138,513	139,497	33.2%
Region	1,023,369	1,055,738	1,088,335	1,117,639	1,143,704	1,167,421	1,186,497	15.9%

Employment Forecasts – Round 8A								
Jurisdiction	2010	2015	2020	2025	2030	2035	2040	% change: 2010-2040
Anne Arundel	323,148	342,011	361,688	376,085	391,312	404,986	424,061	31.2%
Baltimore City	381,772	388,651	402,534	415,971	428,751	441,346	454,167	19.0%
Baltimore	446,250	465,801	484,533	492,436	499,296	504,820	510,565	14.4%
Carroll	70,889	73,063	76,107	78,421	80,888	82,996	85,351	20.4%
Harford	104,670	115,562	126,040	135,775	146,269	157,191	167,261	59.8%
Howard	181,381	196,381	211,381	226,381	241,381	251,710	260,309	43.5%
Region	1,508,110	1,581,469	1,662,283	1,725,069	1,787,897	1,843,049	1,901,714	26.1%

Inputs for Modeling

The Round 8A forecasts provide the spatial location and concentration of population, households, and employment. These serve as key inputs to the region's travel demand model. Planners use this model to simulate individuals' work and non-work travel patterns.

Output from the travel demand model helps to identify regional transportation needs. This informs the decisions the BRTB makes about potential new projects in developing the long-range transportation plan. Appendix G presents additional information about the travel demand model's forecasts with respect to projects in this plan.

From 2010 to 2040, the region's population is expected to grow 14%, while employment growth is projected at 26%.

By 2040, the Baltimore region's population is expected to surpass 3 million people for the first time.

Coordinating with Other Regions

BMC staff members also use forecasts in discussions on bi-regional growth assumptions with planning organizations in adjoining regions. These include the Metropolitan Washington Council of Governments and Wilmington Area Planning Commission.



Appendix B: Future Conditions and Needs

Environmental Issues

Chapter 1 of this plan (see Page 1-6) describes the federal requirements the region must meet to maintain conformity with national air quality standards. Besides these air quality conformity issues, the region faces several other environmental challenges.

Greenhouse Gas Emissions and Climate Change

There is a strong link between growth in vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions from the transportation sector. More miles traveled directly equates to the combustion of more gallons of fuel and the release of carbon dioxide.

Emissions of carbon dioxide, a key GHG, result from the burning of fossil fuels such as gasoline and diesel fuel. In 2010, 28 percent of the state's GHG emissions were from the on-road transportation sector (see the figure below from Maryland's Greenhouse Gas Reduction Plan, September 2013). The entire transportation sector accounted for 33 percent of emissions in 2010 in the state, and represented the second largest source sector for GHGs in Maryland, behind electricity consumption at 40 percent.



Maryland Greenhouse Gas Emissions by Sector, 2010

Environmentally conscientious planning must consider the implications of potential long-term climate change and the role that vehicle emissions play. GHG emissions that result from human activity are believed to contribute to global warming, which is the increase in average global temperature.







Global warming is a result of an enhanced greenhouse effect, a naturally occurring process by which heat from the sun is radiated off the Earth's surface and then is trapped in the earth's atmosphere by GHGs, causing the Earth's surface temperature to increase. The Earth's surface temperature has increased by 1.4 degrees Fahrenheit over the past 100 years. According to the EPA, the average temperature at the Earth's surface could increase from 2 to 11.5 degrees Fahrenheit in the next 100 years.

Sea Level Rise

Global warming is just one aspect of climate change. Sea level rise, rainfall patterns, snow cover, and ice cover are also changing. The Fort McHenry sea level gauge in Baltimore, Maryland has recorded sea level rise at the rate of 1.03 feet every 100 years between 1902 and 2013¹. The Maryland Climate Change Commission (Scientific and Technical Working Group) reports projections of sea level rise in Maryland of between 0.9 and 2.1 feet by 2050 and between 2.1 and 5.7 feet by 2100². The Maryland State Highway Administration (SHA) is currently planning for changes in mean sea level in the Baltimore region of between 2.01 feet (Harford County, Baltimore County and Baltimore City) and 2.08 feet (Anne Arundel County) by 2050 and between 5.59 feet (Harford County, Baltimore County and Baltimore City) and Baltimore City) and 5.7 feet (Anne Arundel County) by 2100.

How Far Can We Get?

With the understanding that climate change planning and greenhouse gas emissions mitigation is an important consideration of transportation planning, the Baltimore Regional Transportation Board initiated the "How Far Can We Get?" study in FY 2014. The purpose of this study was to understand the level of emission reductions that are achievable through a reasonable level of reduction measure implementation, and to inform the region's next long-range transportation plan. The Maryland State Highway Administration is currently planning for changes in mean sea level in the Baltimore region of between 2.01 feet (Harford County, Baltimore County and Baltimore City) and 2.08 feet (Anne Arundel County) by 2050 and between 5.59 feet (Harford County, Baltimore County and Baltimore City) and 5.7 feet (Anne Arundel County) by 2100.

The combination of measures chosen by the "How Far Can We Get?" Committee, in consideration of feasibility of implementation, could potentially achieve nearly a 3 percent carbon dioxide (CO₂) equivalent reduction in 2030 and just under a 10 percent reduction in 2040. The study shows that the most beneficial measures are those that increase the fuel economy of vehicles, now and into the future. Some of the recommended measures from the study are included in the Transportation Emissions Reduction Measure (TERM) funding list in Chapter 4 of this plan. These include promotion of eco-driving and travel demand management measures such as clean commuting, electric vehicles, and idle reduction for heavy-duty trucks.



¹ http://tidesandcurrents.noaa.gov/sltrends/sltrends.html. Web site accessed April 29, 2015.

² Boesch, D.F., L.P. Atkinson, W.C. Boicourt, J.D. Boon, D.R. Cahoon, R.A. Dalrymple, T. Ezer, B.P. Horton, Z.P. Johnson, R.E. Kopp, M. Li, R.H. Moss, A. Parris, C.K. Sommerfield. 2013. Updating Maryland's Sea-level Rise Projections. Special Report of the Scientific and Technical Working Group to the Maryland Climate Change Commission, 22 pp. University of Maryland Center for Environmental Science, Cambridge, MD.

Appendix B: Future Conditions and Needs

Chesapeake Bay

The Chesapeake Bay watershed includes six states and is 64,000 square miles in size. There are excess amounts of nutrients (nitrogen and phosphorus) and sediment being deposited into the Bay. Down-stream effects of excess nutrients and sediment include loss of water clarity and algal blooms. Sources of these pollutants include agriculture, urban and suburban runoff, wastewater, and atmospheric deposition.

Sea level rise, increased temperatures, and other aspects of climate change are predicted to hinder efforts to clean up the Chesapeake Bay. According to the Maryland Greenhouse Gas Reduction Act Plan³, increased runoff and rainfall events from climate change could affect the Bay through increased erosion and sediment loads. Higher peak stormwater flows also would mean greater amounts of nutrients transported downstream, degrading water quality. Additionally, climate change will likely cause a decline in biodiversity of plants and animals in the forests of Maryland. Increasing summer temperature will likely cause higher ozone levels and more frequent exceedances of the federal ozone air quality standard. Sea level rise will also require costly mitigation measures to protect the region's transportation infrastructure from higher water and damage caused by storm surges.

EPA issued a "pollution diet" in December 2010 across the entire Chesapeake Bay as well as each tidal segment. This pollution diet is in the form of a Total Maximum Daily Load (TMDL), with caps set on levels of nitrogen, phosphorus, and sediment going into the Bay. TMDLs are Clean Water Act regulatory

tools that set daily limits on pollutants going into water bodies. There are a series of accountability measures to ensure the TMDL caps are being met.

As part of Maryland's plan to reach its interim (2017) nitrogen and phosphorus reduction goals for the Chesapeake Bay TMDL, the state is implementing a set of measures to address sources of water pollution, one of which is urban stormwater runoff. Urban stormwater runoff includes runoff from roadways. There are a number of different ways to mitigate the effects that presence of roadways can have on stormwater runoff pollution, including stormwater management ponds, stream restoration, tree planting, and street sweeping.

State of the Bay Report

According to the Chesapeake Bay Foundation 2014 State of the Bay report, the health of the Chesapeake Bay is slowly improving. Water quality indicators such as dissolved oxygen and water clarity have seen an improvement, while levels of nutrient pollution did not improve in 2014. Amounts of underwater grasses providing critical habitat have improved, while the number of blue crabs has dropped dramatically.





³ Maryland Department of the Environment. 2013. Maryland's Greenhouse Gas Reduction Action Plan.



Freight Movement and Connections

The efficient movement of freight, within and through the region and between modes, is a vital element of the region's economy. Many businesses maintain smaller inventories and rely on "just-in-time" deliveries of materials and goods. Anything that complicates or slows the movement of freight slows the delivery of materials and goods to consumers and businesses. MAP-21 has recognized the importance of freight by including it in one of the eight basic planning factors that each long-range transportation plan must address: "Increase the accessibility and mobility options available to people and for freight."

Regional Freight Network

The greater Baltimore region is Maryland's leading goods movement center. Each year, more than 307 million tons of freight valued at nearly \$1 trillion move over Baltimore's highway, rail, port, and airport facilities, serving domestic and international demand for a wide range of goods.⁴

Between now and 2030, freight on the region's transportation system is projected to nearly double,⁵ with significant percentage increases across the modes and the largest volume increase in truck tonnage. The growth in freight demand, combined with the predicted growth in private vehicle travel, commuter or intercity rail, and passenger air services, will place additional stress on the capacity of the region's transportation system.

Given current levels of congestion, the doubling of freight traffic on the region's infrastructure will create additional challenges for transportation planners. Other trends and challenges include the need to enhance highway safety, a need for improved intermodal connections, the security of goods movement, and lack of sufficient truck parking.

Growth at the Port of Baltimore

Another issue planners need to account for is the expected significant growth at the Port of Baltimore. An August 31, 2015 press release from the Maryland Port Administration notes that the port's public marine terminals had a record year in 2014, and overall the port handled 29.5 million tons of international cargo at a value of nearly \$53 billion. Baltimore is ranked as the top port among all U.S. ports for handling autos and light trucks, farm and construction machinery, imported forest products, imported sugar, and imported aluminum. Overall, Baltimore is ranked ninth for the total dollar value of cargo and 13th for cargo tonnage for all U.S. ports.

In addition, the Port of Baltimore is one of two East Coast ports with a 50-foot channel. The Seagirt Marine Terminal, the port's primary container facility, features a 50-foot berth that will enable the port to accommodate super-draft ships that will be able to pass through the widened Panama Canal beginning in 2016. The Seagirt Terminal has 11 cranes, four of which are "Super Post-Panamax," capable of handling the biggest ships in the world. This will help to make the Port of Baltimore into a gateway for general cargo such as containers and autos and bulk cargo such as gypsum and iron ore. This growth will require the Maryland Port Administration and its partners to evaluate the need for additional facilities to accommodate increased demand.

⁵ Maryland Department of Transportation. Attainment Report on Transportation System Performance.



⁴ Cambridge Systematics. *Mid-Atlantic Rail Operations Study*.

Appendix B: Future Conditions and Needs

"Mega-Regional" Projects

Chapter 4 mentions two "mega-regional" facilities that have regional freight implications: the B&P Tunnel that carries freight and passenger traffic through Baltimore City and the Amtrak / freight rail bridge over the Susquehanna River between Harford and Cecil counties. Both of these facilities need significant improvements (or replacement) to handle increased rail traffic. MDOT is studying alternatives for improving these facilities to better accommodate current and future rail traffic and has provided periodic updates to the BRTB about findings and developments.

Funding for any possible future improvements to these facilities would be from sources outside the jurisdiction of the BRTB. Nonetheless, regional planners and modelers need to be aware of the potential effects of any improvements (or lack of improvements) on the region's transportation network. The BRTB, supported by BMC staff, will determine these potential effects on regional travel demand and patterns should these projects advance beyond the study phase.

Freight Initiatives

Freight Modeling Initiative

BMC and SHA are working together under a grant from the Federal Highway Administration to study freight movement in the Baltimore region and to enhance the simulation of freight traffic in BMC's and SHA's travel models. This "C20" freight model project will provide information on the components of freight movement: locations of cargo transfers, type of commodities and characteristics, long-distance freight routing, and local delivery patterns.

This information will be incorporated into two simulation tools: a statewide supply chain freight model for use by SHA and an urban-tour-based commercial vehicle model for use by BMC. The statewide supply chain freight model seeks to provide insight into suppliers' and distributors' choice in transportation mode, shipment size, and commodity-specific characteristics to simulate long-distance truck traffic. The urban-tour based commercial vehicle model seeks to understand and simulate the local delivery of goods and services to area households.

Global Cities Initiative

Launched in March 2012, the Global Cities Initiative (GCI) is a \$10 million, 5-year project sponsored by Brookings and JPMorgan Chase. The Baltimore region is one of the regions chosen to participate in this initiative.

GCI aims to help leaders of U.S. metropolitan areas to strengthen their regional economies by becoming more competitive in the global marketplace. The initiative:

- looks at such key indicators as advanced manufacturing, exports, foreign direct investment, freight flow, and immigration
- shares best practices and policy innovations from across the nation and around the world
- creates an international network of leaders from global cities focused on deepening global trade relationships.

The Baltimore region, for purposes of this initiative, consists of the jurisdictions covered by the BMC as well as Cecil County. The BMC serves on the steering committee, along with the Baltimore Development Corporation and the Greater Baltimore Committee (the lead local agency on the project). The initiative will result in a regional export strategy to be released in early 2016. This process involves all of the regional economic development agencies. In addition, BMC managed an on-line survey of regional businesses as part of the research. Local companies are also taking part in individual interviews and focus groups managed by the Greater Baltimore Committee.







Comprehensive Planning / Growth Management

To develop a comprehensive plan, each local jurisdiction first forecasts the number of new residents and new workers expected in the jurisdiction over a period of 20+ years, and where the new residents and workers will choose to locate. The forecasts, often called socioeconomic forecasts, are then used to plan for the public facilities and services—such as schools, water/sewer lines, roads, police departments, and fire stations—needed to accommodate all residents and workers in the local jurisdiction.

Growth management refers to the policies and procedures that local jurisdictions, regions, and states use to accommodate more residents and workers. While specific policies and procedures differ from jurisdiction to jurisdiction, in general most local jurisdictions use growth management to encourage,

guide, and support new development in areas where public facilities and services are in place or are planned to be in place. Such an approach in most cases is effective, maximizes cost-effectiveness, and minimizes environmental impacts. In addition, growth management is also used to limit new development on land or where a particular land use is valuable to the public. For example, local jurisdictions often use growth management to preserve environmental, historic, and/or economic resources.

The commitment to growth management in the Baltimore region dates from the 1960s. That decade saw innovative policies such as the Urban Rural Demarcation Line (URDL) in Baltimore County and ambitious efforts such as the plan for a whole "new" town, Columbia, in Howard County. In addition, the state of Maryland, considered a pioneer in statewide growth management policies, has provided both guidance and technical expertise to support the commitment.

As noted in the first section of this chapter, the BRTB's Cooperative Forecasting Group (CFG) convenes its members from the local jurisdictions and the state of Maryland to develop a socioeconomic forecast for the entire region. So the forecast, and the regional transportation plan based on the forecast, are consistent with its members' growth management policies and procedures.

Growth Management Legislation

The Priority Funding Act of 1997 provided a new approach to statewide growth management, based on fiscal incentives, as opposed to regulations, to manage growth. The legislation created five programs to encourage investment in developed areas and preservation of farmland, forests, and other natural resources.

The Priority Funding Areas (PFA) program provides incentives for jurisdictions and developers by concentrating growth-related projects in PFAs that are existing communities and places where local governments want state funding for future growth. Growth-related projects include most state programs that encourage growth and development, such as highways, sewer and water construction, economic development assistance, and state leases or construction of new office facilities. And the Rural Legacy Areas (RLA) program provides state funds to support the preservation of large, contiguous tracts of land that are designated by local governments and land trusts and are critical to the economy, environment, and quality of life.

The Sustainable Communities Act of 2010 established Sustainable Communities (SCs) to stimulate reinvestment in Maryland's older communities by preserving historic or non-historic properties and refocusing the state's community programs.

The Sustainable Growth and Agricultural Preservation Act of 2012 linked development potential to wastewater treatment. This act established four additional designated areas, or tiers, to encourage development in areas with existing or planned public sewer service and to limit development in areas with private septic systems. Local jurisdictions set the boundaries of all designated areas, which the State then uses to set priorities for infrastructure investment statewide.



Appendix B: Future Conditions and Needs



Priority Funding Areas / Major Expansion Projects



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Appendix C: Scenario Thinking



Preparing for an Uncertain Future

The region faces several challenges as it plans for the transportation systems of 2040. For example:

- improving and maintaining existing infrastructure
- · connecting people to jobs and other opportunities
- moving goods to promote continued economic growth
- · conserving and enhancing environmental resources
- finding the funding to meet all transportation needs and aspirations

Issue: Within the transportation planning framework (including federal, state, regional, and local requirements and policies), and accounting for regional challenges, how can the region make effective transportation investment decisions over the next 25 years? Which mix of long-term transportation investments will best enable the region to meet future challenges?

* The last thing the region wants is to plan for projects that will be ineffective or irrelevant as a result of future changes.

Scenarios: Statutory Framework

Selecting the most effective projects can be a daunting task. To help regions consider a range of different factors, MAP-21 gives metropolitan regions the option of considering multiple scenarios in developing their long-range transportation plans. For regions that utilize a scenario approach, MAP-21 encourages consideration of such factors as distribution of population and employment, potential revenues, and potential regional investment strategies.







Informed Decision Making

One of the goals of *Maximize2040* is "Promote Informed Decision Making." This goal is consistent with MAP-21's emphasis on performance-based planning and programming. That is, monitoring the performance of transportation systems to make sure the region is getting the best "bang for the buck" with its investments.

In developing *Maximize2040*, the BRTB applied the following requirements:

- Involve partner agencies and interested parties in a continuing, cooperative, and comprehensive planning process.
- Select the major transportation projects that will best meet federal, state, and regional requirements and policies over the next 25 years.
- Do this within a fiscally constrained plan—one where estimated costs do not exceed forecasted revenues.

Given these requirements, a basic question is "How can the region make informed decisions about the future, especially when there are a lot of uncertainties about the future?"

The typical approach to making decisions about future transportation systems involves:

- · Developing population and employment forecasts for the region and its jurisdictions
- Applying these forecasts to the regional travel demand model to predict where and how people will travel, given proposed changes to the existing network of roads and transit lines.

Forecasts and models are essential to the transportation planning work the region conducts. Their basic approach is to predict and react. However, much about the future is unpredictable. As a result, forecasts and models may not provide all of the information the region needs to make the most informed decisions about the future.

A Different Approach: Scenario Thinking

Scenario thinking is a way to supplement forecasts and models. Scenarios can help a region prepare and adapt, as opposed to predict and react. The region can use a scenario approach to examine uncertain forces that could dramatically affect how we will live and travel over the next 25 years. The goals of scenario thinking are to:

- Prepare the region to be resilient: better able to adapt to a variety of potentially significant future changes.
- Identify investment strategies, policies, and projects that can be effective under a variety of possible future conditions.



Appendix C: Scenario Thinking

Survey to Gather Public Input

To begin the scenario thinking process, the BRTB surveyed the public and stakeholder groups in June and July 2014. The survey asked people to choose which external forces might have the greatest effects on transportation, the environment, and growth in the Baltimore region between now and 2040. To help keep things organized, the survey divided forces into five basic types, according to a model sometimes referred to by the acronym "STEEP": (1) Social-Demographic, (2) Technological, (3) Economic, (4) Environmental, (5) Political.

The survey generated 209 total responses. According to these responses, the most critical forces facing a future Baltimore region are:

Social-Demographic Forces

- Older and more diverse population
- Changes in work and lifestyle patterns, such as increases in teleworking or delayed retirement
- Changes in transportation preferences, such as the recent decline in per capita vehicle miles traveled (VMT)

Technological Forces

- Innovations in interconnected systems (vehicle-to-vehicle and vehicle-to-network)
- Innovations in personal transportation, such as driverless vehicles and/or shared vehicles

Economic Forces

Long-term systemic unemployment

Environmental Forces

- Climate change
- Threats to water resources

Political Forces

• Political will to tap new sources of transportation funding, whether federal, state, local or private

See additional details about survey responses:

https://infogr.am/survey-results-70?src=web.





In developing Maximize2040, the BRTB considers major trends and external forces that could dramatically change our lives. The objective is to find the investment strategy that best addresses the needs of the Baltimore region, while recognizing the challenges it could face in the future.

More than 200 people throughout the Baltimore region participated in the survey. Preparing for the Future: Big Ideas, which asked participants about the social, economic, technological, environmental and political forces that could play a role in long-range transportation planning. The BRTB would like to share the survey results from a total of 209 participants with the public, as an update to where we are in the planning process for Maximize2040. Please take a look:







Refining Public Input through a Focus Group

In July 2014, the BRTB convened a focus group to look at the survey responses and try to determine the forces that will be most critical for the Baltimore region.

The focus group concluded that two of the forces indicated in the survey responses (the top vote getters in the survey) are certain or nearly certain to happen in the future:

- The region's population is getting older and more diverse
- There will never be enough funding to meet all transportation needs and aspirations.

Since the group saw these two forces as certain or nearly certain, its members believed that the scenario thinking effort should focus more on uncertain forces, all the while being cognizant of the importance of the two more certain forces. The group recommended developing scenarios around these uncertain forces:

- Changes in patterns and preferences with respect to work, lifestyle, and travel
- The degree to which climate change might affect regional transportation systems (and low-lying communities)
- · Innovations in interconnected systems, vehicles, and devices

In addition, the focus group wanted the scenario initiative to consider the degree to which quality of life in the region might improve or decline over the next 25 years. How might these changes affect the region's economic competitiveness relative to other regions? Another concern was the extent to which air pollutants such as ozone, diesel emissions, and fine particulate matter might affect public health in the future.

The focus group concluded that these trends are certain or nearly certain to happen in the future:

- The region's population is getting older and more diverse
- There will never be enough funding to meet all transportation needs and aspirations.

Developing and Applying Scenarios to Support the Regional Transportation Plan

Based on public and focus group input, BMC staff members developed three scenarios to examine critical forces facing the region. These scenarios presented possible events and conditions in three very different futures. Although the scenarios assumed some best and worst case future conditions, these are all challenges the region faces today:

- "Wash Overflow," in which population growth and job growth have spilled over from the Washington, DC region into the Baltimore region
- "Simmered Up," in which climate change effects have led to rising sea level and more extreme weather events throughout the U.S., and particularly in the Baltimore region
- "Zuber Connected," in which significant advances in vehicle-to-vehicle and vehicle-to-network communication systems and sensors have occurred



Appendix C: Scenario Thinking

Scenario Exercises: Workshops to Engage Regional Stakeholders

Groups of regional stakeholders (transportation and non-transportation professionals) gathered on two days (September 23, 2014 and December 11, 2014) to work through these scenarios.

Participants included:

- professors and instructors from local universities and colleges
- staff members from the Maryland Department of Transportation, Maryland State Highway Administration, Maryland Transit Administration, and Maryland Port Administration
- staff members from local jurisdictions specializing in emergency response and resiliency planning
- staff members from groups dealing with environmental issues and public health
- representatives from private transportation providers, including ZipCar
- organizations focused on workforce development and health/disability issues
- staff members from Ft. Meade, the Chesapeake Science and Security Corridor, the BWI Partnership, the Central Maryland Transportation Alliance, and the Greater Baltimore Committee
- Public Advisory Committee members
- representatives of consulting firms

At the September workshop, participants were assigned to be in one of three groups (one for each of the scenarios). The December group was smaller, so that group broke into two subgroups: one focused on the Wash Overflow scenario and the other discussing the Simmered Up scenario.

Participants were asked to assume the events and conditions in their scenario actually had happened in the years between 2014 and 2039, 25 years in the future. This led to participant discussions on the likely effects of these events and conditions on key regional socioeconomic and travel trends and goalfocused performance measures. The groups also considered which investment approaches might enable the region to address future challenges most effectively.

The graphic at right illustrates this approach:

- 1. Discuss the external forces that likely will be critical to the region (purple ring).
- 2. Analyze the effects of these forces on socioeconomic and travel trends and performance measures (red ring).
- 3. Determine which types of actions the region can take to best prepare for these effects (blue ring).









Scenario Findings: Trends and Measures

September Workshop

The chart below shows the probable future effects of each scenario on key indicators, trends, and performance measures, as determined by each of the three groups at the September workshop.

Scenario Findings: Indicators, Trends, and Measures					
	Wash Overflow	Simmered Up	Zuber Connected		
Socioeconomic Indicators					
Gross domestic product					
• Jobs					
Population					
Average Age					
Regional Travel Trends					
Distance to work					
Distance to shop					
Personal auto use					
Transit use					
 Freight deliveries 					
Total miles traveled					
Performance Measures					
Traveler safety (injuries/fatalities)					
Traffic congestion (individual)					
Traffic congestion (freight)					
Road/bridge conditions					
Transit infrastructure conditions					
Air quality					

Much less/worse	Less/worse	Same/neutral	More/better	Much more/better



Appendix C: Scenario Thinking

Technology: "Savior" or Catalyst for Increased Driving?

All three groups agreed that technology will play a large role no matter how the socioeconomic trends or the environmental forces play out. The groups discussed whether or not technological advances will be a "savior" with respect to safety and congestion in the region. That is, technological advances in vehicle-to-vehicle and vehicle-to-network systems and sensors could help to improve safety and ease congestion significantly in the future. On the other hand, the improvements resulting from technological advances could act as a catalyst for increased driving and increased "sprawl." Opinions were divided on this topic.

Increase in Freight Deliveries

The groups also thought that freight and commercial trips are likely to increase in the future. Again, the role of technology was seen as central to this topic.

Deteriorating Infrastructure Conditions

All three groups concluded that infrastructure conditions (roadway, bridge, and transit) are likely to deteriorate in the future. Again, technology could help in this area by facilitating asset management and through the development of new, more durable and heat-tolerant materials (pavement, bridge, rail).













December Workshop

The chart below shows the probable future effects of each scenario on key trends and performance measures, as determined by each of the two groups at the December workshop.

Scenario Findings: Indicators, Trends, and Measures				
	Wash Overflow	Simmered Up		
Socioeconomic Indicators				
Gross domestic product				
• Jobs				
Population				
Average Age				
Regional Travel Trends				
Distance to work				
Distance to shop				
Personal auto use				
• Transit use				
Freight deliveries				
Total miles traveled				
Performance Measures				
Traveler safety (injuries/fatalities)				
Traffic congestion (individual)				
Traffic congestion (freight)				
Road/bridge conditions				
Transit infrastructure conditions				
Air quality				

Much less/worse	Less/worse	Same/neutral	More/better	Much more/better

Additional Comments and Concerns

The conclusions of the December Wash Overflow and Simmered Up groups were similar to those of the September groups, with a few notable exceptions:

• In the area of travel trends, the December Wash Overflow group generally was more pessimistic than the September group. The December group, for example, believed that distance to work and personal auto use would increase because of the conditions noted in the scenario. That is, these conditions could contribute to additional "sprawl."



Appendix C: Scenario Thinking

- For both the Wash Overflow and Simmered Up scenarios, the December group was less certain than the September group that advances in vehicle and infrastructure technologies would lead to safer conditions.
- In the area of performance measures, the December Wash Overflow group generally was more optimistic than the September group. The December group, for example, believed that transit infrastructure conditions (i.e., the condition of transit vehicles, rails, etc.) would improve.
- This group also was more optimistic than its September counterpart with respect to air quality, believing that air quality would improve because of continued stringent statutory and regulatory requirements as well as advances in vehicle technologies.
- On the other hand, the December Simmered Up group was less optimistic than its September counterpart with respect to air quality. This group believed that air quality would be worse under its scenario conditions.

Both December groups held out hope that technological advances in vehicle and infrastructure technology would improve conditions with respect to traveler safety and traffic congestion. But there also was a lot of uncertainty about this.

There also was some concern about growing inequality—that is, the future might see disparity between those who can afford new technologies and those who can't afford them, potentially set"The *Maximize2040* workshop is an important part of [the] evaluation process. By engaging voices from a cross section of the community to better understand the unique demands of Baltimore and beyond, we can collectively help shape a better future."

— Jeremy Pomp, Zipcar Baltimore

ting up a "haves" vs. "have nots" situation. There also were concerns about privacy in an era where vehicle and infrastructure technologies will enable everyone's positions and movements to be tracked to an even greater extent than they are today.









Scenario Findings: Investment Strategies

All of the scenarios examined in the breakout sessions at each workshop assumed some best and worst case future conditions. However, these conditions are all challenges we face to some degree today.

At each workshop, following the discussions and exercises in the breakout sessions, the group at large reconvened to review the findings of each breakout group. Each breakout group summarized (1) the effects its scenario will have on key socioeconomic and travel trends and on key performance areas and (2) what kinds of policy choices and investments in transportation network operations and capital projects might help the Baltimore region to prepare for these effects. The larger group also looked at some of the areas in which all three groups had some agreement.

September Workshop

The chart below summarizes the conclusions of the September group.

Scenario Findings: Investment Strategies				
	Wash Overflow	Simmered Up	Zuber Connected	
 Road/bridge maintenance 				
 Transit vehicle maintenance/ replacement 				
 Road technologies 				
 Transit technologies 				
 NHS road expansion 				
 Non-NHS road expansion 				
 Intersection/interchange improvements 				
Inter-regional transit expansion				
Commuter transit expansion				
Local transit expansion				
Transit station improvements				
Bike/walk access improvements				
Emissions reduction				

Important and Urgent	Important, but action can wait	Not as important or urgent	

All three of the September groups found these investment areas to be both important and urgent:

- Road and bridge maintenance (or relocation as necessary)
- Expansion of commuter transit services
- Emission reduction measures



Appendix C: Scenario Thinking

All three groups determined that these investment areas are at least important but not urgent (investment is important, but it could be delayed to allow the region to address more urgent issues first):

- Transit facility maintenance / transit vehicle replacement
- Transit technologies (vehicle-to-vehicle and vehicle-to-network communications systems)
- Transit station improvements
- Improvements to pedestrian and bicycle facilities / improvements to pedestrian and bicycle access to other types of transportation

Other types of investments were not determined to be important in all three scenarios, although some scenarios may have found them to be critical for their particular set of events and conditions.

December Workshop

Scenario Findings: Investment Strategies				
	Wash Overflow	Simmered Up		
Road/bridge maintenance				
 Transit vehicle maintenance/ replacement 				
 Road technologies 				
Transit technologies				
NHS road expansion				
 Non-NHS road expansion 				
 Intersection/interchange improvements 				
Inter-regional transit expansion				
Commuter transit expansion				
Local transit expansion				
Transit station improvements				
Bike/walk access improvements				
Emissions reduction				

The chart below summarizes the conclusions of the December group.

Important and Urgent	Important, but action can wait	Not as important or urgent

Both of the December groups found these two investment areas to be both important and urgent:

- Road and bridge maintenance (or relocation as necessary)
- Expansion of local transit services







Here are investment areas both December groups determined were at least important but not urgent:

- Transit facility maintenance / transit vehicle replacement
- Transit technologies (vehicle-to-vehicle and vehicle-to-network communications systems)
- Commuter transit expansion
- Transit station improvements
- Improvements to pedestrian and bicycle facilities / improvements to pedestrian and bicycle access to other types of transportation
- Emission reduction measures

Scenario Thinking: Where Does the Region Go from Here?

Staff has briefed the BRTB members on the findings of the scenario exercises. The local jurisdictions and state agencies can use these findings to inform their decision making as they deliberate on which projects the region should plan for and implement over the next 25 years, given the financial resources expected to be available.

In addition, periodically staff will update the BRTB members on developments and trends relative to the topics discussed in the scenarios. These include population and employment projections, potential climate change effects, and developments in technology as well as other national or regional forces or trends that could affect the region's ways of living and traveling in the future.



Appendix D: Regional Goals and Strategies



As noted in Chapter 2 of this document, the Baltimore Regional Transportation Board has adopted nine broad goals to guide transportation investments over the 2020-2040 period. Goals represent the guid-ing principles, the transportation vision, for the region. These principles describe the system the region would like to achieve, given the will and the resources.

Applying Strategies to Achieve Regional Transportation Goals

This appendix presents detailed strategies the BRTB has adopted to support the regional goals. Strategies are approaches or policies to help the region implement and make progress toward goals.

In developing goals and strategies for *Maximize2040*, the BRTB used as a baseline the goals and strategies in the 2011 regional transportation plan (titled *Plan It 2035*). Working from this baseline, the BRTB sought input on proposed goals and strategies from each of its advisory groups. Some of these advisory groups formed subcommittees to review proposed goals and strategies and provide recommendations. BMC staff passed along all recommendations from the advisory groups to the BRTB for consideration.

The BRTB also welcomed comments from the public on draft goals and strategies for *Maximize2040*. The BRTB approved the final goals and strategies for *Maximize2040* in April 2014.

* In the material that follows, *italicized text* indicates strategies or concepts that were recommended as additions or revisions by the public and/or BRTB advisory groups and subsequently adopted by the BRTB. This list represents a more effective and comprehensive set of policies that can help the region to address regional goals and meet federal requirements.







Improve System Safety

Make conditions safer for pedestrians, bicyclists, transit riders, and motorists.

At a basic level, this involves designing and building safer features to accommodate all users: pedestrians, bicyclists, transit riders and operators, and motorists. This approach includes a focus on making interactions among users of different modes safer. Promoting safety research and education programs is another important way the region can improve safety for all travelers.

The following strategies can improve traveler safety in the Baltimore region:

- Adopt relevant state and local plans that seek to reduce transportation-related injuries and fatalities.
- Improve traveler safety in all modes through traffic and transit system management and operations techniques.
- Invest in cost-effective safety improvements to eliminate hazardous or substandard conditions in high crash locations and corridors (all modes).
- Improve the ability of transportation and emergency service agencies to respond in a timely manner to emergency incidents.
- Improve conditions to enable pedestrians and bicyclists to travel more safely on a day-to-day basis, including safe interactions with users of other modes and safe access to transit stations and stops.
- Support research into better understanding the causes of bicycle and pedestrian crashes and injuries to promote more effective countermeasures.
- Educate all travelers of all modes on safe travel techniques that are mode- and age-appropriate.





Appendix D: Regional Goals and Strategies

Improve and Maintain the Existing Infrastructure

Improve the conditions of existing transportation facilities; systematically maintain and replace transportation assets as needed.

When funding is limited, it makes sense to direct a significant portion of funds to preserving and operating existing facilities. Recognizing this, recent regional transportation plans have allocated approximately 75 percent of funding to system preservation and operations.

The following strategies can help the region improve and maintain its existing transportation assets:

- Continue to improve the condition of roadway systems (pavement, bridges, tunnels).
- Replace aging traffic signals and Intelligent Transportation System elements on a timely, systematic basis.
- Maintain and replace aging transit vehicles on a timely, systematic basis.
- Research and invest in cost-effective measures that will reduce emissions and life-cycle costs of transit rolling stock and infrastructure elements.
- Continue to improve the condition of existing transit infrastructure and stations/stops.



- Increase emphasis on improving the condition of existing pedestrian and bicycle facilities.
- Encourage local jurisdictions to develop comprehensive asset management programs to monitor the conditions of transportation assets and repair/replace those assets on a timely, systematic, cost-effective basis.







Improve Accessibility

Help people of all ages and abilities to access specific destinations.

Everyone needs to go places: work, doctor's office, shopping, school. Ways to reach these destinations include cars, public transit, walking, and bicycling. This goal considers the needs of all travelers when designing roads, transit stations and stops, and pedestrian and bicycle facilities. The goal also seeks to help people who don't or can't drive get where they need to go.

The following strategies can improve accessibility for all travelers:

- Increase transportation alternatives for all segments of the population, *including the disabled, the elderly, minority and low-income populations, and transit-dependent individuals.*
- Continue to improve conditions for pedestrians and transit riders to meet or exceed Americans with Disabilities Act requirements.
- Leverage transportation funds in coordination with other funds to provide affordable options for accessing necessities or amenities (e.g., jobs, health care, child care, education).
- Consider affordable housing and workforce/economic development planning when determining long-range priorities.
- Continue to invest in pedestrian and bicycle facilities and programs, *especially those that link to activity centers and public transit*.
- Integrate strategies identified through the Coordinated Public Transit – Human Services Transportation Plan into regional planning and decision making



- Encourage the private sector to provide appropriate access on commercial properties for bicyclists, pedestrians, and transit users.
- Support operating policies that enable year-round, obstacle-free access to pedestrian, bicycle, and transit facilities.





Appendix D: Regional Goals and Strategies

Increase Mobility

Help people and freight to move reliably and efficiently.

Travelers and freight carriers value the ability to get from one specific location to another as reliably and efficiently as possible. Anything that delays or complicates a trip, such as recurring traffic congestion or slowdowns related to crashes or construction, impedes that ability.

The following strategies can improve the reliability and efficiency of the region's transportation system:

- 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, *includ-ing 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.
- Develop and support a regional, long-distance bikeway network, including consistent guide signage.







Conserve and Enhance the Environment

Pass on to future generations the healthiest natural and human environments possible.

Per federal requirements, the region is responsible for ensuring that transportation plans, programs, and projects do not worsen air quality. In addition, the region has begun to consider the potential effects of climate change on the transportation system. Responsible environmental stewardship also includes conserving resources such as the Chesapeake Bay, wetlands, farmland, wildlife habitat areas, and historic and cultural resources.

The following strategies can help the region practice responsible stewardship:

- Ensure that the region conforms to the applicable state air quality plan by developing programs to reduce congestion (e.g., provide alternatives to the use of single-occupant passenger vehicles through Travel Demand Management (TDM) techniques), reduce growth in mobile source emissions, and encourage emission reduction technologies.
- Invest in transportation programs and projects, *including best management practices*, that reduce surface runoff and protect water resources.
- Promote efficient use of energy resources by supporting fuel-efficient best management practices and alternative fuel use, including consideration of programs to provide incentives for the use of zero-emission vehicles.
- Invest in transportation programs and projects that reduce greenhouse gas emissions in accordance with state and local plans and initiatives regarding sustainability and climate change (e.g., Maryland's Greenhouse Gas Reduction Plan).
- Preserve and protect natural and cultural resources.
- Enhance the quality of human health by providing multimodal transportation infrastructure and services that promote active living and physical activity and minimize transportation-related emissions.





Appendix D: Regional Goals and Strategies

Improve System Security

Provide a secure traveling environment for everyone; improve the ability of the region to respond to natural and man-made disasters.

Every traveler understands the need to feel secure and safe when using the transportation system. The concept of transportation system security also covers preparing for and responding to severe weather events, natural disasters, and man-made threats.

The following strategies can help the region address personal security needs as well as regional preparation and response approaches:

- Provide for the personal security of transit riders through the use of closed-circuit TV and other security-related features.
- Continue to refine a regional emergency coordination and response plan to address large-scale, inter-jurisdictional emergency events, including evacuation routes and procedures.
- Improve the capabilities of jurisdictions to respond to and recover from emergencies, including security threats and natural disasters, through the use of traffic and transit system management and operations techniques.
- Identify policies and procedures for communication, resource sharing, and cooperative response to emergencies among transportation and non-transportation response agencies.



- Leverage transportation and security funds to implement regional priorities.
- Increase redundancy in the overall system.
- Plan for the potential transportation-related implications of climate change (e.g., rising sea level, storm surge).
- Encourage equitable sharing among all modes of the benefits and burdens of security and safety initiatives.







Promote Prosperity

Support the revitalization of communities, the development of activity centers, and the movement of goods and services.

The region's transportation system should support competitive yet responsible development and growth. This includes considering the link between an efficient, connected transportation system and the economic vitality of nearby communities. The region also can promote economic development by improving transportation facilities that provide access to major activity centers and improve goods movement within and through the region.

The following strategies can help the region promote prosperity and economic opportunity through transportation investments:

- Incorporate as appropriate into the region's transportation programs and projects the six livability principles developed jointly by the U.S. Department of Housing and Urban Development, U.S. Department of Transportation, and U.S. Environmental Protection Agency.
- Emphasize the coordination of land use decisions, transportation planning, housing availability, and employment opportunities, including consideration of the connections between land use decisions and the costs of transportation.



- Coordinate transportation investments with state planning policies and local plans regarding growth and development (e.g., the 1992 Planning Act and the 1997 Priority Funding Areas Act).
- Concentrate transportation investments within local- and state-designated growth areas to encourage prosperity in and revitalization of existing communities.
- Improve transportation infrastructure (all modes) that improves access to existing communities and regional generators of economic activity (e.g., activity centers and freight corridors), *including the consideration of expanded transit service coverage and hours of operation*.
- Coordinate with communities to provide context-sensitive infrastructure and facilities that integrate with community assets, needs, and preferences.
- Promote development around existing transit stations.



Appendix D: Regional Goals and Strategies

Foster Participation and Cooperation among All Stakeholder Groups

Enable all interested and affected parties to participate and cooperate to find workable solutions.

Fostering participation and cooperation means finding ways to communicate more effectively with, and encourage input from, all groups with a stake in the transportation system. This includes local jurisdictions, state agencies, the public, and the private sector. It also means finding ways to encourage financial participation from public and private entities that stand to benefit from transportation projects and programs. This can help the region leverage federal transportation funds to the greatest extent possible.

The following strategies can help the region foster participation and cooperation among all stakeholders:

- Coordinate transportation planning and programs across all modes, across inter-jurisdictional and inter-regional boundaries, and among all stakeholders as appropriate and feasible to provide af-fordable, reliable, safe, and secure transportation alternatives.
- Through traditional means and through social media options, engage with and encourage input *early and often* from all groups with a stake in the performance of the region's transportation system.
- To the greatest extent possible, hold public outreach events at accessible venues within affected communities.
- Promote environmental justice through programs and policies to ensure that the benefits and burdens of transportation projects are shared equitably.
- Engage with businesses, developers, and communities to identify and build support for new approaches and public/private partnerships for funding improvements to the transportation system (all modes).
- Leverage federal transportation funds to the greatest extent possible by encouraging matching contributions from entities that stand to benefit from transportation projects and programs—private organizations and companies as well as local jurisdictions.
- To the greatest extent possible, work with planners and engineers in all jurisdictions to develop common policies and design strategies, *including Complete Streets policies and design templates*, for transportation facilities.









* The following goal and set of supporting strategies, new as of this plan, were recommended by several advisory groups and adopted by the BRTB. This goal is consistent with the federal emphasis on performance-based planning and programming.

Promote Informed Decision Making

Ensure that adopted transportation policies and performance measures guide the regional decision making process.

Federal laws and regulations place a major emphasis on managing and measuring the performance of the transportation system. Policy-driven, performance-based planning and programming can result in (1) increased accountability and transparency and (2) improved project decision making. This also involves applying consistent policies and data to help the public and decision makers understand the trade-offs involved in all transportation alternatives.

The following strategies can improve the region's ability to make sound transportation decisions based on consistent policies and performance data:

- Analyze, compare, and share data on system conditions, system performance, and the effects of transportation investments relative to established performance measures and targets for use in transportation planning and decision making.
- Develop regional assessments of demographic, travel, land use, environmental, fiscal, and technology trends for use in all plans, programs, and projects.
- Increase the public's and elected officials' understanding of the trade-offs involved in transportation alternatives.





Appendix E: Revenues and Cost Estimates



Regional Financial Plan – 2020-2040

Each metropolitan transportation plan must include a financial plan. In this financial plan, the region demonstrates consistency between (1) reasonably available and projected sources of revenues and (2) the estimated costs of implementing proposed transportation system improvements. This consistency is referred to as "fiscal constraint."

Fiscal Constraint

MAP-21 requires regional transportation plans to be fiscally constrained. That is, the total estimated costs of projects and programs cannot exceed forecasted revenue levels.

For *Maximize2040*, the BRTB, in consultation with the Maryland Department of Transportation, has forecasted the amount of revenues from federal, state, local, and private sources the region reasonably anticipates will be available for 21-year period from 2020-2040.

Available/Anticipated Revenues

Shown below are the revenues (from federal, state, local, and private sources) expected to be available for the 21-year period from 2020-2040, broken down by type of investment:

	System operations	\$20.054 billion
•	system operations.	229.934 DIIIIOI

- System preservation: \$12.102 billion
- Major expansion projects: <u>\$15.590 billion</u>
- Total revenues: \$57.646 billion

The development of Maximize2040 was an 18-month process. One of the early components was the financial forecast. The forecast included an increased state share of funding to cover the cost of a New Starts project (Red Line light rail project) that was in the last regional transportation plan. Late in the process of developing Maximize2040, the new administration decided to withdraw the project from the New Starts Program. The state funding set aside for this project will be reallocated to other projects within the state of Maryland but not necessarily within the BRTB's region. The state as a member of the BRTB will continue to work and coordinate with the other BRTB members to address additional monies available to the Baltimore region.







Definitions – Roadway Projects

System operations (roadways) – Covers the salaries and wages of personnel who maintain and operate highway systems and vehicles.

System preservation (roadways) – Covers capital costs for routine asset management and maintenance activities. These activities include: repaving roadways; repairing bridges; clearing snow and ice; and maintaining roadside lighting, guardrails, and signs.

Definitions – Transit Projects

System operations (transit) – Covers routine maintenance, employee wages, spare parts, and consumables. Note that while routine maintenance is considered a function of system operations, maintenance activities may be paid for with federal capital funds.

System preservation (transit) – Covers planning, design, acquisition/construction, and major asset rehabilitation activities necessary to keep the existing transit system in a State of Good Repair.

System Expansion Funding

The remaining \$15.59 billion will be available to fund *major expansion projects*. Examples of such projects include major new or widened roads, major roadway and bridge rehabilitations, and major new or expanded transit service.

Forecasted Revenues by Year: Operations, Preservation, and Major Expansion

The table below shows projected revenues by year for system operations, system preservation, and major expansion projects in the region. Consistent with MDOT assumptions, the BRTB has assumed that 41.6% of statewide revenues (federal + state + private funds) will be available for the Baltimore region for the 2020-2040 period.

In addition to revenues expected from federal, state, and private funding sources, the table shows \$150 million from a local source. Anne Arundel County has indicated it will be able to commit this amount toward its major expansion projects. With this local commitment, total projected revenues for major capital projects are approximately \$15.59 billion.

Maximize2040: Regional Revenue Forecasts – System Operations, System Preservation, and Major Expansion Projects

MDOT State	ewide Revenue Proj	ections	Baltimore Region Revenue Projections (41.6% of Statewide Totals for Operations and Preservation)						
	Operations	Preservation		Operations	Preservation	Major Expansion	Cumulative Expansion	Totals	
2020	\$2,217,000,000	\$1,105,000,000	2020	\$922,000,000	\$460,000,000	\$538,000,000	\$538,000,000		
2021	\$2,307,000,000	\$1,129,000,000	2021	\$960,000,000	\$470,000,000	\$559,000,000	\$1,097,000,000		
2022	\$2,441,000,000	\$1,154,000,000	2022	\$1,015,000,000	\$480,000,000	\$565,000,000	\$1,662,000,000		
2023	\$2,539,000,000	\$1,179,000,000	2023	\$1,056,000,000	\$490,000,000	\$585,000,000	\$2,247,000,000		
2024	\$2,641,000,000	\$1,205,000,000	2024	\$1,099,000,000	\$501,000,000	\$537,000,000	\$2,784,000,000		
2025	\$2,745,000,000	\$1,232,000,000	2025	\$1,142,000,000	\$513,000,000	\$561,000,000	\$3,345,000,000		
2026	\$2,855,000,000	\$1,259,000,000	2026	\$1,188,000,000	\$524,000,000	\$587,000,000	\$3,932,000,000		
2027	\$2,968,000,000	\$1,287,000,000	2027	\$1,235,000,000	\$535,000,000	\$613,000,000	\$4,545,000,000		
2028	\$3,086,000,000	\$1,315,000,000	2028	\$1,284,000,000	\$547,000,000	\$640,000,000	\$5,185,000,000		
2029	\$3,207,000,000	\$1,344,000,000	2029	\$1,334,000,000	\$559,000,000	\$670,000,000	\$5,855,000,000		
2030	\$3,334,000,000	\$1,373,000,000	2030	\$1,387,000,000	\$571,000,000	\$699,000,000	\$6,554,000,000		
2031	\$3,465,000,000	\$1,404,000,000	2031	\$1,441,000,000	\$584,000,000	\$731,000,000	\$7,285,000,000		
2032	\$3,604,000,000	\$1,434,000,000	2032	\$1,499,000,000	\$597,000,000	\$763,000,000	\$8,048,000,000		
2033	\$3,748,000,000	\$1,466,000,000	2033	\$1,559,000,000	\$610,000,000	\$796,000,000	\$8,844,000,000		
2034	\$3,897,000,000	\$1,498,000,000	2034	\$1,621,000,000	\$623,000,000	\$831,000,000	\$9,675,000,000		
2035	\$4,061,000,000	\$1,531,000,000	2035	\$1,689,000,000	\$637,000,000	\$864,000,000	\$10,539,000,000		
2036	\$4,224,000,000	\$1,565,000,000	2036	\$1,757,000,000	\$651,000,000	\$901,000,000	\$11,440,000,000		
2037	\$4,394,000,000	\$1,599,000,000	2037	\$1,828,000,000	\$665,000,000	\$936,000,000	\$12,376,000,000		
2038	\$4,571,000,000	\$1,635,000,000	2038	\$1,902,000,000	\$680,000,000	\$979,000,000	\$13,355,000,000		
2039	\$4,755,000,000	\$1,670,000,000	2039	\$1,978,000,000	\$695,000,000	\$1,021,000,000	\$14,376,000,000		
2040	\$4,947,000,000	\$1,707,000,000	2040	\$2,058,000,000	\$710,000,000	\$1,064,000,000	\$15,440,000,000		
	\$72,006,000,000	\$29,091,000,000	Revenues (Fed+State)	\$29,954,000,000	\$12,102,000,000	\$15,440,000,000		\$57,496,000,000	
			Revenues (Local)		\$150,000,000			\$150,000,000	
			Total Revenues	\$29,954,000,000	\$12,102,000,000	\$15,590,000,000		\$57,646,000,000	



Appendix E: Revenues and Cost Estimates

The following table shows the breakdown of forecasted revenues for each mode by federal and state dollars. This table assumes that the current modal allocation for federal dollars (78 percent of federal dollars for highways and 22 percent of federal dollars for transit) will hold in future years.

Maximize2040 Regional Revenue Forecasts – Federal/State Breakdown by Mode												
Federal			Stat	e	Totals							
	Highways	Transit	Highways	Transit	Highways	Transit						
2020	\$289,000,000	\$82,000,000	\$1,209,000,000	\$341,000,000	\$1,498,000,000	\$423,000,000						
2021	\$298,000,000	\$84,000,000	\$1,254,000,000	\$354,000,000	\$1,552,000,000	\$438,000,000						
2022	\$304,000,000	\$86,000,000	\$1,303,000,000	\$368,000,000	\$1,607,000,000	\$454,000,000						
2023	\$311,000,000	\$88,000,000	\$1,351,000,000	\$381,000,000	\$1,662,000,000	\$469,000,000						
2024	\$288,000,000	\$81,000,000	\$1,378,000,000	\$389,000,000	\$1,666,000,000	\$470,000,000						
2025	\$297,000,000	\$84,000,000	\$1,431,000,000	\$404,000,000	\$1,728,000,000	\$488,000,000						
2026	\$307,000,000	\$86,000,000	\$1,487,000,000	\$419,000,000	\$1,794,000,000	\$505,000,000						
2027	\$315,000,000	\$89,000,000	\$1,544,000,000	\$435,000,000	\$1,859,000,000	\$524,000,000						
2028	\$324,000,000	\$91,000,000	\$1,604,000,000	\$452,000,000	\$1,928,000,000	\$543,000,000						
2029	\$334,000,000	\$94,000,000	\$1,665,000,000	\$470,000,000	\$1,999,000,000	\$564,000,000						
2030	\$344,000,000	\$97,000,000	\$1,728,000,000	\$488,000,000	\$2,072,000,000	\$585,000,000						
2031	\$355,000,000	\$100,000,000	\$1,795,000,000	\$506,000,000	\$2,150,000,000	\$606,000,000						
2032	\$366,000,000	\$103,000,000	\$1,864,000,000	\$526,000,000	\$2,230,000,000	\$629,000,000						
2033	\$377,000,000	\$106,000,000	\$1,936,000,000	\$546,000,000	\$2,313,000,000	\$652,000,000						
2034	\$386,000,000	\$109,000,000	\$2,012,000,000	\$568,000,000	\$2,398,000,000	\$677,000,000						
2035	\$403,000,000	\$114,000,000	\$2,085,000,000	\$588,000,000	\$2,488,000,000	\$702,000,000						
2036	\$410,000,000	\$116,000,000	\$2,171,000,000	\$612,000,000	\$2,581,000,000	\$728,000,000						
2037	\$423,000,000	\$119,000,000	\$2,252,000,000	\$635,000,000	\$2,675,000,000	\$754,000,000						
2038	\$436,000,000	\$123,000,000	\$2,341,000,000	\$660,000,000	\$2,777,000,000	\$783,000,000						
2039	\$449,000,000	\$127,000,000	\$2,432,000,000	\$686,000,000	\$2,881,000,000	\$813,000,000						
2040	\$463,000,000	\$131,000,000	\$2,526,000,000	\$712,000,000	\$2,989,000,000	\$843,000,000						
	\$7,479,000,000	\$2,110,000,000	\$37,368,000,000	\$10,540,000,000	\$44,847,000,000	\$12,650,000,000						











Funding Breakdown: System Preservation Needs

For this plan update, the federal agencies have requested that the BRTB show a breakdown of the funding projected for system preservation by project type. To comply with this request, SHA and MTA have provided the tables shown on the next page with the funding allocated for system preservation needs by project type.

Major Expansion Projects: Forecasted Revenues vs Estimated Costs

Here is a breakdown of expected revenues versus total estimated costs for major expansion projects for the 2020-2029 and 2030-2040 periods. This breakdown demonstrates that the region expects to have sufficient funds to pay for the projects in *Maximize2040* in the time periods in which the region expects these projects to be implemented.

- Forecasted Revenues, 2020-2029: \$6,005,000,000
- Estimated Costs, 2020-2029: \$2,906,000,000
- Forecasted Revenues, 2030-2040: \$9,585,000,000
- Estimated Costs, 2030-2040: \$9,578,000,000

Shown on the pages following the system preservation tables are copies of the materials used to determine the funding anticipated to be available for implementing the programs and projects in *Maximize2040*:

- "Financially Constrained Long Range Plan, Year 2010 to 2040 Update for the Baltimore Metropolitan Area," prepared by the Maryland Department of Transportation
- Letter of commitment of funding from Anne Arundel County


Appendix E: Revenues and Cost Estimates

Maximize2040: SHA Regi	ional System P	reservation Br	eakdown			
	•					
SHA System Preservation	2020	2021-2025	2026-2030	2031-2035	2036-2040	Totals
Pavement: Resurfacing /						
Rehabilitation	\$91,000,000	\$485,000,000	\$540,000,000	\$602,000,000	\$672,000,000	\$2,390,000,000
Congestion Management	\$11,000,000	\$57,000,000	\$64,000,000	\$71,000,000	\$79,000,000	\$282,000,000
Environmental	\$32,000,000	\$171,000,000	\$191,000,000	\$213,000,000	\$237,000,000	\$844,000,000
Safety and Spot Improvements	\$75,000,000	\$399,000,000	\$445,000,000	\$496,000,000	\$553,000,000	\$1,968,000,000
Urban Reconstruction	\$11,000,000	\$57,000,000	\$64,000,000	\$71,000,000	\$79,000,000	\$282,000,000
Bridges: Replacement /						
Rehabilitation	\$59,000,000	\$314,000,000	\$350,000,000	\$390,000,000	\$435,000,000	\$1,548,000,000
Enhancements / Alternative						
Transportation	\$5,000,000	\$29,000,000	\$32,000,000	\$35,000,000	\$40,000,000	\$141,000,000
Totals	\$284,000,000	\$1,512,000,000	\$1,686,000,000	\$1,878,000,000	\$2,095,000,000	\$7,455,000,000

Maximize2040: MTA	Regional System Preservatio	on Breakdown						
Base Category	System Preservation Sub-Category	Sum of Percent of Total	2020	2021-2025	2026-2030	2031-2035	2036-2040	Total
Admin/Maint Facilities	Agencywide Admin/Maint Facilities	1.18%	\$ 2,076,800	\$ 11,127,400	12,413,600 \$	13,806,000	15,410,800 \$	54,834,600
	Bus Admin/Maint Facilities	7.95%	\$ 13,992,000	\$ 74,968,500	83,634,000 \$	93,015,000	103,827,000 \$	369,436,500
	Light Rail Admin/Maint Facilities	0.11%	\$ 193,600	\$ 1,037,300	1,157,200 \$	1,287,000	1,436,600 \$	5,111,700
	MARC Admin/Maint Facilities	0.85%	\$ 1,496,000	\$ 8,015,500	8,942,000 \$	9,945,000	11,101,000 \$	39,499,500
	Mobility Admin/Maint Facilities	0.44%	\$ 774,400	\$ 4,149,200	4,628,800 \$	5,148,000	5,746,400 \$	20,446,800
Admin/Maint Facilities Total			\$ 18,532,800	\$ 66,297,900	110,775,600 \$	123,201,000	\$ 137,521,800 \$	489,329,100
Environmental	Agencywide Environmental	2.40%	\$ 4,224,000	\$ 22,632,000	25,248,000 \$	28,080,000	31,344,000 \$	111,528,000
Environmental Total			\$ 4,224,000	\$ 22,632,000 \$	25,248,000 \$	28,080,000	\$ 31,344,000 \$	111,528,000
Infrastructure	Agencywide Infrastructure	11.30%	\$ 19,888,000	\$ 106,559,000	118,876,000 \$	132,210,000	147,578,000 \$	525,111,000
	Light Rail Infrastructure	4.21%	\$ 7,409,600	\$ 00£'002'6E \$	44,289,200 \$	49,257,000	54,982,600 \$	195,638,700
	MARC Infrastructure	10.56%	\$ 18,585,600	\$ 008'085'66 \$	111,091,200 \$	123,552,000	\$ 137,913,600 \$	490,723,200
	Metro Infrastructure	8.28%	\$ 14,572,800	\$ 78,080,400	87,105,600 \$	96,876,000	108,136,800 \$	384,771,600
Infrastructure Total			\$ 60,456,000	\$ 323,920,500	361,362,000 \$	401,895,000	\$ 448,611,000 \$	1,596,244,500
IT Systems	Agencywide IT Systems	2.19%	\$ 3,854,400	\$ 20,651,700	23,038,800 \$	25,623,000	28,601,400 \$	101,769,300
	ITP IT Systems	0.63%	\$ 1,108,800	\$ 5,940,900	6,627,600 \$	7,371,000	8,227,800 \$	29,276,100
IT Systems Total			\$ 4,963,200	\$ 26,592,600	29,666,400 \$	32,994,000	36,829,200 \$	131,045,400
Passenger Amenities	Agencywide Passenger Amenities	3.84%	\$ 6,758,400	\$ 36,211,200	40,396,800 \$	44,928,000	5 50,150,400 \$	178,444,800
	MARC Passenger Amenities	2.17%	\$ 3,819,200	\$ 20,463,100	22,828,400 \$	25,389,000	28,340,200 \$	100,839,900
	Metro Passenger Amenities	0.23%	\$ 404,800	\$ 2,168,900	2,419,600 \$	2,691,000	3,003,800 \$	10,688,100
Passenger Amenities Total			\$ 10,982,400	\$ 58,843,200	65,644,800 \$	73,008,000	\$ 81,494,400 \$	289,972,800
Rolling Stock	Agencywide Rolling Stock	0.32%	\$ 563,200	\$ 3,017,600	3,366,400 \$	3,744,000	4,179,200 \$	14,870,400
	Bus Rolling Stock	15.63%	\$ 27,508,800	\$ 147,390,900	164,427,600 \$	182,871,000	204,127,800 \$	726,326,100
	Light Rail Rolling Stock	8.17%	\$ 14,379,200	\$ 77,043,100	85,948,400 \$	95,589,000	106,700,200 \$	379,659,900
	MARC Rolling Stock	7.25%	\$ 12,760,000	\$ 68,367,500	76,270,000 \$	84,825,000	94,685,000 \$	336,907,500
	Metro Rolling Stock	10.52%	\$ 18,515,200	\$ 99,203,600	110,670,400 \$	123,084,000	137,391,200 \$	488,864,400
	Mobility Rolling Stock	1.78%	\$ 3,132,800	\$ 16,785,400	18,725,600 \$	20,826,000	23,246,800 \$	82,716,600
Rolling Stock Total			\$ 76,859,200	\$ 411,808,100	459,408,400 \$	510,939,000	570,330,200 \$	2,029,344,900
Total			\$ 176,000,000	\$ 943,000,000	1,052,000,000 \$	1,170,000,000	\$ 1,306,000,000 \$	4,647,000,000
Grand Total		100.00%						











Appendix E: Revenues and Cost Estimates

DOCUMENTATION OF ASSUMPTIONS

Date: August 2013 (Extended to 2040 July 2014)

Subject:Methodology and Assumptions used to derive the
2013 - 2040 Constrained Long-range Transportation Plan.

Total Program Revenues/Expenditures (Operating and Capital):

- FY 1981 to FY 2012 figures are actual expenditures from historical records. FY 2013 to FY 2018 figures are from the FY 2013 Trust Fund Forecast and Consolidated Transportation Plan (CTP).
- The federal funds received directly by WMATA are <u>not</u> included in this exercise.
- FY 2019 to FY 2040 projections of state funds use a historical annual average growth rate of 3.89%. A regression model was used to determine the appropriate starting point in FY 2019. Federal fund projections for the same period are based on an average growth rate of 2.75% for Highway and 4.7% for Transit program funds, but also assume an O. A. of 90%.

Operating Expenditures:

- FY 1981 to FY 2012 are actual expenditures from historical records. Expenditures for FY 2013 to FY 2018 are operating budget projections contained in the FY 2013 Trust Fund Forecast.
- FY 2019 to FY 2040 projections are derived by inflating the previous year with an estimate for the percentage change in CPI-U plus 2%. The Consumer Price Index is a generally accepted measure of inflation. The projected annual change in index figures is based on information received from two econometric firms, Global Insight and Moody's Analytics. A blended average of the forecasts received from the two firms is used. Two percent (2%) is added to the forecasted rate to account for the additional operating costs associated with new capital expansions. The size of this additional factor is decided based on testing to determine what amount, when added to CPI, best approximates the historical trend in operating expenditures.

Capital - Systems Preservation:

• Department records were used to determine the split between systems preservation and expansion for FY 1981 to FY 2012. FY 2013 to FY 2018







represents the current version of the capital program adjusted for the revenue increase passed during the 2013 legislative session.

• An annual growth rate of 2.2% is assumed for systems preservation for the FY 2019 – FY 2040 period. This growth rate is based on a regression analysis of historical system preservation expenditures.

Capital - Expansion:

• Expenditures for capital expansion were derived by subtracting both operating and systems preservation expenditures from the total program expenditures for each year.

Baltimore Area - Percentage of Capital Expansion:

- Total capital figures from FY 1981 to Present were split into surface and nonsurface. Surface included highway (SHA) and transit (MTA, MARC, & WMAT) costs. Non-surface included port, aviation, and motor vehicle administrations plus the Secretary's Office expenses.
- The surface / non-surface data and the system preservation / expansion data were combined, analyzed, and evaluated to produce estimates of the percentage of Maryland expansion associated with surface transportation for the various time periods.
- Surface capital in the Baltimore Region was derived by adding the expenditures for all of MTA (excluding LOTS and non-Baltimore region Park and Ride expenditures), one-half of MARC and that portion of SHA that pertained to the region (Anne Arundel, Baltimore, Carroll, Harford, and Howard counties).
- These Baltimore specific figures were used to derive estimates of Baltimore surface expansion. These figures, when used with the above-mentioned projections, produce the estimates shown for Baltimore as a percent of Total Surface Expansion.



Appendix E: Revenues and Cost Estimates

		(Millior	ns of Dollars)		
Fiscal Year	Operating	Systems Preservation	Operating & Systems Pres.	Expansion	Statewide Total
1981	265	111	376	247	623
1982	287	136	423	236	659
1983	322	164	486	284	770
1984	352	167	519	246	765
1985	385	204	589	319	908
1986	428	234	662	403	1 065
1987	441	264	705	506	1,000
1988	478	260	738	615	1,353
1989	508	227	735	677	1 412
1990	551	270	821	760	1,581
1991	591	268	859	773	1.632
1992	577	187	764	542	1,306
1993	638	254	892	418	1,310
1994	689	279	968	393	1,361
1995	709	400	1,109	497	1,606
1996	784	391	1,175	465	1,640
1997	770	417	1,187	493	1,680
1998	808	451	1,259	411	1,670
1999	868	515	1,383	420	1,803
2000	913	476	1,389	455	1,844
2001	979	578	1,557	632	2,189
2002	1,045	612	1,657	772	2,429
2003	1,158	620	1,778	772	2,550
2004	1,178	619	1,797	762	2,559
2005	1,237	714	1,951	780	2,731
2006	1,303	729	2,032	793	2,825
2007	1,396	724	2,120	701	2,821
2008	1,488	766	2,254	680	2,934
2009	1,527	974	2,501	368	2,869
2010	1,583	896	2,479	336	2,815
	1,548	583	2,131	650	2,781
2012	1,572	806	2,378	656	3,034
2013	1,646	1,238	2,884	534	3,418
2014	1,728	1,148	2,876	891	3,767
	1,798	1,126	2,924	869	3,793
2016	1,867	1,078	2,945	918	3,863
2017	1,931	1,071	3,002	1,031	4,033
2018	1,998	1,121	3,119	1,029	4,148
2019	2,081	1,081	3,162	1,443	4,605
2020	2,217	1,105	3,322	1,447	4,769
2021	2,307	1,129	3,436	1,504	4,940
2022	2,441	1,154	3,595	1,521	5,116
2023	2,539	1,179	3,718	1,576	5,294
2024	2,641	1,205	3,846	1,444	5,290
2025	2,745	1,232	3,977	1,510	5,487
2026	2,855	1,259	4,114	1,579	5,693
2027	2,968	1,287	4,255	1,651	5,906
2028	3,086	1,315	4,401	1,726	6,127
2029	3,207	1,344	4,551	1,805	6,356
2030	3,334	1,373	4,707	1,88/	6,594
2031	3,465	1,404	4,869	1,9/3	5,842
2032	3,604	1,434	5,038	2,061	7,099
2033	3,748	1,466	5,214	2,151	7,365
2034	3,897	1,498	5,395	2,246	7,641
2033	4,061	1,031	5,592	2,330	1,928
2030	4,224	1,505	5,789	2,438	8,227
4031 	4,394	1,099	5,993	2,534	<u> </u>
2430	4,371	1,035	0,200 6.405	2,002	0,008
2039	4,755	1,070	0,425	2,10/	9,192
2040	4,947	1,707	0,034	∠,004	9,008

MDOT Operating & Capital Expenditures - Statewide History, Program & Forecast

MDOT - Office of Finance 29-Jul-14







MDOT Operating & Capital Expenditures - Statewide History, Program & Forecast





Appendix E: Revenues and Cost Estimates

* Original MDOT Page

BALTIMORE METROPOLITAN AREA Percentage of Capital Expansion

	Surface Enhan of Maryland E	cement % nhancement:		Baltimore Enha	ncement %		
	1981 - 2012	87.7%		1981 - 2012	41.6%		
		Ţ			Ũ	-	
Fieral	Statewide	Sunfana	Drivata	Total Surface	Baltimoro	Boltimore	Total Balto.
Veor	Expansion	Percentane	Finds	Availahla		Now Storte	Expansion
	Funds	1 croorneage					Funds
2010	336						192
2011	650						173
2012	656						229
2013	534						231
2014	891						426
2015	869						250
2016	918						231
2017	1,031						284
2018	1,029						576
2019	1,433	1,257	23	1,280	533	100	633
2020	1,447	1,269	23	1,292	538	100	638
2021	1,504	1,319	23	1,342	559	100	659
2022	1,521	1,334	23	1,357	565	100	665
2023	1,576	1,382	23	1,405	585	97	682
2024	1,444	1,266	24	1,290	537	0	537
2025	1,510	1,324	24	1,348	561	0	561
2026	1,579	1,385	24	1,409	587	0	587
2027	1,651	1,448	24	1,472	613	0	613
2028	1,726	1,514	24	1,538	640	0	640
2029	1,805	1,583	25	1,608	670	0	670
2030	1,887	1,654	25	1,679	699	0	699
2031	1,973	1,730	25	1,755	731	0	731
2032	2,061	1,807	25	1,832	763	0	763
2033	2,151	1,886	25	1,911	796	0	796
2034	2,246	1,969	26	1,995	831	0	831
2035	2,336	2,048	26	2,074	864	0	864
2000	2,438	2,138	26	2,164	901	0	901
203/	2,534	2,222	26	2,248	936	0	936
2038	2,002	2,320	20	2,352	979	0	9/9
2039	2,101	2,420	27	2,403	1,021	0	1,021
2040	2,884	2,529	21	2,556	1,064	0	1,064
1 otal 19-40	29,850	26,175	412	26,587	11,072	497	16,470
Total 10-40	36,764						19,062

MDOT - Office of Finance 29-Jul-14







* Revised Page – New Starts Funding Removed

]	Surface Enhan	cement %		Baltimore Enha	ncement %		
	of Maryland E	nhancement		of Surface En	hancement		
	1981 - 2012	87.7%		1981 - 2012	41.6%		
•	·						
		Û			\bigcup		
- Eircol	Statewide	Surface	Driviota	Total Surface	Daltimora	Daltimore	Total Balto.
Year	Expansion	Percentage	Funds	Available	Percentage	New Starts	Expansion
түрт	Funds	T Grouniuge.	гыныс	FIVGIADIC	1 stochays		Funds
2010	336						192
2011	650						173
2012	656						229
2013	534						231
2014	891						426
2015	869						250
2016	918						231
2017	1,031						284
2010 2010	1,029	1 057	00	1 000	500		570
2019	1,433	1,257	23	1,280	533	U	533
2020	1,447	1,269	23	1,292	538	U 0	538
2021	1,504	1,319	20	1,342	559	U	509 565
2022	1,521	1,334	20	1,357	505	0	505
2023	1,070	1,302	20	1,400	000 527	0	505
2024	1,444	1,200	24	1 2/9	561	0	561
2020	1,510	1,324	24	1,340	587	0	587
2020	1,575	1,305	24	1 / 172	613	0	613
2021	1,031	1,440	24	1 538	640	0	640
2020	1,720	1 583	25	1,000	670	0	670
2020	1,000	1,654	25	1,000	699	0	699
2031	1,001	1,00-1	25	1 755	731	0	731
2032	2 061	1,700	25	1,730	763	0	763
2033	2,001	1,886	25	1,002	796	0	796
2034	2 246	1,000	26	1,995	831	0	831
2035	2,210	2 048	26	2 074	864	0	864
2036	2,438	2,138	26	2,164	901	0	901
2037	2,534	2,222	26	2,248	936	0	936
2038	2.652	2.326	26	2,352	979	0	979
2039	2.767	2.426	27	2,453	1.021	0	1.021
2040	2,884	2,529	27	2,556	1,064	0	1,064
Total	29,850	26,175	412	26,587	11,072	0	15,973
Total	36 764						18 565
'10-'40	55,704						10,000

BALTIMORE METROPOLITAN AREA Percentage of Capital Expansion

MDOT - Office of Finance 29-Jul-14



Appendix E: Revenues and Cost Estimates



2664 RIVA ROAD, P.O. BOX 6675 ANNAPOLIS, MARYLAND 21401 OFFICE OF PLANNING AND ZONING

August 14, 2014

Mr. Todd Lang Transportation Planning Director Baltimore Metropolitan Council Offices @ McHenry Row 15900 Whetsone Way, Suite 300 Baltimore, Maryland 21230

SUBJECT: PROJECTED AVAILABILITY OF LOCAL FUNDING FOR TRANSPORTATION FOR PROJECTS PROPOSED FOR THE REGIONAL LONG RANGE PLAN

Dear Mr. Lang:

Based on development forecasts and assuming use of impact fees for transportation per County code, it is estimated that Anne Arundel County will have approximately \$ 150 million available for projects that have been recommended for inclusion in the Baltimore Region's Long Range Transportation Plan from projected revenues from impact fees assessed by the County. This estimate covers the period from 2015 until 2040.

Use of impact fees for specific projects is subject to availability approval of the County Executive and appropriation by the County Council.

Please contact me at (410) 222-7440 if you have any questions.

Sincerely, Harry My Ch

UH In GGC Cc: G Cardwell J: BRTB/ LRP Local Funding 8-15-14

BRTB Representative

Harvey Gold

"Recycled Paper" www.aacounty.org







Cost Estimating Methodology

Estimating project costs for *Maximize2040* was a joint effort that included the assistance of staff from state agencies, local jurisdictions, transportation consultants, and BMC. The Maryland State Highway Administration (SHA) provided cost estimates for state highway facilities. Sponsoring jurisdictions supplied cost estimates for local facilities. The Maryland Transit Administration (MTA) developed capital cost estimates for transit projects.

In practical terms, there are at least two rounds of cost development. The first estimate, expressed in year of expenditure dollars, is less intensive. This first-round estimate is developed for use in documents such as *Maximize2040*. The second, more detailed, estimate is developed as the project moves to project planning and is reviewed at least once a year to reflect updates to fields in the cost estimating program. When developing cost estimates, however, there are some basic principles and factors that can and should be identified early in the process to minimize errors throughout the design process. Some of these considerations are:

- Identify all potential impacts before a project gets initial funding and provide reasonable costs with contingencies to cover those impacts.
- Make sure that all specifications clearly define the scope of work.
- Use standard pay items from the category code book whenever possible.

Estimating Highway Project Costs

The cost estimates for *Maximize2040* highway projects were guided by SHA's 2014 Highway Construction Cost Estimating Manual. The manual is intended to provide uniform and consistent guidelines for the preparation of engineering cost estimates on highway construction projects.

Documented below is the methodology that SHA used to develop cost estimates for highway projects for consideration in *Maximize2040*. Details on individual projects vary depending on the level of project development (e.g., whether the project is in the preliminary or final engineering phase, whether the project sponsor has completed the required environmental documentation, whether right of way has been acquired, etc.).



Projects that have progressed into some stage of SHA project planning utilize the latest Consolidated Transportation program (CTP) estimates. These estimates document detailed Project Planning (PP), Preliminary Engineering (PE), Right-of-way (RW), and Construction (CO) phases of a project and are updated on an annual basis. When a selected alternative has not yet been chosen, the CTP assumes the highest cost of the most reasonable alternative. Right-of-way costs are provided by the SHA District office.



Appendix E: Revenues and Cost Estimates

For projects not included in the CTP, staff developed a cost-per-mile estimate by applying information provided in the 2014 SHA Highway Construction Cost Estimating Manual. SHA personnel have reviewed each project's characteristics individually and have utilized the following cost assumptions:

- Roadway length and lane miles: Project costs include new lane miles and additional full-depth shoulder where applicable. New construction is estimated at \$1.6 million per lane mile, including grading (Category 2), paving (Category 5), and shoulders (Category 6).
- Drainage Items: determined by calculating both the hydraulic structure costs for drainage spillways and earthwork costs (\$32/mile Class I Excavation) necessary to construct the adjacent stormwater management facilities.
- Small Structures: Estimated using SHA's asset management system. Costs are: retaining walls (\$150/sf), box culverts (\$250/sf), and bridge removal (\$35/sf).



- Bridges: Estimated using SHA's asset management system and aerial mapping. Costs are: bridge over water, span < 55 feet (\$225/sf); bridge over water, span > 55 feet (\$215/sf); bridge over roadway (\$175/sf); bridge deck replacement (\$100/sf); and bridge superstructure replacement (\$200/sf).
- Sidewalks: Estimated using aerial mapping. Costs are: \$9/sf.
- Curb and Gutter: Estimated using aerial mapping. Costs are: \$35/lf.
- Signal Modification: Estimated using aerial mapping. Costs are: \$65,000/each, one structure per affected leg.
- Pavement Markings: Estimated using aerial mapping. Costs are: 5" epoxy markings (\$2.10/LF), 5-inch preformed thermoplastic markings (\$3.90/LF), 5-inch lead-free reflective thermoplastic (\$0.85/LF), and 5-inch permanent preformed patterned marking tape (\$3.50/LF).
- Resurfacing: Estimated using aerial mapping. Costs are: \$100,000/sf of existing pavement to remain.

The following percentages from SHA's Cost Manual have been applied to: small structures, bridges, sidewalks, signal modifications, curb and gutter, and resurfacing:

- 40% Category 1 Preliminary items
- 0-30% Category 7 Landscaping
- 15-45% Utilities
- 40% Contingencies (Page F3)

Assumptions:

- Administrative/Overhead: A 15.3% contingency is applied to the combined construction cost estimated for administrative/overhead items.
- Preliminary Engineering a 15% contingency is applied to the construction cost estimate combined with the environmental/administrative/overhead contingencies for preliminary engineering.







Estimating Transit Project Costs

MTA developed rail transit cost estimates utilizing the cost estimating methodology developed for a recent light rail project. Neat construction costs (includes overhead fr were estimated for mainline, vehicle, and station costs, including those for tunnels and elevated or at-grade guideways. A contingency of 40% was added to these costs due to the lack of detailed design. "Soft costs" were estimated at 32% for design fees and other associated items. Right of way costs were then included in estimates.

Bus Rapid Transit (BRT) cost estimates were developed using an average industry standard of \$20 million per mile.



Year of Expenditure Cost Estimates

In all cases, BMC staff applied a 2.2% annual inflation rate to account for capital cost escalation and to determine year of expenditure cost estimates as required by MAP-21. This rate is consistent with the rate that MDOT uses to determine system preservation funding needs through FY 2040.



Appendix F: Project Evaluation and Scoring



Evaluation and Scoring Process

As indicated in Chapter 4, the local jurisdictions, in consultation with the Maryland Transit Administration and the Maryland State Highway Administration, submitted projects for consideration for *Maximize2040*.

Technical Score

BMC staff members scored each project for technical merit, based on consistency with regional goals and strategies.

See the table on the following page for explanations of criteria and methodologies. Unless otherwise indicated, a candidate project receives 5, 3, or 1 points, depending on the degree to which it addresses a problem or provides benefits. High = 5 points; medium = 3 points, low = 1 point. A "not applicable" condition scores 0 points.

The maximum technical score for transit and highway projects is 50 points.

Policy Score

Each submitting jurisdiction and agency provided a policy score, depending on priority and demonstrated support.

- High Priority (up to 5 projects can have this rating) 30 points
- Medium Priority (up to 4 projects can have this rating) 20 points
- Low Priority (an unlimited number of projects can have this rating) 10 points
- Demonstrated MDOT Financial Support 10 points added to priority score

Maximum Score

The maximum total score (technical score + policy score) is 90 points.







Modec	Critoria	Mathadalagias
	Criteria	Methodologies
Goal: Safety Highway	Crash severity (injuries and fatalities) – 5, 3, or 1 points	Total number of injuries and fatalities for m 3 years, multiplied by 2 and added to total of injuries; divide this total by annual VMT i for this segment to determine accident sev 1,000,000 VMT
Goal: Access	ibility	
Highway	Complete Streets features – 5, 3, or 0 points	Degree to which project delivers safety / ac benefits for all modes (ADA improvements, bike facilities, etc.) – total population first, th population – per mile benefits Significant features = 5 points Moderate features = 3 points Not applicable = 0 points
Highway	Access to Job/Activity Centers – 5, 3, or 1 points	Degree to which project improves infrastru abling access to and supporting major Job/ Centers – 1/2 mile buffer analysis – per mile
Transit	Transit station/stops – 10, 6, or 2 points	Degree to which project supports access to destinations – EJ population – 1/4 mile buff Improve existing station/stops = 10 points New station/stops = 6 points Operations improvement plan = 2 points
Transit	Access to Job/Activity Centers – 10, 6, or 2 points	Degree to which project improves infrastru- abling access to and supporting major Job/ Centers – 1/4 mile buffer analysis – per mile
Goal: Mobili	ity	
Highway	2020 Level of Service (LOS) – 7, 4, or 1 points	2020 LOS (with Existing + Committed) – LOS E-F = 7 points LOS D = 4 points LOS C-A = 1 point
Highway	2040 LOS – 3, 2, or 1 points	2040 LOS (with Existing + Committed) – LOS E-F = 3 points LOS D = 2 points LOS C-A = 1 point
Transit	Transit options – 5, 3, or 1 points	Extent to which project provides options (fr Transit project focused on mobility (MARC, muter bus) = 5 points Metro or light rail project = 3 points Local bus project = 1 point
Transit	Ridership – 5, 3, or 1 points	Average daily number of riders in Year 2040 of project (using data generated from BMC demand model based on all-project netwo

Appendix F: Project Evaluation and Scoring

Technical Cri	teria and Scoring Method	lologies
Modes	Criteria	Methodologies
Goal: Environm	ental Conservation	
Highway and Transit	Effects on ecologically significant lands / historical properties – 5, 3, or 0 points	Geographic proximity to ecologically significant lands (using Maryland green infrastructure mapping data) / geographic proximity to culturally significant properties and resources (using National Register of Historic Places, Maryland Inventory of Historic Prop- erties)
		Little to no effects = 5 points Moderate effects = 3 points Significant effects = 0 points
Highway and Transit	Emissions and greenhouse gas (GHG) Reductions – 5, 3, or 1 points	Degree to which project includes components that reduce GHG emissions (e.g., Transportation Demand Management or Transportation System Management components, carbon sequestration, electric vehicle infrastructure)
Goal: Security		
Highway	Evacuation route or parallels – 5, 3, or 0 points	Degree to which project falls on an existing evacua- tion route (as defined in <i>Evacuation Traffic Manage-</i> <i>ment Support</i> document) or improves a critical link to an existing evacuation route –
		Falls on evacuation route = 5 points Improves critical link = 3 points No evacuation function = 0 points
Goal: Economic	Prosperity	
Highway and Transit	Connection to Priority Funding Area (PFA) –	Points assigned depending on project location rela- tive to PFA –
	5, 3, or 0 points	Within PFA = 5 points Connecting to PFA = 3 points Outside PFA = 0 points
Highway and Transit	Connection to Sustainable Community –	Points assigned depending on project location rela- tive to Sustainable Community –
	5, 3, or 0 points	Within Sustainable Community = 5 points Connecting to Sustainable Community = 3 points Outside Sustainable Community = 0 points









Evaluation and Scoring of Candidate Projects

The table on the following pages shows how candidate projects submitted by the state agencies and local jurisdictions scored according to the evaluation criteria. Each project has a total score consisting of technical score plus policy score (agency/jurisdictional priority points).

The table also shows other information, including:

- whether or not the candidate project was in the previous long-range plan, *Plan It 2035* (indicated by a check mark)
- the primary goal each candidate project would address
- the correspondence between public project ideas and candidate projects a check mark indicates that a candidate project is essentially the same as an idea submitted by the public, and a dot indicates that a candidate project is consistent with a public project idea (for example, when a public project idea proposes the same thing but does not include a specific location)
- individual estimated project costs (year of expenditure) and cumulative estimated costs this is to enable a fiscal constraint analysis.

BMC staff members distributed this table to members of the Technical Committee and the BRTB. Members of both groups assembled to discuss the preliminary results of the project scoring as well as to present alternatives to this list based on agency or jurisdictional considerations and priorities. At the end of this process, the combined group had agreed on a preferred alternative.



Appendix F: Project Evaluation and Scoring

Maximize2040) - Preferred Alter	native										
Sponsor	Project Name	In Plan It 2035	Project Description	Project Limits P	rimary Goal	Public Idea	^o riority Tec oints Sco	h Tota re Scon	Estimate Cost	ed Capital Est YO	imated Cost - Cui E Co:	nulative YOE it
MTA	Red Line	>	New light rail line	Woodlawn to Bayview	Accessibility	>	40	44	84 \$2,9	000'000'006	\$3,527,000,000	\$3,527,000,000
Baltimore City	West Baltimore MARC Station		Station upgrades		Accessibility	•	40	43	83 5	\$53,000,000	\$64,000,000	\$3,591,000,000
Harford County	Aberdeen MARC Station	`	Transit Oriented Development (TOD); new train station, additional parking, U.S. 40° Green Boulevard", and Station Square Plaza - new pedestrian underpass and green, terraced holza/shmphihaster	LI S. 40 @ MD 132/Rel Air Road	Mobility		Ģ	64	2	346.210.000	0000002\$	33.661.000.000
Baltimore Citv	Bayview MARC and Intermodal Station	`	New station (to connect with Red Line)	Lombard Street at Bawiew Boulevard	Accessibility		6 04	37		80.000.000	000.000.792	\$3.758.000.000
SHA	H-695	>	Widen corridor from 6 lanes to 8 lanes.	I-95 to MD 122	Mobility	>	4	36	76 \$3	375,000,000	\$456,000,000	\$4,214,000,000
Anne Arundel County	MD 175	`	From AA County line to MD 295 go from 2 to 3 lanes. From MD 295 to MD 170 go from 4 to 6 lanes	AA County line to MD 170	Mobility		40	35	75 \$2	225,000,000	\$274,000,000	\$4,488,000,000
МТА	MARC Growth and Investment 2020-2029	>	Improvements to MARC mainline capacity, maintenance facilities, and station areas		Mobility		64	34	74 \$2	21 2,000,000	\$258,000,000	\$4,746,000,000
MTA	MARC Growth and Investment 2030-2040	`	Improvements to MARC mainline capacity, maintenance facilities, and station areas		Mobility		64	34	74 \$2	271.000.000	\$410.000.000	\$5.156.000.000
SHA	MD 140	>	Widen from 4 to 6 lanes. NB 3rd lane drops north of Owings Mills Boulevard.	Garrison View Road to Owings Mills Road	Mobility		6	34	74 \$	000'000'0	\$36,000,000	\$5,192,000,000
MTA	MTA Bus Expansion Program		Purchase of 140 buses over the next 20 years at a cost of \$800,000 per bus.		Accessibility		40	34	74 \$1	11 2,000,000	\$169,000,000	\$5,361,000,000
Howard County	U.S. 1 / MD 175 Interchange	>	Design and construction of grade-separation at U.S. 1 / MD 175 coordinated with 1-95 / MD 175 improvements and consistent with MD SHA "MD 175 improvement Study".	U.S. 1 milepoints 5.54-5.79; MD 175 milepoints 1.4 to 1.9	Mobility		40	34	74 \$1	100,000,000	\$1 22,000,000	\$5,483,000,000
Anne Arundel County	U.S. 50/301	>	Bridge reconstruction/widening; movable barrier on bridge	l-97 to MD 2	Mobility	`	40	34	74 \$2	290,000,000	\$353,000,000	\$5,836,000,000
Carroll County	MD 140	>	Widen from 6 to 8 lanes, full interchange at MD 97 (Malcolm Drive), Continuous Flow Intersection (CFI) at Center Street and Englar Poad, addition of pedestrian and bicycle facilities	Market Street to Sullivan Road	Mobility		40	33	73 \$2	265,000,000	\$401,000,000	\$6,237,000,000
Carroll County	MD 32	>	Widen from 2 to 4 lanes, addition of pedestrian and bicycle facilities	MD 26 to Howard County line	Mobility		6	ŝ	73 \$1	125,000,000	\$189,000,000	\$6,426,000,000
Baltimore County	F.795	>	Widening from 4 to 6 lanes, including addition of auxilliary lanes to Owings Mills Boulevard; includes new interchange at Dolfield Boulevard.	Franklin Boulevard to Owings Mills Boulevard	Mobility	>	40	32	72 \$1	145,000,000	\$176,000,000	\$6,602,000,000
Baltimore City	Green Line	>	Extension of Metro line, including two new stations (at Amtrak line and North Avenue)	Johns Hopkins Hospital to North Avenue	Accessibility	>	30	42	72 \$1,1	119,060,000	\$1,692,000,000	\$8,294,000,000
Anne Arundel County	MD 198	>	Widen MD 198 to provide easier access to Ft. Meade and Odenton Town Center	MD 295 to MD 32	Mobility		40	30	70 \$2	200,000,000	\$302,000,000	\$8,596,000,000
Harford County	U.S. 1 Bypass	>	Widen from 2 to 4 lanes and improve the U.S. 1 @ MD 24 and U.S. 1 @ MD 924 interchange	MD 147 / U.S. 1 Business to North of MD 24 / MD 924	Mobility		40	30	70 \$1	196,000,000	\$238,000,000	\$8,834,000,000
Harford County	MTA Commuter Service		Additional MTA Commuter Bus Service from Harford County to Downtown Baitmore, to Harbor Esist, and a reverse commute route from Baitmore that will serve Aberdeen Proving Gourd. Project will also include installing shelters and extending the U.S.40Commuter service to commet with Harford Transit	Harford County to Downtown Biltimore and to Harbor East and from Baltimore to APG	Mobility		10	4	50	\$2,000,000	000/000 \$3,000/000	\$8,837,000,000
Anne Arundel County	MD 295	>	Widen from 4 to 6 lanes	F195 to MD 100	Mobility	`	40	29	69 \$1	190,000,000	\$287,000,000	\$9,124,000,000
Harford County	MD 22	>	Welening of existing 2- and 3-laws section to 4 and 5 lanes. Incude HOV lane from Old Post Road to APG gate, bicycle and pedestrian access, and transit queue jump lanes where applicable	MD 543 to APG Gate	Mobility		30	39	69 \$3	355,000,000	\$537,000,000	\$9,661,000,000
Howard County	U.S. 1 Typical Section		Design/install U.S. 1 Design Manual typical section as defined in State/County MOU for U.S. 1 Revitalization	Montevideo Road north to MD 100 - U.S. 1 milepoints 6.1 to 7.56	Mobility		30	39	69 \$	\$65,000,000	\$ 98,000,000	\$9,759,000,000

aximize2040





Maximize2040 - Preferred Alternative

ponsor	In Project Name 203	n Plan It 035	Project Description	Project Limits	Primary Goal	Public Idea	Priority Tec Points Scor	n Tot e Sco	al Estim re Cost	ated Capital E Y	stimated Cost - Ct OE Cc	umulative YOE ost
toward County	MD 32	>	Widen to 41 area (41 ane cross section) per FELS Preferred Alternative to provide access-controlled, divided highway with 3-44 contraction. Cuotales will be 10 feet voide (41 on proved): inside shoulders will be 10 feet voide (4-bot paved, 5- foot granders includers with retrohanges at Rosemary Lane and MD 144 and unordeds to 1-20 intervione.	MD 108 to I-70 (MD 32 milepoints 10.46 to 20.01	Mobility	>	6	8	8	\$235,000,000	\$286,000,000	\$10,045,000,000
larford County	U.S.1	`	Widen from 4 to 6 lanes, including bicycle and pedestrian accommodations	MD 152 to MD 147 / U.S. 1 Business	Mobility		40	28	89	\$280,000,000	\$423,000,000	\$10.468.000.000
toward County	L15, 29		Widen to six larves including auxiliary lanes from Milddle Patuxent River to Seneca Dr including grade separated access to the Community of Rivers Edge, at approximately Rivers Edge Dr and ULS 29.	U.S. 29 from Patuxent River Bridge to Seneca Dr. ;U.S. 29 milepoints 0.00 to 5.0	Mobility		. 4	56	99	\$60.000.000	000,000	\$10.559,000,000
arroll County	MD 26	`	Within the form 4 to 6 lanes, addition of pedestrian and bicycle facilities	MD 32 to Reservoir	Mobility		: 0 1	25	65	\$75,000.000	\$91,000,000	\$10.650.000.000
toward County	Bus Rapid Transit	>	The Bus Rapid Transit U.S. 29 will emulate light rail operations at a lower cost, and it adsigned to link Howard County or commutes with suburban Montgomery County and Washington DC by connecting to the Montgomery County and that the Ster Egynig Tansportation emeric for WMATA. Metro and MARC.	U.S. 29 at Mount Hebron to U.S. 29 / MD 108. Dedicated right of way will start at or near U.S. 29 / Broken Land Parkway. South of Burtonsville / U.S. 29 the BRT will Montgomery BRT right of way.	Mobility		30	35	65	\$317,400,000	\$480,000,000	\$11,130,000,000
toward County	120	>	Widen from 4 to 6 lanes, including noise wals. Includes reconstruction of 1-70 / Mainottivulle Road interchange to provide adequate 2040 capacity and traffe flow and upgrading of 1-70 / U.S. 29 interchange to allow widening of 1-70 to 6 lanes and for U.S. 29 northbound to weekbound movement.	5HA milepoints 10.65 to 17.4; U.S. 29 to U.S. 40 (near MD 32)	Mobility		64	24	2	\$585,000,000	\$712,000,000	\$11,842,000,000
arroll County	MD 97 North	>	Widen from 2 to 5 lanes, including interchange at Meadow Branch Road, addition of pedestrian and bicycle facilities	MD 140 overpass to Bachmans Valley Road	Mobility		30	34	2	\$120,000,000	\$181,000,000	\$12,023,000,000
toward County	801 CIW		Widen roadway where needed/possible to four lanes and implement design criteria for 8 to 10 foot pedestrian/bloyde pathways, new signalized intersections in rouding pedestrian actuation: all based on the 2014 Howard County MD ISBClarkoulie Design Study.	Trotter Road to Guilford Road - MD 108 milepoints 3.65 to 5.15	Mobility		20	ŝ	ß	\$15,000,000	\$18,000,000	\$12,041,000,000
arroll County	Westminster Tran sit Hub		The Westmather TrailBlass transportation hub will be a centrally located facility to enable transfers for TrailBlaser riders, provide a Mobily Manager office space and travel- training classroom and offices. This facility will include vending, tickening & restrooms.	Undefinect, general Westminster area.	Accessibility		5	ŝ	43	\$1,500,000	\$2,000,000	\$12,043,000,000
altimore County	I-83 Bridge over Padonia Road		Reconstruct I-83 bridge and make necessary pedestrian and bike improvements to Padonia Road.	- H83 Bridge over Padonia Road	Preservation		30	22	52	\$10,000,000	\$ 12,000,000	\$12,055,000,000
arroll County	MD 851 (Sykesville Main St/Springfield Ave)		Infrastructure improvements and pavement rehabilitation	Howard County line to Cooper Drive	Preservation		30	22	52	\$7,300,000	000'000'6\$	\$12,064,000,000
une Arundel County	00 00 00 00 00 00 00 00 00 00 00 00 00	>	Widen roadway to accommodate additional traffic	AA/Howard County Line to 1-97	Mobility	>	Ő	m	6	\$375,000,000	\$567,000,000	\$12,631,000,000
larford County	MD 24	>	Widen from 4 to 6 lanes; includes sidewalks and bicycle accommodations where appropriate	U.S. 1 Bypass to south of Singer Boad	Mobility		30	5	61	\$165.000.000	\$2.01.000.000	\$12.832.000.000
altimore County	MD 26		Roadway, curb, sidewalk, bicycle, ADA, pedestrian improvements as part of an enhanced streetscape.	Rolling Road to Courtleigh Drive	Accessibility		30	31	61	\$20,000,000	\$ 24,000,000	\$12,856,000,000
nne Arundel County	U.S. 50 Bus Rapid Transit			Proposed Annapolis-Parole Intermodal Center to Prince George's County line	Mobility		30	15	61	\$470,000,000	\$572,000,000	\$13,428,000,000



Appendix F: Project Evaluation and Scoring

Sponsor	Project Name	In Plan It 2035	Proiect Description	Proiect Limits	Primary Goal Id	ublic Pri lea Po	iority Tec ints Sco	h Tota re Scor	ll Estima e Cost	ted Capital Es Y(stimated Cost - Co OE Co	Imulative YOE Sst
Harford County	MD 24 (Section G)		MD 24 will be resurfaced and reconstructed including slope repair and guardrail replacement	900 feet south of Sharon Road to 1,700 feet north of Ferncliff Lane.	Preservation		50	6	8	\$10,000,000	\$12,000,000	\$13,440,000,000
Howard County	Bus Rapid Transit to BWI Airport		The Bus Rapid Transit will emulate light rail operations at a lower cost and is designed to ink Howard County commuters from Dorsey MAC to Anne Arundel Mills to the BWI car rental center to BWI Airport.	Dorsey MARC to Anne Arundel Mills to BWI Consolidated Rental Car to BWI Thurgood Marshall Light Rail Station	Mobility		20	6	8	\$194,000,000	\$293,000,000	\$13,733,000,000
Howard County	Snowden River Parkway Widening		Design and construct widening of Snowden River Parkway from Datand Mills foad to Broken Land Parkway including auxillary lanes, &pedestrian, bicycle and transit improvements on both sides of the road.	Broken Land Parkway and Oakland Mills Road	Mobility		20	6	09	\$15,000,000	\$18,000,000	\$13,751,000,000
Carroll County	MD 140 at MD 91	>	Divided highway with interchange at MD 91 and intersection improvements, addition of pedestrian and bicycle facilities	Baltimore County line to Kays Mill Road	Mobility		30	29	59	\$130,000,000	\$197,000,000	\$13,948,000,000
Baltimore County	MD 140 / Painters Mill Road	>	Intersection improvements, additional left turn lane, and parallel access roads.	Reisterstown Road and Painters Mill intersection and access roads east and west of Reisterstown Road	Mobility		30	27	57	000'000'21\$	\$ 21,000,000	\$13,969,000,000
Carroll County	MD 31 (New Windsor Main Street/ High Street)		Infrastructure improvements and pavement rehabilitation	Church Street to Coe Drive	Preservation		30	27	57	\$12,200,000	\$ 15,000,000	\$13,984,000,000
Anne Arundel County	MD 713	``	Widen from 2-4 lanes from MD 175 to Arundel Mills Blvd Widen from 4-6 lanes from Arundel Mills Blvd to MD 176	MD 175 to MD 176	Mobility		20	37	57	\$110,000,000	\$166,000,000	\$14,150,000,000
Howard County	MD 32	>	Safety, capacity, operational, and access improvements on MD 32 north of 1-70 consistent with MD SHA Feasibility Study, MD SHA Access Comon Study and Carrol County perpead for widening MD 3.2 north of this project's limits.	north of I-70 - SHA milepoints 19.6 to 23.6	Safety	>	1	26	36	\$25,000,000	\$ 38,000,000	\$14,188,000,000
Baltimore City	Moravia Road		Roadway, curb & sidewalk rehabilitation on Moravia Road between Belair Road and Sinclair Lane. ADA Improvements and basic streetscape elements will be part of this project.	Belair Road to Sinclair Lane	Accessibility		30	25	55	\$10,000,000	\$12,000,000	\$14,200,000,000
Baltimore County	Broening Highway / I-695		Construct a full interchange at Exit 44 of 1-695 to adequately support redevelopment at Sparrows Point		Mobility		30	24	54	\$80,000,000	\$121,000,000	\$14,321,000,000
Baltimore County	H-695	`	Safety and capacity improvements. Widen from 6 to 8 lanes.	H95 to I-83	Mobility	`	20	34	54	\$690,000,000	\$1,043,000,000	\$15,364,000,000
Baltimore City	Patapsco Avenue		Roadway, curb & sidewalk rehabilitation on Parapsco Avenue between Gable Avenue and Annapolis Road. ADA Improvements and basis streetscape elements will be part of this project.	Gable Avenue to Annapolis Road	Accessibility		30	22	52	\$10,000,000	\$ 12,000,000	\$15,376,000,000
Howard County	Bus Rapid Transit to Purple Line		Bus Rapid Transt will emulate light rail operations at a lower cost, and is designed to link Howard County commuters from Dorsey MARC to the Laurel MARC Station and Laurel and to College Park and the Eurple Line Light Rail	Dorsey MARC to College Park Purple Line Light Rail Station	Mobility		20	32	52	000'000'06E\$	000'000'000'5\$	\$15,966,000,000
Harford County Anne Arundel County	U.S. 40 +97	>	Widen from 4 lanes to 6 lanes including turn lanes and bicycle and pedestrian access. Add toll lanes to address capacity needs	MD 543 to Loflin Road MD 32 to U.S. 50/301	Mobility Mobility		20	32	52	\$10,000,000 \$220.000.000	\$ 15,000,000 \$333.000.000	\$15,981,000,000 \$16.314,000,000
Howard County	MD 175		Widening, bicycle, transit and pedestrian improvements consistent with Anne Arundel County widening proposals.	Oceano Avenue to Anne Arundel County line (MD 175 milepoints 0.00 to 1.54)	Mobility		10	40	20	\$5,000,000	\$ 8,000,000	\$16,322,000,000
Harford County	MARC Service		Expand MARC service to Delaware and provide additional service to Harford County including reverse commute, late evening service and weekend service	Washington DC to Delaware	Mobility	``	20	29	49	\$17,000,000	\$ 26,000,000	\$16,348,000,000
Anne Arundel County Harford County	MD 3 U.S. 40 @ MD 22	>	Improve safety and capacity on MD 3 Capacity Improvements	AA/PG County Line to MD 32	Safety Mobility		20 20	29	49 \$1	1,185,000,000 \$98,000,000	\$1,792,000,000 \$148,000,000	\$18,140,000,000 \$18,288,000,000







Maximize 2040 - Preferred Alternative

Sponsor	In Pl Project Name 2035	lan It 5 Project Description	Project Limits	Primary Goal	Public Prior Idea Poin	ity Tech ts Score	Total Score	Estimate Cost	ed Capital Estin YOE	nated Cost - Cu Co	mulative YOE st
Howard County	U.S. 1 Revitalization Projects	U.S. 1 - MD 175 to Whiskey Bottom Road- widening ped, bile, transft, streetscape and access impovements consistent with U.S. 1 Design Manual (to the extent possible); developer participation with Stark coordination and SHA Courty MOU for U.S. 1 revitalization cross section.	U.S. 1 milepoints. 97 to 5.6	Mobility		6	68	64	\$25,000,000	000'000's	\$18,300,000
Howard County	U.S. 29 Third Columbia Interchange	Design and construction of U.S. 29 interchange either between MD 175 and Boken Land Parkway or as an extension of the U. 29/Broken Land Parkway interchange. The Howard Hughes Coprototion as inducted with Downrow Columba Rezoring General Plan amendment. Is committed to participation.	North of U.S. 29/Broken Land Parkway and south of U.S. 29/MD 175.	Mobility		50	82	84	\$40,000,000	\$60,000,000 \$	\$18,378,000,000
Carroll County	MD 26	Widen from 2 to 4 lanes, addition of pedestrian and bicycle facilities	MD 32 to MD 97	Mobility		20	27	47 \$	223,000,000	\$337,000,000	\$18,715,000,000
Harford County	MD 543	Widen from 2 to 4 lanes including turn lanes and bicycle and pedestrian access	Wheel Road to I-95	Mobility		20	27	47	\$30,000,000	\$45,000,000	\$18,760,000,000
Baltimore County	MD 7 / MD 43	Upgrade from partial to full interchange, including two new ramps to accommodate full movements at interchange.	MD 7 / MD 43 interchange	Mobility		20	26	46	\$60,000,000	\$73,000,000	\$18,833,000,000
Baltimore County	Security Boulevard Extended	New 2-lane roadway to enhance potential development of site in the Federal Center. Includes sidewalks and roundabout at Fairbrook.	s Rolling Road to Johnnycake Road	Prosperity		20	25	45	\$4,000,000	\$5,000,000	\$18,838,000,000
Harford County	Abingdon Road	Capacity improvements including turn lanes, bicycle lanes and sidewalks	MD 924 to U.S. 40	Mobility		10	35	45	\$3,000,000	\$4,000,000	\$18,842,000,000
Howard County	2E CM	Proposed widening to minutum 31 lanes in each direction (reasability and weed Study required); Increased capacity at grade-separators feasibility of future HOV andor HOT Innes improved freight operations and access to Regional Activity Centers.	Cedar Lane to Anne Arundel County - MD 33 milepoints 0,00 to 8,00	Mobility	`	6	35	45 S	200,000,000	\$302,000,000	\$19,144,000,000
Baltimore County	H695 Bridge over U.S. 40	Bridge replacement	Bridge over U.S. 40 (west side, Catonsville)	Preservation		20	24	44	\$20,000,000	\$ 30,000,000	\$19,174,000,000
Howard County	Broken Land Parkway at Snowden River Parkway	Capacity operational and aftery improvements at this significant of the significant of the significant of the model of the significant of the MD 32 amps.	Broken Land Parkway- MD 32 to north of Snowden River Parkway,Snowden River Parkway- east of Ministrel Way to Patusen Woods Drive.	Aillido M		10	34	4 :	\$4,000,000	\$5,000,000	\$19,179,000,000
Baitimore County	MD 150	New left turn lane and associated improvements.	MU 140 / Hooks Lane Intersection Old Philadelphia Road @ Perryman	Mobility Mobility		8 8	57 F	t 43	\$1,000,000	\$ 1,000,000	510,100,000 510,103,000,000
Harford County	MD 152	Capacity intervents including turn lanes and bicycle and pedestrian access where applicable	Carrs Mill Road to 1-95	Mobility		2 P	1 R	t 4	000'000'000	\$ 45,000,000	\$19,237,000,000
Baltimore County	7 GM	Roadway, curb, sidewalk, bicycle, ADA, pedestrian improvements as part of an enhanced streetscape.	Campbell Boulevard to Mohrs Lane	Accessibility		20	22	42	\$7,000,000	000'000'6\$	\$19,246,000,000
Baltimore County	U.S. 40E	Roadway, curb, sidewalk, bicycle, ADA, pedestrian improvements as part of an enhanced streetscape	Middle River Road to Campbell Boulevard	Accessibility		10	32	42		\$0	\$19,246,000,000
Carroll County	MD 30 Relocated (Manchester Bypass)	New 2 lane roadway	Brodbeck Road to north of MD 86	Mobility		20	21	41	\$97,800,000	\$148,000,000	\$19,394,000,000
Harford County	MD 24	Add an additional travel lane in each direction including turn lanes	U.S. 1 Bypass to MD 23	Mobility		10	30	40	\$8,000,000	\$ 12,000,000	\$19,406,000,000
Baltimore County	2 DW	Roadway, curb, sidewalk, bicycle, ADA, pedestrian improvements as part of an enhanced streetscape	MD 43 to Rossville Boulevard	Accessibility		10	30	40		\$0	\$19,406,000,000
Howard County	MD 100	Design and construct MD 100 widening to 6 lanes with auxiliar merge/diverge lanes.	/ I-95 to Anne Arundel County - MD 100 milepoints 5.5 to 7.5	Mobility	>	10	29	39	\$80,000,000	\$121,000,000	\$19,527,000,000
Harford County	Perryman East	Construct a new 2 lane road in Perryman to handle a bulk of th truck traffic accessing the distribution centers on the peninsule including turn lanes and bitycle and pedestrian access	e MD 715 to Michaelsville Road	Mobility		10	29	39	\$3,600,000	\$4,000,000	\$19,531,000,000



Appendix F: Project Evaluation and Scoring

Maximize2040) - Preferred Alte	rnative										
Sponsor	Project Name	In Plan It 2035	Project Description	Project Limits	Primary Goal	Public F Idea F	^b riority Te ^b oints Sci	ch Tot ore Sco	al Estim re Cost	ated Capital	Estimated Cost - (YOE	:umulative YOE :ost
Howard County	U.S. 29		Development and construction of consistent highway cross- section capable of accommodating US29 peak period traffic.	MD 100 to I-70 - U.S. 29 milepoints 10.17 to 13.24	Mobility		0	59	39	\$50,000,000	\$76,000,000	\$19,607,000,000
Harford County	Pernyman West		Construct a new 2 lane road and bridge over Cranberry Run in Perryman including turn lanes and bicycle and pedestrian access	U.S. 40 at Mitchell Lane to Canning House Road	Mobility		6	27	37	\$8,000,000	\$10,000,000	\$19,617,000,000
Carroll County	MD 140 Relocated (Taneytown Bypass)		New 2 lane roadway, addition of pedestrian and bicycle facilities	Trevanion Road to MD 140	Mobility		10	26	36	\$68,000,000	\$103,000,000	\$19,720,000,000
Harford County	Thomas Run Road		Capacity improvements including center turn lane, sidewalks and bicycle accessibility	MD 22 to West Medical Hall Road	Mobility		10	26	36	\$14,000,000	\$21,000,000	\$19,741,000,000
Baltim ore County	U.S. 40E		Roadway, curb, sidewalk, bicycle, ADA, pedestrian improvements as part of an enhanced streetscape	Campbell Boulevard to Harford County Line	Accessibility		10	26	36		\$0	\$19,741,000,000
Howard County	MD 175 / MD 108 Grade separation		Consistent with the U.S. 1 MD 175 improvement (feasibility) Study, this project, in the 195 Corridor, would design and build a partial grade-reparation at MD 108MD 175 and would include direct access to Columbia Gateway Drive, a Suburban Femblyment Center.	.25 miles prior to MD 175/MD 108 intersection from all approaches. Also a direct connection to Columbia Gateway Drive	Mobility		10	25	35	\$18,000,000	\$22,000,000	\$19,763,000,000
Howard County	I-95 / MD 100 Interchange		Reconstruct this interchange to improve merge/weave, capacity and safety, including collector / distributor lanes to/from the I- 95/MD 175 Interchange.	/ -95 milepoints 8.27 to 8.77	Mobility	>	10	24	34	\$65,000,000	\$ 98,000,000	\$19,861,000,000
Harford County	H95 @ MD 543 Interchange		Capacity Improvements		Mobility		10	24	34	\$15,000,000	\$ 23,000,000	\$19,884,000,000
Harford County	U.S. 1		Add an additional travel lane in each direction including turn lanes and bicycle and pedestrian access where applicable	Baltimore County to MD 152	Mobility		10	23	33	\$29,000,000	\$ 44,000,000	\$19,928,000,000
Harford County	Amtrak Bridge Replacement	ų	Amtrak replacing the existing bridge with two new spans/four tracks.	Havre de Grace (Harford County) to Perryville (Cecil County)	Preservation		10	21	31	\$120,000,000	\$181,000,000	\$20,109,000,000
Howard County	l-95 / MD 175 Interchange	>	Design and construct needed improvements to the interchange consistent with preferred options in the MD SHA "MD 175 Improvement Study"	H95 milepoints 5.8 to 6.8 at MD 175	Mobility		10	19	29	\$105,000,000	\$159,000,000	\$20,268,000,000
Howard County	I-95 Feasibility Study		SHA study of capacity, safety and access expansion through use of I-95 collector-distributor lanes from MD 32 to MD 100 (similar to I-270)	1-95 milepoints 4.2 to 9.2	Mobility		10	14	24		\$0	\$20,268,000,000

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This appendix presents details about the technical analyses the BRTB (through the efforts of BMC staff) has conducted during the development of *Maximize2040*. These analyses help the BRTB to evaluate and understand the potential effects of the proposed projects and programs of *Maximize2040* with respect to adopted regional transportation goals, including conserving and enhancing the environment, increasing mobility, and improving accessibility.

Analysis of Preferred Alternative – Air Quality Conformity

Chapter 1 describes the federal requirements each MPO must follow to make sure the projects in *Maximize2040* will not cause new air quality violations, worsen existing violations, or delay timely attainment of air quality standards.

To protect public health, the U.S. Environmental Protection Agency (EPA) sets the national ambient air quality standards (NAAQS) for "criteria pollutants." The EPA then determines the areas that do not meet these standards.

The EPA has determined that the Baltimore region does not meet the national standard for ground-level ozone. As a result, the EPA has classified the region as a "nonattainment" area for ground-level ozone. The EPA also has classified the region as a "maintenance" area for carbon monoxide (CO) and fine particulate matter (PM_{25}).

What does this mean for the region? The State Implementation Plan (SIP) developed by the Maryland Department of the Environment determines how the region will reach the NAAQS. Part of this SIP includes motor vehicle emission budgets. The region must show that its transportation plans and programs conform to the air quality goals in the SIP and do not exceed the motor vehicle emission budgets.

This process is coordinated through the Interagency Consultation Group, a subcommittee of the BRTB. The Maryland Department of the Environment (MDE) submitted SIPs for 8-hour ozone, $PM_{2.5'}$ and CO. The maintenance SIP for CO was approved in 2003. The "rate of further progress" budget for mobile sources from the 8-hour ozone SIP was deemed adequate by EPA in 2008. The maintenance SIP for PM_{2.5} was approved in 2014.







The results of the conformity analysis indicate that projected mobile source emissions are below the established budgets for years 2017, 2025, 2035, and 2040. Based on the conformity analysis, the BRTB, in its capacity as the MPO for the Baltimore region, has concluded that implementation of the projects in Maximize2040 and the amended 2016-2019 Transportation Improvement Program will not worsen the region's air quality or delay the timely attainment of national ambient air quality standards.

Air Quality Conformity – Final Emissions Results (in tons)						
	2017	2025	2035	2040		
Daily Summer NOx						
Total Emissions Modeled	50.7	25.9	18.2	18.2		
Motor Vehicle Emissions Budget	106.8	106.8	106.8	106.8		
Conformity Result	Pass	Pass	Pass	Pass		
Daily Summer VOC						
Total Emissions Modeled	26.5	18.2	12.0	11.6		
Motor Vehicle Emissions Budget	41.2	41.2	41.2	41.2		
Conformity Result	Pass	Pass	Pass	Pass		
Daily Winter CO						
Total Emissions Modeled	381.0	271.1	197.1	194.9		
Motor Vehicle Emissions Budget	1,689.8	1,689.8	1,689.8	1,689.8		
Conformity Result	Pass	Pass	Pass	Pass		
Annual Direct PM _{2.5}						
Total Emissions Modeled	887	538	448	441		
Motor Vehicle Emissions Budget	1,218.60	1,051.39	1,051.39	1,051.39		
Conformity Result	Pass	Pass	Pass	Pass		
Annual NOx						
Total Emissions Modeled	19,294	10,002	7,742	7,344		
Motor Vehicle Emissions Budget	29,892.01	21,594.96	21,594.96	21,594.96		
Conformity Result	Pass	Pass	Pass	Pass		

Analysis of Preferred Alternative – Travel Demand Model

The BMC staff applied performance measures to quantify the effects of simulated horizon year travel on the Baltimore region transportation network. Numerical data collected to quantify Maximize2040 performance measures came from the Baltimore Region Travel Demand Model (Version 4.4a). Staff validated the travel demand model against 2010 reported observed conditions.

The Version 4.4a model includes seven person-level trip purposes: (1) Home-Based Work, (2) Home-Based School, (3) Home-Based Shopping, (4) Home-Based Other, (5) Journey to Work, (6) Journey at



Work, (7) Other-Based Other. The model also includes three truck purposes: Commercial Vehicle, Medium Trucks, and Heavy Trucks. Staff used the Round 8-A socioeconomic forecasts to simulate household and non-household travel behavior choices.

The following figure illustrates model simulated travel for 2010, 2017, 2025, 2035, and 2040 conditions for an average Baltimore region weekday. Based on horizon year input assumptions, the model forecasts a 16.6% increase in total household person trips (motorized and non-motorized) from 2010 to 2040, resulting in a total of 9.94 million total person trips produced in 2040. The model forecasts an increase of 25.3% in non-household vehicle trips over this same period, resulting in 1.15 million commercial and truck vehicle trips. Trips for 2010 and 2040 are distributed throughout the region and the output vehicle trip tables from the mode choice module are assigned to the 2010 and 2040 transportation networks, respectively.



Simulated Household Person Trips and Non-Household Vehicle Trips

Performance measures have been developed to analyze simulation characteristics to show travel demand results. Performance measures were calculated for two simulations:

- 2019 Existing and Committed (E + C)¹,
- Maximize2040 Preferred Alternative.

The E + C network illustrates the forecasted level of service that would result in year 2040 if only the projects currently built, or the limited group scheduled for construction by calendar year 2019, were completed. E + C, in this case, shows what is referred to as a "no-build" scenario, wherein all project planning terminates with the projects that are currently funded and scheduled.

1 This is the 2019 network (existing + committed projects), with 2040 population and employment projections.









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The following table displays 2010, 2019 E + C, and 2040 Preferred Alternative performance measures for the 24-hour period:

Travel Demand Performance Measures for Baltimore Region						
	Indicator of Travel Demand	2010	2019 E + C	2040 Preferred Alternative		
	Interstates	31,257,000	37,701,000	39,425,000		
Vehicle Miles Traveled	Arterials	25,202,000	32,745,000	32,116,000		
(VMT)	Collectors	5,307,000	7,443,000	7,043,000		
	All Roads	61,767,000	77,889,000	78,584,000		
	Interstates	8,473,000	14,215,000	14,650,000		
Congested VMT	Arterials	6,962,000	13,974,000	12,394,000		
(LOS E and F)	Collectors	1,495,000	3,491,000	3,035,000		
	All Roads	16,930,000	31,680,000	30,080,000		
	Interstates	27.1%	37.7%	37.2%		
Percentage of Congested	Arterials	27.6%	42.7%	38.6%		
VMT (LOS E and F)	Collectors	28.2%	46.9%	43.1%		
	All Roads	27.4%	40.7%	38.3%		
	Total Transit Ridership (Linked Trips)	302,885	317,145	323,213		
	Travel Characteristics					
Auto Occupancy Ratio	Home-Based Work Trips	1.09	1.09	1.09		
	Home-Based Non-Work Trips (Shop/Other)	1.53	1.53	1.53		
	All Home-Based Trips	1.41	1.40	1.40		
	Home-Based Transit Mode Share	4.7%	4.3%	4.3%		
	Performance					
Congested Speed (mph) for AM Peak Period	Interstates	48.2	39.9	42.8		
	Freeways	47.2	35.6	36.5		
	Principal Arterials	32.9	27.8	29.1		
	Minor Arterials	30.5	26.0	26.8		
	Collectors	30.4	25.3	26.2		
	All Roads	37.3	30.5	32.1		
	Vehicle Hours of Delay (AM Peak Period)	75,656	388,398	304,725		
	Vehicle Hours of Delay (24-Hour Period)	233,513	1,078,030	918,973		



Following are some significant observations related to the travel demand model data as presented in the table:

- The Baltimore region on an average weekday is projected to have a 27 percent growth in VMT from a 2010 total of 61.7 million to a 2040 Preferred Alternative projection of 78.3 million.
- Congested VMT (Level of Service E and F) is projected to increase 77 percent from 17.0 million in 2010 to 29.5 million in the 2040 Preferred Alternative. The congested VMT in the 2040 Preferred Alternative accounts for nearly 38.3 percent of total VMT in the region while the 2019 E + C shows a 40.7 percent level compared to the 2010 network at 27.6 percent.
- Transit ridership shows an increase of 6.0 percent from 2010 to 2040, but the transit mode share for all trips decreases.
- Vehicle hours of delay for the 2040 Preferred Alternative are almost four times greater than the hours of delay for 2010 because of increased traffic congestion.
- Vehicle hours of delay for the 2040 Preferred Alternative are projected to decrease by 17.3 percent from 2019 E + C.
- Average speed for all roads under the 2040 Preferred Alternative shows a decrease of 13.9 percent between 2010 and 2040 due to increased traffic congestion.

Analysis of Preferred Alternative – Environmental Justice

Background

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires the U.S. Department of Transportation to make EJ analysis part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, programs, and activities on minority populations and/or low-income populations (collectively "EJ populations"). In grant agreements where the BRTB is a recipient of FHWA/FTA funds, there is a requirement to facilitate compliance with Executive Order 12898 and DOT's Implementing Order 5610.2, "Environmental Justice in Minority Populations and Low-Income Populations." This is accomplished by incorporating environmental justice principles into every stage of the transportation decision-making process.

Building from the framework of Title VI of the Civil Rights Act of 1964, which ensures nondiscrimination in federal programs, EJ directives address how low-income and minority populations are affected by the actions of the federal government (i.e., funding to MPOs). In its publication, *An Overview of Transportation and Environmental Justice*, the U.S. Department of Transportation (U.S. DOT) outlines the three main objectives stemming from this mandate:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations;
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process; and
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.







Definitions from FTA Circular 4703.1 – Identification of Minority and Low-Income Populations

The EJ analysis utilized U.S. Department of Transportation (U.S. DOT) definitions of minority and low-income populations to identify concentrations of minority and low-income populations and to determine any disproportionate benefits and burdens of transportation decisions. Specifically, these terms are defined as follows:

A minority population means any readily identifiable group or groups of minority persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed or transient persons (such as migrant workers or Native Americans), who will be similarly impacted by a proposed DOT program, policy, or activity. The U.S. Department of Transportation Order on Environmental Justice, issued to comply with Executive Order 12898, defines minority as a person who is a member of one of these groups:

- Black (a person having origins in any of the black racial groups of Africa)
- Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race)
- Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands)
- American Indian and Alaskan Native (a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition).

A low-income population means any readily identifiable group of persons whose median household income is at or below the Department of Health and Human Services' poverty guidelines who live in geographic proximity, and, if circumstances warrant, geographically dispersed or transient persons, who will be similarly impacted by a proposed DOT program, policy, or activity. According to data from the U.S. Census Bureau, the 2014 poverty threshold for a family of four is \$24,418.¹ The U.S. Census Bureau updates poverty thresholds each year using the change in the average annual Consumer Price Index for All Urban Consumers (CPI-U).

An adverse effect means "the totality of significant individual or cumulative human health or environmental effects, including interrelated social and economic effects, which may include, but are not limited to: bodily impairment, infirmity, illness, or death; air, noise, and water pollution and soil contamination; destruction or disruption of man-made or natural resources; destruction or diminution of aesthetic values; destruction or disruption of community cohesion or a community's economic vitality; destruction or disruption of the availability of public and private facilities and services; vibration; adverse employment effects; displacement of persons, businesses, farms, or non-profit organizations; increased traffic congestion, isolation, or exclusion or separation of individuals within a given community or from the broader community; and the denial of, reduction in, or significant delay in the receipt of benefits of DOT programs, policies or activities."

A disproportionately high and adverse effect on minority and low-income populations is defined as "an adverse effect that: (1) is predominantly borne by a minority and/or a low-income population or (2) will be suffered by the minority and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population."

1 https://www.census.gov/hhes/www/poverty/data/threshld/



Methodology

Following the outline as laid out in FTA Circular 4703.1, an EJ analysis involves three fundamental steps.

- 1. Determine whether there are any EJ populations potentially affected by the activity.
- 2. Once it has been determined that one or more EJ populations are present, consider the potential effects of the activity on the EJ populations.
- 3. The analysis in Step 2 should provide the information to determine benefits or burdens.

To identify how the burdens and benefits of the transportation planning process and transportation improvements are distributed within the region, BMC staff completed a series of analyses. Following are the steps used to complete these analyses:

Step 1: Determine whether there are any EJ populations potentially impacted by the activity—in this case, the Preferred Alternative investment outlined in *Maximize2040*.

A Geographic Information System (GIS) was utilized to view and tabulate demographic information and analyze this information in relation to the proposed *Maximize2040* projects. Spatial and demographic data from the 2010 U.S. Census data were analyzed at the census tract and block group level, relative to Transportation Analysis Zones (TAZs).

Data from the American Community Survey five-year estimates for 2006-2010 were used for minority (persons other than non-white Hispanics). These data were available at the TAZ level. A total of 1,387 TAZs make up the Baltimore modeling area.

To determine threshold minority and low-income levels, the regional average of minority population and households below the poverty level were calculated for the metropolitan planning area. Those block groups where the minority or low-income population was greater than the regional average were identified as communities where EJ issues should be analyzed.

Step 2: Consider the potential effects of the activity on the EJ populations.

According to the U.S. DOT definitions of minority and low-income, staff determined determined that more than 35 percent of all residents in the region are minorities, and 11.5 percent of the households in the region meet the federal definition of low-income in 2010. By comparing census block group data on minority populations across the region, the analysis enabled BMC staff to identify areas with percentages of minority residents greater than the regional average. Staff completed a similar assessment for low-income households. In many cases, where there is an overlap of low-income and minority populations, maps were generated to identify all minority populations as well as low-income populations.

Step 3: Use information from Step 2 to determine benefits or burdens.

The benefits of the transportation projects in *Maximize2040*, when evaluated on the basis of their spatial distribution, do not disproportionately benefit EJ or non-EJ communities. Most individuals will not see a significant change in travel times from one area of the region to another (home to work, school, retail centers, hospitals, etc.), mostly due to the allocation of approximately 77% of available resources to system preservation and system operations. Also, the remaining expansion projects will have a negligible impact on overall travel time. Low-income and minority populations are not disproportionately affected and are beneficiaries of the improvements to the transportation network.









Baltimore Region TAZs by Minority Population

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Estimating Accessibility for Environmental Justice Populations

The BMC staff conducted analyses to estimate accessibility by Environmental Justice populations in the region with respect to home-based work (HBW) and home-based non-work (HBNW) trips. Zones are grouped by their appropriate population concentration and compared. Comparisons are also made between the 2040 existing and committed projects (E + C) network (no new projects beyond what is currently in place or in the TIP) and the Preferred Alternative. The methodology is similar to that employed for the 2011 long-range transportation plan update, with some modifications.

Staff identified Baltimore region zones by the share of minority population, based on 2010 Census data. This process differs from the 2011 process in that it considers a total minority population, rather than include separate analyses for each racial/ethnic group (Asian, black, Hispanic, other, and white). Breakpoints were set so that approximately one-fifth of the 2010 regional population is in each category. The following table shows the share breakpoints for the different categories.

Racial Categorization of Zones (Percent)			
Category	Minority Share		
1 (Lowest)	0.09		
2	0.21		
3	0.38		
4	0.71		
5 (Highest)	1.00		

The analysis also considers income. HBW, home-based shop (HBS), and home-based other trips are broken down into four income categories in the model, so these categories were carried into the EJ analysis. Home-based school (SCH) trips are not broken down by income level, so these trips were excluded from the income analysis, although they are included in the racial minority analysis.

Staff then examined transportation accessibility using a 30-minute highway time and a 60-minute transit time. HBW analysis is based on congested travel times used by the model; the HBNW review assumes uncongested travel times.

The HBW analysis for the minority share considers employment (jobs) and the competing labor force for those jobs. Within the given time radius of each zone, the number of jobs and the labor force are summed and the ratio taken. The time includes highway terminal time (for highway access) and walk and wait time (for transit access). Highway and transit accessibility are considered separately. HBNW trips are considered by summing the population and number of HBNW attractions within the given radius to get attractions per person.

For the income analysis, productions and attractions are summed for trips in each income category within each time radius and compared for both HBW and HBNW (excluding SCH) trips. In addition to producing labor force, job, population, production, and attraction statistics, the process includes calculating the jobs/labor force, attractions/population, or attraction/production ratios. Also determined is the average (weighted by employment or attractions) travel time.

Environmental Justice Charts

The following charts show the concentrations of attractions for each level of population share. For example, E + C Category 1 refers to the first level of population share. "E + C" refers to existing and committed projects; "PA" refers to preferred alternative projects.


















































Results of Environmental Justice Analyses

Generally, the HBW analysis for racial minorities shows a slight or no improvement in the jobs to labor force ratio for the highway travel time, although the fourth highest minority share shows a slight decrease. Transit travel time shows a minor across-the-board improvement.

For HBW income analysis, there is virtually no difference in the attractions/productions ratio for highway trips, and a slight improvement in three of the income categories for transit trips.

Differences between the two scenarios (E + C projects versus E + C and Preferred Alternative projects) for HBNW trips are virtually nonexistent. Since HBNW trips utilize the uncongested travel times, it appears that the network changes in and of themselves have little effect on accessibility; it is the reduction in congestion that makes the difference, which shows up when the congested travel times are used for HBW trips.

* Overall, the analysis shows virtually no change or only a slight improvement in accessibility based on the construction of the Preferred Alternative projects. Highminority and low-income communities do not find themselves disadvantaged by the projects in Maximize2040.

Analysis of Preferred Alternative – Natural and Cultural Resources

When agencies collaborate in their planning for the natural, cultural, and community context of the transportation system, it can lead to better results. Collaboration can lead to the avoidance or minimization of effects to important resources, improved procedures for mitigation on a regional basis, fewer project delays and re-do loops, added trust among stakeholders, and, ultimately, better transportation solutions and environmental outcomes.

MAP-21 includes legal requirements for coordination with resource agencies during planning. These requirements state that planning agencies (such as MPOs) consult with federal, state, and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation as part of the development of the long-range transportation plan. These consultations are expected to involve a comparison of transportation plans with conservation plans, maps, and inventories of natural, cultural, and historic resources. Additionally, MAP-21 requires MPO plans to include a discussion of potential environmental mitigation activities and potential areas to carry out mitigation activities based on this resource agency consultation.

The Baltimore Regional Transportation Board (BRTB) understands the potential benefits of effective coordination with resource agencies during planning. For *Maximize2040*, the BRTB has built on the previous consultation process performed for the 2011 long-range plan (known as *Plan It 2035*). For *Maximize2040*, the environmental coordination process involved greater mapping capabilities and additional communication. The goals of this coordination are to:

- 1. determine potential mitigation areas and types and
- 2. enhance the linkage between long-range transportation planning and the NEPA process.

The BRTB continues to be involved in the Interagency Review meetings, hosted by SHA and involving the resource and regulatory agencies, in order to understand and discuss potential effects of projects that are at all stages of planning. These meetings provide an opportunity for the BRTB to share projects that are very early in the planning stages with the resource and regulatory agencies. As agencies are exposed to the location and magnitude of proposed projects, an appropriate strategy can be developed that provides benefits beyond the effects of an individual activity.







Consultation to Improve Environmental Impact Mitigation

In developing this plan, the BRTB has consulted with federal, state, and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation. During this consultation process, involved agencies were provided opportunities for coordination at two SHA-led interagency review meetings in the summer of 2015, as well as communications through phone calls, emails, and the online interactive mapping application. The online interactive mapping application was created to conduct a broad analysis comparing proposed projects with resources in the area. The following resources have been mapped with the proposed projects and shared with coordinating agencies:

- Maryland Department of Natural Resources Protected Lands (Maryland Agricultural Land Preservation Foundation Districts, Rural Legacy Areas, Maryland Environmental Trust Easements, Forest Legacy Easements, DNR Lands, County Parks, Federal Lands, Private Conservation Properties)
- Greenways
- Maryland Green Infrastructure Network
- Chesapeake Bay Critical Area
- Impaired Watersheds
- National Register of Historic Places
- Maryland Inventory of Historic Properties
- Maryland Department of Planning Land Use / Land Cover Data
- Sensitive Species Project Review Areas
- Wetlands of Special State Concern
- Sea Level Rise

Through these comparisons, and ongoing conversations with resource/regulatory agencies, this environmental consultation process creates the opportunity to bring issues to light in advance of project planning. Analysis of natural and historic resources becomes very detailed at the short-range project planning level, so it is important to provide an opportunity during long-range transportation planning for broad-based discussions of resources that consider all proposed projects.

In addition to the mapping information listed above, the U.S. Fish and Wildlife Service (FWS) provides a website: Information for Planning and Conservation (IPaC). IPaC is a tool designed to streamline the FWS review process. It can provide an initial project scoping of threatened or endangered species, critical habitat, migratory birds, or other natural resources. Staff will explore this service further in the future with regard to long-range transportation planning. Staff also will explore in the future the possibility of mapping the National Wetlands Inventory with plan projects.

The following maps have been created for this analysis process. The maps, as shown here, display a comparison of highway and transit projects in the Preferred Alternative with resource data.



Protected Lands and Greenways











Green Infrastructure Network

G-24









Impaired Watersheds



G-26











Maryland Inventory of Historic Properties



Land Use / Land Cover











G30











G32

The project planning process, which involves NEPA, is heavily detailed and time consuming. Performing coordination and discussing regional mitigation opportunities ahead of time is meant to improve process efficiency and identify any regional mitigation goals. The environmental coordination process will continue through the partnerships that have been made during this analysis process. Bringing together environmental concerns and regional mitigation planning into the long-range planning process is the ultimate goal.

Specific Impact Mitigation Strategies and Measures

The purpose of considering mitigation early in the long-range planning process is to focus attention on regional level conservation and restoration needs. This focus provides a context into which later decisions on specific mitigation concepts and strategies can be developed during the later project development process. The table below displays resource types along with corresponding legislation that provides protection and possible mitigation strategies and measures that could be applied during later project development.

Examples of Mitigation Measures							
Resource	Examples of Mitigation Measures	Regulation					
Parks and Recreation Areas	For publicly-owned parks, replace land with land of equivalent value and equivalent location; Replace impacted facilities; Restore and landscape disturbed area	Section 4(f) of the U.S. Department of Transportation Act					
Wildlife and Waterfowl Refuges	For publicly owned refuges, replace land with land of equivalent value and equivalent location; Incorporate habitat features	Section 4(f) of the U.S. Department of Transportation Act					
Cultural Resources	Vegetative buffer screening; Measures to preserve a site's historic integrity; Project review/Memorandum of Agreement with Maryland's State Historic Preservation Office; Ensure compatibility with Certified Heritage Area management plans	Section 4(f) of the U.S. Department of Transportation Act; Section 106 of the National Historic Preservation Act					
Water Resources and Wetlands	Mitigation for wetland and waterway impacts includes creation, restoration, preservation, enhancement, or monetary compensation. Site-specific stormwater management plans; use low-impact development (LID) stormwater design; BMP tracking; stormwater discharge monitoring; design of stormwater management capacity for new impervious surfaces, as well as existing; water quality banking program with MDE; sediment control during construction	Rivers and Harbors Act of 1899; Clean Water Act; COMAR Title 08.05, Water Resources Administration, Nontidal Wetlands; COMAR Title 9, Wetlands and Riparian Rights (Tidal Wetlands); 2000 Maryland Stormwater Design Manual (with 2009 Environmental Site Design Revisions); Maryland Phase II Watershed Implementation Plan for the Chesapeake Bay TMDL					







Examples of Mitigation Measures						
Resource	Examples of Mitigation Measures	Regulation				
Endangered and Threatened Species	Mitigation may include placing conservation easements on properties occupied by the species, expanding/ linking habitat areas through habitat creation areas, or enhancing low quality habitat	Endangered Species Act				
Forests	Forest replacement on a 1:1 basis, for construction activities.	Maryland Reforestation Law, Forest Conservation Act				
Chesapeake and Atlantic Coastal Bays Critical Area	Replace forests in the Critical Area on not less than an equal area basis. Mitigation typically includes installation of native shrub and tree species prioritizing on- site locations before moving off-site (within the same impacted watershed and county.) Techniques must be used to reduce stormwater runoff pollutant loading. The techniques must be capable of reducing pollutant loads generated from a developed site to a level at least 10% below the loads generated at the same site prior to development.	Critical Area Act (1984); COMAR 27.01.02.04				
Nontidal Wetlands of Special State Concern	Mitigation for wetland impacts includes creation, restoration, preservation, enhancement, or monetary compensation. Acreage replacement ratios vary depending on wetland and mitigation type.	COMAR 26.23.06.0102				
Prime Farmland Soils	A farmland conversion impact rating form is completed for major capital projects. The resulting score is intended for use as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level.	Farmland Protection Policy Act				

Mitigation of Natural Resource Impacts

When SHA is issued authorizations from the Maryland Department of the Environment (MDE) and the U.S. Army Corps of Engineers (COE) for activities which will cause unavoidable losses of wetlands, those impacts must be compensated for through wetland mitigation. Wetland mitigation is the creation, restoration, enhancement, and preservation of wetlands lost due to regulated maintenance and construction project activities. In order to meet the "no net loss" goals of MDE and the COE, SHA generally mitigates at a 2:1 ratio for shrub/scrub and forested wetlands, and at a 1:1 ratio for emergent wetlands for most impacts to wetlands by highway projects.

The COE compensatory mitigation rule was approved in 2008. The rule establishes a preference hierarchy for mitigation options (i.e., mitigation bank credits, in-lieu fee program credits, and



permittee-responsible mitigation projects). The permittee may use any of these three options to mitigate for project impacts. However, the COE preference is the use of mitigation banks.

Meeting the Chesapeake Bay TMDL

The U.S. EPA has issued a "pollution diet" or Total Maximum Daily Load (TMDL) for water going into the Chesapeake Bay. With the TMDL, and the resulting Maryland Watershed Implementation Plan (WIP), caps are set on levels of phosphorus, nitrogen, and sediment going into watershed segments of the Bay. As just one part of the Phase I WIP developed by the state of Maryland, SHA is required to treat water pollution from 20 to 30 percent of impervious surfaces that were constructed prior to 1985 by 2017. This level of required treatment is significant, and is expected to result in a dramatic level of new stormwater treatment in the state and the Baltimore region. Other transportation modal administrations in the state, such as MDTA and MTA, are to provide a certain level of treatment as well.

Ongoing and Future SHA Mitigation Strategies

Moving forward, SHA is working closely with the state and federal review agencies, local planning groups, the business community, environmental organizations, the general public, and other stakeholders, engaging in several other wetland and stream mitigation strategies. The watershed approach, wetland banking, and advanced mitigation (mitigation constructed in advance of the highway improvements) are just a few examples of what is anticipated. With the new mitigation rules in place, mitigation will be pursued earlier in the project development process, through a watershed approach, utilizing new tools such as the Watershed Resources Registry found at *www.watershedresourcesregistry. com.* The watershed approach is described below.

The watershed approach to compensatory mitigation is a flexible approach that encourages various partnerships between all state and federal review agencies, local planning and regional planning organizations, as well as the general public. This approach involves assessing the needs of the watershed in a comprehensive manner that allows planners and review agencies to determine the improvements that are most needed with a particular watershed and sub-watersheds. Areas targeted for improvement may include water quality and quantity, stormwater runoff, riparian buffer, stream restoration, wetland creation and restoration, wildlife habitat creation and restoration, fish passage, reforestation, etc. The watershed approach balances the needs of the watershed by often using out-of-kind mitigation strategies that would be most beneficial based upon those identified needs. By identifying the most needed improvements within a given watershed, SHA and its partners can create a priority list of mitigation strategies that can serve as a long-term plan for the overall improvement to the watershed. SHA uses the Watershed Resources Registry to assess the improvement needs of the watersheds potentially impacted by highway projects. This registry includes DNR's Green Infrastructure Network and is consistent with FHWA's Eco-logical Approach.

Although these projects are not in the Baltimore region of Maryland, SHA used the watershed approach on such large and complex projects as the InterCounty Connector (ICC) in Montgomery and Prince George's counties and the U.S. 301 Transportation Study in Charles County. SHA also employs similar watershed approaches to mitigation on smaller projects in its design and construction program.







What Is 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.

Why Is Congestion Management Important?

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. The process includes:

- Developing congestion management objectives
- Establishing measures of multimodal transportation system performance
- Collecting data and monitoring system performance to define the extent and duration of congestion and to determine the causes of congestion
- Identifying congestion management strategies
- Establishing an implementation schedule and identifying possible funding sources for each strategy
- Evaluating the effectiveness of implemented strategies.







Managing Congestion in Larger Metropolitan Areas – Air Quality Concerns

A CMP is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements also state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process.



In TMAs designated as ozone or carbon monoxide nonattainment 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.

The CMP must provide an analysis of 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.

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 visions of how to deal 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 some of the key elements of the regional CMP.

1. CMP 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 the *Maximize2040* goals directly relate 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 signal and message systems 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.

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 manage-

ment 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 intelligent transportation systems (ITS), better signal timing, implementing flextime or telework arrangements at major employment centers, 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. 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, and Howard. 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).



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

3. CMP Performance Measures

Performance measures are a critical component of the CMP. According to Federal regulation, the CMP must 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 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). LOS indicators with a simple standardized A-through-F grading system are assigned to the regional network. The advantage of these measures is that data are generally available from travel models, and there is a large existing body of experience in defining and applying these measures. On the other hand, they are limited in that they traditionally focused on the movement of vehicles, rather than people or goods. Another limitation of volume-to-capacity measures is that they may not be readily understood by the public without a citizen education effort.

Travel Time Measures

Travel time measures focus on the time needed to travel along a selected portion of the transportation system. Common variations of travel time metrics include:

- travel time the amount of time needed to traverse a segment or corridor
- **travel speed** usually measured in one of two ways: (a) average travel speed: the length of a segment divided by the travel time, or (b) spot speed: the speed of a vehicle or a sample of vehicles over a given time interval passing a point along a roadway





- delay the difference between travel time and acceptable or free-flow travel time
- travel time index ratio of peak-period to non-peak-period travel time.

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 predicable, 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 estimates that nonrecurring sources of congestion are responsible for perhaps half of all delay experienced by travelers.

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. Data Collection 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 coordinated 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 Vehicle Probe Project 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 Vehicle Probe Project (VPP) 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. More information on the VPP Suite can be found at the link below:

http://www.i95coalition.org/wp-content/uploads/2015/02/One_Pager_VPP_VPP_Suite-31dec2014-final2.pdf







The following maps show VPP data collected for the a.m. and p.m. peak periods. The first map shows average 2014 travel speeds for the a.m. peak period for freeways and major arterials. The second map shows average 2014 travel speeds for the p.m. peak period for freeways and major arterials.



H-6









5. Congestion Analysis

Analysis Based on VPP Data

Using VPP data, beginning in 2013 BMC developed the "Quarterly Congestion Analysis Report" identifying the Top 10 Bottlenecks in the Baltimore Region.



The VPP 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.

Top 10 Bottlenecks in the Baltimore Region 1st Quarter 2014

By Impact Factor

(Number of Occurrences x Average Duration in Minutes x Average Length)

Location		Average Duration	Average max length (miles)	Occurrences	Impact Factor
1	I-695 CW @ MD-147/Harford Rd/Exit 31	2 h 37 m	9.17	89	128,065
2	US-29 N @ MD-175	1 h 57 m	5,76	164	110,520
3	I-95 N @ MD-100/Exit 43	1 h 39 m	8.07	131	104,596
4	I-695 CCW @ Edmondson Ave/Exit 14	1 h 52 m	5.44	142	86,452
5	1-95 S @ 1-495/Exit 27-25	2 h 36 m	20.91	26	84,812
6	I-695 CW @ I-83/MD-25/Exit 23	1 h 26 m	6.59	122	69,193
7	1-83 S @ 1-695	58m	3.87	295	66,201
8	MD-295 S @ 1-495/1-95	2 h 46 m	12.58	31	64,720
9	I-97 S @ US-301/US-50	1 h 28 m	11.68	58	59,607
10	MD-295 N @ 1-195	1 h 40 m	8.71	68	59,222







Along with the ranking, staff attempts to assess what is causing the congestion and utilizes tools in the VPP Suite to illustrate what is occurring at each location. The following example uses the top ranked bottleneck from the first quarter of 2014.



In this time spiral each trip around the pircle represents a day 7 The center represent January 1, 2014 and the puter edge represents April 1, 2014.



Haximum queue length < 1 Harford Rd/Exit 31



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 10 congested locations in 2014 based on VPP data.









Jurisdictional Priority Letters

Each year, the local jurisdictions send so-called "priority letters" to MDOT. These letters list the projects the jurisdictions consider critical to addressing their transportation needs. These needs often include alleviating traffic congestion and addressing safety concerns.

These priority letters are a source of information to help BMC and MDOT staffs identify corridors for additional analysis related to relieving traffic congestion and improving safety. BMC technical analysis would focus on better understanding the extent, duration, and causes of congestion along a 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) would help the 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 regional long-range transportation plan, and the TIP. Data gathered and analyzed by BMC staff also could provide background information for subsequent NEPA analysis.

These types of analyses might be conducted in future years under proposed consultant activities. UPWP funds could be designated for data collection and analysis.

6. Implement/Manage Strategies

Integrated Corridor Management: Focus on MD 295

In 2013, FHWA issued a Request for Applications inviting states, MPOs, and local governments to apply for deployment planning grants to initiate or continue Integrated Corridor Management¹ (ICM) development with their partners, such as arterial management agencies, tolling authorities, and transit authorities. The purpose of this program is to promote the integrated management and operations of the transportation system, thereby improving multimodal transportation system management and operations.

Using the Vehicle Probe Project Suite, BMC staff identified a portion of MD 295 as having the worst bottleneck in 2012. Based on this, staff began developing a congestion brochure to highlight the issues and potential tools that could be used to address the congestion. In the process of gathering information for the brochure, staff learned that the Maryland State Highway Administration (SHA) was also studying this corridor to identify low-cost improvements.

¹ As noted in the TRB RTSMO Committee Glossary of Regional Transportation Systems Management and Operations Terms, "ICM may encompass several activities, such as cooperative and integrated policy among stakeholders, concept of operations for corridor management, communications among network operators and stakeholders, improving the efficiency of cross-network junctions and interfaces, mobility opportunities, including shifts to alternate routes and modes, real-time traffic and transit monitoring, real-time information distribution (including alternate networks), congestion management (recurring and non-recurring), incident management, travel demand management, public awareness programs, transportation pricing and payment, access management, and grown management. Integrated Corridor Management may result in the deployment of an actual transportation management system (ICMS) connecting the individual network-based transportation management systems; or integrated corridor management may just be a set of operational procedures – agree to by the network owners – with appropriate linkages between their respective systems." (See https://docs.google.com/a/baltometro.org/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnx0cmJydHN tb2NvbW1pdHRIZXxneDo0NWY10TFjMTg1Nzc3ZTAy)



MD 295 Congestion Brochure











As a result of meetings with staff from SHA to discuss the corridor and potential solutions, SHA and BMC staff agreed that the region should apply for the ICM grant to help jump start this approach in the corridor. The grant work will include developing a Concept of Operations for integrated corridor operations; beginning the development of an Analysis, Modeling, and Simulation Plan for the corridor; and developing an ICM deployment approach.

The area selected includes the north-south corridor of MD 295, US 1, and I-95 from I-695 to MD 32. The project will consider roadway and transit alternatives and will include the following groups: SHA; BMC/ BRTB and relevant committees; Anne Arundel, Baltimore, and Howard counties; MTA, Central Maryland Regional Transit, the National Park Service, and Fort Meade.

SHA will be the lead for this project, working closely with BMC and the other project stakeholders.

Maximize2040 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 statewide Intelligent Transportation System architecture and transportation systems management and operations (TSMO) 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 STP funds.

Specific Strategies – Preferred Alternative Projects

BMC staff requested some detailed information from local jurisdictions submitting projects for consideration for *Maximize2040*. 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 chart shows the strategies proposed for each project in the preferred alternative:


Congestion Management Strategies – Projects in the Preferred Alternative			
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*
Regional			
MARC Growth and Investment Phases 1 and 2		Improvements to MARC mainline capacity, maintenance facilities, and station areas, 2020-2040	 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 capacity and capacity etc.)
MTA Bus Expansion Program Phases 1 and 2		Purchase of buses to meet increasing ridership demands (beyond replacement needs), 2020-2040	 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.)
Anne Arundel Cou	inty		
U.S. 50 Bus Rapid Transit	Proposed Annapolis- Parole Intermodal Center to Prince George's County line	New bus rapid transit service	 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.)
MD 175	Howard County line to MD 170	Widen from 2 to 3 lanes from Howard County line to MD 295 Widen from 4 to 6 lanes from MD 295 to MD 170	 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 bottlenecks
MD 100	Howard County line to I-97	Widen from 4 to 6 lanes	 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 bottlenecks

* Congestion management strategies listed in this table 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.







Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
MD 198	MD 295 to MD 32	Widen from 2 to 4 lanes to provide easier access to Ft. Meade and Odenton Town Center	 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 bottlenecks 	
MD 295	I-195 to MD 100	Widen from 4 to 6 lanes	 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 bottlenecks 	
MD 713	MD 175 to MD 176	Widen from 2 to 4 lanes: MD 175 to Arundel Mills Boulevard; widen from 4 to 6 lanes: Arundel Mills Boulevard to MD 176	 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 bottlenecks 	
U.S. 50/301	I-97 to MD 2	Bridge reconstruction/ widening; movable barrier on bridge	Construct new lanes	
Anne Arundel Cou	inty / Howard Coun	ity		
Bus Rapid Transit to BWI Airport	Dorsey MARC station to BWI light rail station	New bus rapid transit service: Dorsey MARC station to Arundel Mills to BWI consolidated rental car facility to BWI light rail station	 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.) 	
Baltimore City				
Bayview MARC and Intermodal Station	Lombard Street at Bayview Boulevard	New station	 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.) 	



Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
Green Line	Johns Hopkins Hospital to North Avenue	Extension of Metro line, including two new stations (at Amtrak line and North Avenue)	 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.) 	
West Baltimore MARC Station		Station upgrades	• Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.)	
Moravia Road	Belair Road to Sinclair Lane	Roadway, curb, and sidewalk rehabilitation; ADA Improvements; streetscape elements	 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.) 	
Baltimore County				
I-695	I-95 to MD 122	Widen from 6 to 8 lanes	 Traffic Operations Strategies (i.e., 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 bottlenecks 	
I-695	l-95 to l-83	Widen from 6 to 8 lanes; allows for future lanes from I-95 SW to I-95 NE	 Traffic Operations Strategies (i.e., 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 bottlenecks 	
l-695 / Broening Highway		Full interchange at Exit 44 of I-695 to support redevelopment at Sparrows Point	 Traffic Operations Strategies (i.e., controlled by Traffic Management Center, Traffic Incident Management, Traveler Information Systems, Work Zone Management, Special Event (planned and unplanned) Coordination, etc.) Add interchange 	







Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
I-795	Franklin Boulevard to Owings Mills Boulevard	Widen from 4 to 6 lanes, including addition of auxiliary lanes to Owings Mills Boulevard; includes new interchange at Dolfield Boulevard	 Traffic Operations Strategies (i.e., 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 bottlenecks TMA is in the vicinity 	
I-83 over Padonia Road		Reconstruct I-83 bridge; pedestrian and bike improvements to Padonia Road	 Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) 	
MD 26	Rolling Road to Courtleigh Drive	Roadway, curb, sidewalk, bicycle, ADA, and pedestrian improvements	• 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.) 	
MD 140	Garrison View Road to Owings Mills Road	Widen from 4 to 6 lanes; northbound third lane drops north of Owings Mills	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) 	
		Boulevard	Construct new lanes	
			Remove bottlenecks	
			• TMA is in the vicinity	
MD 140 / Painters Mill Road	MD 140 / Painters Mill intersection; access roads east and west of MD 140	Intersection improvements, additional left turn lane, and parallel access roads	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) 	
Carroll County				
TrailBlazer Transit Hub	Westminster area	Centrally located facility to enable transfers and travel training for TrailBlazer riders	• Public Transportation – Operations Strategies (i.e., providing real time arrival information, enhanced transit amenities and safety, transit signal priority, bus rapid transit, etc.)	



Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
MD 26	MD 32 to Reservoir	Widen from 4 to 6 lanes; addition of pedestrian and bicycle facilities	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) 	
			Construct new lanes	
MD 31 (New Windsor Main Street / High Street)	Church Street to Coe Drive	Infrastructure improvements and pavement rehabilitation	• Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.)	
			• Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.)	
MD 32	MD 26 to Howard County line	Widen from 2 to 4 lanes; addition of pedestrian and bicycle facilities	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) 	
			• Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.)	
			Construct new lanes	
			Remove bottlenecks	
MD 97 North	MD 140 overpass to Bachmans Valley Road	Widen from 2 to 5 lanes, including interchange at Meadow Branch Road; addition of pedestrian and	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park 	
		bicycle facilities	and ride lot, etc.)	
			Construct new lanes	
			Remove bottlenecks	
MD 140	Sullivan Road	to 8 lanes, full interchange at MD 97 (Malcolm Drive), Continuous Flow Intersection (CFI) at Center Street and Englar Boad addition	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) 	
		of pedestrian and bicycle facilities	Construct new lanes Remove bottlenecks	







Congestion Management Strategies – Projects in the Preferred Alternative

Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*
MD 140 at MD 91	Baltimore County line to Kays Mill Road	Divided highway with new interchange at MD 91 and intersection improvements, addition of pedestrian and bicycle facilities	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) Construct new lanes Remove bottlenecks
MD 851 (Sykesville Main Street / Springfield Avenue)	Howard County line to Cooper Drive	Infrastructure improvements and pavement rehabilitation	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park
			and ride lot, etc.)
Harford County			
Aberdeen MARC Station Transit Oriented Development (TOD)	U.S. 40 at MD 132 / Bel Air Road	New train station, additional parking, U.S. 40 "Green Boulevard," Station Square Plaza	 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.)
MD 22	MD 543 to APG Gate	Widen existing 2- and 3-lane section to 4 and 5 lanes; include HOV lane from Old Post Road to APG gate; bicycle and pedestrian access and transit queue jump lanes where applicable	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, 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



Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
MD 24	U.S. 1 Bypass to south of Singer Road	Widen from 4 to 6 lanes; includes sidewalks and bicycle accommodations where appropriate	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) Construct new lanes 	
MD 24 – Section G	900 feet south of Sharon Road to 1,700 feet north of Ferncliff Lane	Resurfacing and reconstruction, including slope repair and guardrail replacement		
U.S. 1 Bypass	MD 147 / U.S. 1 Business to north of MD 24 / MD 924	Widen from 2 to 4 lanes; improve U.S. 1 / MD 24 and U.S. 1 / MD 924 interchanges	 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 	
U.S. 1	MD 152 to MD 147 / U.S. 1 Business	Widen from 4 to 6 lanes, including bicycle and pedestrian accommodations	 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 	
Harford County / E	Baltimore City			
MTA Commuter Bus Service	Harford County to downtown Baltimore and Harbor East; from Baltimore to Aberdeen Proving Ground (APG)	Additional service to downtown Baltimore / Harbor East; reverse commute from Baltimore to APG; connection of U.S. 40 service with Harford Transit	 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.) 	
Howard County				
U.S. 29 Bus Rapid Transit	U.S. 29 at Mount Hebron to MD 198 / U.S. 29 (Burtonsville)	New bus rapid transit service	• 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.)	







Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
I-70	U.S. 29 to U.S. 40 (near MD 32)	Widen from 4 to 6 lanes; includes reconstruction of I-70 / Marriottsville Road interchange and upgrading of I-70 / U.S. 29 interchange	 Traffic Operations Strategies (i.e., 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 bottlenecks 	
MD 32	MD 108 to I-70	Widen from 2 to 4 lanes; includes new interchanges at Rosemary Lane and MD 144 and upgrades to I-70 interchange	 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 bottlenecks 	
MD 32	North of I-70	Widen from 2 to 4 lanes; safety, operational, and access improvements	 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 	
MD 108	Trotter Road to Guilford Road	Widen roadway where needed/ possible to 4 lanes; includes 8- to 10- foot pedestrian/ bicycle pathways and new signalized intersections (including pedestrian actuation)	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) Construct new lanes 	
Snowden River Parkway	Oakland Mills Road to Broken Land Parkway	Widen from 4 to 6 lanes; includes auxiliary lanes and pedestrian, bicycle, and transit improvements on both sides of road	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) Construct new lanes 	



Congestion Management Strategies – Projects in the Preferred Alternative				
Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*	
U.S. 1 Typical Section	Montevideo Road north to MD 100	Widen from 4 to 6 lanes; construct typical section as defined in State/ County MOU for U.S. 1 revitalization	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) Promoting alternatives to single-occupant vehicle travel (i.e., transit, ridesharing, bicycling, walking, park and ride lot, etc.) Construct new lanes 	
U.S. 1 / MD 175 Interchange		Grade separation at U.S. 1 / MD 175 coordinated with I-95 / MD 175 improvements	 Arterial and Local Road Operations (i.e., signal timing optimization, coordinated intersection signal timing, turn restrictions, geometric improvements, transit signal priority, road diet, etc.) 	
U.S. 29	Patuxent River Bridge to Seneca Drive	Widen from 4 to 6 lanes; includes auxiliary lanes and grade-separated access to community of Rivers Edge	 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 	

CHART

The Coordinated Highways Action Response Team (CHART) program is a statewide program operated jointly by MDOT, SHA, MDTA, and Maryland State Police. CHART focuses its operations on nonrecur-

ring congestion, such as crashes. The Statewide Operations Center, Authority Operations Center, and the two satellite Operations Centers in the region survey the state's roadways to quickly identify incidents. CHART also includes traffic patrols, which operate 24 hours / 7 days per week on many of the state highways in the region. The patrols play a key part in guiding traffic around the incidents and in clearing the scene more quickly. The faster broken-down or crashed vehicles are cleared, the less time travelers spend in their cars due to lane blockages. Besides mitigating congestion and reducing delay, CHART operations save many gallons of fuel that otherwise would be burned and polluting the air.

7. Monitor Effectiveness of Strategies



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







Public Outreach and Engagement

Public Participation Plan

MAP-21 requires MPOs to consult with state and local officials, transit operators, and the public when conducting transportation planning. This includes developing a public participation plan.

The BRTB's public participation plan defines the process for providing the public and interested parties with reasonable opportunities to be involved in the planning process. This document is available from the BMC website: <u>www.baltometro.org/be-involved/participate/public-participation-plan</u>.

Engaging All Stakeholders

MAP-21 also stipulates that the public participation plan consider the needs of people and groups traditionally underserved by transportation systems, including low-income and minority households.

Throughout the planning process to develop *Maximize2040*, the BRTB provided members of the public and other stakeholders with opportunities to provide comments on draft goals and measures, give opinions on potentially gamechanging future forces and trends, share project ideas, review draft plans, attend public meetings, and give the BRTB feedback.

Flyer and E-Newsletters

BMC staff periodically sent materials to people on the BRTB mailing list to inform them about opportunities to participate. These materials included flyers announcing events (see example at right) and e-newsletters. These are available online at <u>www.maximize2040.com</u>.







Twitter and Facebook

Throughout the process, the BMC website contained links through which people could follow *Maximize2040* progress on <u>www.twitter.com/maximize2040</u> and <u>www.facebook.com/maximize2040</u>.

Public / Stakeholder Input

Goals and Strategies



The BRTB sought input on proposed goals and strategies from each of its advisory groups. Some of these groups formed subcommittees to review and provide recommendations on proposed goals and strategies. BMC staff passed along all recommendations from the advisory groups to the BRTB for consideration.

The BRTB also welcomed comments from the public on draft goals and strategies for *Maximize2040* from Friday, March 14 through Monday, April 14, 2014.

The BRTB approved the final goals and strategies for Maximize2040 in April 2014.

A link to the <u>comments from the public on the draft goals and strategies</u> is online, as is the <u>BRTB response</u>.

Critical Future Trends and Forces

One of the goals of *Maximize2040* is "Promote Informed Decision Making." This goal is consistent with MAP-21's emphasis on performance-based planning and programming. That is, monitoring the performance of transportation systems to make sure the region is getting the best "bang for the buck" with its investments. A basic question is "How can the region make informed decisions about the future, especially when there are a lot of uncertainties about the future?".

To help answer that question, the BRTB sought out opinions from the public and regional experts. The public input phase of this process took place from September to December 2014. More than 200 people throughout the Baltimore region participated in a survey that asked about the social, economic, technological, environmental, and political forces that could play a role in long-range transportation planning.

Responses to that survey are at *https://infogr.am/survey-results-70?src=web*.

From those results, the BRTB crafted three extreme scenarios and invited experts from around the Baltimore region to provide insight about how to craft *Maximize2040* to reflect possible future trends and events. Appendix C includes details about this process and its results.



Ideas for Large-Scale / Long-Term Projects

As noted in Chapter 4, the BRTB solicited ideas for major, long-term projects from the public. This process took place from September 9 through December 9, 2014. Below is an image from the BMC website showing the interactive map through which people could submit project ideas.

In addition, advisory committee members and BMC staff members participated in numerous events throughout the region. This gave people who attended those events the opportunity to speak with committee members and staff members and to submit project ideas in hard copy format.



Suggestions for Large-Scale / Long-Term Projects

Of the more than 1,140 public project ideas submitted by the public, 178 relate to major, long-term projects that potentially could be included in *Maximize2040*. A summary of these major ideas follows:

- 101 suggestions to extend the MARC (commuter rail), Metro (subway), or light rail systems (e.g., recommendations to extend Metro and light rail lines beyond their existing termini: to Columbia, to Harford County, to Dundalk, to Pennsylvania, etc.; also, support for the Red Line project)
- 31 suggestions to construct new or widened roads on the National Highway System (NHS) (e.g., recommendations to widen I-695, construct a new Harford-Baltimore County connector, extend U.S. 29 northward, etc.)
- 22 suggestions to construct new or widened non-NHS roads (e.g., widening of MD 97 in Carroll County, MD 543 in Harford County, MD 32 and MD 100 in Howard County, etc.)
- 14 suggestions to construct new or upgraded interchanges
- 10 suggestions to provide high-speed rail service to Washington, DC, and/or New York City









Suggestions for Small-Scale / Short-Term Projects, General Comments

Most of the other submittals from the public (more than 750 submittals) recommended relatively small-scale and/or short-term projects. Many of these recommended projects are important to the daily travels of people in the region, and they can be considered for the short-term regional TIP or for the short-term capital improvement programs of the modal agencies and local jurisdictions.

Examples of suggestions for short-term or small-scale projects include:

- improvements to or expansions of specific local bus routes
- pothole repairs or roadway resurfacings at specific locations or along specific corridors
- turn lane improvements or signal adjustments at specific intersections
- improved bicycle and pedestrian facilities at specific locations, including improved connections between modes

In addition, more than 200 submittals contained general comments related to transportation. General comments included:

- suggestions to widen or double deck roads throughout the region (no specific locations noted)
- suggestions to "relieve congestion" (no specific locations or methods noted)
- statements that "buses should run on time" (no specific routes noted)
- comments about the traffic-slowing effects of "too much construction"
- recommendations for increased law enforcement related to texting, checkpoints, red light cameras, etc.
- suggestions for increased driver education and bike safety education programs
- suggestions to raise or lower the fuel tax and/or tolls



So, We Have Project Ideas from the Public - Now What?

BMC staff presented all of the recommendations for major, long-term projects to the Technical Committee that advises the BRTB as well as the BRTB itself for review and consideration for *Maximize2040*. In addition, staff presented a summary of the other submittals (small-scale project ideas and general comments) to these groups.

Staff also shared all comments related to small-scale, short-term projects, as well as general comments, with the responsible modal agencies and local jurisdictions for review and consideration.

The objective of this sharing of ideas from the public is to make the BRTB members, the modal agencies, and the local jurisdictions aware of the kinds of issues people are concerned about, as well as the specific projects that submitters believe would address these issues over the short and long terms.

A table with a <u>complete list of ideas (major projects, minor projects, and general comments) submitted</u> by the public is online at *www.maximize2040.com*.

Informing Stakeholders about the Plan Development Process

Periodically throughout the development of *Maximize2040*, BMC staff published informational briefs under the name of *"Max*Notes."

The intent of these briefs was to explain some of the inputs and technical analyses involved in developing the plan. Topics included sociodemographic projections, financial projections, and performance measures. An example of one of these *Max*Notes issues is shown at right.





Regional Goals, Performance Measures, and Targets

MAP-21 Requirements

MAP-21 is the federal law that establishes the requirements of federal surface transportation programs. This law requires regions to follow a performance-based approach to planning.

For Maximize2040: A Performance-Based Transportation Plan, the Baltimore Regional Transportation Board (BRTB) has adopted broad goals to guide transportation investments over the 2020-2040 period. In accordance with MAP-21 requirements, the BRTB has developed regional performance measures and targets to help it gauge the effectiveness of its investments.

Definitions

- Goal broad aspiration or guiding principle (e.g., "Improve system safety")
 Performance measure specific metric used to
- assess progress toward achieving a goal (e.g., "Decrease number of highway fatalities")
- Performance target specific level to be reached within a certain time frame (e.g., "Decrease number of highway fatalities to 0 by 2040")

Adopted Performance Measures/Targets

- Improve System Safety Roads • Reduce serious injuries per 100 million vehicle
- miles traveled (VMT) to 3.0 by 2040.
- Reduce fatalities per 100 million VMT to 0 by 2040.
- Reduce number of serious injuries to 676 by 2040.
 Reduce number of fatalities to zero by 2040.
- Improve System Safety Transit

Reduce number of preventable accidents per 100,000 revenue vehicle miles to 0 by 2040.





for a *9VEA EV* Baltimore Region



Improve/Maintain Existing Infrastructure – Roads

- Maintain percentage of roadway miles with acceptable ride quality at 82% or above.
 Maintain percentage of structurally deficient state
- Maintain percentage of structurally deficient state and local bridges below 5.0%.

 Improve/Maintain Existing Infrastructure – Transit
 Maintain average age of MTA and local transit agency bus fleets below 7.0 years.

Improve Accessibility

- Increase percentage of roadway miles with sidewalks (both sides of the roadway) to 25% by 2040.
 Increase bicycle/walk-to-work mode share to 5.0%
- Increase bicycle/walk-to-work mode share to 5.09 by 2040.
 Increase average weekday MTA and local agency
- transit ridership (all modes) to 500,000 by 2040.

Increase Mobility Maintain portion of

VMT in congested conditions on arterial roads during the evening peak hour below 25%.



- Conserve and Enhance the Environment

 Maintain levels of emissions at less than vehicle emission budgets in the State Implementation Plan
- Promote Prosperity and Economic Opportunity

 Maintain average truck turnaround time at Seagirt
- Marine Terminal below 58 minutes.

For more information ...

about performance measures, please contact: Terry Freeland, Baltimore Metropolitan Council (410) 732-0500, ext. 1028 tfreeland@baltometro.org





1-5



Public Comments on Preferred Alternative

Comment period scheduled for September 1 through October 15

The BRTB conducted a public comment period on the draft *Maximize2040*, including the preferred alernative list of programs and projects. This comment period ran from September 1 through October 15, with public meetings in each jurisdiction as well as a webinar-style "town call." Details are shown below:

"Town Hall" Meetings

- Anne Arundel County / City of Annapolis Wednesday, September 30 – 5:30 to 7:30 p.m. Annapolis High School, Cafeteria 2700 Riva Road, Annapolis, MD 21401
- Baltimore City

Thursday, October 8 – 5:30 to 7:30 p.m. Benton Building, Third Floor 417 E. Fayette Street, Baltimore, MD 21202

Baltimore County

Wednesday, October 7 – 7 to 9 p.m. Baltimore County Planning Department Jefferson Building, First Floor Hearing Room 105 W. Chesapeake Avenue, Towson, MD 21204

Carroll County

Monday, September 21 – 5:30 to 7:30 p.m. Carroll County Office Building, Room 003 225 North Center Street, Westminster, MD 21157

Harford County

Monday, September 28 – 5:30 to 7:30 p.m. Emergency Operations Center 2220 Ady Road, Forest Hill, MD 21050

• Howard County Tuesday, September 15 – 6 to 8 p.m.

George Howard Building, Ellicott Room 3430 Courthouse Drive, Ellicott City, MD 21043

Regional "Town Call"

The BRTB also conducted a regional "town call" to enable interested people to participate via computer or phone. Information on how participants were able to access this town call is shown below:

Thursday, October 1 – noon to 1 p.m.

To access using a computer, tablet, or smartphone, go to *bit.ly/Maximize2040TownCall*

To access using a phone, dial 1-877-309-2070 (Toll free) and enter Access Code 743-489-149







Thank you for your involvement in the development of <u>Maximize2040: A</u> <u>Performance-Based Transportation Plan</u>.

After many months of planning and discussions with key stakeholders, especially the public, the BRTB is scheduled to vote on the final version of *Maximize2040* on **Tuesday, November 24 at 9 a.m.** at the <u>Baltimore Metropolitan Council</u>.

Below is a link to the BRTB's response to comments, and highlights of the planning process for *Maximize2040*.



BRTB RESPONSE TO COMMENTS

The BRTB members appreciate all comments sent in by the public during the last year and a half. The level of participation in the regional planning process shows that people care about the future of transportation in our region. Public comments also provide a framework to keep the process focused on real needs in the face of fiscal, environmental, and economic challenges.

BRTB members received all comments made regarding the draft plan. To view the BRTB response to these comments, click on the link below.

As all of the public comments received in this process demonstrate, the Baltimore region has a diverse set of needs and expectations - including more reliable commuting, more effective freight movement, and more choices in transportation and transit alternatives for everyone in the region.

Maximize2040 is required to be fiscally constrained, so the programs and projects in the plan represent the best judgment of the BRTB about what is desirable and possible. The BRTB considered statutory and regulatory requirements, existing conditions, and future possibilities. This is a snapshot the BRTB can reconsider during the next four years.

The BRTB (which includes local jurisdictions and MDOT) will engage the public to address the future of transit in the region, with the potential to add other projects as amendments to *Maximize2040.* Any mix of projects should enable the safe movement of people and goods in ways that provide additional opportunities for individuals and the region while realizing the need for environmental and fiscal responsibility.

Once again, the BRTB extends its appreciation for all the public input it received in this process. We look forward to further discussions about how we can maximize our region's transportation investments for the future.

:: Download the BRTB Response to Comments ::

:: View All Comments Received ::



Public Comments and BRTB Response

Coments were received in a number of ways, including e-mail, mail, Twitter, in writing via survey/comment card, and through an online survey/comment card.

Comments were also welcome in person during the Public Comment Opportunity during the BRTB meetings on Tuesday, October 27 at 4:30 p.m. or Tuesday, November 24 at 9 a.m. (vote).

BRTB members received <u>all comments</u> made regarding the draft plan.

A <u>response to public comments</u> was issued on November 17, 2015 via email and shared on BMC's Twitter and Facebook accounts.

All comments and the BRTB response to comments were also posted online at <u>www.maximize2040.com</u>.

