

## Administrator's Message

Dear Maryland Residents,

The Maryland Department of Transportation Maryland Transit Administration (MDOT MTA) has been providing transit services to the State for almost 50 years since its inception as the Metropolitan Transit Authority in 1969. Today, MDOT MTA operates the 12th largest multimodal transit system in the country with over 300,000 daily riders, five transit modes, and paratransit service, while providing support to locally operated transit systems throughout Maryland. In our MARC train operations, MDOT MTA operates 42 stations along 190 miles of track, with employees committed to managing, maintaining, and operating this system that delivers service to nearly 40,000 patrons daily. MDOT MTA is committed to improving the transit experience for our customers every day. To this end, we have adopted the following vision statement:

To provide safe, efficient, and reliable transit across Maryland with world-class customer service.

MDOT MTA's Cornerstone Plans translate this vision statement into strategic priorities, policies, programs, and initiatives for each of our transit modes. We are committed to responsibly managing our assets, from rail cars to stations, in a manner that supports our operational demands while seeking ways to enhance our customers' experience. Each Cornerstone Plan synthesizes MDOT MTA plans, policies, and reports, with performance data, local and national trends, and stakeholder input. MDOT MTA comprehensively analyzes this information to create targeted recommendations for investment in each mode that coordinate with the needs of the transit system overall. This Cornerstone Plan highlights MDOT MTA's long-term plans and priorities for MARC Train over the next 25 years.

Most importantly, the Cornerstone Plans are living documents; these plans and projects may continue to evolve as our team continues in its vision to continually improve our ability to deliver safe, efficient, and reliable transit with world-class customer service.

Sincerely,

Kevin B. Quinn

**MDOT MTA Administrator** 

Levin Quinn

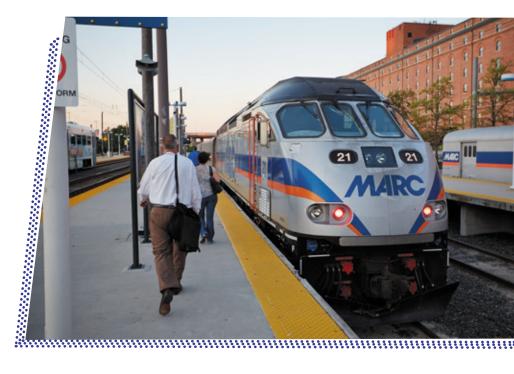


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## Purpose of the Plan

Public transportation serves a critical role in Maryland, connecting residents to jobs and services and driving the state's economy. MDOT MTA is committed to safely, efficiently, and reliably connecting Maryland's residents, businesses, and visitors to life's opportunities through effective planning and responsible management.

#### **MDOT Mission Statement**

The Maryland Department of Transportation is a customer-driven leader that delivers safe, sustainable, intelligent, and exceptional transportation solutions in order to connect our customers to life's opportunities.

The MARC Cornerstone Plan was developed to be consistent with the goals of the MDOT Maryland Transportation Plan (MTP). These goals include:

- Ensure a Safe, Secure, and Resilient Transportation System
- Facilitate Economic Opportunity and Reduce Congestion in Maryland through Strategic System Expansion
- Maintain a High Standard and Modernize Maryland's Multimodal Transportation System
- Improve the Quality and Efficiency of the Transportation System to Enhance the Customer Experience
- Ensure Environmental Protection and Sensitivity
- Promote Fiscal Responsibility
- Provide Better Transportation Choices and Connections

The Cornerstone Plan is part of MDOT MTA's continuing commitment to achieve its goals through effective planning and management. This plan includes strategic priorities that support the four cornerstones of MDOT MTA service. Specific initiatives are also identified that provide recommended paths forward to implementation.

This document recommends initiatives through 2045 that will inform other statewide and regional planning and programming documents, including Metropolitan Planning Organization Constrained Long Range Plans for Regional Transportation Board, (BRTB) Transportation Planning Board (TPB), and Wilmington Area Planning Council (WILMAPCO) that are updated every five years.

MDOT MTA is a Transportation Business Unit (TBU) of the Maryland Department of Transportation (MDOT). As the 12th largest multimodal transit system in the United States, MDOT MTA operates:

- Local Buses (CityLink, LocalLink, and Express BusLink)
- Commuter Buses
- Light RailLink
- Metro SubwayLink
- Maryland Area Regional Commuter (MARC) Train service
- MobilityLink (a comprehensive paratransit system)

Additionally, MDOT MTA manages the taxi access service within the MDOT MTA MobilityLink service area and directs funding and statewide assistance to Locally Operated Transit Systems (LOTS) in each of Maryland's 23 counties, Baltimore City, Annapolis, and Ocean City.



#### Safety

Provide a safe and secure environment for every customer and employee. Ensure the transportation system is resilient to natural and man-made hazards.

#### **Efficiency**

Preserve existing assets and maximize the efficient use of resources and infrastructure.



Deliver a reliable, frequent, convenient, and easy to use transit service for customers.



#### World Class Customer Service

Improve communication and responsiveness with MDOT MTA customers and stakeholders in an effective and professional manner.





Because this plan depends on the further development of strategic priorities and initiatives, MDOT MTA uses a "feedback loop" planning process by which progress is monitored and results are driven.

By continuing to develop this feedback loop, MDOT MTA can create a strong institutional standard of excellence in serving its customers.

# ITERA **ITE**RATIVE PLANNING PROCESS

#### **IDENTIFY**

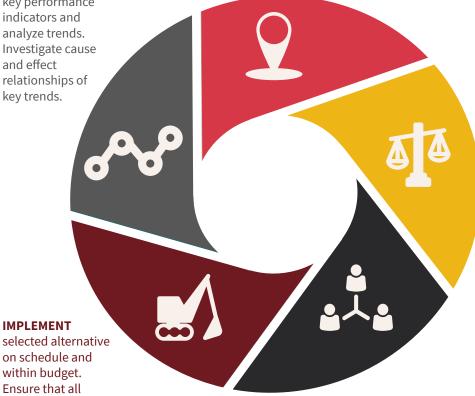
issues and needs and frame from a customer pespective. Identify key parties who have a stake in the issue.

#### **MONITOR**

key performance indicators and analyze trends. Investigate cause and effect relationships of key trends.

**IMPLEMENT** selected alternative on schedule and within budget.

potential projects threats are identified and accounted for.



## **EVALUATE**

alternative scenarios and project options, including no build scenario. Evaluate capacity to implement project.

#### **ENGAGE**

key stakeholders and general public. Maximize participation in planning process and clearly define project.

## **Overview of MARC Train**

#### **History**

In 1973, the State of Maryland began taking over most commuter rail operations from Conrail. By 1984 the State assumed control of all remaining commuter rail services and rebranded the system Maryland Area Regional Commuter (MARC). MARC inherited a wide range of legacy equipment including self-propelled rail diesel cars, diesel locomotives, and standard passenger coaches. Since that time, MDOT MTA has gradually replaced the aged fleet with modern passenger equipment.

#### Service

MARC provides regional connections to transit systems in two major metropolitan areas: Baltimore and Washington. MARC also provides connections to local transit services, including:

- Virgina Railway Express (VRE)
- Washington Metropolitan Area Transit Authority (WMATA)
- Purple Line (currently under construction)
- Montgomery County RideOn
- Prince George's County The Bus
- Harford County Transit Link
- Frederick County's TransIT
- Cecil County's Cecil Transit
- Regional Transit Agency of Central Maryland (RTA)



Photo by Will Anderson

#### MARC Service Area



Regionally, MARC provides several direct connections to Amtrak's inter-city services, connection with Baltimore-Washington Thurgood Marshall Airport, and inter-city bus services via Penn Station in Baltimore and Union Station in Washington D.C.

MARC provides service on three different routes including the Brunswick, Camden, and Penn Lines. These three routes provide direct access to Washington, D.C. and passengers can transfer between these routes at Washington's Union Station. There is no direct connection between the Camden and Penn lines in Baltimore. The Camden and Brunswick Lines only operate on weekdays, while the Penn Line operates seven days a week.

#### **Host Railroad Partners**

With the exception of the Frederick branch of the Brunswick Line, MDOT MTA does not own the rails on which it provides MARC service. MARC operates on rails owned by what are commonly referred to as "Host Railroads," which are the organizations that own, and maintain the rails and supporting structures. MARC pays a fee to these host railroads to operate trains on all three lines and to store trains when not in service. Service changes, such as schedule, span of service, frequency, and any new or re-located station must be coordinated with and approved by the host railroads. Additionally, MDOT MTA contracts with other entities for the operation and maintenance of the train service and vehicles.

#### MARC Train Service Profile

	BRUNSWICK LINE	CAMDEN LINE	PENN LINE
Host Railroad	CSX Transportation	CSX Transportation	AMTRAK
<b>Primary Function</b>	Freight	Freight	Passenger
AM Peak Service			
PM Peak Service	-		
Reverse Commute Service		-	
Midday Service			
Weekend Service			
Hours of Operation (Approximate)	4:30am - 9:30am 3:30pm - 9:00pm	5:00am - 9:30am 3:30pm - 9:00pm	4:00am - 12:00am
Northern Terminus	Martinsburg, WV/Fredrick	Baltimore-Camden	Baltimore-Penn/ Perryville
Average Peak Frequency	20 min (Germantown)	30 min (Baltimore-Camden)	15 min (Baltimore-Penn)
Route Length	74 mi.	39 mi.	77 mi.
Trains Per Weekday	18	21	57
	provided li	mited unava	ilable

CSX Transportation owns the railroad along the Brunswick and Camden Lines while the National Railroad Passenger Corporation (AMTRAK) owns the right-of-way along MARC's Penn Line. This influences MDOT MTA's ability to respond to the specific needs and requests of existing and potential MARC passengers. These needs include span of service, frequency, and adding new stations or re-locating other stations.

The MARC Penn Line has benefited from operating on the Northeast Corridor which is owned and operated by AMTRAK and has the primary function of facilitating the movement of passenger trains. While MDOT MTA has partnered with CSX to provide service on the Brunswick and Camden Lines, the primary function of CSX is to facilitate the movement of freight. This contrast between the two host railroads further limits the discretion MDOT MTA has on MARC Train service levels across the system.

#### 1996

New Dorsey station opens on the Camden Line, replacing Elkridge Station

#### 2010

Edgewood Station is replaced with a new modern staton

# MARC Train Milestones

#### 2013

MARC begins weekend service on the Penn Line between Martin Airport and Washington, D.C.

#### 2014

MARC replaced older bi-level railcars limited to the Brunswick Line with new Multi-level railcars that can can be deployed systemwide.

#### 2015

MARC added additional Camden Line Service between Washington D.C. and Baltimore Camden Station

MARC ridership has grown to a total average daily ridership of 40,000 passengers in 2017.

#### 2018

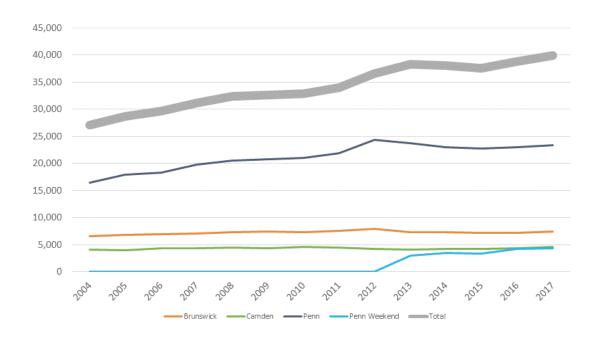
MARC procured eight new diesel locomotives, which meet the latest environmental emissions requirements.



#### Ridership

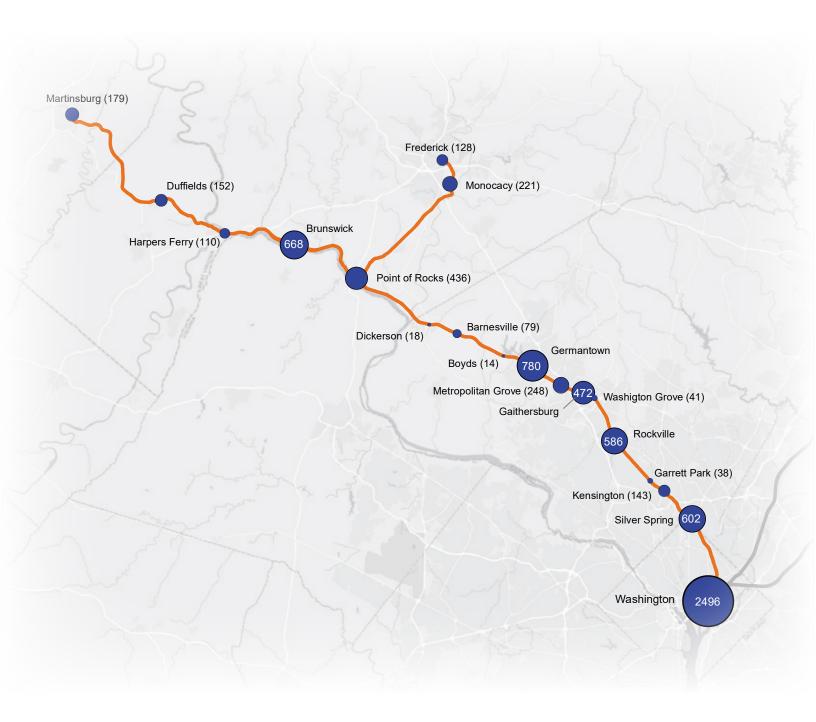
MARC provides nearly 40,000 daily trips, accounting for 8% of MDOT MTA's total ridership. Ridership has grown since 2002 with an overall average annual growth of 2% in weekday boardings systemwide. Of the three routes, the Penn Line has experienced the largest increase in average weekday boardings with annual growth of 3%. The Brunswick Line has also experienced a steady increase of just under 1% in average weekday boardings while the Camden Line has remained relatively steady. Since its inception in 2013, MARC Penn Line Weekend Service has grown by 5%.

Daily Ridership 2002 - 2017

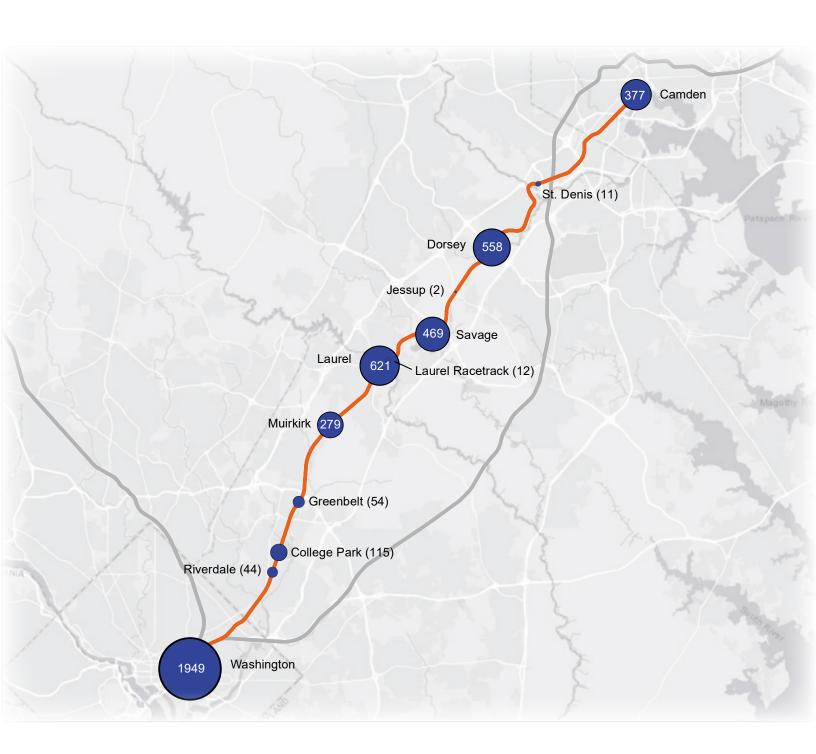


The Penn Line is a segment of the Northeast Corridor (NEC), the busiest passenger railroad corridor in the United States. Stretching from Boston, Massachusetts to Washington, DC, passenger service on the NEC accommodates 710,000 commuters and 40,000 intercity travelers on 2,000 trains each day. The Penn Line carries the largest share of MARC passengers throughout the system with 64% of the total 21,700 annual passengers in 2017. The Brunswick Line carries 22% of all MARC passengers and has the second largest share of average annual passengers throughout the MARC system. The Camden Line accounts for 14% of all MARC Train passengers.

#### Brunswick Line Average Weekday Station Boardings (2002 - 2017)



Camden Line Average Weekday Station Boardings (2002 - 2017)

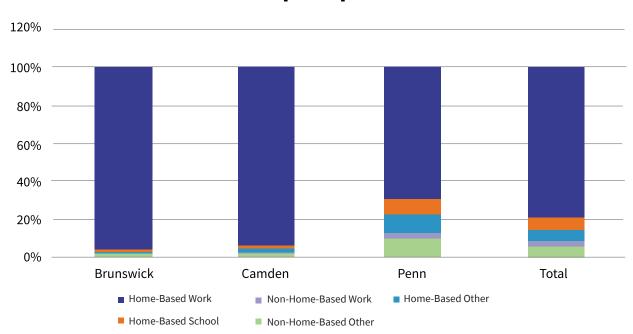






According to passenger surveys, nearly 80% of MARC Train passenger trips are for commuting trips. Trips originating from home made for school and/or other purposes account for a combined 12% of MARC trips systemwide.

#### **Trip Purpose**



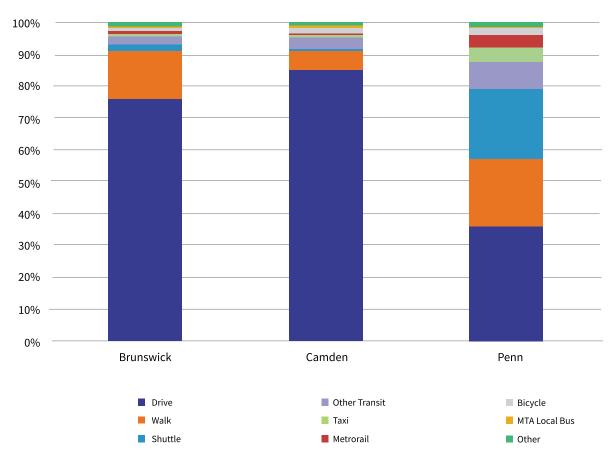
2016 MARC Origin Destination Survey

The Penn line also supports the greatest variety of trip purposes, while the Brunswick and Camden lines are very strongly dominated by commute trips. Commute trips account for 69% of all MARC Penn line trips. Weekend and mid-day service on the Penn line contribute to increased use of MARC for purposes other than commuting. Commute trips account for 95% and 94% of Brunswick and Camden Line trips respectively. Washington Union Station is the terminus for all three MARC Train routes, and nearly 40% of all MARC Train trips begin or end there.

#### **Station Access**

Sixty-six percent of MARC Train passengers use automobiles to access MARC Train stations, based on a 2016 MDOT MTA survey. Automobile access to MARC is higher for the Brunswick and Camden Lines (77% and 86% respectively), while just 36% of Penn Line passengers drive to a MARC Train station. Nearly as many passengers access MARC's Penn Line by transit as by driving (35%). Of the three MARC Train routes, the Penn Line also has the largest share of passengers who bike or walk to a station (24%). The Brunswick and Camden Line share of passengers who bike or walk to a MARC station is 16% and 7% respectively.

#### **MARC Station Access from Home**

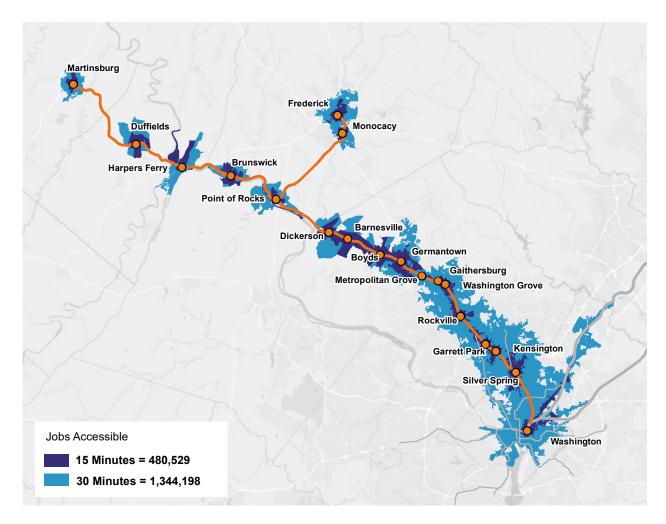


2016 MARC Origin Destination Survey

#### **Job Accessibility**

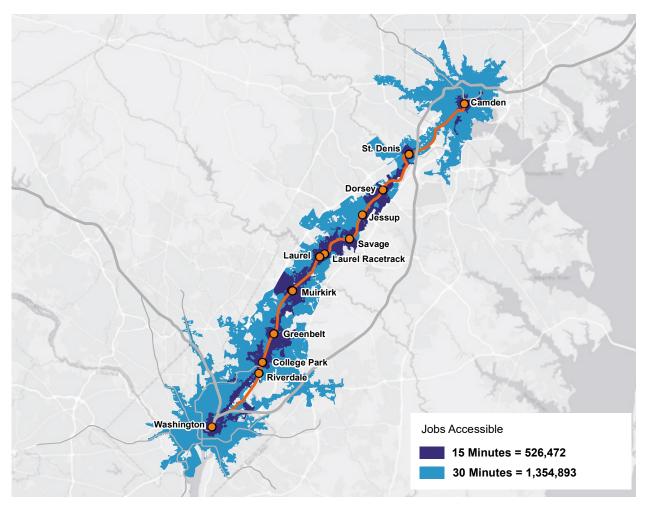
MDOT MTA identified the number of jobs within 15 and 30 minutes of each MARC station for each line. These travel times from MARC stations are based on walking and use of transit from MARC stations.

Jobs Accessible by Brunswick Line MARC Stations



#### **Brunswick Line**

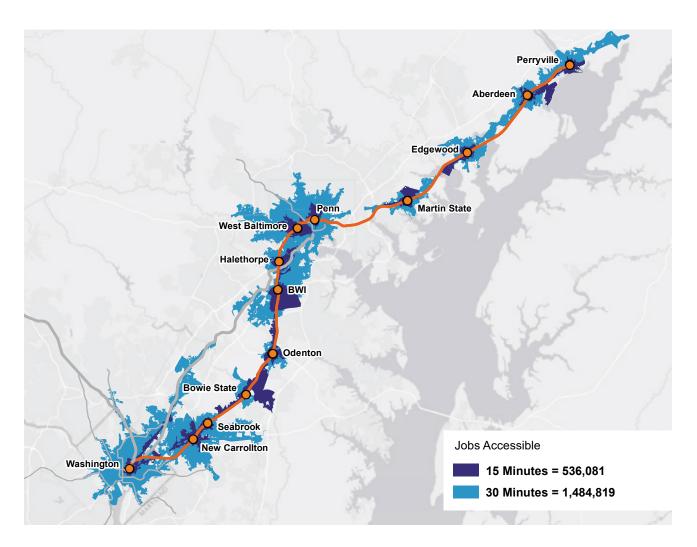
Over 1.3 million jobs are located within a 30-minute walk or transit trip of Brunswick Line MARC stations, including over 480,000 jobs within 15 minutes of the stations. The Brunswick Line job accessibility map illustrates that the areas in proximity to MARC Train stations increase as the Brunswick Line approaches areas with more redundant transit networks, particularly Washington D.C.



#### **Camden Line**

Over 1.3 million jobs are located within a 30-minute walk or transit trip of Camden Line MARC stations, including over half a million jobs within 15 minutes of Camden Line MARC stations. The Camden Line job accessibility map illustrates that the number of jobs in proximity to MARC Train stations increase as the Camden Line approaches areas with more redundant transit networks, particularly Washington D.C., and Downtown Baltimore.

Jobs Accessible by Penn Line MARC Stations



#### **Penn Line**

Over 1.4 million jobs are located within a 30-minute walk or transit trip of Penn Line MARC stations, including over half a million jobs within 15 minutes of Penn Line MARC stations. The Penn Line job accessibility map illustrates that the number of jobs in proximity to MARC Train stations increase as the Penn Line approaches areas with more redundant transit networks. This is observed particularly in the Baltimore and Washington regions.





## **Strategic Priorities**

MDOT MTA has established nine strategic priorities that require ongoing commitment to support the four cornerstones. Strategic priorities are not discrete projects. Rather, they are conditions that will drive future decisions and initiatives. Many strategic priorities are consistent across all modes, but some are unique to MARC Train.

#### Safety and Security

Ensuring that MDOT MTA systems are safe and secure for riders, employees, contractors, and the public is MDOT MTA's number one priority. Providing a safe and secure MARC system involves a broad range of activities, from timely inspection and maintenance of vehicles, electrical systems, and guideway; to proper training and operating protocols and communication; to effective police enforcement, security equipment. The latest safety and security efforts include Positive Train Control which is a system that minimizes the risk of train collisions.



In 2014, 2015, 2016, and 2017 the MDOT MTA Police Force reported the lowest number of serious crime incidents among the top 12 transit agencies in the country¹. MDOT MTA will continue to strategically deploy MDOT MTA Police Officers, public safety announcements, ad campaigns (e.g., "See Something, Say Something," and "Keep Your Smartphone Safe"), and technology (e.g., closed-circuits television and emergency blue light telephones) to ensure system safety.

MDOT MTA is committed to increasing its ability to proactively mitigate threats when possible and recovery quickly when events occur. The agency's resiliency strategy prioritizes the safety of customers and employees. MDOT MTA resiliency strategies are critical to protect customers, employees, and physical assets from threats posed by natural and manufactured threats such as fires, floods, extreme weather, burglary, theft, vandalism, and terrorism.

<sup>1</sup> Lowest number of part 1 crime of the top 12 transit system agencies – APTA Bus Safety & Security Gold Excellence Award MARTA National Study

#### **Operational Performance**

Daily operations has the biggest impact on MDOT MTA's customers and is at the forefront of MDOT MTA's strategic priorities. Operations include vehicle maintenance and availability, dispatching, field supervision, call center management, coordination with MARC Train maintenance staff when equipment issues arise, and coordination with MDOT MTA and local police to address security concerns. Efficient and effective management of these functions is critical to providing safe, efficient, and reliable transit service.

The operations personnel of MARC Train are on the front line in terms of identifying critical issues that customers face. Strengthening feedback loops between operations personnel and MDOT MTA decision-makers is critical to monitoring performance and being responsive to the needs of the customers.

MDOT MTA will continue to focus on efficient and effective management of MARC Train operations with the four cornerstones guiding key operational initiatives.





#### **Asset Management**

MDOT MTA is committed to effectively managing its capital assets and maintaining its system in a State of Good Repair (SGR) to support safe, efficient, and reliable transit service. Transit Asset Management is a strategic approach to managing the agency's fleet, infrastructure, equipment, and facilities to optimize their performance, useful life, and minimize their whole life cost. MDOT MTA will align its asset and safety management practices and proactively review and communicate safety-related issues.

MDOT MTA will employ historical data to better inform future investment decisions and accurately capture capital and operating costs to assess and optimize the total cost of asset ownership. Maintenance and capital programs will be assessed to improve operational performance, reduce asset related risks, and reduce SGR backlog. Through improved asset management, internal/external communication, service reliability, convenience, and accessibility, MDOT MTA will enhance customers' experience.

MARC Train assets include vehicles, stations, guideways, facilities and systems. Maintaining the estimated \$2 billion portfolio of MARC train assets in a state of good repair will cost approximately \$152 million per year over the timeframe of this Plan.

Asset Management will also help reduce the impact of our activities on the environment and develop ways to make our transit system more resilient. Lifecycle cost considerations and improved efficiencies of equipment in good repair will help reduce the financial, social, and environmental costs of the MARC Train system, which supports MDOT MTA's commitment to sustainability.







Asset Management is a strategic approach to optimizing performance and minimizing lifecycle costs

#### **Improved Customer Experience**

MDOT MTA strives to provide our customers with worldclass service at every stage of their trip. MDOT MTA will seek opportunities to upgrade technology and amenities to make it easier, more efficient, and more convenient to access and use transit to access jobs, education, healthcare and recreation, and services. Key focus areas for enhancing the MARC Train system include station access and technology improvements.

Ensuring that the public can safely, efficiently, and reliably access stations is a key focus for improving the customer experience with the system. MDOT MTA is committed to ensuring our facilities and vehicles are accessible to all members of the public, including those with disabilities. Further, we continue to find ways to strengthen the connections for all those accessing our vehicles and stations, including those who arrive by:

- Wheelchairs and other mobility devices
- Foot
- Bicycle
- Bus or other transit
- Carpool
- Carshare
- Taxi
- Park & Ride



MDOT MTA currently facilitates the MARC Riders Advisory Council which meets monthly. The council consists of 15 members that represent the three MARC routes. Council members provide direct input on their experiences with train service to MARC Train staff.

MDOT MTA is committed to developing strong relationships with partners and customers and using their input to deliver better service. MDOT MTA is committed to the following public engagement objectives to ensure a truly collaborative process with our stakeholders:

- Reach a meaningful cross-section of stakeholders across demographics, interests, and experiences of people who are affected by transit, including those who are often underrepresented.
- Incorporate customer, community, and stakeholder input and insight into MDOT MTA decisions.
- Provide clear avenues for members of the public to receive information, provide input, and share concerns.
- Explain when and how public input is used.
- Provide interactive experiences across a variety of meeting formats, both in-person and online.



#### **Practical Design**

Practical Design guides all MDOT investments, applying the idea that the needs of the system are prioritized over the wants of a specific project. This approach enables MDOT MTA to complete more projects by ensuring that each individual project targets its core priorities and needs. Practical design also provides greater flexibility to address problems and improve the system through innovation.

MDOT MTA will apply Practical Design principles to achieve its mission with constrained resources. Practical design adheres to the following guidelines:

- Every project will make the facility safer after its completion.
- The design solution shall be reached in a collaborative environment.
- The design solution shall match the project need(s).
- Designs shall use the flexibility that exists in current engineering specifications and guidance while ensuring the minimum design thresholds are achieved.
- The goal cannot be to shift investment costs to maintenance. Rather, the goal should be to obtain the best value for the least cost.

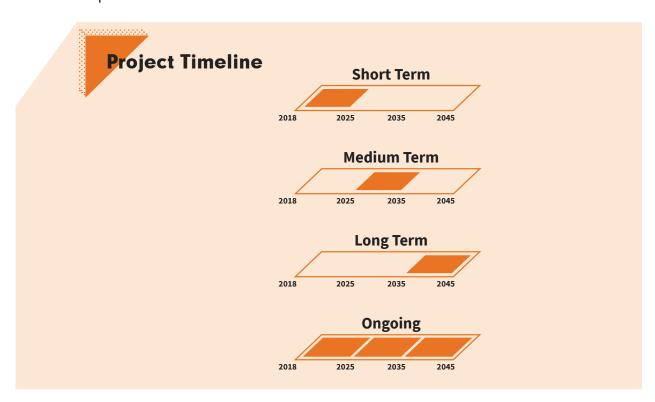


## **MARC Train Investment Areas**

This section of the Plan categorizes the initiatives needed to provide safe, efficient and reliable MARC train service over the next 25 years in six investment areas:

- Vehicles
- Stations
- Guideways
- Facilities
- Systems
- Service

The first five categories are consistent with MDOT MTA and the Federal Transit Administration asset types established for Transit Asset Management; the sixth represents operating initiatives related to MARC Train service that are not captured by the other asset types. Key initiatives in each investment area are identified. These initiatives highlight major investments and customer-facing changes that MDOT MTA anticipates. It is not an exhaustive list, as additional projects are anticipated in each investment area to maintain a state of good repair and improve customer experience. All costs are were estimated in 2018 dollars.



Investment Areas	Timeframe	Initiative	Pg. #				
		GP39H-2 Locomotive Mid-Life Overhaul	32				
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		Camden Line Station Renovations	39				
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	Medium Term	Penn-Camden Connector	48				
Guideways	Ongoing	Passenger Rail Investment and Improvement Act (PRIIA) - Penn Line					
	5 5	CSX Joint Benefits - Brunswick and Camden Lines	47				
		Frederick Branch	47				

Investment Areas	Timeframe	Initiative							
	Short Term	Riverside Heavy Maintenance Building	51						
Facilities	Short ferm	Martin's Yard Expansion	52						
racilities	Medium Term	Replacement Penn Line Storage Yard	52						
	Long Term	Brunswick Yard Maintenance Facility	53						
	Short Term	Positive Train Control (PTC)							
Systems	Short Term	Real-Time MARC Tracking	55						
Systems	Medium Term	Train Approaching Warning System	55						
	Long Term	Closed Circuit Television (CCTV)	55						
			56						
		Run-Through Service to L'Enfant Plaza and N. Virginia							
Service	Ongoing	Brunswick Line	58						
Jei vice	Oligonia	Camden Line	60						
		Penn Line	62						





### **Vehicles**

MDOT MTA inherited a wide variety of legacy equipment from previous railroads when it began assuming control of commuter rail operations in 1973. Over the last four decades MARC has gradually been able to retire older cars and replace them with newer, safer, and more reliable equipment. Today the MARC Train fleet comprises 223 revenue vehicles including 177 railcars and 46 locomotives. MARC vehicles make up the biggest share of all MARC assets, representing nearly \$1 billion in assets. MDOT MTA operates and maintains four different locomotive types including both diesel, and electric locomotives manufactured by four different builders. Only a small part of MARC's fleet is made up of electric locomotives; these are used on the Penn Line only. MDOT MTA recently acquired eight new SC-44 "Charger" diesel locomotives in 2018. These locmotives meet the latest TIER IV environmental emissions standards. The age of MARC's locomotive fleet ranges from less than a year old to 30+ years old. The frequency with which overhauls are required increase with age, and the older vehicles have gone through several overhauls and rebuilds.

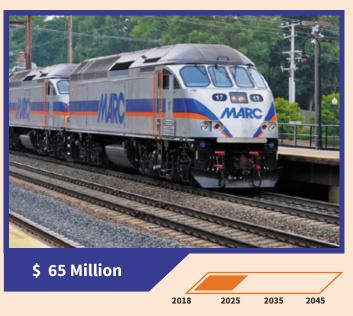
# **GP39H-2 Locomotive Mid-Life Overhaul**



Entered into service in 1987 and were last overhauled in 1998. The GP39H-2 locomotive is the oldest locomotive in service in the MARC fleet. To keep these six locomotives operating reliably and to extend their useful life, MDOT MTA will overhaul the locomotives by replacing key components. The GP39H-2 locomotives will be removed from service in pairs to undergo the mid-life overhaul.

The MP36PH-3C locomotive is the backbone of the MARC locomotive fleet accounting for 54% of all locomotives that are in service. Procured in 2009, these locomotives are deployed throughout the entire MARC system and are approaching their midlife. In order to ensure continued reliability, the locomotives will undergo a mid-life overhaul that overhauls or replaces all major systems and components.

# MP36PH-3C Locomotive Mid-life Overhaul



#### **MARC III Railcar Overhaul**



The MARC III Railcars were purchased in 1999 to expand MARC's railcar fleet and provide increased capacity to meet growing demand, and replace aging railcars on the Brunswick and Camden Lines.

MDOT MTA began the overhaul of the MARC III railcars in the summer of 2018. This includes the replacement and overhaul of the communications system with new passenger destination signs, HVAC system, electrical systems, seats, and other elements that ensure a safe and pleasant ride for passengers.



#### **MARC IV Railcar Overhaul**



The MARC IV railcars are the newest railcars in the fleet. These railcars are scheduled for a midlife overhaul in 2028. The overhaul will include the replacement of major component parts, electrical systems, seats and other elements that ensure a safe and pleasant ride for passengers.

The schedule for this overhaul also coincides with the replacement of the MARC III railcars. MDOT MTA will identify options and determine the benefits of overhauling the MARC IV or replacing it along with the MARC III railcars in an effort to standardize the fleet.

New railcar procurement is expected to begin in 2035 as the MARC II and MARC III railcars approach the end of their life cycle. Prior to the next procurement, MDOT MTA will develop specifications for its next railcar. In the interest of maintenance and repair efficiency, MDOT MTA plans to standardize MARC's railcar fleet as older railcars are retired. This will also provide MDOT MTA with an opportunity to explore the inclusion of additional features for passengers including bike racks, electrical and USB outlets, and any other modern features available at the time of procurement.

#### **Railcar Fleet Replacement**



The expected useful life of MARC locomotives ranges from 20 to 30 years. MDOT MTA will replace MARC locomotives as they reach their useful life. Based on experience with maintenance, reliability, and operator feedback for the current fleet, MDOT MTA will work towards standardizing its fleet of locomotives. This will reduce the need for specialized equipment, parts and training needed for different varieties of locomotives.

#### **Locomotive Fleet Replacement**



#### **Non-Revenue Vehicles**



MDOT MTA also operates and maintains a number of non-revenue vehicles to support the operation of MARC service. This includes automobiles, trucks, and other special vehicles found in stations and/or yard facilities. As part of the ongoing function of MARC operations, MDOT MTA will continue to make the appropriate investments in non-revenue vehicles to maintain a state of good repair and maintain the efficient operation of MARC service.



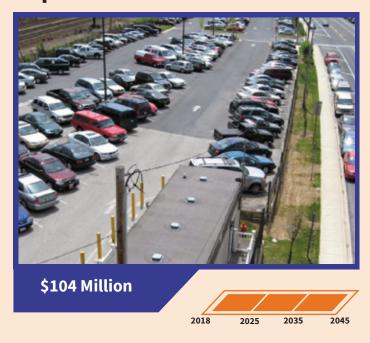
## **Stations**

The MARC Train system is composed of 42 stations. Station designs vary at each location, but major components include: signage, platforms, elevators, shelters, buildings and parking lots and garages. In addition to inspecting stations and managing corrective maintenance, MDOT MTA is pursuing several station enhancement efforts.



MDOT MTA will continue efforts to improve access to MARC Train stations by foot, bike, local transit or rail, and car. MDOT MTA will seek opportunities to install bike racks at stations, and providing or improving sidewalks, crosswalks and other access infrastructure that would better accommodate people accessing the stations by biking or on foot. Parking is also a critical need for MARC Train passengers. Several MARC Train Park and Ride lots are currently operating at or above capacity. To meet existing demand, MDOT MTA will continue to monitor for opportunities to expand parking at the appropriate stations where feasible.

#### **Improve Station Access**





#### **Camden Station Replacement**



MDOT MTA is constructing a new Camden Station in coordination with the Maryland Stadium Authority. This new station building will improve passenger amenities at the Camden Line terminus in Baltimore, provide wayfinding information to passengers and tourists, and will establish a more recognizable presence of MARC Train service in downtown Baltimore.

MDOT MTA is currently renovating the BWI Rail station. Renovations will include a modernized interior, façade upgrades, roof, HVAC, plumbing and electrical systems. The improvements also include the inspection and repair of the parking garage to maintain a state of good repair. Work commenced on the station in the summer of 2018 and is slated to be completed in 2019.

#### **BWI Station Improvements**

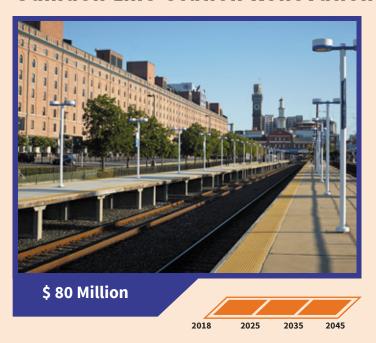


The existing New Carrollton station is served by both Amtrak and Penn Line MARC Train service. The existing facility consists of one platform which is served by both northbound and southbound trains. Amtrak's construction will provide benefits to both Amtrak and MARC Train service by facilitating the more efficient movement of trains through the area.

#### **New Carrollton Second Platform**



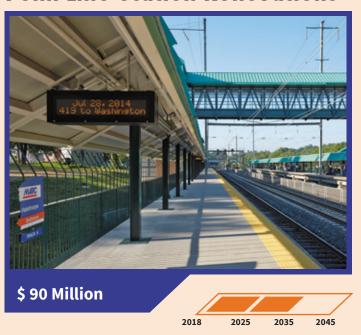
#### **Camden Line Station Renovations**



Camden Line consist of 11 stations in addition to Washington Union Station. MDOT MTA will continue to make improvements consistent with the lifecycle of each station. As various amenities and elements are replaced, MDOT MTA will also include enhancements with improved technology and features available at the time. This also includes elements such as upgraded security, communication systems, wayfinding, and other improvements as appropriate.



#### **Penn Line Station Renovations**



The Penn Line consists of 12 stations in addition to Washington Union Station. MDOT MTA will continue to make improvements consistent with the lifecycle of each station. MDOT MTA will also include enhancements with improved technology and features available at the time. Such enhancements include upgraded security, and communication systems, wayfinding, and other improvements as appropriate.

The West Baltimore **MARC** Train station will need capital improvements to bring it into a state of good repair by providing ADA accessible platforms. Based on the location selected for the proposed, new Baltimore and Potomac Tunnel, the West Baltimore MARC station may need to be relocated. Major station improvements are intended to be coordinated with the construction of the new tunnel.

#### **West Baltimore Station**



Nineteen of the 42 stations that MARC serves currently have atgrade pedestrian crossings. At these stations, passengers must cross active railroad tracks to access the far-side platform. CSX currently requires at-grade pedestrian crossings to be eliminated as part of any significant station improvements on the Brunswick and Camden Lines.

## Eliminate At-Grade Pedestrian Crossings

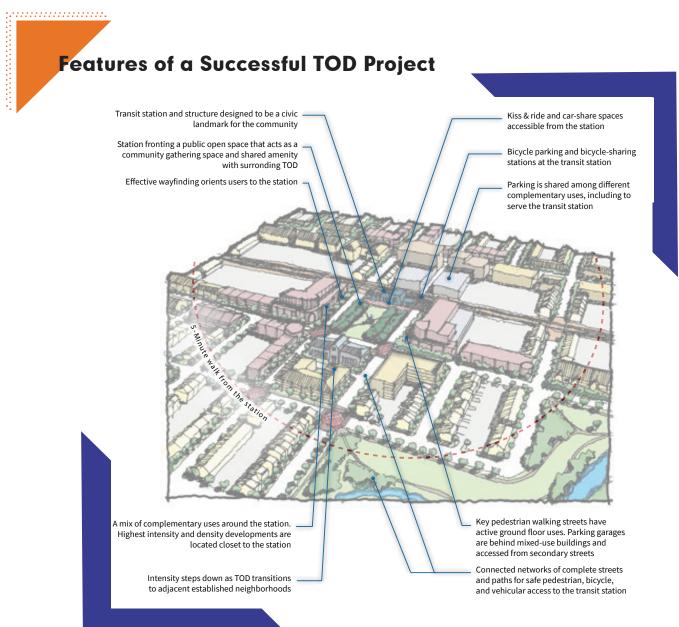


The Brunswick Line consist of 18 stations in addition to Washington Union Station. MDOT MTA will continue to make improvements consistent with the lifecycle of each station. As various amenities and elements are replaced, MDOT MTA will also include enhancements with improved technology and features available at the time. This also includes elements such as upgraded security, and communication systems, wayfinding, and other improvements as appropriate.

# **Brunswick Line Station Renovations**







## Penn Station Transit Oriented Development



MDOT promotes Transit Oriented Development (TOD) as a tool to support economic development, promote transit ridership, maximize the efficient use of infrastructure. transportation Amtrak, has selected a development team to pursue redevelopment as a mixed-use transit and residential hub. While Amtrak will be leading the process for redevelopment, MDOT MTA will coordinate closely to ensure that development is coordinated with MARC Train service needs and goals. One such need involves the impacts to MARC Train storage and maintenance that currently occurs at the station.

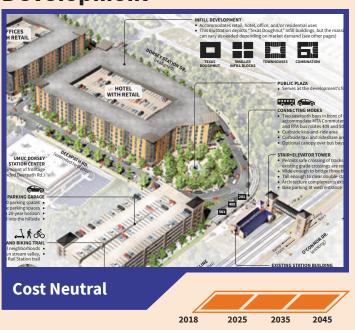
MDOT MTA supports the planning and implementation of TOD. The agency will work with stakeholders to coordinate the planning and development of mixed use development near MARC Train stations systemwide. Laurel Station is the busiest non-terminal station on the Camden Line with average daily weekday boardings of 621 passengers. The MDOT parking lot and adjacent land have been proposed for redevelopment in the past and MDOT MTA will coordinate with stakeholders to support redevelopment of this property to enhance access between the station and the community.

# Laurel Transit Oriented Development





## Dorsey Transit Oriented Development



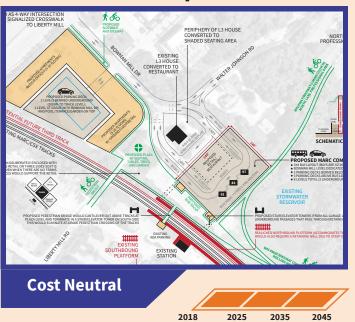
Dorsey Station is the second most active staton on the Camden Line serving all inbound and outbound MARC trains. The station experiences an average of 558 weekday boardings. The station has also been identified as having TOD potential. MDOT MTA has been evaluating the site to determine requirements for supporting existing and anticipated MARC service while accommodating mixed use development.

# Monocacy Transit Oriented Development



Monocacy Station is one of two stations located exclusively on the Frederick Branch of the MARC Brunswick Line. An average of 221 weekday boardings occur at Monocacy with three inbound and outbound trains serving the station each weekday MDOT MTA will work with stakeholders to support development that preserves and supports MARC operations.

# Germantown Transit Oriented Development



MDOT promotes Transit Oriented Development (TOD) as a tool to support economic development, promote transit ridership, and maximize the efficient use of transportation infrastructure. Germantown Station is served by all nine inbound and outbound MARC trains to Washington D.C. on weekdays. As a growing multimodal hub, Germantown station is well-situated to become a thriving transit-oriented center. MDOT MTA has begun evaluating the site to determine how development on the surface lots can be accommodated while also supporting convenient station access for MARC passengers and meet the demands of passengers accessing the station by car.



Photo by Harbor Group Management



## **Guideways**

MARC Train operates on 187 miles of rail, all of which is owned by Amtrak or CSX. MDOT MTA contributes to capital improvements through cost sharing agreements with the host railroads. MDOT MTA owns three miles of track on the Fredrick Branch of the Brunswick Line and contracts with CSX to maintain rail infrastructure.

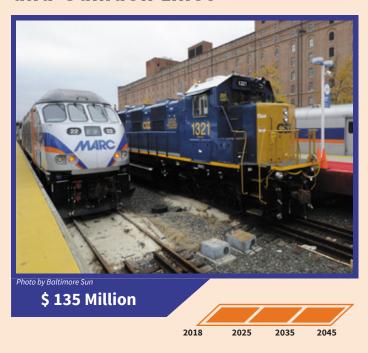
# Passenger Rail Investment and Improvement Act (PRIIA) – Penn Line



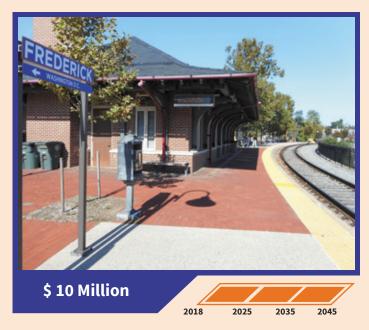
As part of the Passenger Rail Investment and Improvement Act of 2008 Section 212 (PRIIA 212) a collaborative planning and decisionmaking effort for passenger rail carriers along the Northeast Corridor (NEC) was created. MARC Penn Line service uses the southern portion of the NEC to provide service between Perryville and Washington, D.C. Through PRIIAA 212, a cost-sharing arrangement for NEC infrastructure along the MARC Penn Line for commuter and intercity rail services was established. The new cost-sharing arrangement and policy recommendations seek to advance the development of improvements along the MARC Penn Line. PRIIA 212 replaces the previous Joint Benefits program MDOT had with Amtrak.

As part of the operating agreement with CSX, MDOT MTA provides funding to CSX to support the necessary improvements to maintain CSX-owned railway for the Brunswick and Camden Lines. This includes the upgrading of signal systems, switches, grade crossings and other infrastructure shared by both railroads. The current MDOT MTA agreement with CSX is for \$5M annually for capital improvements.

## CSX Joint Benefits – Brunswick and Camden Lines



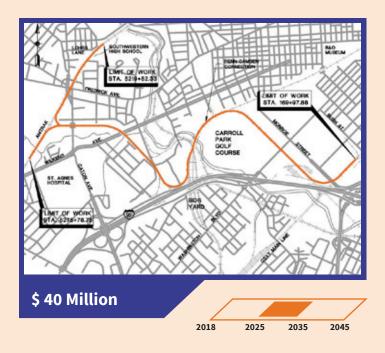
#### Frederick Branch



The Frederick Branch of the Brunswick Line is the only mainline track that MDOT MTA owns. Unlike, the agreements with Amtrak and CSX, MDOT MTA is solely responsible for the maintenance along the Frederick Branch from Monocacy Junction to Downtown Frederick (3.4 miles). Over the next 30 years, MDOT MTA will be making improvements to grade crossings to improve safety, replacing switch machines, and replacing rail ties.



#### **Penn-Camden Connector**



The Penn-Camden Connector is a new rail link that will enable efficiencies through the consolidation of vehicle maintenance and repair for both the Penn and Camden lines. The rail link will also leverage the capital investment in the Riverside Heavy Maintenance Building. The new rail link will also facilitate access to a new storage and maintenance facility for Penn Line MARC trains.



### **Facilities**

MARC Train operates six maintenance and layover facilities at Riverside, Brunswick, Martin's Yard, Martinsburg, Washington D.C. Wedge Yard, Frederick, and Baltimore Penn Station. Establishing these facilities at key locations helps to efficiently position trains for service. MDOT MTA currently subcontracts the maintenance of these facilities to a third party.

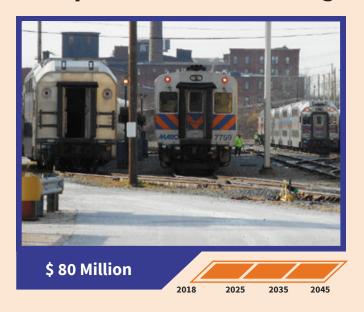
Existing MARC Storage and Maintenance Facilities

STORAGE & MAINTENANCE FACILITY	OVERNIGHT CAPACITY	MAINTENANCE (FULL/PARTIAL)	LOCATION
PENN STATION		PARTIAL	BALTIMORE, MD
MARTIN'S YARD	4	PARTIAL	RIVER RIVER, MD
RIVERSIDE YARD		FULL	BALTIMORE, MD
BRUNSWICK YARD		PARTIAL	BRUNSWICK, MD
FREDERICK YARD		PARTIAL	FREDERICK, MD
MARTINSBURG YARD		PARTIAL	WASHINGTON, D.C.
	OCCUPIED OCC	UPIED = OCCUPIEI DEN LINE BRUNSWI	D= CK LINE UNOCCUPIED

Storage and maintenance facilities are among the most critical needs for MARC Train if it is to continue to improve and build on the service it currently provides. These facilities support the required maintenance and inspections to keep trains operable, and provide space for trains to layover when not in service. Specialized maintenance equipment required for MARC Trains includes: tracks to accommodate 9-car trains, 9-car inspection pits, diesel locomotive service facilities, railcar washer, bridge crane, and wheel truing capabilities. The most efficient operation is realized when layovers, maintenance, and inspections occur at the same location.

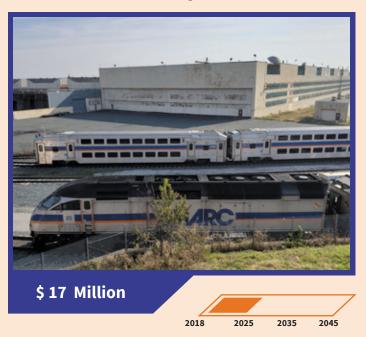
MDOT MTA is in the process of acquiring the Riverside Maintenance facility from CSX. This facility currently provides heavy maintenance MARC locomotives and serves as an overnight storage facility for Camden Line trains. Once acquired, MDOT MTA will be able to construct the appropriate facilities needed to adequately maintain and inspect its locomotives including the most recently procured SC-44 "Charger" locomotives. The expanded facility would also be made accessible to Penn Line trains via the Penn-Camden Connector (see page 46)

## Riverside Yard Acquisition and Heavy Maintenance Building





#### **Martin's Yard Expansion**



Martin's Yard is one of two locations that MDOT MTA stores MARC train sets dedicated to Penn Line Service. The facility is used to store two of the eight train sets that serve the Penn Line. MDOT MTA is working to expand the storage capacity at Martin's Yard to accommodate two additional train sets. When complete, the facility will be able to accommodate up to four seven-car train sets.

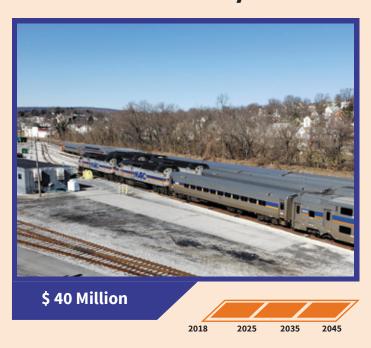
MDOT MTA currently stores six of its eight MARC train sets at Baltimore's Penn Station overnight and on weekends. In response to Amtrak's future plans for the redevelopment of the Station, MDOT MTA has been actively exploring alternative locations to store trains for Penn Line service including the proposed construction of a Northeast Storage and Maintenance Facility in Cecil County, the expansion of the existing Martin Airport facility, and the purchase of CSX's existing Mount Clare Yard via the proposed Penn Camden Connector. Mount Clare Yard has the potential to absorb all six train sets currently stored at Penn Station with additional capacity to lengthen train sets to meet existing demand.

# Replacement Penn Line Storage Yard



#### MARC contracts with CSX to store its trains at Brunswick Yard in Brunswick, MD. The current agreement limits the type of maintenance that can be conducted as MDOT MTA does not own the property. This limitation requires MDOT MTA to cycle MARC train equipment in a way that they can be positioned for heavier maintenance activities as required. The acquisition of Brunswick Yard would enable MDOT MTA to make the necessary improvements to perform heavy maintenance on rail vehicles.

#### Brunswick Yard Maintenance Facility





### **Systems**

MARC utilizes three major classes of Systems assets:

- Electrification overhead catenary located along the Penn line only, this system provides DC power to MTA's electric locomotives.
- Signals and Train Control Rail signals, instrument houses, Positive Train Control (PTC) equipment, and traffic signals.
- Security/Monitoring Communications, Closed Circuit Television (CCTV), and other security equipment.

These systems are also supported fully or in part by the Joint Benefits program with CSX, and PRIIA with Amtrak.

#### **Positive Train Control**



Positive Train Control (PTC) is technology used on railroads to minimize and prevent trains from colliding with one another due to human error.

To comply with Federal Railroad Administration (FRA) regulations, MDOT MTA installed PTC hardware on its locomotives and cab cars, provided training for its operations and maintenance staff and worked with its host railroads to comply with PTC implementation by December 31, 2018.

MDOT MTA plans to update the platform for its "MARC Tracker" feature for riders. This system enables riders to receive real time information on the location of any train. The newer system will be more reliable and accurate.

#### **Real-Time MARC Tracking**



# Train Approaching Warning System



The train approaching warning system is an added safety feature employed at passenger rail stations to alert waiting passengers of oncoming trains. This can come in the form of automated, verbal announcements, flashing lights, or alarms which are activated while the train is approaching. This is particularly helpful along the MARC Penn Line where trains regularly pass MARC train station platforms at over 100 MPH. These systems helps to reduce the risk of injury for waiting passengers.

#### **Closed Circuit Television (CCTV)**



To improve security at MARC stations, MDOT MTA is working to install closed circuit television at all stations throughout the system. While some stations already incorporate the use of CCTV in all areas, many of the stations are limited. MARC personnel will coordinate with MDOT MTA Police to install these systems in all stations to improve safety, and security.

### **Service**

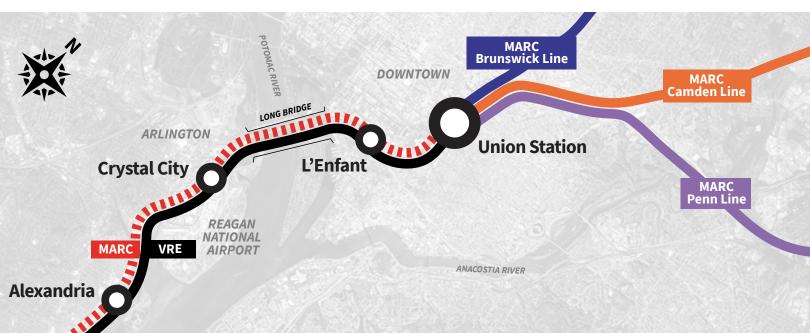
## RUN-THROUGH SERVICE TO L'ENFANT PLAZA AND NORTHERN VIRGINIA

MDOT MTA and Virginia Railway Express (VRE) are exploring the potential for MARC Train to extend service south to Northern Virginia. The potential benefits to run-through service include the following:

- Direct, one-seat ride to employment centers in Northern Virginia from Maryland
- Alleviate congestion on the Red Line at Union Station
- Provide direct access to the L'Enfant Plaza rail hub
- Potential increase in mid-day storage capacity

While the rail infrastructure for this service exists today, the current facilities do not have spare capacity for additional service. Additionally, CSX owns the right-of-way south of the 1st Street Tunnel and Long Bridge. Implementation of run-through service would require a cost-sharing partnership with other rail constituents including VRE, Amtrak, CSX, and others.





### VIRGINIA RUN-THROUGH

This illustrates the various types of capital investments necessary for run-through service to Northern Virginia. These improvements would require partnerships with multiple stakeholders including District Department of Transportation, Virginia Railway Express, Amtrak, and CSX.





MDOT MTA works closely with the host railroads to negotiate and facilitate improved MARC Train service. All three lines are experiencing capacity limitations such that providing additional MARC service would begin to conflict with the host railroads' operations. MDOT MTA continues to work with both CSX and Amtrak to optimize the use of the rail lines and facilitate reliable MARC Train service.

#### **BRUNSWICK LINE**

Increased service on the Brunswick Line would help to support the growing I-270 corridor. Future service patterns could gradually evolve to include basic service patterns illustrated to the right. Several capital investments must be made to enable these service improvements on the Brunswick Line, as illustrated on the following page.

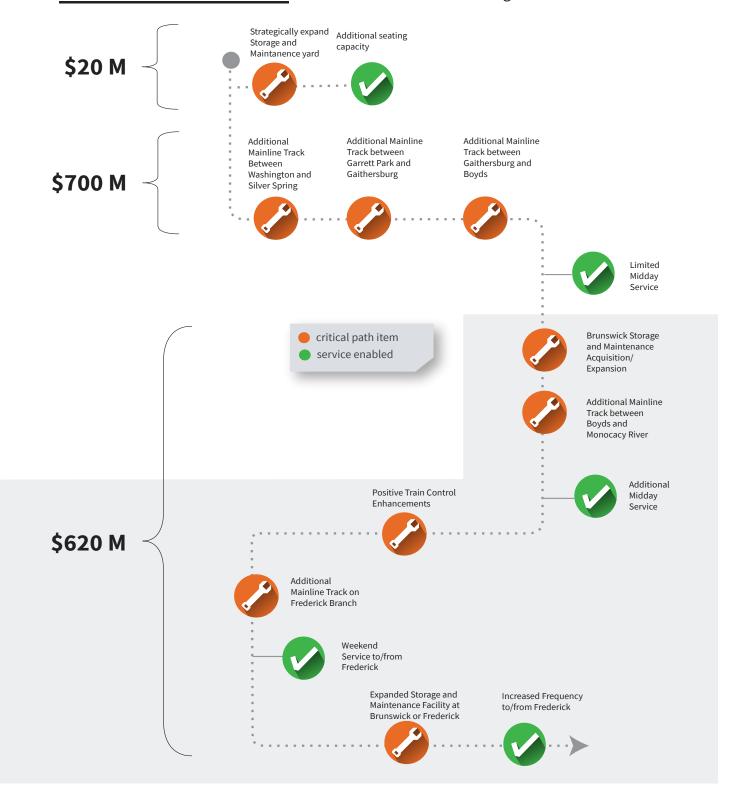


#### **BRUNSWICK LINE SERVICE** Martinsburg ( **Duffields Harpers Ferry** Frederick **Brunswick** Monocacy **Point of Rocks** Dickerson **Barnesville Boyds** Germantown **Metropolitan Grove** Gaithersburg **Washington Grove** Rockville **Garrett Park** Kensington **Silver Spring** Washington DC (Union Station) . Rederite Express Parkern 3hure Engless Pattern

**POTENTIAL FUTURE** 

### BRUNSWICK LINE

This illustrates the various types of capital investments necessary for increased service on the Brunswick Line. These improvements would require partnerships with multiple stakeholders including CSX.



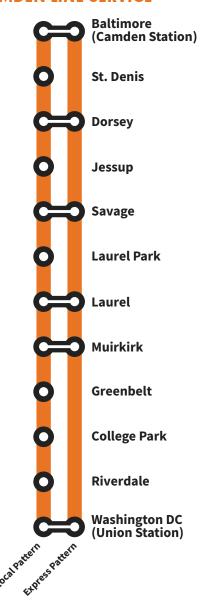


#### **CAMDEN LINE**

Several capital investments must be made to enable these service improvements on the Camden Line, as illustrated to the right.

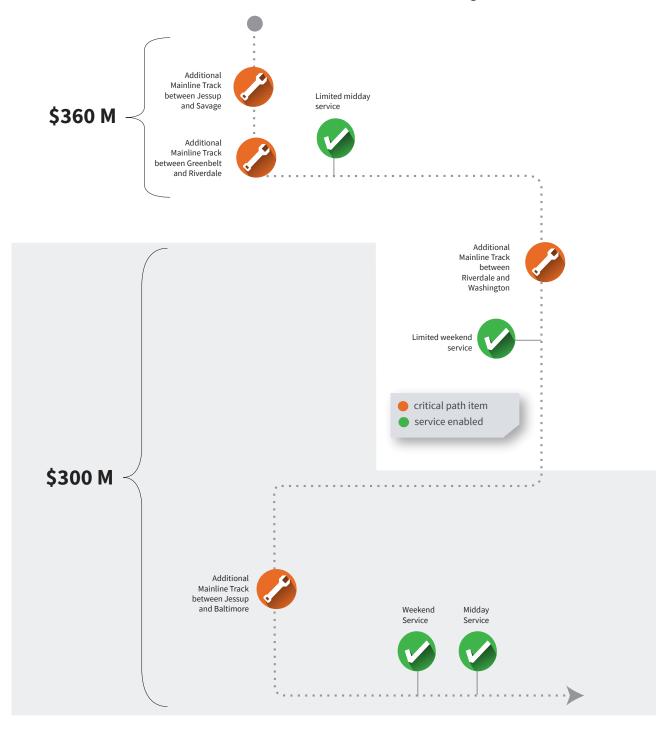


### POTENTIAL FUTURE CAMDEN LINE SERVICE



## CAMDEN LINE

This illustrates the various types of capital investments necessary for increased service on the Camden Line. These improvements would require partnerships with multiple stakeholders including CSX.

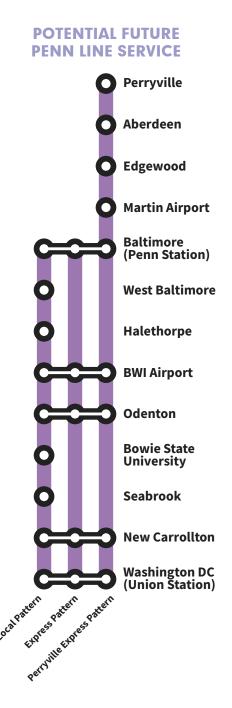




#### **PENN LINE**

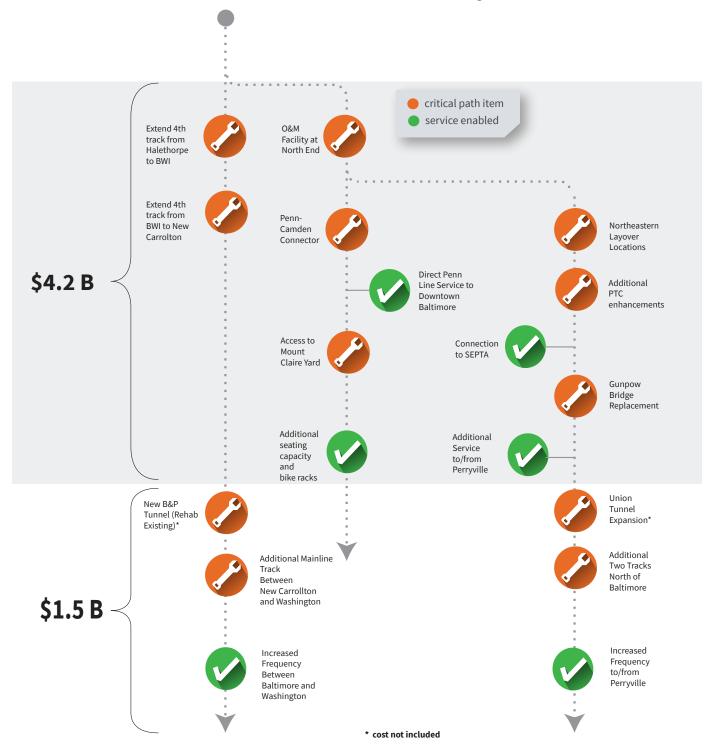
As part of the Northeast Corridor, the Penn Line operates on a railroad that primarily serves passenger trains. This has been extremely helpful with the expansion of MARC Train service between Perryville and Washington. Future service patterns could gradually evolve to include basic service patterns illustrated in the adjacent figure. Several capital investments must be made to enable these service improvements on the Penn Line, as illustrated to the right.





## PENN LINE

This illustrates the various types of capital investments necessary for increased service on the Penn Line. These improvements would require partnerships with multiple stakeholders including Amtrak.





## Conclusion

The MARC Cornerstone Plan's strategic priorities and initiatives lay the foundation for MDOT MTA to continue furthering its vision to provide safe, efficient, reliable transit with world-class customer service as MDOT MTA manages and enhances the MARC Train system. This comprehensive approach empowers MDOT MTA to prioritize initiatives using a data-driven approach with which MDOT MTA staff can synthesize new technologies, research, and best practices.

MDOT MTA is committed to maintaining assets in a state of good repair and supporting our operations while simultaneously seeking opportunities to enhance customers' experience, whether this is by making our service safer, more efficient, reliable, or enjoyable. The fleet's mid-life overhaul, ticket vending machine replacement, and station renovations all focus on keeping our assets in a state of good repair. These initiatives are scheduled to coincide with assets reaching the end of their useful lives, which will ensure the safety and reliability of the Light RailLink system for years to come. However, they simultaneously will improve customer service and customers' experience.

Other MARC Train initiatives are primarily focused on enhancing the service and making the customer experience safer, more efficient or more enjoyable. Positive Train Control (PTC) implementation, fleet standardization, and mobile ticketing are examples of such initiatives), but also facilitate better operations and support long-term asset management plans.

In addition to the initiatives, which have well-defined timeframes and scopes, the strategic priorities outline broader goals that may include ongoing programs, or policies.

Every day, MDOT MTA strives to improve transit service to better serve Marylanders. Our team is constantly monitoring performance, identifying needs, evaluating alternative solutions, engaging stakeholders, implementing solutions, and monitoring outcomes all toward the goal of providing safe, efficient, reliable transit, delivered with world-class customer service.



## **Glossary**

#### **Acronyms**

**ADA** (Americans with Disabilities Act of 1990): Civil rights legislation that prohibits discrimination and guarantees that people with disabilities have the same opportunities as everyone else to participate in the mainstream of American life.

**AMTRAK** (National Railroad Passenger Corporation)

APTA (American Public Transportation Association): Intercity passenger rail service provider

**BWI** (Baltimore/Washington International Thurgood Marshall Airport)

**CBD** (Central Business District): the commercial and business center of a city. Baltimore's CBD is roughly associated with the inner harbor area.

**FTA** (Federal Transit Administration)

**LOTS** (Locally Operated Transit Systems): Transit systems operated by local jurisdictions in Maryland. These transit systems receive federal funding and technical support through MDOT MTA.

MARC (Maryland Area Rail Commuter)

**MDOT** (Maryland Department of Transportation)

**MDOT MTA** (Maryland Department of Transportation: Maryland Transit Administration)

PRIIA (Passenger Rail Improvement and Investment Act)

**SGR** (State of Good Repair): Physical assets owned, operated and maintained by MDOT MTA are evaluated and given condition scores on a 1-5 scale. Assets with a score of at least 2.5 out of 5 are in a state of good repair.

**TOD** (Transit Oriented Development): A place of relatively higher density that includes a mix of residential, employment, shopping, and civic uses designed to encourage multi-modal access to the station area.

**TVM** (Ticket Vending Machine): Machines used to purchase fares for use of Light RailLink and other MDOT MTA operated transit modes.

#### **Relevant Terms**

**Catenary:** Overhead wires that transmit electricity to Light Rail Vehicles for propulsion and operation of electronic systems.

**CSX:** Freight railroad that operates in the Baltimore area. MDOT MTA must coordinate with CSX on certain matters.

**Headway:** The amount of time between transit trips at a given station. At a given station, if a train comes at 8:00am and the next comes at 8:15am, the headway is 15 minutes.

**Norfolk Southern:** Freight railroad that operates in the Baltimore area. MDOT MTA must coordinate with Norfolk Southern on certain matters.

**Pantograph:** Device on the roof of a locomotive that makes contact with the catenary wires to transmit electricity.

**Pattern:** A variation of a transit route.

**Platform:** Paved area where passengers board and alight (exit) trains.

**Short Turn:** A pattern that involves the service turning around before the end of the line.

**Transit Asset:** A physical asset required to support transit service either directly or indirectly, including vehicles, stations, facilities, guideways, and system assets.

