



MONTGOMERY COUNTY PLANNING DEPARTMENT
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

MCPB
Item No.
Date: 05-31-18

MARC Rail Communities Sector Plan – Worksession #3: MTA/MCDOT Briefing

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Completed: 05-23-18

Staff Recommendation

Briefing

Summary

The third worksession for the MARC Rail Communities Sector Plan will consist of two briefings. Representatives of the Maryland Mass Transit Administration will brief the board on the current status of the agency's Draft Growth and Investment Plan Update 2013-2050. The Plan Update outlines the administration's policy and capital programming objectives for each of its three commuter rail branches.

Representatives of the Montgomery County Department of Transportation will then brief the board on a Pedestrian Safety Audit done by the Department for a portion of Middlebrook Road in Germantown. The Audit reviewed accident and other pedestrian safety data along Middlebrook Road and met with area stakeholders to identify and discuss issues related to pedestrian safety in the area.

Planning staff highlighted the findings of both studies at previous Board sessions on the Sector Plan, and the Audit is included as an appendix to the plan. These briefings will enable the Board to hear directly from relevant state and county officials on two important aspects of the Sector Plan. These briefings should inform the Board's decisionmaking over the remaining sector plan worksessions.

MTA's Draft Plan Update and MCDOT's Pedestrian Safety Audit are attached.

Attachments

1. Maryland Transit Administration: Growth and Investment Plan Update 2013-2050
2. Montgomery County Department of Transportation: Pedestrian Road Safety Audit—Middlebrook Road

MARC

Taking Stock and Rolling Forward



Growth and Investment Plan Update 2013 to 2050



September 9, 2013



Overview

■ Introduction

- Update Process
- Stakeholder Outreach

■ Background

- Existing Service Map, Description and Trends
- Objectives
- Accomplishments
- Major Programmed Investments

- Benefits of Investment in MARC Service

- Challenges

■ Phased Growth and Investment Plan

- Penn Line
- Camden Line
- Brunswick Line

■ Next Steps

Introduction

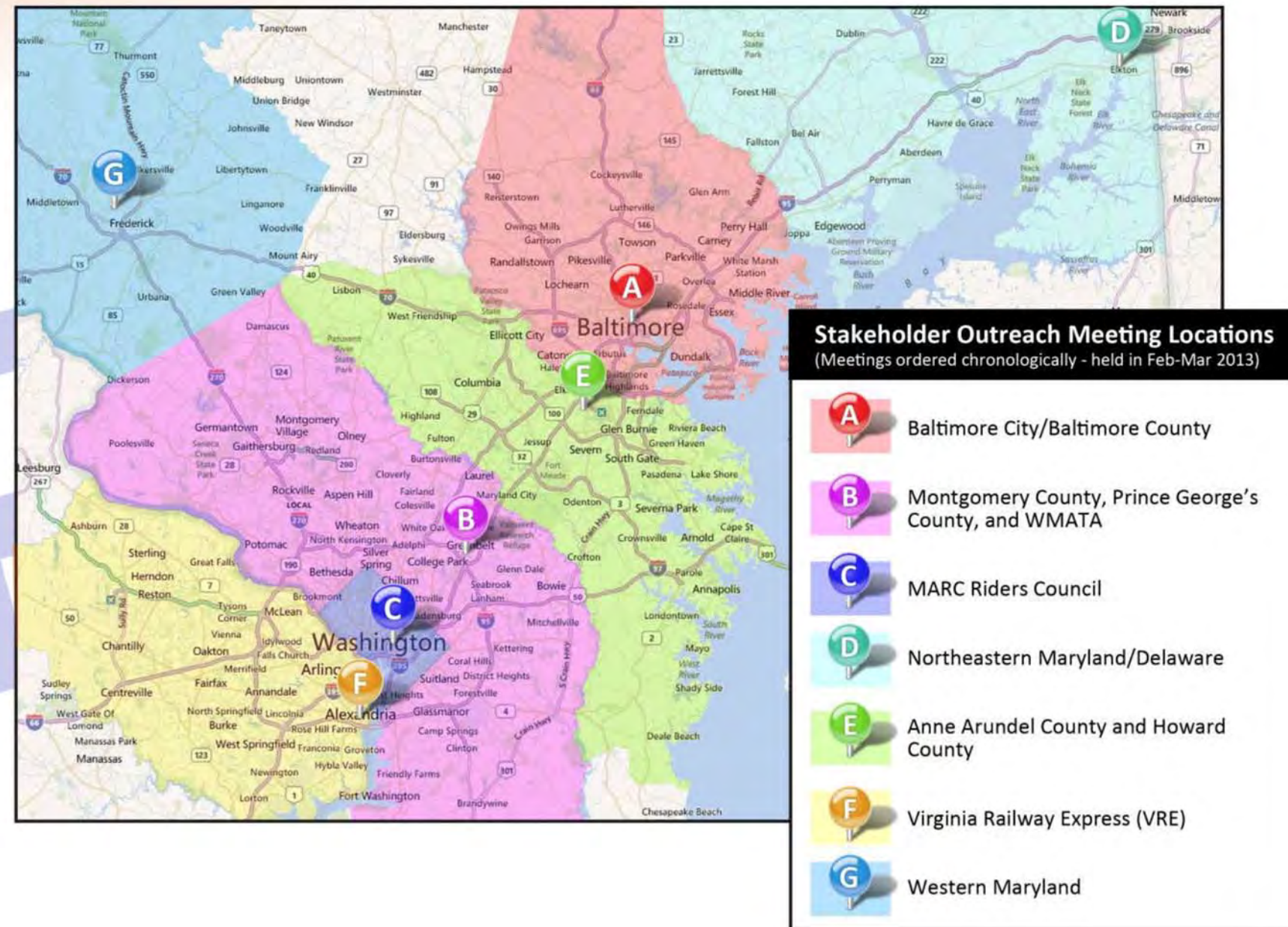
- **MTA operates MARC Train Service, a commuter rail system whose service areas include Baltimore and Washington and surrounding areas, as well as Martinsburg, West Virginia. MARC service operates on the Penn, Camden, and Brunswick Lines with an average of 36,000 daily trips.**
- **Why update the MARC Growth and Investment Plan (MGIP)?**
 - Re-align agency priorities with current economic climate and federal policy, with a focus on State of Good Repair
 - Establish bold, new objectives for MARC service
 - To get feedback and suggestions from stakeholders to improve MARC service
- **How is this plan different than the September 2007 MGIP?**
 - Presents a MARC program that ties together future ridership increases, rolling stock investments, and facility/parking expansions
 - Identifies accomplishments and benefits of targeted investment in MARC service over the last 6 years
 - Enhanced focus on Sustainability and Transit Oriented Development

Update Process

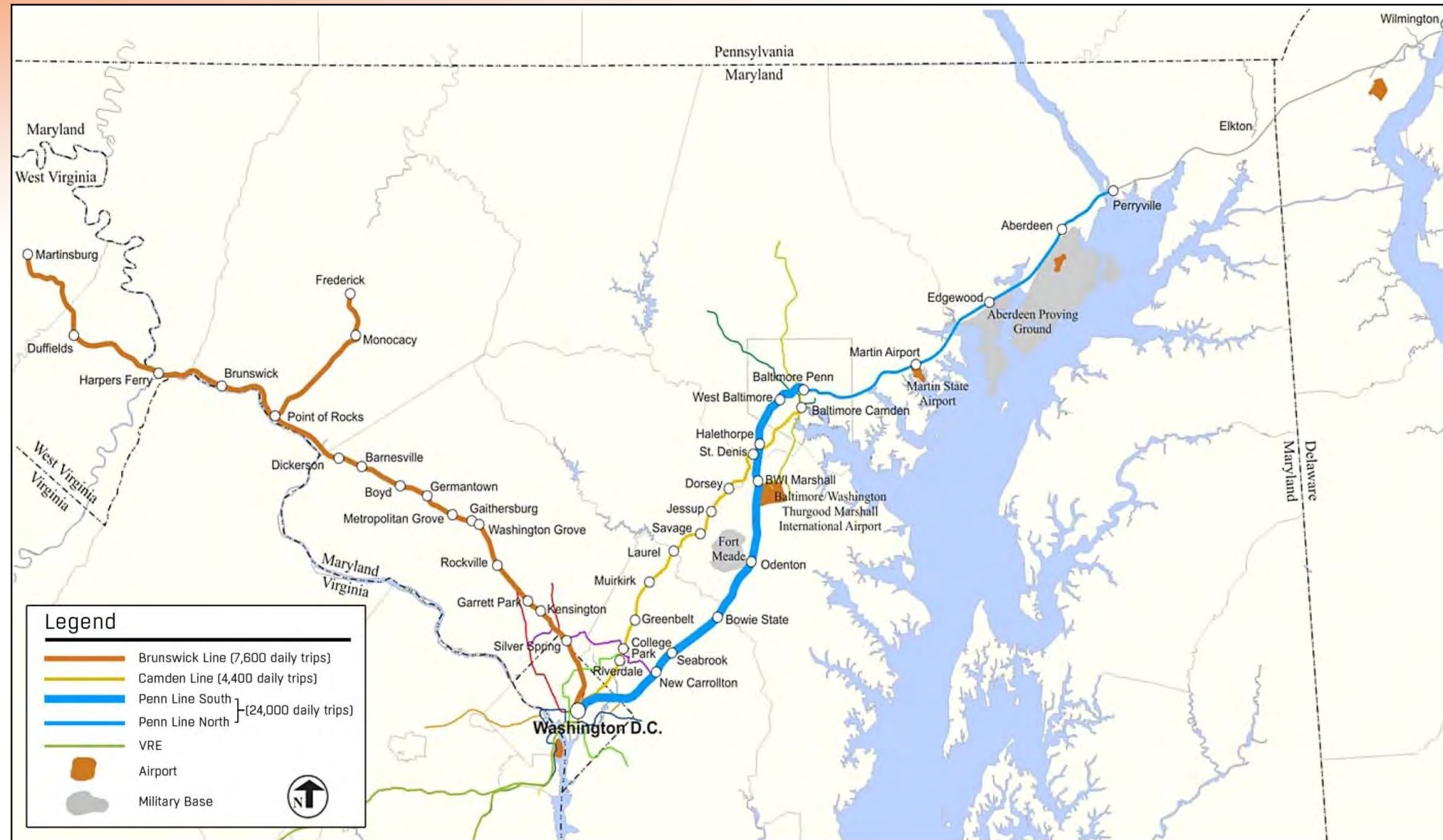


Stakeholder Outreach

- Reviewed 2007 MARC Growth and Investment Plan.
- Discussed current MARC service, trends, and issues.
- Reviewed major programmed investments, including operating and capital projects.
- Received feedback on proposed Objectives and Timeframes.



Existing Service



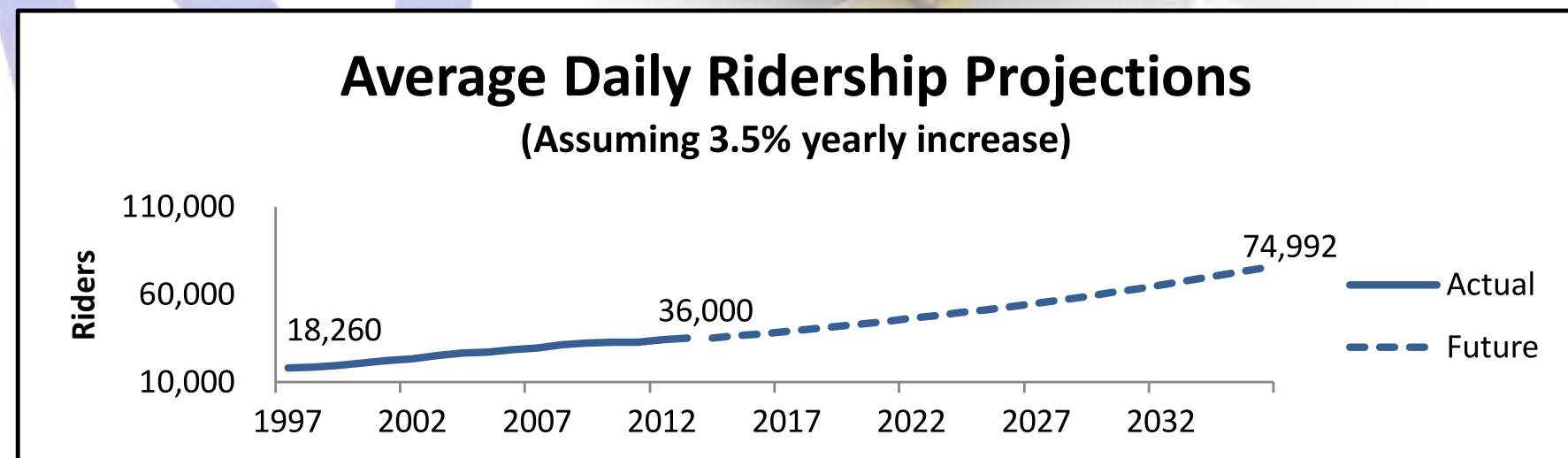
Existing Service Description

*2012 Statistics

	Penn Line	Camden Line	Brunswick Line
Owner/Operator	Amtrak/Amtrak	CSX/Bombardier	CSX/Bombardier
Stations	12	11	18
Route-miles	76.6	36.6	85
Weekday trains	57	18	19
Train sets	8	5	9
Frequency			
• Weekday Peak	30 min (Wash-Balt) 70 min (Wash/Balt – Perryville) 60 min (Wash/Balt-Martins)	45 min	40 min (Wash-Brunswick) 50 min (Wash-Martinsburg) 75 min (Wash – Frederick)
• Weekday Off-Peak	Hourly (Wash-Balt) 1 mid-day train in each direction (Perryville)	None	One mid-day train (Fri. only)
• Weekend	None	None	None
Daily Passenger Trips	24,000	4,400	7,600
On-Time Performance	93%	96%	90%

Trends: Ridership

- All time record level: 36,000+ daily trips
 - Ridership has increased 3.5% annually over the past 15 years
- Average annual growth from 2007 to 2012:
 - Penn Line: 3.5%
 - Camden Line: 0.5%
 - Brunswick Line: 1.7%
- Ridership demand is expected to continue to grow at historical rates



Trends: Parking

Existing Conditions

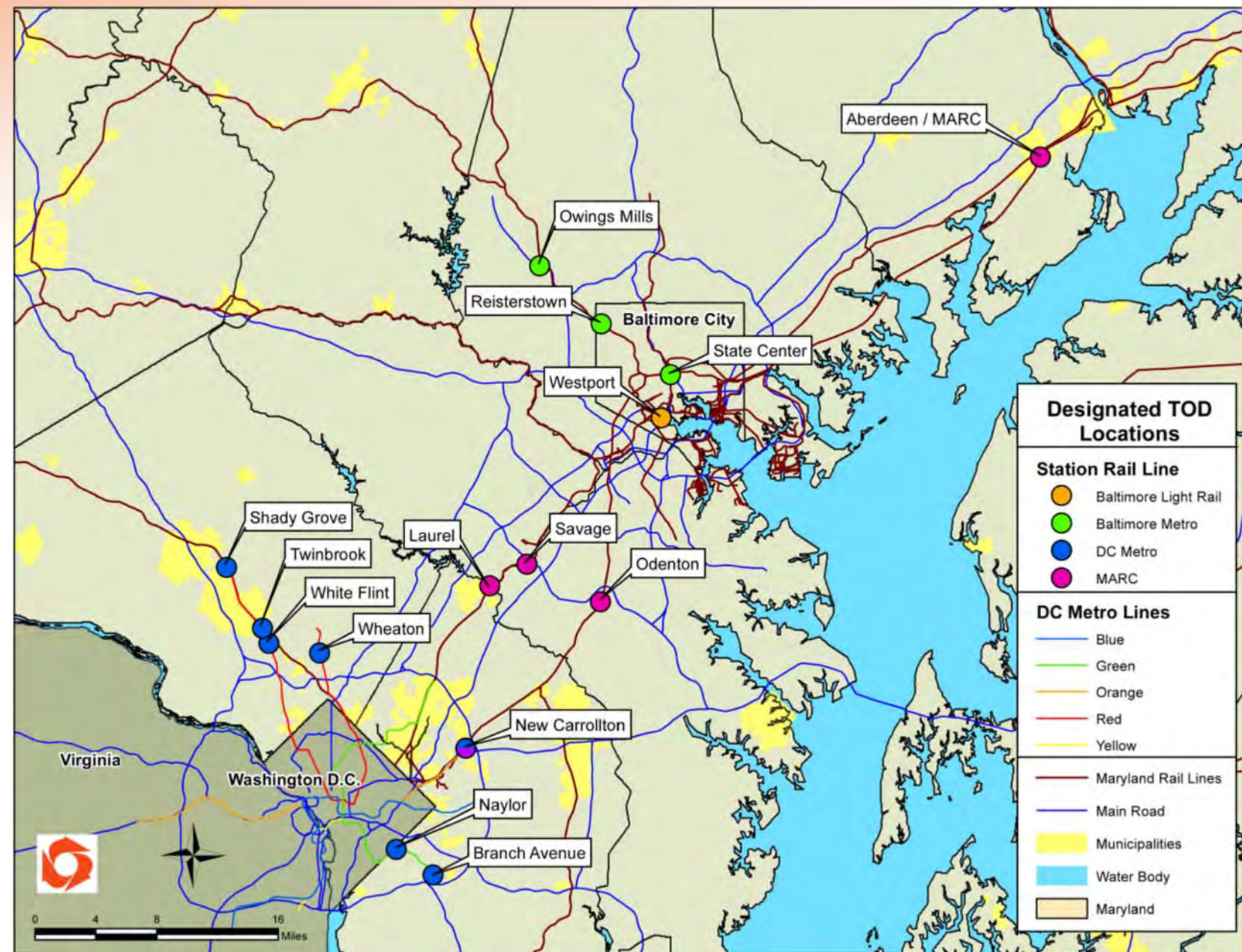
- Parking is at capacity at many stations
- Penn Line: 8 of 11 stations are at or near capacity
 - Even with current parking expansions, 9 of 11 stations will be at or near capacity by 2015
- Camden Line: Laurel is at full capacity
- Brunswick Line: Several stations will be at capacity by near term

Long Term Outlook

- Over 70% of all MARC stations will be at capacity by 2025, requiring a targeted and phased approach to station access and parking facility management and expansion



Trends: Sustainability



Goals

- Support Multi-modal Transportation
- Purchase environmentally friendly locomotives
- Design and build sustainable facilities (new and rehab)

Current Activities

- Providing enhanced bike and pedestrian access
- Alternative energy – EV Charger installations at many stations
- Green facilities (new stations and rehabs)

Long-Term Projects

- Tier IV Locomotive Fleet (zero emissions)

Trends: Transit Oriented Development (TOD)

- Increase the number of riders that are able to walk or bicycle to stations while reducing auto trips and sprawl development.
- Create high density mixed use (residential, office, retail) communities on existing surface parking lots within walking distance to MARC stations.



Source: BartonPartners, 2008



Source: Grimm + Parker, 2007.

- Design MARC stations that support sustainable communities and contribute to the economic health of the neighborhoods in which they are located.
- Evaluate each MARC station to determine appropriate level of TOD. As service changes, ensure that TOD addresses not only commuter needs but also permanent resident needs.

Objectives

■ Maintain a State of Good Repair

- Preserve current and future rolling stock
- Maintain existing and new facilities
- Update and enhance rail infrastructure

■ Increase Ridership

- Meet ridership demand
- Increase seats available during peak travel periods

■ Improve Service

- Increase peak service and off-peak service
- Maintain reliability at 95% on-time or better
- Provide express and limited stop service
- Provide late evening and weekend service

■ Enhance the Customer Experience

- Improve communication with riders
- Increase customer system ease-of-use

Accomplishments: Maintain a State of Good Repair

Objectives

- ☑ Preserve current and future rolling stock
- ☑ Maintain existing and new facilities
- ☑ Update and enhance rail infrastructure



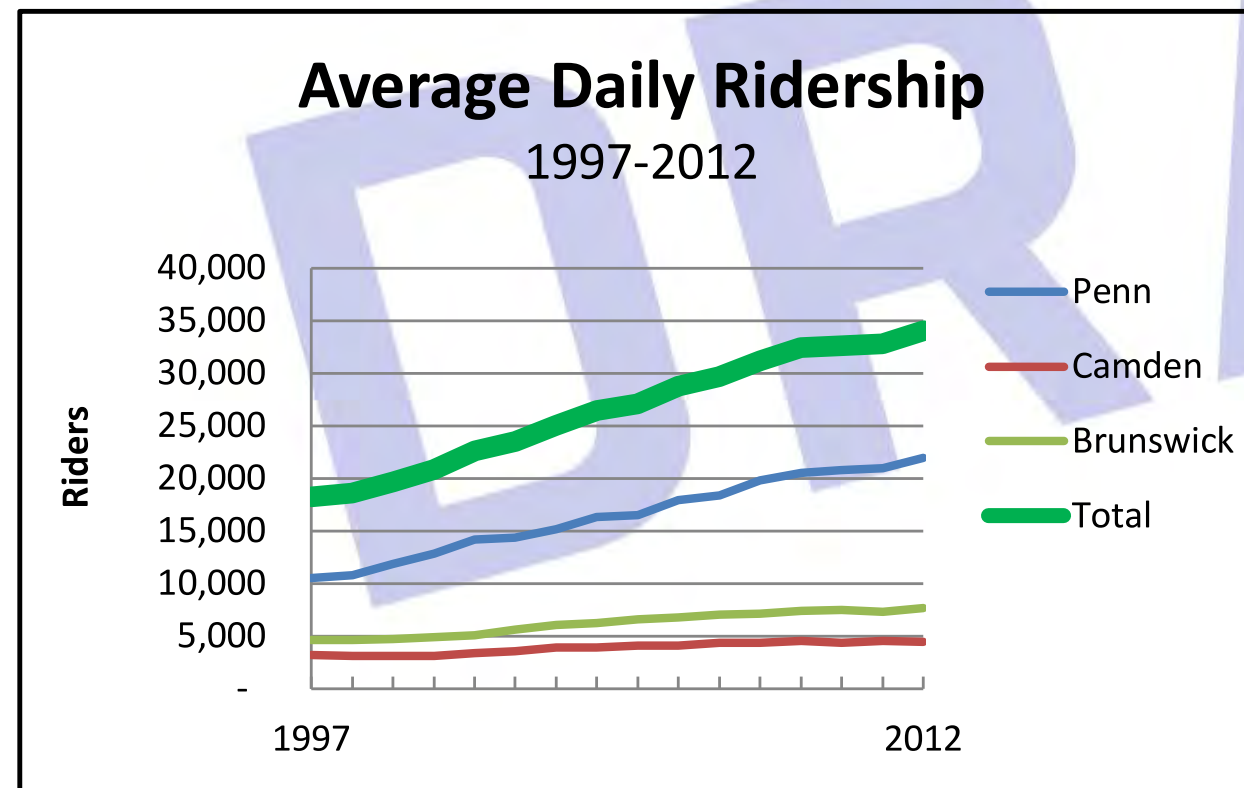
Accomplishments: 2007-2012

- Purchase of 26 diesel locomotives
- Purchase of 13 VRE bi-level rail cars
- MARC IIB Railcar overhaul (34)
- AEM - 7 Locomotive Overhaul (4)
- BWI 4th track Preliminary Engineering (PE)/National Environmental Protection Act (NEPA)
- Odenton, Germantown, Kensington, Edgewood, Aberdeen, and Point of Rocks parking expansions
- Complete rehab of Laurel platform
- Storage at Martin's Facility
- Interlockings on Brunswick Line
- New Stations at Halethorpe and Edgewood
- Various station platform improvements including Germantown, Gaithersburg, Metro Grove and BWI
- Brunswick and Martinsburg service facility improvements
- Frederick Maintenance Fuel Shed construction

Accomplishments: Increase Ridership

Objectives

- ☑ Meet ridership demands
- ☑ Increase available seats during peak travel periods



Accomplishments: 2007-2012

Systemwide

- Procurement of 54 new multi-level passenger vehicles will increase fleet by 16 railcars and allow for more capacity across all lines

Penn Line – 3.5% increase in ridership

- Expanded Martins Airport storage facility to hold an additional set of cars which allows for increased revenue frequencies

Camden Line – 0.5% increase in ridership

- CSX has completed the installation of the signaling and power switch at Dorsey which will allow MARC to expand service by operating turn back service utilizing existing equipment

- Added 2 multi-level railcars to service

Brunswick Line – 1.7% increase in ridership

- Improved and expanded the storage facility at Martinsburg enabling the reassignment of a train set from Brunswick. This allowed MARC to provide a new frequency in the morning for the West Virginia riders and eliminate deadhead moves.

Accomplishments: Improve Service

Objectives

- ☑ Increase peak and off-peak service
- ☑ Maintain reliability at 95% on-time or better
- ☑ Provide express and limited stop service
- ☑ Provide late evening and weekend service



Accomplishments: 2007-2012

■ Systemwide

- Implemented schedule changes on all 3 lines

■ Penn Line

- Added 10 revenue frequencies; 2 for BRAC Baltimore to Perryville and 8 for the Baltimore-Washington market by reducing the shop count and better utilization of equipment
- BRAC - Reverse Commute service added

■ Brunswick Line

- Contracted with the local bus operator Pan Trans to meet two MARC trains at Brunswick which provide additional options for West Virginia riders
- Added Germantown shuttle to alleviate crowding
- CSX has completed the installation of 3 interlockings which provide additional train dispatching options, reducing freight train interference

■ Camden Line

- CSX has completed the installation of the signaling and power switch at Dorsey which will allow MARC to expand service by operating turn back service utilizing existing equipment

Accomplishments: Enhance the Customer Experience

Objectives

- ☑ Improve communication with riders
- ☑ Increase customer system ease-of-use



Accomplishments: 2007-2012

- Improved On-Time Performance: 95% in Aug 2012
- ADA-compliant public address system and LED signs completed on Brunswick line; other lines currently under construction
- Quick Trak – Installed ticket vending machines at 16 stations
- Increased MARC Rider's Council/Meet the Managers Meetings
- MARC Newsletter
- Installed bike racks and lockers at several stations
- Installed Electric Vehicle (EV) chargers at BWI garage
- Improved MARC Tracker online interface and accuracy
- Improved subscriber e-mail alert system and Twitter
- On-line ticketing
- New Public Information System (PIDS/PA) at Washington Union Station

Major Programmed Investments

(Greater than \$5m)

Operating	Completion Date (FY)	Cost (\$M)
Weekend Service between Washington and Baltimore	Ongoing	\$8/year

Capital	Completion Date (FY)	Cost (\$M)
MARC IV Multi-Level Railcar Procurement (54)	2015	\$159
Track Improvements on CSX lines	2015	\$51
Washington Mid-Day Storage Facility (Wedge Yard)	2014	\$48
New Diesel Locomotive Procurement (10)	2015	\$40
MARC III Coaches Overhaul (63)	2017	\$34
Halethorpe Station	2013	\$30
ADA-Compliant Public Address/LED Station Signage	2013	\$17
Procurement of Riverside Maintenance Facility	2018	\$17
Positive Train Control	2015	\$15
Diesel Locomotive Repowering (6)	2015	\$12
Hanson Interlocking	2016	\$10

Benefits of Investment in MARC

- **Improves service for current riders**
 - Addresses existing problems with capacity, frequency, and reliability
 - Provides fast, reliable transportation in key corridors including I-95 and I-270
- **Provides framework for mobility across Maryland**
 - Strengthens economic and social ties between Baltimore and Washington
 - Serves BRAC-related travel markets (Aberdeen and Fort Meade)
 - Efficient and environmentally sustainable (air, water, energy) transportation investment
 - Reduces need to expand highways in areas with limited/expensive construction opportunities
 - Encourages efficient regional land use development and transit-oriented development (TOD)
- **Connects the region's transportation network**
 - Provides backbone for integrated Maryland region transit system
 - Supports more efficient rail freight movement
 - Offers mobility choice for commuters and regional travelers
 - Connectivity with Commuter Bus, Locally Operated Transit Systems (LOTS) and future Red/Purple Lines

Challenges

Challenges to future growth

- Acquisition of property and development of Penn Line Maintenance Facility
- Capacity constraints for overnight and midday storage at Martins, Baltimore and Washington Union Terminal
- Balancing MARC growth with the demand for improvements and potential state investment in the Northeast Corridor
- Insufficient track capacity on all three lines
- Available Parking at many stations is maxed out
- Minimal growth on Camden and Brunswick Lines
- Trains are crowded during rush hour
- Insufficient spare equipment
- MARC scheduling flexibility and ability to expand service constrained by infrastructure and presence of other operators (Amtrak and freight)
- Dated technological resources
- Inability to react and be flexible to changing markets

Phased Growth and Investment Plan

Timeframes

- Near-Term – Programmed investments between 2013 and 2019
- Long-Term – Potential investments between 2020 and 2029
- Future – Potential investments between 2030 and 2050



Penn Line: Near-Term 2013-2019 (Planned)

Maintain a State of Good Repair - \$56 million*

- Halethorpe – New station and platforms
- Penn Station improvements (Bathrooms and Maintenance's office area)
- Hanson Interlocking
- Positive Train Control
- West Baltimore parking expansion

Systemwide - \$254 million*

- Procure 54 MARC IV multi-level railcars to replace plus increase number of seats - \$180 million
- Procure 10 new diesel locomotives to replace electric locomotives - \$40 million
- Overhaul 63 MARC III railcars - \$34 million

*Certain additional costs yet to be determined.

Increase Ridership - \$10 million*

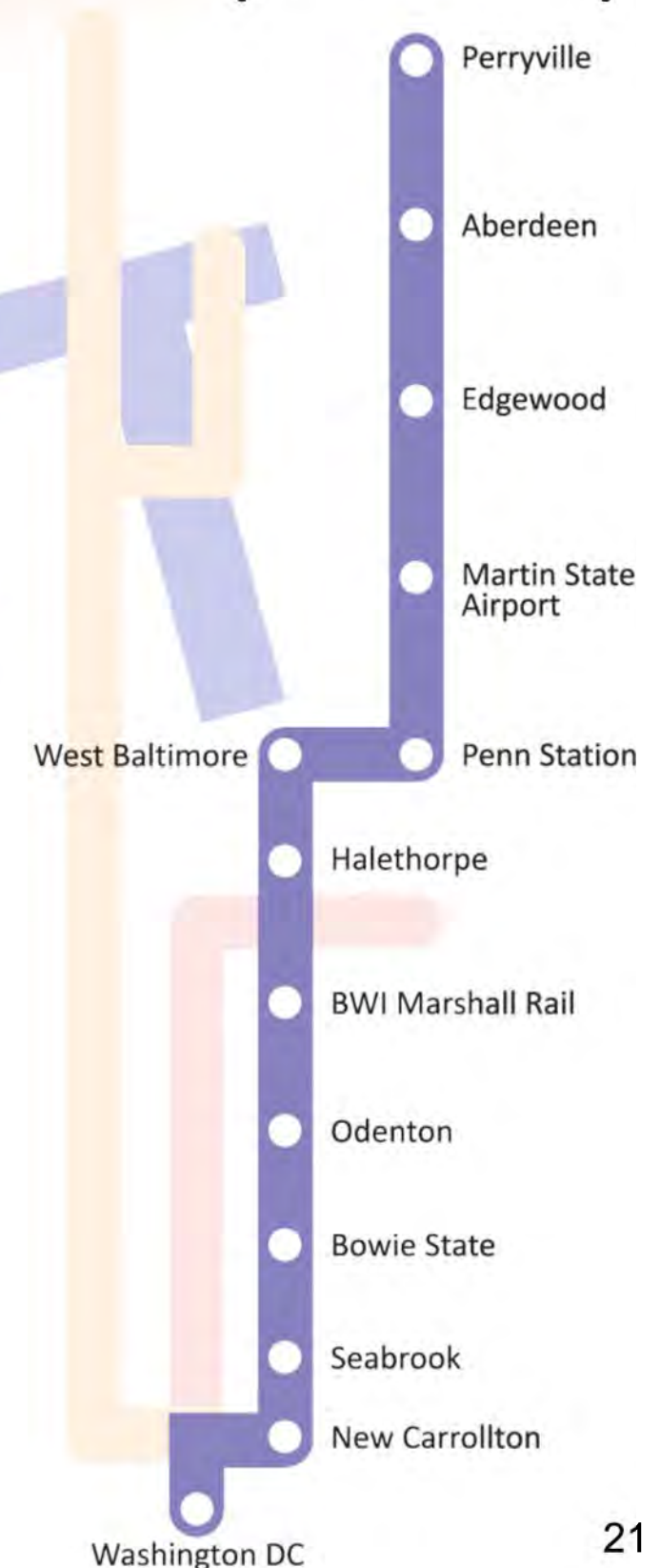
- Weekend service between Baltimore-Washington
- Expanding utilization of Commuter Bus and LOTS systems to increase connectivity

Improve Service - \$40 million*

- Washington Mid-Day Storage Facility (Wedge Yard)
- Maintain 94-95% on-time performance

Enhance the Customer Experience - \$27 million*

- ADA-Compliant Public Address System and LED signage
- Develop system uniformity standards (aesthetics, signage, brand)
- Closed Circuit Television System through Homeland Security Grants
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders



Penn Line: Long-Term 2020 to 2029 (Potential)

Maintain a State of Good Repair - \$707 million*

- Platform Construction at New Carrollton #1 Track
- Parking Facility Expansions:
 - Aberdeen, Halethorpe, Seabrook, and Bowie State
- Odenton - TOD, parking garage, and platform extension
- Penn Station improvements
- Station upgrade/construction for Elkton station
- Upgrade Perryville station to handle NB trains
- New stations at West Baltimore and Bayview

Increase Ridership - \$93 million*

- Washington-Baltimore:
 - Expanded peak and reverse peak hours
 - 30-minute headway off-peak service
- New Bayview station
- Penn North Shuttle – Link with SEPTA

Improve Service - \$480 million*

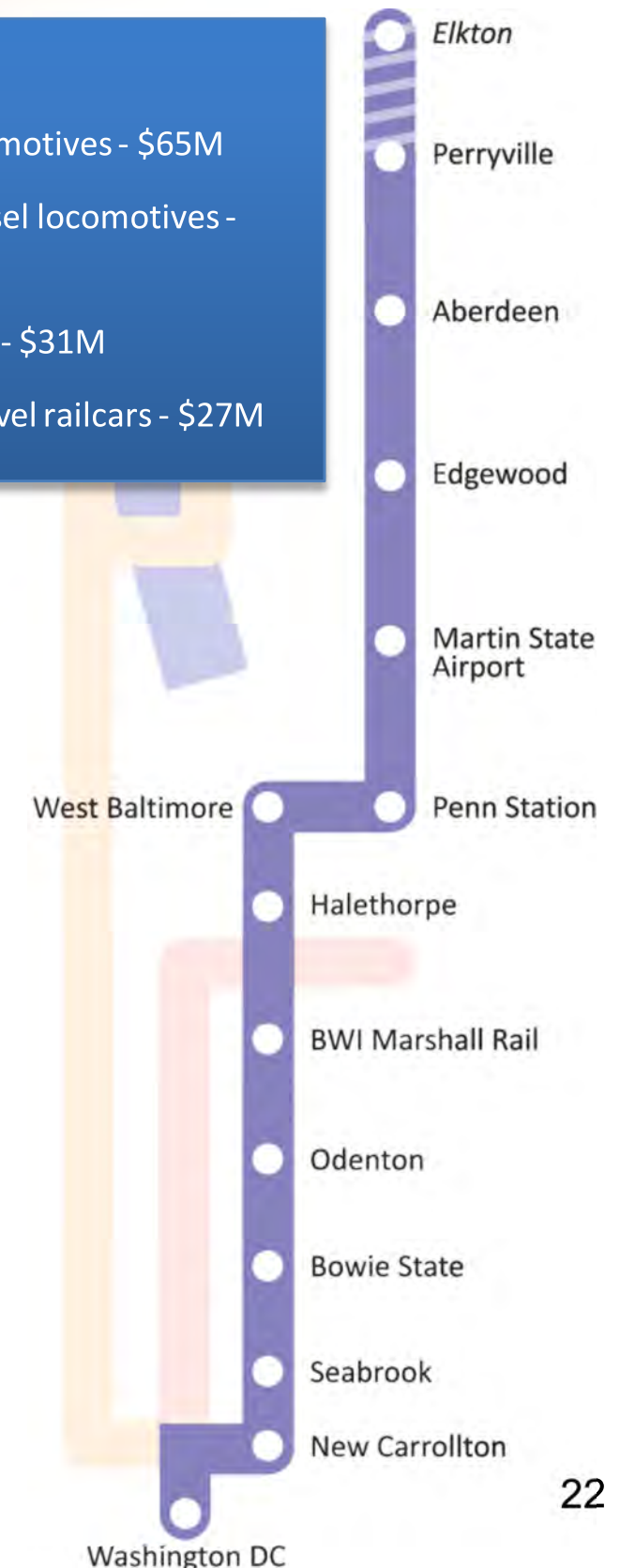
- New BWI Station
- Semi-express trains between Baltimore-Washington
- Expand and enhance Martins maintenance capacity
- Connectivity with Red Line at West Baltimore and new Bayview Stations
- Overnight Storage and Maintenance Facility-Penn Line north
- Washington Terminal planned expansion
- Maintain 94-95% on-time performance

Enhance the Customer Experience - \$19 million*

- Pedestrian overpass at Odenton
- E-Ticketing
- EV charger installations
- Install additional bike racks/lockers at stations

Systemwide- \$138 million*

- Overhaul 26 MP36 diesel locomotives - \$65M
- GP39 (6) Repower 6 GP39 diesel locomotives - \$15M
- Overhaul 34 MARC IIB railcars - \$31M
- Overhaul 54 MARC IV multi-level railcars - \$27M



*Certain additional costs yet to be determined.

Penn Line: Future 2030 to 2050 (Potential)

Maintain a State of Good Repair

- Parking facility expansion and platform rehabilitation (locations to be determined)
- 4 track additions
 - Penn Station to Perryville
 - BWI Airport to New Carrollton
 - Union Tunnel – complete 4 track railroad through Baltimore city
- New Bush River crossing - total of 4 main tracks (Amtrak funded)
- New Susquehanna River crossing - total of 4 main tracks (Amtrak funded)
- Amtrak B&P Tunnel replacement and rehab of existing tunnel for MARC use (Amtrak funded)
- Station modifications to support 4 main tracks at BWI, Odenton, Bowie State, Seabrook, and New Carrollton
- Canopy construction at Seabrook, Odenton, Bowie State, Martin Airport, and Perryville

Increase Ridership

- Washington-Baltimore:
 - Expanded peak and reverse peak service
 - Additional peak express service
 - Off-peak local and limited stop service
- North of Baltimore:
 - Aberdeen: Expansion of peak and introduction of limited peak service
- MARC service extended to L'Enfant Plaza and Northern Virginia

Improve Service

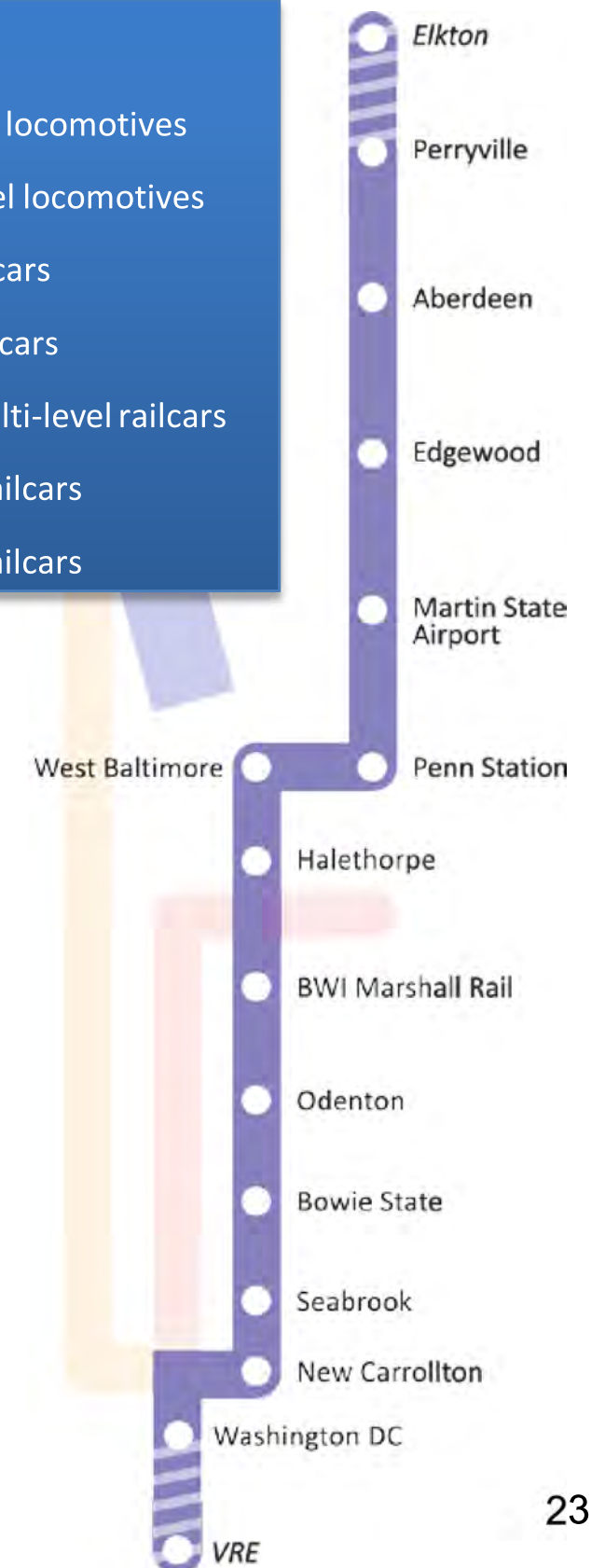
- Full 4-track railroad provides MARC with flexibility to optimize service to meet and anticipate demand
- Connectivity with Baltimore regional transit
- Washington Union Station Master Plan
- Maintain 94-95% on-time performance

Enhance the Customer Experience

- Expanded TOD presence
- EV charger installations
- Installation of bike racks/lockers at stations

Systemwide

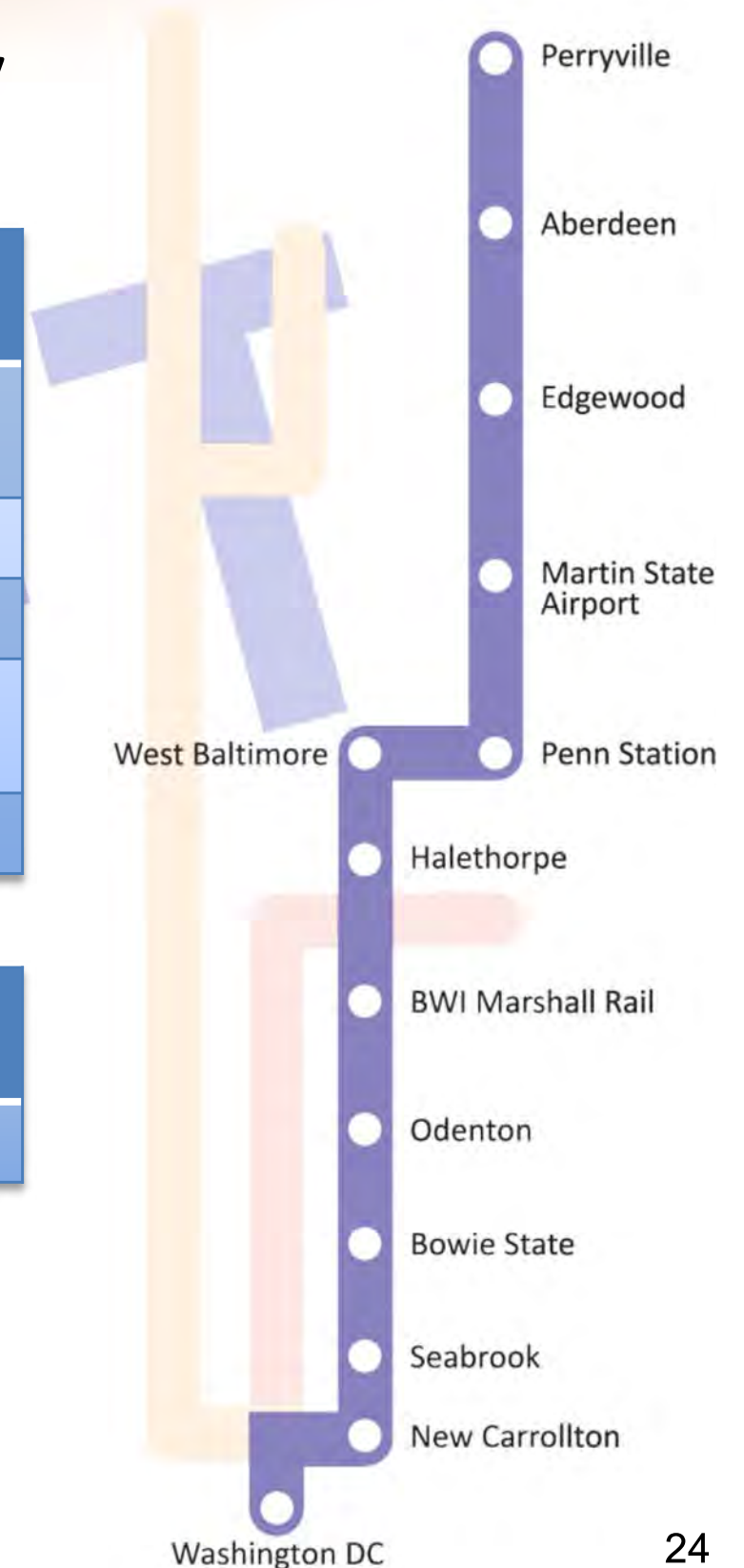
- Overhaul 26 MP36 diesel locomotives
- Purchase expansion diesel locomotives
- Replace 34 MARC IIB railcars
- Overhaul 63 MARC III railcars
- Overhaul 54 MARC IV multi-level railcars
- Overhaul 50 expansion railcars
- Purchase 50 expansion railcars



Penn Line – Summary

Penn Line Capital Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)	Total Cost (\$M)
Maintain a State of Good Repair	\$56*	\$707*	\$763*
Increase Ridership	\$0*	\$90*	\$90*
Improve Service	\$40*	\$480*	\$520*
Enhance the Customer Experience	\$27*	\$19*	\$46*
TOTAL	\$123*	\$1,296*	\$1,419*

Penn Line Operating Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)
Incremental Operating Costs	\$10/year*	\$6/year*



*Certain additional costs yet to be determined.

Camden Line: Near-Term 2013 to 2019 (Planned)

Maintain a State of Good Repair - \$16 million*

- College Park platform construction and shelter addition
- Positive train control

Increase Ridership - \$10 million*

- Lengthen existing trains to accommodate growing ridership
- Savage TOD project/garage and pedestrian crossover

Improve Service - \$2 million*

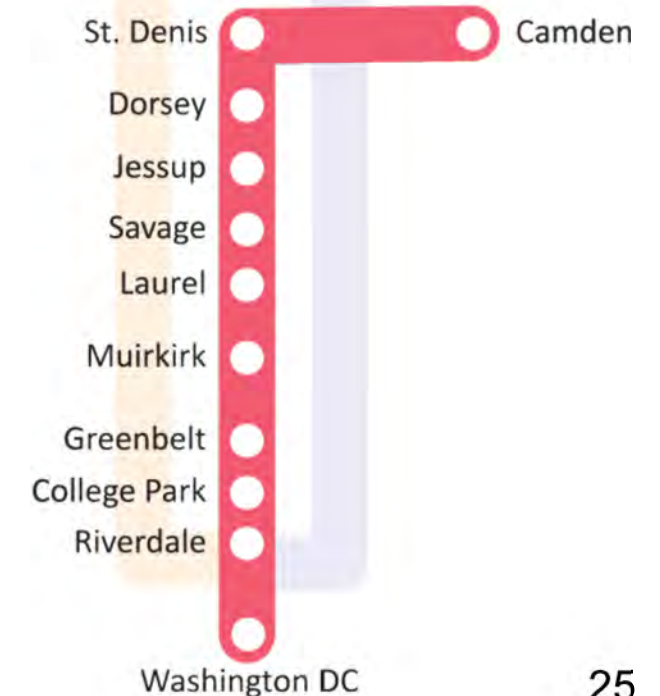
- Add two more roundtrips
- Turn back service between Washington-Dorsey
- Maintain reliability at 95%

Enhance the Customer Experience - \$7 million*

- ADA-Compliant Public Address System and LED signage
- Develop system uniformity standards (aesthetics, signage, brand)
- Closed Circuit Television System through Homeland Security Grants
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders

Systemwide - \$254 million*

- Procure 54 MARC IV multi-level railcars to replace plus increase number of seats - \$180 million
- Procure 10 new diesel locomotives to replace electric locomotives - \$40 million
- Overhaul 63 MARC III railcars - \$34 million



*Certain additional costs yet to be determined.

Camden Line: Long-Term 2020 to 2029 (Potential)

Maintain a State of Good Repair – \$126 million*

- Parking facility expansions
 - Laurel
 - Muirkirk
 - Laurel Park Raceway
- Extend 3rd main track Savage-Laurel to reduce congestion
- Muirkirk Station – Canopy and station improvements tied to ICC completion
- Dorsey platform rehabilitation
- New Station at Camden

Increase Ridership - \$3 million*

- Additional peak and reverse peak trains
- Improved rail-bus transfers and connecting bus service to Ft. Meade area from Savage
- Additional mid-day afternoon train

Improve Service - \$51 million*

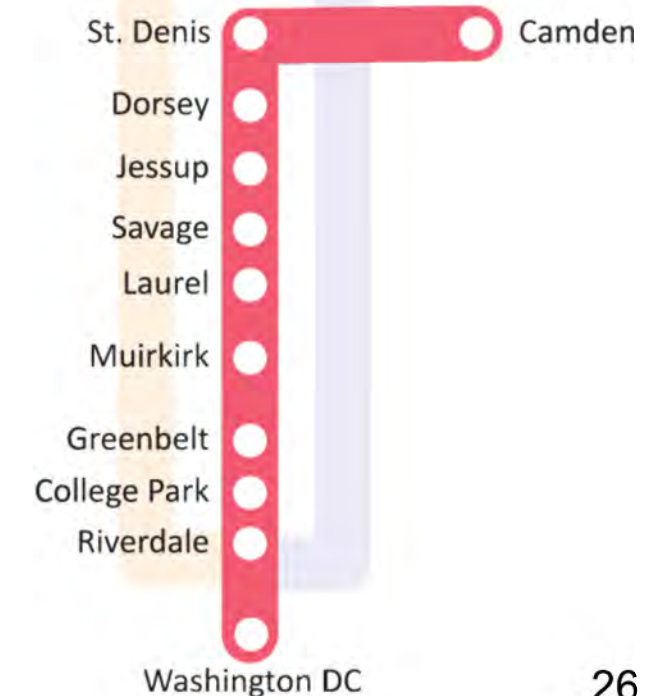
- One additional reverse peak service
- Washington Terminal planned expansion
- Maintain reliability at 95%

Enhance the Customer Experience - \$9 million*

- E-Ticketing
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders

Systemwide- \$138 million*

- Overhaul 26 MP36 diesel locomotives - \$65M
- GP39 (6) Repower 6 GP39 diesel locomotives - \$15M
- Overhaul 34 MARC IIB railcars - \$31M
- Overhaul 54 MARC IV multi-level railcars - \$27M



**Certain additional costs yet to be determined.*

Camden Line: Future 2030 to 2050 (Potential)

Maintain a State of Good Repair

- Parking facility expansions as needed
- Investments to support service extension from Camden through Baltimore terminal
- Continued expansion to 3 main tracks between Baltimore-Washington

Increase Ridership

- Peak headways reduced to 20 minutes

Improve Service

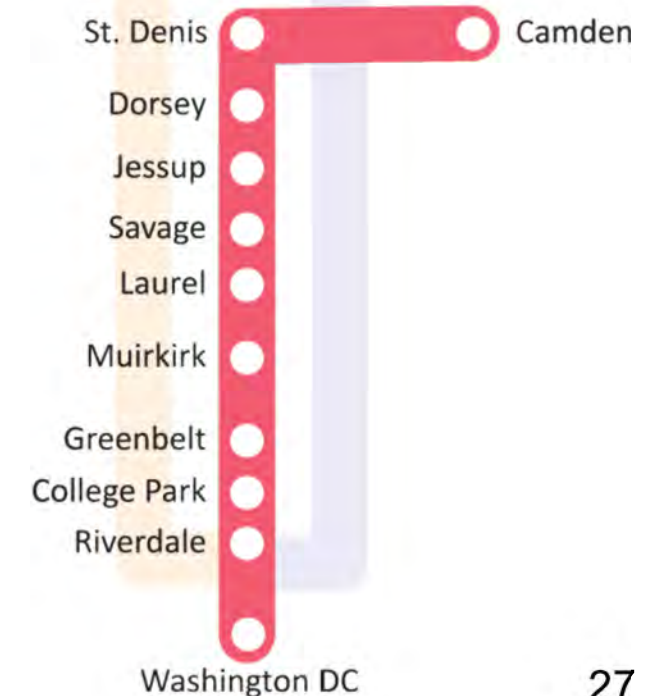
- Limited mid-day service
- Weekend service
- Washington Union Station Master Plan
- Maintain 95% on-time performance

Enhance the Customer Experience

- Expanded TOD presence
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders

Systemwide

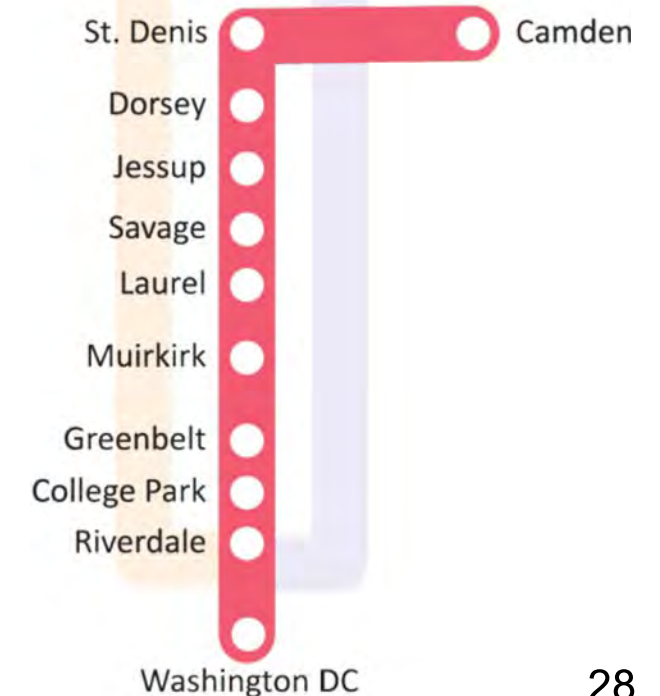
- Overhaul 26 MP36 diesel locomotives
- Purchase expansion diesel locomotives
- Replace 34 MARC IIB railcars
- Overhaul 63 MARC III railcars
- Overhaul 54 MARC IV multi-level railcars
- Overhaul 50 expansion railcars
- Purchase 50 expansion railcars



Camden Line – Summary

Camden Line Capital Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)	Total Cost (\$M)
Maintain a State of Good Repair	\$16*	\$126*	\$142*
Increase Ridership	\$10*	\$0*	\$10*
Improve Service	\$0*	\$51*	\$51*
Enhance the Customer Experience	\$7*	\$9*	\$16*
TOTAL	\$33*	\$186*	\$219*

Camden Line Operating Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)
Incremental Operating Costs	\$2/year*	\$4/year*



*Certain additional costs yet to be determined.

Brunswick Line: Near-Term 2013 to 2019 (Planned)

Maintain a State of Good Repair - **\$50 million***

- Explore parking facility expansions
- Positive train control

Increase Ridership - \$1 million*

- Lengthen existing trains to accommodate growing ridership
- Expand “Meet the MARC” connecting services

Systemwide - \$254 million*

- Procure 54 MARC IV multi-level railcars to replace plus increase number of seats - \$180 million
- Procure 10 new diesel locomotives to replace electric locomotives - \$40 million
- Overhaul 63 MARC III railcars - \$34 million

Improve Service – \$1 million*

- Expanding utilization of LOTS systems to increase connectivity
- Maintain 94-95% on-time performance

Enhance the Customer Experience - **\$7 million***

- ADA-Compliant Public Address System and LED signage
- Develop system uniformity standards (aesthetics, signage, brand)
- Closed Circuit Television System through Homeland Security Grants
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders



**Certain additional costs yet to be determined.*

Brunswick Line: Long-Term 2020 to 2029 (Potential)

Maintain a State of Good Repair - **\$176 million***

- 3 main tracks, Barnesville Hill
- Add another new Montgomery County station or expand an existing station
- Point of Rocks platform expansion providing access to Frederick branch and improved facilities
- Parking facility expansions as deemed necessary
 - Germantown Parking Garage
- Brunswick parking lot – additional access point
- Duffields – potential new station at Northport
- Brunswick Maintenance service facility expansion

Systemwide- \$138 million*

- Overhaul 26 MP36 diesel locomotives - \$65M
- GP39 (6) Repower 6 GP39 diesel locomotives - \$15M
- Overhaul 34 MARC IIB railcars - \$31M
- Overhaul 54 MARC IV multi-level railcars - \$27M

Increase Ridership - \$26 million*

- Lengthen existing trains to accommodate growing ridership
- New Corridor Cities Transitway Station at Metropolitan Grove

Improve Service - \$55 million*

- Increase limited stop and express service
- One reverse peak service to Brunswick
- One additional round trip from Brunswick to DC
- Washington Terminal planned expansion
- Maintain 94-95% on-time performance

Enhance the Customer Experience - **\$8 million***

- E-Ticketing
- Harpers Ferry ADA improvements
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders



**Certain additional costs yet to be determined.*

Brunswick Line: Future 2030 to 2050 (Potential)

Maintain a State of Good Repair

- Additional triple tracking
- Parking facility expansions to be determined

Increase Ridership

- Lengthen existing trains to accommodate growing ridership

Systemwide

- Overhaul 26 MP36 diesel locomotives
- Purchase expansion diesel locomotives
- Replace 34 MARC IIB railcars
- Overhaul 63 MARC III railcars
- Overhaul 54 MARC IV multi-level railcars
- Overhaul 50 expansion railcars
- Purchase 50 expansion railcars

Improve Service

- Increased peak and off-peak service
- Reverse commute service
- Improve Frederick branch service – 30 minute peak headway, increase number of trains from 3 to 6
- Limited reverse-peak service
- Washington Union Station Master Plan
- Maintain 94-95% on-time performance

Enhance the Customer Experience

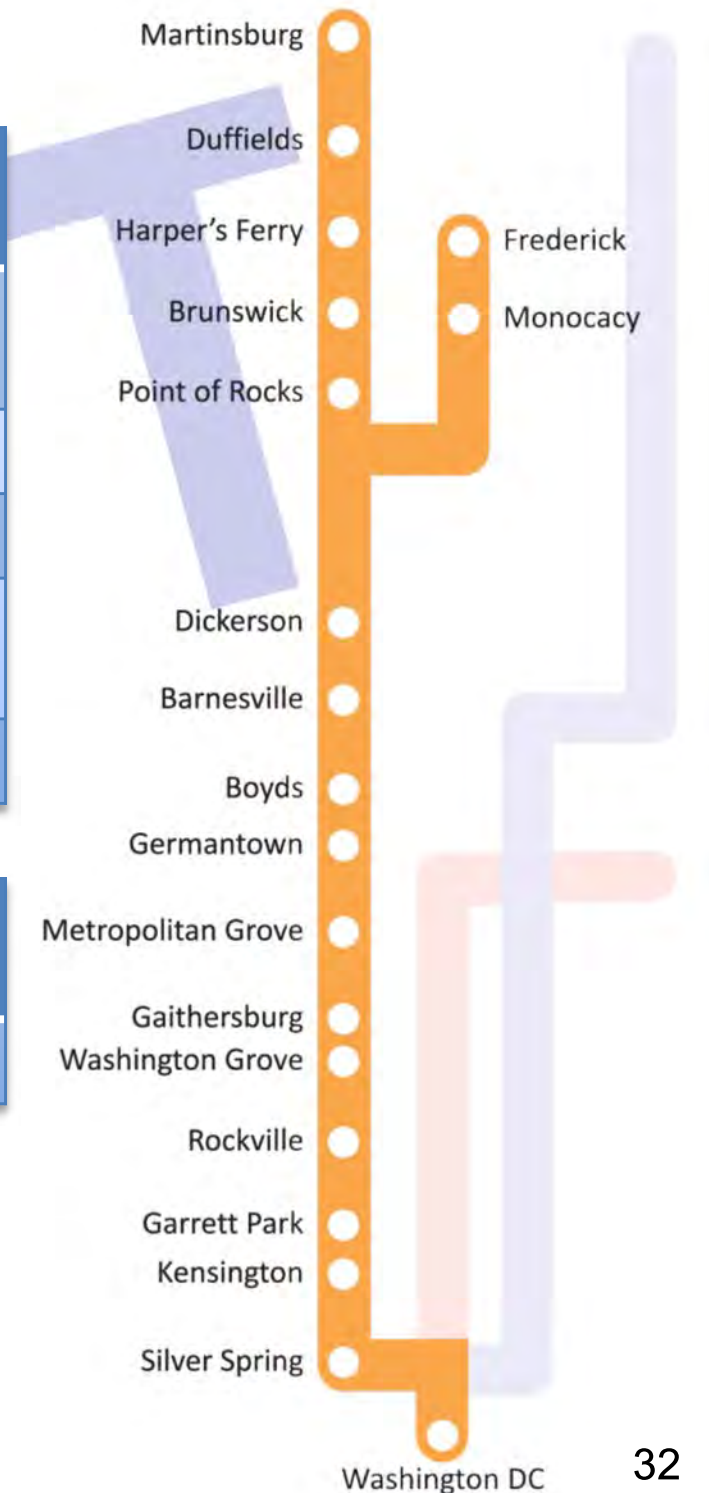
- Expanded TOD presence
- Install additional bike racks/lockers at stations
- Increase EV chargers available to riders



Brunswick Line – Summary

Brunswick Line Capital Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)	Total Cost (\$M)
Maintain a State of Good Repair	\$50*	\$176*	\$226*
Increase Ridership	\$0*	\$25*	\$25*
Improve Service	\$0*	\$55*	\$55*
Enhance the Customer Experience	\$7*	\$8*	\$15*
TOTAL	\$57*	\$264*	\$321*

Brunswick Line Operating Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)
Incremental Operating Costs	\$2/year*	\$6/year*



*Certain additional costs yet to be determined.

Overall Summary

All Capital Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)	Total Cost (\$M)
Systemwide	\$254	\$138	\$392
Penn Line	\$123	\$1,296	\$1,419
Camden Line	\$33	\$186	\$219
Brunswick Line	\$57	\$264	\$321
TOTAL	\$467	\$1,884	\$2,351

All Operating Improvements	Near-Term Cost (\$M)	Long-Term Cost (\$M)
Incremental Operating Costs	\$14/year	\$16/year

Please provide your comments on the
Draft MARC Growth and Investment Plan Update at:

MGIP@mta.maryland.gov

Or mail your comments to:

Maryland Transit Administration
Office of Planning and Programming
6 St. Paul Street, Room 923
Baltimore, Maryland 21202

Pedestrian Road Safety Audit

Middlebrook Road

From Father Hurley Boulevard to Waring Station Road

December 2017

Prepared for



Montgomery County
Department of Transportation

Prepared by

STV Incorporated
7125 Ambassador Road, Baltimore, Maryland 21244



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1. Introduction

1.1 Objective

The objective of this study was to complete a Pedestrian Road Safety Audit (PRSA) for Middlebrook Road between Father Hurley Boulevard and Waring Station Road in Germantown, Maryland. The study limits are shown in **Figure 1**. For the purpose of this report, Middlebrook Road is assumed to have an east-west orientation. The Corridor was selected for a PRSA based on its inclusion on the Montgomery County Department of Transportation's (MCDOT) list of High Incidence Areas (HIA). Montgomery County has recently adopted the international Vision Zero Initiative which strives to reduce the number of fatal and serious injury crashes to zero. A Two Year Action Plan has been finalized in November 2017 with input from the Pedestrian Bicycle and Traffic Safety Advisory Committee, community organizations, and the public. The audit was conducted to identify safety issues related to pedestrian and bicycle safety in the study area. As a result of the audit, the PRSA team has identified a variety of issues related to pedestrian and bicycle safety and developed a number of suggestions to improve overall safety in the audit area.

1.2 Background

The study area is an approximately 1.4 mile segment of Middlebrook Road located in Germantown, Maryland. The study area includes six signalized intersections at Father Hurley Boulevard, Century Boulevard, Germantown Road, Crystal Rock Drive, Great Seneca Highway, and Waring Station Road. There are three unsignalized intersections at Locbury Drive, Cross Ridge Drive, and Ridgecrest Drive as well as eight commercial driveways within the study area. Pedestrian activity throughout the study area is primarily generated by the adjacent shopping centers, residential land use, Seneca Valley High School at Crystal Rock Drive, and the public transit stops within the corridor.

The Middlebrook Road study area was identified as an HIA for pedestrian-related crashes, as part of the Montgomery County Executives' Pedestrian Safety Initiative. Based on crash data provided by MCDOT, 17 pedestrian crashes occurred during the study period from January 2011 through December 2015. The purpose of this PRSA is to identify safety issues that may be contributing to the reported pedestrian crashes in the study area.

The PRSA was performed on November 9 and November 10, 2016 during daytime and nighttime hours. The PRSA team consisted of nine members with expertise in pedestrian and bicycle safety and traffic engineering, representing:

- MCDOT,
- Montgomery County Division of Transit Services,
- City of Gaithersburg,
- Montgomery County Police Department,
- T3 Design, and
- STV Inc., the PRSA consultant.



Figure 1: Middlebrook Road PRSA Study Area

1.3 Organization of the Report

This report first presents a description of the existing geometric, operational, and safety conditions for the study area based on field reviews and available data. Next, the report details the existing conditions and general issues throughout the corridor identified by the PRSA team. Finally, the report presents suggestions for pedestrian safety improvements based on the issues identified throughout the corridor.

This report has served as a resource to SHA and MCDOT, as well as other stakeholders for implementing pedestrian safety improvements within the audit area. There has been an ongoing vetting of the suggestions and recommendations in this report with collaboration among agencies and stakeholders to implement short- and intermediate-term recommendations and to assess the feasibility and constructability of long-term projects such as signal timing upgrades or a road diet. Ultimately, as a result of this process, a range of pedestrian safety recommendations will be implemented.

1.4 Existing Conditions

1.4.1 Site Characteristics

Within the study area, Middlebrook Road is classified as a divided business arterial roadway from Father Hurley Boulevard to Germantown Road, and a major highway from Germantown Road to Waring Station Road. The roadway varies from four through lanes west of Germantown Road to six through lanes east of Germantown Road and serves Germantown, Maryland. The posted speed limit on Middlebrook Road is 40 miles per hour throughout the study area. During school hours (6:45 AM – 3:00 PM) the speed limit is 30 miles per hour in the school zone between Germantown Road and Great Seneca Highway. The lane geometry throughout the corridor is shown in **Figure 2**. The study area includes six signalized intersections:

- Middlebrook Road at Father Hurley Boulevard
- Middlebrook Road at Century Boulevard
- Middlebrook Road at Germantown Road
- Middlebrook Road at Crystal Rock Drive
- Middlebrook Road at Great Seneca Highway
- Middlebrook Road at Waring Station Road

Within the study area, there is also one unsignalized intersection with a marked crosswalk on Middlebrook Road which provides access between residential land uses and shopping centers:

- Middlebrook Road at Celebration Way

The roadways intersecting Middlebrook Road are summarized below:

Father Hurley Boulevard

- Four-lane divided roadway that runs in the north-south direction.
- Consists of a dedicated left lane, a through lane, and a shared through/right-turn lane in the north- and southbound directions.
- Connects residential communities north and south of Middlebrook Road. Provides access to I-270 approximately one-mile north of Middlebrook Road

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Celebration Way

- Two-lane roadway that runs in the north-south direction.
- Consists of a shared left/through/right-turn lane in the south- and northbound direction.
- Connects shopping centers to the south with the residential neighborhood to the north of Middlebrook Road.

Century Boulevard

- Two-lane roadway that runs in the north-south direction.
- Consists of a shared left/through/right-turn lane in the south- and northbound direction.
- Connects shopping centers north and south of Middlebrook Road.

Germantown Road

- Six-lane divided roadway that runs in the north-south direction.
- Consists of two dedicated left-turn lanes, two through lanes, and one through/right-turn lane in the southbound direction.
- Consists of two dedicated left-turn lanes, three through lanes, and one dedicated right-turn lane in the northbound direction.
- Connects residential communities and shopping centers north and south of Middlebrook Road. Provides access to I-270 approximately 0.5 miles north of Middlebrook Road.

Crystal Rock Drive

- Two-lane roadway that runs in the north-south direction.
- Consists of one left/through/right-turn lane in the south- and northbound directions.
- Connects residential communities north and south of Middlebrook Road. Provides access to Seneca Valley High School on the south side of Middlebrook Road.

Great Seneca Highway

- Four-lane divided roadway that runs in the north-south direction.
- Consists of two dedicated left-turn lanes and one dedicated right-turn lane in the northbound direction.
- Connects residential communities and shopping centers south of Middlebrook Road. Provides access to S. Christa McAuliffe Elementary School 0.4 miles south of Middlebrook Road.

Waring Station Road

- Roadway runs in the north-south direction.
- Three-lane roadway with a through lane in each direction and a Two -Way Left-Turn Lane south of Middlebrook Road.
- Consists of one dedicated left-turn lane and a shared through/right-turn lane in the southbound direction.
- Consists of a shared through/left-turn lane and a dedicated right-turn lane in the northbound direction.
- Connects to the US Department of Energy north of Middlebrook Road and residential communities south of Middlebrook Road.

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Middlebrook Road offers a number of pedestrian accommodations including concrete or asphalt sidewalk of varying width along both sides of Middlebrook Road throughout the entire length of the study area. Marked crosswalks and countdown pedestrian signals are provided at each of the signalized intersections. In addition, there is an unsignalized intersection crosswalk providing additional crossing opportunities at Celebration Way. There are bicycle accommodations to the east of Great Seneca Highway with a marked bike lane in both the east- and westbound directions.



Figure 2: Study Area Lane Geometry

1.4.2 Traffic Data

Average annual daily traffic (AADT) volumes in vehicles per day for Middlebrook Road were obtained from a count conducted at Waring Station Road and is provided in **Table 1**.

Table 1: 2016 AADT

Road	Location	AADT
Middlebrook Road	Waring Station Road	33,670 vpd

Total peak hour vehicular volumes entering the intersections, provided in vehicles per hour (vph), from turning movement counts on Middlebrook Road are shown in **Table 2**.

Table 2: Traffic Count Data

Year	Location	AM Peak Hour	AM Peak Volume	PM Peak Hour	PM Peak Volume
2016	Middlebrook Rd at Father Hurley Blvd	7:15 – 8:15 AM	1,893 vph	5:00 – 6:00 PM	2,269 vph
2016	Middlebrook Rd at Century Blvd	7:30 – 8:30 AM	1,407 vph	6:00 – 7:00 PM	1,967 vph
2016	Middlebrook Rd at Germantown Rd	7:30 – 8:30 AM	3,303 vph	5:00 – 6:00 PM	4,315 vph
2016	Middlebrook Rd at Crystal Rock Dr	7:15 – 8:15 AM	2,137 vph	5:45 – 6:45 PM	2,621 vph
2016	Middlebrook Rd at Great Seneca Hwy	7:15 – 8:15 AM	3,342 vph	5:30 – 6:30 PM	3,741 vph
2016	Middlebrook Rd at Waring Station Rd	7:30 – 8:30 AM	3,463 vph	5:00 – 6:00 PM	3,886 vph

There are 16 bus stops within the study area, eight on the north side and eight on the south side of Middlebrook Road, that serve Montgomery County Ride On bus routes 97 and 74. Route 74 is only accessed by two stops on the corridor located between Crystal Rock Drive and Great Seneca Highway with headways of 27 to 45 minute headways during weekdays, while Route 97 services all 16 bus stops within the study area with headways of 15 to 30 minutes during weekdays. There are no bus stops located between Century Boulevard and Crystal Rock Drive, as buses use these roads to travel to the Germantown Transit Center.



Figure 3: Study Area Bus Stops

1.4.3 Crash Data

The PRSA team reviewed all crash records collected by the Montgomery County Police Department in the study area during the study period from January 2011 through December 2015 to identify the location of all the reported pedestrian and bicycle crashes within the corridor. **Figure 4** summarizes the location, date, time, severity, type, and ambient conditions of each reported pedestrian and bicycle crash.

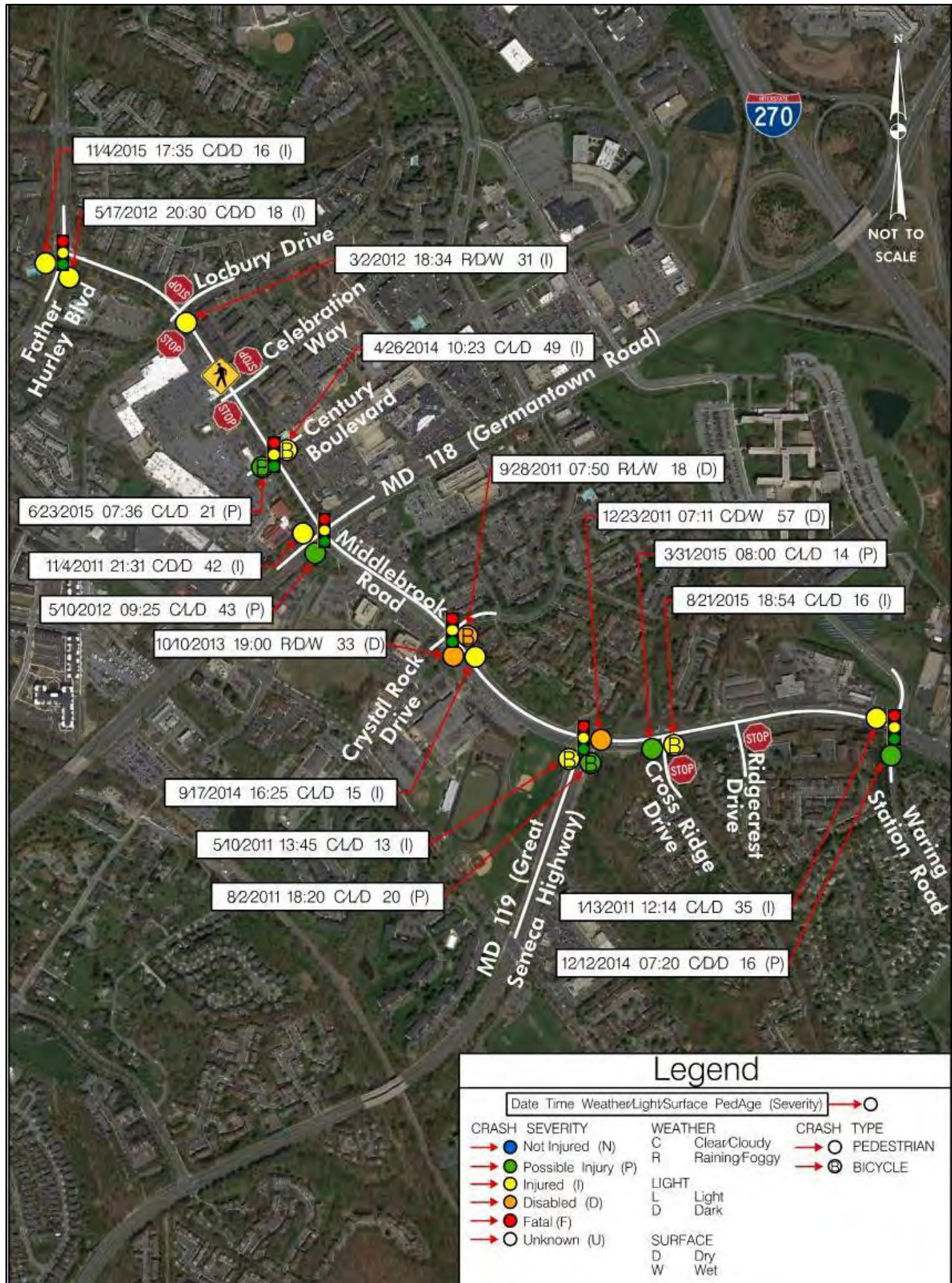


Figure 4: Pedestrian Crashes on Middlebrook Road 2011 – 2015

As shown in **Figure 5**, 17 pedestrian-related crashes occurred during the study period, 6 of which involved cyclists. The bicycle crashes occurred both within the area where bicycle lanes are provided east of Great Seneca Highway and the area where bicycle lanes are not provided west of Great Seneca Highway. There were 302 vehicle crashes within the study limits from 2011 through 2015, of which 53 crashes (18%) occurred at or near the Waring Station Road intersection, 50 crashes (17%) occurred at or near the Great Seneca Highway intersection, and 47 crashes (16%) occurred at or near the Germantown Road intersection. The number of vehicular crashes has varied over the years with no significant pattern over the 5 year study period. Although vehicular crashes are not the focus of this audit, additional future study of vehicular crash patterns at these intersections should be considered.

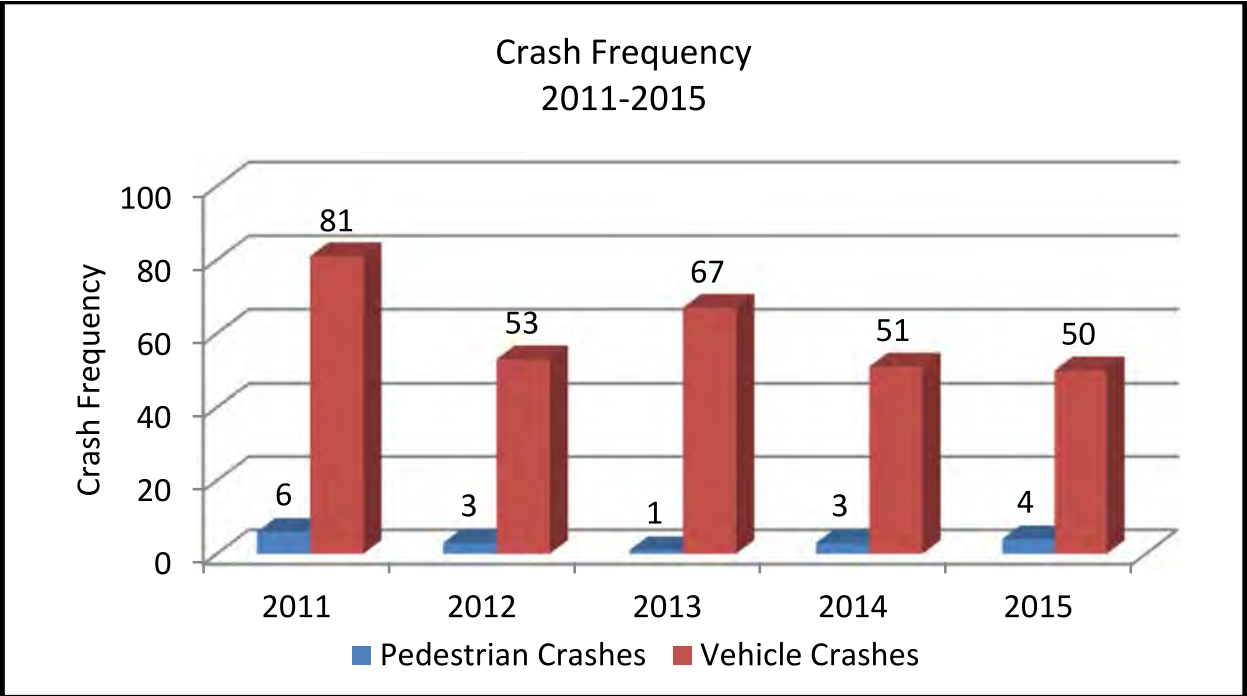


Figure 5: Study Area Crash Frequency

Figure 6 shows the pedestrian crash severity for the seventeen pedestrian crashes. Three of the crashes resulted in disablement of the pedestrian, and nine crashes resulted in injury. The other five pedestrian crashes resulted in possible injury. There were no crashes that resulted in fatalities during the study period.

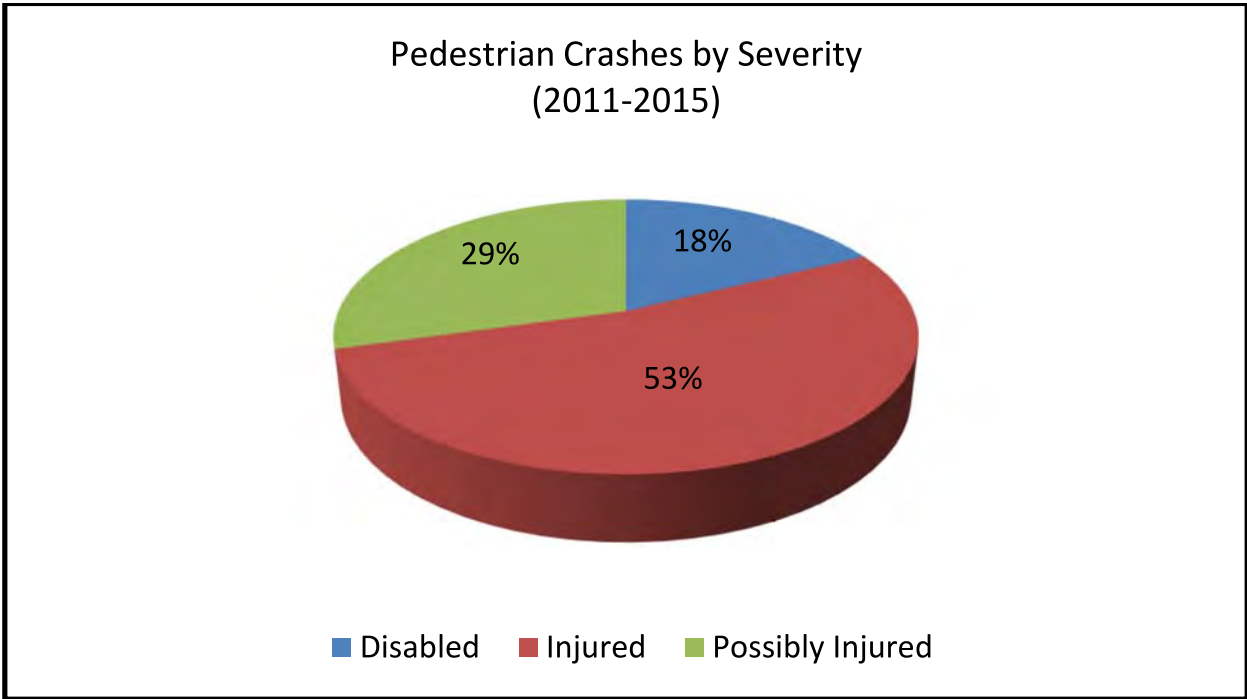


Figure 6: Pedestrian Crashes by Severity

Figure 7 shows the vehicle movements prior to the pedestrian crashes. As shown, 12 of the 17 pedestrians involved in crashes were struck by a vehicle making either a left or right turn. Based on field observations,

there are significant conflicts between turning vehicles and pedestrians in the crosswalk both during the Walk and Flashing Don't Walk phases of the pedestrian signal.

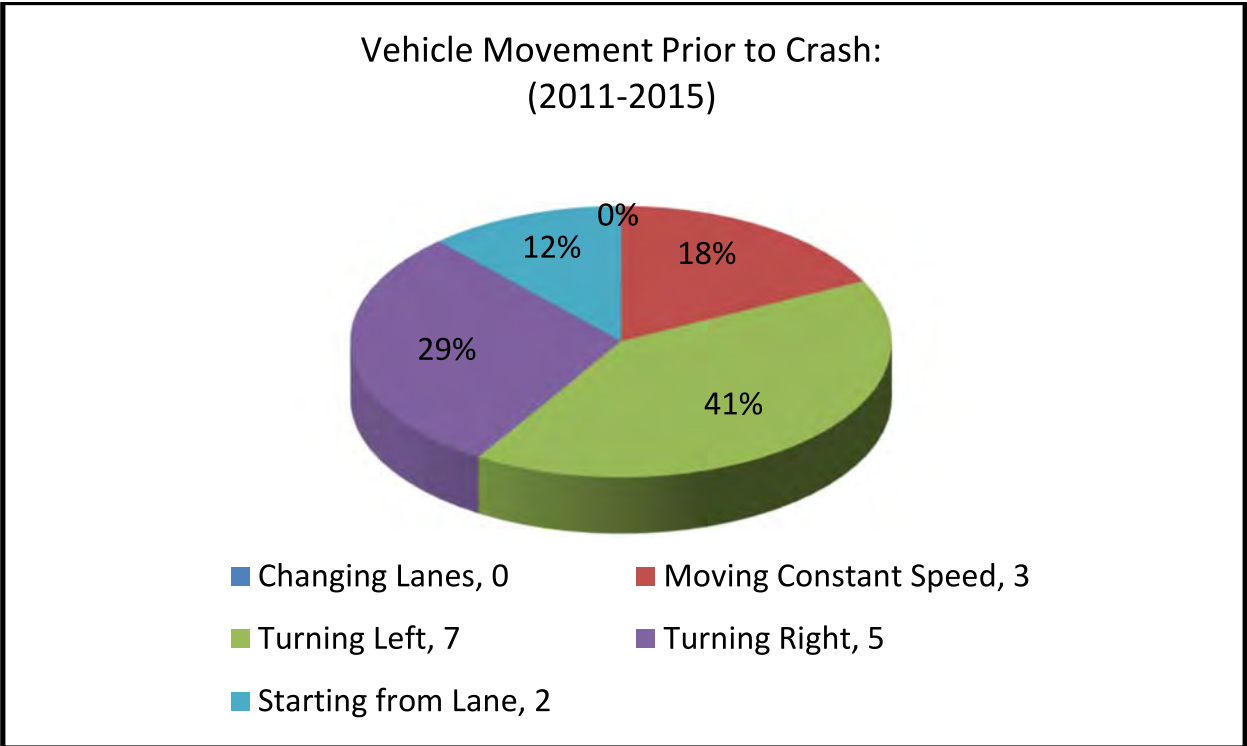


Figure 7: Vehicle Movement Prior to Pedestrian Crash

Figure 8 shows the distribution of pedestrian crashes compared to the distributed frequency of crashes by age group based on study area residential demographics. 2010 Census data (www.census.gov) for the study area zip code was obtained in order to distribute the total number of crashes (17) over the age demographics of the surrounding population. This was done in order to provide a comparison between the actual number of pedestrian crashes by age group (shown in red) and the distributed number of pedestrian crashes by age group based on the census data (shown in blue). Of the 17 pedestrians involved in crashes, eight (47%) were under the age of 20 (ages 13, 14, 15, 16, 16, 16, 18, and 18). When compared to the study area demographics from the census data, the under 20 age group is over-represented in the 2011-2015 pedestrian crash data, while the over 50 age group is under represented. This trend is consistent with field observations and can be attributed to the high school in the study corridor.

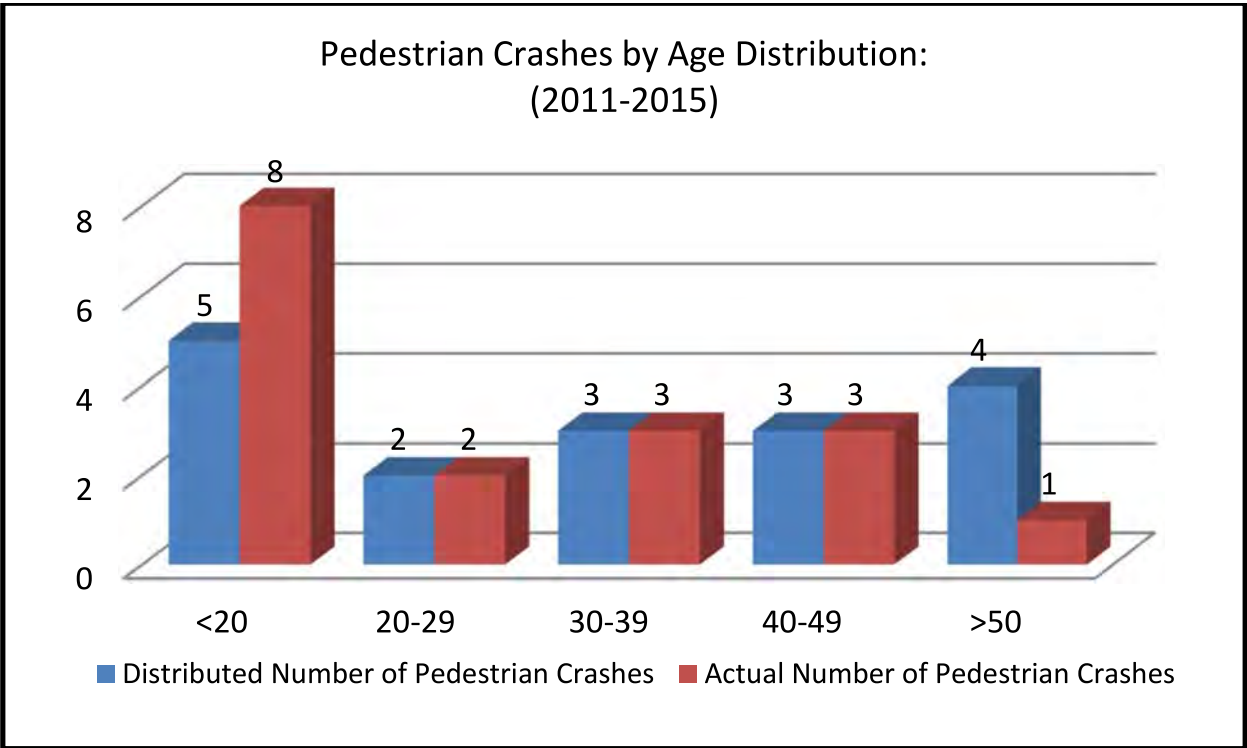


Figure 8: Pedestrian Crashes by Age

As shown in **Figure 9**, the majority of pedestrian crashes were uniformly distributed throughout the day from 6 AM to 12 AM, with no pedestrian crashes occurring during the pre-AM peak hours. Based on this information, time of day was not a significant factor in the pedestrian crashes. However, it should be noted that the high school arrival and dismissal times are currently 7:45 AM and 2:30 PM, respectively, which fall within the AM Peak and Midday categories, though these bell times were implemented in the 2015-2016 school year and were 20 minutes earlier during the earlier years that crash data was analyzed.

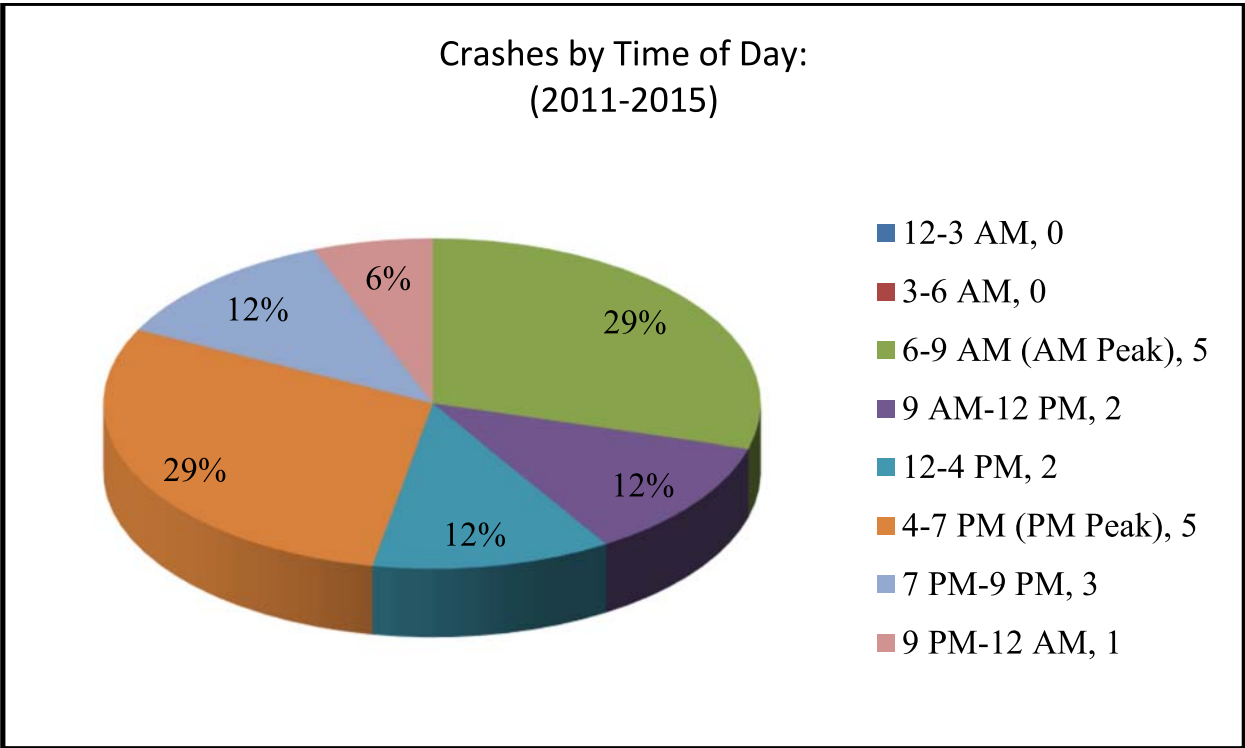


Figure 9: Pedestrian Crashes by Time of Day

Ten of the 17 pedestrian crashes occurred under daylight conditions. The other crashes occurred while dark when street lights were on. While the crash reports did not indicate that lighting was a contributing factor in any of the pedestrian crashes, it should be noted that several locations within the corridor appeared to not be adequately lit based on industry standards during the field audit.

Thirteen of the 17 pedestrian crashes occurred under dry pavement conditions. The crash reports did not indicate that weather was a contributing factor in any of the pedestrian crashes.

2. Road Safety Audit Findings

2.1 Safety Benefits of Existing Roadway Features

Notable existing roadway features that enhance pedestrian safety in the study area include, but are not limited to:

- **Continuous Sidewalks:** A concrete or asphalt sidewalk of varying width is present along the north and south sides of Middlebrook Road. A concrete sidewalk is also provided along both sides of Father Hurley Boulevard, Locbury Lane, Celebration Way, Century Boulevard, Germantown Road, Crystal Rock Drive, Great Seneca Highway, Ridgecrest Drive, and the south side of Waring Station Road. Concrete sidewalk is provided along one side of White Saddle Drive and the north side of Waring Station Road. The majority of the sidewalks are five feet in width, but there are some places where they are three feet in width, which is less than the five feet required by Montgomery County’s Context Sensitive Road Design Standards.

- **Pedestrian Signage:** Pedestrian crossing and advanced pedestrian signs are located along east- and westbound Middlebrook Road.
- **Countdown Pedestrian Signals (CPS):** Countdown pedestrian signals are provided at all six of the study’s signalized intersections. Countdown pedestrian signal research has shown that pedestrians easily understand how the signal works, that more pedestrians start during the Walk phase, and that fewer people initiate walking late in the clearance phase. Studies have also shown that few pedestrians remain in crosswalks during the steady Don’t Walk phase where countdown signals are used.
- **Accessible Pedestrian Signals (APS):** Accessible pedestrian signals are provided at the signalized intersections of Great Seneca Highway and at Germantown Road. Accessible pedestrian signals provide direction through audible and tactile signals which help pedestrians with hearing and visual impairments to cross the street safely.



Figure 10: Countdown Pedestrian Signal

2.2 Opportunities for Improvements

The Middlebrook Road PRSA team identified a number of pedestrian safety issues in the study area during the audit. These issues were discussed by the team and prioritized to identify the issues presenting the greatest impediments to pedestrian safety in the study area. This section describes the observed safety issues identified by the PRSA team and suggests improvements to address each issue.

Seneca Valley High School

Seneca Valley High School is located at the intersection of Middlebrook Road and Crystal Rock Drive, with two driveway access points east of Crystal Rock Drive along the south side of Middlebrook Road. The student drop off loop and additional parking is accessed from Crystal Rock Drive. Many school students were observed crossing Middlebrook Road at Crystal Rock Drive during school arrival and dismissal times (7:45 AM and 2:30 PM, respectively), and nearly half of the pedestrian crashes (8 of 17) involved high school-aged children. Students were also observed utilizing public transit to travel to and from school.

Seneca Valley High School is being rebuilt on the existing site and is slated to be completed by August 2019. As part of this redevelopment, the vehicular access point to the site are anticipated to change. Current plans show that the parking lot access and student drop off loop will remain on Crystal Rock Drive, while the additional parking areas are proposed to be access from Wisteria Drive, effectively closing the driveway access points on Middlebrook Road. While the reconfiguration of the school access points is expected to reroute pedestrians away from Middlebrook Road, the new school is expected to nearly double the capacity of the existing school (1,300 existing to 2,400 future students), potentially increasing the number of students crossing the street. The audit team recommends that at the completion of construction, the intersection of Middlebrook Road at Crystal Rock Drive be further reviewed to determine how the change in school access points has affected pedestrian travel patterns at this intersection.

Maryland-National Capital Park and Planning Commission (M-NCPPC) Road Diet Study

M-NCPPC, has conducted a road diet feasibility study in support of the MARC Germantown Rail Plan update. The study includes analysis of two proposed cross-sections on Middlebrook Road between Germantown Road and Great Seneca Highway that reduce vehicular travel lanes in order to install bicycle facilities, such

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as buffered bike lanes or a protected bike path, which would tie into existing bike lanes provided on Middlebrook Road east of Great Seneca Highway.

Based on the field audit, there appears to be potential available capacity for vehicles on Middlebrook Road between Great Seneca Highway and Germantown Road. The intersection of Middlebrook Road at Crystal Rock Drive is a heavily crossed intersection due to its proximity to Seneca Valley High School, and the wide travel lanes and 6-lane section contribute to a vehicle centered design within this section. Removing travel lanes at this intersection and potentially reducing pedestrian crossing distances would reduce pedestrian exposure to vehicular conflicts and help calm vehicular traffic. Based on discussions with M-NCPPC, the audit team supports further consideration of the recommendation for the road diet which M-NCPPC is scheduled to present to the Planning Board in December 2017.

Pedestrian-Vehicle Conflicts

At multiple locations along the corridor, pedestrians were observed crossing outside of marked crossings or during the Don't Walk phase of the pedestrian signal. Additionally, conflicts between turning vehicles and pedestrians crossing during the Walk phase were observed. The audit team recommends coordination with the MCDOT Pedestrian Safety Coordinator and Seneca Valley High School to increase pedestrian education about where and when to cross and recommends that signal phasing changes, such as protected left-turn phases or Leading Pedestrian Intervals (LPIs), be evaluated where turn conflicts are present.



Left: Pedestrian crosses during Don't Walk phase. Right: Pedestrian crosses outside of marked crosswalk.
Figure 11: Examples of Pedestrian-Vehicle Conflicts

Pedestrian Facility Conditions

A number of issues related to pedestrian facilities were observed during the audit. Examples include lack of crosswalk markings across side-streets, faded crosswalks, and no Accessible Pedestrian Signals (APS) at some intersections.



Left: No marked crosswalks across side streets. Right: Crosswalk markings are faded.

Figure 12: Examples of Pedestrian Facility Issues

The audit team identified a number of suggestions to improve the condition of the existing pedestrian facilities including, but no limited to, the installation of crosswalks across all side-streets, restriping pavement markings for crosswalks and stop bars along Middlebrook Road, and installing APS where applicable.

Maintenance

A number of conditions were observed that may contribute to pedestrian safety issues that could be resolved through maintenance improvements. Such issues include signs that are damaged, sidewalk that is damaged or overgrown with vegetation.



Left: Damaged sidewalk on the south side of Middlebrook Road. Center: Sign is leaning east of Great Seneca Highway. Right: Overgrown vegetation greatly reduces sidewalk width.

Figure 13: Examples of Maintenance Issues

The audit team recommends that all damaged or missing signs be replaced and that all foliage along the sidewalk be trimmed to maintain the full available width of walkable space. The condition of the sidewalk should be assessed along Middlebrook Road and the feasibility of repairs should be evaluated.

Lighting Conditions

While the majority of crashes occurred during daylight, observations during dark conditions indicated that multiple light fixtures were non-functioning and have been reported for repair. Additionally, the unsignalized crossing at Celebration Way did not have dedicated lighting to improve pedestrian visibility at night.

Lighting throughout the study area can be improved by inspecting street lighting for repair. The audit team also recommends evaluating the feasibility of additional street lighting at the unsignalized crosswalk near Celebration Way.

2.3 Summary of Issues and Suggestions

The following section provides a summary of the issues identified during the PRSA process and the suggestions for improvements at each location discussed in this report. The anticipated timeframe for completion [Short Term (ST), Intermediate (I) and Long Term (LT)] is referenced after each suggestion.

Safety Issue	Suggestion(s)
Pedestrian Vehicle Conflicts	<ul style="list-style-type: none">Consider installing lane arrow pavement markings along Middlebrook Road and lane usage or shoulder markings, particularly on side streets, where applicable. (ST)Restripe all faded stop bars along the corridor. (ST)Consider installing Turning Traffic Yield to Peds signs (R10-15L) at intersections with permissive left turns. (ST)Work with MCPD to ensure appropriate levels of enforcement of posted speed limits. (I)Consider coordination with the MCDOT Pedestrian Safety Coordinator to increase pedestrian education and enforcement along Middlebrook Road. (I)Determine the feasibility of installing a Leading Pedestrian Interval at signalized intersections with high left and right turn conflicts. (LT)Evaluate the feasibility of adding protected left turn phases for applicable approaches to reduce conflicts. (LT)Evaluate the traffic signal coordination along Middlebrook Road to help create gaps at unsignalized intersections. (LT)Consider installing speed limit sign (S5-1) with flashing lights during school hours to better notify vehicles of the speed reduction. (LT)Evaluate right turn radii, particularly at the Great Seneca Highway and Father Hurley Boulevard intersections, for opportunities to reduce turn radii to reduce crossing distances and vehicular speeds. (LT)Evaluate the feasibility of a road diet on Middlebrook Road between Crystal Rock Drive and Great Seneca Highway to assist with lowering speeds and reducing crossing distance as discussed in the M-NCPPC study. (LT)

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Pedestrian Facility Issues	<ul style="list-style-type: none">▪ Consider installing pedestrian warning signs (W11-2) along the north and south sides of Middlebrook Road, where applicable. (ST)▪ Consider installing Detectable Warning Surfaces (DWS), where necessary, to comply with ADA requirements. (ST)▪ Consider restriping faded crosswalk markings and updating crosswalk markings to ladder markings where applicable. (ST)▪ Consider installing crosswalks at unsignalized intersections, where applicable. (ST)▪ Assess the condition of damaged sidewalk and asphalt path and determine the feasibility of repairs. (I)▪ Consider relocating pedestrian push buttons to conform to ADA standards. (LT)▪ Determine the feasibility of reconstructing sidewalk ramps to align with adjacent crosswalks where feasible. (LT)▪ Consider installing or repairing the Accessible Pedestrian Signals (APS) where applicable. (LT)▪ Evaluate the pedestrian crossing times at the signalized intersections to ensure that the Flashing Don't Walk interval meets standards. (LT)▪ Consider the installation of green pavement for conflict areas within the marked bicycle lanes. (LT)▪ Consider installing Rectangular Rapid Flashing Beacons (RRFB) on the pedestrian warning signs at the unsignalized crosswalk at Celebration Way. (LT)
Maintenance	<ul style="list-style-type: none">▪ Trim the foliage blocking signage along the corridor. (ST)▪ Trim the foliage along and above the sidewalk. (ST)▪ Replace all damaged or faded signage throughout the study area. Evaluate sign size to prevent vehicular damage to future signs. (ST)▪ Consider adding route information to the bus stop signs throughout the corridor. (ST)▪ Consider installing missing Keep Right (R4-7) signs in intersection medians where applicable. (ST)▪ Consider reinstalling raised pavement markers to the correct height between Great Seneca Highway and Waring Station Road. (LT)
Lighting	<ul style="list-style-type: none">▪ Inspect street lighting throughout the corridor and repair or replace as necessary. (ST)▪ Determine the feasibility of additional street lighting at unsignalized locations where pedestrians cross Middlebrook Road. (LT)▪ Consider installing higher wattage lights between Germantown Road and Crystal Rock Drive. (LT)