PREPARED BY

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Final Report

MD 32 Enhanced Bus Feasibility Study

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BALTIMORE METROPOLITAN COUNCIL

ANNE ARUNDEL COUNTY MARYLAND

CONTENTS

Introduction

Suburb-to-suburb transit has proven challenging in central Maryland with very few routes operating at even a moderate level of ridership nor service span or frequency that could attract more; however, over the past 20 years there have been broad discussions about establishing a core east-west transitway in various parts of the MD 100, MD 175, and MD 32 corridors. Through a grant from the Baltimore Regional Transportation Board's Unified Planning Work Program, the Anne Arundel County Office of Transportation was tasked with leading a study to determine the feasibility of bus rapid transit or enhanced bus service in the MD 32 corridor between Annapolis and Clarksville. Activity centers and targeted growth areas such as Annapolis/Parole and Odenton Town Centers, BWI Airport, Fort Meade, the US 1 corridor, Columbia Gateway, and Columbia Town Center each have specific access, circulation, and mobility needs which, if strung together, could meet the thresholds for a transitway with higher frequency and capacity.

This report assesses the opportunities for enhanced bus service in the MD 32 corridor. The report begins by outlining the various forms that enhanced bus service can take, enumerating existing transit service within the corridor, and describing the land use areas and trip generators that enhanced bus service in the MD 32 would seek to connect. The report then presents alignment alternatives considered, divided into four segments, and proposes a preferred alignment and phasing program, defines station types and , presents implementation considerations and related steps that would increase the likelihood of successful service.

Planning and Evaluating Enhanced Bus Service

The concept of "enhanced bus service" has many meanings and elements with respect to the amount and characteristics of service provided, the running way, vehicles, stations, and other matters. Enhanced bus service can evolve over time as demand warrants and opportunities arise to make coordinated land use and transportation investments.

A few commonly described forms of "enhanced bus service" are:

- **Express Bus** typically operates as a limited stop version of a local bus route using the same vehicles as local bus routes.

- **Commuter Bus** is generally characterized by the use of over-the-road coaches carrying 40 to 60 passengers from outlying areas to urban centers, and in some cases from suburb to suburb with a passenger travel time of 45 minutes or more. Commuter bus service is typically provided from a park-and-ride lot and can be operated directly by or under contract to a transit agency. Commuter bus fares are typically paid by monthly or multi-trip tickets based on distance travelled (zone-to-zone). Commuter bus service generally operates in peak-period, period-direction and may have some limited mid-day or reverse commute component.

- **Bus Rapid Transit** can take many forms and should be thought of as a toolbox of approaches which improve the speed, reliability, and convenience of local bus service but in a dedicated corridor or guideway. The Federal Transit Administration (FTA)[1] and the Maryland Department of Transportation (MDOT)[2] have defined BRT in similar ways and both have published guidelines for its planning and implementation.

[1] US Department of Transportation/Federal Transit Administration. (June 2016). *Final Interim Policy Guidance Federal Transit Administration Capital Investment Grant Program*. Washington, DC.
[2] Maryland Department of Transportation. (2018). *A Guide to Evaluate the Feasibility of Bus Rapid Transit* Hanover, MD.
It is worth noting that the guidance document was published by MDOT under the Hogan Administration and many observers perceived it to be a political document as pretext for withdrawing MDOT's support for BRT projects such as the Corridor Cities Transitway and Southern Maryland Regional Transit and transferring responsibility from the projects to the local governments. Nonetheless, the guidance provides useful descriptive and evaluation tools.

Existing Transit Services[3]

Transit services operating outside of the urban cores of Baltimore and Washington mostly provide access to jobs, health care and social services for those with few mobility options. More than 65% of all trips on the Central Maryland Regional Transit Authority (RTA) and county-operated bus services are for work-related purposes, and 85% of RTA riders do not own a vehicle. Seventy-six percent of all riders have an average annual income of $40,000 or less.

Multiple transit providers currently serve the corridor with linkages to the core urban systems in Baltimore and Washington, DC. Figure *1* illustrates the existing transit service within the study corridor, which is characterized by several north-south regional lines and a density of local (RTA) bus service in the western portion of the corridor. Figure 2 illustrates the relative density of transit trips between the primary activity centers within the study area.

MTA's regionally operated services include Light Rail Link, MARC and Commuter Bus service to Baltimore, Annapolis, Washington, DC and the I-270 corridor.

The RTA operates fixed-route and demand-response services within Anne Arundel, Howard, northern Prince George's Counties, and the City of Laurel. The RTA operates fifteen fixed routes throughout its service area. The routes are divided into numbering sequences:

- 200 series routes serve Anne Arundel County; Arundel Mills Mall serves as the primary transfer location,
- 300 series routes serve the City of Laurel; Towne Centre at Laurel serves as a major transfer location,
- 400 series routes serve Howard County; Columbia Mall serves as the primary transfer location, and
- 500 series routes provide regional connections between counties

Over the past two years, Anne Arundel County has taken over operation of certain services from RTA and operates routes 201 and 202. In addition, Anne Arundel County operates:

- the County Connector service between BWI Airport/Business District and Arundel Mills (in partnership with the BWI Business Partnership.
- the Crofton Connector that runs between the Odenton MARC Station and the two controlled gates to Fort Meade along Odenton Road (MD 175)

Other services in the area include:

- the BWI Airport Shuttle runs continuous shuttles to the BWI MARC Station and the BWI Consolidated Rental Car Facility on Ridge Road (near Arundel Mills) every five to ten minutes throughout the day.
- The privately-operated Bay Runner Shuttle operates between BWI Airport and the Eastern Shore via Parole three times daily with reservations required.

Total transit system ridership in central Maryland has had a long-term growth trend since the early 1990s, although in the two years prior to and throughout the COVID pandemic ridership has declined in parallel with national trends. This is generally attributed to the impact of low gasoline prices (which attracts a shift to auto use) and the growth of TNCs such as Uber and Lyft which offer demand-responsive transportation. In the case of the RTA, ridership is also likely affected by a decline in service reliability related to the aging fleet. Due to deep revenue losses, MTA has proposed to discontinue or significantly

[3] This section adapted from the Central Maryland Transit Development Plan, January 2018, prepared by the KFH Group for Howard and Anne Arundel County governments. All mapping of existing services is as of September 15, 2020.

reduce service on many of its regional routes. Whether these reductions are permanent or simply reflective of near-term revenue shortfalls remains to be seen.

Key Takeaways Regarding Existing Transit Services

- The most transit service today operates between BWI Airport and BWI MARC Station and between Columbia Mall and East Columbia/Gateway. Comparably less service extends as far south/east as Parole. No service extends further west to Clarksville.
- Overall, service within the area is dispersed, lacks evening and weekend span, and has frequency that does not lend itself to a significant consolidation in the form of bus rapid transit.
- County investments in the locally operated transit systems are critical to providing equitable transportation services to all residents. Further expansion of the RTA system should be considered from an equity and quality perspective rather than creating new local services which may ultimately dilute existing services.

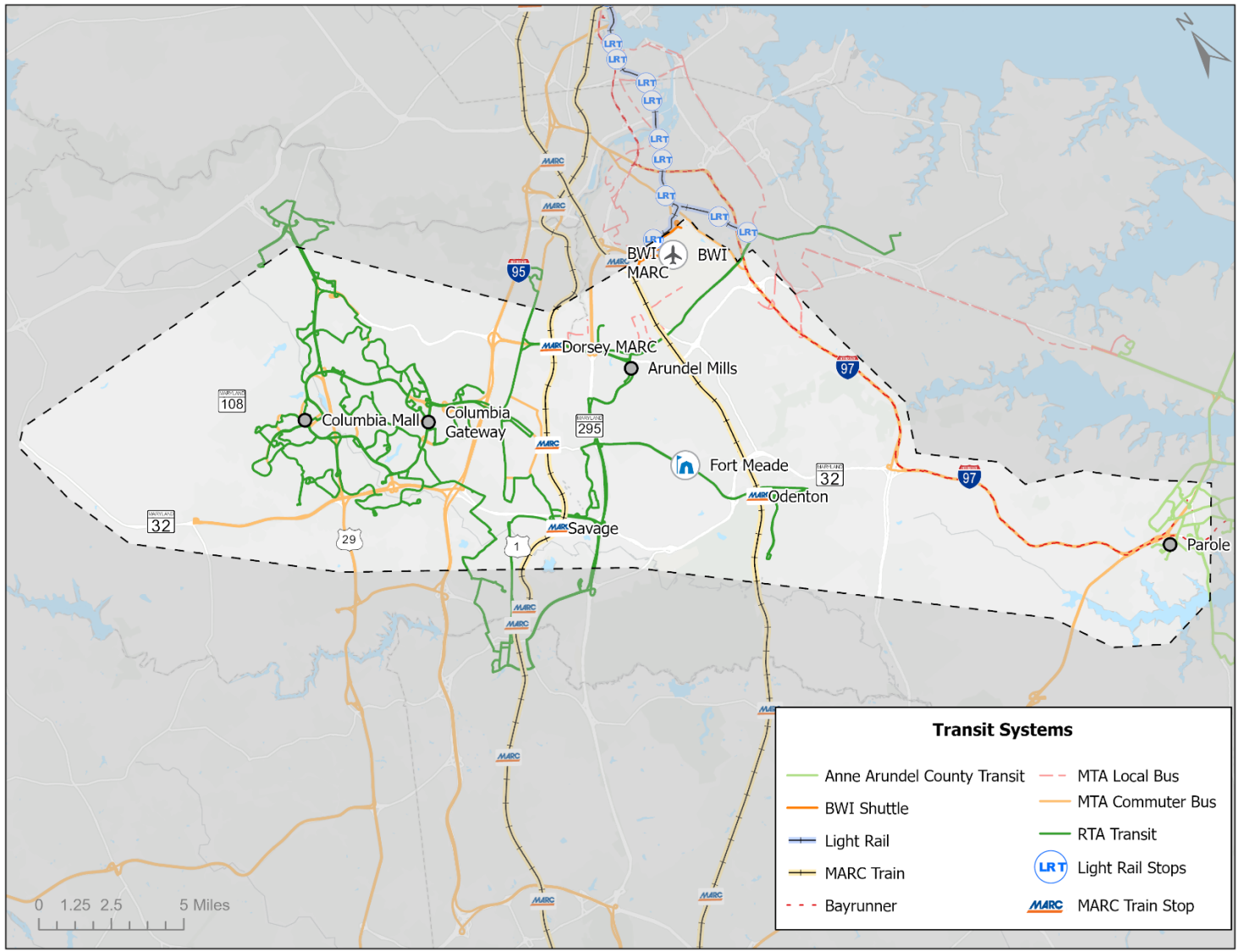


Figure 1: Existing Transit Service

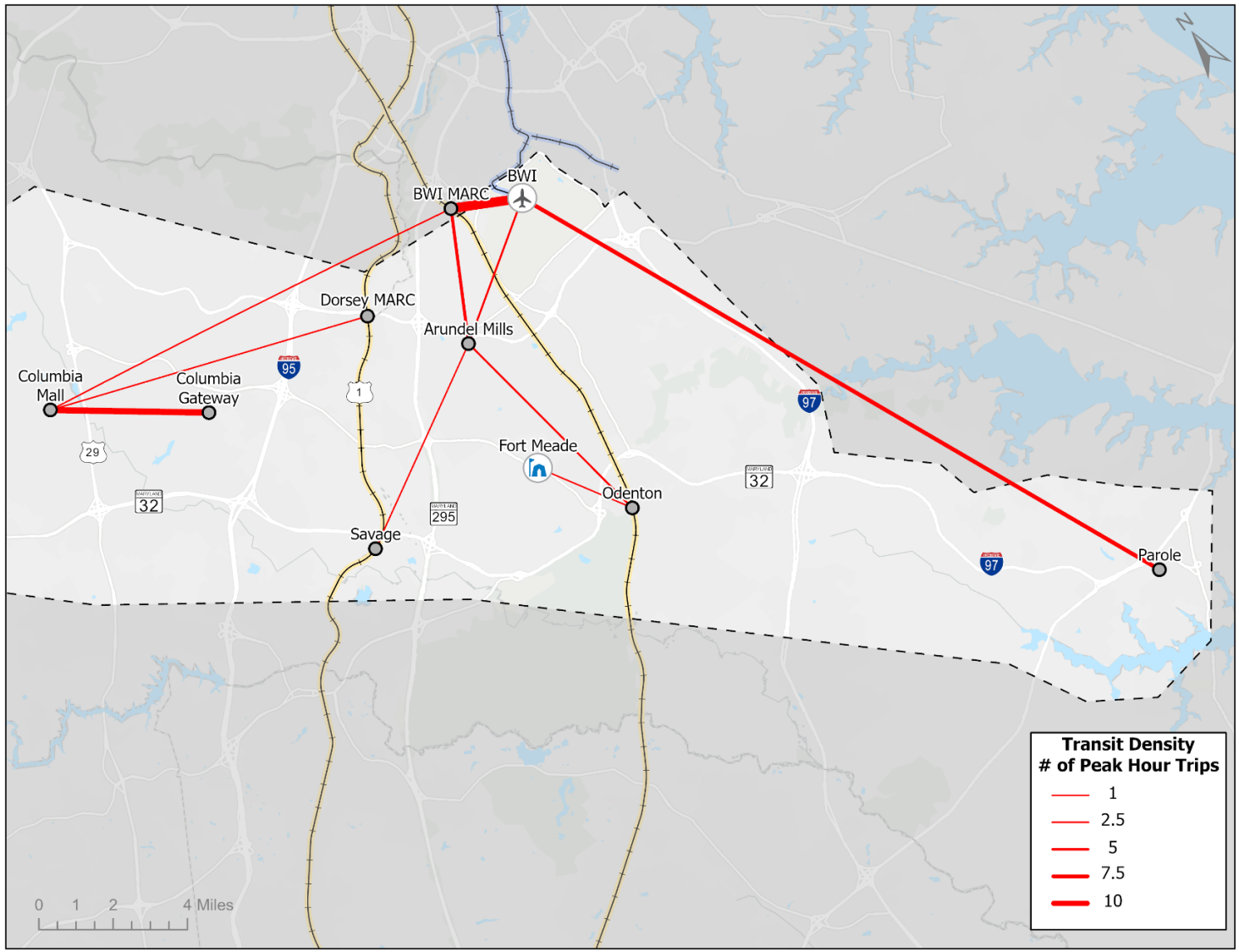


Figure 2: Schematic View of Transit Service by Number of Peak Hour Trips

Land Use, Major Trip Generators, Targeted Growth Areas, and Transit Hubs

The study area is generally characterized by low-to-moderate density residential and commercial land uses, with a few nodes of moderate-to-high density residential and employment areas occur along the corridor with additional density envisioned in certain areas by local land use plans. Broadly speaking, the areas north of MD 100 are largely settled and characterized by older residential communities, some of which are undergoing a generational and socioeconomic transition – especially in the area north of BWI Airport. The area between MD 100 and MD 32 has grown rapidly over the past two decades with a mix of various industrial, commercial, and office uses, such as Arundel Mills, Fort Meade and Columbia which are synergistic from an employment/residential perspective and having excellent north-south access via I-95, MD 295, and US 29. South of MD 32 is mostly residential with many new subdivisions having been built since the early 1990s. Large sections of the corridor also include light industrial, warehousing, distribution and flex space, especially near BWI Airport, Fort Meade and in the US 1 corridor.

Specific major trip generators and targeted growth areas are as follows.

Parole Town Center

Parole is one of Anne Arundel County's three designated Town Centers. The 1994 Parole Urban Design Concept Plan identified four goals for Parole: a "high quality system of new streets and public spaces friendly to pedestrians and linking north and south Parole," "land uses which complement commerce and support twenty-four hour community activities," development distributed "to achieve a community focus in balance with present and future transportation facilities," and preserved "natural areas and water quality as part of an open space system."

The plan outlined desired improvements in five functional areas—Circulation, the Environment, Settings and Buildings, Streetscape, and Pedestrians and Public Spaces—and offered design concepts for eleven sub-areas within Parole. Finally, the 1994 plan included a phasing and implementation program that identified key actions and a monitoring and evaluation program for the plan's recommendations. Under that plan, the Town Center has enhanced its status as a regional shopping and employment destination while also becoming home to about 8,500 people.

The plan includes specific reference to an Intermodal Transfer Center that would provide access between Parole and Annapolis via enhanced local transit, as well as commuter bus service to Baltimore and Odenton. Transit connections to points further west along MD 32 are not discussed in the plan.

The County is now updating the 1994 plan, and has articulated a vision that "by 2040, Parole will be a vibrant and authentic place offering a variety of employment opportunities; high-caliber service providers; commercial, dining and entertainment options; and appealing living alternatives." The updated plan will address how to provide functional and aesthetic streets that serve all modes of transportation, what level of development the area can support, and how to develop an identity and sense of place for Parole.

Annapolis/Parole Transit Center (Planned)

To advance the Intermodal Transfer Center discussed above, Anne Arundel County has performed a transit center feasibility study as a preliminary screening exercise and is the foundation for the next step as the basis to guide future decisions regarding the location of one or more transit centers in the Parole area. The report identifies two sites as potential locations for the Annapolis Transit Center: Westfield Mall and Harry S. Truman Park and Ride lot. Consideration was given to combining the two existing transit sites to one location but due to frequency of service, parking, and operational considerations was determined not feasible to combine transit hubs.

Each site serves different purposes for the transit customer. Westfield Mall is primarily an origin and destination, for the community and employees of the mall. Local transit providers offer service to Westfield Mall throughout the day. Harry S. Truman Park and Ride is long haul commuter based with morning and evening peak commuter bus service requiring all day parking.

Local and private bus operators serve Harry S. Truman Park and Ride lot on a limited basis during the day.

It is recommended that both the Westfield Mall transit center and Harry S. Truman Park and Ride improvements move forward as separate but related projects. The Westfield Mall transit center would be designed and constructed primarily for local bus services in close collaboration with the Mall's ownership, Annapolis Transit and Anne Arundel County. The Harry S. Truman Park and Ride improvements would reconstruct the existing bus loading area to upgrade the passenger amenities and meet ADA requirements. It would be designed and constructed in close collaboration with MDOT MTA and MDOT SHA primarily for commuter and intercity bus services with provision for local bus routes.

Odenton Town Center

As one of Anne Arundel County's designated Town Centers, growth in Odenton Town Center is closely tied to ongoing transit-oriented development at the Odenton MARC station. Specifically, the 2016 Odenton Town Center Master Plan calls for a densely developed core area immediately adjacent to the station, Historic, Transition, and Industrial areas just outside the core, and improved pedestrian improvements and access management in East and North Odenton. The plan also envisions a public common that links the MARC station area with the Odenton Library.

To achieve this vision, the plan outlines development requirements in land use, urban design, historic preservation, transportation facilities, and environmental protection, and establishes design standards for urban form, streetscape, parking, landscaping, site design, architecture, signage, and historic preservation.

In addition to its emphasis on connections to the Odenton MARC station, the plan states that "future transit service…should include…express or Bus Rapid Transit (BRT) service to Columbia, Annapolis, Baltimore and Washington, D.C."

Odenton MARC Station

The Odenton MARC Station is an off-street hub for RTA-operated services, the Fort Meade base-operated shuttle and provides a loading area for taxis and kiss-and-ride. Approximately 2,000 surface-level parking spaces are available. An historic train station provides shelter, restrooms, ticketing, and customer service for transit users. The County's long-term plan is to continue transit-oriented development as part of the Odenton Town Center. A parking garage would replace the surface parking.

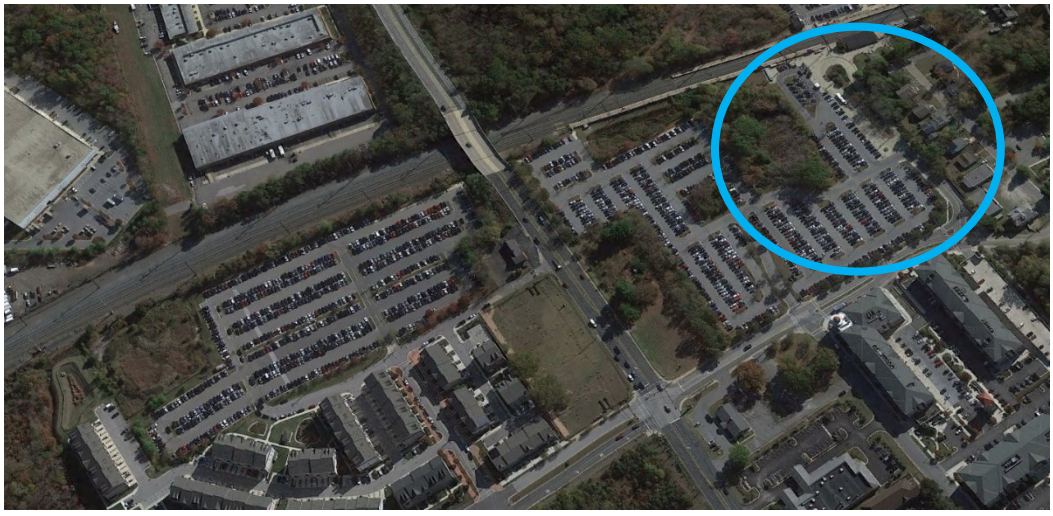


Figure 3. The Odenton MARC Station is a focal point of planned development.

BWI Airport/Business District

Baltimore-Washington International Thurgood Marshall Airport (BWI) is a major transportation and employment destination about 20 miles north of Parole. Currently, transit connections between BWI and Parole are limited; any route requires multiple transfers and takes substantially longer than travel in an automobile. Airport planning documents focus on infrastructure at the airport itself such as ramps, taxiways, and terminals, and do not identify any needed transit access improvements. However, future physical and passenger traffic growth envisioned for BWI will require additional employment at the airport and enough transportation system capacity for both airport employees and passengers.

BWI MARC/Amtrak Station

The BWI MARC/Amtrak Station brings together regional and intercity rail, local and airport buses, and taxi/shared mobility services. The station's parking garage provides a sheltered and dedicated pick up/drop off area for bus service and a new customer service center and waiting area was constructed in 2019.

Arundel Mills

Arundel Mills is the state's largest shopping mall with over 2 million SF of retail shops, entertainment, restaurants, and the Maryland Live! Casino spins off millions in economic activity. Arundel Mills is surrounded by newer residential communities (Arundel Preserve) and established communities (Harmans). A campus of Anne Arundel Community College, several hotels and ancillary outparcel retail are also in the area; commercial office space is present but not a significant use. As many as 10,000 people work in the Arundel Mills area, although much of the employment is part-time in the retail and service industries.

Arundel Mills is also located within boundaries of the 2003 BWI/Linthicum Small Area Plan, which recommends extending the Light Rail line from BWI airport to the Arundel Mills area but does not recommend additional transit service between the Arundel Mills area and points southeast. As mentioned above, the TDP identifies Arundel Mills-to-Annapolis via BWI as a future route.

Arundel Mills Bus Hub

Arundel Mills Mall provides a consolidated, on-street boarding area for transit users which includes two bus shelters, several benches and trash cans. No other services are available at the bus stop, which is awkwardly situated between two intersections thus not providing a safe pedestrian environment for transit users. (See Figure 4 and Figure 5.)

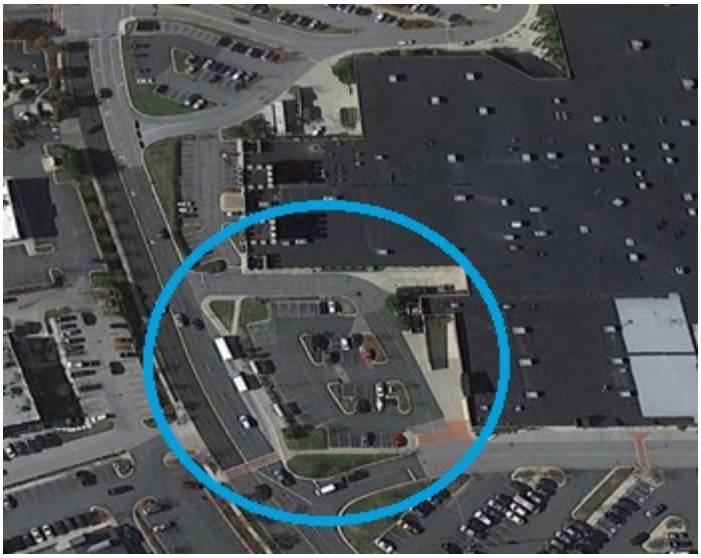


Figure 4. The bus hub at Arundel Mills is located along the inner ring road behind Medieval Times.

Figure 5. The Bus Hub at Arundel Mills

Fort Meade

Fort Meade is Maryland's largest employer and is home to a variety of intelligence, information, and cyber operations for the U.S. Army. The base includes residential, recreational, and office uses for approximately 56,000 civilian and military personnel.

Ongoing and future construction at the base is primarily on East Campus, where three additional office buildings totaling about 2.6 million square feet are in various stages of design and construction with estimated completions from 2020 through 2026, with a fourth building envisioned for completion in 2028. Additional construction is taking place at South Campus (south of Samford Road and west of Obrien Road), where two buildings totaling about 210,000 square feet are planned for replacement with three buildings totaling about 130,000 square feet of storage space and 350,000 square feet of operations and laboratory space.

On-campus transit includes a base-operated shuttle from Odenton MARC station to various on-base facilities and the Crofton Connector, which travels from Crofton to Fort Meade via Odenton. As mentioned above, the TDP identifies Anne Arundel Community College-to-Fort Meade as a future route but does not call for a service between Fort Meade and Parole or Annapolis.

National Business Park

Although not a traditional transit node, the National Business Park is home to several million square feet of office-industrial flex space and more than 1,500 jobs owing to the proximity to I-95, MD 295, Fort Meade and BWI Airport. NBP is organized around the National Business Parkway, a 2-mile roadway between MD 32 and MD 175.

US 1 Corridor

The US 1 in Howard County is an 11-mile corridor just west of the Howard/Anne Arundel County line. Land use on the east side of the corridor is industrial and primarily focused on warehousing, food production and distribution, and automobile distribution. To the west, land use is largely residential, with ongoing development resulting in an increase in density in many parts of the corridor.

Howard County's ongoing US 1 Corridor Master Plan is developing implementation strategies to address transportation, infrastructure, land use and economic development needs between I-95 and the Howard County/Anne Arundel County line. The plan has identified six discrete character areas in the corridor, and

for each will articulate specific strategies in the categories of “redevelop” (to address land use and aesthetics), “connect” (to address transportation), and “preserve” (to address environmental protection and historic preservation). “Redevelop” strategies aim to identify how the County can improve the character and quality of development, as well as whether mixed-use development is a viable goal for the plan corridor. “Connect” strategies are primarily focused on safety and access improvements for people walking and bicycling, with less emphasis on transit improvements. Finally, the plan attaches “Preserve” strategies to “green fingers,” which are “natural areas that present opportunities for natural area preservation and community recreation.”

Columbia Gateway

Columbia Gateway is a forty-year-old industrial and office park west of I-95 between MD 32 and MD 175 that Howard County has designated as an “Innovation District” to foster collaboration between the companies, educational institutions, and new startups in Gateway. In the short term, the Howard County Economic Development Agency (HCEDA) is taking a programmatic approach by planning and organizing events to facilitate connections among Gateway tenants. In the long term, HCEDA and Howard County envision a redeveloped Gateway with a more urban form and containing housing and public spaces in addition to offices. This redevelopment would include new grid streets and a boulevard-style extension of McGaw Road across Snowden River Parkway into Gateway. The Gateway Innovation District plan envisions BRT service to Gateway but does not specify specific routes or destinations.

Downtown Columbia

This 2010 plan, as amended in 2016, guides development in Downtown Columbia by establishing a framework of neighborhoods with distinct identities, identifying needed transportation and environmental improvements, and providing for their implementation with a set of Community Enhancements, Programs and Public Amenities (CEPPAs) required to be furnished by the Howard Hughes Corporation as development proceeds.

The plan has a three-part vision of “a diverse, mixed-use, livable, physically distinctive and human-scaled place with a range of housing choices and recreational, civic, cultural and educational amenities,” “a variety of safe, convenient and innovative transportation alternatives” that “enhance multi-modal connectivity,” with “natural resources [that are] protected and enhanced [and] a network of public spaces [that] provide places for individual contemplation and social gathering.”

Columbia Mall Transit Hub

Similar to Arundel Mills, Columbia Mall provides a consolidated, on-street boarding area for transit users which includes two bus shelters, several benches and trash cans. No other services are available at the bus stop. This location serves as the primary “pulse point” for RTA; more than 500 daily boardings occur here.

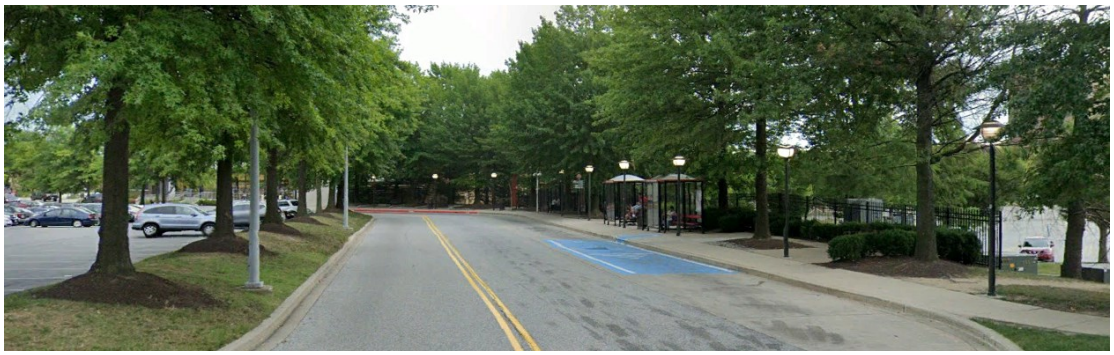


Figure 6. Transit Transfer Point at Columbia Mall

Downtown Columbia Transit Center (Planned)

Planning is underway for a new Downtown Columbia Transit Center to serve as the central station for the BRT, RTA routes, MTA commuter bus, and the Downtown Columbia shuttle. The facility will be centrally located in Downtown Columbia. An alternatives analysis conducted for Howard County evaluated several sites, and the recommended site (known as Site 3) is located on the southside of Mall Ring Road along Little Patuxent Parkway (near Union Jacks Pub/Restaurant). The analysis calls for fourteen bus bays—eight for existing RTA routes, two for RTA growth, two for MTA, and two for BRT routes. It will have sheltered waiting areas, bicycle parking, a transit information booth, facilities for driver break time (including restrooms), real-time transit information, and commuter parking for MTA routes. The facility is intended to be part of a mixed-use, mixed-income residential project developed by the Howard County Housing Commission.

Key Takeaways Regarding Major Activity Centers & Targeted Growth Areas

- Most of the plans for targeted growth areas in the study corridor recognize the role of transit in in contributing to a community that is sustainable in terms of mobility, economics, and the environment; most have a specific designated location for a transit node or hub to facilitate ease of transfers.
- The level of growth targeted to these areas should make them viable for enhanced transit service if there is a mix of uses and urban design that supports walkability and accessibility to transit.
- The industrial/flex space areas along US 1 and National Business Parkway have a propensity for transit use, although their density makes the areas difficult to serve by transit. Organizing future land uses towards a node would contribute to the viability of transit service in these areas.

Commuting Patterns

As indicated in Figure 7 below, commuting patterns in the corridor have two key characters: either there is high rate of home-to-work trips within a 5-mile radius (Fort Meade, Parole, Columbia Town Center) or in areas that are largely business/leisure destinations, trips are very dispersed (Arundel Mills, Gateway, BWI Marshall). It is the dispersion of trips especially to and from some of the smaller nodes that makes it very inefficient to serve them; however, those areas such as Arundel Mills and BWI tend to have the most workers who rely on transit. It is those workers who are presently being served by RTA and Anne Arundel County who would form the core of any enhanced bus service ridership in the corridor.

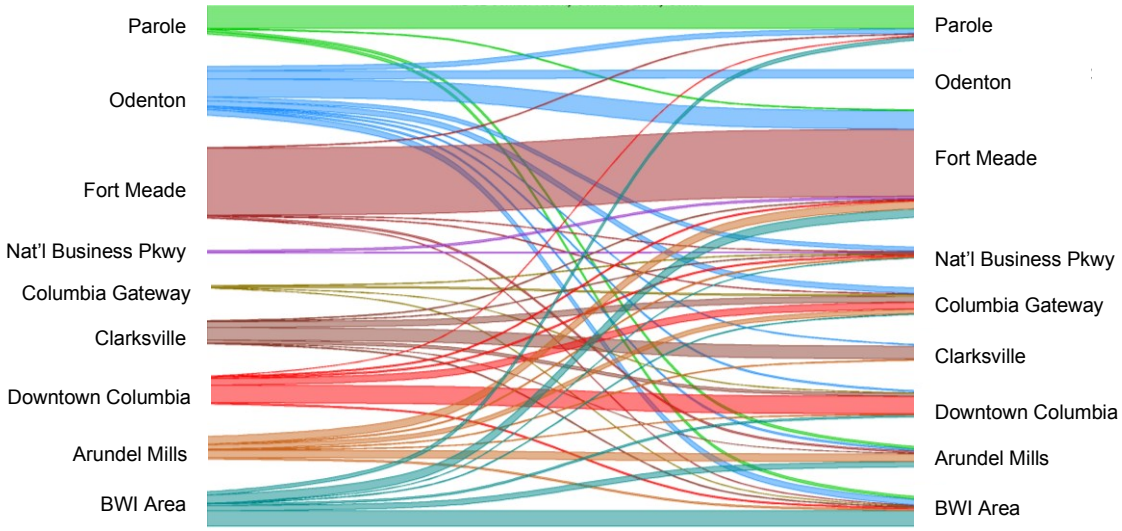


Figure 7. Peak Hour Origin-Destination Distribution along the Study Corridor

Prior Transit Plans & Studies

Numerous studies over the past two decades have identified east-west transit as a need in the study area, although there is not a consensus as to a specific alignment, stations, or mode. Some studies have focused on more northern and eastern destinations such as BWI Airport and Arundel Mills, while others have focused more on southern destinations such Fort Meade and Columbia. Nearly all of the studies have recognized the opportunity to connect to the MARC Train.

These studies have included:

- Baltimore Region Rail System Plan
- BWI to Dorsey Corridor Preservation Study
- Maximize 2045
- Anne Arundel Corridor Growth Management Plan
- Move Anne Arundel!
- Central Maryland Transit Development Plan (LOTS)
- Howard County Bus Rapid Transit Study
- Central Maryland Regional Transit Plan (MTA)
- Anne Arundel County General Development Plan
- Howard County General Plan

None of these studies and plans focused exclusively on the MD 32 corridor, but the previous recommendation closest to the corridor assessed in this study is the Central Maryland Regional Transit Plan's Odenton-to-Clarksville corridor, which it designates as a "Long Term Opportunity Corridor."

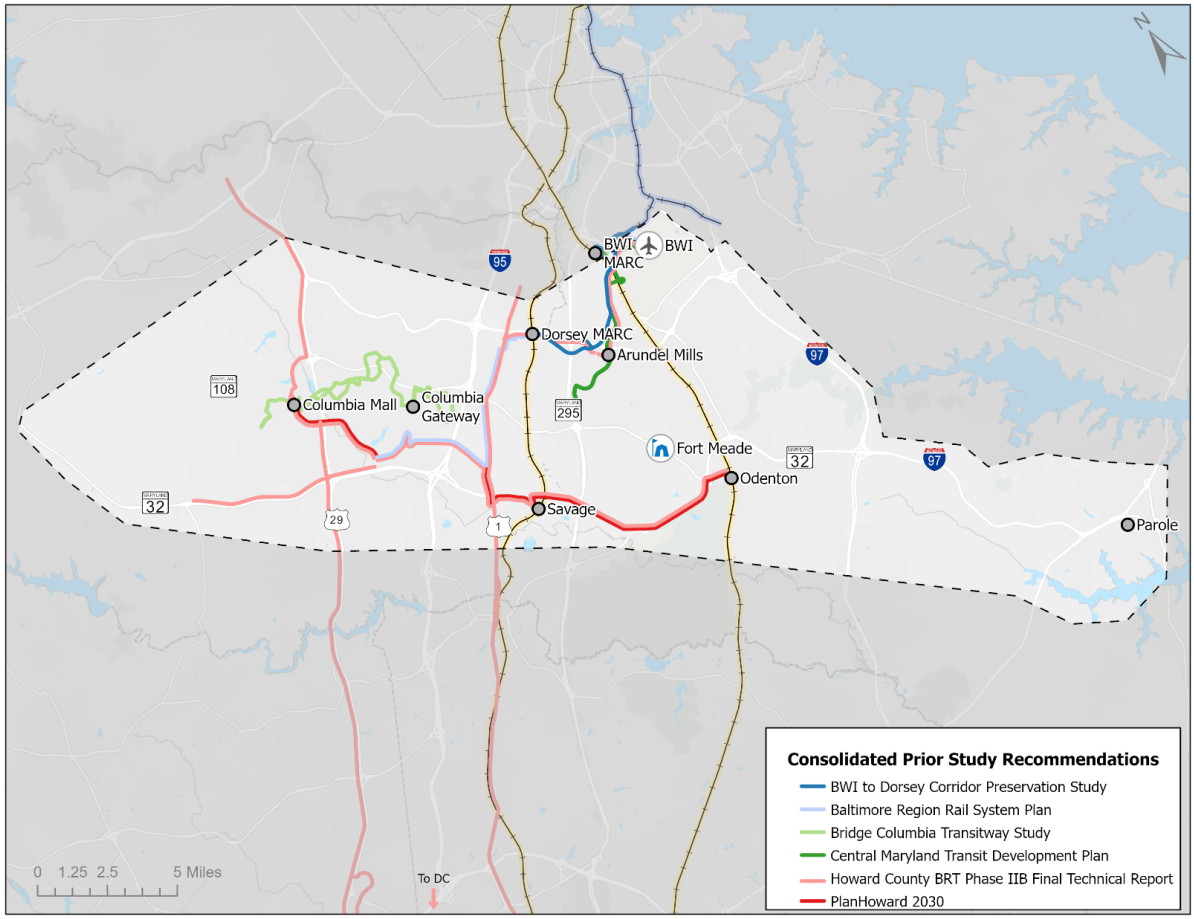


Figure 8: Prior Transit Study Corridors/Alignments

Figure 8, above, shows previously recommended transit corridors.

In the context of these corridors, it is apparent that the MD 32 corridor as initially conceived for this study is actually more of a triangular corridor extending north to BWI Airport. Planners and policymakers have identified the need for east-west transit in the MD 32 corridor between Parole and Clarksville, with the most notable segment of consensus being between BWI/Fort Meade and Columbia Town Center. Most studies have focused on enhanced bus or bus rapid transit service rather than rail, and most studies have focused on operating within existing rights of way rather than new corridors.

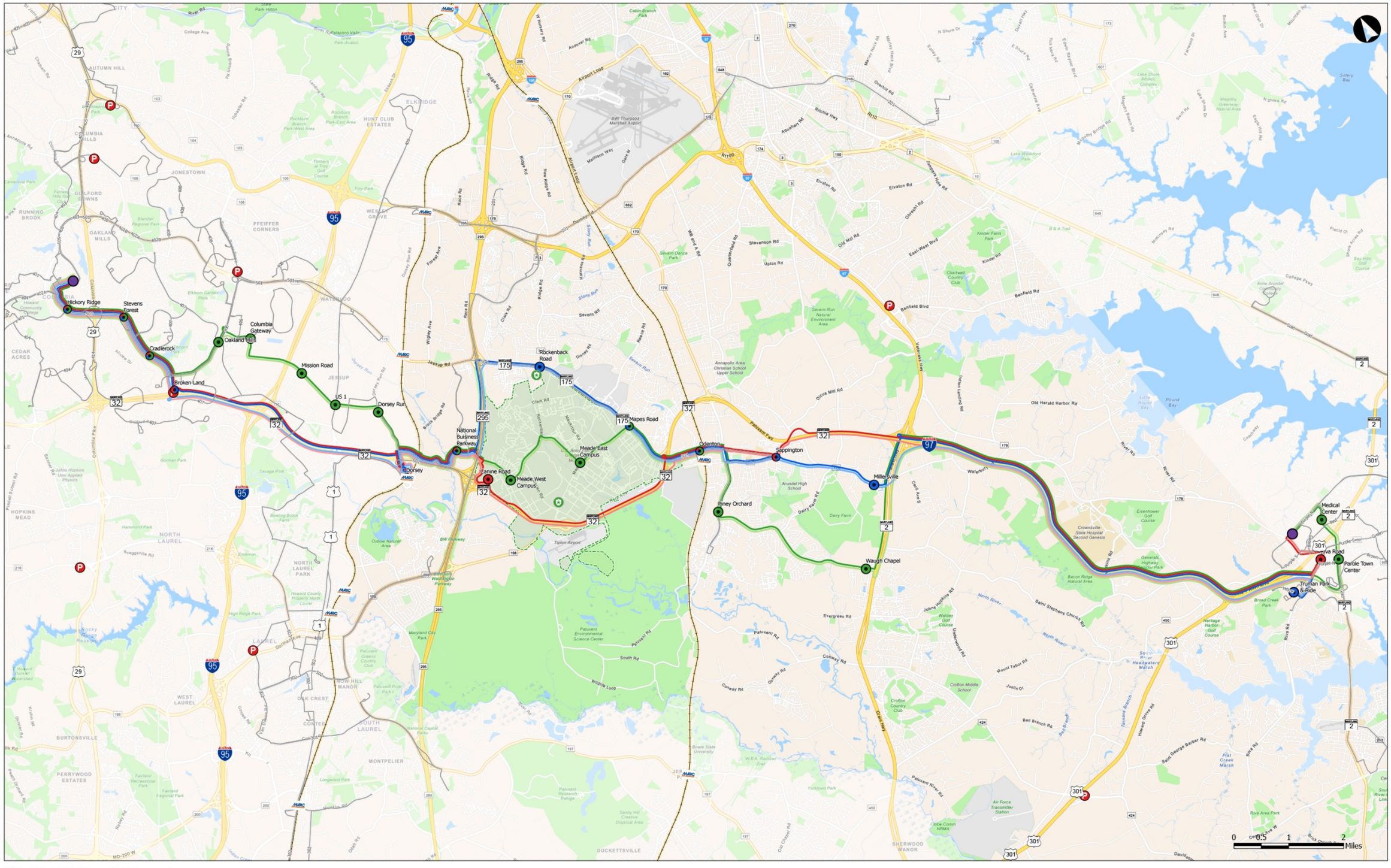
For more details on previous studies, please see Appendix A.

Alternatives Considered

The study considered several alignment alternatives together with potential station locations in four segments:

Segment 1: Columbia to US 1
Segment 2: US 1 to Odenton
Segment 3: Odenton to MD 3
Segment 4: MD 3 to Annapolis/Parole

This section describes the the alternatives considered withinh segment, qualitatively describes the benefits and drawbacks of each, and presents estimated travel times for each alternative.



MD 32 BRT Rapid Transit

Alternative Route 1 WB
Alternative Route 1 EB
Alternative Route 2 WB
Alternative Route 2 EB
Alternative Route 3 WB
Alternative Route 3 EB
Fort Meade
Security Gate
Proposed Transit Center
Proposed Transit Stop
Park & Ride

Segment 1: Columbia to US 1

The western portion of the corridor extends from Clarksville to US 1.

Western Terminus

An initial screening of land use, transit propensity, and future land use plans selected a western terminus for enhanced bus service. Although prior studies show a potential western terminus in Clarksville at MD 108 and MD 32, As shown in Figure 7, Downtown Columbia accounts for a larger number of commuter origins within the corridor than Clarksville. The Middle Patuxent Environmental Area, which poses a barrier between Clarksville and Downtown Columbia, means that there is no clear alignment that could serve both areas in sequence. Downtown Columbia has a larger employment base and more concentrated residential population. In addition, future land use plans for Downtown Columbia call for several million more square feet of mixed-use development at transit-supportive densities, while plans envision low-to-moderate-density residential and medium-scale commercial development in Clarksville and its environs. Therefore, this study only considered alternatives with a western terminus at Downtown Columbia but also proposes to maintain a stop at the Broken Land Park & Ride that would allow passengers travelling from Clarksville on existing transit service (MTA Route 335) to transfer to points east along MD 32. Between Downtown Columbia and the park & ride, tansit signal priority would be installed along Broken Land Parkway to maintain smooth vehicle progression and reduce dwell times.

Broken Land Park & Ride to US 1

East of the park & ride, the study considered two alternatives: MD 32 and a transit-specific route (the “Gateway Connector”) providing service to Columbia Gateway.

MD 32

Travelling eastbound, transit vehicles would enter MD 32 as they currently do via the cloverleaf ramp on the southwest corner of the interchange. Travelling westbound, it is envisioned that the ramp leading from MD 32 to Broken Land Parkway northbound could be adjusted to allow transit vehicles to directly enter the park & ride rather than having to make left turns at two traffic signals (as shown in Figure 9). Vehicles would then travel north on Broken Land Parkway towards Downtown Columbia.

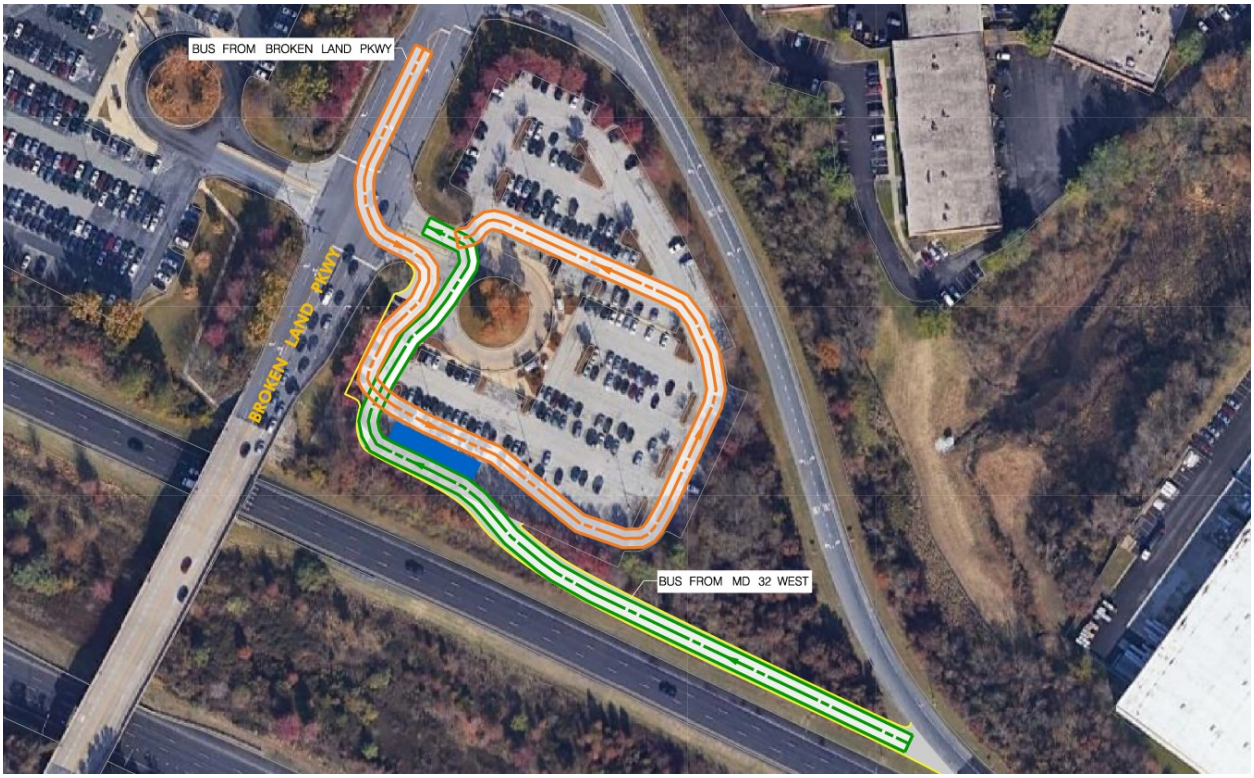


Figure 9. Proposed Ramp Alternations to Allow Routing Through Broken Land Park & Ride in Lieu of Delay-Causing Left Turns

Gateway Connector

This segment would access Gateway via Snowden River Parkway and run in the railroad right-of-way currently owned by CSX betweenLee Deforest Drive and Dorsey Run Road. The railroad is presently out-of-service but not formally abandoned, which is a condition precedent to acquiring the land. The segment would also be part of a broader strategy to improve access to Columbia Gateway, a 920-acre office/light industrial business park designated for redevelopment as a mixed-use town center in Howard County's General Plan. Within the 100' right-of-way, a four-lane limited access road with center BRT stations and bypass lanes would be constructed. Access to the Gateway Connector would occur only at Columbia Gateway, US 1, and Dorsey Run Road. Gateway Connector would pass under I-95 with potential for transit-only entrance and exit if Gateway were to develop to its full potential.

Segment 2: US 1 to Odenton

Through this segment, the key alignment challenge is Fort Meade. Presently, Anne Arundel County operates the *Crofton Connector* which serves the base during an extended morning and afternoon peak hour; however, the route is defined with the Odenton MARC Station as its center point. Riders cannot continue west of Odenton unless they are properly credentialed to access Fort Meade. If this restrictive policy is maintained, there is no effective or efficient way to serve the largest job center in the region *and* the two end points of the MD 32 corridor.

Security concerns are understandable given the high-profile nature of activities at Fort Meade, and restricted access to military facilities is a common barrier to transit service operating *through* rather than to the base. What makes Fort Meade different is that there is no on-base shuttle at Fort Meade despite the sprawling nature of the campus and the distance between buildings with significant employment, the distance from highway access each gate to those buildings, and the seas of parking surrounding those buildings which can sometimes require up to a half-mile walk to the building.

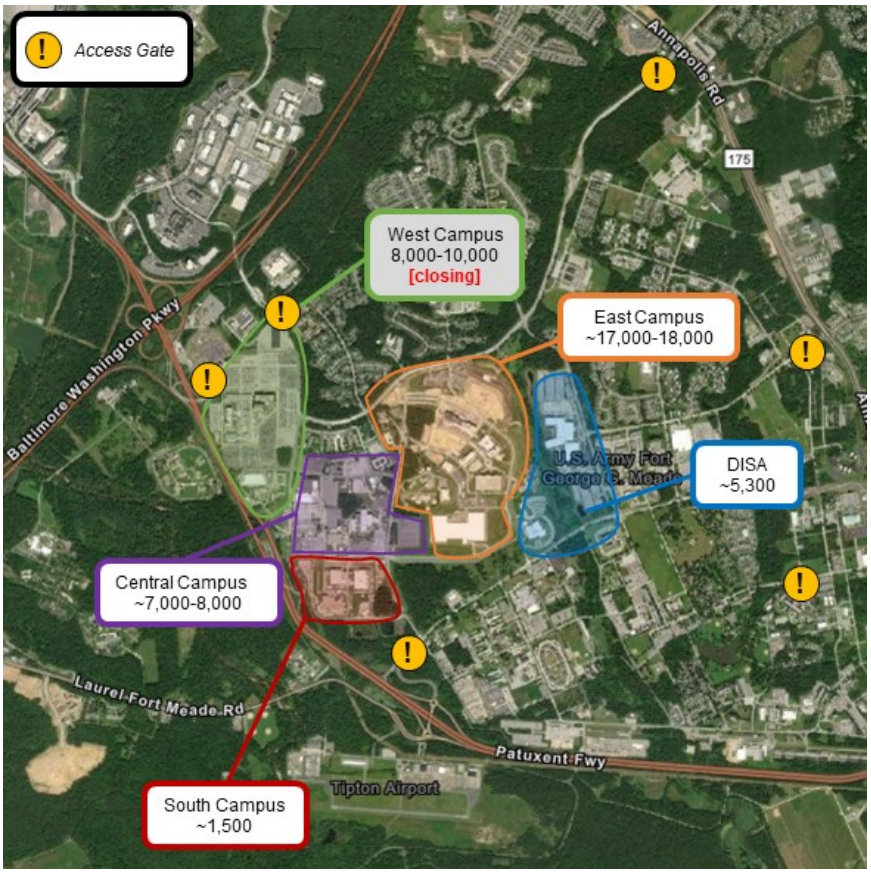


Figure 10. Fort Meade Access Gates and Estimated Employment by Campus Area

It is unlikely that security restrictions will be relaxed to allow open door service through Fort Meade; therefore, two alternatives were considered to serve Fort Meade and destinations at the either end of the corridor:

- Enhanced bus service would travel along MD 32. All passengers destined for Fort Meade would transferring at Odenton MARC Station to the existing Crofton Connector service.
- Establish a transfer point/transit center at the base (most likely near the Canine Road gate) with a connection to Connector Road allowing service to and from National Business Parkway without entering the base. Ideally, an on-base shuttle system would then bring employees to their destination.

The team also considered an on-campus alignment that would follow Connector Road, Rockenbach Road, Cooper Ave, and Mapes Road and could be implemented if security procedures allowed enhanced bus service through Fort Meade is permitted.

Segment 3: Odenton to MD 3

Odenton MARC Access

The logical BRT alignment to access Odenton MARC station is to enter via the bus loop; however, this will delay the bus by up to five minutes for entry/pickup/exit of the station. At a minimum, transit signal priority at the intersection of MD 175 and Town Center Boulevard would alleviate this delay. Alternatively, enhanced bus service could bypass the MARC bus loop by remaining on MD 175 and providing for enhanced pedestrian connectivity between the MD 175/Town Center Boulevard intersection and the MARC station.

East of Odenton MARC

East of the Odenton MARC station, three possible alignments were studied:
An alignment that would travel east on MD 175 to Sappington Station Road, then rejoin MD 32.

- An alignment that would travel south on Piney Orchard Parkway and east on Odenton Road to Sappington Station Road, then travel via MD 175 to MD 3 and on to I-97
- An alignment that would travel further south on Piney Orchard Parkway to travel east on Waugh Chapel Road, then join MD 3 north to I-97

The MD 175-to-MD 32 alignment would provide the most direct route through Odenton, while the Odenton Road and Waugh Chapel alignments would provide access to Millersville and the Waugh Chapel areas, respectively.

Segment 4: MD 3 to Annapolis/Parole

From MD 3, all service alignments would travel along I-97 to as far as MD 665 and Riva Road. From there, there are three possible alignments, one of which would serve the Harry S. Truman park & ride lot and two of which would serve the planned Annapolis/Parole Transit Center on Bestgate Road.

- An alignment that would serve the Truman Park & Ride lot by turning south on Riva Road and enter the lot
- An alignment that would serve Parole Town Center and Westfield Annapolis by turning north on Riva Road, west on West Street, north onto Generals Highway, and east onto Bestgate Road.
- An alignment that would serve Parole Town Center, Anne Arundel Medical Center, and the Annapolis Transit Center by remaining on MD 665 to turn north on MD 2, continue straight onto Medical Parkway, then turn west onto Bestgate Road.

Alignments Summary

Table 1. Alignments Summary

	Alternative A		Alternative B		Alternative C	
	WB	EB	WB	EB	WB	EB
Segment 1	via Broken Land Pkwy and the Gateway Connector		via Broken Land Parkway and MD 32		via Broken Land Parkway and MD 32	
Segment 2	via Fort Meade on-campus route		via MD 32		via MD 295 and MD 175	
Segment 3	via Waugh Chapel Rd		via MD 32		via Odenton Rd and MD 175	
Segment 4	To Mall via MD 2 and Medical Pkwy		To Mall via Riva Rd, West St, and Generals Hwy		To Truman P&R via Riva Rd	

Travel Time Analysis

To compare alternatives, the travel times were estimated for each segment and alternative. Travel times were obtained from INRIX through the RITIS Probe Data portal. INRIX travel times are based on "real-time" averaged speed collected at a specific hour and experienced throughout the year along a given distance of a TMC segment. The average speed and travel time corresponding to each segment were downloaded for all months in 2019 and correspond to a typical weekday during three time periods: AM Peak (8:00 AM), Mid-day (12:00 PM) and PM Peak (5:00 PM). In the few instances where INRIX data was not available, the travel time was estimated either on an assumed speed or the speed limit of a roadway and the roadway distance (Distance Traveled / Speed). This was mostly the case for Alternative 3 (green line) which has segments inside Fort Meade and the proposed Gateway Connector along CSX railroad.

An additional bus delay of 60 seconds was attributed to the TMC segments located on the roads where a stop is proposed. The total travel times is the sum of all the averaged travel times for all the segments plus the delay experienced at the station. The travel times were summarized for each of the four BRT segments as shown in the Map based on corresponding departure and arrival stations (to/from).

Table 2, below, shows the results of the travel time analysis in minutes. Colors correspond to those shown in Table 1, above.

Table 2. Travel Time Analysis Results

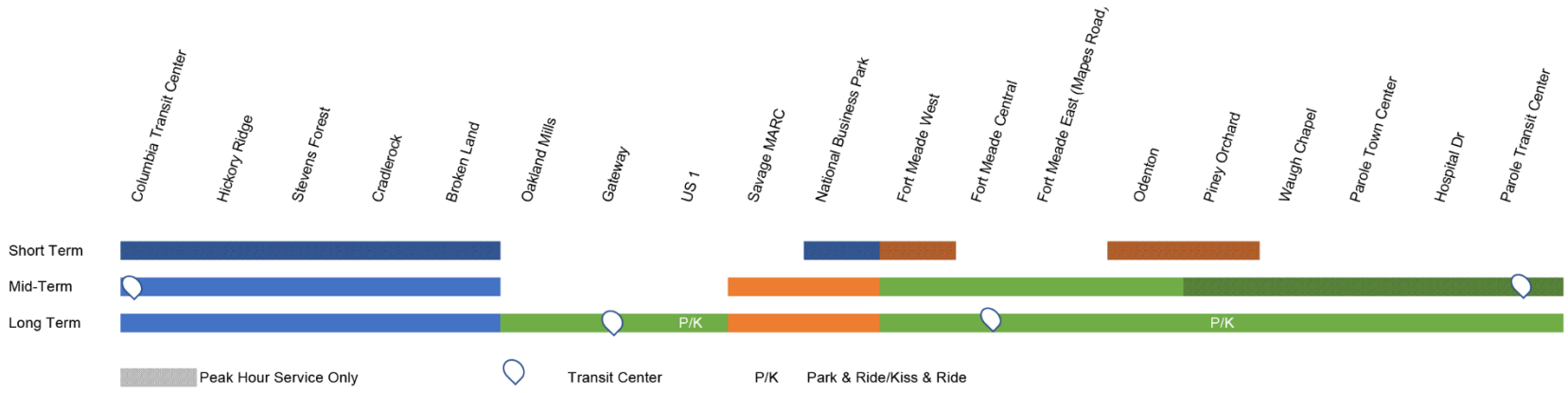
			Alignment A		***Alignment B***		***Alignment C***	
			WB	EB	WB	EB	WB	EB
Segment 1	Downtown Columbia to US 1	AM Peak	**22**	**24**	**20**	**20**	**20**	**21**
		Midday	**17**	**21**	**17**	**17**	**17**	**17**
		PM Peak	**28**	**26**	**26**	**20**	**26**	**20**
Segment 2	US 1 to Odenton	AM Peak	**18**	**30**	**13**	**17**	**15**	**23**
		Midday	**16**	**26**	**8**	**14**	**14**	**19**
		PM Peak	**20**	**32**	**11**	**24**	**17**	**28**
Segment 3	Odenton to MD 3	AM Peak	**19**	**14**	**8**	**5**	**14**	**8**
		Midday	**11**	**12**	**6**	**4**	**9**	**6**
		PM Peak	**16**	**18**	**8**	**5**	**12**	**8**
Segment 4	MD 3 to Annapolis	AM Peak	**21**	**29**	**21**	**29**	**25**	**29**
		Midday	**17**	**22**	**17**	**22**	**17**	**22**
		PM Peak	**30**	**26**	**28**	**26**	**25**	**25**
Total	Columbia to Annapolis	AM Peak	**80**	**97**	**62**	**71**	**74**	**81**
		Midday	**61**	**81**	**48**	**57**	**57**	**64**
		PM Peak	**94**	**102**	**73**	**75**	**80**	**81**

Preferred Alternative

Rather than simply designating a preferred “ultimate” alignment, this study developed three service phases, with alignments adjusted for each phase of service.

Service Phasing

	Phase 1		Phase 2		Phase 3	
	Routing	*Service*	*Routing*	*Service*	*Routing*	*Service*
Segment 1	MD 32	Peak Hour; 30 minute headways	MD 32	All Day; 20 minute headways	Gateway Connector	All day; 15 minute headways
Segment 2	MD 32	Peak Hour; 30 minute headways	MD 32	All Day; 20 minute headways	Through Fort Meade Campus	All day; 15 minute headways
Segment 3	Waugh Chapel Road as far as MD 3	Peak Hour; 30 minute headways	Waugh Chapel Road continuing onto I-97	All Day; 20 minute headways	Waugh Chapel Road continuing onto I-97	All Day; 20 minute headways
Segment 4	No service	N/A	Annapolis Transit Ctr via MD 2 and Hospital Dr	All Day; 20 minute headways	Annapolis Transit Ctr via MD 2 and Hospital Dr	All Day; 20 minute headways



Phase 1 could be implemented by combining the existing Crofton Connector and portions of the RTA routes 502 and 503 and would operate as such until the transit centers at Parole and/or Downtown Columbia are constructed, and feeder service is restructured to serve them. Phase 1 service is proposed as peak-hour only with a maximum of 30 minute headways.

Phase 2 would extend service to full operating hours along the Phase 1 routing and add stops within Fort Meade or at an adjacent transit center and at National Business Parkway and Savage MARC Station when MARC service is operating. Service would increase to operate every 20 minutes in this phase. Peak hour service would be extended to Parole Transit Center on the suggested alignment.

Phase 3 would be driven by further growth at Columbia Gateway, Odenton Town Center and Parole Town Center. Service would be for full operating hours from end to end.

Stations

Ultimately, stations along the corridor would assume one of four typologies:

- **Walk-up** stations, the purpose of which is to provide transit service to and from neighborhoods, commercial destinations, and employment centers.
- **Kiss & Ride** stations, the purpose of which is to provide a small-footprint, short-dwell time location along a transit route to accommodate carpool dropoffs, TNCs, taxicabs, etc
- **Park & Ride** stations, the purpose of which is to provide a place for motorists to leave vehicles unattended for one day or less while travelling on transit
- **Transit Center** stations, the purpose of which is to provide service from multiple transit routes to and from employment, commercial, or dense mixed-use areas and to provide for centralized transfers between transit routes.

More detail on the proposed station typologies is found in Appendix B.

Most proposed stations are based on existing stop locations, and most are recommended to remain as on-street walk-up style with typical low-floor boarding. Enhanced passenger infrastructure to include shelters and real-time arrival destination signage should be the minimum standard in Phase 1. Phase 2 assumes that the transit centers at Downtown Columbia and Parole have been constructed.

Exceptions to this include:

- Waugh Chapel where a kiss-and-ride or park-and-ride facility is recommended in conjunction with the widening of MD 3.
- Fort Meade where an on-base or base-adjacent transit center is recommended at Phase 2 or 3;
- Columbia Gateway where a transit center would be included in the master plan to be developed in Howard County; and,
- On US 1 where a kiss-and-ride or park-and-ride facility is recommended in conjunction with construction of the Gateway Connector.

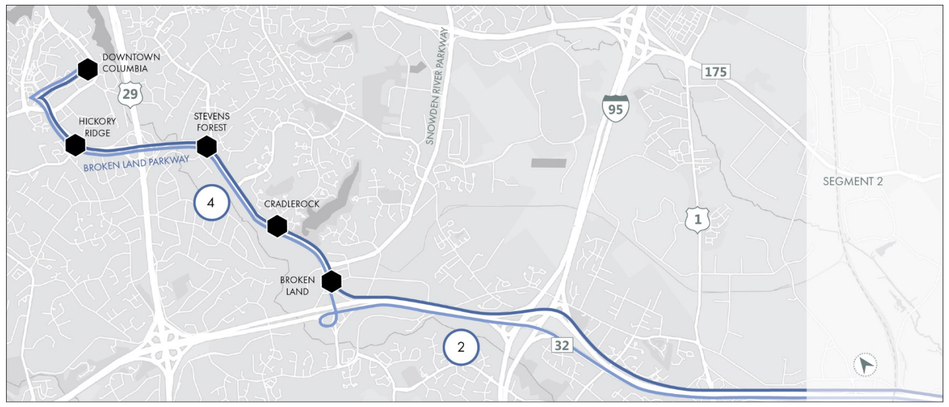
During Phase 3, service would operate to the Annapolis Transit Center, but not to the Harry S. Truman Park & Ride. The park & ride lot is presently a major origin point for commuters to Washington and Baltimore who park in the lot and carpool or ride MDOT MTA commuter buses. However, it is not located within comfortable walking distance of most destinations within Parole. In addition, the Annapolis Transit Center Feasibility Study explored whether relocating local transit service to the Truman park & ride lot was feasible and concluded that it was not; therefore, designating the lot as the destination for enhanced bus service in the MD 32 corridor would not support passenger transfers between MD 32 corridor service and local bus service to destinations throughout the Annapolis area.

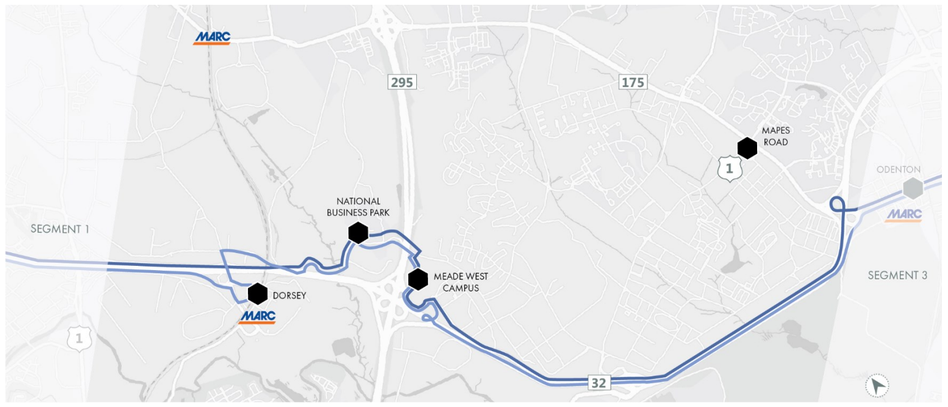
Figures X through Y, on the next page, illustrate the proposed alignment, phasing, and stations.

Segment 1

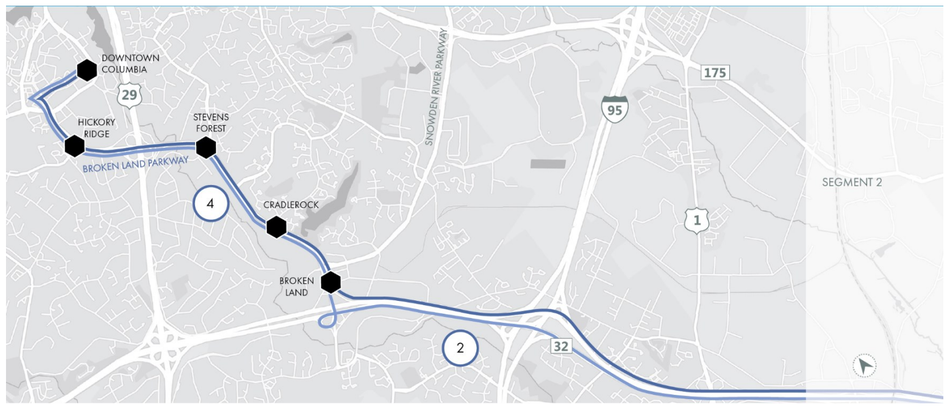
Segment 2

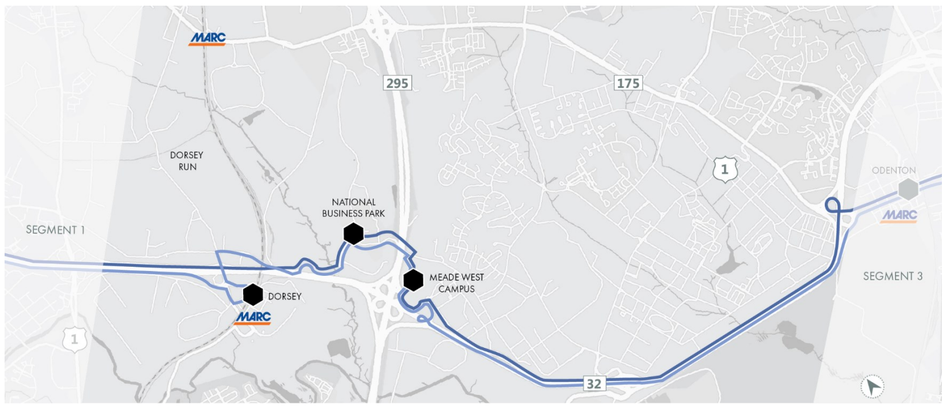
Phase 1



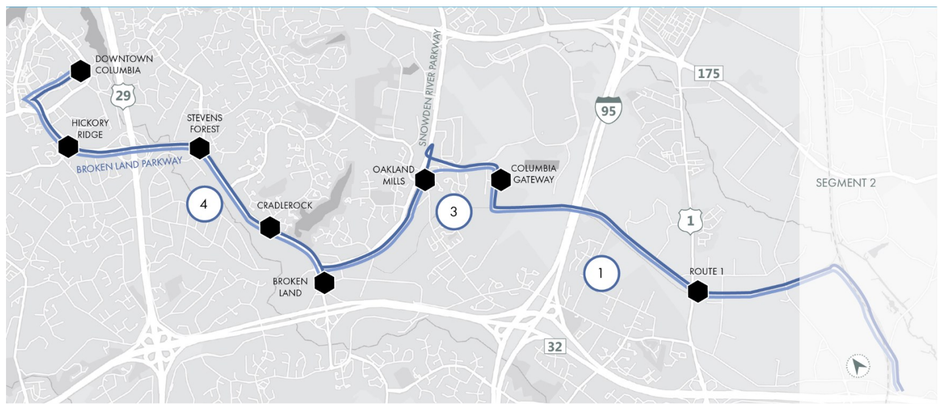


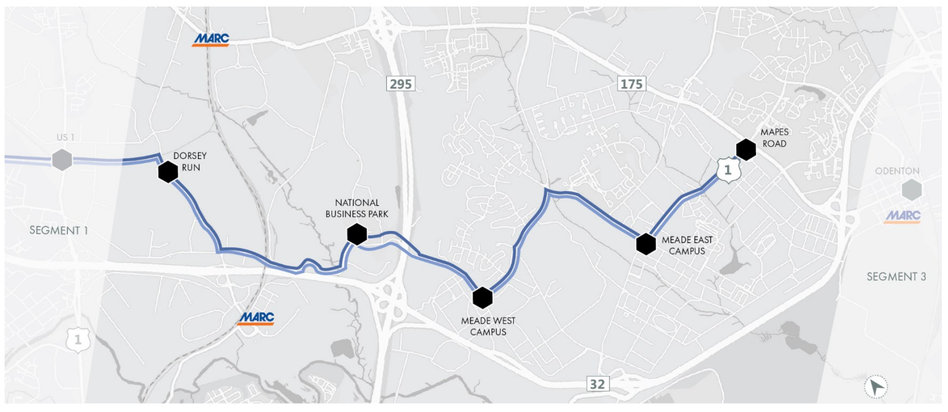
Phase 2





Phase 3

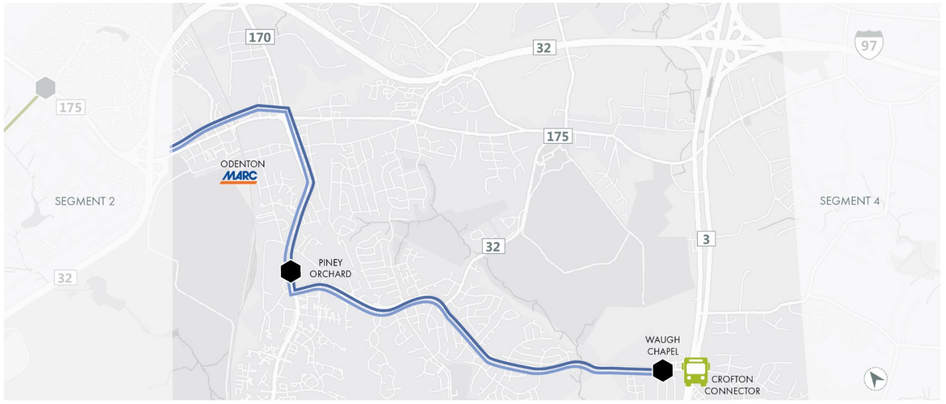


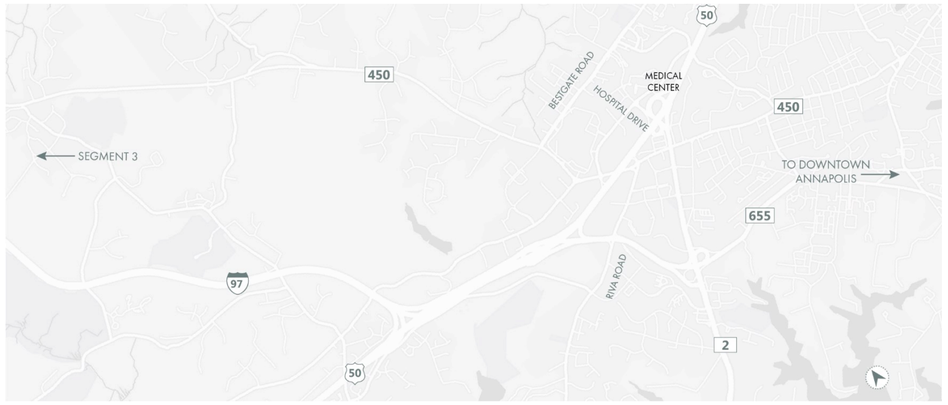


Segment 3

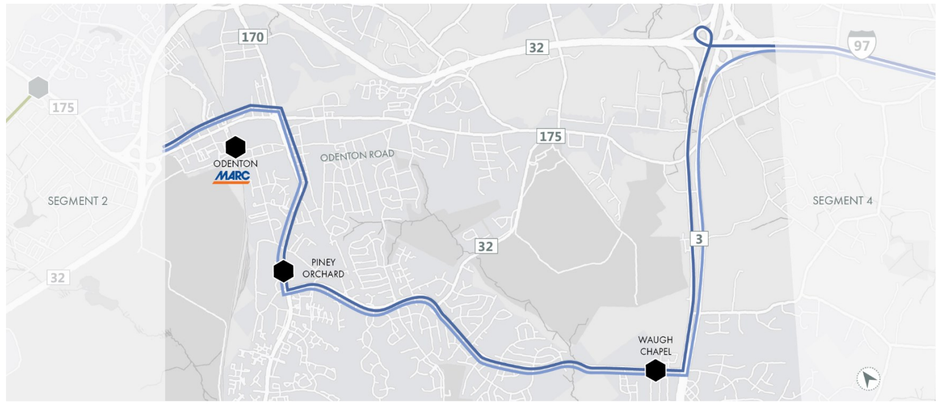
Segment 4

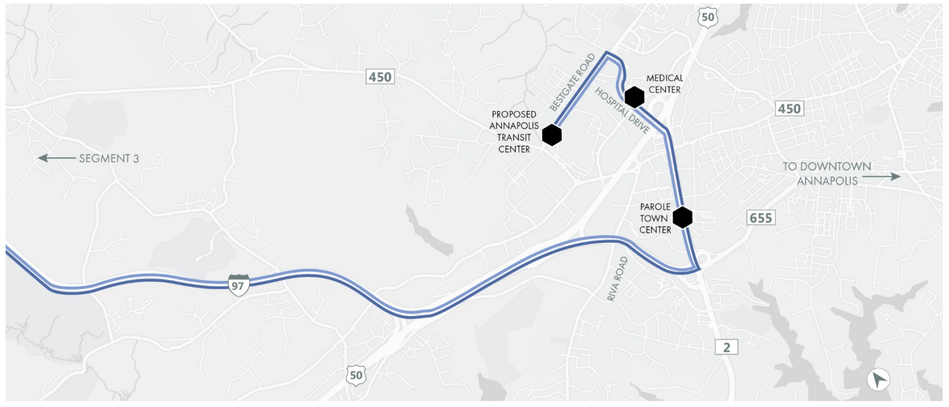
Phase 1



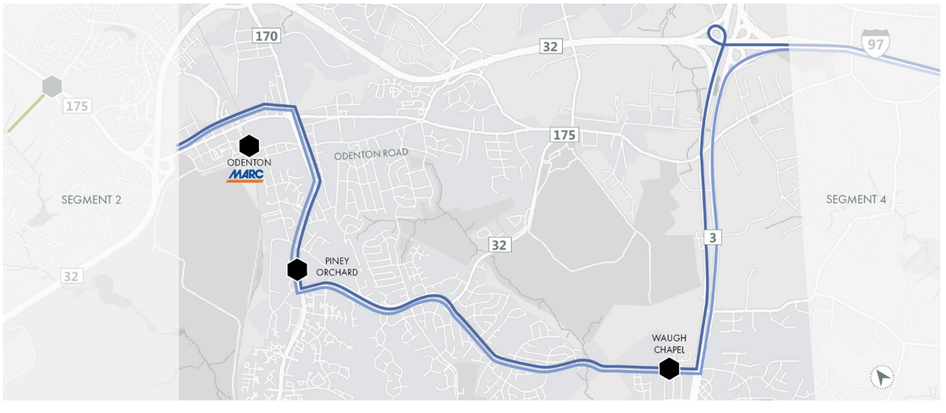


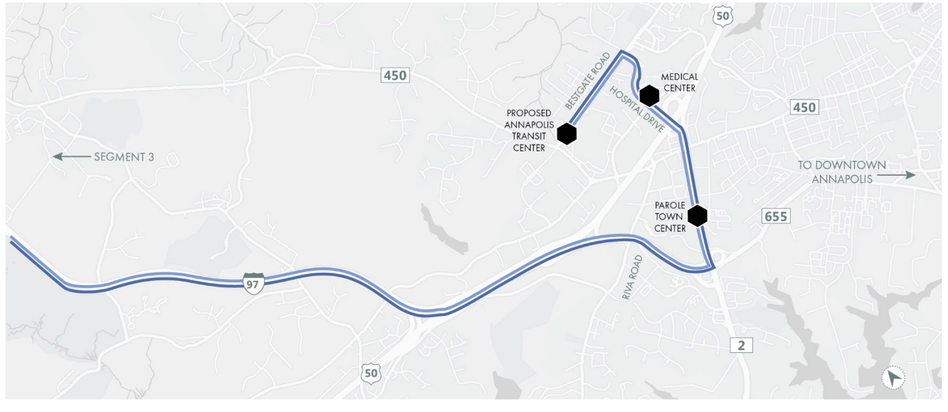
Phase 2





Phase 3





Complete station typology recommendations by phase are as follows:

	Phase 1	Phase 2	Phase 3
Segment 1			
Downtown Columbia	Park & Ride	Transit Center	Transit Center
Hickory Ridge	Walk-Up	Walk-Up	Walk-Up
Stevens Forest	Walk-Up	Walk-Up	Walk-Up
Cradlerock	Walk-Up	Walk-Up	Walk-Up
Broken Land	Park & Ride	Park & Ride	Park & Ride
Oakland Mills	-	-	Walk-Up
Columbia Gateway	-	-	Transit Center
Route 1	-	-	Kiss & Ride
Segment 2			
Dorsey	Park & Ride	Park & Ride	Park & Ride
National Business Park	Walk-Up	Walk-Up	Walk-Up
Meade West Campus	Walk-Up	Walk-Up	Transit Center
Meade East Campus	-	-	Transit Center
Mapes Road	Walk-Up	Walk-Up	Walk-Up
Segment 3			
Odenton	Transit Center	Transit Center	Transit Center
Piney Orchard	Walk-Up	Walk-Up	Walk-Up
Waugh Chapel	Walk-Up	Walk-Up	Park & Ride
Segment 4			
Parole Town Center	-	Walk-Up	Walk-Up
Medical Center	-	Walk-Up	Walk-Up
Annapolis Transit Center	-	-	Transit Center

Challenges, Opportunities & Next Steps

Improving Service Speed and Reliability

To maximize ridership, transit service must be competitive with auto travel. Time spent walking to and from bus stops and waiting for the bus must be made up with a higher speed or more reliable trip. Throughout the corridor, there are opportunities to improve speed and reliability including the use of transit signal priority, special access lanes and ramps and queue jumps. Opportunities specific to this corridor include:

- Approaching the Broken Land Park & Ride from the east, a bus-only entrance from MD 32 would eliminate two left turns for eastbound buses.
- Transit signal priority should be enabled at the following locations:
    - At the either location of the planned Parole Transit Center, transit signal priority could be installed to allow left-turning buses to access Riva Road (from Truman Parkway and Eisenhower Park and Ride location) or Bestgate Road and West Street (from the Annapolis Mall location.)
    - Town Center Boulevard to allow prompt entry and exit from the Odenton MARC Station (if service enters the station rather than staying on MD 175)
    - Along Broken Land Parkway from Snowden River Parkway to Little Patuxent Parkway.

Fleet Needs, Operations & Maintenance Facility

The fleet of vehicles necessary to provide enhanced bus service is defined the desired bus frequency and the total end-to-end running time in both directions (including boarding/dwell time at stops and layover time at each endpoint), plus spare vehicles. The anticipated vehicle need for each phase is as follows:

	Cycle time	Headway	Vehicles Needed (inc. spare)
Phase 1	90 – 100 minutes	30	4
Phase 2	130 – 140 minutes	20	8
Phase 3	200 – 220 minutes	15	20*

*due to extended operating hours

It is anticipated that the maintenance and operations needs for Phase 1 and 2 could be accommodated within the existing Central Maryland Transit Operations Facility (CMTOF). Phase 3 would require expanding CMTOF to accommodate the anticipated fleet size.

Phase 1 could be provided using the existing fleet type (cutaway buses). As service is more fully developed in Phases 2 and 3, investment in a new fleet of larger, branded vehicles is recommended.

Additional Considerations

Land Use Intensity is Critical to Ridership Demand

Building walkable, dense communities (residential, commercial, or mixed-use) is the core of building a suburb-to-suburb transit market. MDOT's guidance on bus rapid transit indicates that a minimum of 25 jobs + residents per acre is necessary to support bus rapid transit; while not a requirement for BRT this guidance is instructive and provides a measure of screening for alignments and stations. Harper's Choice and Clary's Forest, downtown Columbia, Westfield Annapolis Mall, and in small areas along Veterans Highway near New Cut Road and Brightview Drive meet this threshold; large acreage facilities such as Arundel Mills Mall and BWI Airport are also significant trip generators even though they do not meet the threshold. Other areas are slated to grow over the next twenty years such that they could achieve 25 jobs + residents per acre such as Odenton, Parole, Columbia Gateway, and parts of the US 1 corridor near MD 175.

This will be a particular challenge in Anne Arundel County where developers perceive that mixed-use development is a challenge. Higher rents necessary to support mid- or high-rise buildings have proven to be unachievable in most locations. As one developer indicated, "outside of Annapolis, we struggle to get the rent level necessary to achieve the density that [the County] is seeking. When you are doing several stories above podium or may need structured parking, construction costs rise significantly, and rents need to follow. There just are not that many places in Anne Arundel County where higher rents are achievable. This makes it difficult to underwrite a new development from a financing standpoint."[4]

ACTION: The General Development Plans currently underway should encourage dense, mixed-use development at as many of the potential station locations as is possible. The County should consider tax or other development incentives and infrastructure funding support to help write down the cost of development and improve the cost of construction.

Urban Form and Accessibility Matters

While density is critical and mixed-use development is preferred, the form of development is just as important. Development that "turns its back" on or has barriers to available transit service undermines the usability of the transit service. On at least one end of the trip, the transit rider should arrive within a very short walk of their destination. For example, placing a transit center on the outer edge of a mall or major employer thus requiring riders to walk through vast parking lots does not encourage ridership beyond those for whom there is no choice but to ride (nor is such a location equitable to non-choice riders., Even in industrial/flex space areas, the form of development can influence transit ridership. Planners and developers should pay close attention

[4] Land Use Market Analysis for Gen Plan, P 6-6, https://www.aacounty.org/aacoOIT/PZ/land-use-market-analysis.pdf

to where employees enter and exit the building and making sure that there is a direct pathway and sidewalk to the transit stop. Transit centers where multiple buses and other transportation modes converge can also increase ridership.

ACTION: The counties should advance plans for transit centers where they are currently planned and embark on planning efforts where transit centers are not currently planned. The County should clearly identify and reserve land for transit centers in advance of development plans.

Service Quality and Frequency Must Improve

Service that operates on headways of 20 minutes or more makes Bus Rapid Transit less rapid for the typical rider. When considering the total trip time (traveling to stop + waiting for bus + time in transit + traveling to destination), transit loses its competitiveness with auto travel. Efforts must be made to drive down the total trip time in each of its elements. Development intensity and urban form address the time spent on each end of the trip; the time spent waiting for the bus can be a major detractor to riders unless on-time performance is nearly perfect as advertised. Frequent service (10 – 15) addresses the issue but can be quite costly and difficult to justify at times of low ridership.

ACTION: The counties should avoid “across the board” increases to service frequencies and focus on building specific ridership markets by increasing public confidence through increased frequency.

Conclusion

This project critically assessed a vision for enhanced bus service in the MD 32 corridor, reaching the following conclusions:

Strategic enhancements to transit service and station areas can build ridership to prepare the corridor for BRT. These improvements would form the core of Phase 1 as described above.

In the mid-term, construction of transit centers will ease transfers to and from MD 32 corridor service and further build ridership. These are already planned at Parole and Downtown Columbia, and—if possible—should include Fort Meade as well. Adding these transit centers, and more frequent, all-day service, would constitute Phase 2.

In the long term, greater development in Downtown Columbia, Columbia Gateway, and Parole Town Center, as well as transit access through Fort Meade, will generate ridership to support frequent, all-day service. Therefore, Phase 3 would include direct routing through Gateway and Fort Meade.

This incremental approach to building transit service and infrastructure in concert with ongoing development and land use changes will provide for improved transit along MD 32 in the short term and position the corridor for enhanced bus service in the long term.

Appendix A. Previous Studies

Numerous studies over the past two decades have identified east-west transit as a need in the study area, although there is not a consensus as to a specific alignment, stations, or mode. Some studies have focused on more northern and eastern destinations such as BWI Airport and Arundel Mills, while others have focused more on southern destinations such Fort Meade and Columbia. Nearly all of the studies have recognized the opportunity to connect to the MARC Train.

Baltimore Region Rail System Plan

Published in August of 2002, the Baltimore Region System Plan is the product of the MTA and its Baltimore Region System Plan Advisory Committee, appointed by the Maryland Transportation Secretary a year earlier. The objectives of the Plan were to: 1) establish for the forty-year horizon a system of rail lines that provides fast and reliable service between major life activity centers in the region; 2) serve areas with greatest density of population and employment; and 3) build upon existing transportation investments. Through a series of public workshops, symposia, staff analysis, and Advisory Committee action, a report was issued which envisioned the construction of 66 new miles of metro subway and light rail lines. When completed, there would be 109 miles of rail service in the Baltimore region. As part of the plan, MTA envisioned extending the existing Light Rail line from BWI Airport to Downtown Columbia via Arundel Mills Mall, Dorsey MARC Station, US 1, and Columbia Gateway referred to as the "Yellow Line."

Figure 11: Baltimore Regional Rail System Plan

BWI to Dorsey Corridor Preservation Study

Although viewed as a very long-term component of the Rail System Plan, Anne Arundel County and MTA jointly prepared a feasibility study to establish a general alignment which could be included in the County master plan for the purpose of intensifying land uses, reserving right of way and other transit-supportive policy actions. Extending from the BWI Business District Light Rail Station, potential stations were identified for the BWI Regional Intermodal Transportation Center (never constructed), BWI Amtrak/MARC Station, Northrup Grumman (MD 170 just south of MD 195), Baltimore Commons Business Park, Arundel Mills and Dorsey MARC Station.

Dorsey Station was chosen as an endpoint for this study because it would provide a connection between two MARC lines and Amtrak and would still leave the option of extending westward to Columbia Town Center at a later date. The corridor preservation study identified a preferred alignment with slight variations as shown in Figure 12.

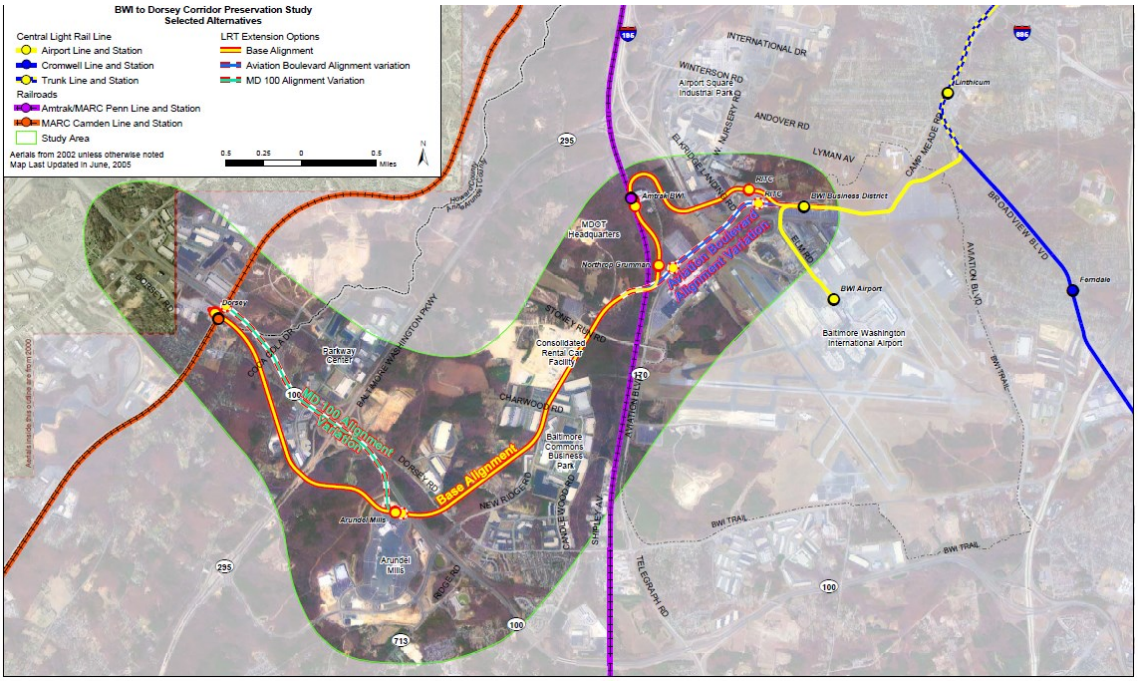


Figure 12: BWI to Dorsey Corridor Preservation Study Corridor

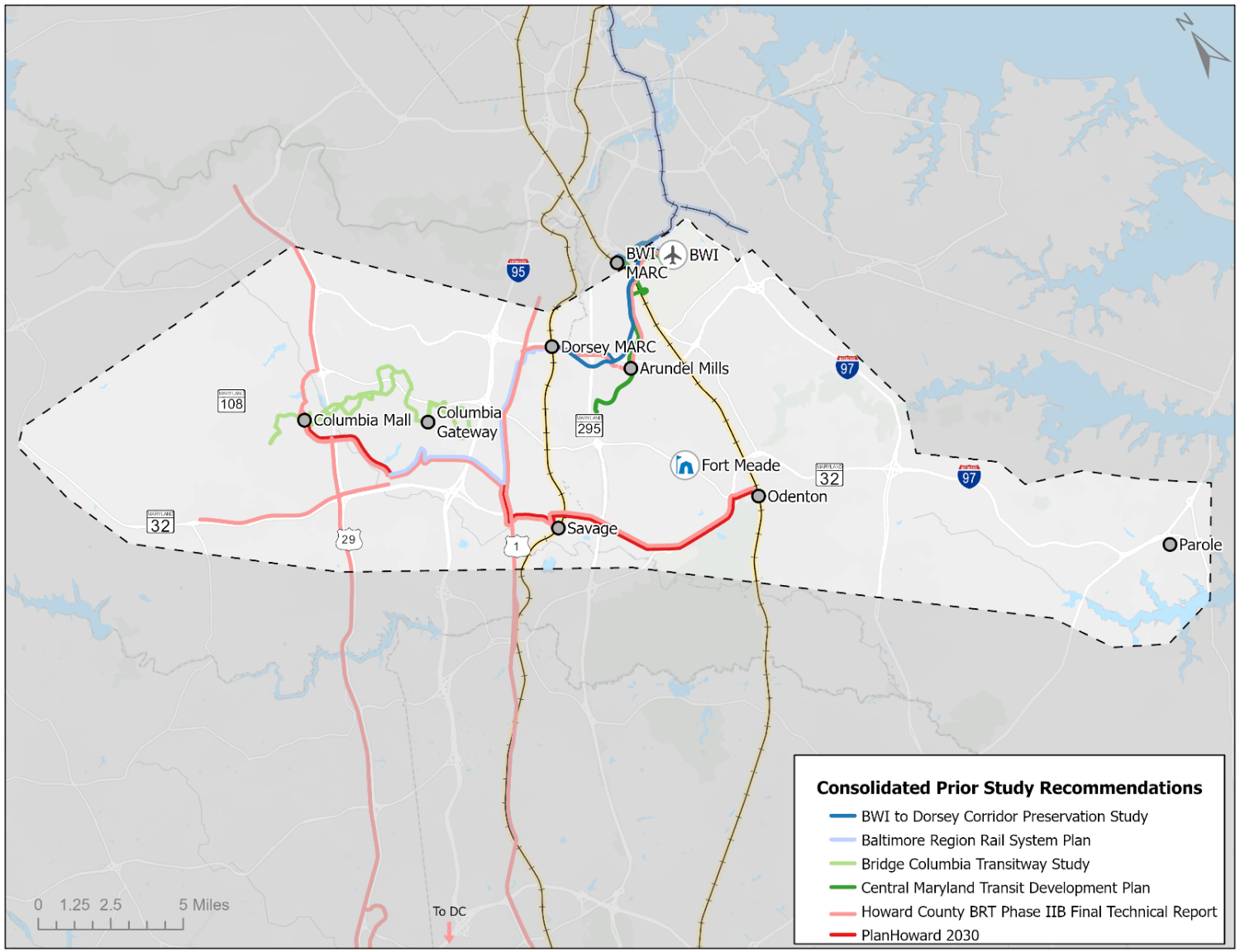


Figure 13: Prior Transit Study Corridors/Alignments

Maximize 2045

Maximize2045 establishes the region's broad transportation goals and performance measures, which serve as guiding principles as the region plans and carries out projects. This approach provides a framework for the region to monitor progress toward regional goals by measuring performance and status of achieving targets.

- US 50 bus rapid transit between New Carrollton MARC/Metro station and Parole on a separate right of way.
- Bus rapid transit from Dorsey MARC station to Arundel Mills to BWI consolidated rental car facility to BWI light rail station.
- US 1 corridor bus rapid transit from Dorsey MARC to College Park Purple Line Light Rail Station
- US 29 corridor bus rapid transit connecting Ellicott City and Downtown Columbia Transit Center Location (Mall Ring Road) to MD 198 in Montgomery County with grade-separated facilities in median of US 29.
- Downtown Columbia to Odenton MARC Station bus rapid transit.[5]

Anne Arundel Corridor Growth Management Plan

The Corridor Growth Management Plan (CGMP), completed in 2012, identified concept-level transportation solutions with impacts and costs for various alternatives for the nine regional and four connector corridors including MD 100 and MD 32. The goal of the study was to identify, analyze, and understand the relationship between land use patterns and the mobility and accessibility constraints and opportunities to decrease congestion along the corridor, enhance travel choices, and improve safety for vehicles, bicyclists, and pedestrians while not substantially changing the character of the corridors.

The CGMP recommends operation of all-day weekday high quality transit service along this corridor with stops in Marley Station, BW Medical Center, MD 170 (potential future MARC Station), Arundel Mills, Dorsey MARC Station, Snowden River Park & Ride, and Long Gate Park & Ride/ Ellicott City. The CGMP also recommends providing additional park and ride capacity.

The CGMP recommends widening from 6 to 8 lanes (between I-95 and MD 295 and construct new carpool (HOV 2 or more persons) lanes from I-95 to I-97. In terms of transit, the CGMP recommendations evaluating subscription (van pool) and local bus service, and having those vehicles use the HOV lanes and eventually adding express bus service.

Move Anne Arundel!

Move Anne Arundel! is a comprehensive multimodal approach to transportation improvements that was adopted in 2019 as the framework for the upcoming General Development Plan. It included an update of the travel forecast from the CGMP to more accurately reflect current and anticipated growth trends for the County.

[5] This is listed as an "illustrative project" meaning that it can be amended into the constrained long-range plan if funds become available.

Move Anne Arundel recommends addressing the major highway bottleneck between MD 295 and MD 100 by resolving merging and weaving throughout the area. No specific transit service is proposed along MD 100.

Move Anne Arundel recommends prioritizing eastbound highway improvements between MD 295 and MD 198 and westbound improvements between MD 170 and Fort Meade; adding commuter bus service from South County and Parole to Fort Meade; and working with base leadership to establish a transit center that can serve local and commuter buses.

Move Anne Arundel recommends extending the HOV lanes on US 50 from I-97 to the Prince George's County line; and, adding commuter bus service from the park and ride lots in Annapolis and Severna Park to College Park, Silver Spring, and Bethesda.

Move Anne Arundel acknowledged that the 2009 General Development Plan identified a **cross-county bus rapid transit line** as a future transportation initiative similar to the proposed Yellow Line described in the Baltimore Region Rail System Plan – and that the 2012 Howard County General Development Plan identified extension of that corridor to Columbia Town Center. To advance the initiative, Move Anne Arundel recommended that the two counties develop a joint land use plan and right-of-way acquisition strategy which would one day increase the viability of a cross-county rapid transit line.

Central Maryland Transit Development Plan (LOTS)

The Central Maryland Transit Plan is developed every five years as a condition of funding from MTA's Office of Local Transit Services. In 2018 for the first time, Anne Arundel and Howard Counties cooperated to develop a joint plan for Central Maryland. The TDP makes two recommendations relevant to this study corridor:

- A **high-frequency east-west transit corridor within Howard County**, linking the Howard County General Hospital, Howard Community College, Downtown Columbia, and Snowden Square and the Gateway employment area. As proposed, it would connect most of higher density residential and employment locations in Howard County. While the TDP concluded that a separate transitway network is not warranted, the identified corridor is appropriate for the future development of improved transit. The transitway analysis showed that surface streets and highways can be used for most of the route. Current and future congestion on Route 175 between Dobbin Center Parkway past Tamar Drive could require transit priority measures such as bus-on-shoulder queue-jumper lanes and signal priority. (Figure 14)

- As an alternative to operating a number of individual routes covering the study corridor, the TDP suggests consideration of **higher frequency shuttle between Arundel Mills and BWI Marshall**, allowing each of the longer distance routes to serve one or the other while passengers needing to travel to the other key destination can catch the shuttle. Figure 15 presents a conceptual version of this route, which could initially operate at half hour headways with a future vision of higher frequency. The span of service would need to include seven day per week service, from early morning to the closing of the MTA light rail services at midnight.

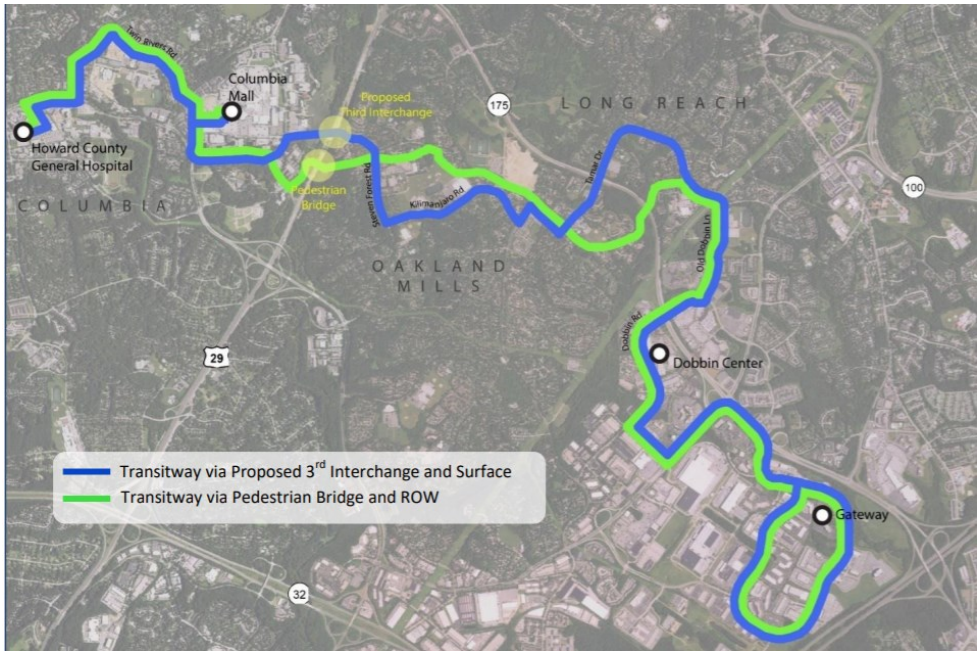


Figure 14: Potential High-Frequency East-West Transit Corridor Within Howard County as Identified in the Central Maryland Transit Development Plan

Figure 15: Potential High Frequency Shuttle Between Arundel Mills and BWI Marshall as Identified in the Central Maryland Transit Development Plan

Howard County Bus Rapid Transit Study

A concept plan for Bus Rapid Transit was the initial BRT study conducted for Howard County. It presented a very high-level plan and costs for a BRT system along a wide range of roads and corridors, but did not perform ridership analyses, develop a service plan, or perform an operational analysis.6

Phase I

Following the completion of the concept plan, the county developed a Phase I study. The purpose of the study was to evaluate a BRT network for the county, including linkages to multiple activity centers and transit systems. The study included ridership analysis and the impact on both transit and vehicle travel times on the routes, car trips diverted to transit, for the routes presented in the concept plan. The study was developed based on a best-case scenario, i.e., the system had all the characteristics a BRT system. The study focused on four corridors:

- **US 29** between Mount Hebron and Silver Spring
- **Broken Land Parkway** between Columbia Town Center and Savage MARC Station
- **MD 32** between Clarksville and Odenton Town Center
- **MD 216** between Scaggsville and Odenton Town Center

Phase II

The Phase II study examined specific route alignment and stations, ancillary feeder transit services, landside services such as park and rides and pedestrian accessibility, preliminary operating costs, and land use plans to support high quality transit service within and between them.

- **US 29:** From Silver Spring Transit Center running north along US 29 with stations in Four Corners, White Oak, Fairland, Burtonsville, Maple Lawn, Route 32, Town Center, Long Gate, US 40 West and Mount Hebron

- **Broken Land Parkway:** From Columbia Town Center running east along Broken Land Parkway, the CSX rail ROW to US 1 and MD 32 with stations at Stevens Forest, Snowden River, Gateway, US 1, and Savage MARC station

- **US 1:** From the College Park Transportation Center (Metro Green Line, MARC Camden Line and future Purple Line) running north along US 1 with stations in south Laurel, downtown Laurel/ Laurel MARC, North Laurel, Savage, Jessup, Dorsey MARC Station, and Elkridge having a terminus of BWI or Arundel Mills

[6] Howard County BRT—Concept Plans and Preliminary Cost Estimates for the Envisioned System, for the Howard County Office of Transportation, April 20, 2012.

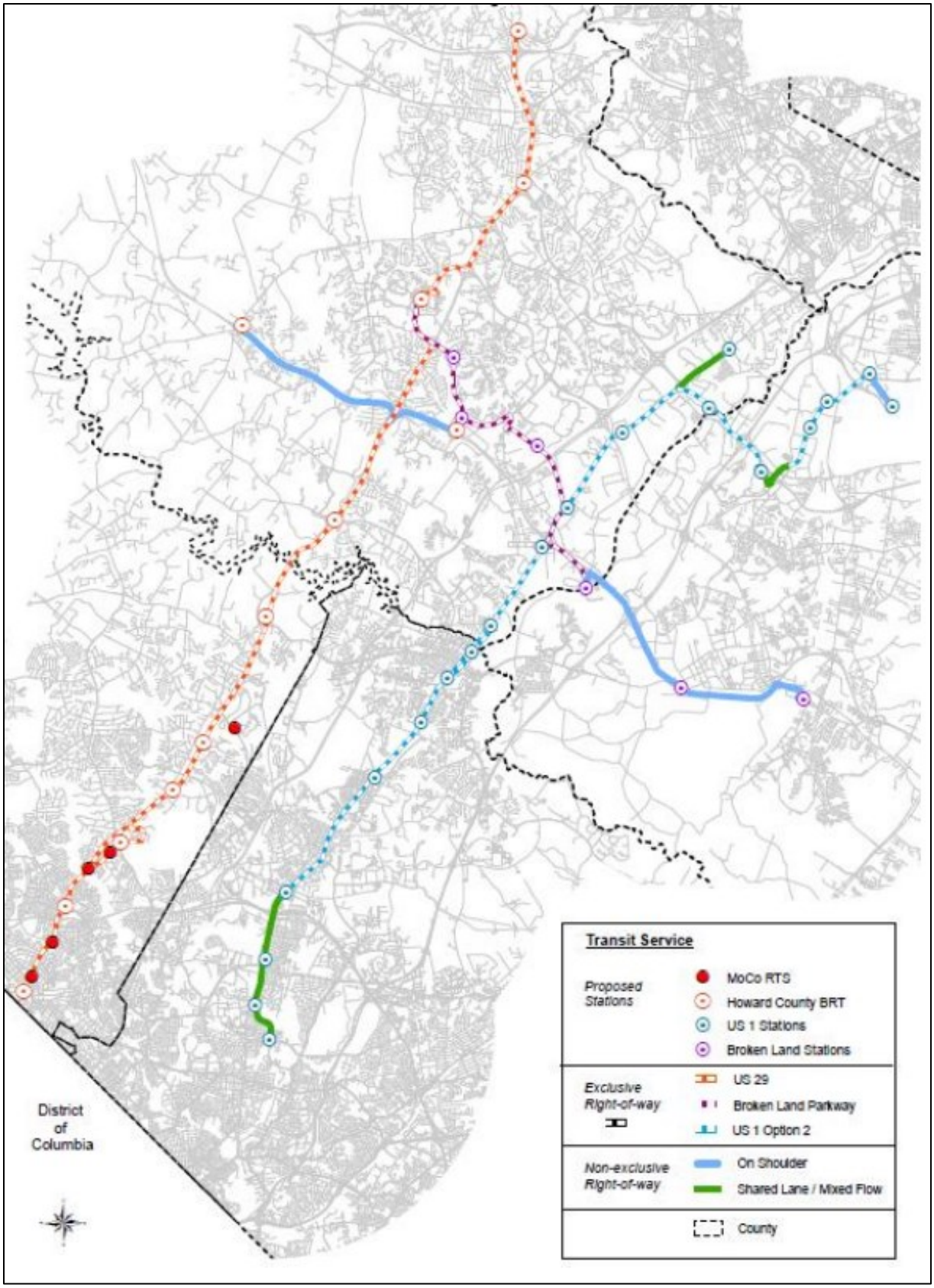


Figure 16: Howard County BRT Study Corridors

Central Maryland Regional Transit Plan (MTA)

The Central Maryland Regional Transit Plan was mandated by the Maryland General Assembly to create a vision for future transit services in the core service areas served by MTA. In addition to asset management, minor service improvements and customer service initiatives, the CMRTP identifies "corridors of opportunity" for future transit investment. Corridors of opportunity are defined by transit demand that justifies infrastructure, service, and technology improvements, and have regional significance and often provide connectivity between different jurisdictions.

BWI Marshall Airport to Columbia Town Center was identified as a mid-term opportunity corridor and Odenton to Clarksville as a long-term opportunity corridor. Mid-term opportunity corridors are described as having moderate existing transit demand, while long-term opportunity corridors are selected for their potential to benefit areas where transit demand is expected to increase over the next 25 years. To prepare these corridors for successful transit investments, jurisdictions, MDOT MTA, BRTB, and/or local transit providers should build transit ridership by implementing or improving existing service; implementing incremental transit priority infrastructure so that existing transit is faster and more reliable; reviewing and changing land use and zoning ordinances to be more transit supportive; and, facilitating better pedestrian and bicycle access to get to the existing and potential future transit corridors.

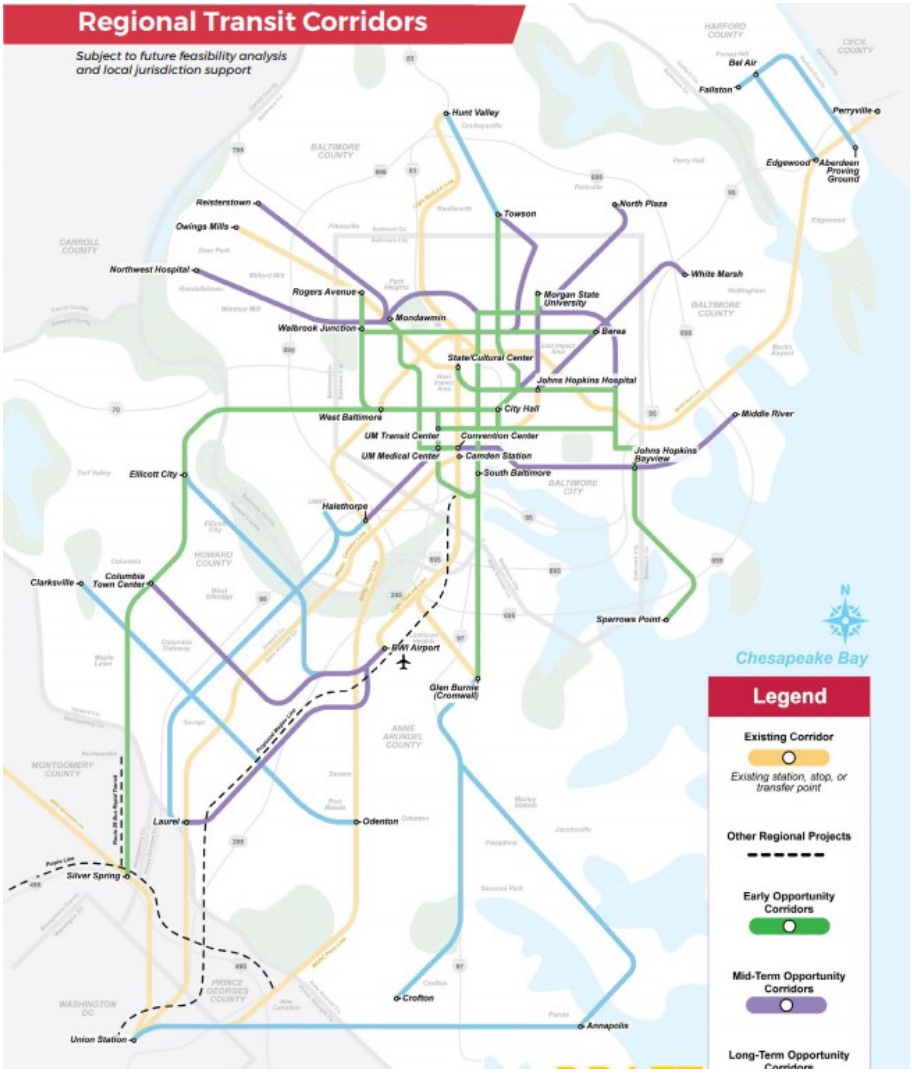


Figure 17. Central Maryland Transit Plan

Anne Arundel County General Development Plan

The 2009 Anne Arundel County General Development plan includes a proposed extension of the Yellow Line from the BWI Business Park to the Dorsey Road MARC station on the Camden Line and ultimately connecting Columbia in Howard County. The GDP adopts the alignment identified in the 2005 Corridor Preservation Study alignment and recommends its implementation between the BWI Business Park Light Rail Station and the Dorsey MARC station.

As of this writing, the 2020 update of the General Development Plan is underway.

Howard County General Plan

The 2012 Howard County General Plan references several potential transit corridors for high-quality, high-capacity service:

- The economic development element of the General Development Plan recommends study of a potential Bus Rapid Transit (BRT) line to connect Downtown Columbia to the Snowden River Parkway area, Gateway Business Park, Route 1, and Fort Meade. To obtain the necessary rights-of-way (ROW) to create the Howard County portion of the system, the County would need to acquire railroad ROW being abandoned in a piecemeal manner by CSX.

- The transportation element of the General Development Plan recommends the Yellow Line light rail extension on the Baltimore Region Rail System Plan and a bus rapid transit (BRT) route along US 29 connecting from Ellicott City to Silver Spring in cooperation with Montgomery County government.

As of this writing, the 2020 update of the General Development Plan is underway.

Appendix B. Station Typologies

Distinct intermodal, land use, and operational considerations at different locations within the MD 32 study corridor mean that not all BRT stations will be alike. This document details four station typologies for the corridor that reflect those influences and their associated infrastructure requirements while still setting a standard for station design and passenger accommodation that wil meets the needs of transit riders.

Influences on Station Type

Intermodal connections, land use patterns, and operational considerations all affect what station type is appropriate at any given location. Passengers arrive at stations as pedestrians, on bicycles, via transit transfers, dropped off by private operators such as taxis, Uber, and Lyft, or by leaving their own vehicle. Each one of these access modes directly requires different infrastructure. Land use patterns, such as residential density, nearby commercial or employment centers, and street network connectivity influence station type indirectly by affecting when and how often transit should serve a given stop as well as by passengers' access modes. Finally, operational considerations affect station type as well. Where it is important to keep time spent boarding and exiting from/entering into traffic to a minimum, station design elements such as high-level platforms can help meet these objectives. In contrast, route termini must have layover space but do not require rapid passenger boarding and alighting. Table 3, below, lists the degree of importance for various influences among the four typologies in this memo.

Table 3. Station Type Influences

Influence	Walk-up	Kiss & Ride	Park & Ride	Transit Center
Pedestrian and bicycle	High	Low	Medium	High
Transit connections	Low	Low	Medium	High
Private operators (Taxi, TNC)	Low	High	Medium	Medium
Park and ride	Low	Low	High	Medium
Residential density	High	Low	Low	Medium
Presence of commercial and employment centers	High	Low	Low	High
Street network connectivity	High	Low	Low	High
Speed of passenger boarding	High	High	Low	Low
Speed of exit from/entry into traffic	High	High	Low	Low
Need for layover space	Low	Low	Medium	High

Proposed Typologies Summary

This document proposes four typologies for bus rapid transit stations in the MD 32 corridor:

- **Walk-up** stations, the purpose of which is to provide transit service to and from neighborhoods, commercial destinations, and employment centers.
- **Kiss & Ride** stations, the purpose of which is to provide a small-footprint, short-dwell time location along a transit route to accommodate carpool dropoffs, TNCs, taxicabs, etc
- **Park & Ride** stations, the purpose of which is to provide a place for motorists to leave vehicles unattended for one day or less while travelling on transit
- **Transit Center** stations, the purpose of which is to provide service from multiple transit routes to and from employment, commercial, or dense mixed-use areas and to provide for centralized transfers between transit routes

For each proposed typology, the document discusses a typical location context, most frequent modes of access, infrastructure requirements, and provides examples or additional discussion. The document also includes example photos and representative graphics demonstrating typical features of each station type.

Station Typologies

Walk-up Station

Walk-up stations provide transit service to and from neighborhoods, commercial destinations, and employment centers. They are typically located at intermediate locations along transit routes and are usually situated in moderate-density suburban to dense urban areas, in residential neighborhoods or within ¼ mile of pedestrian destinations such as retail, office, or apartment buildings.

The predominant mode of access for walk-up stations is pedestrian, although depending on location some passengers may arrive on bicycle or be dropped off by a carpool, TNC, or taxicab.

Infrastructure required at walk-up stations include, at a minimum, sidewalk access to nearby destinations, an ADA-accessible landing pad, and a shelter, sign, trash can, and transit map. Depending on available space, high-level platforms and bus pull-outs may be included as well.

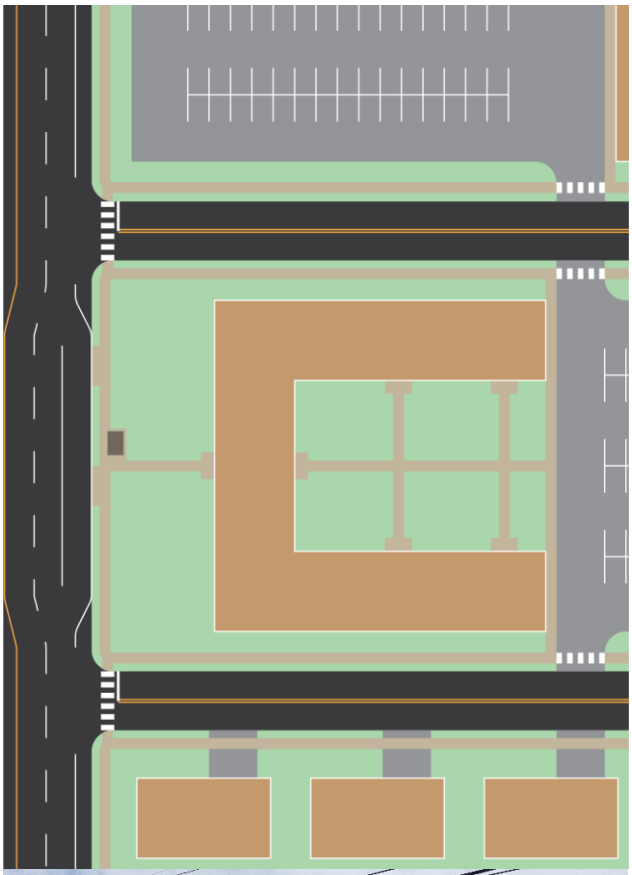
Walk-up stations are the most common type of bus stops, but they are unlikely to be the most common along the MD 32 corridor because there are relatively few walkable areas within the study corridor.

In the vicinity of the study area, the MD 2/Ritchie corridor (MTA Route 70) has multiple walk-up stop pairs with ridership >50/day. Within the study area but outside the MD 2 corridor, the only high-ridership walk-up stop is Arundel Mills Mall, over 325 riders/day among the RTA, MTA, and Anne Arundel County Office of Transportation.

Table 4. Selected High-Ridership Walk-up stops in the MD 2 corridor

Stop Pair	Total Ridership
Calvert St & Bladen St	240
Hospital Dr & Crain Hwy	180
Ritchie Hwy & Jumpers Hole Rd	129
Hospital Dr & Elvaton Rd	110
Ring Rd & West Campus Dr	107
Hospital Dr & BW Medical Center	101
Oakwood Rd & Oak Manor Dr	58
Ritchie Hwy & Marley Station Mall	54

However, walk-up stations can be designed or envisioned for future transit-oriented development, and—whether in a TOD area or not—pedestrian/bicycle access improvements are key to successful walk-up station areas.



- Examples
  - MD Wholesale Food Center (Assateague Dr at US 1, Jessup)
    - Employment/Retail Center
    - Approx. 45 boardings + alightings/day (Winter 2019)
    - Two shelters, solar-powered lighting, trash/recycling receptacles
  - Ritchie Highway at Marley Station Mall
    - Employment/Retail Center
    - Approx 63 boardings + alightings/day (Spring 2019)
    - One shelter (in southbound direction), map
  - Oak Leaf FLASH Station
    - Residential Neighborhood (mix of single-family, townhouse, and high-rise apartments)
    - Shelters in both directions, map, off-board fare-payment

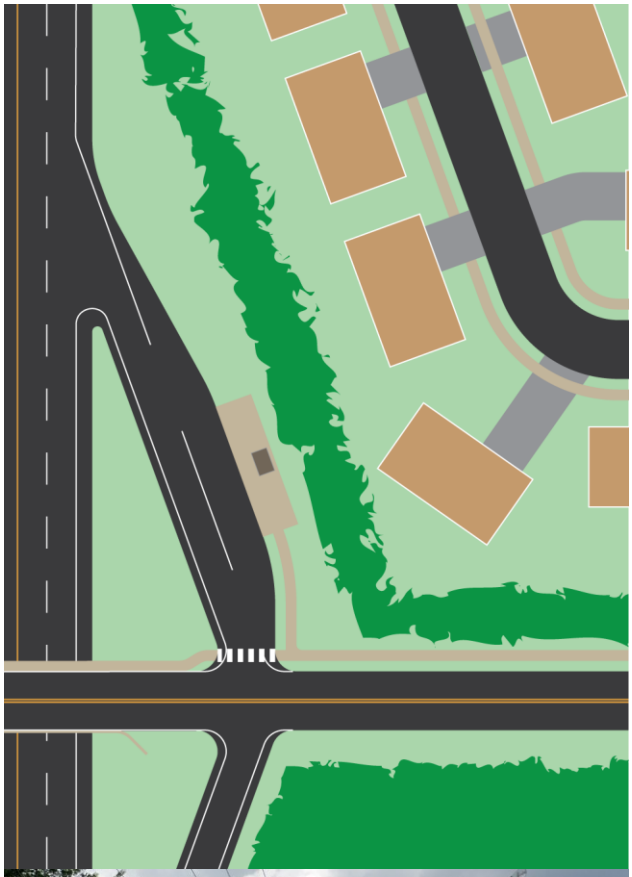
Kiss & Ride

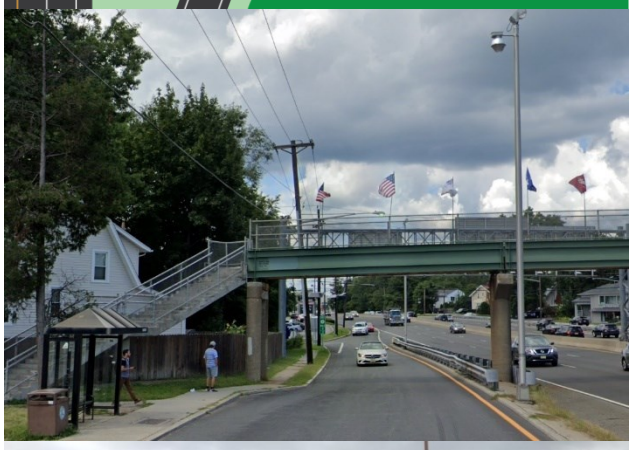
Kiss & Ride stations provide a small-footprint, short-dwell time location along a transit route, primarily to accommodate carpool dropoffs, TNCs, and taxicabs. They are typically located at intermediate locations along transit routes in low-density rural to moderate-density suburban areas and tend to be situated where collector or arterial roads cross a transit route, where another transit route intersects the subject route, where there are no pedestrian destinations within ¼ mile, and where there is not enough space or demand for a park & ride lot.

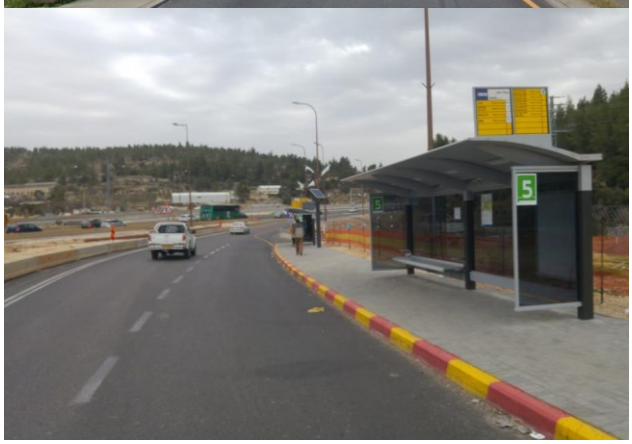
The predominant mode of access for Kiss & Ride stations is vehicular; most passengers are dropped off by carpool, TNC, or taxicab, or transfer from other transit service. Depending on site context, some passengers may arrive on foot or bicycle. Physical infrastructure at Kiss & Ride stations is usually located along an entrance or exit ramp from a limited-access highway to keep travel time to a minimum by limiting diversion time off the main transit route. Kiss & Ride stations require an ADA-accessible landing pad, shelter, sign, trash can, transit map, and a pull-out to accommodate buses and vehicles dropping off/picking up passengers. If there are any nearby pedestrian destinations, sidewalk access between them and the transit stop should be provided as well.

Kiss & Ride stations are common in locations where carpooling comprises a larger share of commuting, because they provide a quick and seamless interface between a carpool and transit trip. They provide service at intermediate locations along a transit route with minimal additional travel time as compared to stops that are a greater distance from the primary route.

However, there can be safety concerns for passengers and vehicles at Kiss & Ride stations, because passengers frequently have to cross or walk along entrance and exit ramps to access the stations, and because there is a high speed differential between vehicles pulling into/out of the Kiss & Ride pull-outs and passing vehicles.In mixed traffic, the Kiss & Ride pullout can be shared between transit vehicles and vehicles dropping off/picking up, while for BRT with a dedicated guideway, the Kiss & Ride pullout can be located across-platform from the bus pullout.







- Examples
  - NJ 4 in Bergen County, NJ (multiple locations; good example is NJ 4 at Main St, Rivers Edge, NJ)
  - US 101 (Ventura Fwy) at Van Nuys Blvd and Reseda Blvd, Los Angeles

Park & Ride

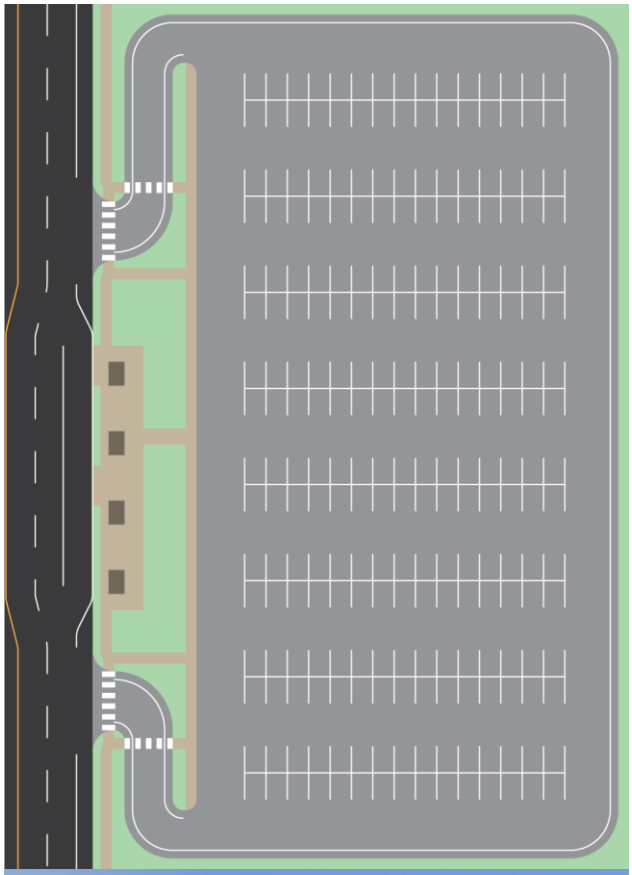
Park & Ride stations provide a place for motorists to leave vehicles unattended for one day or less while travelling on transit. They may be located at intermediate or terminal locations along transit routes but are usually found in low-density rural to moderate density suburban areas and are most common at or near arterial freeway interchanges. Most passengers arrive at Park & Ride lots in private vehicles. Depending on their location and size, lots collect passengers from drivesheds that vary in size from a neighborhood to large parts of a county. Depending on site and transit route context, some passengers may arrive on bicycles, other transit routes, or as pedestrians. Not all patrons ride transit; some join carpools or vanpools.

Park & Ride stations need a parking lot that fits within available space but is sized to comfortably accommodate the number of passenger vehicles anticipated on a typical day. These stations also need sidewalk access between the parking lot and transit stops, and shelters, signs, trash cans, and transit maps at the transit stops. If there are any nearby pedestrian destinations, sidewalk access between them and the transit stop should be provided as well.

Many use existing linear rights-of-way, but some rely on shared parking or lease agreements with shopping centers, churches, or other properties, and still others have required purchase. Park & Ride lots in the corridor vary widely in size, as shown in Table X, but most have capacity to spare.

Table 5. Existing Park & Ride Lots in the Corridor

Name	Locale	Spaces
Ten Oaks Ballroom	Clarksville	170
Broken Land West	Columbia	318
Broken Land East	Columbia	346
Snowden River	Columbia	305
Dorsey MARC	Dorsey	802
Savage MARC	Savage	978
Odenton MARC	Odenton	1300
Benfield Blvd	Millersville	82
Earleigh Heights	Severna Park	64
Severna Park	Severna Park	180
Hahn Drive	Severna Park	200
Truman	Annapolis	800



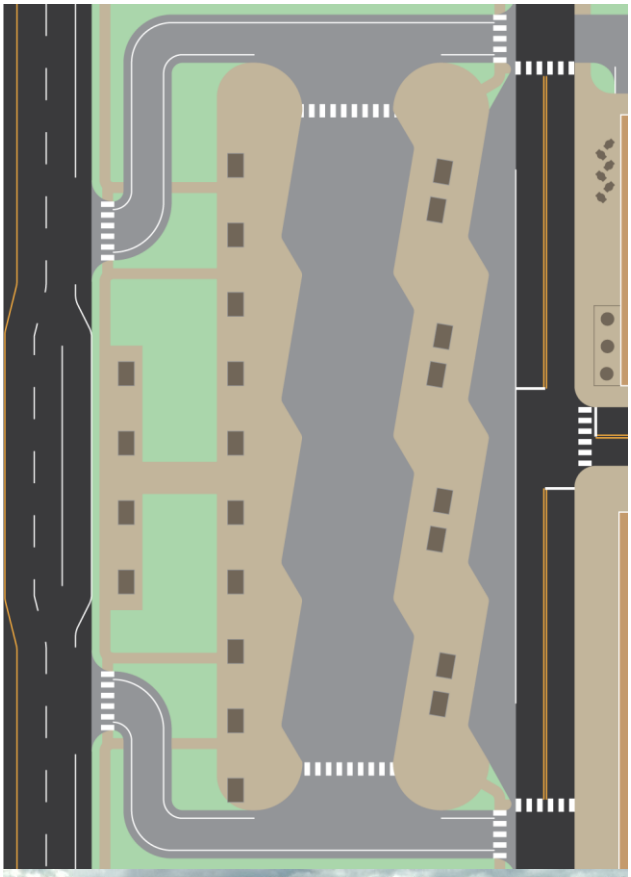
- Examples
  - Broken Land Parkway P&R
    - 665 spaces; averages 67% occupancy
    - 4 commuter bus routes
  - Savage MARC
    - 643 spaces; averages 29% occupancy
    - 1 commuter rail and 2 local bus routes
  - Burtonsville FLASH Station
    - 584 spaces; averages 61% occupancy
    - 1 BRT, 4 commuter bus, and 2 local bus routes

Transit Center

Transit Centers provide service from multiple transit routes to and from employment, commercial, or dense mixed-use areas, as well as provide for centralized transfers between transit routes. They are usually located at terminal locations of at least some routes but frequently accommodate intermdiate stops as well.

Most passengers arrive at transit centers on transit vehicles. Depending on transit operators' service plans and route structures, a varying-size share of passengers transfer to other transit routes without leaving the transit center property. The majority of those who begin or end their transit trip at a transit center do so as pedestrians; the remainder typically access the center on a bicycle or in a taxicab, TNC, or carpool.

At a minimum, transit centers bus pull-outs or off-street bus bays, shelters, signs, trash cans, transit maps, and sidewalk access to nearby destinations. Higher-ridership transit centers may also include fully-enclosed waiting areas, attendant desks, motor vehicle drop-off areas, and vending machines or convenience stores.



Station Typologies of Similar Corridors

Southern Maryland Rapid Transit (SMRT)

SMRT is a 19-mile proposed rapid transit corridor, currently envisioned to be constructed as BRT, from White Plains/Waldorf in Charles County to the Branch Avenue Metro station Prince George's County. Planning for this corridor developed a matrix of access patterns (Intermodal, Mid-Line Local, Regional-Terminal/Collector) reflective of the proposed service pattern and land-use patterns (Town Center/Mixed-Use, Special Anchor, Residential Neighborhood, Rural Isolated) reflective of the land-use context in Southern Maryland. Station types were based on pairings of these two attributes. Although there are twelve potential pattern pairings, only five station types are proposed:

- Intermodal – Town Center/Mixed-Use
- Mid-Line Local – Town Center/Mixed-Use
- Mid-Line Local – Special Anchor
- Mid-Line Local – Residential Neighborhood
- Regional Collector - Rural

Corridor Cities Transitway (CCT)

The CCT is a 15-mile proposed BRT corridor from Clarksburg to the Shady Grove Metro station in Montgomery County. The CCT alignment is entirely in the suburban or suburban activity center context zone, so there are only moderate land-use differences among the station areas. Therefore, the CCT has adopted a form-based station typology.

Basic components, to include "trash and recycling receptacles, benches, emergency phones, ticket vending machines, map display cases, variable message signs, bike storage, and wind screens," would be required at all stations, along with branded signage and an ADA-accessible waiting area that allows for level boarding.

Stations would be one of three layouts: median-platform, side-platfom, or aerial platform, depending on available space and site conditions. Terminus and high-ridership stations would be twice as long as intermediate stations, but the intermediate stations would have space reserved should future conditions dictate expansion. [7]

FLASH

FLASH is a premium bus service with some BRT features currently in operation between Burtonsville and Silver Spring in Montgomery County. The County also plans for future FLASH service in the MD 355 and MD 586 corridors.

FLASH used a capacity/context matrix to develop station typologies. The matrix included five categories of station components: base station types (i.e. signage), shelter & furnishings, public art, communication & utility (e.g. map, CCTV, electric service, wifi), and landscape/low impact development. Station capacity (low, medium, or high) dictated an initial determination as to which of the station components should be optional, required, or enhanced. Station context (suburban/residential/open space, or urban/mixed-use/restricted space) was a second attribute that allowed for station components to be added or subtracted "based on site conditions." [8]

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[7] https://www.cctmaryland.com/images/pdfs/environmentalstudies/cctchapter2alternatives_08102017.pdf#page=17

[8] https://www.montgomerycountymd.gov/dot-dte/Resources/Files/MWCOG-BRT-Report-July2017lr.pdf