

4

Bus Rapid Transit Stations and Right of Way

4.1 Introduction

Stations are the “front door” for any bus rapid transit system. As opposed to bus stops for local bus service, which typically include just a sign on a pole and maybe amenities like a shelter, BRT stations often provide an expanded level of amenities, more akin to light rail transit, to further reinforce the image that BRT is a premium bus service. While the scope of this study is not focused on the design of the BRT stations, it is necessary to think about the types of amenities and passenger loads when appropriately sizing the station. BRT stations are typically larger than traditional bus stops to accommodate the increased passenger loads and amenities associated with BRT.

When developing a concept for a BRT station the following decisions need to be made:

- ▶ **Where will the station be located?** Stations can be located on the street, within the busway, or as part of a larger transit center. Depending on the design of the BRT guideway they can be located in the center of the roadway or along the curb like traditional bus stops. BRT stations are often physically separated from the surrounding pedestrian environment. This is done to keep the station from impeding pedestrian flows, but to also provide more controlled access to the system. Many systems provide off board fare collection, and controlling access to the station platform is one method of reducing fare evasion.
- ▶ **What type of station?** There is a range of station types based on size and the level of amenities and complexity. A simple station may just include a bus shelter, while a transit center would provide opportunities for many different modes of travel (car, bus, train), high levels of passenger amenities and information, and potentially parking.
- ▶ **What is the appropriate level of passenger amenities?** Passenger amenities, like station type, can vary based on the design of the BRT system and scale of the station. Smaller stations may only provide basic passenger information and seating. Larger stations can include digital displays for passenger information, vending machines, landscaping, and shelters of a higher quality material or finish.

Due to the increased size and cost associated with BRT stations, they are often viewed in the same light with light rail or streetcar stations in terms of promoting higher levels of property development around them. This fact, combined with the greater spacing requirement, requires another level of focus and study when determining the proper placement.

The following sections describe some of the considerations that should be factored into station location and design, followed by a review of how the *Countywide Transit Corridors Functional Master Plan* (CTCFMP) station locations fare in that regard. Alternative station locations are also suggested to address certain concerns or limitations with the CTCFMP locations. Finally, a set of policy considerations are provided to help the City consider optional station locations as a function of their most important policy goals for both improving mobility for current transit system users and facilitating investment in future transit-oriented development.

This chapter also addresses the right of way requirements for the MD 355 BRT in the City of Gaithersburg. The right of way requirements are heavily driven by station locations and attributes. The right of way requirements will inform the policy decisions adopted by the Gaithersburg City Council.

4.2 Station Location Functional Considerations

When determining station locations for BRT, a number of factors should be considered. This section discusses a range of station considerations for the MD 355 corridor.

Existing Transit Ridership

Existing transit ridership is often the first factor considered in siting BRT stations. Existing ridership is a good indicator of the potential for future ridership. BRT stations should be located in areas where there is a solid foundation of existing transit use.

Stop-by-stop ridership for existing transit routes along the MD 355 corridor was reviewed for those locations near proposed BRT stations in the City of Gaithersburg⁸. Table 4-1 shows the typical weekday boardings and alighting for stops along the MD 355 corridor in the City of Gaithersburg⁹.

Table 4-1: Transit Ridership along MD 355 in the City of Gaithersburg at Proposed BRT Stations

Location	Boardings	Alightings
MD 355 & Professional Dr	106	106
MD 355 & Watkins Mill Rd	317	317
MD 355 & MD 124	177	257
MD 355 & Odendhal Ave	920	960
MD 355 & Brookes Ave	361	376
MD 355 & Education Blvd	249	276

⁸ Ridership figures pulled from Logit data used as part of the *Demand and Service Planning Report to Montgomery County DOT*, Institute for Transportation and Development Policy, December 2012.

⁹ Existing stop ridership was identified by proximity (1/4 mile) to an existing intersection identified as a potential BRT station through previous planning efforts.

Existing and Future Land Use

Existing and future land uses are an important factor in identifying locations where there is the potential for latent demand for transit services. Major residential or commercial developments or planned developments that would generate large numbers of people should be served by the BRT. In addition to locations with high levels of existing transit ridership, locations with the potential for future transit ridership should be also be considered for BRT station locations.

Future population and employment density for the corridor are shown in Figures 4-1 and 4-2. The regional land use forecast for 2040 from the MWCOG shows that the area along MD 355 from Montgomery Village Avenue (MD 124) to Diamond Avenue is forecasted to have the highest density of households along the MD 355 corridor in the City. The same forecast shows that the 2040 employment density will be greatest in the zone west of MD 355 from MD 124 to Diamond Avenue. The level of detail provided by the region's land use forecast does not allow for a specific intersection(s) to be identified for a station, but does provide a sense for where the focus should lie along the corridor.

Figure 4-1: Household Density - Year 2040

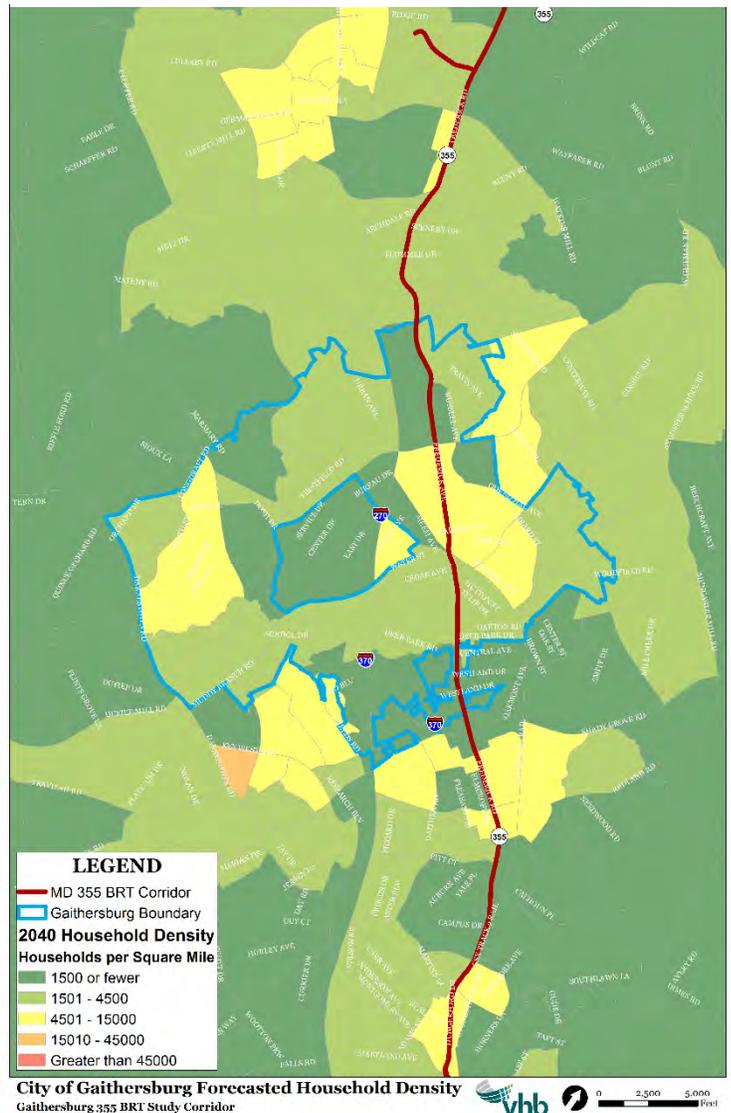
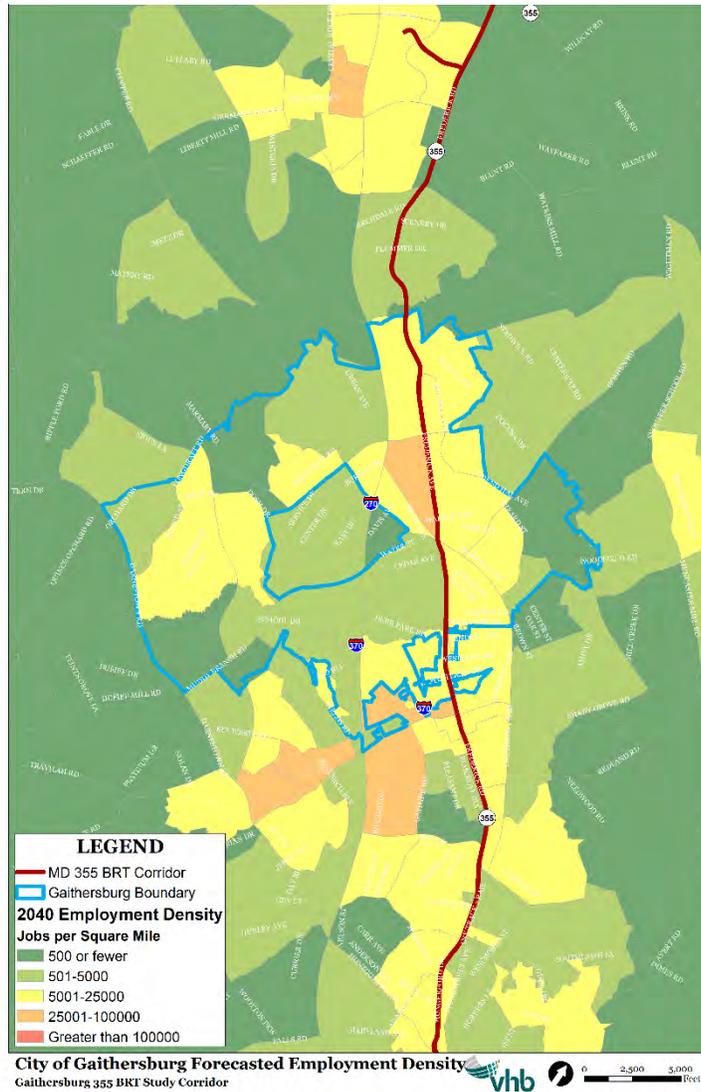


Figure 4-2: Employment Density - Year 2040



Pedestrian, Bicycle, and Other Transportation Connections

Pedestrian, bicycle and other transportation connections are important to enhance and improve overall connectivity for the transit system. This includes sidewalks/bicycle trails, pedestrian friendly intersections, presence of a traffic signal. BRT stations should be located in areas that capitalize on existing transportation connections. These connections, often referred to as the “last-mile”, provide vital links for those accessing transit.

The focus of this study was the BRT feasibility on MD 355 in the City and did not entail documenting where bike and pedestrian facilities should be provided. However, when siting future BRT stations the existing bike and pedestrian connections should be acknowledged and taken advantage of. The entire MD 355 corridor has sidewalks, as do many of the cross street connections. In addition there is a shared use path along the west side of MD 355 from beyond the City’s boundary at the north down to MD 124. As the BRT concept advances in further stages of planning and design, efforts to coordinate the design with other City efforts focused on planning for bikes and pedestrians should be added.

Traffic/Roadway Network Implications

Station locations require a wider cross section than a typical BRT roadway segment to accommodate platforms, benches, shelters, and intersection turning lanes. BRT stations should be sited in locations that are able to accommodate the required infrastructure and support walkable, transit oriented development. Intersections with existing wide cross-sections, multiple turn lanes, and complex designs, such as Montgomery Village Avenue, should be avoided where possible. Unless a complete reimagining of the intersection and corridor is planned, adding a BRT station at these locations would further widen the road and make an already complex intersection more complicated.

Bus Stop Spacing

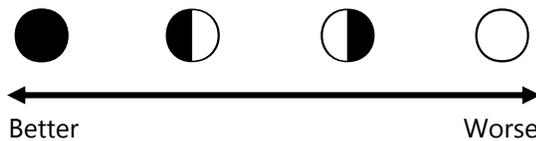
BRT stations should be sited at locations that benefit the overall operations of the corridor, and should ideally be spaced every half mile to mile. This distance is related to the distance people are willing to walk to transit, and is typically in the order of a quarter to a half a mile, which equates to a five- to 10-minute walk. The spacing provides a suitable balance between transit access and speed.

4.3 Potential Station Locations

An assessment of potential station locations started with the proposed locations from the *Countywide Transit Corridors Functional Master Plan*. Each location proposed was assessed using the four primary aspects discussed above:

- ▶ Existing Transit Ridership
- ▶ Existing and Future Land Use
- ▶ Existing Connections
- ▶ Traffic Complications

The scoring system used is the same one that was used to rate the different guideway design alternatives.



In addition to the station locations identified through the CTCFMP, additional locations were identified based on challenges identified through the assessment of the Functional Master Plan station, gaps in accessibility or coverage, and a view towards promoted transit-oriented development.

Countywide Transit Corridors Functional Master Plan Stations

The *Countywide Transit Corridors Functional Master Plan* identified multiple potential station locations for the City of Gaithersburg along MD 355, including:

- ▶ Professional Drive
- ▶ Watkins Mill Road

- ▶ Montgomery Village Avenue (MD 124)
- ▶ Odendhal Avenue
- ▶ Brookes Avenue
- ▶ Education Boulevard

These location are used as the starting point for proposed station locations in the City of Gaithersburg. Each station identified is discussed below for consistency with the criteria described above. A presentation of the pros and cons associated with each are location is included. The locations viewed as most viable or challenging will be identified.

Professional Drive

Existing ridership for stops within a quarter mile of the intersection of Professional Drive and MD 355 is around 100 boardings. This station would serve the adjacent office and residential complexes along Professional Drive. The west side of MD 355 is forecasted to see greater growth in both employment and residential density than the eastern side. There are sidewalks and pedestrian connections available on both approaches of Frederick Avenue. There is an existing traffic signal with crosswalks and pedestrian signals across the north, east, and west approaches. There is a shared use path along the west side of MD 355. The roadway cross-section include six through lanes and a single left turn lane for each approach on MD 355. This station would be over one mile from the next station to the north at Middlebrook Road and half a mile from a station at Watkins Mill Road to the south. The stop spacing to the north is greater than average because of the limited development in the Great Seneca Creek, just north of the City boundary.



Looking north along MD 355 at Professional Drive

Table 4-2: Professional Drive Station Rating

Existing Ridership	○
Land Use	◐
Existing Connections	◑
Traffic Complications	●

Watkins Mill Station

A station at Watkins Mill Road would not be near an existing transit stop on MD 355. However, there are stops along Russell Avenue that are within a quarter mile of the intersection. Existing ridership is around 300 boardings. With the future extension of Watkins Mill Road over I-270, a local transit or shuttle service connection could be made available to the Corridor Cities Transitway and the MARC train.

A station at Watkins Mill Road would serve the residential and commercial uses to the east of MD 355. Development is occurring on other sites around the intersection and is planned to continue with the future interchange for I-270.

There are sidewalks and pedestrian connections available on all approaches of this intersection. There is a traffic signal with pedestrian signals, but crosswalks are available only on the north, west, and east approaches of the intersection. The shared use path that is along the west side of MD 355 continues through this intersection to the south.

The cross section at Watkins Mill Road maintains six through traffic lanes and includes a separate left turn lane on each approach. A dedicated right turn lane is provided on the north approach with space provided for a second lane that can be activated when the interchange is complete.

A station at Watkins Mill Road would be about half a mile from the station at Professional Drive to the north and half a mile from a station at Montgomery Village Avenue to the south.



Looking north along MD 355 at Watkins Mill Road

Table 4-3: Watkins Mill Road Station Rating

Existing Ridership	◐
Land Use	●
Existing Connections	●
Traffic Complications	◐

Montgomery Village Avenue Station

A station at Montgomery Village Avenue would not be near an existing transit stop on MD 355, but there are stops on Montgomery Village Avenue (MD 124) as well as stops closer to Lakeforest Boulevard that fall within a quarter mile of the intersection. Total existing ridership is around 200 boardings. MD 124 runs along the north side of Lakeforest Mall where the Lakeforest Transit Center is located, approximately half a mile south on Russell Avenue from MD 124.

A station at Montgomey Village Avenue would serve the Lakeforest Mall and adjacent commercial developments. The Lakeforest Mall is being talked about for redevelopment, as are some of the surrounding properties, although no specific redevelopment proposals have been submitted.

There are sidewalks and pedestrian connections available on all approaches of this intersection. There is a traffic signal with pedestrian signals, but crosswalks are available only on the east, west, and south legs of the intersection. The shared use path that runs along the west side of MD 355 terminates at MD 124.

Northbound MD 355 has three dedicated left turn lanes feeding onto Montgomery Village Road westbound. This connects with I-270 and is a major movement throughout the day. After the Watkins Mill Interchange is complete, it may be possible to eliminate one of the northbound left turn lanes. Additionally there are two left turn lanes from MD 355 to eastbound MD 124. The intersection also includes channelized right turn lanes from each approach. The traffic volumes associated with MD 124 and complicated roadway geometry suggest that placing a station at this location will be more challenging than other locations with less traffic activity. A station at Montgomery Village Avenue would be about a half mile from the station at Watkins Mill Road to the north and approximately 0.4 miles from a station at Odendhal Avenue to the south.



Looking southwest along MD 355 at Montgomery Village Drive (MD 124)

Table 4-4: Montgomery Village Drive (MD 124) Station Rating

Existing Ridership	○
Land Use	◐
Existing Connections	◐
Traffic Complications	○

Odendhal Avenue Station

A station at Odendhal Road would be less than 300 feet from the nearest existing transit stop at Whetstone, with many stops within a quarter mile. The total existing ridership for stops within a quarter mile of the station is around 900 riders. The station would be adjacent to three existing routings for buses serving the Lakeforest Transit Center.

Land uses adjacent to Odendhal Road are low density commercial, with a connection available to the Lakeforest Mall. As mentioned before, the Lakeforest Mall has been part of discussions for development. A station at this location and redevelopment around the mall would create a benefit to both.

There are sidewalks and pedestrian connections available on all approaches of this intersection. There is a traffic signal with pedestrian signals, and crosswalks are available on all legs of the intersection. The fourth side of the intersection includes a gas station driveway. The driveway is signalized as part of the intersection, but consideration for pedestrian safety across active commercial driveways could be a concern.

This intersection is a three-legged intersection with lower traffic volumes than some of the larger intersections to the north. The intersection provides only two southbound lanes from the north approach and a separate left turn lane. The south approach includes three northbound through lanes and the two-way left turn lane. This station would be less about a half mile from the station at Montgomery Village Avenue to the north and about half a mile from a station at Brookes Avenue.



Looking south along MD 355 at Odendhal Avenue

Table 4-5: Odendhal Avenue Station Rating

Existing Ridership	●
Land Use	◐
Existing Connections	◐
Traffic Complications	◐

Brookes Avenue Station

A station at Brookes Avenue would be less than 200 feet from an existing bus stop on MD 355. Ridership for the stops within a quarter mile of the proposed station is around 350 riders. There are two existing routes that utilize this segment of MD 355.

A station at Brookes Avenue would serve adjacent residential properties to the east side of MD 355 and commercial properties along the west. The station would be about 300 feet from the Father Cuddy Bridge. The bridge and railroad tracks would be a major barrier to attracting riders from the south, and significantly limit the redevelopment opportunities associated with this station location. MD 355 is inclined in this location as it approaches the Father Cuddy Bridge, and significant retaining walls are necessary to support the roadway and maintain mobility on adjacent local streets. Additional land would need to be acquired to construct a station, with significant impacts on adjacent street and private property access, as well as elevated construction cost.

There are sidewalks and pedestrian connections available along both sides of MD 355 and into the residential neighborhood to the east. Brookes Avenue intersects MD 355 at a median separated location and no signalized intersection is provided, so there are no marked or controlled crossings on MD 355 at this location.

The cross section for MD 355 includes four though lanes and a third lane in each direction that functions as a right turn lane. The median dividing MD 355 and the lack of any signalization would need to be addressed in order to allow pedestrians to access median platforms. This station would be about a half mile from the station at Odendhal Avenue to the north and three quarters of a mile from a station at Education Boulevard to the south.



Looking south along MD 355 at Brookes Avenue

Table 4-6: Brookes Avenue Station Rating

Existing Ridership	◐
Land Use	○
Existing Connections	○
Traffic Complications	○

Education Boulevard Station

A station at Education Boulevard would be less than 100 feet from the existing local stop. The existing stops within a quarter mile of this location currently serve approximately 250 riders daily.

A station at Education Boulevard would serve Gaithersburg High School, as well as the residential developments on the east side of MD 355. The west side of MD 355 around this station is not forecasted to grow much in terms of households or employment. The east side shows very limited growth in households and more growth in jobs. These are likely located closer to Olde Towne Gaithersburg which is about a half mile walk from Education Boulevard.

There are sidewalks and pedestrian connections available on approaches of this intersection. There is a traffic signal with pedestrian signals, and high-visibility crosswalks are available on all legs of the intersection.

The cross section for MD 355 at Education Boulevard is six though lanes in each direction with a separate left turn lane on each approach from MD 355. The east-bound and westbound portions of Education Boulevard are separated by a wide median that extends the pedestrian crossing distance on that street, but doesn't represent an issues for a BRT station. This station is located about three-quarters of a mile from the previous station at Brookes Avenue and almost 1.5 miles from a station at Shady Grove Route, outside the City of Gaithersburg, to the south.



Looking north along MD 355 at Education Boulevard

Table 4-7: Education Boulevard Station Rating

Existing Ridership	
Land Use	
Existing Connections	
Traffic Complications	

Other Possible Station Locations

The following additional locations have been identified as potential station locations not identified as part of the CTCFMP. The same assessment for these locations was done as the previous locations. The locations were identified in an effort to respond to challenges associated with some of the locations identified in the County’s master plan document.

Travis Avenue/Spectrum Avenue Station

Travis Avenue/Spectrum Avenue is a potential replacement for the Professional Drive station. This location is further south of Great Seneca Creek, increasing potential for redevelopment opportunities that could be challenging at Professional Drive. There are already higher intensity developments (Paramount 355) at Travis Avenue with additional development currently under construction at the northwest corner of Watkins Mill Road.

A station at Travis Avenue would be about two-tenths of a mile from the nearest existing bus stop. This stop is not located along MD 355, but east of MD 355 on Travis. If a station was to be located at Travis Avenue reconsideration for the location of other existing bus routes and stops could be made to ensure better synergies between the BRT and local bus.

As mentioned above, the area around Travis Avenue has already developed with mid-rise mixed-use properties on the west side of MD 355. The east side is traditional suburban commercial with residential properties further to the east. Just to the south of Travis Avenue is another mid-ride development currently under construction at Watkins Mill Road. This development would be within the walkshed of a station at either Travis Avenue or Watkins Mill Road. Additional redevelopment may be challenging north of the intersection with Travis Avenue due to the power lines.

The existing pedestrian network here is similar to the network at Professional Drive and Watkins Mill Road. The intersection is signalized with pedestrian accessible pedestrian signals and crossings along the north, west, and east legs.

The intersection provides three though lanes in each direction along MD 355 as well as dedicated left turn lanes. The southern approach also includes a dedicated right turn lane. The cross section for Spectrum Avenue and Travis Avenue is narrower than other streets intersecting MD 355, making the overall intersection footprint smaller than some of the other intersections along the corridor.



Looking south along MD 355 at Travis Avenue/Spectrum Avenue

A station at Spectrum Avenue/Travis Avenue would be about a third of a mile from the Professional Drive and Watkins Mill Road stations. As an alternative not considered as part of the CTCFMP, a decision would need to be made about which stations make the most sense from a transit operations as well as supporting future land use standpoint to ensure proper spacing of a half mile to mile between stations.

Table 4-8: Travis Avenue/Spectrum Avenue Station Rating

Existing Ridership	○
Land Use	◐
Existing Connections	◐
Traffic Complications	●

Christopher Avenue Station

Christopher Avenue is seen as an alternative to the Watkins Mill Road station due to its lower traffic volumes, which would contribute to improved pedestrian access and the possibility as a transit-oriented development focal point. While the Watkins Mill Road intersection does have some higher intensity development going in, the intersection footprint is larger than Christopher Avenue. Additionally, the future interchange with I-270 will likely increase traffic volumes at Watkins Mill Road and MD 355.

There are currently no existing bus stops or routes that travel along MD 355 at Christopher Avenue. The majority of the transit service occurs a block to the east on Russell Avenue.

The existing land use around Christopher Avenue is a combination of suburban office campus, big box retail, and auto sales. The combination of the smaller intersection footprint, lower traffic volumes, and BRT would provide opportunities for redevelopment in a walkable and transit-oriented scale.

The existing pedestrian network is adequate with sidewalks and connections. The intersection is signalized with pedestrian signals and crosswalks across the east, west, and north approaches. The mixed use path that runs along the west side of MD 355 provides connections for bikes and pedestrians.



Looking north along MD 355 at Christopher Avenue

The intersection at Christopher Drive provides three through lanes in each direction along MD 355 and dedicated left turn lanes for the north and south approaches. The east, south, and west legs provide channelized right turns with a yield condition.

A station at Christopher Avenue would be about a third of a mile from the Watkins Mill Road and MD 124 stations. Given the close spacing to the other stations identified in the CTCFMP, this station location should only be considered if one of the adjacent stations is eliminated.

Table 4-9: Christopher Avenue Station Rating

Existing Ridership	○
Land Use	◐
Existing Connections	◑
Traffic Complications	◑

Lakeforest Boulevard/Perry Parkway Station

The Lakeforest Boulevard/Perry Parkway location was identified to respond to two challenging locations. The MD 124 location presents challenges associated with the scale of the intersection in its current design. The addition of a station platform along with the widening required just to add the BRT guideway would further increase the intersection width and extend pedestrian crossing distances. Additionally, a station at this location would likely never

be able to fully realize any redevelopment opportunities oriented toward a walkable, transit-friendly design because of this size.

The next station to the south at Odendhal Avenue is a logical station location because of the interaction with the existing transit routes that serve the Lakeforest Transit Center. However, the hybrid design alternative identifies a transition from a two-lane guideway to a single-lane guideway at Odendhal Avenue could present some operational challenges associated with a single-lane reversible guideway design. Buses would need to exit the guideway into mixed traffic headed south and enter the guideway headed north from mixed traffic during non-peak travel times. This design alternative also results in the need for a curbside BRT station in the southbound direction.

Lakeforest Boulevard would still be proximate to many existing bus stops and transit routes. The future redevelopment of Lakeforest Mall and other surrounding properties could be combined with relocation of the Lakeforest Transit Center and restructuring of local bus routes that would position them closer to Lakeforest Boulevard and MD 355. The land use benefits cited for MD 124 and Odendhal Avenue apply to this location as well. The Lakeforest location is more central to the Lakeforest Mall and ring properties while MD 124 and Odendhal Avenue flank the sides. The combination of design, land use, and operational considerations suggest that a station at Lakeforest Boulevard is a preferred alternative to replace the MD 124 and Odendhal Avenue stations.

The existing pedestrian network is strong with ample sidewalks and connections. The intersection is signalized with pedestrian signals and crosswalks across the east, west, and south approaches.

The intersection layout is not ideal with three through lanes in each direction and two left turn lanes on both approaches from MD 355. The intersection, like MD 124, also includes channelized right turn lanes on all four approaches. The intersection could be redesigned to provide a more compact and pedestrian-oriented layout and support transit-oriented redevelopment of the surrounding parcels.

A Lakeforest Boulevard station would be located about 0.2 miles from the MD 124 and Odendhal Avenue stations. This station location is intended as a replacement for one or both of the adjacent stations identified in the CTCFMP.



Looking north along MD 355 at Lakeforest Boulevard

Table 4-10: Lakeforest Boulevard Station Rating

Existing Ridership	
Land Use	
Existing Connections	
Traffic Complications	

Chestnut Street/Walker Avenue Station

The previous section discussed some of the challenges with locating a station at Brookes Avenue. The design and land acquisition challenges with the Brookes Avenue location suggest that station should be eliminated entirely. However, this would force those living in the focal study area to walk further to access the BRT. The land use density in the area south of Odendhal Avenue only weakly supports a station near Chestnut Street, but any potential redevelopment in this area would benefit from a station location.

An alternative to considering Brookes as the location for a station would be to consider Chestnut Street and Walker Avenue as the station location. This location is similarly close to existing bus stops and routes as the Brookes location.

Existing land use for this area is traditional suburban commercial. Future forecasts for the area west of MD 355 shows the greatest density in jobs and households. If this portion of MD 355 redevelops with higher density land uses, the BRT could support economic growth and transit-oriented development potential.

A traffic signal is essential to provide safe pedestrian access to BRT stations on MD 355, and Chestnut Street is the only traffic signal location in this portion of the corridor. The location provides sidewalks on both sides of MD 355 and connectivity to the residential neighborhoods on the east and commercial businesses to the west. The intersection at Chestnut Street is signalized with pedestrian signals and marked crosswalks on the north, south, and west legs of this three-legged intersection. Walker Avenue, which is about 80 feet south of Chestnut, is not signalized.

The intersection at Chestnut Street includes two through lanes in each direction, a separate left turn lane in the northbound direction, and a separate right turn lane in the southbound direction. North of Chestnut is the two-way left turn lane. Adding a station at this location would require additional right-of-way beyond what is shown in the design layout alternatives included in Appendix B.

The misalignment between Chestnut Street and Walker Avenue complicates the potential station layout. Optimizing vehicular access and pedestrian access to Walker Avenue would require realignment of Chestnut Street to intersect MD 355 opposite Walker Avenue, which is only possible through future dedication of private property for the new roadway alignment. This option is best considered through the redevelopment and land use review process. A

new Chestnut Street alignment could help to normalize the street grid, minimize traffic operations issues, and improve future redevelopment opportunities in this portion of the corridor.

The location of the Chestnut Street intersection within the hybrid design alternative is at the southern transition point between the dual-lane and single-lane guideway. As a result, a curbside platform and mixed traffic operation north of Summit Avenue may be required for northbound buses to operate acceptably.

A station near Chestnut Street and Walker Avenue would be located approximately half a mile from a station at either Lakeforest Boulevard or Odendhal Avenue. A Chestnut Street/ Walker Avenue station would be located three-quarters of a mile from a station at Education Boulevard.



Looking north along MD 355 at Chestnut Street and Walker Avenue

Table 4-11: Chestnut Street/Walker Avenue Station Rating

Existing Ridership	●
Land Use	◐
Existing Connections	◐
Traffic Complications	◐

Cedar Avenue/Fulks Corner Avenue Station

The location of the Education Boulevard station a half mile away from downtown Gaithersburg limits the potential for a station to take advantage of the interactions that would happen between downtown Gaithersburg and the BRT. Placing a station closer to downtown Gaithersburg would provide better access for transfers between the BRT and MARC train. It could also support development/redevelopment opportunities centered on downtown.

Cedar Avenue and Fulks Corner Avenue are currently served by a bus stop in each direction and two Ride On routes. The downtown Gaithersburg MARC station is about a quarter mile from the intersection of MD 355 and Cedar/Fulks Corner.

Existing land use around this intersection is a combination of apartments, low-rise commercial, and office. Opportunities for redevelopment are more likely on the east side of MD 355 due to the established residential properties on the west side. A challenge to future development is the roadside grade north of the intersection associated with the bridge over the railroad tracks.

Sidewalks are currently found on both sides of MD 355. There are no existing bike facilities nearby, and the intersection is not currently signalized. There are only crosswalks across Cedar and Fulks Corner. A station at this location would likely require the addition of a signal and marked crosswalks to provide adequate pedestrian facilities. A traffic signal at Cedar Avenue/Fulks Corner Avenue would be located approximately 900 feet from the nearest traffic signal at Summit Avenue.



Looking north along MD 355 at Cedar Avenue/Fulks Corner Avenue

The existing intersection provides three through lanes in each direction with a dedicated left turn lane. A median break is currently provided at this intersection to allow left turn movements and traffic coming from both Cedar Avenue and Fulks Corner Avenue which are controlled by STOP signs.

A station at Cedar Avenue/Fulks Corner Avenue would be about a third of a mile away from a station at Brookes Avenue or half a mile from a station at Chestnut Street. This location is less than a mile from the station proposed at Odendhal Avenue to the north and approximately a third of a mile from a station at Education Boulevard to the south.

Table 4-12: Cedar Avenue/Fulks Corner Avenue Station Rating

Existing Ridership	◐
Land Use	◐
Existing Connections	◐
Traffic Complications	◐

Summit Avenue Station

A station at Summit Avenue would replace a station at either Education Boulevard or Cedar Avenue/Fulks Corner Avenue. A station at this location would provide many of the same benefits to one at Cedar/Fulks Corner in terms of a strong connection to downtown Gaithersburg. The potential for redevelopment opportunities would be limited due to the historic structures on the northeast and southwest corners.

There is an existing bus stop in each direction along MD 355. The MARC station is about a third of a mile away, and City Hall is even closer. The existing land use is single family residential, institutional, and some office. A significant challenge to constructing a station at this location would be the additional right-of-way required and the associated impacts to the existing historic structures. These structures and the established homes would likely preclude any redevelopment opportunities at this location.

The existing intersection is well served by the sidewalk network and connections to surrounding properties. The intersection is signalized with pedestrian push button signals on the west, east, and north legs of the intersection.

The intersection provides three southbound and two northbound through lanes on MD 355 with a dedicated left turn lane on each approach. There is also a dedicated right turn lane from northbound MD 355 to eastbound Summit Avenue. Right turning traffic from westbound Summit Avenue is channelized into a third northbound lane.

The stop spacing between proposed stations and this location is less than half a mile. If no station is built in the focal study area between Odendhal Avenue and Summit Avenue the spacing would be a mile.



Looking north along MD 355 at Summit Avenue

Table 4-13: Summit Avenue Station Rating

Existing Ridership	◐
Land Use	○
Existing Connections	◐
Traffic Complications	◐

Deer Park Drive Station

The southernmost station proposed in the CTCFMP is the Education Boulevard station. The next station identified by the CTCFMP to the south is the Shady Grove Road station, over a mile away and outside the City of Gaithersburg boundaries. Placing a station between Education Boulevard and Shady Grove Road would provide greater access to the BRT from residents in southern Gaithersburg.

There are existing bus stops in each direction of MD 355 at Deer Park Drive. Deer Park Drive is also where the Ride On 55 and 59 routes stop running together on MD 355 and split, with the 55 continuing north along MD 355 and the 59 turning west onto Deer Park Drive. The existing land uses are primarily residential and single story commercial. Highland Square on the northwest corner of MD 355 and Deer Park Drive is a midrise apartment complex that is the type of design that can be more supportive of transit than other lower intensity residential complexes. The existing right-of-way at Deer Park is narrower than the rest of MD 355 south of the focal segment, which suggests a greater degree of property acquisition and design considerations would be required to site a station at this location than other proximate locations.

The existing intersection is well served by the sidewalk network and connections to surrounding properties. The intersection is signalized with pedestrian push button signals on the west, east, and north legs of the intersection. The intersection provides three southbound and three northbound through lanes on MD 355 with a dedicated left turn lane on each approach.

The Education Boulevard station is located a third of a mile to the north of Deer Park Drive. The Shady Grove Road station is located about one mile to the south.



Looking north along MD 355 at Deer Park Drive

Table 4-14: Deer Park Drive Station Rating

Existing Ridership	
Land Use	
Existing Connections	
Traffic Complications	

North Westland Drive Station

A station at North Westland Drive would provide a southern access point between Education Boulevard and Shady Grove Road. The location is served by a stop in each direction that is currently served by the Ride On 55 and 59 routes. Land use around North Westland Drive includes a mix of suburban office and commercial uses with single family residential neighborhoods behind those properties. Property setbacks here are greater than at Deer Park Drive, as is the right of way.

The existing intersection is not signalized, only providing a crosswalk across the east leg. MD 355 at North Westland Drive is comprised of six through lanes, three in each direction, with a left turn lane on the southbound approach. If a station is added at this location, a traffic signal would need to be constructed to provide appropriate traffic control and pedestrian access. This location is approximately 1,000 feet from the closest signal at South Westland Drive.

The spacing between Education Boulevard, to the north, and North Westland Drive is approximately two-thirds of a mile. The spacing between North Westland Drive and Shady Grove Road to the south over half a mile. This location provides better spacing between stations than the Deer Park Drive location would. This station also provides greater potential for future redevelopment and right of way for station construction than the Deer Park station location.



Looking north along MD 355 at North Westland Drive

Table 4-15: North Westland Drive Station Rating

Existing Ridership	
Land Use	
Existing Connections	
Traffic Complications	

4.4 Station Location Policy Considerations

The previous sections on functional considerations focus on ensuring suitable design and operations. The City’s consideration of ideal station locations for the BRT service should also include a variety of policy considerations as described in the following sections.

Evolution of Bus Rapid Transit

The implementation of BRT is intended to serve multiple objectives. From a transportation system perspective, the BRT system is intended to improve transportation service options for both existing users and those who will be generated by future development in the City. From a placemaking perspective, the BRT station locations can both help define the form of that future development along Frederick Avenue as well as serve as a catalyst for that development.

The *Countywide Transit Corridors Functional Master Plan* suggests station locations within the City of Gaithersburg that are influenced to a large degree by serving existing transit service and ridership patterns. Stations proposed on MD 355 at junctions like MD 124 and Odendhal Avenue reflect, in part, the potential for transfers to and from existing bus routes.

Over time, however, one objective of the City’s Comprehensive Plan is to increase transit-oriented development both along MD 355 and at nearby redevelopment sites such as Lakeforest Mall. These redevelopment sites have the potential to create new focal points for transit-oriented development along Frederick Avenue. For instance, the level of traffic volume (both existing and projected) on Montgomery Village Avenue - MD 124 (even after the completion of the Watkins Mill Road interchange with I-270) suggests that its junction with Frederick Avenue is not likely to be a strong candidate for a focus of walkable, transit-oriented development that would entice choice riders to the system. However, Perry Parkway and Lakeforest Boulevard may serve as a more logical focal point for TOD as the MD 355 North BRT system is developed to connect Gaithersburg to Rockville and Germantown and certain local bus services are restructured to interface with the BRT.

The consideration of alternative CTCFMP station locations needs to be done with a systems perspective in addition to a station-by-station perspective. Using the same logic, an alternative station location scheme could be considered for focusing TOD around a series of more walkable station locations that would address expected high-traffic volume and

potentially reduced walkability at the two highest-traffic cross-streets (Watkins Mill Road and MD 124) might include:

- ▶ Establishing a new station north of Watkins Mill Road in the vicinity of Travis Avenue
- ▶ Shifting the Watkins Mill Road station about 500' south to Christopher Avenue
- ▶ Shifting the MD 124 station about 500' southward to Lakeforest Boulevard/Perry Parkway

The degree to which this type of shifting schema might continue southward depends to some extent on the City's interest in facilitating additional future TOD nodes along the corridor. Similarly, the station location decision process needs to consider both the City's interest in accelerating BRT implementation in concert with the state and County's interests and abilities. On the one hand, one advantage of the BRT mode is that it can evolve in logical segments. The implementation of the Metroway service along Jefferson Davis Highway (US Route 1) in the City of Alexandria is a good example of segmented implementation moving forward even as the larger vision (rail service ultimately connecting both the Jefferson Davis Highway and Columbia Pike corridors) suffers a setback in the cancellation of the Columbia Pike Streetcar project. On the other hand, the City's consideration of design options and station locations needs to consider the likely transit service interests, redevelopment objectives, funding resources, and implementation timeframes of the County and state.

BRT Guideway Design Opportunities and Constraints

The vast majority of the station locations identified in the *Countywide Transit Corridors Functional Master Plan* have a logical basis in existing and or future land use, and potential to connect to the larger transportation network. The Montgomery Village Avenue station would be difficult to construct/implement due to the complicated intersection geometry and movements. Additionally, the station location at Odendhal Avenue presents challenges if a hybrid design alternative is chosen, requiring buses to transition from a dual-lane guideway to a single-lane guideway. These two factors point to the benefits of relocating the station to Lakeforest Boulevard. This would require rerouting some of the existing transit service via Odendhal Avenue.

If a station at Brookes Avenue is not feasible, the distance between the Education Boulevard station and the Chestnut/Walker station would be almost three quarters of a mile apart. To improve connectivity and create a stronger connection to Old Town Gaithersburg (as well as MARC), relocating the station at Education Boulevard further north should be considered. One possible location could be the intersection of Cedar Avenue and Fulks Corner Avenue. The challenges of shifting the station here would be additional right-of-way needs and building impacts, requirements for signalization of an unsignalized intersection to provide safe pedestrian crossings, and additional costs associated with the slopes and retaining walls on either side of MD 355 here. Alternatively, locating the station at Summit Avenue would help serve Olde Towne Gaithersburg but would undoubtedly impact the historic buildings on one or both sides of MD 355.

Potential Redevelopment Opportunities

The space required for BRT station shelters and amenities may in some cases be able to be provided through public sector redevelopment, whether simply by right-of-way reservation or dedication, or through incorporation of station siting in TOD redevelopment plans.

In general, within the focal segment of MD 355, the commercial and institutional parcels are larger on the west side of the roadway than on the east side (where the prevailing land use more quickly turns to established single-family residential neighborhoods). For this reason, it might be expected that west side property owners will be more interested and amenable to participating in the station location and TOD establishment process. Where stations are to be sited it may be desirable to shift all elements of the right of way a few feet to the west regardless of the BRT design treatment (median or curb running, reversible or bidirectional). The City could engage property owners and other interested stakeholders to evaluate BRT station location potential. The City might also consider incentives that could be offered to developers who provide right-of-way or other design or implementation elements that facilitate TOD establishment at BRT stations. Such incentives could potentially include additional density or an exchange of transportation impact mitigation actions or fees. Changes to existing City policies might be considered to encourage such policy approaches that provide a win-win solution for both the private and public sector interests.

4.5 Summary

The table below summarizes the functional review from above of all the locations that have been proposed in the CCTCFMP and this study.

Table 4-16: Summary of Gaithersburg BRT Station Location Ratings

	Existing Ridership	Land Use	Connectivity	Existing Traffic
Professional Drive	○	◐	◑	●
Travis Avenue/Spectrum Avenue	○	◐	◑	●
Watkins Mill Road	◐	●	●	◐
Christopher Avenue	○	◐	◑	◐
Montgomery Village Drive (MD 124)	○	◐	◐	○
Lakeforest Boulevard	●	●	◐	◐
Odendhal Avenue	●	◐	◑	◐
Chestnut Street/Walker Avenue	●	◐	◑	◐
Brookes Avenue	◐	○	○	○

	Existing Ridership	Land Use	Connectivity	Existing Traffic
Cedar Avenue/Fulks Corner Avenue	◐	◐	◐	◐
Summit Avenue	◐	○	◐	◐
Education Boulevard	○	◐	●	●
Deer Park Road	◐	◐	◐	◐
North Westland Drive	◐	◐	◐	◐

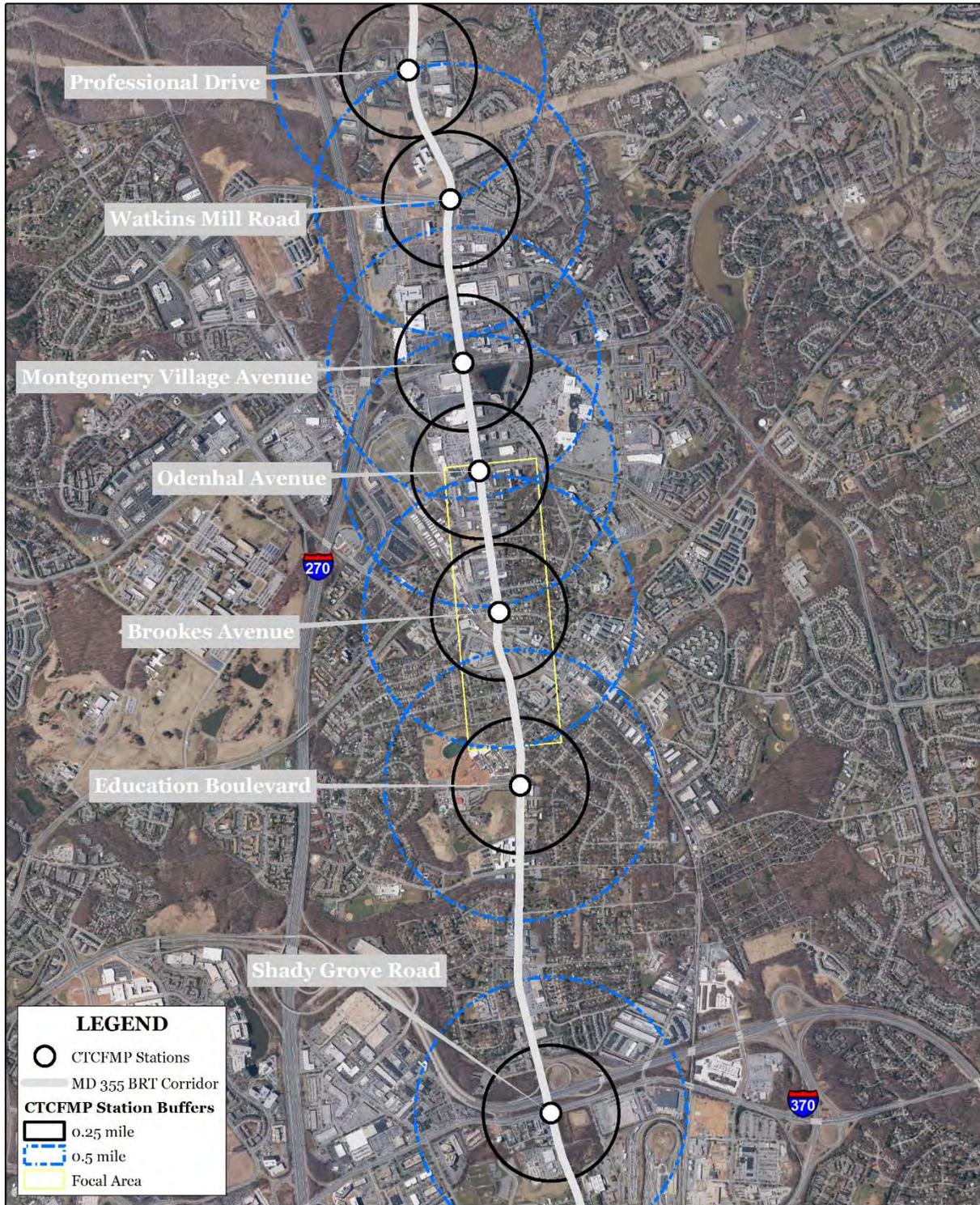
Two different approaches to identify BRT stations might be considered and presented to constituents for review and comment before establishing recommended locations in the City's Master Plan. One approach is to use the station locations identified in the *County's Countywide Transitway Corridors Functional Master Plan*, as shown in Figure 4-3. These locations provide a consistent spacing of approximately a half mile between stations, providing for improved bus speeds over local bus when combined with the exclusive guideway treatment. Some of these locations present challenges because of the existing scale of the intersection and the associated expansion that would need to occur to accommodate both the guideway and station platforms. The MD 355/MD 124 intersection is already challenging for pedestrians and would only get worse as the BRT causes the intersection to expand. Other locations, like Brookes Avenue, would further impact properties in the focal area while providing little benefit in terms of access and future redevelopment.

An alternative option would be to modify those station locations that present challenges to design, right-of-way needs, or BRT operations by offsetting them somewhat in the interests of better serving future TOD focal points, summarized in Figure 4-4. The locations selected as part of this approach include:

- ▶ Travis Avenue/Spectrum Avenue
- ▶ Christopher Avenue
- ▶ Lakeforest Boulevard
- ▶ Chesnut Street/Walker Avenue
- ▶ Cedar Avenue/Fulks Corner Avenue
- ▶ Deer Park Drive
- ▶ North Westland Drive

The spacing for these locations is comparable to the CTCFMP station locations. While avoiding some of the challenging intersections, some of these station locations come with their own challenges that were documented above.

Figure 4-3: CTCFMP Station Locations



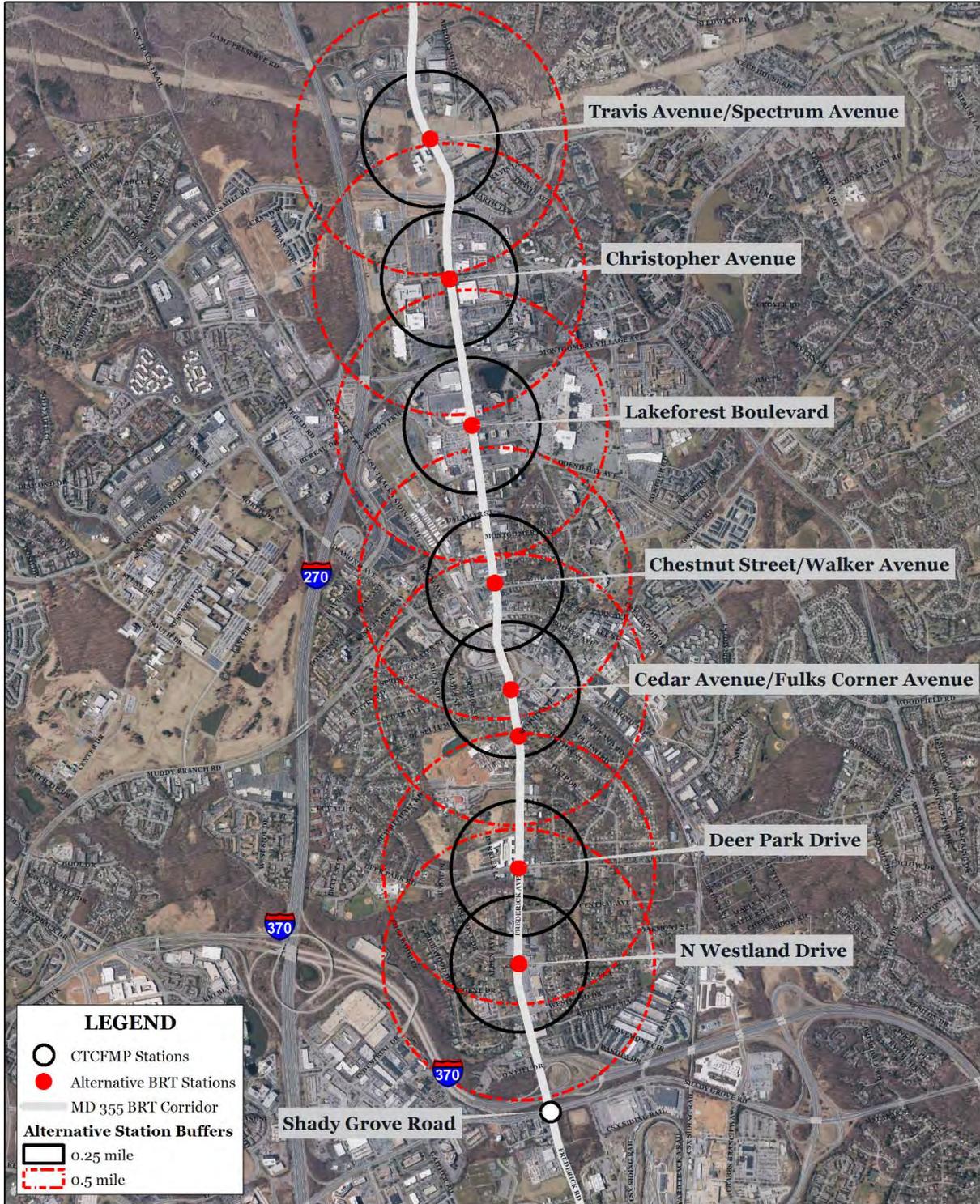
CTCFMP BRT Stations
Gaithersburg 355 BRT Study Corridor



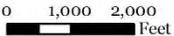
0 1,000 2,000 Feet



Figure 4-4: TOD Station Scheme



Alternative BRT Stations
 Gaithersburg 355 BRT Study Corridor


The following discussion seeks to identify a set of preferred station locations that provide the greatest benefit to the City of Gaithersburg, while reducing overall impacts. Using the station ratings from above, a numeric value was given to each rating category (see Appendix E). Those locations with the lowest scores were dropped from consideration. Those locations that scored the highest were advanced for further consideration. The planning team reviewed the potential station spacing for the highest scoring station locations, and considered other subjective criteria, such as potential future land use benefit, to select a preferred set of station locations from the shortlist of options. This approach attempts to balance traffic operations/impacts, BRT operations, station spacing, property impacts, and opportunities for future redevelopment. This set of station locations reflects a longer term look at the BRT corridor, and the redevelopment opportunities that could be achieved with the BRT.

The Professional Drive and Watkins Mill Road stations are carried forward from the CTCFMP. While the Travis Avenue/Spectrum Avenue location provided slightly better overall scoring than the Professional Drive location, neither represents a significantly better station location than the other. The Watkins Mill Road station location was seen as a preferred location over the Christopher Avenue location because of its land use potential. Selecting the Watkins Mill Road station eliminates the Travis/Spectrum station from consideration due to close proximity. MD 124 is eliminated from consideration due to the challenges associated with the size of the intersection and overall traffic operations complications. Shifting this station location to Lakeforest Boulevard/Perry Parkway provides more benefits associated with redevelopment of the Lakeforest Mall and surrounding properties. Both the Lakeforest Boulevard/Perry Parkway station and Odendhal Station locations performed well in the scoring evaluation, but spacing between stations would be too close to justify keeping the Odendhal Avenue station.

Within the focal study area, redevelopment potential between Odendhal Avenue and the Father Cuddy Bridge is likely to support one BRT station. The spacing between Lakeforest Boulevard and a station south of Summit Avenue would be too great. The Brookes Avenue location was eliminated as the lowest scored location, which suggests that Chestnut Street is the best location in the northern portion of the focal segment. This station could either be located at Chestnut Street in its existing road configuration, or considered as part of a redevelopment project including realignment of Chestnut Street with Walker Street, providing a four way signalized intersection and expanded pedestrian connectivity on both sides of MD 355.

Cedar Avenue and Fulks Corner Avenue present opportunities for redevelopment associated with downtown Gaithersburg as well as connection to the MARC train service. This location is preferred over Summit Avenue because of the constraints there with historic properties at the latter location. The Education Boulevard location did not score particularly high, but could provide some redevelopment opportunities south of the intersection and fits well into the station spacing.

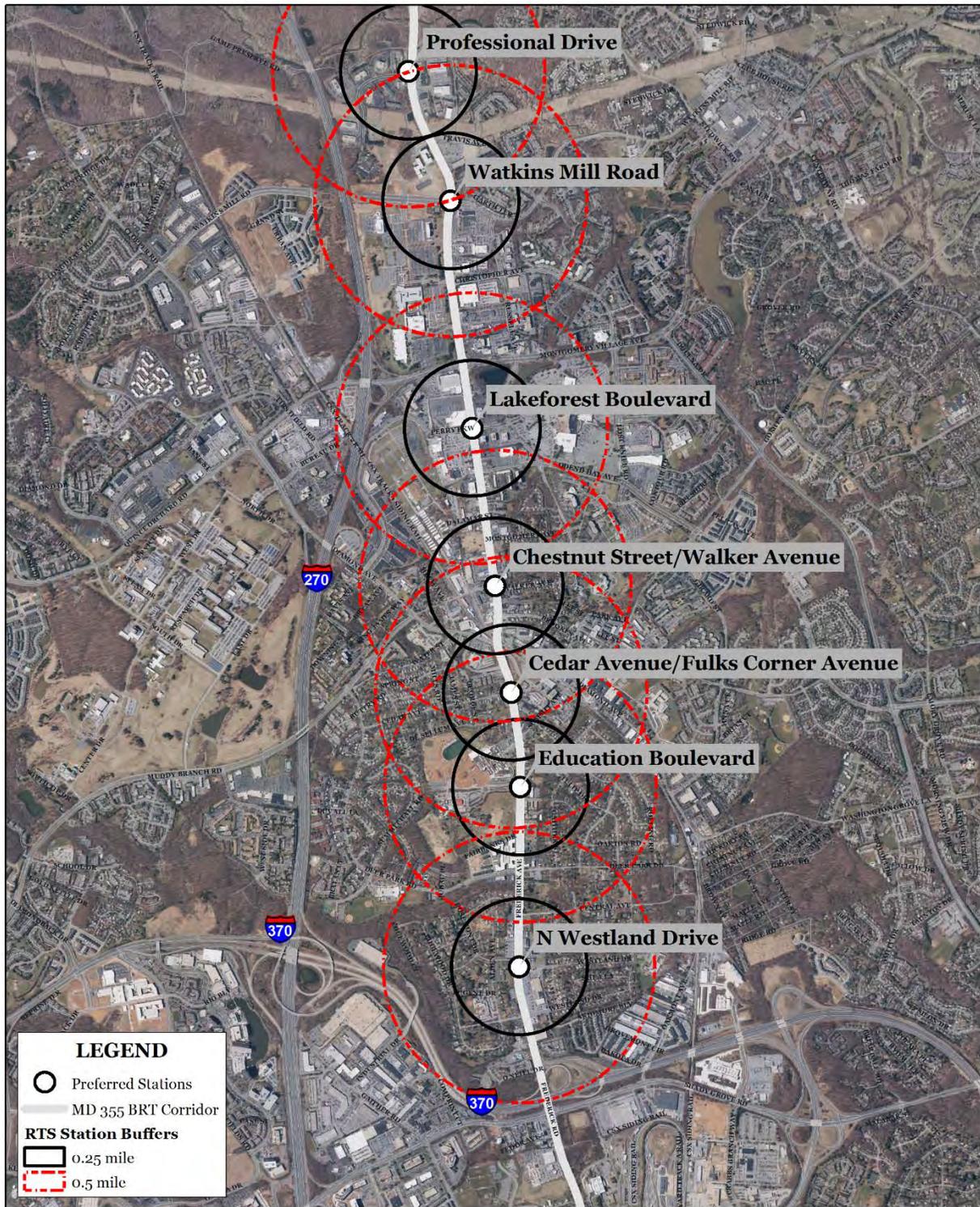
Ignoring station options south of Education Boulevard would create a significant gap in the preferred station spacing schema, given that the next station to the south is planned for Shady Grove Road. Deer Park Drive has greater challenges with available right-of-way than other proximate locations, which suggests the North Westland Drive location is preferable. This location has greater existing right-of-way and provides somewhat better opportunities for redevelopment.

Based on the assessment, the proposed station locations in the City of Gaithersburg include the following locations:

- ▶ Professional Drive
- ▶ Watkins Mill Road
- ▶ Lakeforest Boulevard
- ▶ Chestnut Street/Walker Avenue
- ▶ Cedar Avenue/Fulks Corner Avenue
- ▶ Education Boulevard
- ▶ North Westland Drive

The collection of preferred stations provides strong BRT coverage for transit riders in the City of Gaithersburg and establishes multiple viable locations for potential long-term redevelopment. These station locations and their $\frac{1}{4}$ and $\frac{1}{2}$ mile walkshed distances are depicted in Figure 4-5.

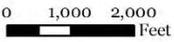
Figure 4-5: Proposed Station Locations



LEGEND

- Preferred Stations
- MD 355 BRT Corridor
- RTS Station Buffers**
- ▭ 0.25 mile
- ▭ 0.5 mile

Preferred Station Locations
 Gaithersburg 355 BRT Study Corridor


4.6 Bus Rapid Transit Right of Way

The feasibility of the Bus Rapid Transit system in the City of Gaithersburg, and throughout Montgomery County, is dependent on the availability of publicly owned property to construct the planned BRT guideways and maintain appropriate roadway capacity. Any roadway widening required to construct BRT guideways will require the city, county, and/or state to acquire additional property along the corridor. The purpose of this section is to define the preferred right of way dimensions for consideration and adoption by the City of Gaithersburg to complete concept planning and detailed design for the MD 355 corridor.

The concept of right of way for the MD 355 is divided into two categories, for portions of MD 355 outside of the focal segment: typical BRT corridor right of way and typical BRT station area right of way. These right of way elements are primarily based on Maryland State Highway Administration (SHA) dual-lane median BRT guideway and roadway design dimensions. The right of way dimensions developed for portions of the corridor outside of the focal segment include minimum and preferred values. The minimum right of way requirements refer to the least amount of publicly owned property required to accommodate the BRT guideway and maintain existing roadway capacity according to minimum Maryland SHA roadway dimensions. The preferred right of way provides the same BRT and roadway capacity accommodations, but is based on Maryland SHA standard design dimensions.

Additionally, this section discusses the right of way requirements for the MD 355 focal segment, where planning-level design concepts were developed and provide a more thorough assessment of right of way requirements than other parts of the corridor. Suggestions for the focal segment right of way are based on the roadway dimensions defined in the hybrid alternative concept.

Existing Right of Way

The existing right of way on MD 355 in the City of Gaithersburg varies significantly depending on the location within the corridor. In some locations, the existing public right of way may be sufficient to construct the preferred BRT guideway without acquiring additional property along MD 355. However, the roadway extents throughout much of the MD 355 corridor in the City of Gaithersburg, particularly in the focal segment, have reached the limits of the public right of way under existing conditions.

North and south of the focal area, the MD 355 corridor maintains a relatively uniform right of way width for significant stretches, but the right of way width along the corridor gradually increases or decreases at several locations to provide a wider roadway cross-section or accommodate intersection turning lanes. From O'Neill Drive to Summit Avenue, the corridor right of way is consistently approximately 120 feet wide, except near Deer Park Avenue (110 feet wide) and Education Boulevard (188 feet wide). From Odendhal Avenue to Perry Parkway, the existing right of way is approximately 112 feet wide. From Perry Parkway to Montgomery Village Avenue (MD 124), the right of way gradually increases to a maximum of 166 feet wide, and remains approximately 160 feet wide to Christopher Avenue. Between Christopher Avenue and Watkins Mill Road, the right of way gradually decreases to approximately 125 feet wide. North of Watkins Mill Road, the right of way widens to approximately 150 feet, but then decreases again to 125 feet wide after Travis Avenue and remains that width until beyond Professional Drive, near the northern boundary of the City of Gaithersburg.

In the focal segment, the right of way is defined by irregular property boundaries and little consistency in the overall right of way dimensions. From Summit Avenue to Cedar Avenue/Fulks Corner Avenue, the right of way is approximately 121 feet wide. The existing right of way is extremely irregular from Cedar Avenue/Fulks Corner Avenue to Brookes Avenue, widening within a range of approximately 140-400 feet surrounding the Father Cuddy Bridge, and then a narrowing to approximately 125 feet near Brookes Avenue. North of Brookes Avenue, the MD 355 right of way is narrowest and very irregular, ranging from approximately 82-105 feet until widening at Odendhal Avenue.

Typical BRT Corridor Right of Way

The MD 355 corridor, outside of the focal segment, is largely characterized by suburban roadway design, typically providing six lanes for through traffic capacity, a wide center median, and sidewalks on both sides of the road. Much of the corridor conforms to this typical roadway geometry and the typical BRT corridor right of way seeks to define the required dimensions to construct the BRT guideway and maintain the traffic capacity provided by the existing roadway geometry.

The typical corridor right of way refers to the width of publicly owned property along the MD 355 corridor, outside of the influence of signalized intersections with multiple turning lanes, to accommodate a dual-lane BRT guideway and six lanes of through traffic. The intent of identifying the typical BRT corridor right of way is to define the baseline requirement for optimal function of both the BRT and traffic through the corridor. As the detailed design process progresses, it is possible that a single-lane median guideway, or other guideway options requiring less physical area to construct than the dual-lane median guideway, may be selected. Such decisions may dictate that less right of way is required to accomplish the preferred BRT design, and the right of way requirements defined in this study may be revised.

BRT Facility and Roadway Dimensions

The typical BRT corridor right of way is based on the standard and minimum dimensions for roadway and BRT facilities defined by the Maryland SHA BRT design team. The Maryland SHA BRT facility and roadway design dimensions included in Appendix A provide a basis for consideration of right of way requirements for the corridor. Tables 4-17 and 4-18 summarize the standard and minimum design dimensions assumed in this evaluation.

Table 4-17: SHA BRT and Roadway Standard Dimensions

Design Element	Standard Width (feet)	Quantity	Total Width (feet)
BRT Guideway Lane	12	2	24
BRT Median Separator	6	2	12
General Traffic Lane	12	6	72
Bicycle Lane	5	2	10
Gutter Pan	1	6	6
Landscape Buffer	4	2	8
Sidewalk	6	2	12
Utility/Maintenance Buffer	2	2	4
Total Roadway Width	n/a	n/a	148

Table 4-18: SHA BRT and Roadway Minimum Dimensions

Design Element	Minimum Width (feet)	Quantity	Total Width (feet)
BRT Guideway Lane	11	2	22
BRT Median Separator	2	2	4
General Traffic Lane	11	6	66
Bicycle Lane	5	2	10
Gutter Pan	1	6	6
Landscape Buffer	0	0	0
Sidewalk	5	2	10
Utility/Maintenance Buffer	2	2	4
Total Roadway Width	n/a	n/a	122

These dimensions may not account for all conditions present on the corridor or undefined design elements that may be desirable, such as transition areas, bus stops, or wider sidewalks to support localized commercial development. To provide some flexibility for unforeseen design considerations and account for likely limits of disturbance necessary for construction, the suggested preferred and minimum right of way dimensions should provide slightly wider dimensions than the overall roadway dimensions in Tables 4-17 and 4-18.

Focal Segment BRT Corridor Right of Way

The suggested right of way for the MD 355 focal segment is based on the dimensions defined in the planning-level design concepts and typical cross-sections for the hybrid design alternative. The cross-section attributes for the focal segment differ somewhat from the SHA design dimensions as they were developed to accommodate an appropriate BRT guideway, using existing roadway design dimensions to minimize impacts to adjacent properties.

The right of way defined by the hybrid alternative concepts responds to localized conditions and varies in width throughout the focal segment. To minimize unnecessary impact to adjacent land uses, the suggested typical BRT corridor right of way in the focal segment should reflect these variations. Table 4-19 summarizes the right of way dimensions identified by the hybrid design alternative cross-sections at five locations on the corridor. Should future redevelopment afford the opportunity to dedicate additional right of way, the minimum dimensions derived from the Maryland SHA design basis will provide an appropriate alternative to the focal segment typical BRT corridor right of way defined in this evaluation.

Table 4-19: MD 355 Focal Segment Corridor Right of Way Dimensions

MD 355 Focal Segment Location	Corridor Right of Way Width
Odendhal Avenue to Montgomery Avenue	97 feet
Montgomery Avenue to Chestnut Street	88 feet
Chestnut Street to Father Cuddy Bridge	102 feet
Father Cuddy Bridge	89 feet
Father Cuddy Bridge to Summit Avenue	120 feet

Typical BRT Station Area Right of Way

Station locations will require additional right of way beyond the typical BRT corridor or focal segment rights of way suggested in the previous section. The requirements for station area right of way are based on typical dimensions for station elements and assumptions regarding planned intersection geometry.

Station Elements Influencing Right of Way Requirements

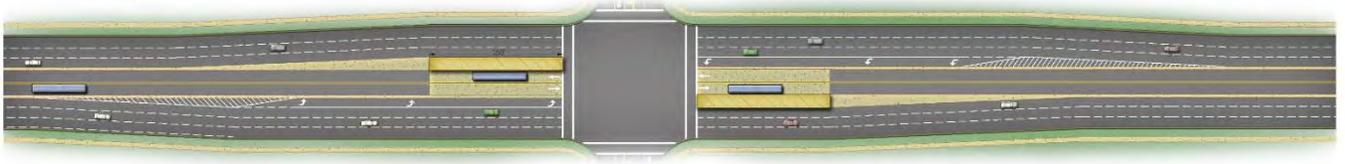
BRT stations on MD 355 will be located at signalized intersections, which provide necessary, safe, and controlled pedestrian access to station platforms. Additional property is needed to accommodate the following elements at intersections with BRT stations:

- ▶ Station platforms along the median guideway in both directions
- ▶ Possible curbside station platforms where stations are located on a single-lane median guideway segments.
- ▶ Turning lanes (right and left), including dual or triple turn lanes at some of the most heavily traveled intersections

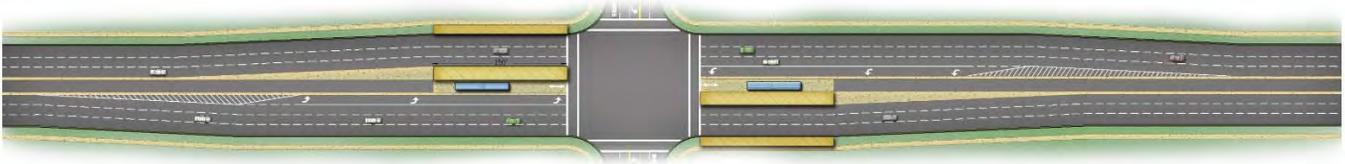
To highlight the influence of station configurations on right of way requirements, three typical station configuration layouts, representative of station types include in the MD 355 planning, were developed. Figure 4-6 shows examples of the dual-lane median, single-lane median reversible, and single-lane median bi-directional station types. All of these station types highlight how incorporation of BRT platforms and intersection turning lane geometry result in a gradual increase in the roadway width approaching the intersection from either direction. The station configuration also influences the right of way required at the intersection, resulting in greater right of way requirements at the intersection than along the corridor segments between stations.

Figure 4-6: Example BRT Station Configurations

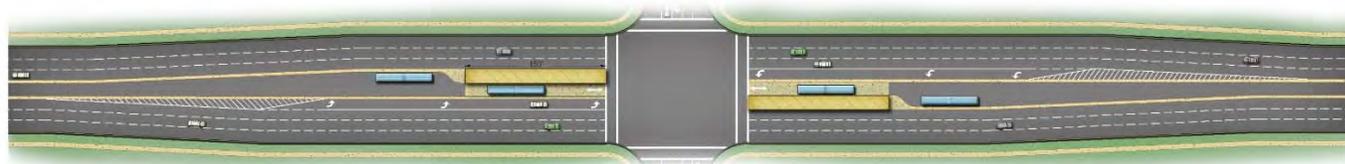
TYPICAL DUAL-LANE MEDIAN STATION CONFIGURATION (FOUR PLATFORMS)



TYPICAL SINGLE-LANE MEDIAN REVERSIBLE STATION CONFIGURATION (FOUR PLATFORMS)



TYPICAL SINGLE-LANE MEDIAN BI-DIRECTIONAL STATION CONFIGURATION (TWO PLATFORMS)



The Maryland SHA design dimensions define a standard width of 15 feet and a minimum width of 10 feet for median station platforms. Curbside station platforms can be 10-12 feet wide, which doesn't include additional sidewalk width. The Maryland SHA Rapid Transit design team also cites the need to provide at least one pedestrian median refuge island that is 6 feet wide on each approach of MD 355 at all signalized intersections, which can be fulfilled by a median station platform (minimum 10 feet wide). It is assumed that the City of Gaithersburg desires to retain the existing number of turning lanes at all BRT station intersection sites at this time.

Most of the station intersections in the city provide a single left turn lane on MD 355 that would need to be replaced at station intersections. Additionally, the station platform is assumed to meet the standard 15 feet wide. These attributes suggest that 30 feet of right of way is required in addition to the typical corridor rights of way at most station sites.

A few station intersections have different or additional requirements that need to be considered. The following is a summary of the station locations requiring additional consideration:

Watkins Mill Road – The MD 355 southbound approach was designed to accommodate up to 3 future turning lanes (right and left). Including the median platforms, this location requires an additional 55 feet of right of way.

Travis Avenue/Spectrum Avenue – The MD 355 northbound approach contains one left turn lane and one right turn lane. Including the median platforms, this location requires an additional 45 feet of right of way.

Christopher Avenue – The MD 355 northbound approach contains one left turn lane and one right turn lane. Including the median platforms, this location requires an additional 45 feet of right of way.

Montgomery Village Avenue (MD 124) – The MD 355 northbound approach contains three left turn lanes and one right turn lane. Only two through lanes are provided on the northbound approach (as opposed to three through lanes at most intersections on the corridor), so one turning lane can be discounted from consideration for additional right of way. Including the median platforms, this location requires an additional 65 feet of right of way.

Lakeforest Boulevard/Perry Parkway – The MD 355 northbound and southbound approaches both contain two left turn lanes. Including the median platforms, this location requires an additional 55 feet of right of way.

Odendhal Avenue – The Odendhal Avenue intersection is a potential transition point between the dual-lane median guideway to a single-lane median guideway, under the hybrid design alternative. To accommodate potential reversible BRT bus travel in mixed traffic in the non-peak direction, median platforms and a curbside platform for southbound buses would be required at this station location (northbound buses could still use the median station). This intersection contains one left turn lane on MD 355 in each direction and requires up to 43 feet of additional right of way.

Chestnut Street/Walker Avenue – The Chestnut Street/Walker Avenue intersection is a potential transition point between the dual-lane median guideway to a single-lane median guideway, under the hybrid design alternative. To accommodate potential reversible BRT bus travel in mixed traffic in the non-peak direction, median platforms and a curbside platform for northbound buses would be required at this station location (southbound buses could still use the median station). This intersection contains one left turn lane on MD 355 in each direction and requires up to 52 feet of additional right of way.

Brookes Avenue – The Brookes Avenue intersection is not currently signalized and is not favored for a station location, but a station at this location would likely provide the same attributes as a station at the Chestnut Street/Walker Avenue intersection. Therefore, the same station area right of way requirements are assigned to this station location.

Each of the potential BRT station locations was assessed for right of way requirements, based on a combination of the typical BRT corridor right of way for the roadway segment containing the station, the station platform dimensions, and the existing number of turning lanes. Table 4-20 summarizes the suggested minimum BRT station area right of way dimensions on MD 355.

Table 4-20: Suggested MD 355 BRT Station Right of Way Dimensions

MD 355 BRT Station Locations	Station Area Right of Way Width
Professional Drive	180 feet
Travis Avenue/Spectrum Avenue	195 feet
Watkins Mill Road	205 feet
Christopher Avenue	195 feet
Montgomery Village Avenue (MD 124)	230 feet
Lakeforest Boulevard/Perry Parkway	180 feet
Odendhal Avenue	140 feet
Chestnut Street/Walker Avenue	140 feet
Brookes Avenue	140 feet
Cedar Avenue/Fulks Corner Avenue	140 feet
Summit Avenue	155 feet
Education Boulevard	155 feet
Deer Park Road	155 feet
North Westland Drive	155 feet

The suggested station area rights of way are provided for all of the possible station areas identified earlier in this chapter, but property acquisition to achieve these dimensions will only be necessary at the locations where stations are actually selected. The alternative design layouts produced for the focal segment (see Appendix B) only included one station located at Odendhal Avenue, so suggested right of way for other potential stations in the focal area exceed the level of property impact depicted on the layout concepts and cross-section diagrams.

Preferred MD 355 BRT Right of Way in the City of Gaithersburg

The suggested preferred MD 355 BRT right of way was developed based on a combination of the typical BRT corridor right of way and BRT station area right of way requirements. The typical BRT corridor right of way width is 150 feet and the suggested minimum BRT corridor right of way width is 125 feet, outside of the focal segment. The focal segment typical BRT corridor right of way varies based on the dimensions identified in the hybrid alternative design.

BRT station areas will require significant additional right of way to accommodate station platforms and turning lanes. The additional right of way required at station areas is dependent on the selected BRT guideway and the number of turning lanes provided at each intersection. The additional station area right of way dimensions range from 30 to 80 feet.

To the greatest extent possible, this study attempts to suggest a reasonably consistent and conservative right of way configuration. No detailed design with information regarding the selection of preferred BRT guideways, modifications to the number of intersection turning lanes, or the most appropriate locations to transition roadway cross-sections has been developed for the MD 355 corridor in Gaithersburg at this time. The most appropriate and conservative basis for establishing the preferred right of way is to select dimensions that accommodate the preferred station locations and the hybrid design alternative. The preferred station locations are identified Figure 4-5 in a previous section of this chapter and a copy of

the hybrid alternative layout drawing is included in Appendix B. To minimize potential confusion for stakeholders or limitations on the detailed design process, transitions between different right of way dimensions along the corridor are limited to critical points where different station right of way requirements about.

Table 4-21 summarizes the suggested right of way dimensions for several roadway segments comprising the MD 355 corridor the City of Gaithersburg to accommodate the preferred station locations and the hybrid design alternative. Diagrams identifying the suggested right of way limits for the MD 355 corridor, based on the suggested right of way dimensions in Table 4-21 offset from the roadway centerline, are included in Appendix F.

Table 4-21: Suggested MD 355 Typical BRT Corridor Right of Way Dimensions

MD 355 Corridor Segment Location	Suggested Right of Way Width
Game Preserve Road to Paramount Park Drive	180 feet
Paramount Park Drive to 700 feet south of MD 124	205 feet
700 feet south of MD 124 to Odendhal Avenue	180 feet
Odendhal Avenue to 200 feet north of Chestnut Street	90 feet
200 feet north of Chestnut Street to 400 feet south of Summit Avenue	140 feet
400 feet south of Summit Avenue to O'Neill Drive	155 feet

The preferred right of way suggestions included in this study are intended for consideration and adoption by the City of Gaithersburg to complete concept planning and detailed design for the MD 355 corridor. During the detailed design process, some station intersections could be designed to achieve the minimum standards for station platform design or accommodate fewer turning lanes based on anticipated shifts in future traffic volume. Such modifications would reduce the necessary right of way to achieve the BRT system design and could ultimately reduce the amount of property required for public acquisition prior to construction. The city may want to consider more detailed evaluations of individual station locations to assess potential designs that require less real estate supporting adequate BRT and roadway infrastructure.