



Gaithersburg Circulator Study FINAL REPORT

June 2014



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EXECUTIVE SUMMARY

The Metropolitan Washington Council of Governments retained the services of Nelson\Nygaard Consulting Associates to assist the City of Gaithersburg in developing a feasibility and planning study for a circulator bus network to link together population bases, employment centers, activity hubs, and other transportation services in northeastern Gaithersburg. The defined study area includes a State of Maryland designated Enterprise Zone, two MWCOG Regional Activity Centers, significant commercial and retail activity, and has been identified under Plan Maryland as a Targeted Growth and Revitalization Area.

The study area is served by a variety of regional transit services, including MARC commuter rail, MTA commuter bus service, WMATA Metrobus service, and several Montgomery County Ride On bus routes. Additionally, two high-profile transit projects are currently in planning: the Corridor Cities Transitway, a Bus Rapid Transit line between Shady Grove and Clarksburg with two stops in the study area, and a Montgomery County Bus Rapid Transit network that would include a line along Route 355.

Montgomery County’s Ride On service, in particular, provides extensive local service within the study area. But, gaps do exist – especially for east-west connections across I-270. The goal of this study was to determine how (and if) the development of a local circulator service could complement current and planned transit services and to strengthen connections to Regional Activity Centers.

To analyze the feasibility of expanded transit service, the study team reviewed the demographics of the study area, as well as the locations of key activity centers that are likely to be destinations for transit trips. Based on this existing conditions assessment, the study team developed the following three service improvement options:

- **Option 1** is a full loop circulator, offering bi-directional service in a circuit around the study area.
- **Option 2** is an “out and back” circulator, serving all of the same locations as the loop in a U-shaped corridor with bi-directional service.
- **Option 3** reroutes some existing Ride On service to improve access to major destinations and activity centers within the study area.

All three options were found to improve the over-all quality of transit connections in the study area, to varying degrees. Chapter 5 of this document presents a “trip score” analysis that shows the expected impact of each option on the quality of transit connections between key origins and destinations. Given that all three options would improve, rather than significantly expand transit coverage in the study area, ridership is expected to grow proportionally with trip scores, as shown in the table below:

Estimated Study-Area Transit Ridership for Each Service Improvement Option

Option	Average Trip Score	Trip Score Improvement from Baseline Score	Estimated Study-Area Daily Transit Ridership (Ride On + Circulator)
Current	3.09		2,240
Option 1 (Full Loop Circulator)	3.61	14%	2,559
Option 2 (Out-and-Back Circulator)	3.44	10%	2,466
Option 3 (Ride On Modifications Only)	3.37	8%	2,422

While Option 1 would result in the greatest improvement in connectivity, and thus ridership, it is also the most expensive of the three options at \$1,009,000 annual operating cost (compared to \$757,000 for Option 2 and \$491,000 for Option 3). When considering operating cost per each additional rider that would be expected to use transit in the study area as a result of each service improvement option, Option 3 shows the greatest cost-effectiveness (see table below).

Estimated Cost per Additional Rider for Each Service Improvement Option

Option	Estimated New Annual Riders	Additional Estimated Annual Operating Cost	Cost Per Additional Rider
Current	-	-	-
Option 1 (Full Loop Circulator)	79,778	\$1,009,000	\$12.65
Option 2 (Out-and-Back Circulator)	56,618	\$757,000	\$13.37
Option 3 (Ride On Modifications Only)	45,558	\$491,000	\$10.78

Besides being the most cost-effective, Option 3 also has the lowest over-all cost. This is particularly important given the limited funding options for a new circulator service in Gaithersburg (discussed in Chapter 7). Thus, the study team has concluded that a modification of Ride On service is the most viable option for achieving the City’s goals of making Gaithersburg a more walkable, unified, and sustainable community, while also helping to foster economic redevelopment. The following document details the steps and corresponding findings that led to this conclusion. The document is comprised of seven chapters immediately following this executive summary:

- Chapter 1: Overview of Study Area – describes Gaithersburg in general and the designated study area in particular
- Chapter 2: Community Profile – includes maps and a discussion of the study area’s socioeconomic and demographic characteristics
- Chapter 3: Existing Transit Service – contains a description of current and planned transportation services available in the study area
- Chapter 4: The Market for Circulator Service – discusses the attributes of successful circulator services and presents case studies from other communities
- Chapter 5: Trip Score Analysis – presents three service improvement options and compares the quality of transit connections between key origins and destinations associated with each option
- Chapter 6: Integration with Long-Range Plans – considers how each service improvement option will need to be modified to complement long-range transit and infrastructure improvements planned for the study area, and presents trip scores for each modified option
- Chapter 7: Summary and Recommendations – presents the cost implications and implementation considerations of each service improvement option and offers recommendations for meeting the City’s mobility goals

1 OVERVIEW OF STUDY AREA

ABOUT GAITHERSBURG

The City of Gaithersburg is located 15 miles northwest of Washington, DC in Montgomery County, Maryland. It began as an agricultural community, but developed into a railroad town after the Metropolitan Branch of the Baltimore & Ohio Railroad opened. The Gaithersburg train station opened in 1884 and is still in operation today¹.



Figure 1-1 Olde Towne Gaithersburg

Gaithersburg experienced substantial growth in the decades following World War II as commuters working in Washington flocked to the area. Less than 4,000 people lived in Gaithersburg in 1960; by 1970, the population had more than doubled, and would more than double again by 1980. Today, the city has nearly 64,000 residents, with just over a million residents in Montgomery County.²

As the city grew, it became a regional employment center, drawing federal agencies like the National Institutes of Science and Technology and large corporations like IBM. In 1978, the city also became a regional shopping destination with the opening of Lakeforest Mall, a 1 million square foot enclosed mall.

Today, Gaithersburg is a mature community experiencing demographic changes. The city has become more diverse, affluent, and educated than it was in past decades, but also has substantial older and low-income populations, suggesting a large and unmet demand for transit. Congestion is a growing problem in and around the city, while some of its older commercial centers are suffering from disinvestment. Though transit use in Gaithersburg has fallen over the past decade, these circumstances imply that there may be a market for circulator bus service.

STUDY AREA

This study focuses on an area in the northern part of Gaithersburg roughly bounded by Watkins Mill Road, I-270 and Clopper Road (Maryland Route 117) to the west; Windbrooke Drive, Lost Knife Road, Odendhal Avenue and Washington Grove Lane to the north and east; and Clopper Road, Quince Orchard Road, the CSX Railroad, and Frederick Avenue to the south.

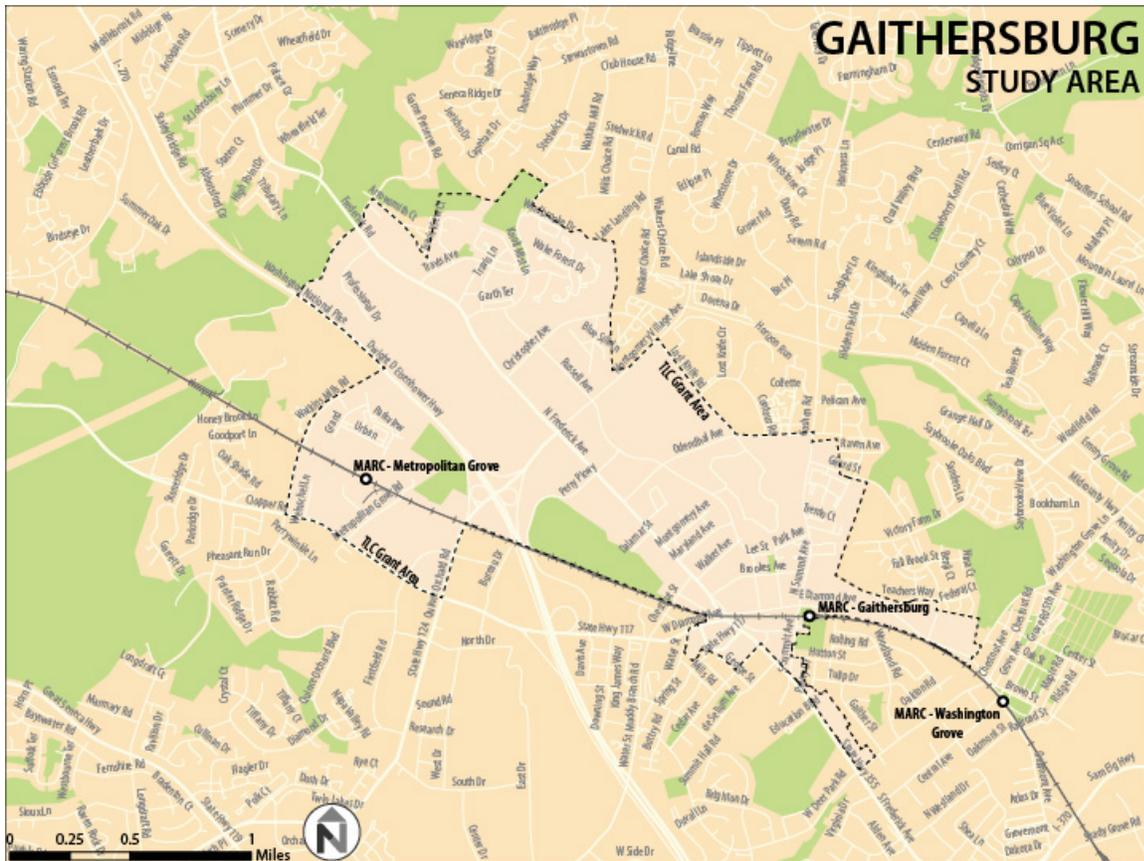
¹ "City History." City of Gaithersburg website. http://www.gaithersburgmd.gov/poi/default.asp?POI_ID=111&TOC=112111; retrieved December 30, 2013

² "Dwelling Units and Estimated Population." July 2013, City of Gaithersburg Planning and Code Administration.

This area includes Olde Towne Gaithersburg, the city’s historic downtown; Lakeforest Mall, a regional shopping center that is also a major bus transfer point, and the Metropolitan Grove MARC station, the site of a transit-oriented development currently under construction. A large portion of the study area is defined as an Enterprise Zone, which is designated by the state of Maryland and provides income tax and property tax credits for businesses that hire full-time employees or make improvements to their properties.

The study area has an extensive highway network, including Interstate 270, which runs north-south through the city, and Maryland Route 355 (Frederick Avenue), a regional north-south thoroughfare. It is also served by multiple transit options, including two MARC (Maryland Area Commuter Rail) stations; Ride On, Montgomery County’s local bus service; commuter express buses operated by the Maryland Transit Administration; and Metrobus, operated by the Washington Metropolitan Area Transit Authority (WMATA). Metrorail and Amtrak stations are located just outside the city.

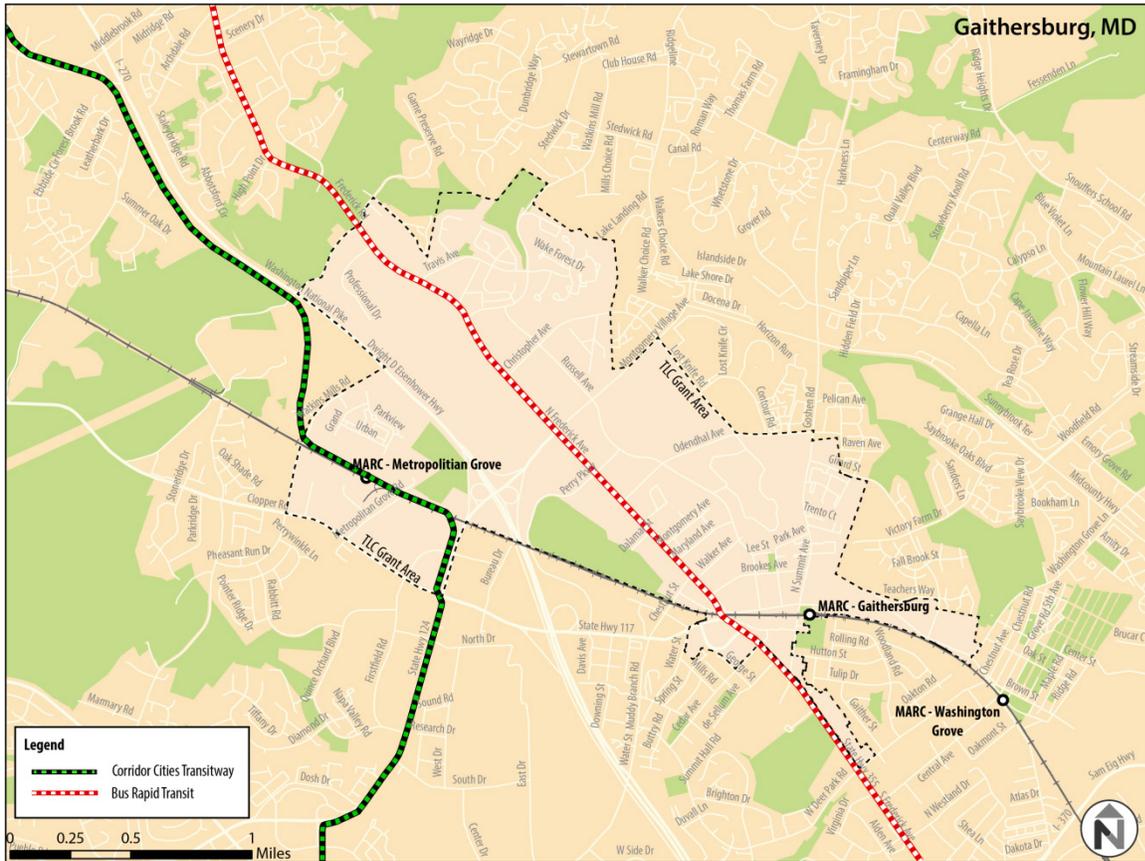
Figure 1-2 Study Area



There are two proposed transit projects in the study area currently in planning: the Corridor Cities Transitway, a Bus Rapid Transit line between Shady Grove and Clarksburg with two stops in the study area, and a Montgomery County Bus Rapid Transit network that would include a line along Route 355 (Figure 1-3).

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Figure 1-3 Proposed Transit Projects in Study Area



2 COMMUNITY PROFILE

POPULATION DESCRIPTION

Gaithersburg is a mature suburban community experiencing demographic shifts and contains many populations who are likely to use public transit. Once experiencing explosive population growth, Gaithersburg has slowed down, gaining 7,320 residents over the past 10 years. The city estimates that there are 63,842 residents as of 2013. The Metropolitan Washington Council of Governments (MWCOG), the region's metropolitan planning organization, anticipates that the city's population will grow to 84,966 by 2040.³

The city has become more diverse in recent years. Once predominantly non-Hispanic white, Gaithersburg is now majority-minority, with non-Hispanic whites making up just 40% of the city's population in 2010. Hispanics make up 24.2% of the city, followed by Asians at 16.9% and blacks at 16.3%. Foreign-born residents now compose 40.7% of the city's population, compared to 34.3% in 2000. Gaithersburg is more diverse than Montgomery County as a whole, which is 49.2% non-Hispanic white and 31.3% foreign-born.³

Gaithersburg has also become more educated. 52.5% of the city's population has at least a 4-year college degree, compared to 31.8% in 1980, though it lags the county rate of 56.2%. Households are smaller in Gaithersburg than they historically were, but have recently been growing in size. The average household size in 1960 was 3.43 people, reflecting the large number of families living in the city. By 1990, it had fallen to 2.57 people, but had increased to 2.85 by 2013, though MWCOG anticipates that it will drop again to 2.5 people in 2040.³ Meanwhile, family households, defined as households with two or more people related by birth, marriage, or adoption, made up 73.1% of the city's population in 2010, compared to 77.7% in 1960.⁴

The city has become more affluent, but faces a rise in the poverty level. It has a median household income of \$79,795, a substantial increase from \$59,879 in 2000, but lower than the county median of \$92,451. Meanwhile, 8.2% of the city's residents live below the poverty line, an increase from 7.1% in 2000.³

Gaithersburg also has an aging population. In recent decades, adults between 18 and 34 were the city's largest age cohort, comprising 43.4% of the population in 1980, while adults between 35 and 64 were 24.4%. Today, that ratio has switched, with older adults making up 40.6% of the population and young adults comprising 25.7%. Meanwhile, adults over age 65 now make up 9.5% of the population, compared to 4.1% in 1980.⁵

³ "Dwelling Units and Estimated Population." July 2013, City of Gaithersburg Planning and Code Administration.

⁴ Census definitions, <http://www.census.gov/cps/about/cpsdef.html>, accessed January 28, 2014.

⁵ "Dwelling Units and Estimated Population." July 2013, City of Gaithersburg Planning and Code Administration.

Transportation Patterns

Gaithersburg's growing minority, immigrant, elderly, and low-income populations normally correlate to an increased demand for public transit in the city. At the same time, however, transit use fell slightly, from 12.2% of all daily commutes in 2000 to 11.9% in 2012.⁶ 70% of all workers drove to work alone in 2012, compared to 68.4% in 2000. It's the reverse of what's happening in Montgomery County as a whole, where the rate of workers driving alone to work has fallen from 72% in 2000 to 65.8% in 2010. However, the percentage of commuters who bike has slightly increased from 0.2% to 0.6%, and the percentage of people who work from home increased from 2.9% to 3.8%.⁵

Why are fewer Gaithersburg residents using transit? One possibility is that they have more cars, perhaps due to the city's increased affluence. In 2000, one out of every ten households had no vehicles, and only 51% had two or more vehicles. But by 2012, 96.6% of all households had at least one car, and 70.8% had at least two cars. During this time, the percentage of households with three or more cars more than doubled from 12.4% to 25.1%.⁶

Meanwhile, commutes in the city are getting longer. The mean travel time to work increased from 31.3 minutes in 2000 to 31.8 in 2012. 17.4% of commuters take more than an hour to get to work, compared to 15.1% in 2000. However, fewer residents are commuting during the traditional morning rush hour, indicating a rise in non-traditional or second shift work schedules. 73.9% of commuters leave for work between 5am and 9am, compared to 78.2% in 2000.⁶

Employment and Commercial Activity

Gaithersburg is a regional employment and shopping destination, though neighborhoods within the study area experienced significant demographic changes and underinvestment in recent years.

The city's workforce has increased from 28,000 workers in 2000 to nearly 34,000 workers in 2010. In 2040, MWCOG anticipates that the city will have 74,546 jobs. The study area currently has 24,987 jobs, which is anticipated to increase to 40,505 jobs in 2040.⁵

In 2011, 9.4% of employed Gaithersburg residents worked in the city, making up over one-fifth of the city's workforce. However, the largest employment destination for Gaithersburg residents is Washington, DC, which in 2011 drew 11.1% of Gaithersburg workers. 71.3% of Gaithersburg's workers commuted to communities elsewhere in Montgomery County, such as Rockville (10.3%), North Bethesda (6.5%), Bethesda (6.2%), Germantown (3.5%), and Silver Spring (2.0%).⁷ The remaining workers commute to locations elsewhere in the greater Washington, DC region.

This is a change from 2002, when the largest commuting destinations from Gaithersburg were entirely in Montgomery County.⁸ This may explain why commutes have grown longer, as more residents travel to the District for work. But it doesn't explain why fewer residents are commuting by transit, since most of the major job destinations for Gaithersburg residents, including Washington, DC, Rockville, Bethesda, and Silver Spring, are accessible by some mode of transit.

⁶ 2008-2012 5-Year American Community Survey; 2000 Census, US Census Bureau.

⁷ US Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2011).

⁸ U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2011).

TRANSIT POTENTIAL AND NEEDS ANALYSIS

The following section is an analysis of the study area's ability to support additional transit service, based on the density of housing and employment, and the presence of populations that are likely to use public transit or are generally transit-dependent.

Transit Potential

Transit service is generally most effective and most efficient in areas with high concentrations of people and businesses. Combining both residential and employment densities yields a transit potential index. This index shows where the conditions are most suitable for transit service based on the number of jobs or people per acre. The following maps illustrate where concentrations of residents and jobs exist in and around the study area. The map of employment density includes offices, industrial workplaces, and retail, indicating where there is transit demand from both workers and consumers.

The maps in the following section use data from the 2010 Census and the 2011 Longitudinal Employment-Household Dynamics Origin-Destination Employment Statistics, both of which are produced by the Census Bureau. All data are aggregated by block group, or a zone usually a few blocks in size that the Census Bureau uses to collect demographic information.

Residential Density

Due to the predominance of single-use commercial and industrial land uses, the study area contains few areas of high-density population. One is the Orchard Pond apartment complex, located at the intersection of Quince Orchard Road and Clopper Road near the Metropolitan Grove MARC station. Another is located at North Summit Avenue and Girard Street near Olde Towne Gaithersburg, which contains a mix of older, garden-style apartments and newer, high-end apartments. A third is the Asbury Methodist Village retirement community on Russell Avenue. There are several other concentrations of people just outside the study area, particularly on Lost Knife Road across from Lakeforest Mall, and in the triangle formed by West Diamond Avenue, Muddy Branch Road, and I-270.⁹

These areas all have an average population density of at least 29 people per acre, which divided by the city's average household size of 2.70 equals 10.74 homes per acre, which is above the 7 homes per acre threshold needed to support basic bus service.¹⁰

Figure 2-1 Residential Density



⁹ 2010 Census, US Census Bureau.

¹⁰ "Transit-Supportive Residential Density Thresholds," <http://www.townofcarrboro.org/PZI/BulletinBoard/PDFs/temp-071107/transit%20density%206.pdf>, accessed January 28, 2014.

Employment Density

Employment density is fairly even throughout the study area, though there is some concentration of jobs in and around Lakeforest Mall, which as a major retail destination indicates transit demand from both workers and shoppers. Another concentration exists on the east side of Olde Towne Gaithersburg, east of Summit Avenue. That may be due in part to the presence of City Hall. The most substantial concentration of jobs is in an office park along Professional Drive at the far north end of the study area. Next to it, at the intersection of Frederick and Montgomery Village avenues, are the campuses of Kaiser Permanente and Lockheed Martin, which have a large number of jobs but sit on large properties, making them appear less dense on the map. Just outside of the study area is the National Institutes of Standards and Technology (NIST), which contains 2,289 employees on 578 acres, meaning it is a large job center but has a very low employment density.¹¹

Figure 2-2 Employment Density



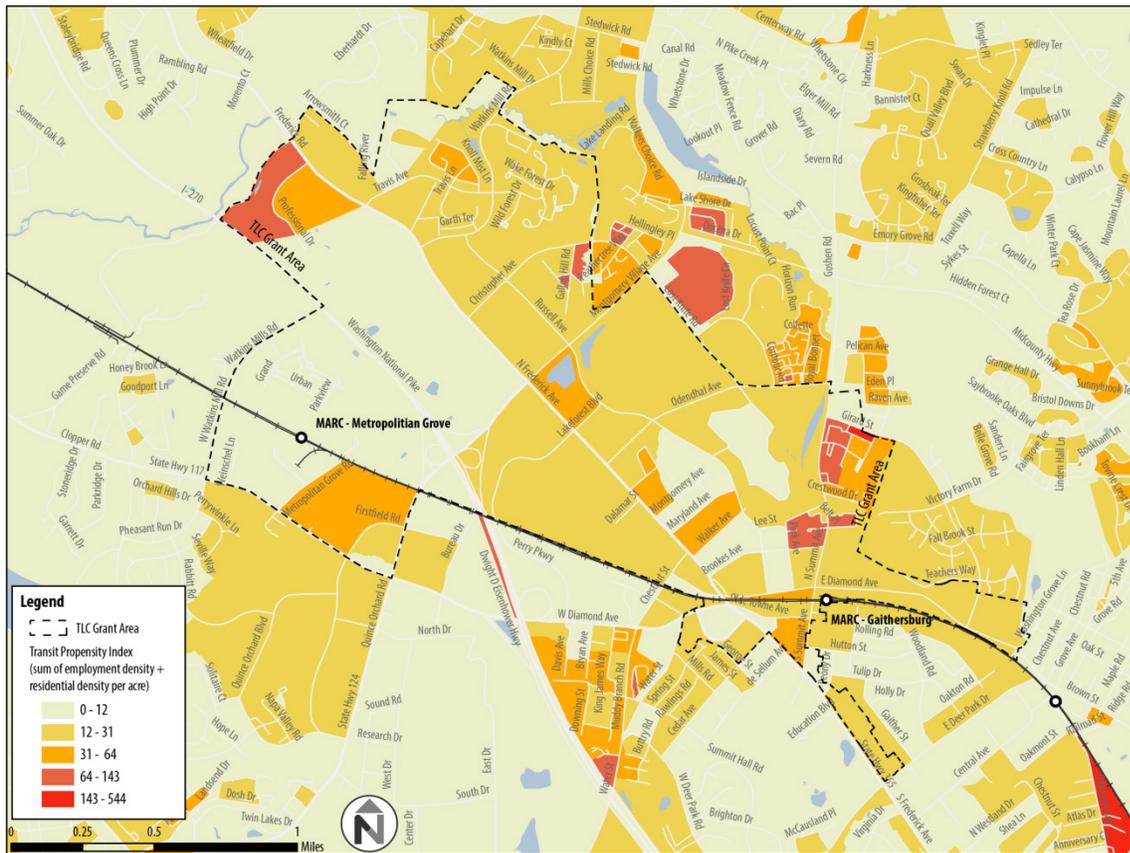
¹¹ US Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2002-2011).

Transit Potential Index

The Transit Potential Index is a composite of the population and employment densities. The index is a reflection of how supportive the operating environment is for transit service. Within the study area, there appears to be significant potential for transit demand along the Route 355 corridor between East Deer Park Drive and Game Preserve Road. There is also potential transit demand along North Summit Avenue and East Diamond Avenue in Olde Towne, on Girard Street, and on Clopper Road near the Metropolitan Grove MARC station.

There may also be potential for transit demand just outside the study area, along Montgomery Village Avenue, Quince Orchard Road, and in the triangle bounded by West Diamond Avenue, Muddy Branch Road, and I-270. These areas may help support circulator service to and from the study area.

Figure 2-3 Transit Potential Index



Transit Need

Above all else, public transportation is a mobility tool. Certain population subgroups are more likely to use transit than other modes as their primary means of local and regional transportation. These groups include senior citizens, persons with disabilities, zero-vehicle households, and residents living below the poverty line.

Identifying areas with relatively high concentrations of these groups can help determine where the need for transit service is greatest. To do so, we calculated the percentage of the total population that they represent in a given Census block group using data from the 2008-2012 American Community Survey, produced by the US Census Bureau. In some block groups within the Study Area, the total population is low, but the percentage of that population that is likely to have a high transit need is high.

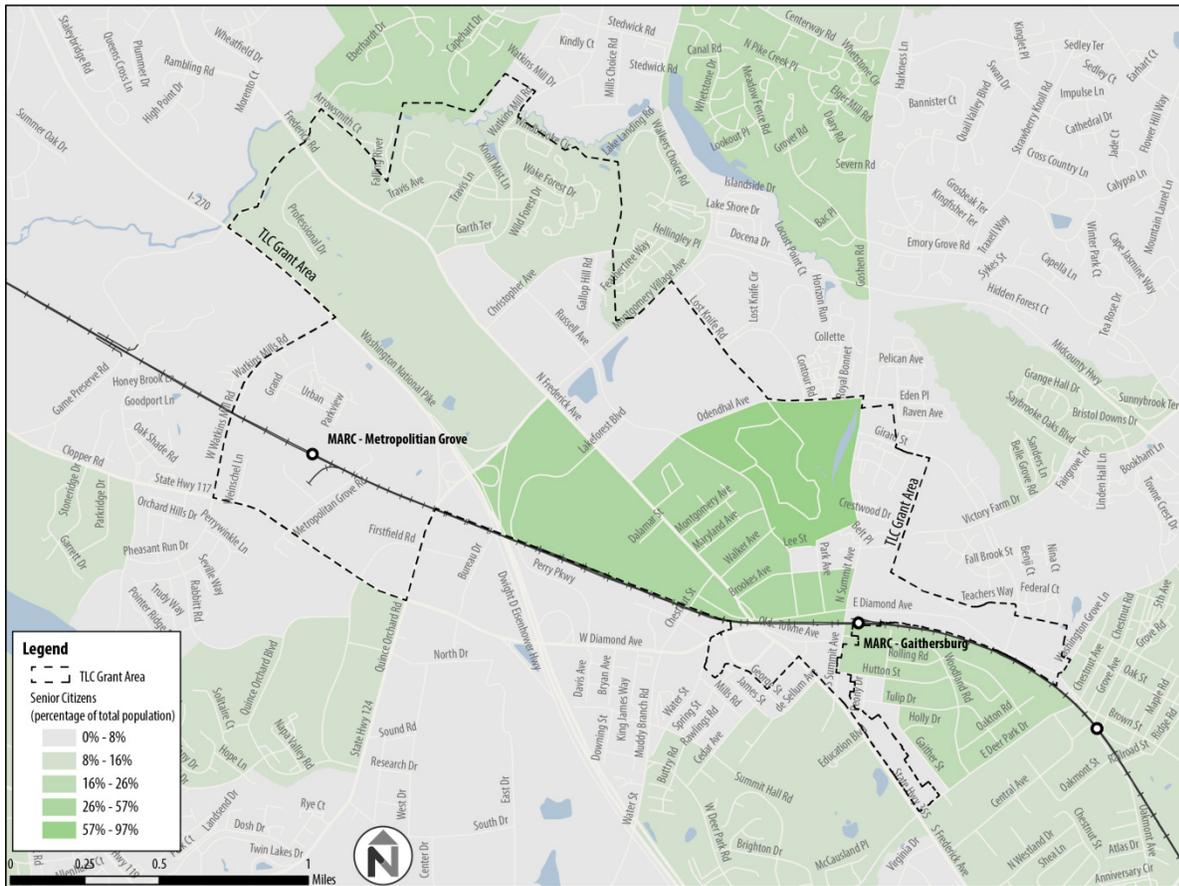
One such zone is the block group bounded by Montgomery Village Avenue, Frederick Avenue, and the CSX/MARC tracks, which contains the Montgomery County Agricultural Fairgrounds and several commercial uses, and a small concentration of elderly and disabled residents living below the poverty line and with no access to a vehicle. Thus, the zone in question shows up as having a relatively high Transit Need Index score.

That does not necessarily mean that transit would work there, because the area scores pretty low on the Transit Potential Index. But it does highlight that the population in that area, regardless of how limited, does have a high transit need.

Senior Citizens

Not surprisingly, the study area is home to a significant concentration of senior citizens, defined as adults over age 65, at the Asbury Methodist Village retirement community. In addition, seniors make up over a quarter of the residents living in Olde Towne west of North Summit Avenue and north of the CSX/MARC tracks, as well as east of South Summit Avenue and south of the tracks. As explained above, there appears to be a large concentration of residents in the area west of Frederick Avenue and south of Montgomery Village Avenue, but it does not represent the area’s low population. Outside the study area, there is a smaller concentration of seniors north of Midcounty Highway in Montgomery Village, where between 16 and 26% of all residents are seniors.¹²

Figure 2-4 Senior Citizens

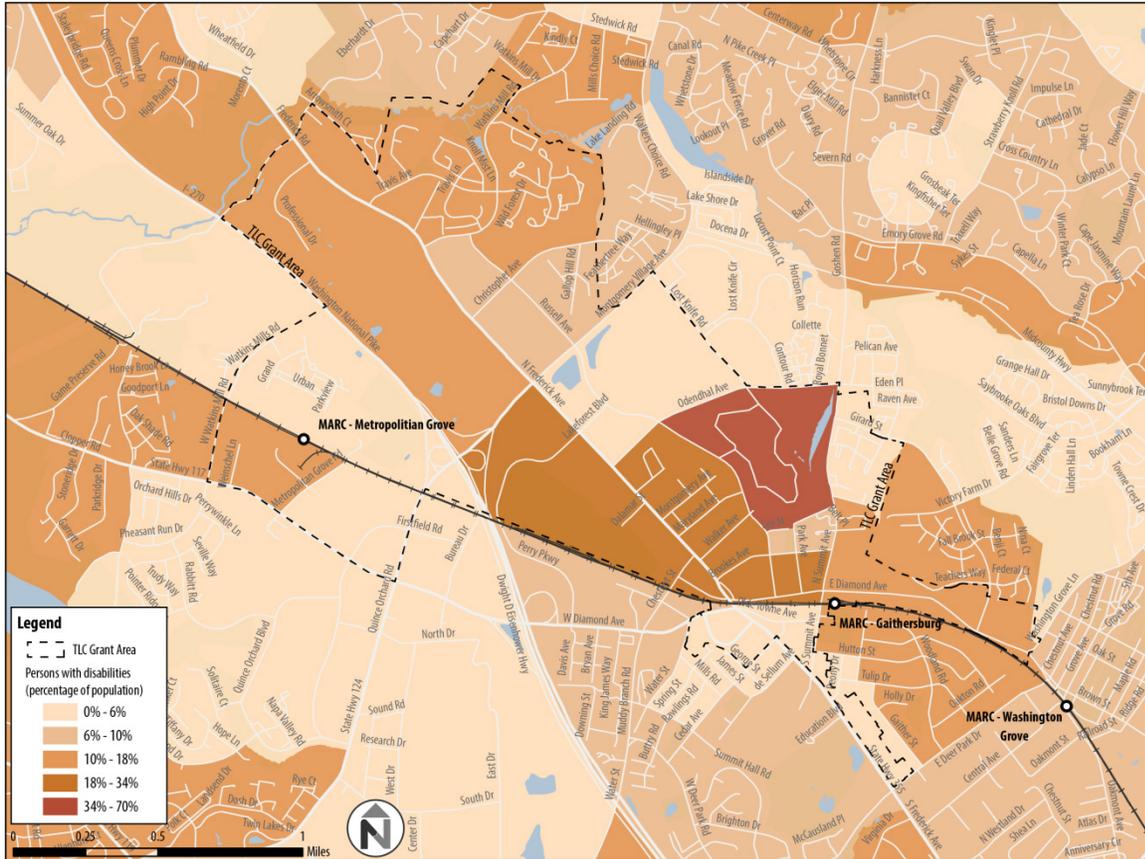


¹² 2008-2012 5-Year American Community Survey, US Census Bureau.

Disabled Residents

The distribution of disabled residents (as reported in the US Census) in the study area is similar to that of senior citizens, indicating that the two populations may have some overlap. Disabled citizens make up between 18% and 34% of all residents in Olde Towne west of North Summit Avenue and upwards of 34% at Asbury Methodist Village. In addition, disabled residents make up at least 10% of the population in several other parts of the study area, including in Olde Towne east of North Summit Avenue and near the intersection of Watkins Mill Road and Frederick Avenue.¹³

Figure 2-5 Disabled Residents

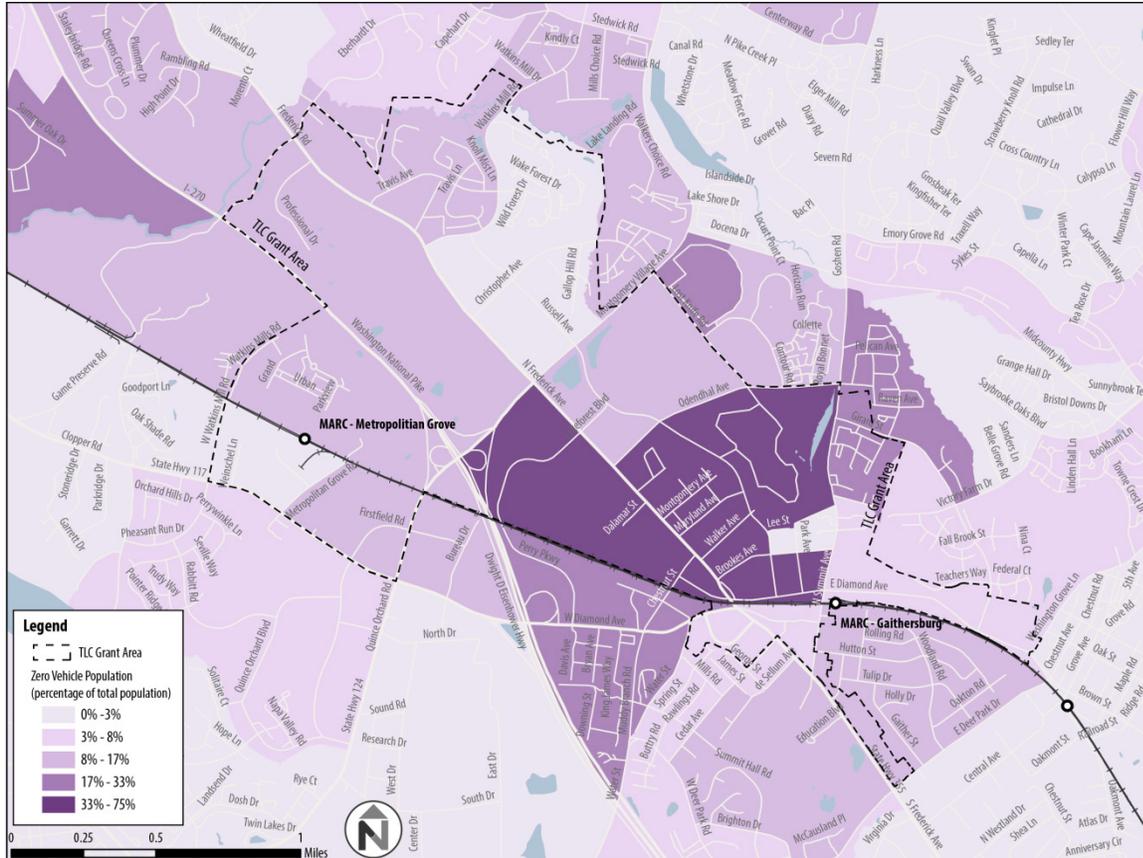


¹³ 2008-2012 5-Year American Community Survey, US Census Bureau.

Zero-Vehicle Population

While fewer than 4% of Gaithersburg households have no car, there are several pockets within the study area where a more substantial number of residents do not have access to a car. As with the senior citizen and disabled resident populations, the largest concentrations are in Olde Towne west of North Summit Avenue and at the Asbury Methodist Village, where over one-third of all residents are carless. Elsewhere in the study area, there are substantial concentrations of carless individuals throughout the Frederick Avenue corridor, around the Metropolitan Grove MARC station, along Girard Street, and on Lost Knife Road across the street from Lakeforest Mall.¹⁴

Figure 2-6 Zero-Vehicle Population

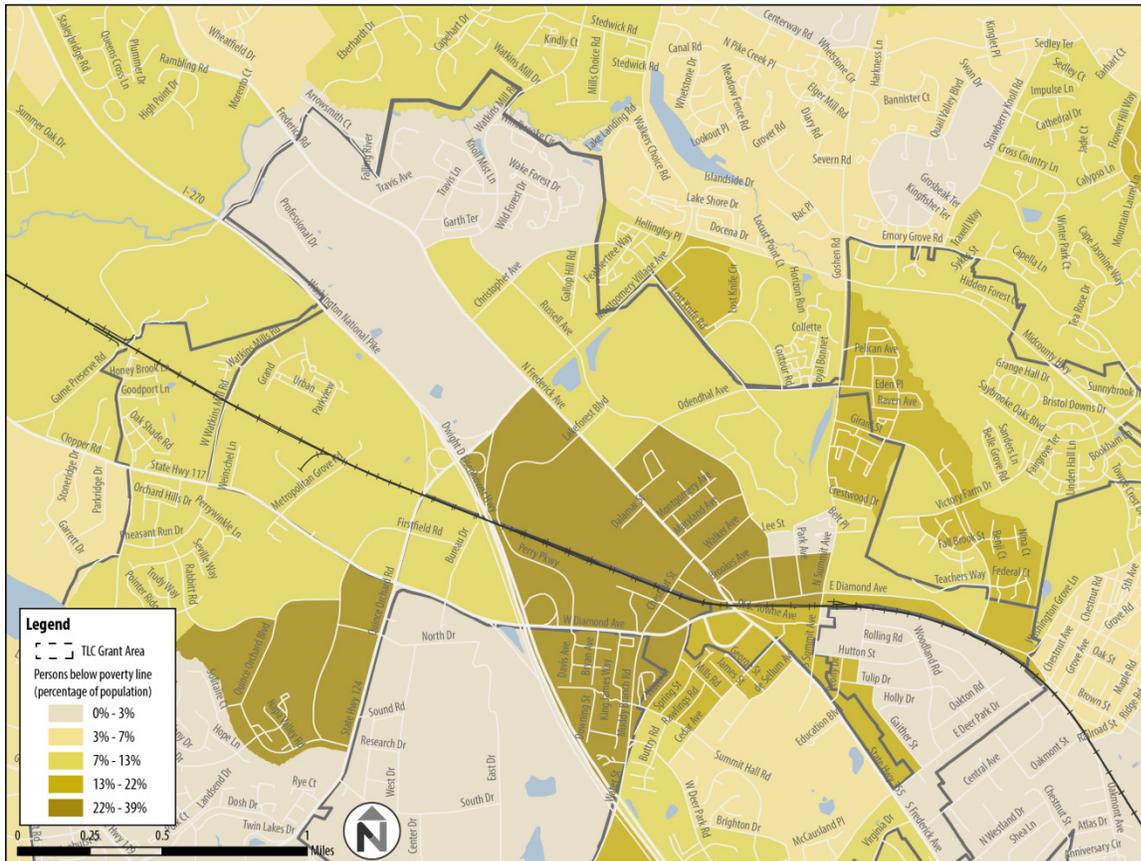


¹⁴ 2008-2012 5-Year American Community Survey, US Census Bureau.

Residents Living in Poverty

8.1% of Gaithersburg residents live below the poverty line, defined as those with a household income below a certain amount depending on their household size, ranging from \$11,720 for a single-person household to \$47,297 for a family of nine. The study area is home to the city's largest concentration of residents living in poverty, located in an area roughly bounded by I-270 to the west, Russell Avenue and North Summit Avenue to the east, Montgomery Village Avenue and Odendhal Avenue to the north, and Muddy Branch Road and East Diamond Avenue to the south. Over 22% of residents in this area live below the poverty line. Other concentrations of poverty in the study area include the apartments at Montgomery Village Avenue and Lost Knife Road, the area east of North Summit Avenue, and the area south of East Diamond Avenue in Olde Towne. Another concentration of poverty exists just outside the study area south of Clopper Road and west of Quince Orchard Road.¹⁵

Figure 2-7 Residents Living in Poverty

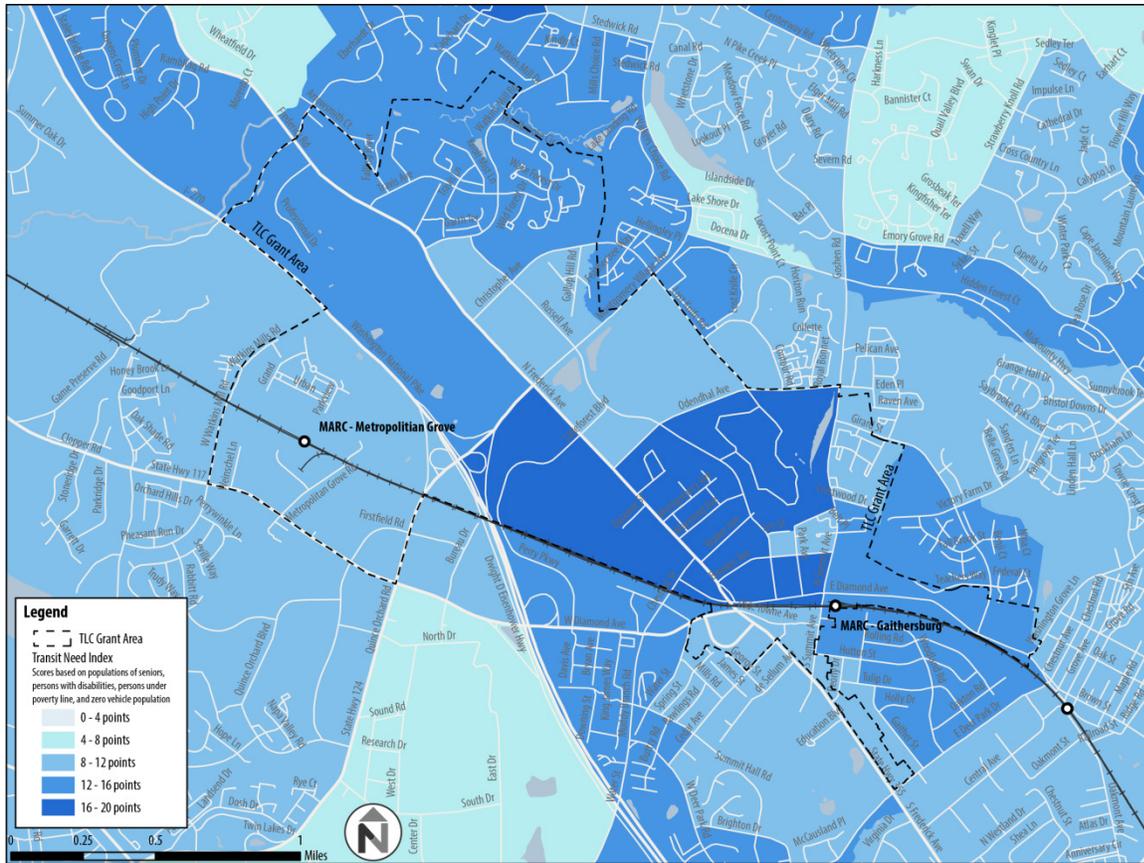


¹⁵ 2008-2012 5-Year American Community Survey, US Census Bureau.

Transit Needs Index

To measure geographic transit need, a score of 1 to 5 was assigned to each Census block group based on the concentration of each of the population subgroups described above within that block group. The highest possible score for a zone was 20, indicating a high concentration of each of the four population subgroups. Within the study area, our analysis indicates that the highest transit need is in the Asbury Methodist Village and in Olde Towne west of North Summit Avenue, both of which scored between 16 and 20 points. Block groups to the east of North Summit Avenue and along North Frederick Avenue north of Montgomery Village Avenue scored between 12 and 16 points. Outside of the study area, the apartments across Lost Knife Road from Lakeforest Mall, and the neighborhood immediately south of the MARC/CSX tracks and east of I-270 also scored between 12 and 16 points.¹⁶ It should be noted that the Transit Needs Index is not an absolute measure, but rather a relative comparison of each block group in a study area to other block groups in the area. A higher Transit Need Index score simply indicates that a block group has higher transit need than neighboring block groups with lower scores.

Figure 2-8 Transit Needs Index



¹⁶ Data aggregated from 2008-2012 5-Year American Community Survey, US Census Bureau.

LAND USES AND MAJOR DESTINATIONS

The study area contains a variety of land uses, including residential, commercial, and light industrial activities, as well as public and institutional uses. It also contains two Regional Activity Centers, “Gaithersburg – Metropolitan Grove” and “Gaithersburg - Central,” designated by the Metropolitan Washington Council of Governments (MWCOG) because of their concentrations of employment and housing¹⁷. MWCOG seeks to direct future growth to the region’s 141 Activity Centers by working with local jurisdictions to coordinate transportation and land use planning in those areas. The study area is a “suburban employment center,” meaning it is projected to have at least 15,000 jobs and a density of 10 jobs per acre by 2030.¹⁸

Public or Institutional Destinations

Major public or institutional destinations within the study area include Gaithersburg City Hall, located in a renovated historic house in the heart of Olde Towne, and the adjacent Wells/Robertson House, a historic home now used as transitional housing for homeless men and women. Nearby is the Gaithersburg MARC station, a historic rail station first built in 1884 and still in operation.

The study area is also home to the Montgomery County Agricultural Fairgrounds on Dalamar Street, which hosts annual events and festivals. Additional civic destinations include the City’s Activity Center at Bohrer Park, a regional indoor and outdoor recreational facility; the Gaithersburg Aquatic Center, an indoor pool that offers classes and swimming; the City Police Station on Fulks Corner Avenue; and the Gaithersburg Main Post Office next to City Hall. Just outside the study area is the Gaithersburg Library, located on Montgomery Village Avenue across from Lakeforest Mall.

In addition, there are six schools located in or near the study area: Gaithersburg Elementary, located on North Summit Avenue in Olde Towne; Watkins Mill Elementary, located on Watkins Mill Road just north of the City and study area; Brown Station Elementary, located on Quince Orchard Boulevard south of the study area; Gaithersburg Middle, located behind Gaithersburg Elementary on Teachers Way; Forest Oak Middle, located on Saybrooke Oaks Boulevard just east of the study area; and Gaithersburg High, located immediately south of the study area on Education Boulevard. The Gaithersburg Youth Center, a city-run facility that offers after-school activities for local middle and high school students, is located across the street from Gaithersburg Middle School.

Major Employers

There are several major employers located within the study area. The largest is a branch office of defense contractor Lockheed Martin, which is located on North Frederick Avenue and has 1,300 employees. Asbury Atlantic, which runs the Asbury Methodist Village retirement community, has 875 employees. Kaiser Permanente, a health maintenance organization located on Watkins Mill Road, has 350 employees.¹⁹ Just outside the study area are the National Institute of Standards and Technology (NIST), a federal agency with 2,289 employees; and Gaithersburg High School, with 233 employees.

¹⁷ “Regional Activity Centers Map,” MWCOG, accessed May 20, 2014:
<http://www.mwco.org/planning/planning/activitycenters/>

¹⁸ “Metropolitan Washington Regional Activity Centers and Clusters,” MWCOG, accessed January 29, 2014:
<https://www.mwco.org/uploads/pub-documents/yLhZVw20070828145020.pdfz>

¹⁹ “Kaiser Permanente Opens New Medical Center in Gaithersburg, Md.,” Kaiser Permanente press release, accessed January 29, 2014: <http://share.kaiserpermanente.org/article/kaiser-permanente-opens-new-medical-center-in-gaithersburg-md/>

Commercial and Retail Activity

Commercial land uses in the study area are varied. Olde Towne has an urban built form, with retail, office, and mixed-use buildings of various eras built up to the street. North of Olde Towne, there is a more spread out, suburban built form, characterized by Lakeforest Mall and strip malls along Frederick Avenue. There are also several office complexes, which include both mid-rise buildings near Lakeforest Mall and low-rise buildings in a campus setting, such as the campuses of Monument, Kaiser Permanente, and Lockheed Martin. There are additional office parks west of I-270, along Clopper Road and Quince Orchard Road. Light industrial buildings, such as self-storage facilities, are scattered throughout the study area.

The study area's largest retail concentration is Lakeforest Mall, a 1 million square foot regional enclosed mall that opened in 1978 and was renovated in 2000.²⁰ Another retail hub is Olde Towne, with a mix of shops and restaurants, an increasing number of which cater to the area's increasingly diverse minority and immigrant population. Along Frederick Avenue and west of I-270, strip malls dominate, as well as big-box stores like Costco, Sam's Club, and Toys 'R' Us, and department stores including Burlington Coat Factory. There are also several car dealerships.

There are two future mixed-use developments in the study area that will contain retail uses. ²¹The Spectrum is under construction at the intersection of Frederick Avenue and Watkins Mill Road and will contain retail and entertainment uses. Watkins Mill Town Center, located next to the Metropolitan Grove MARC station and a future Corridor Cities Transitway station, will contain additional retail use, but construction has yet to begin.

According to a survey conducted by economic consultants in 2013, both residents and major property owners in the Frederick Avenue corridor expressed concerns about its ability to draw shoppers or businesses due to the perception of traffic congestion and that the area was difficult to access.²² Business owners expressed interest in better mass transit as a way to draw more shoppers.

Housing

Figures for housing come from the 12 Traffic Analysis Zones that contain the study area and surrounding neighborhoods. The City and MWCOG use these districts, which usually contain a single neighborhood, to compile both current and future counts of traffic and development.²³

MWCOG predicts that the study area will gain roughly 6,000 housing units by 2040, including units in the construction pipeline or in planning. It also anticipates that the current population will increase from 30,824 to 41,554.²⁶

²⁰ Lakeforest Mall Fact Sheet, Simon Property Group (previous owner): http://web.archive.org/web/20111101034404/http://www.simon.com/Mall/LeasingSheet/5252_LakeforestMall_PropFactSheet.pdf; retrieved December 30, 2013

²¹ Watkins Mill Town Center website, <http://www.watkinsmilltc.com>. retrieved December 30, 2013

²² "Gaithersburg Frederick Avenue & Vicinity Development Capacity Study," Sage Policy Group, December 2012.

²³ "Dwelling Units and Estimated Population." July 2013, City of Gaithersburg Planning and Code Administration.

Figure 2-9 Traffic Analysis Zones²⁶



The study area contains a number of apartment and condominium communities, as well as the Asbury Methodist Village, a 130-acre gated retirement community with 1,250 apartments. Multi-family homes are the majority of the study area’s housing stock, comprising 68% of its 10,809 housing units. By comparison, multi-family homes make up just under half of the over 23,000 housing units in Gaithersburg.²⁴

Owner-occupied households make up roughly half of all households in the city, though Gaithersburg’s housing stock has become dramatically more expensive in recent years. Median home values have more than doubled, from \$171,100 in 2000 to \$372,100 in 2010.²⁶

Much of the housing stock in the study area is older, though there has been significant new construction in recent years, including several new luxury apartment buildings in Olde Towne. There are also two substantial housing developments under construction in the study area: Parklands, a development of for-sale condominiums, townhomes, and single-family homes being built next to the Metropolitan Grove MARC station, and the Spectrum, which will contain rental apartments²⁵.

²⁴ “Dwelling Units and Estimated Population.” July 2013, City of Gaithersburg Planning and Code Administration.

²⁵ Parklands website, <http://parklandsmaryland.com>; retrieved [date]

TRANSPORTATION INFRASTRUCTURE

Major Highways

Interstate 270 and Frederick Avenue (Maryland Route 355) are the primary north-south thoroughfares serving Gaithersburg as well as areas to the north and south. I-270 is a limited-access highway with two exits serving the study area at Clopper Road/West Diamond Avenue and Quince Orchard Road/Montgomery Village Avenue, while a third is planned to be built at Watkins Mill Road in the future²⁶. I-270 has eight lanes, four in each direction, and connects Frederick to the north of Gaithersburg to the Capital Beltway (I-495) to the south. 270 is a major commuter highway that experiences significant congestion at rush hour.

Montgomery County and the State of Maryland plan to expand I-270 between Shady Grove Road, just south of Gaithersburg, and US Route 15 in Frederick County, though no funding is available and the project has been placed on indefinite hold.

Frederick Avenue (Route 355) is a signalized state highway with an average posted speed of 30 miles per hour through the city. It is a conventional suburban strip highway, lined by strip malls and office parks in the northern part of the city, and residential neighborhoods to the south.

Route 355 carries mainly local traffic, though is sometimes used as an alternative to I-270 when it is congested. Despite perceptions of heavy traffic, congestion levels on Route 355 within the study area are lower than on other state highways in Montgomery County and has barely increased over the past five years.²⁷ The average daily traffic counts along Route 355 within the study area range from 23,520 cars at Summit Avenue to 35,508 cars at Montgomery Village Avenue. Traffic speeds along the corridor generally exceed the posted speed limits (between 30 and 40 mph), suggesting that drivers can move easily through the corridor.

Primary Arterial Roads

The study area also contains several important state highways, including Clopper Road/West Diamond Avenue (Maryland Route 117) and Quince Orchard Road/Montgomery Village Avenue (Maryland Route 124). Both roads run east-west, have four or six lanes, and carry significant commuter traffic headed towards I-270. West Diamond Avenue becomes a two-lane road as it approaches Olde Towne Gaithersburg. The Intercounty Connector (Maryland Route 200), is a grade-separated, limited-access toll road that opened in 2011 and has one exit in Gaithersburg at Route 355.²⁸

There are also several significant county- and city-owned arterial roads, including Muddy Branch Road, Odendhal Avenue, Lost Knife Road. Watkins Mill Road, a county road, was recently extended west of I-270, while an interchange is set to open in 2020.

²⁶ "County Begins Work To Improve and Extend Watkins Mill Road," Montgomery County website: <http://www6.montgomerycountymd.gov/apps/news/blog/pioBlog.asp?blogID=17&blogItemID=103Z>. ;retrieved [date]

²⁷ "Gaithersburg Frederick Avenue & Vicinity Development Capacity Study," Sage Policy Group, December 2012.

²⁸ "User's Guide to Intercounty Connector," Washington Post, November 19, 2011: http://www.washingtonpost.com/local/commuting/users-guide-to-intercounty-connector/2011/11/17/gIQAih0RcN_story.html;retrieved December 22, 2013.

companies and shuttles. A description of these services, as well as proposed transit expansions and a review of peer agencies, follows.

METRO RAIL STATIONS

The Washington Metropolitan Area Transit Authority (WMATA) operates the Red Line, a heavy rail transit line in Montgomery County and the District of Columbia.³⁰ While the Red Line has no stops in Gaithersburg, 4.4% of Gaithersburg resident workers commute by Metro.³¹

The Shady Grove Metro station is located outside the study area in nearby Rockville, south of Gaithersburg. Shady Grove is the western terminus of the Red Line. It is the closest Metro station to Gaithersburg, providing access to the greater Washington, DC area, and has a park-and-ride facility with 5,745 spaces. Over 30 Ride On, Metrobus and MTA bus routes serve Shady Grove, and many of the bus routes serving the study area, including Ride On 55, 57, 58, and 59, terminate there. Shady Grove is still one of the busiest stations in the Metrorail system. It had an average weekday ridership of 13,444 in 2012, less than its 2007 peak of 14,439 riders.³²

The Rockville Metro station is located at Route 355 and East Middle Lane in the city of Rockville. This is the second-to-last station on the western leg of the Red Line. Both Metro and MARC commuter rail stop there, as well as Amtrak, making it the closest Amtrak station to Gaithersburg. Three Ride On bus routes serving the study area, the 54, 55, and 56, terminate there. An average of 4,900 riders used the Rockville station each weekday in 2012, a steady increase from previous years.

TRANSIT CENTERS

Montgomery County operates several **transit centers** throughout the county, which serve as hubs for local and regional bus services. One of them, the Lakeforest Transit Center, is located in the study area, while the Germantown Transit Center, which is served by several bus routes that also serve the City, is located outside of Gaithersburg. The Shady Grove and Rockville Metro stations also serve as transit centers for bus routes within the City.³³

The Lakeforest Transit Center is located within the study area on the Lakeforest Mall property at Lost Knife Road and Odendhal Avenue. It is the transit hub for all seven Ride On bus routes serving the study area, including the 54, 55, 56, 57, 58, 59, and 61.

The Germantown Transit Center is located at Aircraft Drive and Germantown Road in Germantown, north of Gaithersburg. Eight Ride On bus routes stop here, and two of the Ride On bus routes serving the study area, the 55 and 61, terminate there.

PARK-AND-RIDE LOTS

The Maryland Transit Administration operates **two park-and-ride lots** at I-270 and Quince Orchard Road, located within the study area, and I-270 and Clopper Road outside the study area. The Quince Orchard Road/Route 124 park-and-ride is served by MTA bus routes 201, 202, and 204 and Ride On bus routes 56 and 61, all of which serve the study area. This lot offers free parking and is heavily used,

³⁰ WMATA website, <http://www.wmata.com>; retrieved December 30, 2013

³¹ 2009-2011 3-Year American Community Survey, US Census Bureau.

³² "Metrorail Average Weekday Passenger Boardings," June 2011: http://www.wmata.com/pdfs/planning/FY12_Historical_Ridership_By_Station.pdf; retrieved December 30, 2013.

³³ Ride On website, <http://www.montgomerycountymd.gov/dot-transit/>; retrieved December 30, 2013

according to Gaithersburg city officials. The Clopper Road/Route 117 park-and-ride is served by just one bus route, the Metrobus J7/J9 Express. It is also free.

RIDE ON



Figure 3-2 Ride On Bus

Ride On is a regional transit service operated by the Montgomery County Department of Transportation (MCDOT) and founded in 1975 starting with a dial-a-ride van in Gaithersburg.³⁴ Fixed-route service in Gaithersburg began in 1976 and has been steadily expanding since. Ride On's primary purpose was to connect residential neighborhoods and job centers to Metro stations, but there is an increasing amount of local service as well.

The majority of Ride On routes use 40' or 60'-foot buses, though some low-ridership routes use smaller vehicles. In the study area, some routes have frequent, all-day service, others are less frequent but run all-day, and a handful are rush-hour only. Seven Ride On routes serve

the study area, including the 54, 55, 56, 57, 58, 59, and 61.³⁵ Ride On ridership increased slightly from 2011 to 2012.³⁶

Route 54 Lakeforest-Rockville provides local service between Lakeforest Mall, NIST, and the Washingtonian Center in southern Gaithersburg, before continuing south to the Rockville Metro station. It runs every 30 minutes for 18 hours a day on weekdays and on weekends, every 30 minutes between 7am and 10pm (8:21pm on Sunday).

Route 55 Germantown-Rockville provides local service along the Frederick Avenue/Route 355 corridor between the Germantown Transit Center and the Rockville Metro station. It serves Lakeforest Mall, Olde Towne Gaithersburg, Gaithersburg High School, as well as two campuses of Montgomery College (Germantown and Rockville). This is one of the highest-ridership services in the Ride On system and usage is growing. On weekdays, the 55 runs from 4:50am to 1:25am, with headways of 10-15 minutes between 7am and 8pm. On weekends, it runs from 5am to 1:33am at headways of 15-20 minutes during the day and 30-45 minutes after 7pm. On Sundays, it runs from 5:30am to 12:46am every 20 minutes during the day and ever 30-45 minutes after 7pm.

Route 56 Lakeforest-Rockville provides local service between Lakeforest Mall and the Kentlands, a major destination for shopping, dining, and entertainment, via Montgomery Village Avenue/Quince Orchard Road before continuing south to the Rockville Metro station. It serves some of the study area's densest neighborhoods. Route 56 runs on weekdays between 4:45am and 10:44pm at 20-30 minute headways, on Saturdays between 6:04am and 9:21pm at 30 minute headways, and on Sundays between 7:04am and 8:51pm at 30 minute headways.

Route 57 Lakeforest-Shady Grove provides local service to Lakeforest Mall, Olde Towne Gaithersburg and the Shady Grove Metro station from suburban neighborhoods on the east side of

³⁴ "A Brief Ride On History/Fares." Montgomery County Department of Transportation. http://www.montgomerycountymd.gov/DOT-Transit/routesandschedules/rideon_history.html ;retrieved December 30, 2013.

³⁵ Ride On website, <http://www.montgomerycountymd.gov/dot-transit/>; retrieved December 30, 2013.

³⁶ "Public Transit Agency Ridership Statistics." Governing Magazine. <http://www.governing.com/gov-data/transportation-infrastructure/public-transportation-agency-ridership-statistics-cities-metro-areas.html> ;retrieved December 30, 2013.

Gaithersburg, detouring along Washington Grove Lane, Muncaster Mill Road and Redland Road. It is a direct connection between Lakeforest Mall and Olde Towne Gaithersburg along Russell Avenue and East Diamond Avenue. Route 57 runs on weekdays from 4:45am to 12:29am at 20-25 minute headways during the day and 30-minute headways after 7pm. On Saturdays, Route 57 runs at 20-30 minute headways from 5:30am to 11:27pm. On Sundays, it runs at 25-30 minute headways from 7am to 9:26pm.

Route 58 Lakeforest-Shady Grove connects residential neighborhoods in Montgomery Village, a planned community north of the Gaithersburg city limit, to Lakeforest Mall via Montgomery Village Avenue and Lost Knife Road. Route 58 was extended in 2013 to serve the new Kaiser Permanente campus on Watkins Mill Road via Russell and Christopher avenues. It runs from 4:49am to 1:39am on weekdays at 15-minute headways during rush hour (from 6:12am to 10:21am towards Shady Grove, from 3:49pm to 6:35pm towards Lakeforest), at 20-25 minute headways during midday, and at 30-minute headways after 8:20pm. On Saturdays, it runs from 5:17am to 1:10am at 30-minute headways. On Sundays, it runs from 5:25am to 1:17am at 30-minute headways.

Route 59 Montgomery Village-Rockville connects Montgomery Village to Rockville via Montgomery Village, Odendhal, and Frederick avenues within the study area. It serves Lakeforest Mall, the Montgomery County Agricultural Fairgrounds, and the west side of Olde Towne. On weekdays, it runs from 4:49am to 12:51am at 15-20 minute headways during the day and 30-minute headways after 5pm going southbound and 8pm going northbound. On Saturdays, it runs from 5:17am to 1:10am at 30-minute headways, and on Sundays from 5:25am to 1:17am at 30-minute headways.

Route 61 Shady Grove-Germantown connects Olde Towne, Lakeforest Mall, and the Metropolitan Grove MARC station (during rush hour only) via East Diamond Avenue, Girard Street, Odendhal Avenue, Frederick Avenue and Montgomery Village Avenue. It is the only existing bus route that serves all three of the Study Area's activity centers and all three of Gaithersburg's MARC stations. On weekdays, it runs from 4:30am to 12:32am at 20-minute headways during rush hour (5am-9am southbound, 3:13pm-7:36pm northbound) 30-minute headways at midday, and 30-40 minute headways in the evenings. On Saturdays, it runs from 6am to 10:56pm at 30-minute headways. On Sundays, it runs from 6:30am to 10:25am at 30-minute headways.

Routes 70 Germantown-Bethesda, 79 Clarksburg-Shady Grove, and 100 Germantown-Shady Grove run express along I-270 through the city of Gaithersburg to Red Line Metro stations, but do not stop within the city.

METROBUS

The Washington Metropolitan Area Transit Authority (WMATA) runs two express bus routes in Gaithersburg. It is the only Metrobus service in the city.

Routes J7/J9 I-270 Express Line stops at Lakeforest Mall and the park-and-ride lot at I-270 and Clopper Road/West Diamond Avenue before running express on I-270 south to the Medical Center and Bethesda Metro stations, where buses serve all stops.³⁷ Both routes run only during rush hour on weekdays (5:40-9:12am and 3:10pm-7:14pm), with most service in the peak direction (southbound towards Bethesda in the morning, northbound towards Gaithersburg in the evening). Buses run at 15-20

³⁷ Metrobus J7/J9 schedule, <http://www.wmata.com/bus/timetables/md/j7-9.pdf?n>; retrieved December 30, 2013.

minute headways in the peak direction, and 20-30 minute headways in the opposite direction. Average weekday ridership for the line was 470 in 2012, compared to 406 in 2011.³⁸

MTA COMMUTER BUS

The Maryland Transit Administration runs several commuter bus routes that connect Gaithersburg to Metro stations, major job centers, and Baltimore-Washington International Airport. Most of the services run during rush hour on weekdays.³⁹

Ridership data is not available by route, but use of the MTA's commuter buses have remained steady over the past several years, averaging about 16,000 riders each weekday. Ridership on the Intercounty Connector routes has grown steadily since their inception in 2011. 763 riders used the Intercounty Connector buses in September 2013, compared to 598 a year earlier.⁴⁰



Figure 3-3 MTA Commuter Bus

Route 201 (Gaithersburg-BWI) connects the Quince Orchard Road park-and-ride to Baltimore-Washington International Airport via I-270 and the Intercounty Connector. The route runs express along the highway, stopping only at other park-and-ride lots. During the week, eastbound service (to BWI) runs once an hour from 4am to 7:23pm, and westbound once an hour from 5am to 12:20am. On weekends and holidays, eastbound service runs hourly from 4am to 7:16pm, and westbound service is hourly from 9am to 12:17am.

Route 202 (Gaithersburg-Fort Meade) is an express route connecting the Quince Orchard Road park-and-ride lot to Fort Meade via I-270 and the Intercounty Connector. It runs only during rush hour in the peak direction, making three eastbound trips in the morning and three westbound trips in the evening.

Route 204 (Frederick-College Park) is an express route connecting the Monocacy MARC station in Frederick County to the University of Maryland in Prince George's County via I-270, making a stop at the Quince Orchard Road park-and-ride. It runs only during rush hour in the peak direction, making four southbound trips in the morning and four northbound trips in the evening.

Route 991 (Hagerstown-Rock Spring) is an express route connecting Hagerstown in Washington County to the Rock Spring Business Park in Bethesda via I-270. It passes through Gaithersburg, but the closest stop is at the Shady Grove Metro station.

³⁸ Metrobus ridership statistics for 2011 and 2012:

http://www.wmata.com/pdfs/planning/FY11_Average_Weekday_Bus_Ridership.pdf,
https://www.wmata.com/pdfs/planning/FY12_Bus_Ridership_By_Line.pdf; retrieved December 30, 2013.

³⁹ "MTA Commuter Bus." Maryland Transit Administration: <http://mta.maryland.gov/commuter-bus>; retrieved December 30, 2013.

⁴⁰ "MTA Average Weekday Ridership," Maryland StateStat: <https://data.maryland.gov/Transportation/MTA-Average-Weekday-Ridership-by-Month/ub96-xxqw?>; retrieved December 30, 2013.

MARC



Figure 3-4 MARC Train

The Maryland Transit Administration operates the MARC (Maryland Area Commuter Rail) Brunswick Line between Washington, DC and Martinsburg, West Virginia, with a spur to Frederick. The Brunswick Line has two stops within the City of Gaithersburg, at Metropolitan Grove, Olde Towne Gaithersburg, and a third at Washington Grove just outside the city limits. Service only runs during rush hour in the peak direction, with 9 eastbound trips in the morning and 10 westbound trips in the evening.

Ridership on the Brunswick Line has been steadily increasing. Average weekday ridership in 2012 was 7,795 passengers, compared to 7,379 passengers in 2008, the earliest full year for which data is available.

AMTRAK

Amtrak's Capitol Limited line, connecting Washington, DC to Pittsburgh, Cleveland, and Chicago, passes through Gaithersburg but does not stop there. The nearest stop is in Rockville, five miles away.⁴¹

TAXIS

There are five taxicab companies serving Montgomery County and the City of Gaithersburg, including Action Taxi, Barwood Taxi, Orange Taxi, Regency Cab, and Sun Cab. Travelers can hail a taxicab from the curb, go to a taxicab stand, or request a pickup.⁴²

PROPOSED TRANSIT SERVICES

The Corridor Cities Transitway (CCT) would be a 15-mile Bus Rapid Transit line between the Shady Grove Metro station and Clarksburg. There would be two stops within the Study Area, both of which would be west of I-270, at the Metropolitan Grove MARC station and at Firstfield, located across Quince Orchard Road from the park-and-ride.⁴³

The CCT would consist of a bi-directional transitway running in a dedicated right-of-way adjacent to the street, with short segments in the median. Buses would have dedicated lanes along the length of the corridor. Maryland approved the \$545 million project in 2012 and is currently seeking federal funding for it. If everything proceeds according to schedule, the CCT's first phase, between Shady Grove and Metropolitan Grove, could open by 2020.⁴⁴ It is anticipated to carry 47,000 riders each day by 2035.

A Bus Rapid Transit line on Route 355 would connect Gaithersburg to Friendship Heights in the south and Clarksburg to the north, running the length of 355 through the city and study area. The 23-mile

⁴¹ "Amtrak Capitol Limited Route," Amtrak website: <http://www.amtrak.com/capitol-limited-train>; retrieved [date]

⁴² "Taxicab Regulation and Licensing in Montgomery County, Maryland," Montgomery County website: http://www.montgomerycountymd.gov/DOT-Transit/taxi_reg/taxi_user.html; retrieved December 30, 2013.

⁴³ Corridor Cities Transitway website, <http://www.cctmaryland.com>; retrieved December 30, 2013.

⁴⁴ "Corridor Cities Transitway," Montgomery County Planning Department: <http://www.montgomeryplanning.org/transportation/projects/corridor.shtm>; retrieved December 30, 2013.

corridor is part of a 81-mile network in a functional master plan that Montgomery County approved in November 2013.⁴⁵

In the study area, the line could have 7 stops at Shady Grove Road, Education Boulevard (Gaithersburg High School), Brookes Avenue (Olde Towne), Odendhal Avenue, Montgomery Village Avenue, Watkins Mill Road, and Professional Drive. The Montgomery County Planning Department, which drafted the plan, envisions buses running on dedicated lanes in the median of Route 355, which may require widening the road. The line and the plan as a whole have no funding and will require additional engineering and design work.

⁴⁵ "Countywide Transit Corridors Functional Master Plan," Montgomery County Planning Department: <http://montgomeryplanning.org/bri>; retrieved December 30, 2013.

4 THE MARKET FOR CIRCULATOR SERVICE

To explore the feasibility of a circulator for Gaithersburg, it's important to understand how circulators work and what makes them successful. Communities implement circulators to augment existing transit connections, promote business or tourism, or carry underserved populations. Unlike traditional local bus service, circulators are designed to provide short trips within a compact, defined area.

WHAT MAKES A SUCCESSFUL CIRCULATOR

Successful circulators typically share most of the following attributes:

- **Frequent and reliable service** – short headways between buses and long hours ensure that riders can depend on the service throughout the day and week.
- **Simple and direct routing** – a route that is too circuitous and includes lengthy deviations will discourage ridership by making service maps confusing and trips too long.
- **Distinctive branding** – service that stands out from the regular transit fleet is important to attract “choice riders,” including commuters and visitors who may not be experienced transit users.
- **Low or free fares** – fares can be perceived as a barrier to access for some riders, especially if transfers to and from other services are not free.
- **Stable and reliable funding** – funding is key to facilitating other service characteristics including free fares, distinctive branding, and frequent service.
- **Clear purpose** – circulators generally provide a solution to a mobility “pain point,” such as limited or expensive parking, long walk distances, and/or heavy traffic congestion that encourages regional transit use.

TWO TYPES OF CIRCULATORS

Communities usually implement circulators in order to provide local circulation within a specific area like a central business district or university campus, or to provide first- or last-mile connections between a transit hub and a significant destination, like a large employer. Often, circulators can and do serve both functions.

Local Circulators

Local circulators, like downtown circulators or campus shuttles, provide service within a compact, defined area. These services rely on simple, easy-to-follow routes that allow for short trip times and high service frequency. That, in turn, encourages ridership. Local circulators work best in urban or campus environments, which have a high density and variety of destinations, allowing them to attract many different markets, like commuters, tourists, and residents. Two local circulator examples are profiled below:

Charm City Circulator (Baltimore)



Simple, easy-to-understand routes can encourage circulator ridership, especially among riders who aren't accustomed to using transit. Baltimore's Charm City Circulator illustrates how clear, simple routing built a ridership base of both regular and infrequent users.

Citing the need to improve gaps in its transit network and reduce the pressure for downtown parking, Baltimore began planning for a downtown circulator bus in 2008 and began service in 2010.⁴⁶ The circulator is operated by the Baltimore City Department

of Transportation and separately from the Maryland Transit Administration. Funding for the Charm City Circulator comes from a tax on public parking.

By operating the service in-house, Baltimore not only can exercise more local control over the circulator, but can provide a uniquely branded product to attract both workers and tourists. The city has aggressively marketed the Circulator, setting aside 5% of the service's budget for marketing. It hired a marketing firm that publicizes the service using social media and purchased distinctive, sleek vehicles with bright, inviting livery.

The circulator has four lines connecting downtown Baltimore to major tourist destinations, shopping districts, and residential areas. The first line, the east-west Orange Route travels between the University of Maryland-Baltimore to Harbor East and Fells Point. The north-south Purple Route opened later that year and connects Mount Vernon Square to Federal Hill, followed by the Green Route between City Hall, Fells Point, and Johns Hopkins Hospital. A fourth route, the Banner Route, connects Fort McHenry to the Inner Harbor and opened last year. Each line has a generally linear route that's easy to remember and follow, though there are some couplets.

All four lines are free. The Orange, Purple, and Green routes run at 10-minute headways, while the Banner Route runs at 15-minute headways. All four lines run from 6:30am to 9pm Monday through Thursday, 6:30am to midnight on Friday, 9am to midnight on Saturday, and 9am to 9pm on Sunday.⁴⁷

The Circulator has become very popular, attracting a mix of tourists, commuters, and shoppers. Over 350,000 rides were taken on the Circulator in November 2013. But the service hasn't been without issues. The original bus fleet, purchased for their fuel efficiency, had engine and air conditioning problems and broke down frequently, disrupting service for months. In 2011, the city buses.⁴⁸

⁴⁶ "For the Charm City Circulator, 'growing pains are inevitable,'" Baltimore Sun, August 26, 2010.

<http://www.bizjournals.com/baltimore/stories/2010/08/23/daily30.html?page=all>, retrieved December 30, 2013.

⁴⁷ "Circulator marks a year on the streets," Baltimore Sun, January 11, 2011. http://articles.baltimoresun.com/2011-01-11/news/bs-md-charm-city-circulator-20110111_1_charm-city-circulator-orange-route-purple-route, retrieved December 30, 2013.

⁴⁸ "Circulator marks a year on the streets," Baltimore Sun, January 11, 2011. http://articles.baltimoresun.com/2011-01-11/news/bs-md-charm-city-circulator-20110111_1_charm-city-circulator-orange-route-purple-route, retrieved December 30, 2013.

DC Circulator (Washington)



Successful circulator services meet the mobility needs of a community. Faced with dramatic changes in its ridership base, the Washington, DC Circulator successfully adapted to serve a new audience.

Planning for the Circulator began in 1997 with a study by the National Capital Planning Commission, which called for a surface transit network designed to move people within downtown DC and adjacent neighborhoods. The system would complement the Metro system by serving short trips within the urban core, providing

an alternative to cars and private shuttle van services and reducing traffic.

The Circulator was originally envisioned as a system for tourists and office workers, but as downtown DC and surrounding neighborhoods added housing, it became popular with residents as well, due in part to the free transfers with Metrobus. 79% of Circulator riders come from the District of Columbia, while another 14% come from nearby communities in Maryland and Virginia. 57% of all trips are made for work, while 42% are for shopping, dining, recreational or cultural trips. 41% of all riders use the service daily and 74% use it at least a few times a week. The rider base is diverse, spread fairly evenly among all income levels and age groups, and well-educated, with 61% of all riders holding a college degree.

Circulator service began in 2005 with the east-west Georgetown-Union Station line and the north-south Convention Center-Southwest Waterfront line, followed by the Smithsonian-National Gallery of Art line in 2006. Also in 2006, the Georgetown-Union Station line was extended north to Glover Park. In 2009, two additional north-south lines opened, Woodley Park-Adams Morgan-McPherson Square and Union Station-Navy Yard, both of which replaced existing Metrobus routes, as well as a second east-west line, the Dupont Circle-Georgetown-Rosslyn line, connecting DC to Arlington.^{49,50} In 2011, the Potomac Avenue-Skyland line opened. The Smithsonian-National Gallery of Art and Convention Center-Southwest Waterfront were discontinued in 2011 due to low ridership, while the Convention Center line was replaced by a Metrobus route.⁵¹

Circulator buses run at 10-minute headways, generally between 7am and midnight, Sunday through Thursday, and from 7am to 2am Friday and Saturday. The Potomac Avenue-Skyland and Union Station-Navy Yard routes close at 9pm, while the Woodley Park-Adams Morgan-McPherson Square line closes at 3:30am on Friday and Saturday.

The Circulator provided more than 4.8 million trips in 2010, making it the region's fourth-

⁴⁹ "DC Circulator Expansion Continues," DDOT, August 2009:

<http://ddot.dc.gov/DC/DDOT/About+DDOT/News+Room/ci.DC+Circulator+Expansion+Continues.print>, retrieved December 30, 2013.

⁵⁰ "Metrobus Routes 98, N22 being replaced by DC Circulator," Metro News Release, March 27, 2009:

http://wmata.com/about_metro/news/PressReleaseDetail.cfm?ReleaseID=2518, retrieved December 30, 2013.

⁵¹ "D.C. Circulator bus route on National Mall ends," TBD, April 1, 2011: <http://www.tbd.com/articles/2011/04/d-c-circulator-bus-route-on-national-mall-ends-57612.html>, retrieved December 30, 2013.

largest bus system in terms of ridership. Nearly half of that ridership comes from the Georgetown-Union Station line. Riders are generally satisfied with the service, citing its ease of use, wide variety of destinations, comfortable, high-quality ride, frequency, and low fares. Support is high for expanding the system.

The growth in resident ridership has resulted in a shift away from serving tourist destinations to serving neighborhood shopping and entertainment districts, like Adams Morgan and Barracks Row. DC is looking at as many as 12 corridors for potential Circulator expansion, which if implemented could nearly quadruple the system's size.⁵² Most of these corridors are outside of downtown DC and the tourist areas.

First- and Last-Mile Connector

First- or last-mile connectors are designed to complement regional transportation services by providing connections between a transit hub and some final destination, like an employment center, that is either too far away to walk or separated by a physical barrier. These services often serve commuters and may only run during daytime hours or during peak periods. However, some first- and last-mile connectors can offer a greater span of service if the demand is there. First- or last-mile circulators are very dependent on easy, reliable connections to other transit services, particularly rail or rapid transit. Two case studies are provided below:

Emery Go-Round (Emeryville, California)



A steady source of funding can support constant improvements to transit service, especially with regards to frequency. One way to raise funding is by merging or reorganizing existing shuttle services, as done with the Emery Go-Round in Emeryville, California.

Located 1.5 miles from the nearest rapid transit station, the small city of Emeryville, located across the bay from San Francisco, wanted to attract businesses without the attendant traffic congestion.

In 1995, the city worked with business owners to consolidate the few private shuttles that already existed to create the Emery Go-Round, a set of three shuttle bus routes connecting neighborhoods, office parks, and shopping centers to the MacArthur BART station in Oakland. Area businesses and property owners fund the service by paying taxes into an improvement district.⁵³ The city collected \$2.8 million in taxes for the service in 2013.⁵⁴

⁵² "DC Circulator Transit Development Plan," DDOT, March 2011:

http://dc.gov/DC/DDOT/Publication%20Files/On%20Your%20Street/Mass%20Transit/DC%20Circulator/DCCirculatorTransitDevelopmentPlan_03-2011.pdf, retrieved December 30, 2013.

⁵³ "How A Free Bus Shuttle Helped Make A Small Town Take Off," NPR, November 13, 2013:

<http://www.npr.org/2013/11/13/243955769/how-a-free-bus-shuttle-helped-make-a-small-town-take-off>, retrieved December 30, 2013.

⁵⁴ "Emeryville's favorite perk, a free shuttle, has uncertain future," San Jose Mercury News, January 18, 2014:

http://www.mercurynews.com/breaking-news/ci_24938150/emeryvilles-favorite-perk-free-shuttle-has-uncertain-future, retrieved January 20, 2013.

Two of the routes make all local stops and run at 10-20 minute intervals from 5am to 10pm during the week and from 9am to 10pm on weekends. A third, express route runs every 15 minutes during rush hour.⁵⁵

Ridership has been strong from the beginning. There were 1.5 million boardings on the Emery Go-Round in 2012, and city officials say the buses are at capacity. Since the service opened, Emeryville has attracted major corporations like Pixar and Peet's Coffee, as well as developed a healthy retail scene featuring both big-box stores and high-end boutiques. Public and business community support for the service is strong, though owners of industrial properties further away from the route that are still part of the taxing district have been reluctant to contribute, endangering the Emery Go-Round's funding structure.⁶⁶

Bethesda Circulator (Bethesda, Maryland)



The Bethesda Circulator functions as a first/last mile connector by encouraging visitors to downtown Bethesda to “park once” or take the Metro and then use the Circulator to reach their final destination. However, the service also links an area of high population density south of Bethesda Metro Station with an area of high employment density north of the station.

Montgomery County first introduced a downtown circulator for Bethesda in 2001

as the Bethesda 8 Trolley, so named for its figure-eight shaped route and nostalgic, rubber-tired trolley vehicles. Through aggressive marketing, a rebranding including new vehicles, and increased service, the Bethesda Circulator was able to grow ridership over 40% in seven years.

Ride On originally operated the circulator service with funds from the state of Maryland and Montgomery County's Mass Transit Fund. In 2006, the county gave control of the service to Bethesda Urban Partnership (BUP), a publicly-funded entity that provides urban district services to the downtown, including transportation demand management (TDM), helping residents and employers find alternatives to driving.⁵⁶ Funding for the circulator comes from revenues in the Bethesda Parking Lot District, which includes over 5,400 spaces in several garages and lots owned by Montgomery County. Additional funding comes from sponsorships of the buses that BUP solicits.

Upon taking over the Circulator, BUP began making improvements, introducing Saturday service in 2010. In 2011, BUP replaced the trolley vehicles in response to complaints that they were unreliable and uncomfortable. The new coaches are sleek, high-end vehicles intended for long-range Bus Rapid Transit service. They have low-floor entry to improve accessibility and a bright, distinctive livery that advertises the shuttle's free cost and displays a map of where it goes. BUP added a third vehicle during rush hour starting in 2012 to compensate for the removal of a popular surface parking lot, which is being replaced with an underground parking garage.

⁵⁵ Emery Go-Round website, <http://www.emerygoround.com>, retrieved December 30, 2013.

⁵⁶ “2013 Evaluation of the Bethesda Urban Partnership,” Montgomery County Government, October 29, 2013: <http://www.bethesdanow.com/files/2013/10/2013-Evaluation-of-the-Bethesda-Urban-Partnership.pdf>, retrieved December 30, 2013.

A private contractor operates the Bethesda Circulator, but BUP staff does marketing, trains drivers, and maintains signs and benches at Circulator stops. BUP heavily advertises the Circulator with printed materials and an extensive social media presence. The visually distinctive buses also serve as advertising.

The free service runs from 7am to 12am Monday through Thursday, 7am to 2am on Friday, and 10am to 2am on Saturday.⁵⁷ Buses come every 10 minutes and there is no printed schedule. Buses run a 2.1-mile loop on Woodmont Avenue, Old Georgetown Road and surrounding streets, forming a corridor that is only about .7 miles long. The service makes 20 stops, including at 8 public parking garages and the Bethesda Metro station, with connections to both the Red Line and local Metrobus and Ride On routes. An expansion first proposed in 2008 but never implemented would extend the route east along Montgomery Avenue and East-West Highway.⁵⁸

Ridership has increased significantly since BUP took over the Circulator in 2006. Average monthly ridership was 18,907 in 2006 and rose to 26,356 in 2013.

THE MARKET FOR A POTENTIAL CIRCULATOR

While local service and first-mile/last-mile connections are always the best roles for circulators, it doesn't necessarily mean that circulators are always the best choice for these roles. In a robust transit network, local routes can provide both local circulation and first-mile/last-mile connections while also offering broader, more comprehensive service coverage. In some cases, communities have implemented circulator service only to discover that they were better served by traditional local bus service. One such example is provided below:

GEORGE (Falls Church, Virginia)



Not all circulator systems are successful. Unreliable funding, routing that does not serve the community's needs, and weak branding can prevent a circulator service from reaching its full potential.

In 2002, the city of Falls Church, located in Northern Virginia 10 miles west of Washington, DC, sought to connect its downtown area and residential neighborhoods to two Metro stations that were each outside a comfortable walking distance. Working with the Washington Area Metropolitan Transit Authority (WMATA), the city introduced GEORGE, a

⁵⁷"Bethesda Circulator," Bethesda Urban Partnership website: <http://www.bethesda.org/bethesda/bethesda-circulator>, retrieved December 30, 2013.

⁵⁸"Technical Assistance for the TLC Program: Bethesda Circulator." Metropolitan Washington Council of Governments, October 20, 2008: http://www.mwco.org/transportation/activities/tlc/pdf/Bethesda_Report.pdf, retrieved December 30, 2013.

circulator bus with two loop routes serving the West Falls Church and East Falls Church Metro stations, located in adjacent Fairfax County and Arlington County, respectively.⁵⁹

The city launched a pilot program with four buses using grants from the Virginia Department of Rail and Public Transportation, the state Department of Transportation, and the Federal Transit Administration, and WMATA operated the service.⁶⁰ In 2005, the city began funding GEORGE with help from the city and from a trust fund managed by the Northern Virginia Transportation Commission, a regional authority that receives gas tax revenue and state transit funding. The service cost \$600,000 to run each year and originally charged passengers a fare of 25 cents.⁶¹

Both GEORGE routes ran at 25-minute headways during rush hour, from 6 to 9:39 am in the morning and from 4 to 7:50 pm in the evening. The 26W, which ran counterclockwise, served the high school, several shopping centers, and residential neighborhoods. The 26E, running clockwise, served city hall, a library, the historic downtown, and a popular music venue.⁶² A third service, the 26A, served the entire city and ran during the middle of the day.

GEORGE duplicated portions of three existing Metrobus routes that served Falls Church, providing both local service within the city and connections to both Metro stations⁶³. All three routes ran much more frequently, coming as often as every 15 minutes during rush hour, and ran for 20 hours a day, from 5 am to 1 am. In addition, existing local buses had much more direct routes, reducing travel time, while GEORGE had a more indirect routing that detoured through low-density residential neighborhoods.⁶²

As a result, GEORGE ridership was very low from the beginning. A ridership count in 2010 found that only a few dozen passengers used each route on a typical weekday, and that the majority of them were getting on and off at the Metro stations. To cut costs, the city gave operation of the service to Arlington County, raised the base fare to \$1.00, and eliminated the mid-day 26A. This reduced costs to only \$200,000 a year.⁶²

In 2009, the city convened a task force of residents and business owners to study GEORGE and make recommendations for its future. The task force found that GEORGE served a small but devoted group of riders who said they primarily used the service for work commutes and did not feel there were any available alternatives. Meanwhile, residents who did not use GEORGE said higher frequency or a different route would encourage them to use it.⁶²

After looking at reconfiguring the route, the task force ultimately recommended reducing service using existing buses instead of ending it altogether due to the higher cost of bus disposal, but the city council voted to eliminate GEORGE in August 2010.⁶³

As seen in the examples above, most successful circulators share many common attributes and community characteristics, such as high population and/or employment density, limited or expensive parking, good pedestrian and transit connections, and very high service frequency.

⁵⁹ "R.I.P. GEORGE Scrapy Falls Church bus line succumbs to ridership, funding problems," TBD, August 16, 2010: <http://www.tbd.com/blogs/tbd-on-foot/2010/08/r-i-p-george-falls-church-bus-line-succumbs-to-ridership-funding-problems-412.html>, retrieved February 25, 2014.

⁶⁰ "GEORGE Task Force – Service Delivery Recommendation FY 11." City of Falls Church, January 27, 2010, <http://www.fallschurchva.gov/Content/Docs/2dGEORGETaskForceReportwithAttachments.pdf>, retrieved February 25, 2014.

⁶¹ "Falls Church to end George bus service amid grim budget forecast." Washington Post, August 16, 2010: <http://www.washingtonpost.com/wp-dyn/content/article/2010/08/15/AR2010081502823.html>, retrieved February 25, 2014.

⁶² GEORGE schedule, City of Falls Church, <http://www.fallschurchva.gov/Content/Docs/GEORGESchedule.pdf>, retrieved February 25, 2014.

⁶³ Schedules for Metrobus 2A/B/C/D, 28A, and 28X, WMATA website: <https://www.wmata.com/bus/timetables/timetables-state.cfm?State=VA>, retrieved April 29, 2014.

Gaithersburg lacks some of these features – most notably there is no shortage of free parking in the community (Figure 4-1). However, the study area does have other characteristics that could form viable markets for circulator service. For example, there are several major employers and activity centers; there are a number of high-density housing complexes and corridors; and regional transit connections are fairly good and getting better. The question of whether a circulator is the most effective way to serve these markets is explored in Chapter 5.

Figure 4-1 Comparison of Operating Environment Characteristics

	DC Circulator	Charm City Circulator	Bethesda Circulator	GEORGE	Gaithersburg
Pedestrian-friendly street grid	✓	✓	✓	✗	✗
Attractions all day (18-hour day)	✓	✓	✓	✗	✓
High population density	✓	✓	✓	✗	✗
High employment density	✓	✓	✓	✗	✗
Limited parking availability	✓	✓	✓	✗	✗
Charge for parking	✓	✓	✓	✗	✗
Frequent, all-day transit (15 minutes or less, 18 hours a day)	✓	✓	✓	✗	✓
Steady high ridership all day and all week	✓	✓	✗	✗	✗
Free circulator fare	✗	✓	✓	✗	

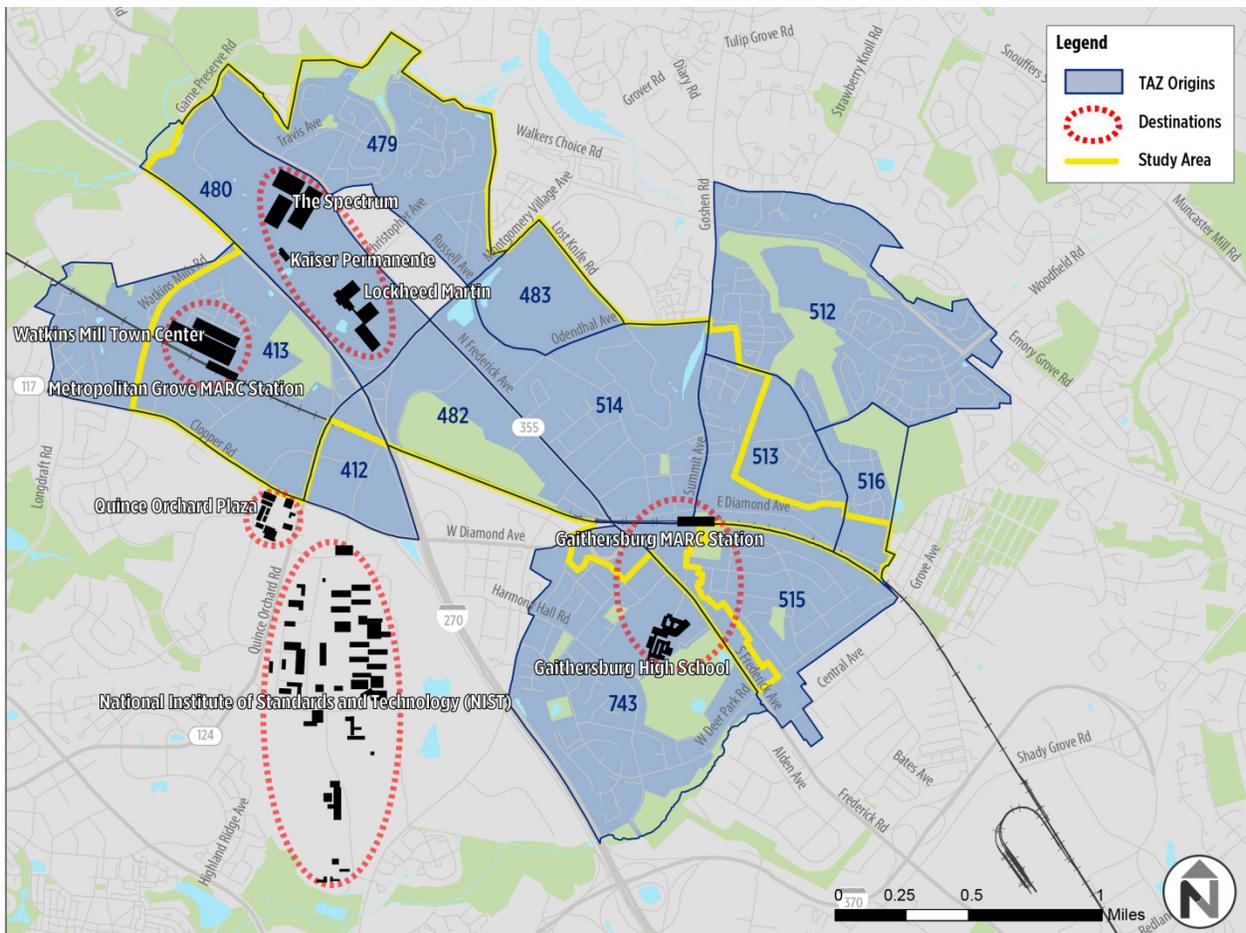
5 TRIP SCORE ANALYSIS

The analysis presented in this chapter focuses on the quality of existing transit connections between key origins and destinations, and how these connections may improve with the addition of a local circulator or with modifications to the existing Ride On network.

METHODOLOGY

To analyze the quality of existing and planned transit connections in the study area, 60 trips were simulated during a typical weekday morning rush hour between each of the 12 Traffic Analysis Zones (TAZs) that comprise the study area and five destinations within or directly adjacent (in the case of Quince Orchard Plaza and NIST) to the study area (Figure 5-1).

Figure 5-1 Study Area TAZs (Origins) and Destinations



Each TAZ and each destination was assigned a landmark address to and from which trips would be simulated (the full list of addresses used for this analysis are shown in Appendix A). If multiple trips were possible between an origin and a destination, the trip with the shortest total travel time, least transfers, or least walking time was selected. For each trip analyzed, a trip score was assigned based on the following characteristics:

- **Walk time.** Potential riders are more likely to use a local bus or circulator if they do not have to walk more than a quarter-mile, which is a five-minute walk for most able-bodied adults.
- **Wait time.** Potential riders are more likely to use any transit service if they do not have to wait as long for each vehicle. To calculate average wait time, we divided the scheduled headway by 2 and added any wait time for transfers.
- **Number of transfers.** For most potential riders the appeal of a transit trip declines with each transfer required to complete the trip.
- **Total travel time.** Potential riders, especially those who have the option of driving, will decide whether or not to use transit based on the estimated travel time.

The quality of each characteristic of a trip was ranked on a four-point scale, with 1 being the poorest quality and 4 being the highest quality (see Figure 5-2 below), and then averaged to produce a total score between 1 and 4 for each trip. A high total trip score between an origin and a destination indicates strong connectivity between the two points.

Figure 5-2 Scoring Criteria for Trips Score Analysis

Points	Walk Time	Wait Time (wait during transfer + headways divided by 2)	Number of Transfers	Total travel time
1	16 + minutes	31 to 40 minutes	3+	90 + minutes
2	11 to 15 minutes	21 to 30 minutes	2	61 to 90 minutes
3	6 to 10 minutes	11 to 20 minutes	1	31 to 60 minutes
4	0 to 5 minutes	0 to 10 minutes	0	0 to 30 minutes

Walk times were analyzed using Google Maps, while wait times consisted of two components:

1. The average time between arriving at a bus stop by foot and boarding a bus was estimated by taking the published service frequency of the bus to be boarded and dividing by two. In reality, some people will arrive at a stop just as a bus has departed and will face a longer wait time, while others will arrive at a stop just as a bus is approaching and have a shorter wait time. On average though, the wait time at a bus stop can be assumed to be 1/2 the service frequency or headway (see Figure 5-3).
2. Trips that require a transfer between buses also require an additional wait time at the transfer point. These wait times were identified by comparing the published arrival time of the first route at a stop with the scheduled arrival time of the route to be transferred to.

Finally, the total travel time for each trip was defined as the sum of the walk time to a stop, the wait time at the stop, the travel time on the first bus, the wait time at a transfer point (if applicable), the travel time on subsequent buses (if applicable), and the walk time to the final destination at the end of the trip.

Figure 5-3 Current Transit Service Frequencies in the Study Area (Minutes)

Route	Morning Rush	Mid-Day	Afternoon Rush	Evening	Weekend	Weekend Evenings
Metro Red Line	6	6	6	12 to 15	6	12 to 15
Ride On 54	30	30	30	30	30	30
Ride On 55	10	15	10	20 to 30	15 to 20	30 to 45
Ride On 56	20	30	20	30 to 45	30	30
Ride On 57	20	25	20	30	20	30
Ride On 58	15	20 to 25	15	30	30	30
Ride On 59	15	20	15	30	30	30
Ride On 61	20	30	20	30 to 40	30	30
Ride On 70	12 to 15		12 to 15			
Ride On 79	30		30			
Ride On 100	6 to 8	15	6 to 10	15 to 30	30	30
Metrobus J7/J9	12 to 20 peak direction/ 30 opposite		12 to 20 peak direction/ 30 opposite			
MTA 201	60		60			
MTA 202	60 peak		60 peak			
MTA 204	30 peak		30 peak			
MTA 991	15 to 20 peak		15 to 20 peak			
MARC Brunswick Line	20 peak		20 peak			

BASELINE ANALYSIS

As a first step, the study team analyzed the quality of connections between key origins and destinations using the existing transit network. This analysis established a baseline against which to compare the effectiveness of transit improvements including potential circulators and modifications to the Ride On network. Trip scores were calculated, using the methodology described above, for each TAZ/destination pair in the study area. An example analysis for a trip beginning at TAZ 515 and ending at the Metropolitan Grove MARC station is shown below:

Sample Trip Score Analysis – TAZ 515 (City Hall) to Metropolitan Grove MARC Station

Currently, a trip from Gaithersburg City Hall in Traffic Analysis Zone (TAZ) 515 to the Metropolitan Grove MARC Station during the morning peak period requires an 11 minute walk to North Frederick Avenue, followed by an approximately 15-minute wait for Ride On Route 59, a 6-minute bus ride to Lakeforest Transit Center, a 9-minute wait time to transfer to Route 61, and finally a 13-minute bus ride to Metropolitan Grove Station (Figure 5-4). Using the scoring system described in Figure 5-4, this trip has an average trip score of 2.5.

Figure 5-4 Map of trip simulation between TAZ 515 and Metropolitan Grove (current conditions)

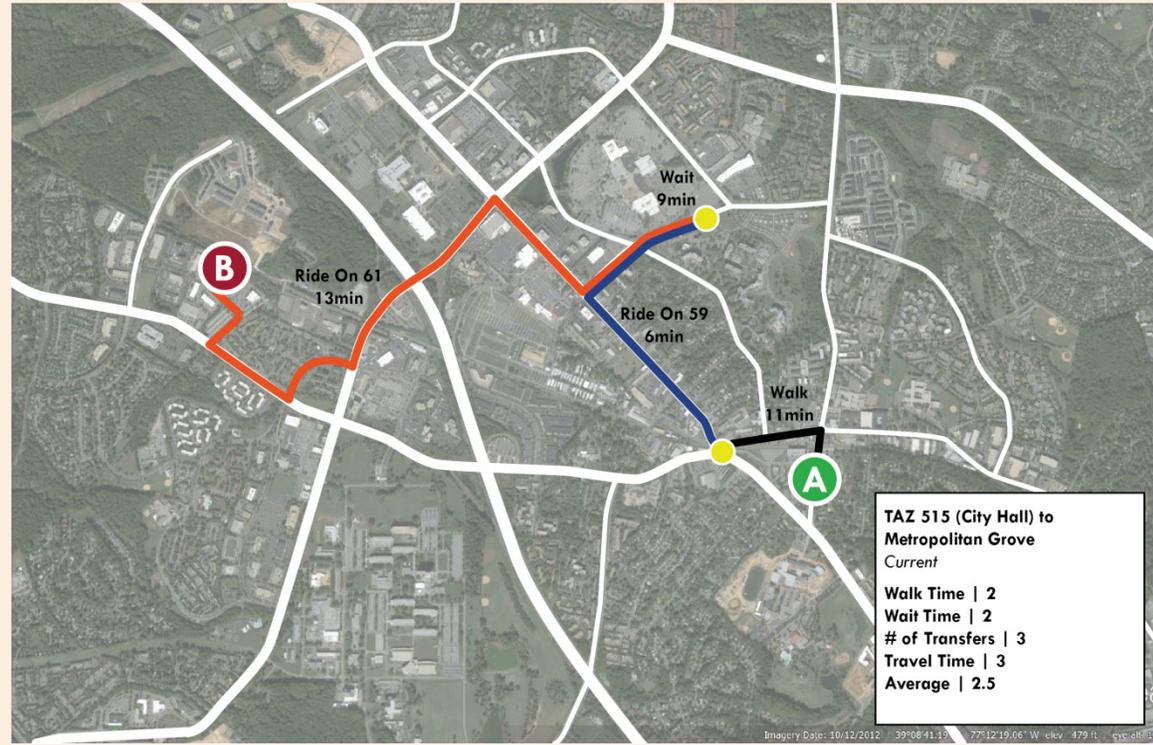


Figure 5-5 shows the baseline trip scores for each origin/destination pair in the study area. A detailed analysis including the four characteristics that constitute each trip score is shown in Appendix B.

Figure 5-5 Baseline Trip Scores

Current	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	2.75	2.75	3.75	3.25	3.75	4
Metropolitan Grove MARC station	3.75		3	3	3	3
Kaiser Permanente	2.75	2.75	3.5		2.75	3.5
Quince Orchard Plaza		3.25	2.75	2.75	2.75	3.5
NIST	4	3.25	2.75	2.5	3.25	3

Current (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	3.25		3.5		3.25	
Metropolitan Grove MARC station	3.5	3.25	3.25	2.5	2.75	2.75
Kaiser Permanente	3.5	2.75	3	2.75	3	2.5
Quince Orchard Plaza	4	3.25	3.25	3.25	3.5	2.25
NIST	3	2.75	2.75	2.5	3.25	2

LEGEND:

2.0 – 2.4	Poor Connectivity
2.5 – 2.9	
3.0 – 3.4	
3.5 – 3.9	
4.0	Strong Connectivity

SERVICE IMPROVEMENT OPTIONS AND ANALYSIS

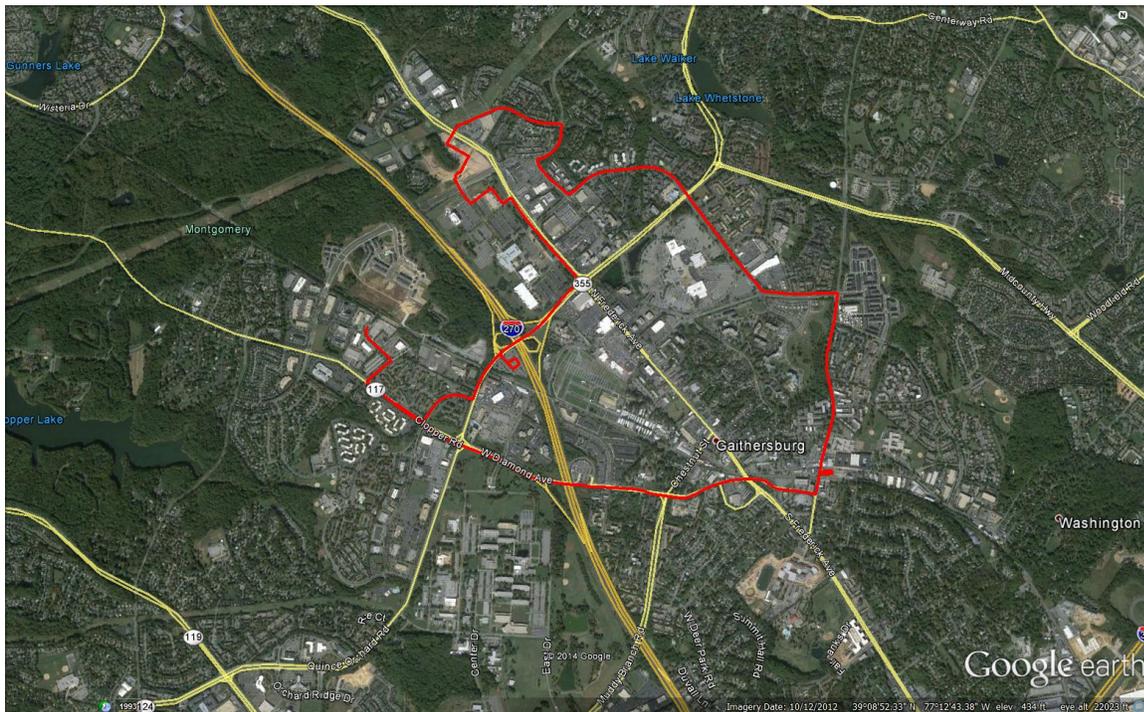
Three service improvement options were considered for the study area. Each option was designed to further improve connectivity between the key origins and destinations identified previously in the study. These options included the following:

- **Option 1** is a full loop circulator, offering bi-directional service in a circuit around the study area.
- **Option 2** is an “out and back” circulator, serving all of the same locations as the loop in a U-shaped corridor with bi-directional service.
- **Option 3** reroutes some existing Ride On service to improve access to major destinations and activity centers within the study area.

The following sections describe the attributes of each of the three service improvement options and present trip score matrices for each option. Both of the circulator options assume that buses would run at 20-minute headways, while Option 3 (modification of existing Ride On routes) would retain the current headways of the three existing services to the extent possible. For all three service improvement options, a travel speed of 13.5 mph is used, reflecting the fact that transit buses typically travel at 12 to 15 mph in urban and suburban environments.

Option 1: Full Loop Circulator

Figure 5-6 Option 1 Alignment



Description and Destinations Served

Option 1 would create an 8.4-mile loop running in both directions around the study area. It would serve all of the major activity centers within the study area, including Olde Towne, Lakeforest Mall, Lockheed Martin, Metropolitan Grove, and NIST, as well as residential neighborhoods along North Summit Avenue, Odendhal Avenue, and Travis Avenue. When the Watkins Mill Road Interchange opens, rerouting the service to use the new road could shorten it to 7.9 miles.

This option would connect to both the Gaithersburg and Metropolitan Grove MARC stations, as well as the Quince Orchard Road Park-and-Ride (in the short-range only) and the Lakeforest Transit Center. It would offer connections to all of the major Ride On, Metrobus, and MTA bus routes serving the study area. Connections to the future Route 355 BRT would be available at Route 355 and Montgomery Village Avenue, and to the Corridor Cities Transitway at Metropolitan Grove.

For this option to be most effective, some provisions will need to be made to allow buses to circulate through the Lockheed Martin/Kaiser Permanente office park without the need to enter and exit onto Fredrick Road multiple times. The current infrastructure does not allow this.

As Option 1 would serve the Quince Orchard Road Park-and-Ride only until the Watkins Mill Road Interchange opens, circular service will eventually bypass this park-and-ride. However, with the exception of MTA Routes 201 and 204, all routes serving the Quince Orchard Road Park-and-Ride also serve other transit hubs in the study area (Figure 5-7), meaning that circulator riders would still be able to make most regional connections.

Figure 5-7 Transit Service at Quince Orchard Road (Route 124) Park-and-Ride

Service	Destinations	Other Transit Centers Served	Directional Span	Frequency
Metrobus J7	Bethesda Metro/Lakeforest TC	Lakeforest TC	northbound 6:30-8:20am, southbound 4:05-6:06pm	15-22 minutes northbound, 20 minutes southbound
Metrobus J9	Bethesda Metro/Lakeforest TC	Lakeforest TC	southbound 5:40-9:12am, northbound 3:10-7:14am	15-22 minutes southbound, 12-30 minutes northbound
Ride On 56	Rockville Metro/Lakeforest TC	Lakeforest TC	southbound 4:45am-10:21pm, northbound 5:10am-10:44pm	25-30 minutes both directions
Ride On 61	Germantown TC/Shady Grove Metro	Lakeforest TC, Metropolitan Grove	southbound 4:30am-11:45pm, northbound 5:00am-12:32am	20 minutes during rush hour peak direction, 30 minutes during the rest of the day
MTA 201	Gaithersburg/BWI Airport	None	eastbound 4:00am-7:23pm, westbound 5:00am-12:20am	60 minutes
MTA 202	Metropolitan Grove/Fort Meade	Metropolitan Grove	eastbound 5:10-8:35am, westbound 3:00-6:33am	60 minutes
MTA 204	Frederick/College Park	None	southbound 5:18-8:46am, northbound 2:57-6:12pm	30 minutes

Fleet Requirement and Operating Cost Estimate

At **8.4 miles** long (in the short-range), buses traveling **13.5 mph** would take approximately 37 minutes to complete a one-way loop. To provide **20-minute service** in each direction, two buses would need to operate concurrently in the clockwise direction, with two additional buses operating in the counter-clockwise direction, for a total of **4 buses**.

Assuming weekday-only service operating **15 hours a day** (6:00 am to 9:00 pm) and **250 days per year**, the annual service hours for four vehicles would be approximately 15,000 hours. Using the average operating cost of the four peer circulators in Figure 5-8 (\$67.29 - not including Ride On), the approximate annual operating cost for Option 1 is **\$1,009,000**. It should be noted that while Ride On is operated by Montgomery County, most of the circulators listed in Figure 5-8 are contracted out to private providers. Operating costs for the contracted services include all staff directly related to transportation, dispatch, and maintenance, but does not include marketing and administrative staff who are employed by the respective contracting agencies (such as Bethesda Urban Partnership). George service was contracted out

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to WMATA while it was in operation. As a general rule, private contractors have lower operating costs than public agencies due to differences in pay, benefits, work rule, and vehicles operated.

Figure 5-8 Peer Circulator Length and Frequencies

Service	Agency	Operating Costs (Including Labor)	Hours of Service	Operating Costs/Hour (2014)
Ride On	MCDOT	\$97,740,239	1,094,393	\$89.31
Bethesda Circulator	Bethesda Urban Partnership	\$684,882	9,880	\$69.32
Charm City Circulator	Baltimore City DOT	\$5,838,361	83,429	\$69.98
GEORGE	Falls Church/WMATA	\$270,527	3,422	\$79.06
Annapolis Circulator Trolley	Annapolis DOT	\$1,271,526	25,024	\$50.81

As a point of reference, most circulator routes are shorter than the route described in Option 1 (Figure 5-9). Shorter routes can provide more frequent service with fewer buses.

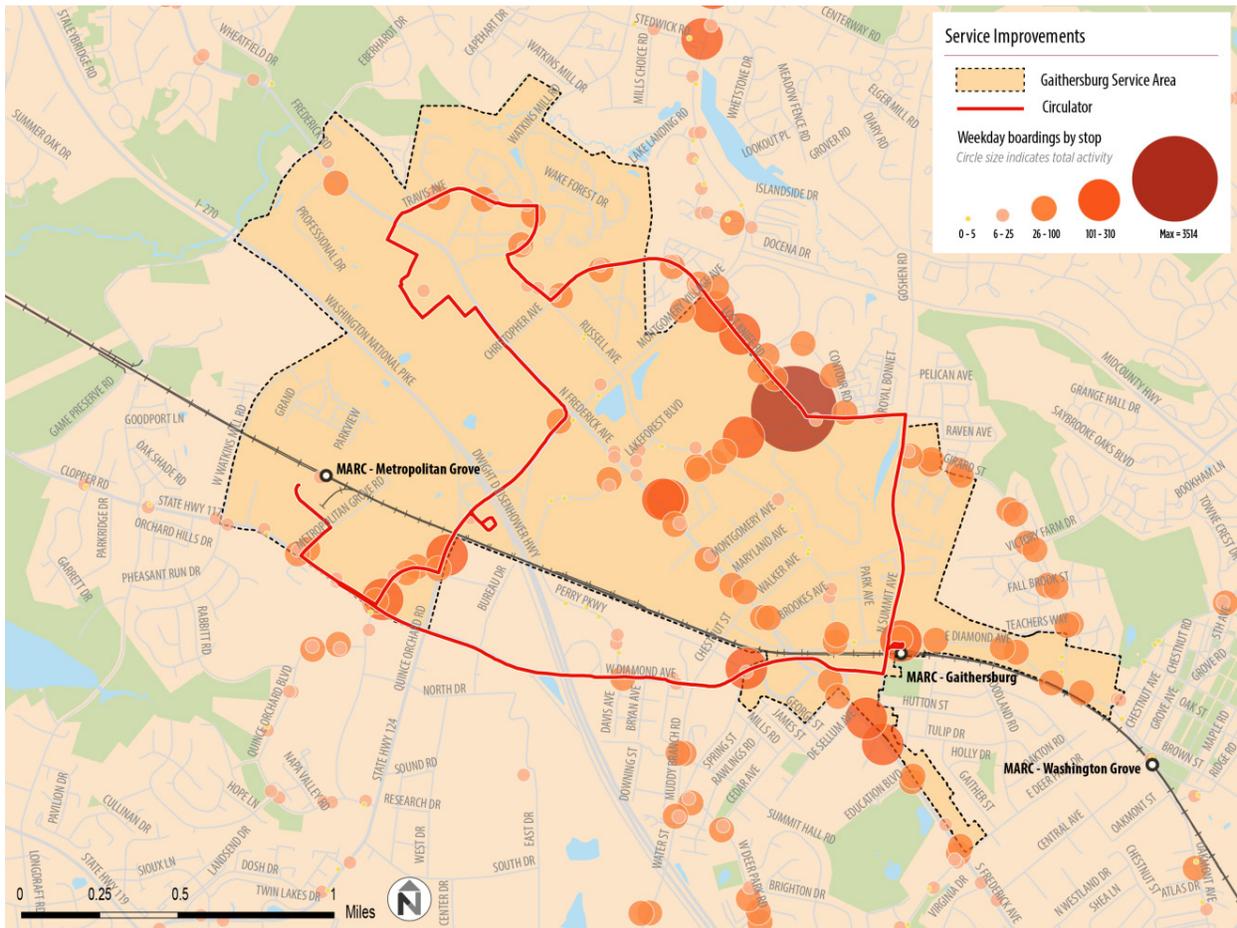
Figure 5-9 Peer Circulator Length and Frequencies

Service	Route	Length (Miles)	Frequency (Minutes)
DC Circulator	Potomac Avenue-Skyland	5.4	10
	Dupont Circle-Rosslyn	3.1	10
	Georgetown-Union Station	6.1	10
	Union Station-Navy Yard	3.4	10
	Woodley Park-Adams Morgan-McPherson Square	4.3	10
GEORGE (Falls Church)	26E	3.5 (loop)	25
	26W	5 (loop)	25
Charm City Circulator (Baltimore)	Purple (Penn Station-Federal Hill)	5.25 (loop)	10
	Orange (Hollins Market-Harbor East)	5 (loop)	10
	Green (City Hall-Fells Point-Johns Hopkins)	6.5 (loop)	10
	Banner (Inner Harbor-Fort McHenry)	3.0	10
Bethesda Circulator (Bethesda)		2.1 (loop)	10

Ridership Impact

As seen in Figure 5-10, the route alignment of Option 1 mostly parallels existing ridership patterns. Given the similarity in coverage area between this option and existing Ride On Service, it is anticipated that circulator ridership under Option 1 will primarily consist of riders shifting from Ride On service, rather than a significant amount of new riders. Some ridership growth is expected, however, as Option 1 includes new service along North Summit Avenue, and more direct service from Metropolitan Grove to the Lockheed Martin/Kaiser Permanente office park and between Metropolitan Grove and Olde Town. The ridership growth resulting from these improved connections is expected to be proportional to the improvement in trip score from the baseline to Option 1 (discussed below). The net increase in transit ridership within the service area will be discussed at the end of this chapter, following the description of each option and a comparison of over-all trip scores.

Figure 5-10 Option 1 and Existing Ridership



Trip Scores

Option 1 brings nearly all trips up to a score of 3 or better (Figures 5-11). For comparison, the baseline trip scores are shown again in Figure 5-12.

Detailed trip characteristics for Option 1 (as well as Options 2 and 3) are presented in Appendix B.

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Figure 5-11 Option 1 Trip Scores

Option 1	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	3.75	4	4	4	3.75	3.75
Metropolitan Grove MARC station	3.75		4	4	4	4
Kaiser Permanente	3.75	4	3.5		3.5	4
Quince Orchard Plaza		3.25	4	3.75	3.75	4
NIST	4	3.5	3.25	3	3.25	3.25

Option 1 (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	4		3.5		3.25	
Metropolitan Grove MARC station	4	3.75	3.25	4	3.25	3.75
Kaiser Permanente	4	3.25	3	3.5	3.25	3.25
Quince Orchard Plaza	4	3.75	3.25	4	3.25	3.5
NIST	3.25	3	2.75	3.25	3.25	3

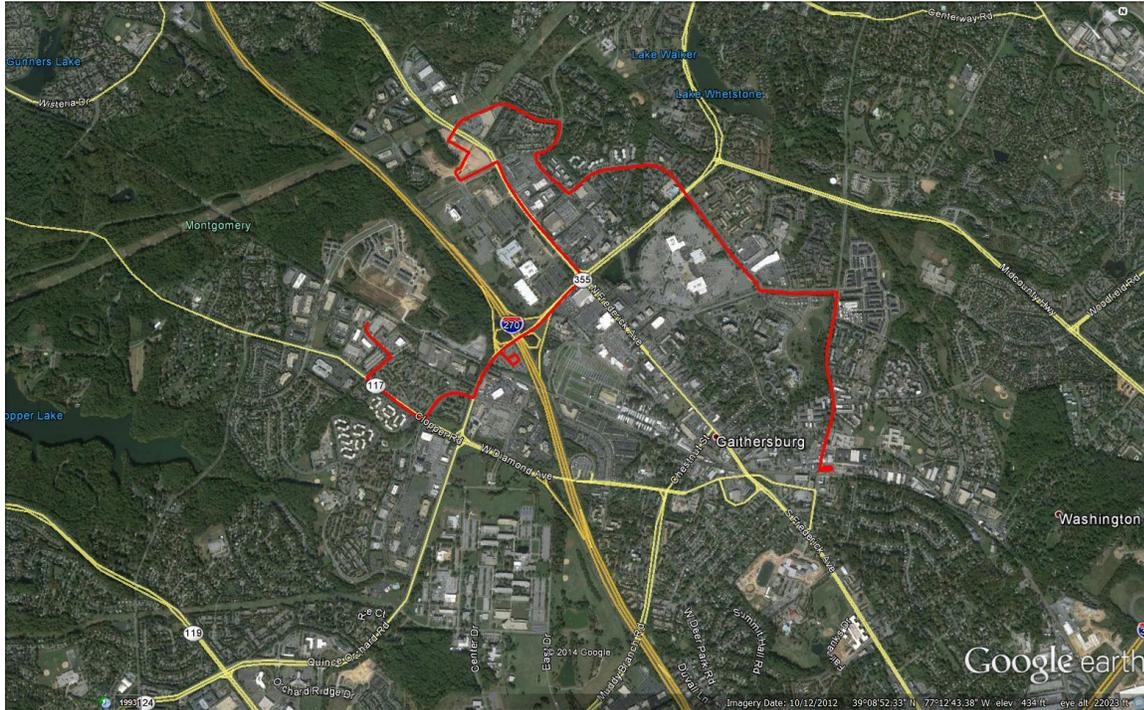
Figure 5-12 Baseline Trip Scores

Current	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	2.75	2.75	3.75	3.25	3.75	4
Metropolitan Grove MARC station	3.75		3	3	3	3
Kaiser Permanente	2.75	2.75	3.5		2.75	3.5
Quince Orchard Plaza		3.25	2.75	2.75	2.75	3.5
NIST	4	3.25	2.75	2.5	3.25	3

Current (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	3.25		3.5		3.25	
Metropolitan Grove MARC station	3.5	3.25	3.25	2.5	2.75	2.75
Kaiser Permanente	3.5	2.75	3	2.75	3	2.5
Quince Orchard Plaza	4	3.25	3.25	3.25	3.5	2.25
NIST	3	2.75	2.75	2.5	3.25	2

Option 2: Out-and-Back Circulator

Figure 5-13 Option 2 Alignment



Description and Destinations Served

Option 2 would create a 6-mile route between Metropolitan Grove and Olde Towne. This option would serve all of the activity centers served by Option 1 with the exception of NIST as the route would not travel along Clopper Road. When the Watkins Mill Road Interchange opens, rerouting the service to use the new road could shorten the route to 5.5 miles.

Fleet Requirement and Operating Cost Estimate

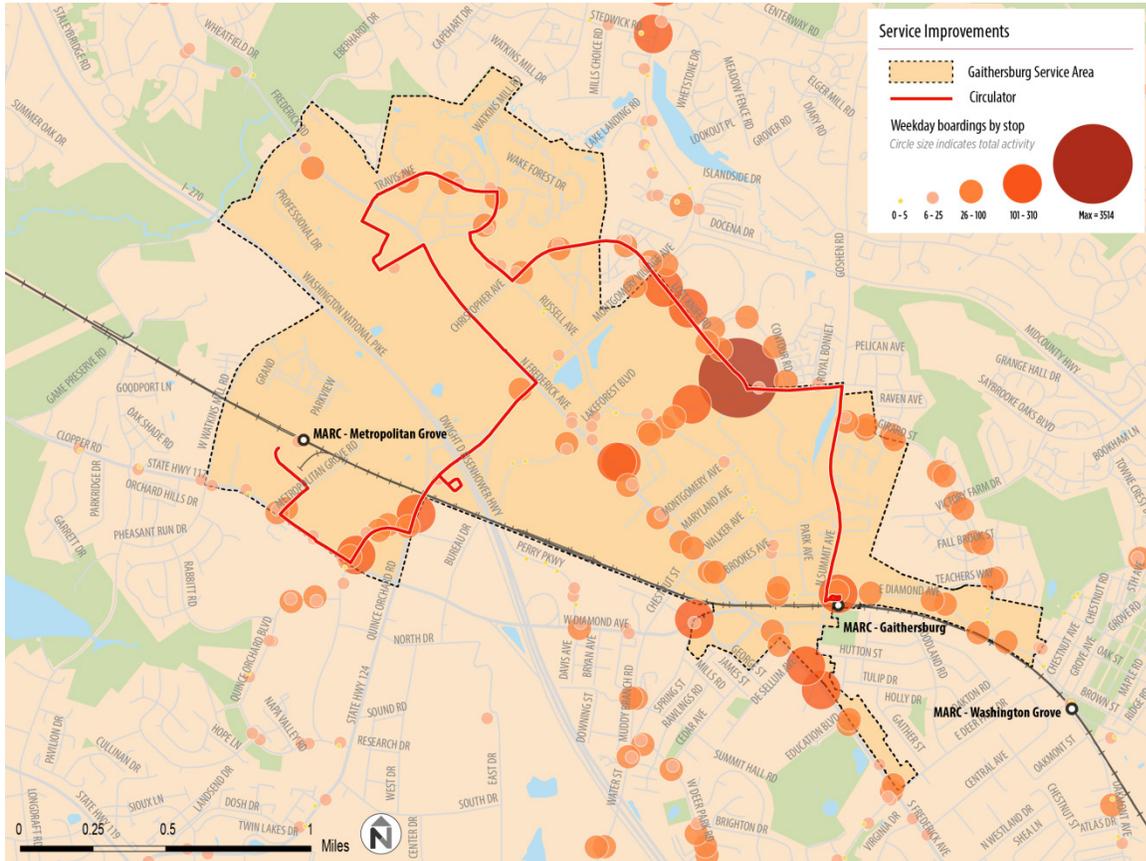
With a route length of **6 miles**, buses traveling **13.5 mph** would take approximately 53 minutes to complete a round-trip. To provide **20-minute service** in each direction, **3 buses** would need to operate concurrently.

Assuming weekday-only service operating **15 hours a day** (6:00 am to 9:00 pm) and **250 days per year**, the annual service hours for four vehicles would be approximately 11,250 hours. Using the average operating cost of the four peer circulators in Figure 5-8 (\$67.29 - not including Ride On), the approximate annual operating cost for Option 1 is **\$757,000** (including labor cost).

Ridership Impact

Like Option 1, Option 2 will mostly serve stops that are currently served by existing Ride On routes (Figure 5-14). Ridership growth will thus be driven primarily by improved connections to the Lockheed Martin/Kaiser Permanente office park and new service along North Summit Drive. Unlike Option 1, this option does not provide a substantially improved connection between Metropolitan Grove and Olde Towne. The effect of Option 2 on net transit ridership in the service area will be presented in Figure 7-2 on page 7-2.

Figure 5-14 Option 2 and Existing Ridership



Trip Scores

Option 2 brings many trips up to a score of 3 or better (Figures 5-15), but does not have much impact on trips to NIST, as the circulator would not operate along Clopper Road. For comparison, the baseline trip scores are shown again in Figure 5-16. For full context, a comparison of trip scores for all options, is shown in Figure 7-1 on page 7-1.

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Figure 5-15 Option 2 Trip Scores

Option 2	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	3.5	3.75	4	4	3.75	3.75
Metropolitan Grove MARC station	3.75		4	4	3	3.75
Kaiser Permanente	3.75	4	3.5		3	4
Quince Orchard Plaza		3.25	4	3.75	2.75	3.75
NIST	4	3.25	2.75	2.5	3.25	3

Option 2 (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	4		3.5		3.25	
Metropolitan Grove MARC station	3.75	3.5	3.25	3.75	3.25	3.5
Kaiser Permanente	4	3.25	3	3.5	3.25	3.25
Quince Orchard Plaza	3.75	3.5	3.25	3.75	3.25	3.25
NIST	3	2.75	2.75	2.5	3.25	2

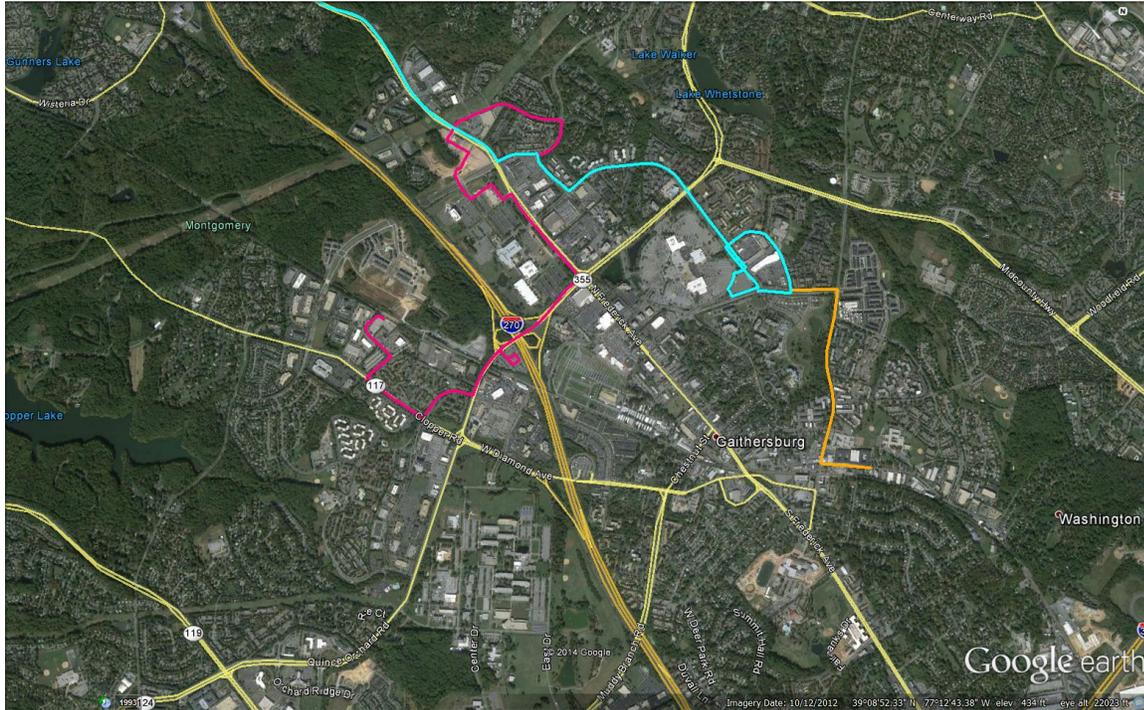
Figure 5-16 Baseline Trip Scores

Current	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	2.75	2.75	3.75	3.25	3.75	4
Metropolitan Grove MARC station	3.75		3	3	3	3
Kaiser Permanente	2.75	2.75	3.5		2.75	3.5
Quince Orchard Plaza		3.25	2.75	2.75	2.75	3.5
NIST	4	3.25	2.75	2.5	3.25	3

Current (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	3.25		3.5		3.25	
Metropolitan Grove MARC station	3.5	3.25	3.25	2.5	2.75	2.75
Kaiser Permanente	3.5	2.75	3	2.75	3	2.5
Quince Orchard Plaza	4	3.25	3.25	3.25	3.5	2.25
NIST	3	2.75	2.75	2.5	3.25	2

Option 3: Ride On Modifications

Figure 5-17 Option 3 Alignments



Description and Destinations Served

Option 3 would reroute three Ride On routes that serve the study area (Route 55, 57, and 58) to provide better coverage of current and planned activity centers. Route 55 (Rockville-Germantown) would be rerouted north of Lakeforest Mall, taking over the 58's route at the intersection of Russell and Christopher avenues. Instead of turning right at Russell Avenue and Watkins Mill Road, the new Route 55 alignment would turn left before turning right at Route 355, continuing on to Germantown. This would reduce travel times for north-south trips through the study area, while providing a minor increase in trip times for areas along Travis Avenue and Watkins Mill Road currently served by Route 55.

Meanwhile, Route 58 would take over Route 55's current route, turning right from Russell Avenue onto Watkins Mill Road, then turning left at Travis Avenue and following it across Route 355 into the new Spectrum development. From there, it would cross West Watkins Mill Road at the entrance to Kaiser Permanente and travel through the parking lot back to Route 355. The new route would turn right at Montgomery Village Avenue (Route 124), entering the Quince Orchard Road park-and-ride on its way to Firstfield Road, where it would turn right, then right again at Clopper Road. The new Route 58 would turn right at Metropolitan Grove Road and enter the Metropolitan Grove MARC station. When the Watkins Mill Road Interchange opens, Route 58 could be rerouted again at Kaiser Permanente, following West Watkins Mill Road to Clopper Road, and then turning left before turning left at Metropolitan Grove Road and entering the MARC station.

This change would bolster connections between the east and west sides of I-270, supplementing the existing Ride On Route 61 that serves Montgomery Village Avenue. In the future, this service could provide a parallel route to Route 61 along West Watkins Mill Road, improving east-west connections to and from the future Watkins Mill Town Center. It would also provide service to the neighborhoods along Watkins Mill Road and Travis Avenue that would no longer have a stop on Route 55.

Finally, Route 57 would move from its current route along Russell Avenue to Summit Avenue, two blocks east. Heading south from Lakeforest Transit Center, Route 57 would turn left onto Odendhal Avenue, then right on Goshen Road, which becomes North Summit Avenue as it passes through Olde Towne. The

new service would turn left at East Diamond Avenue and continue on its existing route to Shady Grove. This would reduce service to Asbury Methodist Village, whose bus stop is on Russell Avenue but has few boardings. However, it would increase service to the large concentration of apartments along the east side North Summit Avenue, as well as the new Hidden Creek housing development at Goshen Road and Odendhal Avenue. Riders headed to Russell Avenue could either walk from Route 57 on North Summit Avenue, or from Route 55 and 59 on Route 355, roughly 0.24 miles to the west.

This rerouting would cause minor changes to the length of each route. Route 55 would actually become 0.3 miles shorter by not serving Watkins Mill Road and Travis Avenue. Extending the 58 to Metropolitan Grove via Watkins Mill Road and Travis Avenue would make it 3.27 miles longer until the Watkins Mill Road Interchange is complete, and then only 2.7 miles longer than today if the route operates along West Watkins Mill Road. Moving Route 57 from Russell Avenue to North Summit Avenue would make it 0.17 miles shorter than it is today.

Fleet Requirement and Operating Cost Estimate

The suggested modifications to Ride On service would have the greatest impact on Route 58, as it would extend the route by **3.27 miles** in the short-range. At 13.5 miles an hour, this extension would require approximately 15 additional minutes of travel time per direction. During peak times (approximately seven hours per day), when Route 58 operates every 15 minutes, two additional vehicles would be required for the route. During off-peak times, when there is no MARC service, connections to Metropolitan Grove are not necessary. Thus, a shorter route (perhaps ending at Clopper Road) requiring only one additional vehicle would suffice.

For the purpose of comparing this scenario to the two circulator options, it is assumed that an additional bus or buses will only be needed for 15 of the current route's 21 hours of weekday service. For the remaining hours (evening and late-night), it is assumed that service will be less frequent, and thus require no additional vehicles compared to the current fleet count. It is also assumed that no additional vehicles will be required on weekends, as there is no MARC service, and connections to Metropolitan Grove are not necessary.

In summary, the proposed modifications to Route 58 will require **2 additional buses for 7 hours** per day, and **1 additional bus for 8 hours** per day. At the existing Ride On operating cost of \$89.31 per hour, the suggested modifications to the route would have an annual cost of approximately **\$491,000**.

It should be noted that as Option 3 relies exclusively on the modification of existing Ride On service, it would require the approval of Montgomery County for implementation. Recent Ride On service changes suggest that the County's transit staff is generally responsive to market changes and changes in the built environment. For example, Route 58 was recently extended from its terminus at Lakeforest Mall to Watkins Mill Road to serve the new Spectrum development. Never the less, given that the expansion of service described in Option 3 will result in an operating cost increase for Ride On, the County may seek funding assistance from the City of Gaithersburg to implement the service improvements.

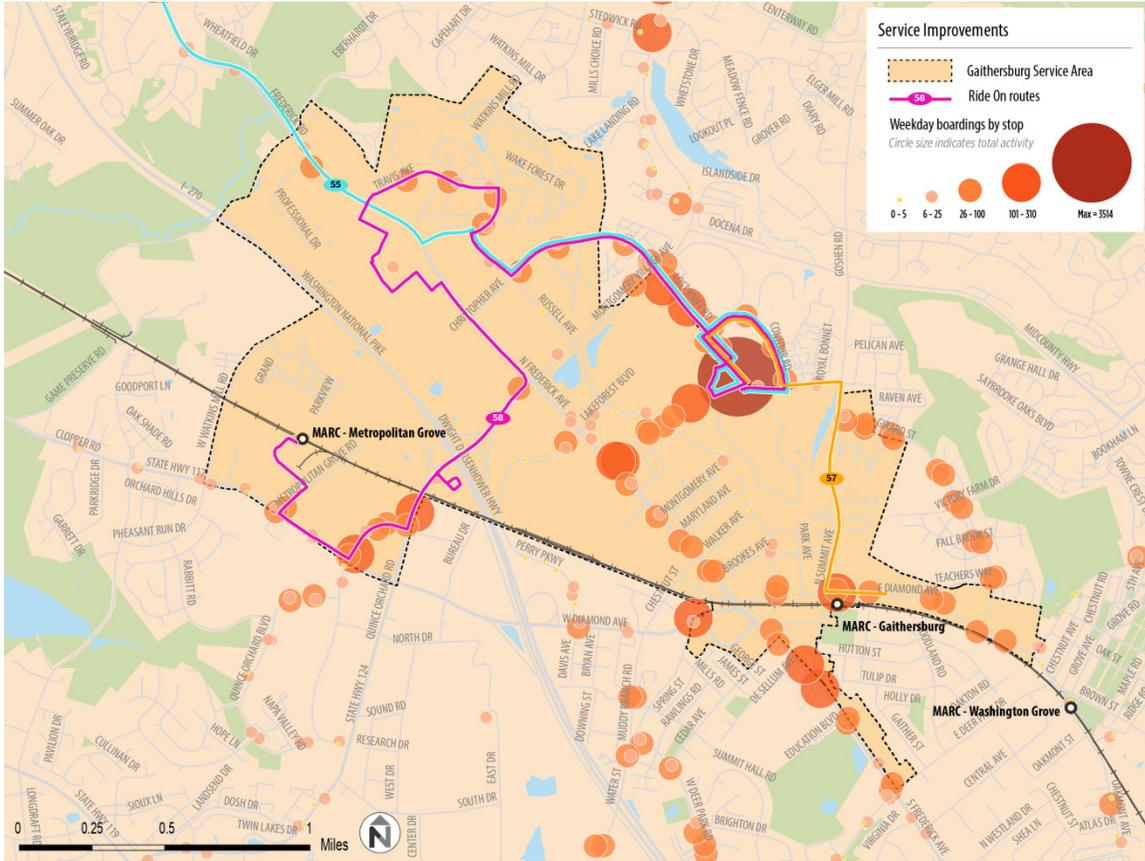
Ridership Impact

Option 3 is nearly identical to Option 2 in terms of coverage area, but differs in that it requires a transfer at Lakeforest Transit Center for eastbound trips beginning west of the transit center and westbound trips beginning east of the mall (Figure 5-18). The effect of Option 3 on net transit ridership in the service area will be discussed at the end of this chapter.

The trip scores for Option 3 are shown in Figure 5-19, with the baseline trip scores shown again in Figure 5-20. A comparison of trip scores for all options is shown in Figure 7-1 on page 7-1.

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Figure 5-18 Option 3 and Existing Ridership



Trip Scores

Figure 5-19 Option 3 Trip Scores

Option 3	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	3	3.25	3.75	3.75	3.75	4
Metropolitan Grove MARC station	3.75		3.75	3.75	3	3
Kaiser Permanente	3.5	3.75	3.75		3.25	3.75
Quince Orchard Plaza		3.25	3.75	3.5	2.75	3.5
NIST	4	3.25	3.25	3.25	3.25	3

Option 3 (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	4		3.5		3.25	
Metropolitan Grove MARC station	3.5	3.25	3.25	3.25	2.75	3.25
Kaiser Permanente	3.5	2.75	3.5	3.5	3	3.75
Quince Orchard Plaza	4	3.25	3.25	3	3.5	3
NIST	3.5	2.75	2.75	2.75	3.25	2.75

Figure 5-20 Baseline Trip Scores

Current	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	2.75	2.75	3.75	3.25	3.75	4
Metropolitan Grove MARC station	3.75		3	3	3	3
Kaiser Permanente	2.75	2.75	3.5		2.75	3.5
Quince Orchard Plaza		3.25	2.75	2.75	2.75	3.5
NIST	4	3.25	2.75	2.5	3.25	3

Current (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	3.25		3.5		3.25	
Metropolitan Grove MARC station	3.5	3.25	3.25	2.5	2.75	2.75
Kaiser Permanente	3.5	2.75	3	2.75	3	2.5
Quince Orchard Plaza	4	3.25	3.25	3.25	3.5	2.25
NIST	3	2.75	2.75	2.5	3.25	2

6 INTEGRATION WITH LONG-RANGE PLANS

Each of the three service improvement options described in Chapter 5 is meant to complement the existing Ride On network and to be implementable in the short-range (pending funding availability). However, given the high-profile roadway and transit projects being planned for the study area, including the Watkins Mill Road Interchange, the Corridor Cities Transitway, and the Route 355 BRT project, each service improvement option is also designed to complement future mobility improvements with minimal modifications.

Figures 6-1 – 6-3 show slightly modified alignments for each of the three service improvement options. The only change between the short-range alignments described previously and these proposed long-range alignments is the re-routing of service to a completed Watkins Mill Road from Quince Orchard Road.

Figure 6-1 Alternative Routing for Option 1 using West Watkins Mill Road

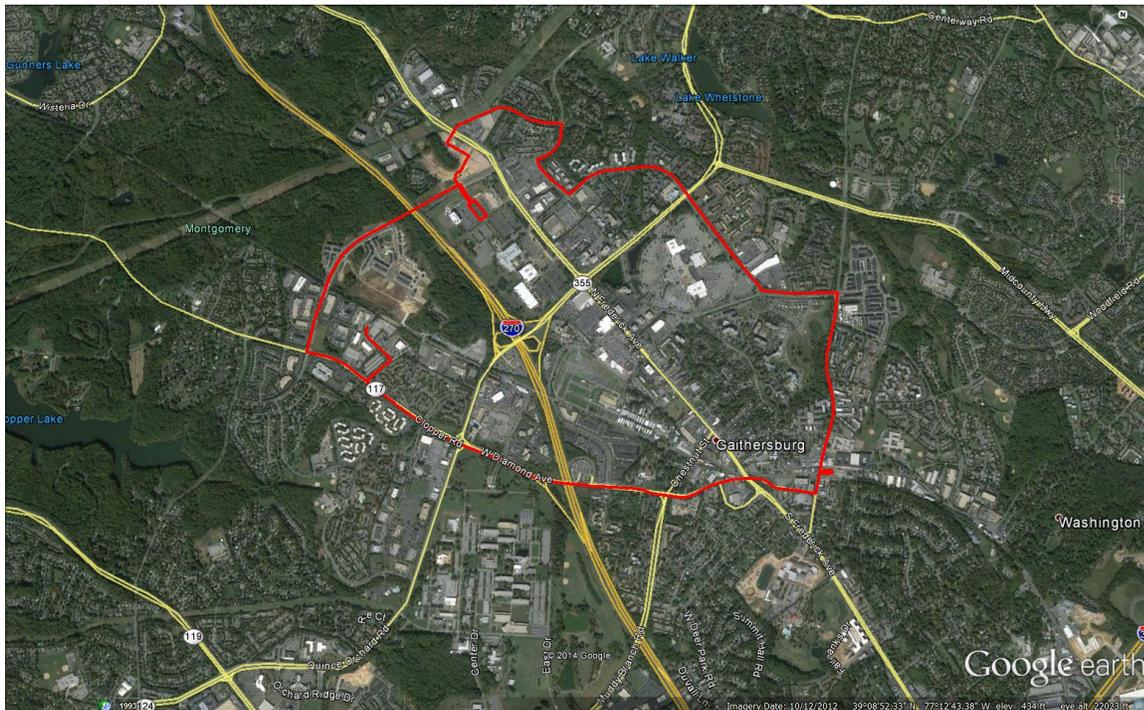


Figure 6-2 Alternative Routing for Option 2 using West Watkins Mill Road

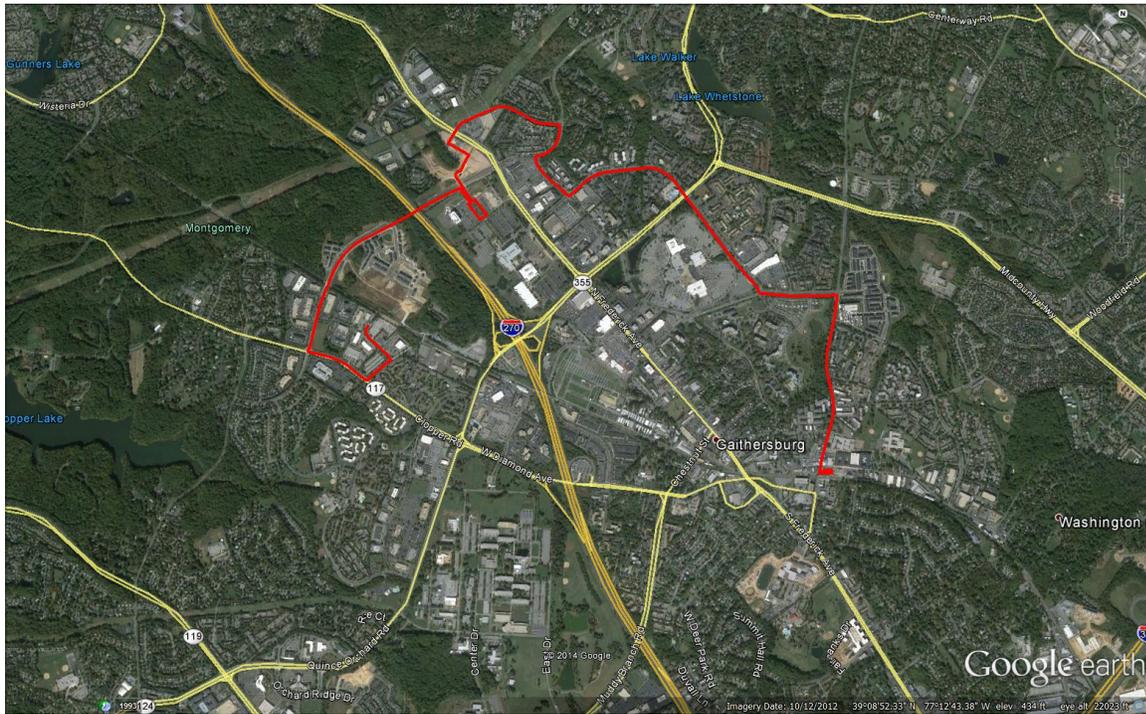
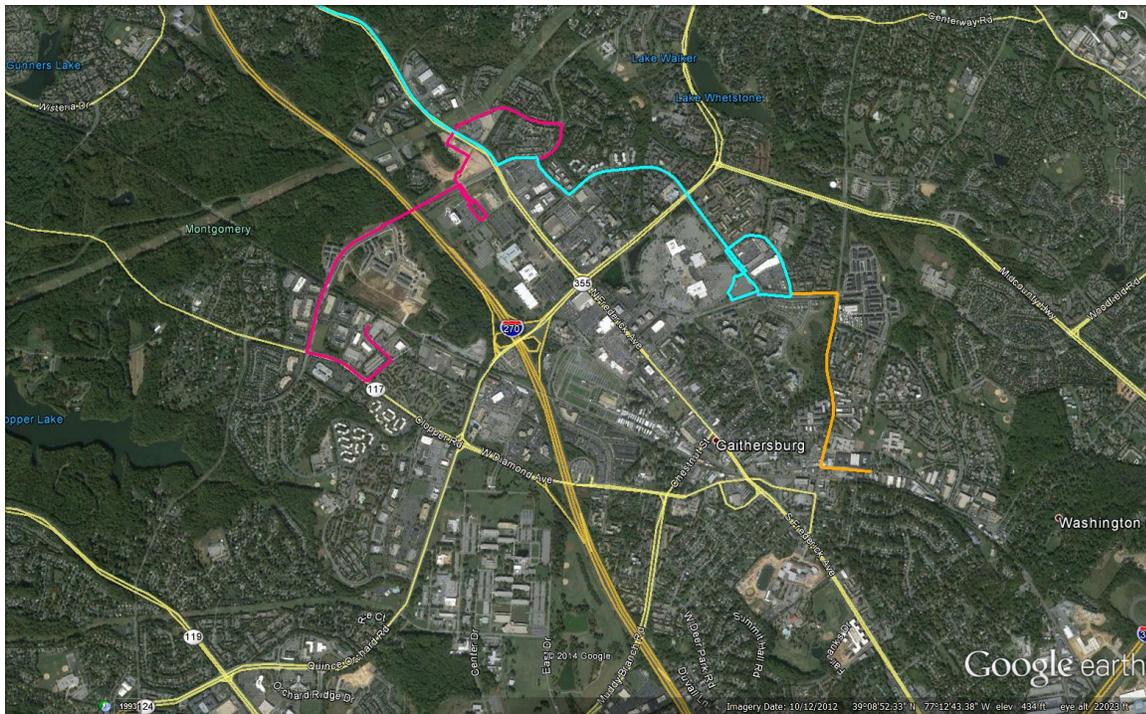


Figure 6-3 Alternative Routing for Option 3 using West Watkins Mill Road



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To evaluate the benefit of each service improvement option in the long range, the study team first developed a new baseline scenario in which the Watkins Mill Road Interchange is complete and both the Corridor Cities Transitway and the Route 355 BRT projects are operational (Figure 6-4).

Overall, the planned long-range transit and infrastructure improvements will have a positive impact on the study area's transit network, reducing wait times and travel times, and strengthening connections between different activity centers. Scores increased by at least 0.25 points for 22 of the 54 simulated trips between the 12 TAZs in the study area and the five destinations (Figure 6-5).

Figure 6-4 Long-Range Baseline Trip Scores

BRT + CCT	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	2.75	3	3.5	3.5	3.75	4
Metropolitan Grove	3.75		3	3	3.25	3
Kaiser Permanente	3	3	3.5		3.5	3.5
Quince Orchard Plaza		3.25	2.75	3	3.25	3.5
NIST	4	3.25	3.25	3.25	3.5	3

BRT + CCT (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	3.25		3.5		3.25	
Metropolitan Grove	3.5	3.25	3.25	2.75	2.75	3.25
Kaiser Permanente	3.5	3.25	3.5	3.5	3	3.75
Quince Orchard Plaza	4	3.25	3.25	3.25	3.5	2.25
NIST	3	2.75	3.25	3.25	3.25	3.5

Figure 6-5 Short-Range Baseline Trip Scores

Current		Metropolitan Grove	Watkins Mill/Travis	Kaiser Permanente	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Olde Towne	2.75	2.75	3.75	3.25	3.75	4
Metropolitan Grove MARC station	3.75		3	3	3	3
Kaiser Permanente	2.75	2.75	3.5		2.75	3.5
Quince Orchard Plaza		3.25	2.75	2.75	2.75	3.5
NIST	4	3.25	2.75	2.5	3.25	3

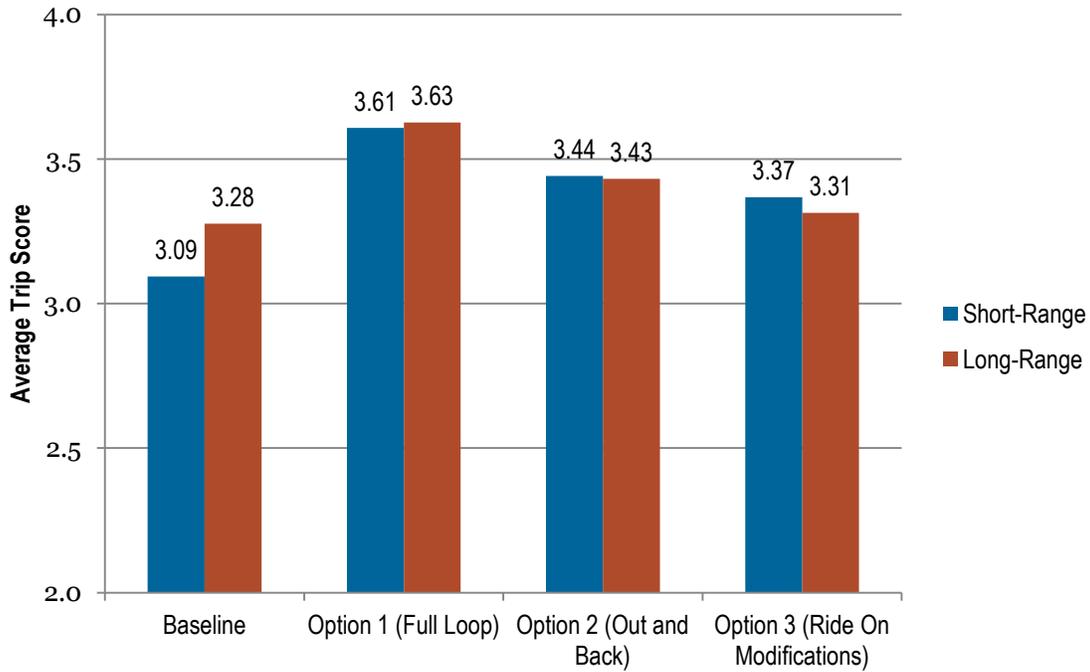
Current (Continued)	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Olde Towne	3.25		3.5		3.25	
Metropolitan Grove MARC station	3.5	3.25	3.25	2.5	2.75	2.75
Kaiser Permanente	3.5	2.75	3	2.75	3	2.5
Quince Orchard Plaza	4	3.25	3.25	3.25	3.5	2.25
NIST	3	2.75	2.75	2.5	3.25	2

The implementation of Route 355 BRT would have a substantial positive impact on north-south trips, especially trips to and from TAZ 743, located at the south end of the study area and whose biggest landmark is Gaithersburg High School. Today, a trip between TAZ 743 and Kaiser Permanente would take 49 minutes and involve two buses and a transfer at the Lakeforest Transit Center. When Route 355 BRT is in place, the same trip could take as little as 13 minutes.

However, even with the planned long-range transit improvements, many trips within the study area would see only minimal improvements in travel time, wait time, and/or number of transfers, because the CCT and Route 355 BRT projects are designed for longer trips throughout the wider region. In addition, neither the Route 355 Bus Rapid Transit nor the Corridor Cities Transitway really serves east-west trips within the study area. For example, trips to and from TAZ 512, located at the eastern end of the study area and home to the recently-built Hidden Creek neighborhood, saw no score increases under the long-range simulation.

A detailed long-range trip score analysis of the three service improvement options is shown in Appendix C, and summarized in Figure 6-6 below. All three options improve connectivity relative to the short-range and long-range baseline scenarios, but Options 2 and 3 have a lower average trip score in the long range than in the short range. The primary reason for this is that shifting service from Quince Orchard Road to Watkins Mill Road, once the Watkins Mill Road Interchange is complete, actually decreases the transit trip score for trips traveling two and from key destinations such as Diamond Square and Quince Orchard Plaza.

Figure 6-6 Average Trip Scores for All Service Improvement Options (Short-Range and Long-Range)



7 SUMMARY AND RECOMMENDATIONS

Each of the three service improvement options considered in this study would improve connectivity, as measured by average trip score, within the study area. As shown in Figure 6-6 on the previous page, Option 1 (Full Loop Circulator) would provide the greatest improvement in connectivity compared to the current Ride On network. However, other factors must be considered as well, including ridership, fleet requirements, and operating costs.

An analysis of existing Ride On ridership suggests that approximately 2,240 daily passenger trips both begin and end within the study area (as opposed to trips that may begin in the study area, but end at Shady Grove or some other destination outside the study area). If a circulator is implemented in the short-range, many of the 2,240 daily passenger trips that are internal to the study area would likely shift to the new service. In other words, if there were no additional ridership growth, then the total transit ridership in the study area would remain unchanged, but would be split between Ride On and the circulator. However, total ridership in the study area is expected to grow as each of the three options makes transit a more attractive option for prospective riders due to improvements in connectivity. Figure 7-1 shows the expected short-range transit ridership in the service area if ridership increases proportionally with connectivity improvements. These estimates include a combination of Ride On ridership and circulator ridership in order to allow for a comparison of the three options (one of which includes Ride On service only).

Figure 7-1 Estimated Study-Area Transit Ridership for Each Option

Option	Average Trip Score	Trip Score Improvement from Baseline Score	Estimated Study-Area Daily Transit Ridership (Ride On + Circulator)
Current	3.09		2,240
Option 1 (Full Loop Circulator)	3.61	14%	2,559
Option 2 (Out-and-Back Circulator)	3.44	10%	2,466
Option 3 (Ride On Modifications Only)	3.37	8%	2,422

Option 1, the Full Loop Circulator, would provide the greatest improvement in connectivity in the study area compared to the current transit network. Consequently, it would also result in the greatest increase in transit ridership in the study area. However, the Full Loop Circulator also requires the most buses to maintain a 20-minute service frequency (Figure 7-2), which makes it the most expensive option in terms of operating cost (as well as capital cost, as more buses would have to be purchased than with other options).

Figure 7-2 Estimated Cost per Additional Passenger Trip in Study Area for Each Option

	Trip Score	Estimated Study-Area Daily Ridership	Estimated New Daily Riders	Estimated New Annual Riders	Additional Buses Needed for Peak Service	Additional Estimated Annual Operating Cost	Cost Per Additional Rider
Current	3.09	2,240	–	–	–	–	–
Option 1 (Full Loop Circulator)	3.61	2,559	319	79,778	4	\$1,009,000	\$12.65
Option 2 (Out-and-Back Circulator)	3.44	2,466	226	56,618	3	\$757,000	\$13.37
Option 3 (Ride On Modifications Only)	3.37	2,422	182	45,558	2	\$491,000	\$10.78

Taking into consideration fleet requirements and operating cost, the Ride On Modifications option (Option 3) is most effective. This option would require only two additional peak vehicles for Ride On to operate, and would have the lowest cost per additional rider of the three options. In addition, this option would be simplest to implement as it would not require the establishment of a new service or brand, and could utilize Ride On’s existing operations and maintenance facilities. Option 3 would, however, require the support and approval of Montgomery County. As noted previously, Ride On does have a history of implementing service changes in response to new developments and other changes in the local transit market, but the County’s ability to implement the improvements described in Option 3 may require funding support from the City of Gaithersburg.

Although the establishment of a stand-alone service or brand has its benefits in terms of marketing, especially if the aim of the service is to attract non-traditional transit users such as tourists and choice commuters, a stand-alone service will likely be very difficult to fund in Gaithersburg over the long-run. Figures 7-3 and 7-4 show sample 10-year budgets for the Full Loop (Option 1) and Out-and-Back (Option 2) circulator options. These budgets show the approximate capital and operating funding that would be required to start up and operate a stand-alone circulator service.

Using Option 1 as an example, the service is estimated to cost \$2,289,000 in the first year, including both the costs associated with purchasing five vehicles (including one spare) and operating the service (\$1,009,000). After the first year, the costs decrease substantially to \$1,079,270 and remain near this level until vehicles must be replaced (assumed in years 8 and 10 in this example). Other than operating costs, annual costs include items such as signage and passenger amenities (optional, but recommended) and contributions to a capital reserve fund to support future vehicle purchases. The construction of an operations/maintenance facility is not included in the initial 10-year budget for either option because these functions would likely be contracted out in the early life of a new circulator service. Maintenance costs are, however, included in the operating cost estimates for each option.

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Figure 7-3 Indicative Budget for Full Loop Circulator (Option 1)

Capital Costs
 Cost escalation 1.03 services
 1.01 vehicles

Cost per vehicle	\$250,000	\$252,500	\$255,025	\$257,575	\$260,151	\$262,753	\$265,380	\$268,034	\$270,714	\$273,421
Year	1	2	3	4	5	6	7	8	9	10
Vehicles required for service	5	5	5	5	5	5	5	5	5	5
Vehicles purchased or replaced	5							3		2
Vehicle Purchases	\$1,250,000							\$804,102		\$546,843
Signage; Stops; Shelters	\$30,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Fund Capital Reserve		\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000		\$30,000	
Total Capital Costs	\$1,280,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$814,102	\$40,000	\$556,843
Operating Costs	\$1,009,000	\$1,039,270	\$1,070,448	\$1,102,562	\$1,135,638	\$1,169,708	\$1,204,799	\$1,240,943	\$1,278,171	\$1,316,516
Total Costs (Capital and Operating)	\$2,289,000	\$1,079,270	\$1,110,448	\$1,142,562	\$1,175,638	\$1,209,708	\$1,244,799	\$2,055,044	\$1,318,171	\$1,873,359

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Figure 7-4 Indicative Budget for Out-and-Back Circulator (Option 2)

Capital Costs
 Cost escalation 1.03 services
 1.01 vehicles

Cost per vehicle	\$250,000	\$252,500	\$255,025	\$257,575	\$260,151	\$262,753	\$265,380	\$268,034	\$270,714	\$273,421
Year	1	2	3	4	5	6	7	8	9	10
Vehicles required for service	4	4	4	4	4	4	4	4	4	4
Vehicles purchased or replaced	4							2		2
Vehicle Purchases	\$1,000,000							\$536,068		\$546,843
Signage; Stops; Shelters	\$30,000	10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	10,000
Fund Capital Reserve		\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$ 30,000	
Total Capital Costs	\$1,030,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$546,068	\$40,000	\$556,843
Operating Costs	\$757,000	\$779,710	\$803,101	\$827,194	\$852,010	\$877,570	\$903,898	\$931,015	\$958,945	\$987,713
Total Costs (Capital and Operating)	\$1,787,000	\$819,710	\$843,101	\$867,194	\$892,010	\$917,570	\$943,898	\$1,477,082	\$998,945	\$1,544,556

In urbanized areas, Federal operating assistance for transit is very limited. Occasionally, funding may be available for a demonstration project or for a project meeting a very specific grant requirement such as congestion mitigation or air quality improvements in an air quality “non-attainment” area, but these funds are limited and not sustainable as a long-term funding strategy. Thus, local circulators are often funded through public-private partnerships or through the creation of special funding districts.

The DC Circulator, for example, is operated by the District Department of Transportation and paid for from general operating funds, parking revenues, and some farebox revenue. Marketing and planning services for the circulator are provided by DC Surface Transit, Inc., a non-profit formed by local Business Improvement Districts, the Washington Sports and Convention Authority, National Capital Planning Commission, and Destination DC.

The Bethesda Circulator was originally funded by the State of Maryland and the Montgomery County Mass Transit Fund. Since 2006, the Bethesda Urban Partnership (BUP), a publicly-funded entity that provides urban district services to downtown Bethesda, including transportation demand management (TDM), has been managing the service. Funding for the circulator comes from parking revenues from the Bethesda Parking Lot District, which includes over 5,400 spaces in several garages and lots owned by Montgomery County. Additional funding comes from sponsorships of the buses that BUP solicits.

Similar funding strategies would have to be considered in Gaithersburg in order to support a new stand-alone circulator service (Options 1 or 2). However, the challenges of raising sufficient funds to support either of these options would be substantial. The study area does not have a large supply of paid parking that could generate revenue, nor would it likely support it in the near future. While there are a number of relatively large employers in and around the study area, including Lockheed Martin, Kaiser Permanente, and the National Institutes of Science and Technology, they generally do not have a shortage of on-site parking and would thus be less inclined to help fund a circulator service than comparable employers in areas where parking is a serious barrier to employee retention. Finally, it is important to emphasize that most successful circulator services have low or free fares. Thus, it is unlikely that fares would cover more than 10% of operating costs for a stand-alone circulator service in Gaithersburg.

For these reasons, Options 3, consisting of Ride On modifications only, is the most practical and financially sustainable option for improving connectivity within the study area. Furthermore, the City of Gaithersburg’s goals of making Gaithersburg a more walkable, unified, and sustainable community, while also helping to foster economic redevelopment does not hinge on the establishment of a stand-alone circulator service. Planned transit improvements including the CCT and Route 355 BRT projects will certainly raise the profile and appeal of transit in the study area. More immediately, the City can help improve existing transit services by focusing on passenger amenities such as shelters, bicycle racks, and sidewalk connections; and corridor and intersection treatments at identified choke points. Examples of transit-focused corridor and intersection treatments are described below:

- **Bus Bulbs** – Where on-street parking is permitted at all times, bus bulbs ensure that cars do not block bus stops, by extending the sidewalk out toward the travel lane. By expanding the bus stop area, bus bulbs also provide a dedicated waiting area for transit users, allowing the adjacent sidewalk to remain clear for pedestrians.

Operationally, bus bulbs can improve travel time and on-time performance by allowing buses to remain in the travel lane while loading and unloading passengers. During peak periods, buses that pull out of the travel lane to access a bus stop can sometimes have difficulty pulling back into traffic, causing delays for passengers.

Bus bulbs can cause moderate traffic delays for other vehicles, and are often considered a traffic calming tool. Thus, bus bulbs are most appropriate in pedestrian-friendly environments or areas that targeted for pedestrian improvements. Bus bulbs are never appropriate at lay-over or recovery points.

- **Bus Bays** – In higher speed and higher traffic-volume environments, like along Fredrick Avenue, bus bays are a more appropriate bus stop treatment than bus bulbs. As opposed to bus bulbs which extend the passenger waiting area out toward the travel lane, bus bays push passengers back, away from fast-moving traffic.

In addition to improving the safety conditions of waiting passengers, bus bays allow traffic flow to continue uninterrupted during passenger loading and unloading. Bus bays do, however, create the potential for transit service delays if buses are unable to quickly re-enter traffic (during periods of congestion), and the potential for conflicts with other vehicles when slow moving buses enters faster moving traffic (during periods of free flowing traffic). These issues can be minimized by creating longer bus bays that include some room for acceleration before re-entry into general traffic. Bus bays are also ideal for lay-over or recovery points.



Bus Bulb - Seattle, WA



Bus Bay - Tucson, AZ

- **Queue Jumps or Restricted Lanes** – Bus lanes can range from being fully exclusive to being restricted to certain vehicle movements or certain times of day. For example, a lane can be designated for buses and turning vehicles only, requiring through-traffic to use other lanes. This approach is known as a queue jump because buses are able to avoid congestion-related delays by bypassing queued vehicles. This treatment is most appropriate at intersections where long cycle times on cross-streets have the potential to create long queues on the primary transit corridor.

Together with the Ride On route modifications described in Option 3, these corridor and intersection treatments have the potential to improve the over-all transit experience in the study area, without the need for additional and on-going operating funding (beyond the costs associated with operating current or expanded Ride On service itself). Instead, the treatments can be introduced incrementally as capital funds become available.



Queue Jump – Portland, OR

APPENDIX A – LANDMARK ADDRESSES

Figure A-1 Landmark Addresses in Trip Simulations

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed/Kaiser	Fairgrounds	Lakeforest Mall
TAZ	412	413	479	480	482	483
Landmark Address	28 Bureau Drive	Metropolitan Grove MARC station	Intersection of Watkins Mill Road & Travis Avenue	655 Watkins Mill Road	16 Chestnut Street	701 Russell Avenue
	Hidden Creek	Olde Towne	Asbury	City Hall	Girard/Victory Farm	Gaithersburg High School
TAZ	512	513	514	515	516	743
Landmark Address	Intersection of Goshen Road & Odendhal Avenue	Gaithersburg Middle School, 2 Teachers Way	201 Russell Avenue	31 South Summit Avenue	Intersection of Girard Street Victory Farm Drive	314 South Frederick Avenue
Destination	Olde Towne (Activity Center)	Metropolitan Grove	Lockheed/Kaiser	Quince Orchard Plaza	NIST	
Landmark Address	Gaithersburg MARC station	Metropolitan Grove MARC station	655 Watkins Mill Road	624 Quince Orchard Road	100 Bureau Drive	

APPENDIX B – DETAILED TRIP SCORE ANALYSIS

Figure B-1 Trip Simulations - Baseline

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.31	3.00	3.15	2.88	3.10	3.40	3.45	3.00	3.15	2.75	3.15	2.38

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Old Towne/Gaithersburg MARC station/Gaithersburg High School	59 bus + 56 bus/12min walking, 14 minutes bus, 12min waiting/20min headways	55 bus + 61 bus/11min walking, 13min bus, 5min waiting/20min headways	55 bus/6min walking, 16min bus/20min headways	55 bus/14min walking, 14min bus/20min headways	55 bus/7min walking, 3min bus/20min headways	55 bus/5min walking, 13min bus/20min headways	16 minute walk OR 55 bus/10min walking, 8min bus/20min headways		13min walk OR 57 bus/4min walk, 3min bus/20min headways			16min walk
Travel Time	39	39	32	38	20	28	28		17			16
Walk Time	2	2	3	2	3	4	1		2			1
Wait Time (headways/2)	3	3	4	4	4	4	4		4			4
# of Transfers	3	3	4	4	4	4	4		4			4
Travel Time	3	3	4	3	4	4	4		4			4
Total	2.75	2.75	3.75	3.25	3.75	4	3.25		3.5			3.25

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Metropolitan Grove MARC station/Watkins Mill Town Center	61 bus/4min walk, 3min bus/30min headways		61 bus + 55 bus/1min walk, 21min bus, 9min wait/30min headways	61 bus + 58 bus/4min walk, 16min bus, 7min wait/30min headways	61 bus/12min walk, 10min bus/30 min headways	61 bus/13min walk, 9min bus/30min headways	61 bus/1min walk, 16min bus/30min headways	61 bus/7min walk, 21min bus/30min headways	61 bus/10min walk, 12min bus/30min headways	61 bus + 59 bus/11min walk, 19min bus, 9min wait/30min headways	61 bus/19min bus/30min headways	61 bus/10min bus, 24min walk/30min headways
Travel Time	22		46	42	37	37	32	43	37	54	34	49
Walk Time	4		4	4	2	2	4	3	3	2	1	1
Wait Time (headways/2)	3		2	2	3	3	3	3	3	2	3	3
# of Transfers	4		3	3	4	4	4	4	4	3	4	4
Travel Time	4		3	3	3	3	3	3	3	3	3	3
Total	3.75		3	3	3	3	3.5	3.25	3.25	2.5	2.75	2.75

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)	
Lockheed Martin/Kaiser Permanente/Spectrum	61 bus/22min walk, 4min bus/30min headways	61 bus/24min walk, 6min bus/30min headways	12min walk			58 bus/20min walk, 4min bus/30min headways	13min walk	58 bus/9min walk, 5min bus/30min headways	58 bus + 57 bus/9min walk, 10min bus, 10min wait/30min headways	58 bus/13min walk, 4min bus/30min headways	58 bus + 57 bus/6min walk, 10min bus, 10min wait/30min headways	58 bus + 61 bus/3min walk, 12min bus, 10min wait/30min headways	58 bus + 57 bus/12min walk, 12min bus, 10min wait/30min headways
Travel Time	41	45	12			39	13	29	44	32	41	40	49

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Walk Time	1	1	2		1	2	3	3	2	3	4	2
Wait Time (headways/2)	3	3	4		3	4	3	2	3	2	2	2
# of Transfers	4	4	4		4	4	4	3	4	3	3	3
Travel Time	3	3	4		3	4	4	3	3	3	3	3
Total	2.75	2.75	3.5		2.75	3.5	3.5	2.75	3	2.75	3	2.5

		61 bus + 55 bus/6min walk, 18min bus, 9min wait/30min headways	61 bus + 58 bus/8min walk, 13min bus, 7min wait/30min headways	61 bus/16min walk, 7min bus/30min headways	56 bus/12min walk, 4min bus/20min headways	61 bus/5min walk, 13min bus/20min headways	61 bus/11min walk, 18min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	56 bus + 57 bus (same vehicle)/7min walk, 15min bus/20min headways	61 bus/4min walk, 17min bus/30min headways	61 bus + 59 bus/17min walk, 15min bus, 9min wait/30min headways
Quince Orchard Plaza	16min walk										
Travel Time	16	48	43	38	26	28	39	33	32	36	54
Walk Time	1	3	3	1	2	4	2	2	3	4	2
Wait Time (headways/2)	4	2	2	3	4	4	4	4	4	3	2
# of Transfers	4	3	3	4	4	4	4	4	3	4	3
Travel Time	4	3	3	3	4	4	3	3	3	3	2
Total	3.25	2.75	2.75	2.75	3.5	4	3.25	3.25	3.25	3.5	2.25

			56 bus + 55 bus/11min walk, 17min bus, 5min wait/30min headways	54 bus + 58 bus/17min walk, 13min bus, 6min wait/30min headways		56 bus/19min walk, 4min bus/20min headways	56 bus/17min walk, 9min bus/20min headways	61 bus/18min walk, 18min bus/30min headways	61 bus/21min walk, 9min bus/30min headways	61 bus + 57 bus/14min walk, 16min bus, 12min wait/30min headways	61 bus/11min walk, 17min bus, 30min headways	61 bus + 57 bus/20min walk, 16min bus, 12min wait/30min headways
NIST	3min walk	17min walk			18min walk							
Travel Time	3	17	48	51	18	33	36	51	45	58	43	63
Walk Time	4	1	2	2	1	1	1	1	1	2	3	1
Wait Time (headways/2)	4	4	3	2	4	4	4	3	3	2	3	2
# of Transfers	4	4	3	3	4	4	4	4	4	3	4	3
Travel Time	4	4	3	3	4	3	3	3	3	3	3	2
Total	4	3.25	2.75	2.5	3.25	3	3	2.75	2.75	2.5	3.25	2

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Figure B-2 Trip Simulation - Option 1 (Full Loop Circulator)

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.81	3.69	3.75	3.69	3.65	3.80	3.85	3.44	3.15	3.69	3.25	3.38

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Olde Towne/Gaithersburg MARC station/Gaithersburg High School	Circulator/6min walk, 6min bus/20min headways	Circulator/11min bus/20min headways	Circulator/12min bus/20min headways	Circulator/4min walk/15min bus/20min headways	55 bus/7min walking, 3min bus/20min headways	Circulator/6min bus/20min headways	Circulator/4min bus/20min headways		13min walk OR 57 bus/4min walk, 3min bus/20min headways		16min walk	
Travel Time	22	21	22	29	20	16	14		17		16	
Walk Time	3	4	4	4	3	3	4		2		1	
Wait Time (headways/2)	4	4	4	4	4	4	4		4		4	
# of Transfers	4	4	4	4	4	4	4		4		4	
Travel Time	4	4	4	4	4	4	4		4		4	
Total	3.75	4	4	4	3.75	3.75	4		3.5		3.25	

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Metropolitan Grove MARC station/Watkins Mill Town Center	Circulator/6min walk, 5min walk/20min headways		Circulator/15min bus/20min headways	Circulator/4min walk/12min bus/20min headways	Circulator/4min walk/8min bus/20min headways	Circulator/17min bus/20min headways	Circulator/15min bus/20min headways	Circulator/7min walk/11min bus/20min headways	61 bus/10min walk, 12min bus/30min headways	Circulator/2min walk/11min bus/20min headways	Circulator/11min walk/14min bus/20min headways	Circulator/9min walk/11min bus/20min headways
Travel Time	21		25	26	22	27	25	28	37	23	35	30
Walk Time	3		4	4	4	4	4	3	3	4	2	3
Wait Time (headways/2)	4		4	4	4	4	4	4	3	4	4	4
# of Transfers	4		4	4	4	4	4	4	4	4	4	4
Travel Time	4		4	4	4	4	4	4	3	4	3	4
Total	3.75		4	4	4	4	4	3.75	3.25	4	3.25	3.75

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Lockheed Martin/Kaiser Permanente/Spectrum	Circulator/10min walk, 9min bus/20min headways	Circulator/4min walk/12min bus/20min headways	Circulator/4min walk/4min bus/20min headways		Circulator/8min walk/20min bus/20min headways	Circulator/4min walk/10min bus/20min headways	Circulator/4min walk/12min bus/20min headways	Circulator/11min walk/15min bus/20min headways	58 bus/13min walk, 4min bus/30min headways	Circulator/6min walk/15min bus/20min headways	Circulator/15min walk, 13min bus/20min headways	Circulator/13min walk/15min bus/20min headways
Travel Time	29	26	18		38	24	26	36	32	31	38	38
Walk Time	3	4	2		3	4	4	2	2	3	2	2
Wait Time (headways/2)	4	4	4		4	4	4	4	3	4	4	4
# of Transfers	4	4	4		4	4	4	4	4	4	4	4
Travel Time	4	4	4		3	4	4	3	3	3	3	3
Total	3.75	4	3.5		3.5	4	4	3.25	3	3.5	3.25	3.25

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Quince Orchard Plaza			Circulator/3min walk/12min bus/20min headways	Circulator/7min walk/13min bus/20min headways	Circulator/7min walk/5min bus/20min headways	Circulator/3min walk/14min bus/20min headways	Circulator/3min walk/12min bus/20min headways	Circulator/10min walk/8min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	Circulator/5min walk/8min bus/20min headways	Circulator/14min walk/11min bus/20min headways	Circulator/12min walk/8min bus/20min headways
Travel Time			16	25	30	22	27	25	28	33	23	35

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Walk Time		1	4	3	3	4	4	3	2	4	2	2
Wait Time (headways/2)		4	4	4	4	4	4	4	4	4	4	4
# of Transfers		4	4	4	4	4	4	4	4	4	4	4
Travel Time		4	4	4	4	4	4	4	3	4	3	4
Total		3.25	4	3.75	3.75	4	4	3.75	3.25	4	3.25	3.5

	3min walk	Circulator/12min walk, 4min bus/20min headways	Circulator/12min walk, 19min bus/20min headways	Circulator/16min walk/16min bus/20min headways	Circulator/16min walk/3min bus/20min headways	Circulator/12min walk/13min bus/20min headways	Circulator/12min walk/11min bus/20min headways	Circulator/19min walk/7min bus/20min headways	61 bus/21min walk, 9min bus/30min headways	Circulator/14min walk/7min bus/20min headways	61 bus/11min walk, 17min bus, 30min headways	Circulator/21min walk/7min bus/20min headways
NIST												
Travel Time	3	26	41	42	29	35	33	36	45	31	43	38
Walk Time	4	2	2	1	1	2	2	1	1	2	3	1
Wait Time (headways/2)	4	4	4	4	4	4	4	4	3	4	3	4
# of Transfers	4	4	4	4	4	4	4	4	4	4	4	4
Travel Time	4	4	3	3	4	3	3	3	3	3	3	3
Total	4	3.5	3.25	3	3.25	3.25	3.25	3	2.75	3.25	3.25	3

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Figure B-3 Trip Simulation Option 2 (Out-and-Back Circulator)

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.75	3.56	3.65	3.56	3.15	3.65	3.70	3.25	3.15	3.38	3.25	3.00

Origin/Destination	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Olde Towne/Gaithersburg MARC station/Gaithersburg High School	Circulator/6 minute walk, 23min bus/20min headways	Circulator/27min bus/20min headways	Circulator/12min bus/20min headways	Circulator/4min walk/15min bus/20min headways	55 bus/7min walking, 3min bus/20min headways	Circulator/6min bus/20min headways	Circulator/4min bus/20min headways		13min walk OR 57 bus/4min walk, 3min bus/20min headways			16min walk
Travel Time	39	37	22	29	20	16	14		17			16
Walk Time	3	4	4	4	3	3	4		2			1
Wait Time (headways/2)	4	4	4	4	4	4	4		4			4
# of Transfers	4	4	4	4	4	4	4		4			4
Travel Time	3	3	4	4	4	4	4		4			4
Total	3.5	3.75	4	4	3.75	3.75	4		3.5			3.25

Origin/Destination	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Metropolitan Grove MARC station/Watkins Mill Town Center	Circulator/6min walk, 5min walk/20min headways		Circulator/15min bus/20min headways	Circulator/4min walk/12min bus/20min headways	61 bus/12min walk, 10min bus/30 min headways	Circulator/21min bus/20min headways	Circulator/23min bus/20min headways	Circulator/7min walk/27min bus/20min headways	61 bus/10min walk, 12min bus/30min headways	Circulator/2min walk, 27min bus/20min headways	Circulator/11min walk, 24min bus/20min headways	Circulator/9min walk, 27min bus/20min headways
Travel Time	21		25	26	37	31	33	44	37	39	45	46
Walk Time	3		4	4	2	4	4	3	3	4	2	3
Wait Time (headways/2)	4		4	4	3	4	4	4	3	4	4	4
# of Transfers	4		4	4	4	4	4	4	4	4	4	4
Travel Time	4		4	4	3	3	3	3	3	3	3	3
Total	3.75		4	4	3	3.75	3.75	3.5	3.25	3.75	3.25	3.5

Origin/Destination	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Lockheed Martin/Kaiser Permanente/Spectrum	Circulator/10min walk, 9min bus/20min headways	Circulator/4min walk/12min bus/20min headways		12min walk	Circulator/16min walk/15min bus/20min headways	Circulator/4min walk/10min bus/20min headways	Circulator/4min walk/12min bus/20min headways	Circulator/11min walk/15min bus/20min headways	58 bus/13min walk, 4min bus/30min headways	Circulator/6min walk/15min bus/20min headways	Circulator/15min walk, 13min bus/20min headways	Circulator/13min walk/15min bus/20min headways
Travel Time	29	26		12	41	24	26	36	32	31	38	38
Walk Time	3	4		2	1	4	4	2	2	3	2	2
Wait Time (headways/2)	4	4		4	4	4	4	4	3	4	4	4
# of Transfers	4	4		4	4	4	4	4	4	4	4	4
Travel Time	4	4		4	3	4	4	3	3	3	3	3
Total	3.75	4		3.5	3	4	4	3.25	3	3.5	3.25	3.25

Origin/Destination	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Quince Orchard Plaza	16min walk	Circulator/3min walk/12min bus/20min headways	Circulator/7min walk/13min bus/20min headways	61 bus/16min walk, 7min bus/30min headways	Circulator/3min walk/18min bus/20min headways	Circulator/3min walk/20min bus/20min headways	Circulator/3min walk/24min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	Circulator/5min walk, 24min bus/20min headways	Circulator/14min walk, 21min bus/20min headways	Circulator/12min walk, 25min bus/20min headways	
Travel Time	16	25	30	38	31	33	44	33	39	45	47	
Walk Time	1	4	3	1	4	4	3	2	4	2	2	
Wait Time (headways/2)	4	4	4	3	4	4	4	4	4	4	4	
# of Transfers	4	4	4	4	4	4	4	4	4	4	4	

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Travel Time		4	4	4	3	3	3	3	3	3	3	3
Total		3.25	4	3.75	2.75	3.75	3.75	3.5	3.25	3.75	3.25	3.25

			56 bus + 55 bus/11min walk, 17min bus, 5min wait/30min headways	54 bus + 58 bus/17min walk, 13min bus, 6min wait/30min headways		56 bus/19min walk, 4min bus/20min headways	56 bus/17min walk, 9min bus/20min headways	61 bus/18min walk, 18min bus/30min headways	61 bus/21min walk, 9min bus/30min headways	61 bus + 57 bus/14min walk, 16min bus, 12min wait/30min headways	61 bus/11min walk, 17min bus, 30min headways	61 bus + 57 bus/20min walk, 16min bus, 12min wait/30min headways
NIST	3min walk	17min walk			18min walk							
Travel Time	3	17	48	51	18	33	36	51	45	58	43	63
Walk Time	4	1	2	2	1	1	1	1	1	2	3	1
Wait Time (headways/2)	4	4	3	2	4	4	4	3	3	2	3	2
# of Transfers	4	4	3	3	4	4	4	4	4	3	4	3
Travel Time	4	4	3	3	4	3	3	3	3	3	3	2
Total	4	3.25	2.75	2.5	3.25	3	3	2.75	2.75	2.5	3.25	2

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Figure B-4 Trip Simulation - Option 3 (Ride On Modifications Only)

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.56	3.56	3.60	3.50	3.35	3.45	3.80	3.06	3.30	3.19	3.10	3.25

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Olde Towne/Gaithersburg MARC station/Gaithersburg High School	59 bus + 56 bus/9 minutes walking, 13 minutes bus, 7min waiting/20min headways	55 bus + 61 bus/4min walking, 20min bus, 15min waiting/10min headways	55 bus/8min walking, 16min bus/10min headways	55 bus/10min walking, 14min bus/10min headways	55 bus/7min walking, 3min bus/10min headways	55 bus/5min walking, 13min bus/10min headways	57 bus/2min walking, 6min bus/20min headways		13min walk		16min walk	
Travel Time	39	44	29	29	15	23	18		13		16	
Walk Time	3	4	3	3	3	4	4		2		1	
Wait Time (headways/2)	3	3	4	4	4	4	4		4		4	
# of Transfers	3	3	4	4	4	4	4		4		4	
Travel Time	3	3	4	4	4	4	4		4		4	
Total	3	3.25	3.75	3.75	3.75	4	4		3.5		3.25	

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Metropolitan Grove MARC station/Watkins Mill Town Center	58 bus/3min walk, 4min bus/30min headways		58 bus/15min bus/30min headways	58 bus/4min walk/11min bus/30min headways	61 bus/12min walk, 10min bus/30min headways	61 bus/13min walk, 9min bus/30min headways	61 bus/1min walk, 16min bus/30min headways	61 bus/7min walk, 21min bus/30min headways	61 bus/10min walk, 12min bus/30min headways	55 bus + 61 bus/4min walking, 20min bus, 15min waiting/10min headways	61 bus/19min bus/30min headways	55 bus + 61 bus/3min walking, 20min bus, 15min waiting/10min headways
Travel Time	22		30	30	37	37	32	43	37	44	34	43
Walk Time	4		4	4	2	2	4	3	3	4	1	4
Wait Time (headways/2)	3		3	3	3	3	3	3	3	3	3	3
# of Transfers	4		4	4	4	4	4	4	4	3	4	3
Travel Time	4		4	4	3	3	3	3	3	3	3	3
Total	3.75		3.75	3.75	3	3	3.5	3.25	3.25	3.25	2.75	3.25

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Lockheed Martin/Kaiser Permanente/Spectrum	58 bus/10min walk/7min bus/30min headways	58 bus/4min walk/6min bus/30min headways	12min walk OR 58 bus/4min walk/4min bus/30min headways		55 bus/11min walk, 12min bus/10min headways	55 bus/7min walk, 7min bus/10min headways	55 bus/15min walk, 7min bus/10min headways	58 bus + 57 bus/13min walk, 11min bus, 5min wait/30min headways	55 bus/14min walk, 10min bus/10min headways	55 bus/11min walk/12min bus/10min headways	58 bus + 61 bus/4min walk, 15min bus, 10min wait/30min headways	55 bus/7min walk, 14min bus/10min headways
Travel Time	32	25	23		33	19	27	44	29	28	44	26
Walk Time	3	4	4		2	3	2	2	2	2	4	3
Wait Time (headways/2)	3	3	3		4	4	4	3	4	4	2	4
# of Transfers	4	4	4		4	4	4	3	4	4	3	4
Travel Time	4	4	4		3	4	4	3	4	4	3	4
Total	3.5	3.75	3.75		3.25	3.75	3.5	2.75	3.5	3.5	3	3.75

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Quince Orchard Plaza		16min walk	58 bus/3min walk, 12min bus/30min headways	58 bus/7min walk/8min bus/30min headways	61 bus/16min walk, 7min bus/30min headways	56 bus/12min walk, 4min bus/20min headways	61 bus/5min walk, 13min bus/20min headways	61 bus/11min walk, 18min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	55 bus + 61 bus/7min walking, 17min bus, 15min waiting/10min headways	61 bus/4min walk, 17min bus/30min headways	55 bus + 61 bus/6min walking, 17min bus, 15min waiting/10min headways
Travel Time		16	30	30	38	26	28	39	33	44	36	43
Walk Time		1	4	3	1	2	4	2	2	3	4	3
Wait Time (headways/2)		4	3	3	3	4	4	4	4	3	3	3
# of Transfers		4	4	4	4	4	4	4	4	3	4	3
Travel Time		4	4	4	3	4	4	3	3	3	3	3
Total		3.25	3.75	3.5	2.75	3.5	4	3.25	3.25	3	3.5	3

NIST	3min walk	17min walk	58 bus/10min walk/12min bus/30min headways	58 bus/10min walk/8min bus/30min headways	18min walk	56 bus/19min walk, 4min bus/20min headways	61 bus/12min walk, 13min bus/20min headways	61 bus/18min walk, 18min bus/30min headways	61 bus/21min walk, 9min bus/30min headways	55 bus + 61 bus/14min walking, 17min bus, 15min waiting/10min headways	61 bus/11min walk, 17min bus, 30min headways	55 bus + 61 bus/13min walking, 17min bus, 15min waiting/10min headways
Travel Time	3	17	37	33	18	33	35	51	45	54	43	54
Walk Time	4	1	3	3	1	1	2	1	1	2	3	2
Wait Time (headways/2)	4	4	3	3	4	4	4	3	3	3	3	3
# of Transfers	4	4	4	4	4	4	4	4	4	3	4	3
Travel Time	4	4	3	3	4	3	4	3	3	3	3	3
Total	4	3.25	3.25	3.25	3.25	3	3.5	2.75	2.75	2.75	3.25	2.75

APPENDIX C – ESTIMATED TRIP SCORE ANALYSIS WITH PLANNED IMPROVEMENTS (CCT, ROUTE 355 BRT, AND WATKINS MILL ROAD INTERCHANGE) IN PLACE

Figure C-1 Trip Simulation – Baseline + Planned Improvements

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.38	3.25	3.20	3.19	3.38	3.40	3.45	3.10	3.29	3.19	3.15	3.19

	355 BRT + 56 bus/14min walk, 11min bus, 10min wait/5min headways	355 BRT + 56 bus/8min walk, 14min bus, 10min wait/5min headways	355 BRT/14min walk/7min bus/5min headways	355 BRT/14min walk/7min bus/5min headways	55 bus/7min walking, 3min bus/20min headways	55 bus/5min walking, 13min bus/20min headways	16 minute walk OR 55 bus/10min walking, 8min bus/10min headways	13min walk OR 57 bus/4min walk, 3min bus/20min headways	16min walk
Olde Towne/Gaithersburg MARC station/Gaithersburg High School									
Travel Time	40	37	24	24	20	28	23	17	16
Walk Time	2	3	2	2	3	4	1	2	1
Wait Time (headways/2)	3	3	4	4	4	4	4	4	4
# of Transfers	3	3	4	4	4	4	4	4	4
Travel Time	3	3	4	4	4	4	4	4	4
Total	2.75	3	3.5	3.5	3.75	4	3.25	3.5	3.25

	16min walk OR 61 bus/4min walk, 3min bus/30min headways	61 bus + 355 BRT/8min walk, 10min bus, 3min wait/30min headways	61 bus + 355 BRT/6min walk/10min bus, 3min wait/30min headways	61 bus + 355 BRT/5min walk/11min bus, 3min wait/30min headways	61 bus/13min walk, 9min bus/30min headways	61 bus/1min walk, 16min bus/30min headways	61 bus/7min walk, 21min bus/30min headways	61 bus/10min walk, 12min bus/30min headways	61 bus +355 BRT/11min walk, 15min bus, 3min wait/30min headways	no change	61 bus +355 BRT/7min walk, 13min bus, 3min wait/30min headways
Metropolitan Grove MARC station/Watkins Mill Town Center											
Travel Time	22	36	34	34	37	32	43	37	44	34	38
Walk Time	4	3	3	4	2	4	3	3	2	1	3
Wait Time (headways/2)	3	3	3	3	3	3	3	3	3	3	3
# of Transfers	4	3	3	3	4	4	4	4	3	4	4
Travel Time	4	3	3	3	3	3	3	3	3	3	3
Total	3.75	3	3	3.25	3	3.5	3.25	3.25	2.75	2.75	3.25

	355 BRT + 61 bus/9min walk/6min bus/15min wait/5min headways	61 bus + 355 BRT/6min walk/10min bus, 2.5min wait/30min headways	12min walk	355 BRT/11min walk/5min bus/5min headways	355 BRT/12min walk/4min bus/5min headways	355 BRT + 55 bus/10min walk/7min bus/10min wait/5min headways	355 BRT/21min walk/5min bus/5min headways	355 BRT/13min walk/5min bus/5min headways	355 BRT/13min walk/8min bus/5min headways	355 BRT + 61 bus/6min walk/14min bus/15min wait/5min headways	355 BRT/3min walk, 7min bus, 5min headways
Lockheed Martin/Kaiser Permanente/Spectrum											

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Travel Time	33	34	12		19	19	30	29	21	24	38	13
Walk Time	3	3	2		2	2	3	1	2	2	3	4
Wait Time (headways/2)	3	3	4		4	4	4	4	4	4	3	4
# of Transfers	3	3	4		4	4	3	4	4	4	3	3
Travel Time	3	3	4		4	4	4	4	4	4	3	4
Total	3	3	3.5		3.5	3.5	3.5	3.25	3.5	3.5	3	3.75

		61 bus + 355 BRT/11min walk, 7min bus, 3min wait/30min headways	61 bus + 355 BRT/9min walk/7min bus, 3min wait/30min headways	61 bus + 355 BRT/8min walk/8min bus, 3min wait/30min headways	56 bus/12min walk, 4min bus/20min headways	61 bus/5min walk, 13min bus/20min headways	61 bus/11min walk, 18min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	56 bus + 57 bus (same vehicle)/7min walk, 15min bus/20min headways	61 bus/4min walk, 17min bus/30min headways	61 bus + 59 bus/17min walk, 15min bus, 9min wait/30min headways
Quince Orchard Plaza	16min walk										
Travel Time	16	37	34	34	26	28	39	33	32	36	54
Walk Time	1	2	3	4	2	4	2	2	3	4	2
Wait Time (headways/2)	4	3	3	3	4	4	4	4	4	3	2
# of Transfers	4	3	3	3	4	4	4	4	3	4	3
Travel Time	4	3	3	3	4	4	3	3	3	3	2
Total	3.25	2.75	3	3.25	3.5	4	3.25	3.25	3.25	3.5	2.25

			CCT + 355 BRT/41min bus, 8min walk, 2.5min wait/3.5min headways	CCT + 355 BRT/41min bus, 6min walk, 2.5min wait/3.5min headways	CCT + 355 BRT/36min bus, 5min walk, 2.5min wait/3.5min headways	56 bus/19min walk, 4min bus/20min headways	56 bus/17min walk, 9min bus/20min headways	CCT + 355 BRT/34min bus, 16min walk, 2.5min wait/3.5min headways	CCT + 355 BRT/36min bus, 7min walk, 2.5min wait/3.5min headways	CCT + 355 BRT/34min bus, 11min walk, 2.5min wait/3.5min headways	61 bus/11min walk, 17min bus, 30min headways	CCT + 355 BRT/34min bus, 5min walk, 2.5min wait/3.5min headways
NIST	3min walk	17min walk										
Travel Time	3	17	48	46	45	33	36	55	47	49	43	43
Walk Time	4	1	3	3	4	1	1	1	3	3	3	4
Wait Time (headways/2)	4	4	4	4	4	4	4	4	4	4	3	4
# of Transfers	4	4	3	3	3	4	4	3	3	3	4	3
Travel Time	4	4	3	3	3	3	3	3	3	3	3	3
Total	4	3.25	3.25	3.25	3.5	3	3	2.75	3.25	3.25	3.25	3.5

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Figure C-2 Trip Simulation - Option 1 (Full Loop Circulator) with Planned Improvements

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.75	3.69	3.85	3.69	3.65	3.80	3.85	3.50	3.15	3.75	3.25	3.44

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Olde Towne/Gaithersburg MARC station/Gaithersburg High School	Circulator/6min walk, 6min bus/20min headways	Circulator/11min bus/20min headways	Circulator/12min bus/20min headways	Circulator/2min walk/17min bus/20min headways	55 bus/7min walking, 3min bus/20min headways	Circulator/6min bus/20min headways	Circulator/4min bus/20min headways		13min walk OR 57 bus/4min walk, 3min bus/20min headways		16min walk	
Travel Time	22	21	22	29	20	16	14		17		16	
Walk Time	3	4	4	4	3	3	4		2		1	
Wait Time (headways/2)	4	4	4	4	4	4	4		4		4	
# of Transfers	4	4	4	4	4	4	4		4		4	
Travel Time	4	4	4	4	4	4	4		4		4	
Total	3.75	4	4	4	3.75	3.75	4		3.5		3.25	

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Metropolitan Grove MARC station/Watkins Mill Town Center	61 bus/4min walk, 3min bus/30min headways		Circulator/13min bus/20min headways	Circulator/2min walk/8min bus/20min headways	Circulator/4min walk/8min bus/20min headways	Circulator/17min bus/20min headways	Circulator/15min bus/20min headways	Circulator/7min walk/11min bus/20min headways	61 bus/10min walk, 12min bus/30min headways	Circulator/2min walk/11min bus/20min headways	Circulator/11min walk/14min bus/20min headways	Circulator/9min walk/11min bus/20min headways
Travel Time	22		23	20	22	27	25	28	37	23	35	30
Walk Time	4		4	4	4	4	4	3	3	4	2	3
Wait Time (headways/2)	3		4	4	4	4	4	4	3	4	4	4
# of Transfers	4		4	4	4	4	4	4	4	4	4	4
Travel Time	4		4	4	4	4	4	4	3	4	3	4
Total	3.75		4	4	4	4	4	3.75	3.25	4	3.25	3.75

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Lockheed Martin/Kaiser Permanente/Spectrum	Circulator/8min walk/13min bus/20min headways	Circulator/2min walk/8min bus/20min headways	Circulator/2min walk/5min bus/20min headways		Circulator/6min walk/16min bus/20min headways	Circulator/2min walk/12min bus/20min headways	Circulator/2min walk/14min bus/20min headways	Circulator/9min walk/17min bus/20min headways	58 bus/13min walk, 4min bus/30min headways	Circulator/4min walk/17min bus/20min headways	Circulator/13min walk, 15min bus/20min headways	Circulator/11min walk/17min bus/20min headways
Travel Time	31	20	17		32	24	26	36	32	31	38	38
Walk Time	3	4	4		3	4	4	3	2	4	2	3
Wait Time (headways/2)	4	4	4		4	4	4	4	3	4	4	4
# of Transfers	4	4	4		4	4	4	4	4	4	4	4
Travel Time	3	4	4		3	4	4	3	3	3	3	3
Total	3.5	4	4		3.5	4	4	3.5	3	3.75	3.25	3.5

Origin/Mode	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)	
Quince Orchard Plaza			16min walk	Circulator/3min walk/12min bus/20min headways	Circulator/10min walk/5min bus/20min headways	Circulator/7min walk/5min bus/20min headways	Circulator/3min walk/14min bus/20min headways	Circulator/3min walk/12min bus/20min headways	Circulator/10min walk/8min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	Circulator/5min walk/8min bus/20min headways	Circulator/14min walk/11min bus/20min headways	Circulator/12min walk/8min bus/20min headways
Travel Time			16	25	25	22	27	25	28	33	23	35	30
Walk Time			1	4	3	3	4	4	3	2	4	2	2
Wait Time (headways/2)			4	4	4	4	4	4	4	4	4	4	4
# of Transfers			4	4	4	4	4	4	4	4	4	4	4

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Travel Time		4	4	4	4	4	4	4	3	4	3	4
Total		3.25	4	3.75	3.75	4	4	3.75	3.25	4	3.25	3.5

	3min walk	Circulator/12min walk, 4min bus/20min headways	Circulator/12min walk, 19min bus/20min headways	Circulator/16min walk/16min bus/20min headways	Circulator/16min walk/3min bus/20min headways	Circulator/12min walk/13min bus/20min headways	Circulator/12min walk/11min bus/20min headways	Circulator/19min walk/7min bus/20min headways	61 bus/21min walk, 9min bus/30min headways	Circulator/14min walk/7min bus/20min headways	61 bus/11min walk, 17min bus, 30min headways	Circulator/21min walk/7min bus/20min headways
NIST												
Travel Time	3	26	41	42	29	35	33	36	45	31	43	38
Walk Time	4	2	2	1	1	2	2	1	1	2	3	1
Wait Time (headways/2)	4	4	4	4	4	4	4	4	3	4	3	4
# of Transfers	4	4	4	4	4	4	4	4	4	4	4	4
Travel Time	4	4	3	3	4	3	3	3	3	3	3	3
Total	4	3.5	3.25	3	3.25	3.25	3.25	3	2.75	3.25	3.25	3

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Figure C-3 Trip Simulation - Option 2 (Out-and-Back Circulator) with Planned Improvements

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.44	3.56	3.70	3.56	3.15	3.65	3.75	3.25	3.15	3.38	3.30	3.00

	Circulator/19min walk/25min bus/20min headways	Circulator/25min bus/20min headways	Circulator/12min bus/20min headways	Circulator/2min walk/17min bus/20min headways	55 bus/7min walking, 3min bus/20min headways	Circulator/6min bus/20min headways	Circulator/4min bus/20min headways	13min walk OR 57 bus/4min walk, 3min bus/20min headways	16min walk
Olde Towne/Gaithersburg MARC station/Gaithersburg High School									
Travel Time	54	35	22	29	20	16	14	17	16
Walk Time	1	4	4	4	3	3	4	2	1
Wait Time (headways/2)	4	4	4	4	4	4	4	4	4
# of Transfers	4	4	4	4	4	4	4	4	4
Travel Time	3	3	4	4	4	4	4	4	4
Total	3	3.75	4	4	3.75	3.75	4	3.5	3.25

	61 bus/4min walk, 3min bus/30min headways	Circulator/13min bus/20min headways	Circulator/2min walk/8min bus/20min headways	61 bus/12min walk, 10min bus/30 min headways	Circulator/19min bus/20min headways	Circulator/21min bus/20min headways	Circulator/7min walk/25min bus/20min headways	61 bus/10min walk, 12min bus/30min headways	Circulator/2min walk, 25min bus/20min headways	Circulator/11min walk, 22min bus/20min headways	Circulator/9min walk, 25min bus/20min headways
Metropolitan Grove MARC station/Watkins Mill Town Center											
Travel Time	22	23	20	37	29	31	42	37	37	43	44
Walk Time	4	4	4	2	4	4	3	3	4	2	3
Wait Time (headways/2)	3	4	4	3	4	4	4	3	4	4	4
# of Transfers	4	4	4	4	4	4	4	4	4	4	4
Travel Time	4	4	4	3	4	3	3	3	3	3	3
Total	3.75	4	4	3	4	3.75	3.5	3.25	3.75	3.25	3.5

	Circulator/16min walk, 8min bus/20min headways	Circulator/2min walk/8min bus/20min headways	Circulator/2min walk/5min bus/20min headways	Circulator/16min walk/15min bus/20min headways	Circulator/2min walk/12min bus/20min headways	Circulator/2min walk/14min bus/20min headways	Circulator/9min walk/17min bus/20min headways	58 bus/13min walk, 4min bus/30min headways	Circulator/4min walk/17min bus/20min headways	Circulator/13min walk, 15min bus/20min headways	Circulator/11min walk/17min bus/20min headways
Lockheed Martin/Kaiser Permanente/Spectrum											
Travel Time	37	20	17	41	24	26	36	32	31	38	38
Walk Time	1	4	4	1	4	4	3	2	4	2	3
Wait Time (headways/2)	4	4	4	4	4	4	4	3	4	4	4
# of Transfers	4	4	4	4	4	4	4	4	4	4	4
Travel Time	3	4	4	3	4	4	3	3	3	3	3
Total	3	4	4	3	4	4	3.5	3	3.75	3.25	3.5

	16min walk	Circulator/8min walk/10min bus/20min headways	Circulator/10min walk/5min bus/20min headways	61 bus/16min walk, 7min bus/30min headways	Circulator/8min walk/16min bus/20min headways	61 bus/5min walk, 13min bus/20min headways	Circulator/15min walk/22min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	Circulator/10min walk, 22min bus/20min headways	61 bus/4min walk, 17min bus/30min headways	Circulator/17min walk/22min bus/20min headways
Quince Orchard Plaza											
Travel Time	16	28	25	38	34	28	47	33	42	36	49
Walk Time	1	3	3	1	3	4	2	2	3	4	1
Wait Time (headways/2)	4	4	4	3	4	4	4	4	4	3	4
# of Transfers	4	4	4	4	4	4	4	4	4	4	4

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Travel Time		4	4	4	3	3	4	3	3	3	3	3
Total		3.25	3.75	3.75	2.75	3.5	4	3.25	3.25	3.5	3.5	3

			56 bus + 55 bus/11min walk, 17min bus, 5min wait/30min headways	54 bus + 58 bus/17min walk, 13min bus, 6min wait/30min headways		56 bus/19min walk, 4min bus/20min headways	56 bus/17min walk, 9min bus/20min headways	61 bus/18min walk, 18min bus/30min headways	61 bus/21min walk, 9min bus/30min headways	61 bus + 57 bus/14min walk, 16min bus, 12min wait/30min headways		61 bus + 57 bus/20min walk, 16min bus, 12min wait/30min headways
NIST	3min walk	17min walk			18min walk							
Travel Time	3	17	48	51	18	33	36	51	45	58	43	63
Walk Time	4	1	2	2	1	1	1	1	1	2	3	1
Wait Time (headways/2)	4	4	3	2	4	4	4	3	3	2	3	2
# of Transfers	4	4	3	3	4	4	4	4	4	3	4	3
Travel Time	4	4	3	3	4	3	3	3	3	3	3	2
Total	4	3.25	2.75	2.5	3.25	3	3	2.75	2.75	2.5	3.25	2

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Figure C-4 Trip Simulation - Option 3 (Ride On Modifications Only) with Planned Improvements

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
TAZ	412	413	479	480	482	483	512	513	514	515	516	743
Average	3.38	3.56	3.40	3.31	3.35	3.55	3.80	3.19	3.30	3.19	3.10	3.25

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Olde Towne/Gaithersburg MARC station/Gaithersburg High School	59 bus + 56 bus/9 minutes walking, 13 minutes bus, 7min waiting/20min headways	55 bus + 61 bus/4min walking, 20min bus, 15min waiting/10min headways	55 bus/8min walking, 16min bus/10min headways	55 bus/10min walking, 14min bus/10min headways	55 bus/7min walking, 3min bus/10min headways	55 bus/5min walking, 13min bus/10min headways	57 bus/2min walking, 6min bus/20min headways		13min walk		16min walk	
Travel Time	39	44	29	29	15	23	18		13		16	
Walk Time	3	4	3	3	3	4	4		2		1	
Wait Time (headways/2)	3	3	4	4	4	4	4		4		4	
# of Transfers	3	3	4	4	4	4	4		4		4	
Travel Time	3	3	4	4	4	4	4		4		4	
Total	3	3.25	3.75	3.75	3.75	4	4		3.5		3.25	

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Metropolitan Grove MARC station/Watkins Mill Town Center	16min walk OR 61 bus/4min walk, 3min bus/30min headways		58 bus/13min bus/30min headways	58 bus/3min walk/8min bus/30min headways	61 bus/12min walk, 10min bus/30min headways	58 bus/3min walk, 20min bus/30min headways	61 bus/1min walk, 16min bus/30min headways	61 bus/7min walk, 21min bus/30min headways	61 bus/10min walk, 12min bus/30min headways	55 bus + 61 bus/4min walking, 20min bus, 15min waiting/10min headways	61 bus/19min bus/30min headways	55 bus + 61 bus/3min walking, 20min bus, 15min waiting/10min headways
Travel Time	22		28	26	37	38	32	43	37	44	34	43
Walk Time	4		4	4	2	4	4	3	3	4	1	4
Wait Time (headways/2)	3		3	3	3	3	3	3	3	3	3	3
# of Transfers	4		4	4	4	4	4	4	4	3	4	3
Travel Time	4		4	4	3	3	3	3	3	3	3	3
Total	3.75		3.75	3.75	3	3.5	3.5	3.25	3.25	3.25	2.75	3.25

	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Lockheed Martin/Kaiser Permanente/Spectrum	61 bus/22min walk, 4min bus/30min headways	58 bus/3min walk/8min bus/30min headways	12min walk OR 58 bus/4min walk/4min bus/30min headways		55 bus/11min walk, 12min bus/10min headways	55 bus/7min walk, 7min bus/10min headways	55 bus/15min walk, 7min bus/10min headways	55 bus/16min walk/12min bus/10min headways	55 bus/14min walk, 10min bus/10min headways	55 bus/11min walk/12min bus/10min headways	58 bus + 61 bus/4min walk, 15min bus, 10min wait/30min headways	55 bus/7min walk, 14min bus/10min headways
Travel Time	41	26	23		33	19	27	33	29	28	44	26
Walk Time	1	4	4		2	3	2	2	2	2	4	3
Wait Time (headways/2)	3	3	3		4	4	4	4	4	4	2	4
# of Transfers	4	4	4		4	4	4	4	4	4	3	4
Travel Time	3	4	4		3	4	4	3	4	4	3	4
Total	2.75	3.75	3.75		3.25	3.75	3.5	3.25	3.5	3.5	3	3.75

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	Diamond Square	Metropolitan Grove	Watkins Mill/Travis	Lockheed Martin/Kaiser Permanente	Fairgrounds	Lakeforest Mall	Hidden Creek (Goshen/Odendhal)	Old Town (Gaithersburg Middle School)	Asbury/West Old Town	355 south of MARC (City Hall)	Girard/Victory Farm	355/Diamond (Gaithersburg High School)
Quince Orchard Plaza		16min walk	58 bus/16min walk, 13min bus/30min headways	58 bus/16min walk/8min bus/30min headways	61 bus/16min walk, 7min bus/30min headways	56 bus/12min walk, 4min bus/20min headways	61 bus/5min walk, 13min bus/20min headways	61 bus/11min walk, 18min bus/20min headways	61 bus/14min walk, 9min bus/20min headways	55 bus + 61 bus/7min walking, 17min bus, 15min waiting/10min headways	61 bus/4min walk, 17min bus/30min headways	55 bus + 61 bus/6min walking, 17min bus, 15min waiting/10min headways
Travel Time		16	44	39	38	26	28	39	33	44	36	43
Walk Time		1	1	1	1	2	4	2	2	3	4	3
Wait Time (headways/2)		4	3	3	3	4	4	4	4	3	3	3
# of Transfers		4	4	4	4	4	4	4	4	3	4	3
Travel Time		4	3	3	3	4	4	3	3	3	3	3
Total		3.25	2.75	2.75	2.75	3.5	4	3.25	3.25	3	3.5	3

NIST	3min walk	17min walk	61 bus + 58 bus/10min walk, 16min bus, 15min wait/30min headways	61 bus + 58 bus/10min walk, 11min bus, 15min wait/30min headways	18min walk	56 bus/19min walk, 4min bus/20min headways	61 bus/12min walk, 13min bus/20min headways	61 bus/18min walk, 18min bus/30min headways	61 bus/21min walk, 9min bus/30min headways	55 bus + 61 bus/14min walking, 17min bus, 15min waiting/10min headways	61 bus/11min walk, 17min bus, 30min headways	55 bus + 61 bus/13min walking, 17min bus, 15min waiting/10min headways
Travel Time	3	17	56	51	18	33	35	51	45	54	43	54
Walk Time	4	1	2	2	1	1	2	1	1	2	3	2
Wait Time (headways/2)	4	4	2	2	4	4	4	3	3	3	3	3
# of Transfers	4	4	3	3	4	4	4	4	4	3	4	3
Travel Time	4	4	3	3	4	3	4	3	3	3	3	3
Total	4	3.25	2.5	2.5	3.25	3	3.5	2.75	2.75	2.75	3.25	2.75