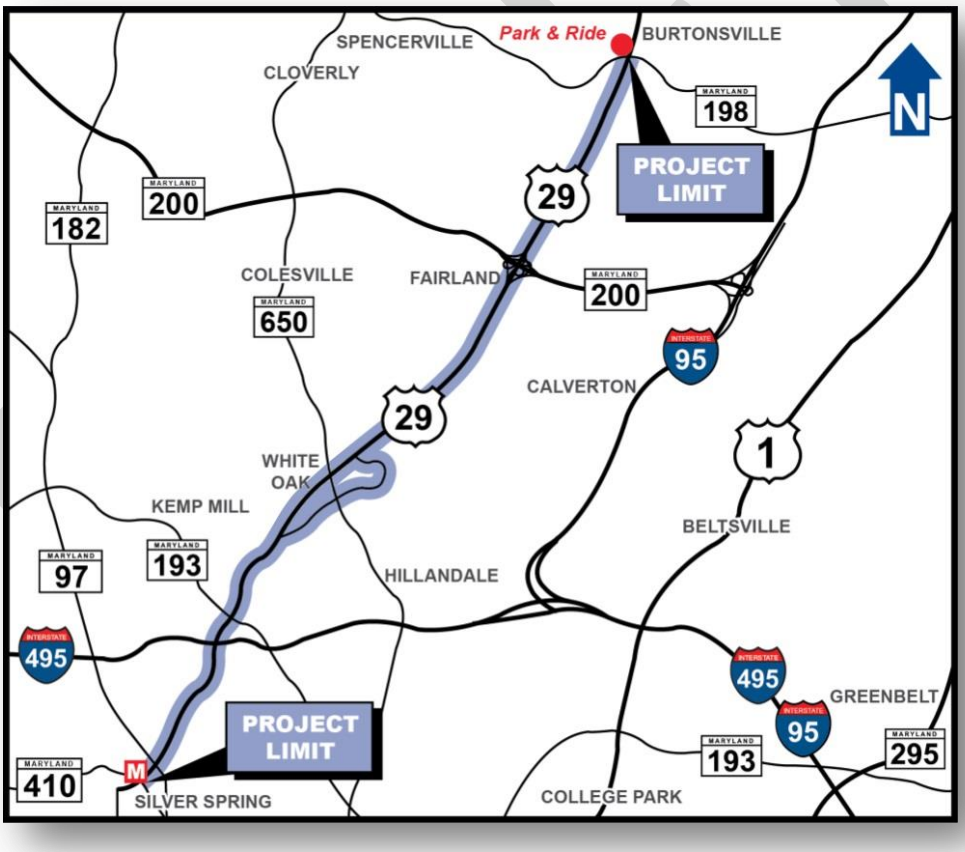
Montgomery County
RAPID TRANSIT
US 29

US 29 Bus Rapid Transit (BRT)
Corridor Planning Study

From Silver Spring Transit Center
to Burtonsville Park and Ride

Preliminary Purpose and Need Document
– DRAFT –
Subject to Change



Montgomery County, Maryland
December 2015

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1 Introduction

Montgomery County is proposing a new Bus Rapid Transit (BRT) line along US 29 between the Silver Spring Transit Center and the Burtonsville Park and Ride in Montgomery County, Maryland. At the county's request, the Maryland Department of Transportation has initiated a corridor study to identify transportation needs and evaluate potential build alternatives for accommodating enhanced transit service via BRT.

This Preliminary Purpose and Need report documents the existing and future transportation needs in the US 29 study corridor that a BRT project could potentially address. The study team has designated it as "preliminary" as it is intended to provide the initial foundation for a potential future formal Purpose and Need statement in the event the project moves into a future development phase as part of the federal National Environmental Protection Act (NEPA) approval process.

What is Bus Rapid Transit (BRT)?

BRT is an innovative, high-capacity, and lower-cost public transit solution that could significantly improve urban mobility. This integrated system uses specialized buses on roadways or dedicated lanes to quickly and efficiently transport passengers to their destinations, while offering the flexibility to meet transit demand (e.g. higher frequencies, all-day service, etc.). BRT systems can easily be customized to community needs and incorporate state-of-the-art technologies that result in more passengers and less congestion. BRT stations typically include passenger shelters and loading platforms, level bus boarding, real-time bus arrival information, automated fare purchase with off-board fare collection, and site treatments such as landscaping and lighting. BRT vehicles are typically specialized buses with low floors that have multiple doors on both sides of the vehicle, increased passenger circulation and bicycle provisions, higher capacity through use of articulated buses, enhanced passenger amenities, and potential for a unique brand identity.

BRT service features stations that are spaced further apart than local bus stops. Buses may operate in dedicated lanes reserved exclusively for BRT or in shared travel lanes used by BRT buses and other traffic. Traffic signal priority, queue jumpers, and station pull-outs may be used in combination with shared traffic lanes and dedicated BRT lanes to improve speed and operations. In cities where BRT has been implemented, it has been described as a bus that offers the convenience of rail transit with a lower capital cost, because it does not require an investment in trains, track, or catenaries.

1.1 Bus Rapid Transit Planning in Montgomery County

Montgomery County first proposed BRT as the most appropriate mode for improving transit in the corridor in the 1993 Strategic Transit Plan. Improvements to county transit systems have been discussed many times in many planning documents since that Strategic Transit Plan was developed and are summarized in **Appendix B**.

In 2011, MCDOT completed a Countywide Bus Rapid Transit Study, which provided an initial look at the possibility of BRT along several main county transportation routes, including US 29. The Study was a proactive effort to explore transit improvements that could address the existing travel demand and anticipated growth in vehicle trips in Montgomery County. The study provided an overview of multiple study corridors, of associated existing and future transit demand, and of potential improvement recommendations for each.

Acting upon the findings from the 2011 document and the recommendations for enhanced transit included in several other local area and sector plans, Maryland-National Capital Park and Planning Commission (M-NCPPC) developed a Countywide Transit Corridors Functional Master Plan. This Functional Master Plan was approved and adopted by the County Council in December 2013.

The Functional Master Plan proposes the development of a BRT network throughout the County to support the County's mobility, land use, and economic development goals. To ensure network integrity and achieve the County's vision, the document outlines recommendations and provides the basis for the rights-of-way reservations required to accommodate enhanced transit improvements (i.e., bus lanes, stations, roadway widening, etc.) in individual transit corridors. The Functional Master Plan also makes recommendations on the allocation of space for transportation system facilities related to motor vehicle traffic, transit, pedestrians, and bicycles. One of several corridors included in the Functional Master Plan, is US 29 (Colesville Road/Columbia Pike) from the Silver Spring Transit Center to the Burtonsville Park and Ride.

While the focus of the US 29 corridor study is enhanced bus transit services, the study team acknowledges that other forms of premium transit are available, and have been considered by the MCDOT in previous feasibility studies. The US 29 corridor is recognized as a potential fit for the overall county BRT system for the following reasons:

1. Planned development in the corridor will create additional vehicle trips that will increase congestion and could be addressed with high quality transit options.
2. Existing traffic challenges could be addressed with BRT.

3. Silver Spring Transit Center provides a multi-modal hub link to get to downtown Washington, D.C. and other bus routes;
4. The corridor has an existing strong transit market with robust bus ridership.
5. US 29 north of New Hampshire Avenue has a wide median that could potentially accommodate lanes for BRT service

1.1.1 Goals and Objectives

To guide the development and implementation of the bus rapid transit system, the study team has developed a list of goals and objectives outlined in **Table 1**. These goals and measurable objectives provide a consistent framework for development of the entire system from the project planning phase for each corridor through the opening of service and ongoing operations. They provide a starting point for the development of individual project purpose statements for individual corridor studies. They also assist in the development of measures of effectiveness appropriate to each phase of the BRT system development and deployment.

Table 1: Bus Rapid Transit Goals and Objectives

Goals		Objectives
1	**Improve quality of transit service**	Make Bus Trips Faster
		Make Door-to-Door Transit Travel Time Competitive with Door-to-Door Auto Travel
		Increase Transit Ridership
		Provide an Appealing Transit Service that will Attract New Riders
2	**Improve mobility opportunities and choices**	Serve as Many Travelers as Possible by Efficiently Utilizing the Right-of-Way
		Balance Travel Times for Automobiles and Transit Users
		Enhance Pedestrian and Bicycle Options in the Corridors
		Create Direct Transfers Between Premium Bus and Other Modes
3	**Develop transit services that enhance quality of life**	Provide Premium Transit Service Convenient to Households and Jobs within the corridor
		Minimize Private Property Impacts
		Serve Transit Dependent Populations
		Engage Public in Process
4	**Develop transit services that support master planned development**	Improve Alternative Transportation Service to and Between Activity Centers
		Increase Trips by Non-Automobile Modes to Support Development in the Master Plan
		Select Station Locations the Support In fill and Redevelopment
5	**Support sustainable and cost effective transportation solutions**	Maintain Environmental Quality
		Minimize cost of Building and Operating Transportation Services

2 Existing Conditions

2.1 Description of Study Area and Study Corridor

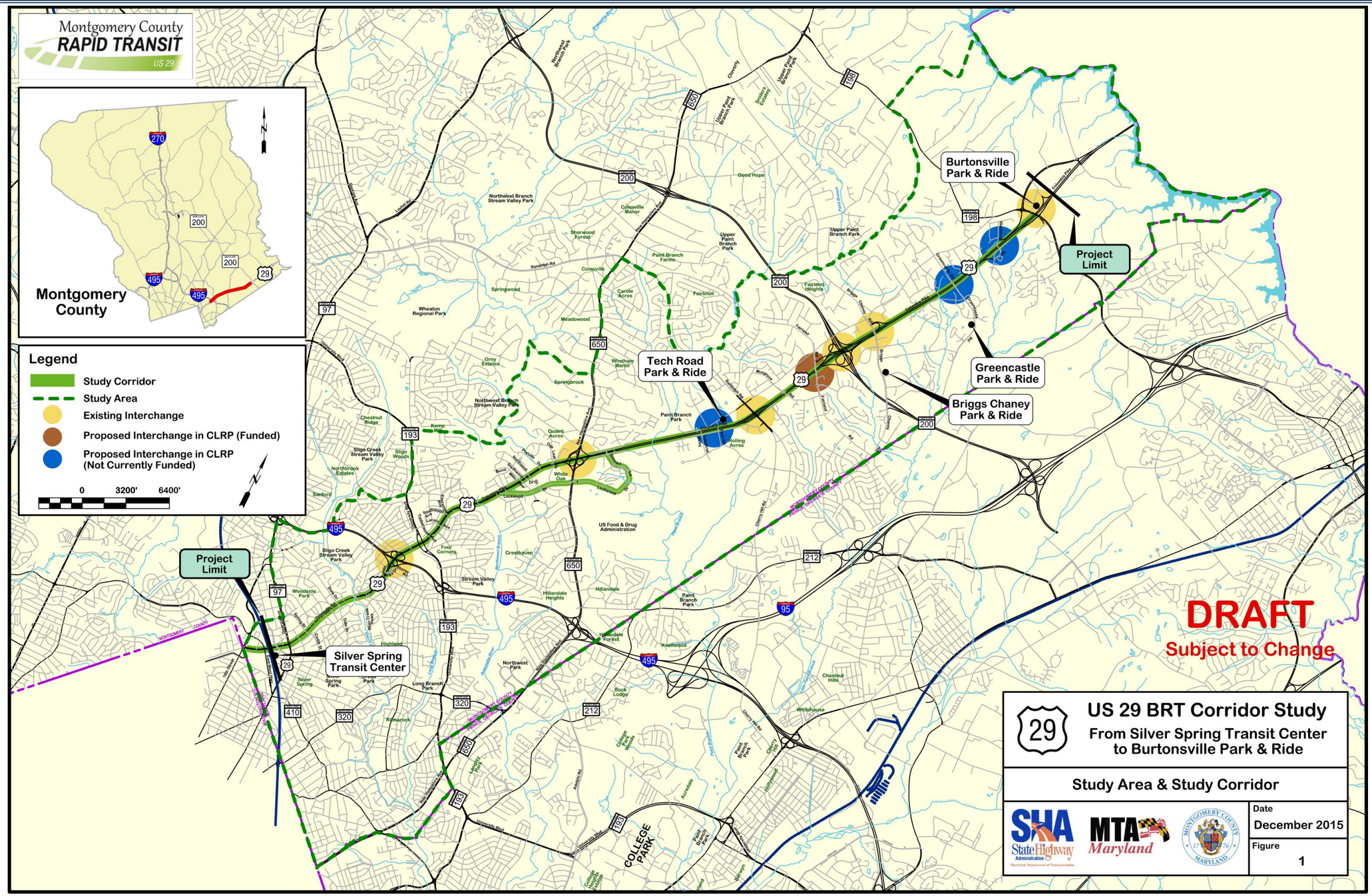
This study focuses on US 29 in eastern Montgomery County, MD and the surrounding communities, employment areas, activity centers, and infrastructure facilities it serves. On a larger scale, Montgomery County is part of the northern Washington, D.C. metropolitan area, and US 29 is a major north-south highway within the National Highway System that begins in the Howard County, MD near Ellicott City and ends in Pensacola, FL. Within Maryland, US 29 is a multi-lane highway, where opposing traffic flows are separated by access controlled interchanges and dividing medians in some sections. US 29 provides the westernmost north-south route between Washington D.C. and the Baltimore area.

In order to provide a more complete assessment of the existing features and needs of the transportation and community facilities in the area, the study team has identified two concentric areas of focus that surround the segment of US 29 under investigation. The Study Area and the Study Corridor. The larger Study Area surrounds the Study Corridor and has been defined for the purposes of evaluating travel demand, traffic patterns, community features, and socio-economic demographics. The smaller Study Corridor is contained within the Study Area has been defined for the purposes of evaluating adjacent land uses, natural and cultural resources, existing infrastructure elements, and transportation operations and safety.

The Study Area, as shown in **Figure 1**, is defined as an aggregate of Transportation Analysis Zones (TAZs) of the TPB/MWCOG model and bounded by:

- The border of Montgomery County (with Prince George's County) on the east,
- The border of Montgomery County (with Howard County) on the north,
- The border of Montgomery County (with District of Columbia) on the south,
- A study team generated border Approximately 1 mile west of US 29, based on TAZs.

Located within the Study Area, the twelve-mile Study Corridor (also shown in **Figure 1**) is comprised of the existing community and infrastructure features and facilities located adjacent to the existing US 29 right-of-way. The Study Corridor has a south terminus at Silver Spring Transit Center and a north terminus at Burtonsville Park and Ride, and includes a spur on Lockwood Drive and Stewart Lane, which runs through a high-density and high-ridership area of White Oak. The corridor intersects with major arterial roadways such as University Boulevard (MD 193), New Hampshire Avenue (MD 650), East Randolph Road, Cherry Hill Road, Fairland Road, Spencerville Road, and highways such as I-495 and MD 200.


Montgomery County RAPID TRANSIT US 29
Montgomery County
Legend
Study Corridor
Study Area
Existing Interchange
Proposed Interchange in CLRP (Funded)
Proposed Interchange in CLRP (Not Currently Funded)
0 3200' 6400'
Burtonsville Park & Ride
Project Limit
Tech Road Park & Ride
Greencastle Park & Ride
Briggs Chaney Park & Ride
Project Limit
Silver Spring Transit Center
DRAFT
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US 29 BRT Corridor Study
From Silver Spring Transit Center to Burtonsville Park & Ride
Study Area & Study Corridor
Date
December 2015
Figure
1

2.1.1 Land Use

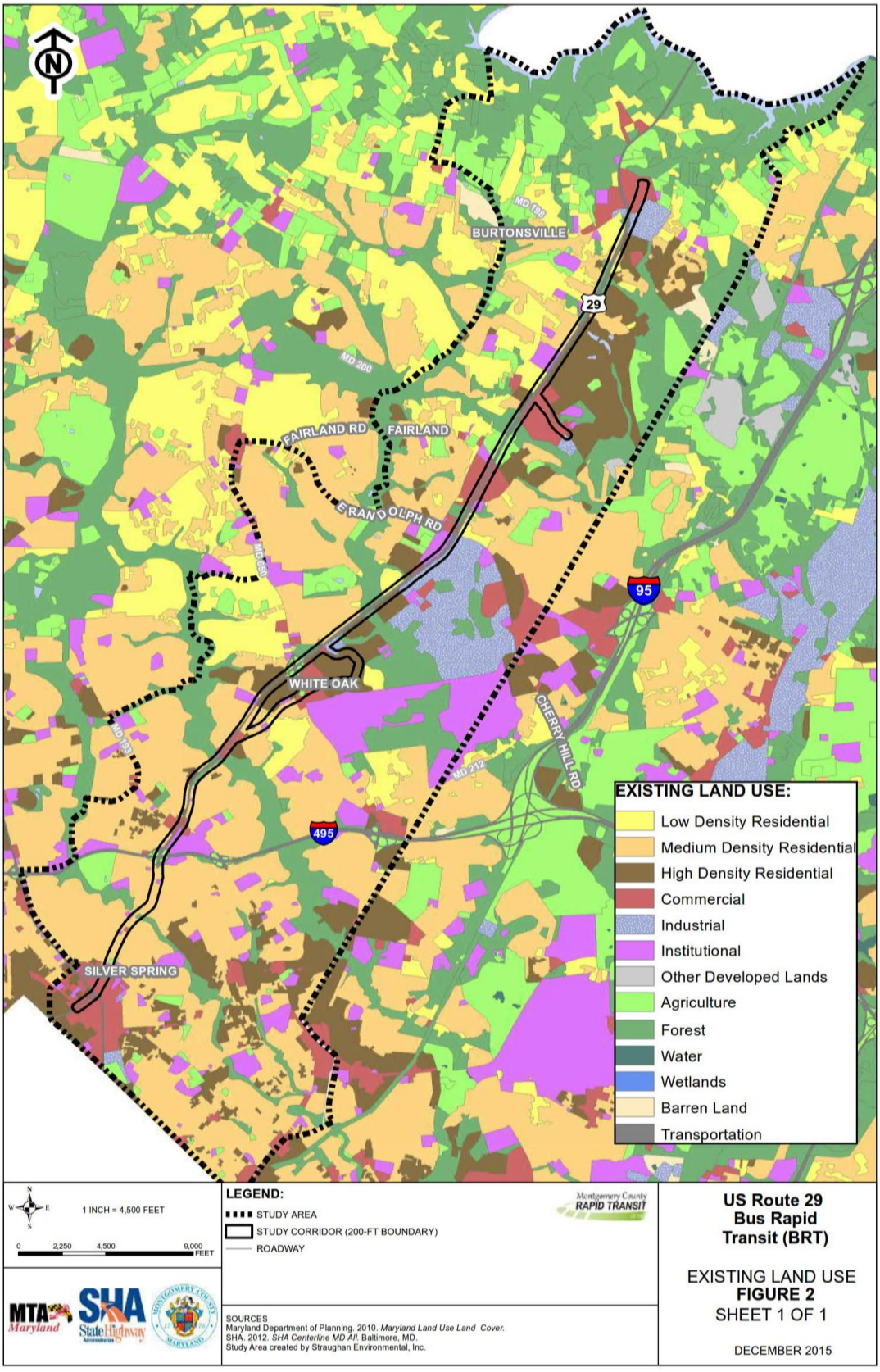
The US 29 serves as the spine that links the residential communities from Silver Spring to Burtonsville, with the regional activity and growth generators at Silver Spring and White Oak, and the robust activity centers that are a short distance away in Washington, D.C., and Howard County. US 29, and the well-established and well-patronized transit services in the study corridor offer good transportation, however, current challenges show that it may not meet needs of the study corridor as it grows.

Residential land uses are located throughout the study area (**Figure 2**). The majority is low and medium density, with some concentrations of high-density residential development near MD 650. Four Corners, Fairland, Burtonsville, and White Oak are just a few of the 14 residential communities in the study corridor. These and others like it are stable communities, many of them among the most desirable communities in Montgomery County. Commercial and institutional land uses are also dispersed throughout the corridor. Some industrial uses are located in the northern half of the study corridor near Industrial Parkway and Tech Road. A summary of Land use types and corresponding acreages within the study corridor are provided in **Table 2**.

Table 2: Land Uses and Acreage within Study Corridor

Land Use Type	Area (Acreage)
Low Density Residential	23
Medium Density Residential	132
High Density Residential	106
Commercial	136
Industrial	27
Institutional	33
Open Urban Land	14
Agriculture	11
Forest	52
Water/Wetlands	4
Transportation	132

Source: Maryland Department of Planning and SHA


BURTONSVILLE
MD 198
29
MD 200
FAIRLAND RD
FAIRLAND
E RANDOLPH RD
MD 650
95
WHITE OAK
CHERRY HILL RD
MD 212
MD 193
495
SILVER SPRING
EXISTING LAND USE:
Low Density Residential
Medium Density Residential
High Density Residential
Commercial
Industrial
Institutional
Other Developed Lands
Agriculture
Forest
Water
Wetlands
Barren Land
Transportation
1 INCH = 4,500 FEET
0 2,250 4,500 9,000 FEET
LEGEND:
STUDY AREA
STUDY CORRIDOR (200-FT BOUNDARY)
ROADWAY
SOURCES
Maryland Department of Planning. 2010. Maryland Land Use Land Cover.
SHA. 2012. SHA Centerline MD All. Baltimore, MD.
Study Area created by Straughan Environmental, Inc.
US Route 29
Bus Rapid
Transit (BRT)
EXISTING LAND USE
FIGURE 2
SHEET 1 OF 1
DECEMBER 2015

The commercial/retail uses are concentrated near the Silver Spring Transit Center, White Oak, and Burtonsville. White Oak and Silver Spring are regional activity centers that are expected to drive growth in the area, as envisioned by the approved and adopted White Oak Science Gateway Master Plan and the Silver Spring Central Business District (CBD) Sector Plan.

The White Oak Science Gateway Master Plan covers nearly 3,000 acres and envisions development that comprise the existing FDA Headquarters and Research Center, a Life Sciences/FDA Village, and the Hillandale Community.

The Silver Spring CBD Sector Plan Center envisioned and laid the foundation for much of the development that has happened in the CBD. Downtown Silver Spring is home to the Discovery Communications, the National Oceanic and Atmospheric Administration, and numerous retail, civic and entertainment venues that were envisioned for its revitalization and new development. The Sector Plan also drives the vision for future development.

2.1.2 Population and Jobs

In 2014, population in the study corridor is estimated at 137,495 according to the Maryland Washington Council of Governments (MWCOG) Transportation Planning Board (TPB). Nearly 60% of the population in the corridor is minorities and 5% of the households in the corridor are considered low-income.

The MWCOG/TPB estimates the 2014 number of households at 52,064 and employment at 67,125 jobs in the corridor. The activity centers at White Oak and Silver Spring are expected to drive future growth in the corridor.

Based on the 2010 decennial Census, as well as more recent American Community Surveys, Maryland has the highest median household income in the country. The most recent 5-yr estimate is $72,483.

2.1.3 Transit-Dependent Populations

U.S. Census data are used in determining potential minority or low-income populations (see **Appendix C, Table 8**). Consistent with SHA's guidelines, minority populations are identified as Block Groups with a meaningfully greater percentage of minorities than that of a greater geographic region. For this planning study, Block Groups with minority populations greater than or equal to that of Montgomery County are considered potential environmental justice populations. Minority populations will include persons who identify themselves as Black or African-American, Asian, American Indian/Alaskan Native, Native Hawaiian/Pacific Islander,

Other, Two or More Races, or any person of Hispanic descent. Likewise, low-income populations will include Block Groups with meaningfully greater percentage of persons living below the federal poverty level than that of a greater geographic region. For this planning study, Block Groups with the percentage of persons living below poverty greater than or equal to that of Montgomery County are considered potential environmental justice populations.

Based on the 100 percent count data from the 2010 U.S. Census, 48 of the 99 Block Groups within the project vicinity are potential minority populations. Based on the 2009-2013 U.S. Census American Community Survey Estimates, 19 of the 99 Block Groups are potentially low-income populations (see **Appendix C**, **Sub-Appendix A**, **Figure 1**). The Block Groups with potential minority populations are concentrated immediately along either side of US 29 north of New Hampshire Avenue (MD 650), as well as the southern portion of the study area near downtown Silver Spring. The Block Groups with potential low-income populations are dispersed throughout the study area with the only concentration just northeast of the US 29 and Intercounty Connector (MD 200) interchange.

Corridor Snapshot

- Two regional activity centers, Silver Spring and White Oak/FDA, serve as an engine for activities and travel in the study area.
- Strong employment growth in these two regional activity centers is forecasted for 2040, with a growth of almost 80% over current levels.
- Intra-study-area trips represent a significant share of travel market for the study area, with approximately 40% of total trips in 2014 and are expected to increase by nearly 30% in 2040.
- DC-bound commuting trips were a major out-flow of trips from the study area, with approximately 20,000 residents living in the study area and commuting to DC.
- Another major DC-bound commuting flow of approximately 10,000 was from Howard County.
- Severe congestion exists north of the beltway on the US 29 corridor and is forecast to exacerbate in the future 2040 condition.
- The study area has a strong transit market, including an average weekday daily Metrorail ridership of approximately 13,000 for Silver Spring Station and more than 15,000 boardings for the Metrobus Z line buses, Ride On buses, and MTA commuter buses.

2.2 Existing Transit Services

One of the attractions of the US 29 Corridor Study Area is its transit service. Montgomery County Ride On, Washington Metropolitan Transit Authority (WMATA) Metrobus Z Line bus, and the MTA Commuter Bus operate in the corridor. WMATA provides Metrorail service at the Silver Spring Station, which is near the recently built Silver Spring Transit Center.

The Transit Center serves as a hub for the Metrorail, MARC, Ride On and Metrobus, and local shuttle services. It is also a future stop for the planned Purple Line Light Rail, scheduled to be completed in 2021. The MTA MARC Brunswick Commuter Rail Line stops in Silver Spring, less than a block away from the Metrorail station. Understanding the transit services – Ride On, Metrobus, Metrorail and MARC – as they operate and perform today provides insight into the challenges that exist for the future. **Figure 3** shows the transit services in the US 29 Study Area.

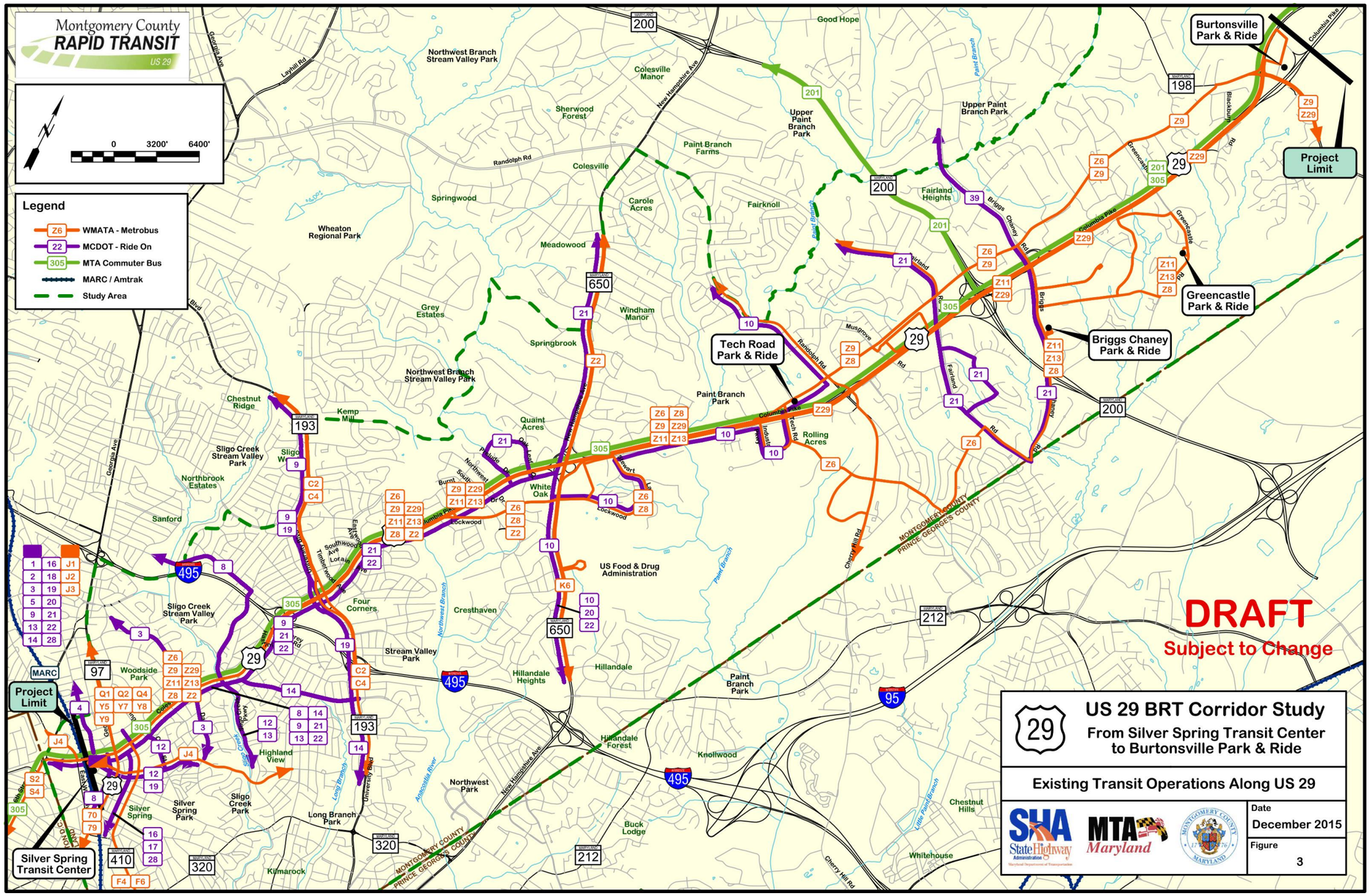
2.2.1 Montgomery Ride On Bus

Table 3 provides a summary of the Montgomery County Transit Ride On Service that covers portions of the US 29 BRT Study Corridor Area with a 20-30 peak period headways. Four of the routes, the 8, 9, and 10, these services generally make frequent, all day stops throughout the corridor at and operate at headways ranging from 20-30 minutes. Routes 13, 21 and 22, which operate on a more limited, peak period stop schedule - only stopping during weekday morning and evening peak travel times - and operate with a lower frequency.

Table 3: Montgomery Ride On Bus Services Summary

Bus Routes	From	To	Headway Peak	Headway Off-Peak	Span of Service
Route 8	Silver Spring	Wheaton	25-30 min	30 min	Weekday (5:50am – 8:31pm) Saturday (7:15am – 7:46pm)
Route 9	Silver Spring	Wheaton	20-30 min	20-30 min	Weekday (4:46am – 10:58pm) Weekend (6:30am – 9:55pm)
Route 10	Twinbrook	Station-Hillandale	20-30 min	20-30 min	Weekday (4:39am – 11:07pm) Weekend (6:39am – 11:08pm)
Route 13	Silver Spring	Takoma	25-30 min	n/a	Weekday (5:50am – 7:45pm) No Mid-Day Service
Route 21	Silver Spring	Briggs Chaney Park and Ride	20-30 min	n/a	Weekday (5:36am – 7:58pm) No Mid-Day Service
Route 22	Silver Spring	Hillandale	20-30 min	n/a	Weekday (5:45am – 7:25pm) No Mid-Day Service

Source: Montgomery County Ride On



Sources: WMATA Metrobus, Ride-On, MTA.

2.2.2 Metrobus

Several Metrobus Z Line buses serve the US 29 Corridor and the rest of the study area. These Z Line buses are mostly weekday services, except for Z8. Several are peak services only, including Z2, Z9/Z29, and Z11/Z13. The Z2, Z6, and Z8 lines provide local service, while Z9/Z29 and Z11/Z13 provide express service.

Most buses run on headways of 6-15 minutes, as summarized in **Table 4**. The Z lines serve the area between Silver Spring Metro and Lockwood Drive/New Hampshire Avenue and offer combined average service headway of 10 minutes in the AM peak and 6-7 minutes in the PM peak. The combined average service headway declines further north; 15 minutes in the AM and 8.5 minutes in the PM from Lockwood Drive/New Hampshire Avenue to US 29 and Industrial Parkway, and 30 minutes north of Industrial Parkway.

The study corridor is a portion of WMATA's Colesville Road/Columbia corridor. This is part of WMATA's Priority Corridor Network (PCN), which is a set of strategies for improving bus service travel times, reliability, capacity, efficiency, and system access. As part of the PCN initiative, WMATA recently conducted the Metrobus Z Line Study. The Z-line study made a series of short, medium, and long-term recommendations for service, operational, traffic operations, and passenger facility improvements. Proposed improvements ranged from modifying span of service (additional weekday and weekend service), adding stop amenities (trashcans, benches, etc.), implementing traffic signal optimizations, to providing new limited stop express service routes. More details from the Z-line are located in **Section 3.1.2** of this document and on-line at: http://www.metrobus-studies.com/Z_Line/Z_Line.html

Table 4: Metrobus Services Summary

Bus Routes	From	To	Headway Peak	Headway Off-Peak	Span of Service
Z2	Silver Spring	Olney	6-15 min	n/a	Weekday (5:32am – 8:06pm) No Mid-Day Service
Z6	Silver Spring	Burtonsville Crossing Park and Ride	6-15 min	20-30 min	Weekday (5:03am – 10:24pm)
Z8	Silver Spring	Greencastle Park and Ride	6-15 min	20-30 min	Weekday (4:50am – 2:19am) Weekend (4:54am – 1:24am)
Z11, Z13	Silver Spring	Greencastle Park and Ride	6-15 min	n/a	Weekday (5:18am – 8:13pm) No Mid-Day Service
Z9, Z29	Silver Spring	Greencastle Park and Ride	6-15 min	n/a	Weekday (5:20am – 7:18pm) No Mid-Day Service

Source: WMATA

2.2.3 Metrorail

The Silver Spring Metrorail station (**Figure 4**) is located at the south end of the study area. The other Metrorail stations close to the study area include Forest Glen, Glenmont, and Wheaton. The Red Line is the busiest Metrorail line running through downtown District of Columbia (DC) and connecting Montgomery County and downtown DC. The U-shaped Red Line alignment is approximately 31.9 miles from Shady Grove to Glenmont, and the US 29 Study Area is on its east leg. As shown in **Table 5**, the Red Line has frequent service during the weekday rush hours, and it provides reasonably frequent services during off-peak hours and weekends. It does not, however, run through the entire study area.

Figure 4: Silver Spring Metrorail Station

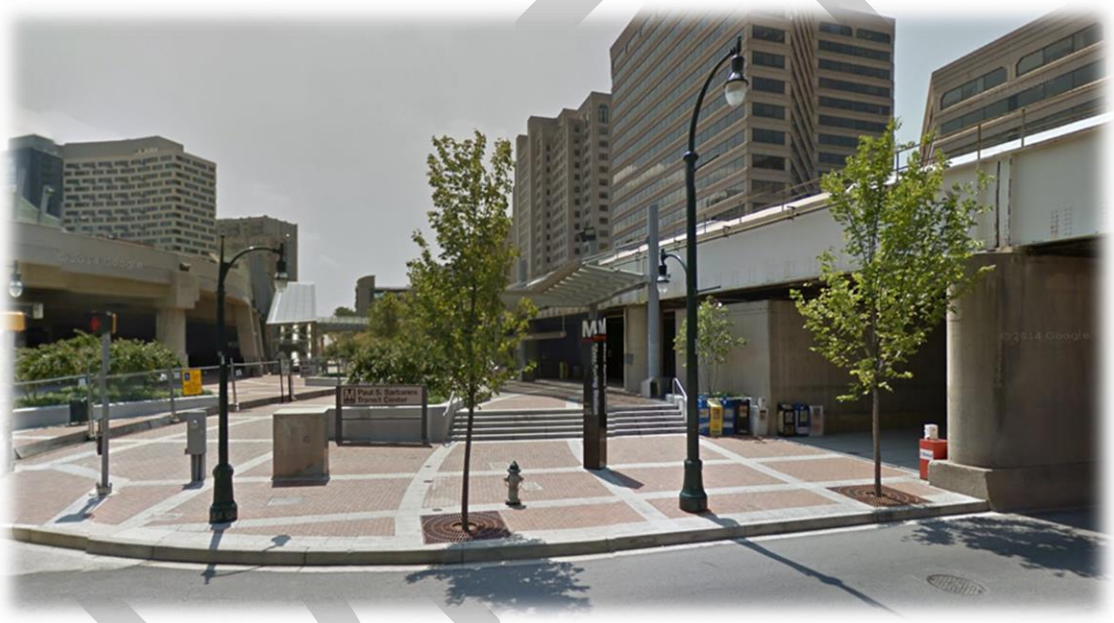


Table 5: Metrorail Service Summary

	Headways				
Weekday	**AM Peak**	**Midday**	**PM Peak**	**Evening**	**Late Night**
Monday to Friday	3-6 min	12 min	3-6 min	6-10 min	15-18 min
Weekend	**Daytime**			**Late Night**	
Saturday	12 min			15 min	
Sunday	15 min			15 min	

Source: WMATA.

2.2.4 MTA Commuter Services: Bus and MARC

MTA provides commuter bus services between Columbia/Ellicott City and District of Columbia, including Route 305, 315, and 325, as show in **Table 6**. These commuter buses operate in the peak direction during peak periods, with 20-minute headway. In the southbound direction, Route 305 and 315 typically pick up passengers in Howard County and at the Burtonsville Park and Ride and discharge passengers at only two locations in the study area – at Fenton Street, and the Silver Spring Metrorail Station. The commuter bus does not provide service for trips originating within the US 29 Corridor Study Area.

Table 6: MTA Commuter Bus Services Summary

Bus Routes	From	To	Headway Peak	Headway Off-Peak	Span of Service
Route 305	Columbia Mall	Washington, D.C. (Library of Congress)	About 20 min	n/a	Weekday (5:08am – 9:01am and 1:45pm - 8:13pm) No Mid-Day Service
Route 315	Lette Plaza in Ellicott City	Silver Spring and Washington, D.C. (Navy Yard)	About 20 min	n/a	Weekday (5:16am – 8:47am and 3:32pm – 7:27pm) No Mid-Day Service
Route 325	Harper's Farm Village Center in Columbia	Silver Spring and Washington, D.C. (Library of Congress)	About 20 min	n/a	Weekday (6:26am – 8:41am and 4:05pm – 6:02pm) No Mid-Day Service
Route 201	Gaithersburg Park and Ride	BWI Marshall Airport and MARC/Amtrak Rail Station	About 60 min	About 60 min	Weekday (4:35am – 6:35pm) Weekend (4:32am – 6:32pm)
Route 202	Gaithersburg	DOT/Ft. Meade	About 60 min	About 60 min	Weekday (5:10am – 6:33pm)

Source: MTA.

The MARC Brunswick Line provides service between Washington, DC, and Martinsburg, West Virginia. Nine inbound trains stop at the Silver Spring station in the morning and nine outbound trains stop at the Silver Spring station in the afternoon and evening, Monday through Thursday. On Fridays, there is an additional outbound train. Like the Commuter Bus, the MARC are true commuter services, providing very limited service, generally at one-to-two stops in the study area.

2.3 Transit Usage

The sections above illustrate that the study area has a strong transit market. The magnitude of the existing transit ridership by different transit modes and providers is shown in **Table 7** and includes the following:

- With a daily ridership of approximately 13,000, Silver Spring Station is one of top suburban stations for the Metrorail system. Average Daily Ridership in the study area is summarized in Table 5.

- The combined ridership of the Metrobus Z Line Buses, Ride On Buses, and MTA Commuter Buses totals 15,000, with 11,000 on the US 29 Corridor.

- Local services Z6 and Z8 carry the largest ridership on the US 29 Corridor, accounting for over 60 percent of the ridership on the corridor.

- Transit travel patterns indicate the strongest transit market is on the southern portion of the US 29 corridor. The heaviest concentration of inbound boardings is within White Oak along Stewart Lane and Lockwood Drive, and the dominant concentration of inbound alightings is south of New Hampshire Avenue and Lockwood Drive. Outbound, the boardings are predominately concentrated in the line segment between Silver Spring and New Hampshire Avenue and Lockwood Drive, while the alightings are heavily concentrated along Stewart Lane and Lockwood Drive.

- The stops with the most boardings and alightings are between New Hampshire Avenue and Lockwood Drive and Silver Spring and include Silver Spring Station, New Hampshire Avenue and Lockwood Drive, Colesville Road and University Boulevard, and Colesville Road and Spring Street. Active stops also include Tech Road, Castle Boulevard, the Briggs Chaney Park and Ride, and Burtonsville Park and Ride.

- Transit load profiles show a predominant concentration of transit rider volumes in the southern portion of the US 29 corridor and a large increase in loads along Stewart Lane and Lockwood Drive. Transit activity shown in **Figures 5a and 5b**, below.

Figure 5a: 2015 Peak Average Daily Weekday Boardings for Northbound and Southbound WMATA Stops on US29

Source: WMATA APC data for Routes Z2, Z6, Z8, Z9/29, Z11/13

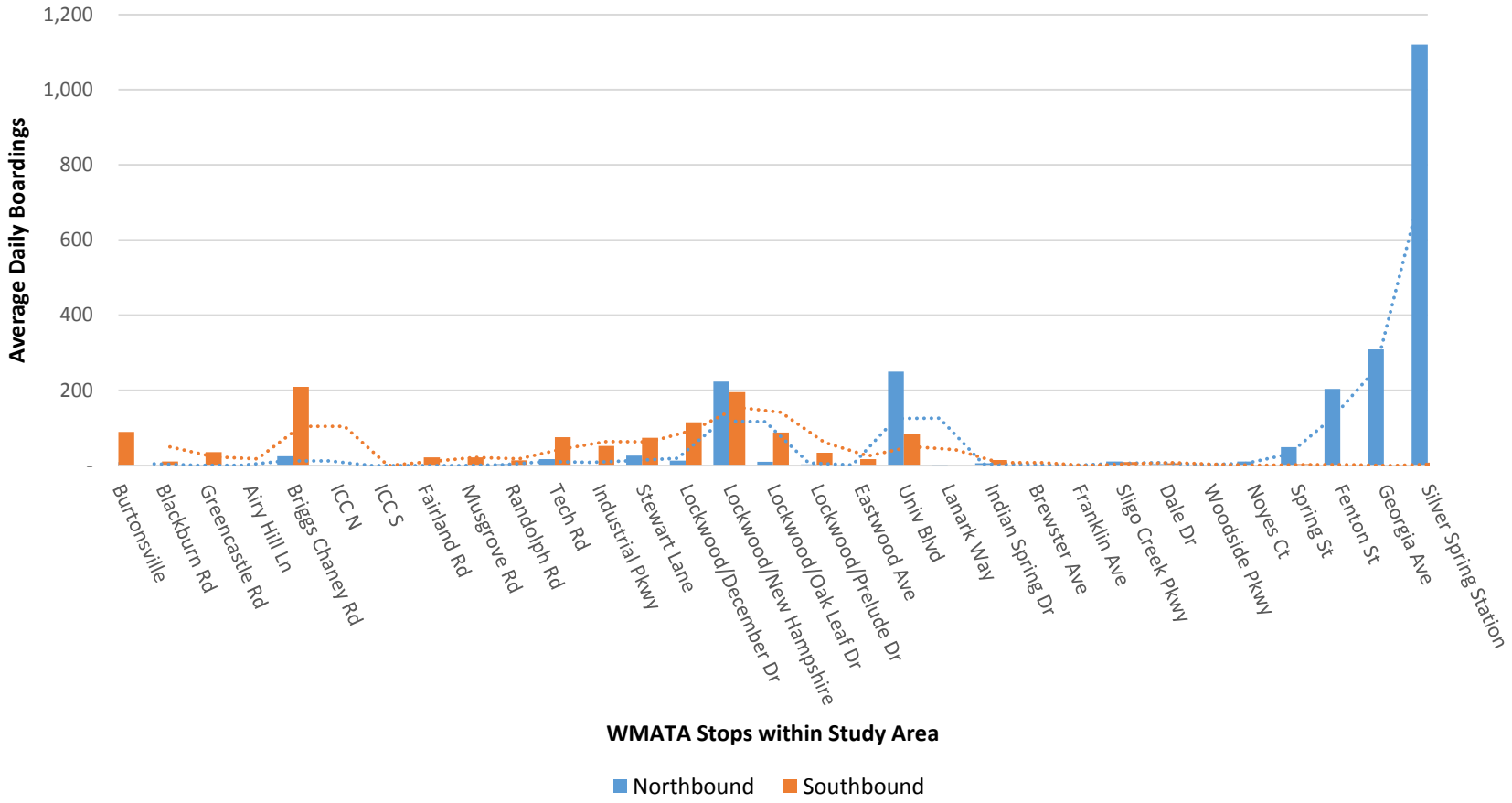


Figure 5b: 2015 Peak Average Daily Weekday Boardings for Northbound and Southbound Ride On Stops on US29

Source: Ride On data for Routes 8, 9, 10, 21, 22

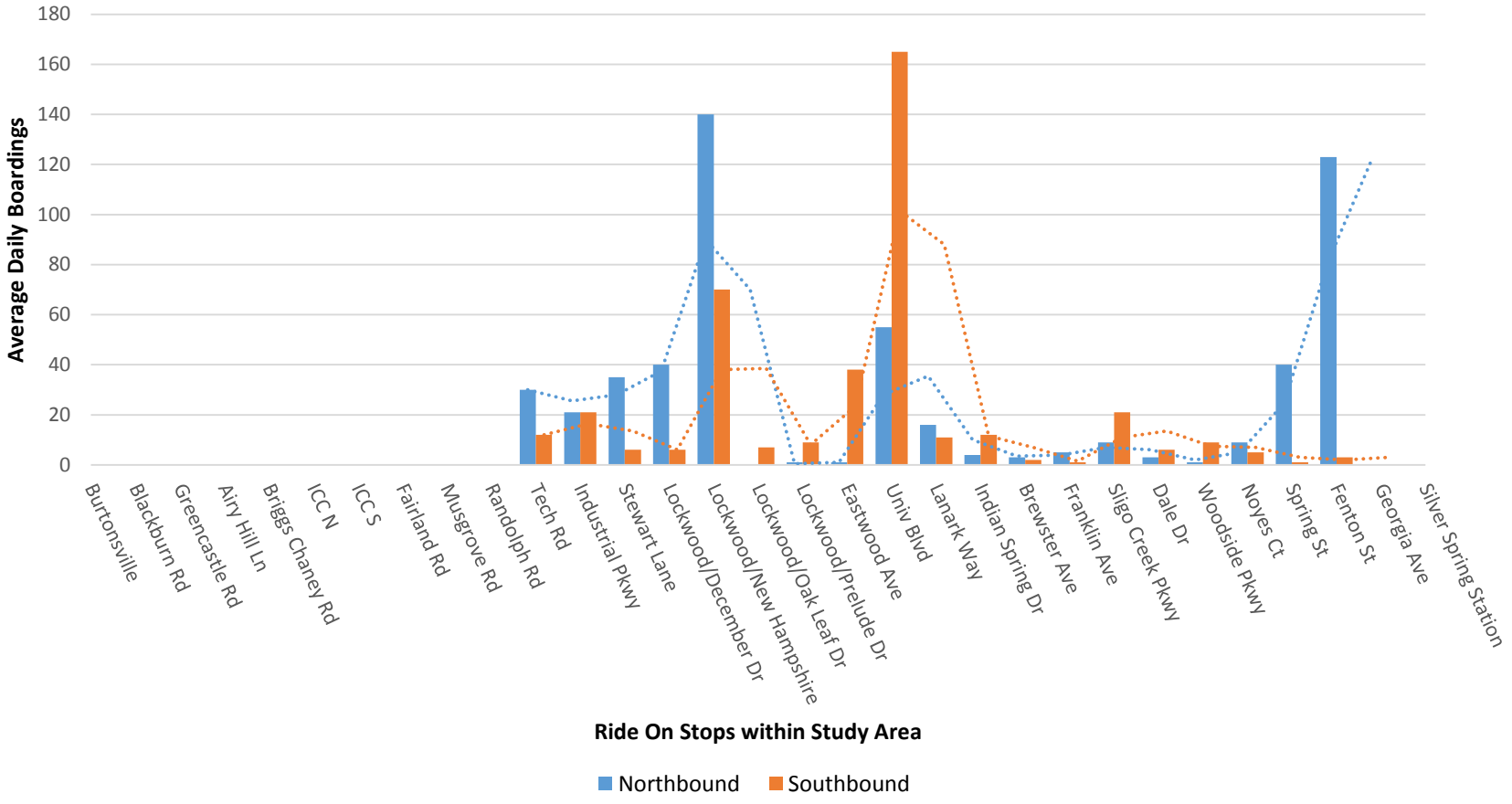


Table 7: Average Daily Ridership in the US 29 Study Corridor

Operator	Station/Route Name	Daily Ridership
WMATA Metrorail	Silver Spring	13,195
	Forest Glen	2,442
	Wheaton	4,227
WMATA Metrobus	Z2	853
	Z6	3,330
	Z8	3,923
	Z9/29	642
	Z11/13	1172
Montgomery Ride On	9	255
	10	346
	21	104
	22	260
MTA	201	85
	202	60
	305	155
	315	161
	325	43

Source: Metrorail: 2014 10-Year Historical Metrorail Ridership.
Metrobus: 16-JUL-14 Washington Metropolitan Area Transit Authority (WMATA) Ridership by Route and Stop.
Ride On Bus: FY13 Montgomery County US 29 Boarding and Alighting Data.
MTA: Feb 2015 MTA Average Ridership.

2.4 Roadway Characteristics

The roadway classification of US 29 changes from a principal arterial with traffic signals in the southern portion of the BRT corridor around Silver Spring and White Oak to a limited-access highway in the northern portion of the BRT corridor around Fairland and Burtonsville.

Along the US 29 BRT study corridor, there are six interchanges, 23 signalized and 22 unsignalized intersections, and numerous driveways. Some segments of the roadway include shoulders, medians, sidewalks, and curb and gutter that vary in design and utilization along the route. Utility poles and light poles are scattered throughout the corridor.

Along the Lockwood Drive/Stewart Lane segment, there are two signalized and 15 unsignalized intersections, and numerous driveways. This does not include the two intersections at US 29 /

Lockwood Drive and US 29 / Stewart Lane that were counted in the section above. Some segments of this roadway also include shoulders, sidewalks, and curb and gutter. Street parking is present in the northbound and southbound directions along Lockwood Drive and Stewart Lane where shoulders are provided. Utility and light poles are located within the right-of-way.

South of MD 650, US 29 has posted speeds of 30 to 45 mph. North of MD 650, US 29 has posted speeds of 45 to 55 mph. The posted speed limit along the Lockwood Drive/Stewart Lane segment is 30 mph.

There are four overpasses that cross over US 29; three grade separated roads and one rail line (shown above in **Figure 1**). These four facilities have column support structures in the median of US 29. In addition, there are three grade-separated underpasses that cross under US 29. All intersections along the Lockwood Drive/Stewart Lane corridor are at grade.

2.5 Existing Traffic Operations

The following is a discussion on the existing and future 2040 no-build traffic operations.

2.5.1 Corridor Travel Patterns - Study Area Daily Trip Patterns

Potential travel markets for the US 29 BRT depends on travel patterns related to the US 29 BRT study area.[1]

Major travel patterns and potential markets for the proposed US 29 BRT include:

- Internal trips within the US 29 Study Area represent a significant share of travel market for the study area, with 37 percent of total trips of the study area in 2014;
- Internal trips are expected to increase by 29% in 2040, compared with those in 2014;
- DC-bound commuting trips were a major out-flow of trips from the study area, with 19,500 residents in the study area commuting to DC for work, based on the 2006-2010 CTPP;
- Another major DC-bound commuting flow of approximately 10,000 was from Columbia and Ellicott City areas north of the US 29 BRT Corridor, which can use US 29 as a commuting route to DC;

[1] Appendix A includes additional information on travel patterns in the study area. Tables 2.4 and 2.5 in Appendix A show the district-level flows of daily person trips for 2014 and 2040, respectively, based on the TPB/MWCOG Version 2.3.57 model results. Figure 2.11 highlights the major worker flows, which are the potential markets for the US 29 BRT, based on the 2006- 2010 CTPP. Similarly, Figure 2.12 displays the major flow patterns of outbound person trips from a home or non-home location, based on the 2014 TPB/MWCOG model results, while Figure 2.13 shows the 2040 flow patterns.

- A smaller number of workers also commuted to work in the study area from Columbia and Ellicott City areas (3,400) and DC (4,000);

Trips to the study area are forecast to increase significantly because of strong employment growth, for example, by 29% from Columbia and Ellicott City areas and DC.

2.5.2 Roadway Congestion

Roadway congestion presents a daily reminder of the high levels of activity that define this corridor, and the congestion is anticipated to worsen as growth and economic development continue to expand in the corridor and the region. Several roadway sections exceed their volume to capacity ratio to the point that they are considered "failing". There are six roadway sections that operate at Level of Service[2] (LOS) F and nine that are at LOS E (See **Appendix A, Table 1A in Sub-Appendix C** for more details on LOS). These grades represent very poor existing traffic operations for the corridor that lead to extended travel times and vehicles detouring to other facilities.

Current Average Daily Traffic (ADT) volumes in the study corridor range from a low of approximately 39,600 vehicles south of Fenton Street to a high of 79,400 vehicles north of Crestmoor Drive. Shown in **Table 8** below is the variation of traffic across the corridor at major crossroads.

Table 8: Existing 2015 Average Daily Traffic

Roadway Sections (North to South)	2015 Existing Average Daily Traffic (vehicles) *Lowest - Highest*
Sandy Spring Road (MD 198) to Cherry Hill Road/E. Randolph Road	70,900 – 73,700
Cherry Hill Road/E. Randolph Road to New Hampshire Avenue (MD 650)	59,800 – 71,600
New Hampshire Avenue (MD 650) to University Boulevard (MD 193)	65,500 – 79,400
University Boulevard (MD 193) to Capital Beltway (I-495)	74,000
Capital Beltway (I-495) to Georgia Avenue (MD 97)	39,600 - 65,200

[2] Level of Service is a traffic analysis tool used to communicate the operational integrity of roadway segments and intersections. Similar to school grading systems, LOS grade of A through C are considered acceptable operations with little to no delay. Grades of D, E, and F are signs of poor traffic operations that show potentially long delays and congestion.

2.6 Existing Environmental Resources

The US 29 BRT study area contains multiple properties that have been inventoried during historic resource surveys and entered into the Maryland Inventory of Historic Properties. A list of those resources is listed in **Table 9**, below. Of those historic resources on the Maryland Inventory of Historic Properties, some resources have not been evaluated for National Register of Historic Places (NHRP) eligibility, but most have had eligibility determinations and have been listed, determined eligible, or determined not eligible for the NRHP. Two of the resources (the Silver Spring Theater and Shopping Center, M:36-7-1) have preservation easements on the property.

Table 9: MIHP Resources and Preservation Easements

MIHP Number	Resource Name	Town	NRHP Eligibility
M: 15-88	Henry S. Krusen House (Bricefield Property)	Burtonsville	Not Eligible (demolished)
M: 32-05	Polychrome Historic District (Polychrome Houses)	Woodmoor	Listed NR-1169
M: 32-7	Argyle Park Neighborhood	Silver Spring	Not Eligible
M: 32-11	North Hills of Sligo Park	Silver Spring	Not Eligible
M: 32-12	Indian Spring Club Estates/Indian Spring Terrace/Indian Spring Manor	Silver Spring	Not Eligible
M: 32-15	Sligo Creek Parkway	Silver Spring, Takoma Park, Hyattsville	Eligible
M: 32-16	Fairway, Chalfonte, Country Club Park, Country Club View	Silver Spring	Not Eligible
M: 32-21	Choi Property	Silver Spring	Not Eligible
M: 33-22	Robert B. Morse Water Filtration Plant	Woodmoor	Eligible
M: 33-26	Bridge 15035	Silver Spring	Eligible
M: 33-27	Bridge 15009, Burnt Mills Bridge	Woodmoor	Not Eligible
M: 34-3	Pease House (Duvall House)	Burtonsville	Not Evaluated (demolished)
M: 34-18	Carroll House (John Hardesty Property)	Burtonsville	Not Eligible
M: 34-19	Samuel S. Aitcheson House (Walter Fehr Property)	Burtonsville	Not Eligible
M: 34-21	Willard Marlow House I & II (William Ellin Property)	Colesville	Not Eligible
M: 34-39	John Hardisty House	Burtonsville	Not Eligible (demolished)

Table 9: MIHP Resources and Preservation Easements

MIHP Number	Resource Name	Town	NRHP Eligibility
M: 34-40	Jackson Yang Property	Burtonsville	Not Eligible
M: 34-41	Carroll and V.E. Ricketts Property	Burtonsville	Not Eligible
M: 34-43	Stephen C. Beaver III House	Silver Spring	Not Eligible
M: 34-53	Fairland Data Center	Silver Spring	Not Eligible
M: 35-142	Georgetown Branch, B&O Railroad	Chevy Chase	Not Eligible
M: 36-7	Old Silver Spring Commercial Area	Silver Spring	
M: 36-7-1	Silver Theatre and Silver Spring Shopping Center	Silver Spring	Eligible
M: 36-7-1	Preservation Easement, Silver Spring Shopping Center (E-568)	Silver Spring	not applicable (n/a)
M: 36-7-1	Preservation Easement, Silver Theatre (E-581)	Silver Spring	n/a
M: 36-7-2	Montgomery Arms	Silver Spring	Eligible
M: 36-7-3	J.C. Penney Co. Building	Silver Spring	Facadectomy
M: 36-7-4	City Springs (No Documentation on File)	Silver Spring	Not Evaluated
M: 36-9	Mrs. K's Toll House	Silver Spring	Not Evaluated
M: 36-18	Woodside Park Historic District	Silver Spring	Not Evaluated

In addition, many other properties over forty-five years of age are located adjacent the project limits that have not been previously inventoried or evaluated for the NHRP. These unevaluated properties include, but are not limited to, the following:

- Calverton Neighborhood
- 12721 Deer Park Drive
- Rolling Acres, Section 1
- Springbrook Village
- 1302 Milestone Drive
- Burnt Mills Townhouses (1968)
- Burnt Mills Village
- Burnt Mills Manor
- Woodmoor
- Northwood Park View
- Northwood Park
- Indian Spring View
- Four Corners Commercial Area
- Seven Oaks
- South Woodside Park
- Bridge 151010
- First India United Methodist
- Silver Spring Library
- 8915 Colesville Road
- Colesville Towers Road
- 1000 Noyes Drive
- 8808 Colesville Road
- Colespring Plaza, 1001 Spring Street
- Spring-Colesville Parking Garage, 1000 Spring Street
- 8728 Colesville Road
- 8727 Colesville Road
- 8501 Colesville Road

Several significant pockets of natural resources dot the corridor. The study area is located entirely within the Anacostia River watershed, spanning from the watershed's northern most boundary to the southern limit. There are four main tributaries of the Patuxent River and sub-basins of the Anacostia that cross through the US 29 study area including Sligo Creek, Northwest Branch (See **Figure 1 and Figure 6**), Paint Branch, and Little Paint Branch.

Figure 6: Northwest Branch, looking towards southeast

Based on preliminary review of available data, nine potential wetland systems were identified within the study area. Three of these wetland systems were identified along the west side of Wexhall Drive, parallel to US 29. Another system was identified near US 29 within an existing forest conservation easement. Two other wetlands were identified on the east side of US 29 near Randolph Road. A potential linear wetland was identified along northbound US 29 just north of Stewart Lane. Finally, two potential wetlands were identified along southbound US 29, one at Prelude Drive and one within Sligo Creek Stream Valley Park. There are no Wetlands of Special State Concern (WSSC) or associated 100-foot buffers located within the study area.

Six streams were identified by the Department of Natural Resources (DNR) as crossing under US 29; Sligo Creek, Northwest Branch, Paint Branch, and three small tributaries associated with Little Paint Branch. Several potential intermittent and ephemeral streams associated with these large perennial waters are also located within the study area.

The study area crosses the 100-year floodplain associated with Sligo Creek, Northwest Branch, and Paint Branch. Authorization from The Maryland Department of the Environment (MDE)is required for project activities that occur within floodplains, including bridges or culverts and temporary construction impacts. Any construction in non-tidal floodplains would require a Waterway Construction Permit from the MDE.

There is no Federal or state parkland located within the study area. One water supply park, the T. Howard Duckett Watershed is owned by the Washington Suburban Sanitary Commission (WSSC) and is located just north of the study limits along the Patuxent River. All other parkland within the study area is owned by the M-NCPPC. See **Appendix C, Table 10** for a detailed list of the parklands.

3 Needs, Problems and Issues

Based upon analysis of this US 29 corridor and feedback from elected officials, county planners, local residents and travelers, the study team has identified the following transportation problems and issues:

1. Limited appeal of existing transit services despite a strong market for transit trips
2. Roadway congestion and safety
3. Limited connectivity of facilities for pedestrians and bicyclists
4. Planned growth within the study area

3.1 Problems and Issues

These factors establish the basis of the needs for transit-related enhancements and ultimately define the purpose of this study, as described in **Section 3**.

3.1.1 Limited appeal of existing corridor transit services

Despite strong transit demand, existing corridor bus service is not attractive due to slow travel speeds, high delay, poor connectivity, unreliable service, and limited pedestrian and bicycle access

The existing transit services in the US 29 corridor have limited appeal as a travel option due to bus overcrowding, lengthy waiting and dwell times, and overall reliability.

Currently, the transit share for all trip purposes in the corridor is 10%, which is higher than transit share in Montgomery County on average. Single-occupant vehicle is the primary travel mode for all trip purposes, accounting for almost 46% of all trips in the study area in 2014. For Home-Based Work (HBW) trips, transit plays an important role, with about 35% of modal share in the study area. For Home-Based Non-Work (HBNW) and Non Home-Based (NHB) trips, transit

only accounts for about 3-4% of trips, while high-occupant vehicle shares are respectively 56% and 45%. More detailed information on transportation mode share provided in **Appendix A, Section 2.2**)

Currently, bus travel times along the corridor take up to an average of over 20% longer than automobile trips, reaching as high as 60% longer in certain segments. Latest on-time performance evaluations indicate a 66% on-time performance for the most heavily utilized bus route in the corridor (WMATA Z8), with average travel speeds between 8 and 18 miles per hour during the peak-hours in the most urbanized sections of Silver Spring. See **Tables 10a and 10b** for a summary of anticipated changes in average bus travel times and speeds. **Table 11** provides a summary of on-time bus performance. It is anticipated that 2040 future bus travel times will increase by a total of 13 minutes in the morning and 14 minutes in the evening peak hours.

There is a great potential for increasing the transit share in the study area, but achieving such a goal requires higher-quality transit service.

Table 10a: Existing 2015 vs. No-Build 2040 Average Bus Travel Times

	Southbound			Northbound		
	2015 Existing	2040 No-Build	Percent Increase	2015 Existing	2040 No-Build	Percent Increase
AM Cars & Trucks	34 min	45 min	32%	21 min	21 min	0%
AM Buses*	34 min	47 min	29%	25 min	25 min	0%
PM Cars & Trucks	23 min	25 min	9%	25 min	37 min	48%
PM Buses*	27 min	30 min	11%	30 min	44 min	47%

*This % increase does not affect buses individually; it is a network-wide bus miles traveled comparison.

Table 10b: Existing 2015 vs. No-Build 2040 Average Bus Speeds

	Southbound			Northbound		
	2015 Existing	2040 No-Build	Percent Difference	2015 Existing	2040 No-Build	Percent Difference
AM Cars & Trucks	21 mph	16 mph	27%	32 mph	33 mph	3%
AM Buses	20 mph	17 mph	16%	21 mph	21 mph	0%
PM Cars & Trucks	29 mph	29 mph	0%	27 mph	22 mph	20%
PM Buses	23 mph	22 mph	4%	27 mph	24 mph	12%

Table 11: Existing 2015 On-Time Bus Performance

Bus Service	On-Time Performance
Weekday AM	81%
Weekday PM	49%
Weekday Midday	68%
Weekend AM	90%
Weekend PM	82%
Weekend Midday	79%

Source: WMATA and Ride On

3.1.2 Limitations in Existing Transit Service

Service and reliability of existing transit services may be in need of enhancements to address know performance issues

A review of current services reveals that the MTA 305, 315, and 325 Commuter Bus and the Metrobus Z29 do not serve the entire corridor. Specifically, the MTA Commuter buses only serve limited stop locations during peak am and pm hours (stops at Burtonsville, Fenton Street, and Silver Spring), and Z29 limits riders from boarding/alighting between Blackburn and Spring St, with the exception of Oak Leaf Drive, Prelude Drive, and University Boulevard. Other Z-line routes serve most of the corridor but there are service gaps north of the Tech Road Park and Ride with routes deviating from the US 29 corridor. MCDOT Ride On service is fairly consistent from Silver Spring to Randolph Road but does not extend north of that location. Unlike the south portion of the corridor, which has a strong transit market, the north portion of the corridor is not well-served by transit.

The Metrobus Z Line provides service from Silver Spring to the Burtonsville Park and Ride. Like other traffic, the Z Line experiences delays due to traffic congestion that causes buses to queue or sit through multiple traffic signal cycles at intersections throughout the corridor. Similar issues are present along Lockwood Drive and Stewart Lane.

At this time there are lags in service that make it harder for users to utilize different transit options to travel the corridor. The WMATA Z-line study offered the following potential short-term operational changes to address these service issues (these improvements are tentatively scheduled to occur in March 2016):

- **Z6**: Improve weekday schedule reliability
- **Z6**: Add Saturday service between Silver Spring Transit Center and Castle Boulevard

- **Z8**: Reduce Saturday frequency to coordinate with new Z6 trips for added frequency on overlapping portions of routes Z6 and Z8
- **Z9, Z29**: Restructure service, combine with Z11, Z13
- **Z11, Z13**: Restructure service, combine with Z9, Z29

Reliability issues (adherence to schedule, bus bunching, slow travel times), creates an unacceptable level of service for those individuals who rely on public transit as their primary mode of transportation. Furthermore, the issues associated with the current bus service do not make it attractive to those individuals with access to alternate transportation options that could elect to take the bus if it offered comfort and convenience.

Another issue with existing bus service, which is generally true of all non-BRT bus systems, is onboard fare collection, which is a major source of delay. Fares are usually taken as riders board the bus through one access point. This adds to dwell time – the time the bus stays at the bus stop to allow for boardings, alightings, and fare collection – which makes the bus a less appealing travel option. Also, congestion in the roadway, particularly during peak hours, affects the frequency of buses as buses progress slowly through the congested corridor. Longer wait times cause a greater number of passengers to gather at a bus stop. When a large group of passengers boards a bus at one time, fare collection takes longer, buses are further delayed, and on-time performance is affected due to the increased dwell time at these stops.

Other contributors to inefficient bus service are closely-spaced bus stops, inefficient pedestrian movements, delays at poorly operating signalized intersections, merging movements into and out of traffic at stops. Bus speeds developed from field verified data collection efforts, show that along US 29 vary from 8 mph to 54 mph as shown in **Table 12**. Note that bus speeds are calculated directly from the travel times and thus include the dwell times at each stop.

Table 12: Existing 2015 Average Daily Traffic Speeds

US 29 Northbound	2015 AM (mph)	2015 PM (mph)
MD 97/Georgia Ave to Dale Dr	14	11
Dale Dr to Sligo Creek Pkwy	12	14
Sligo Creek Pkwy to Franklin Ave	24	19
Franklin Ave to I-495 Southern Ramp	34	33
I-495 Southern Ramp to I-495 Northern Ramp	39	37
I-495 Northern Ramp to EB MD 193	21	12

US 29 Northbound	2015 AM	2015 PM
EB MD 193 to WB MD 193	33	33
WB MD 193 to MD 650 Southern Ramp	33	29
MD 650 Southern Ramp to MD 650 Northern Ramp	42	35
MD 650 Northern Ramp to Fairland Rd	32	25
Fairland Rd to Briggs Chaney Rd	51	44
Briggs Chaney Rd to Greencastle Rd	34	28
Greencastle Rd to Blackburn Rd	43	44
Blackburn Rd to MD 198	54	54

US 29 Southbound	2015 AM (mph)	2015 PM (mph)
MD 198 to Greencastle Rd	17	40
Greencastle Rd to Briggs Chaney Rd	52	49
Briggs Chaney Rd to Fairland Rd	43	31
Fairland Rd to MD 650 Northern Ramp	19	36
MD 650 Northern Ramp to MD 650 Southern Ramp	8	42
MD 650 Southern Ramp to MD 193 Northern Ramp	12	26
MD 193 Northern Ramp to MD 193 Southern Ramp	23	15
MD 193 Southern Ramp to I-495 Northern Ramp	36	29
I-495 Northern Ramp to I-495 Southern Ramp	38	39
I-495 Southern Ramp to Franklin Ave	26	29
Franklin Ave to Sligo Creek Pkwy	16	8
Sligo Creek Pkwy to Dale Dr	20	11
Dale Dr to MD 97/Georgia Ave	19	12

Source: SHA and TPB/MWCOG

3.1.3 Growing BRT Market

Despite transit service issues, there is a growing market for a BRT service that is competitive with auto travel

As identified in the Countywide Bus Rapid Transit Study (2011) and in the Corridor Transitways Functional Master Plan (2013), Montgomery County seeks to enhance the existing and planned transit and transportation options throughout the County. In order to maintain or improve transit modal share, a higher quality of transit service is needed to attract new transit riders, including those who would regularly drive between points along the study corridor, or those who would benefit from longer trips and fewer stops, as offered by BRT. Generally, riders are attracted to transit service when travel times are reduced, reliability is increased, and they feel comfortable and safe.

Based on projected 2040 growth in population (13%), households (17%), and employment (78%) as shown in **Appendix A, Table 2.1**, and anticipated increases in daily trip production (13%) and attractions (43%) as shown in **Appendix A, Table 2.2**, the numbers show a potential increase in transportation demands. Combine these demographic and travel demand growth metrics with the anticipated growth in transit usage (7%), and there is strong evidence for a growing market for transportation facilities and services that could potentially be served by BRT.

3.1.4 Transit Demand and Dependency

Twelve percent[3] of metropolitan Washington D.C. area households without a private vehicle rely on transit, as do many low-income, disabled and elderly corridor residents – Some young adults are seeking independence from private vehicle ownership and multi-modal options

- *Five percent of study area households live below the poverty level*
- *Six percent of study area's population is disabled, and Silver Spring, White Oak, and Fairland communities have populations with 10 percent of the population disabled*
- *Twelve percent of study area's population is 65 years and older, 34% is 40 to 64 years old*
- *Many young adults are looking for locations to live and work that offer reliable multi-modal options*

The above data summaries provide evidence that there is a current and potentially growing need for transit services in the region and within the study area for those who do not currently own a private vehicle. While anticipated growth in employment may decrease the number of households living below the poverty level, there is a significant population within the study area that is aging and may require transit services. By providing improved connectivity and mobility through premium transit services, these transit-dependent populations may be better served.

In addition, according to recent reports by the American Public Transportation Association (APTA)[4], Millennials (those born between early 1980's and early 2000's – or today's young adults) are looking to find employment and homes in communities that have a multitude of transportation choices. In addition, a 2014 study by the Rockefeller Foundation and Transportation for America[5] reported that four in five millennials in 10 major U.S. cities say they want to live in places where they have a variety of options to get to jobs, school or daily needs. Millennials are "driven by pragmatism, with 46 percent saying a need to save money drives

[3] US Department of Commerce, Bureau of the Census, *Statistical Brief: Housing in Metropolitan Areas – Motor Vehicles Available*, August 2015
[4] American Public Transportation Association, *Millennials & Mobility: Understanding the Millennial Mindset*, 2015
[5] Rockefeller Foundation and Transportation for America, *Survey: To recruit and keep millennials, give them walkable places with good transit and other options*, 2014

their choices. Forty-six percent also note convenience of transit and multi-modal options, 44 percent want exercise, and 35 percent say they want to live in a transit-friendly neighborhood.

According to the APTA study and the Rockefeller/Transportation for America, Millennials would like to see the following from public transit in the next 10 years:

- 70 percent who currently do not have regular access to a vehicle say they could not afford to live in an area without access to public transportation
- 86 percent say that it is important that their city offer a low-cost public transportation system with affordable fares, especially for those earning less than $30,000 a year
- 64 percent say that the expense of owning a car is a major reason they want be less reliant on one, including 77 percent of millennials who earn less than $30,000 a year
- 91 percent believe that investing in quality public transportation systems creates more jobs and improves the economy.61 percent want more reliable systems
- 55 percent want real-time updates
- 55 percent want Wi-Fi or 3G/4G wherever they go
- 44 percent want a more user-friendly and intuitive travel experience.

3.2 Roadway Congestion and Safety

3.2.1 Congestion exists and will worsen as traffic volumes increase

The US 29 corridor is characterized by variable traffic congestion (depending on location within the corridor) that hinders bus mobility and results in unpredictable service and travel times (see **Appendix A, Table 3 in Sub-Appendix C**). This is especially true in the southern section near downtown Silver Spring, which has a more dense urban fabric and more narrow right-of-way This congestion also frequently causes existing Metrobus and Ride On bus service on US 29 to operate behind schedule.

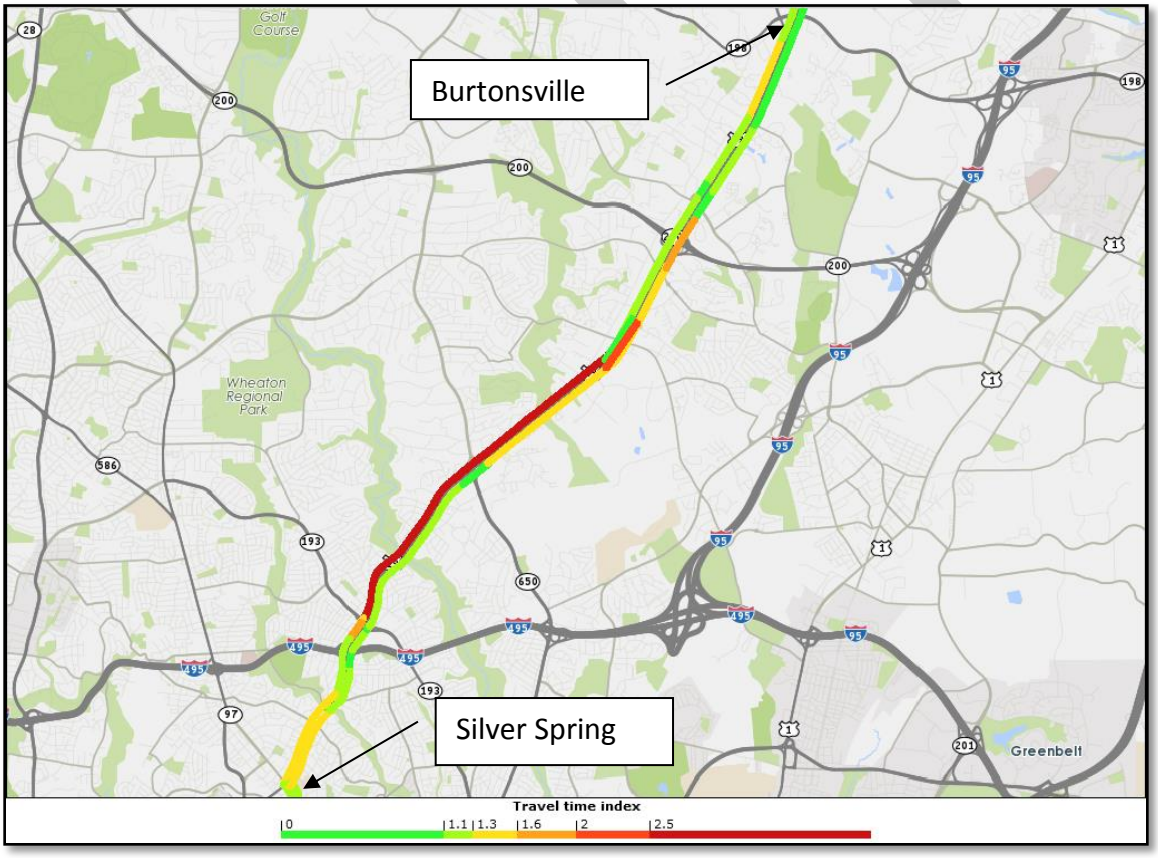
A preliminary review of the corridor congestion was collected from the Regional Integrated Transportation Information System (RITIS) for the two selected peak hours, 8:00-9:00am and 5:00-6:00pm, and averaged over the entire 2014 year for a typical Tuesday, Wednesday, and Thursday. Shown below in **Figures 7 and 8** are the Travel Time Indices (TTI) congestion maps.

TTI refers to the travel time represented as a percentage of the ideal travel time. This means the actual travel time under congestion is divided by the free-flow travel time for an estimate of the proportional time increase. The TTI value represents the travel time multiplicative needed to travel that same segment of roadway under congested conditions. Note that the color designations on the TTI maps shown below do not refer to LOS, which will be represented in later sections of this report.

The map below suggests congestion concerns for US 29 southbound in the morning peak hour, starting from Cherry Hill Road/E. Randolph Road and extending to University Boulevard (MD 193) with a 2.5 TTI. Additionally the Silver Spring downtown area experiences some delays between Sligo Creek Parkway and Georgia Avenue (MD 97) in both northbound and southbound directions.

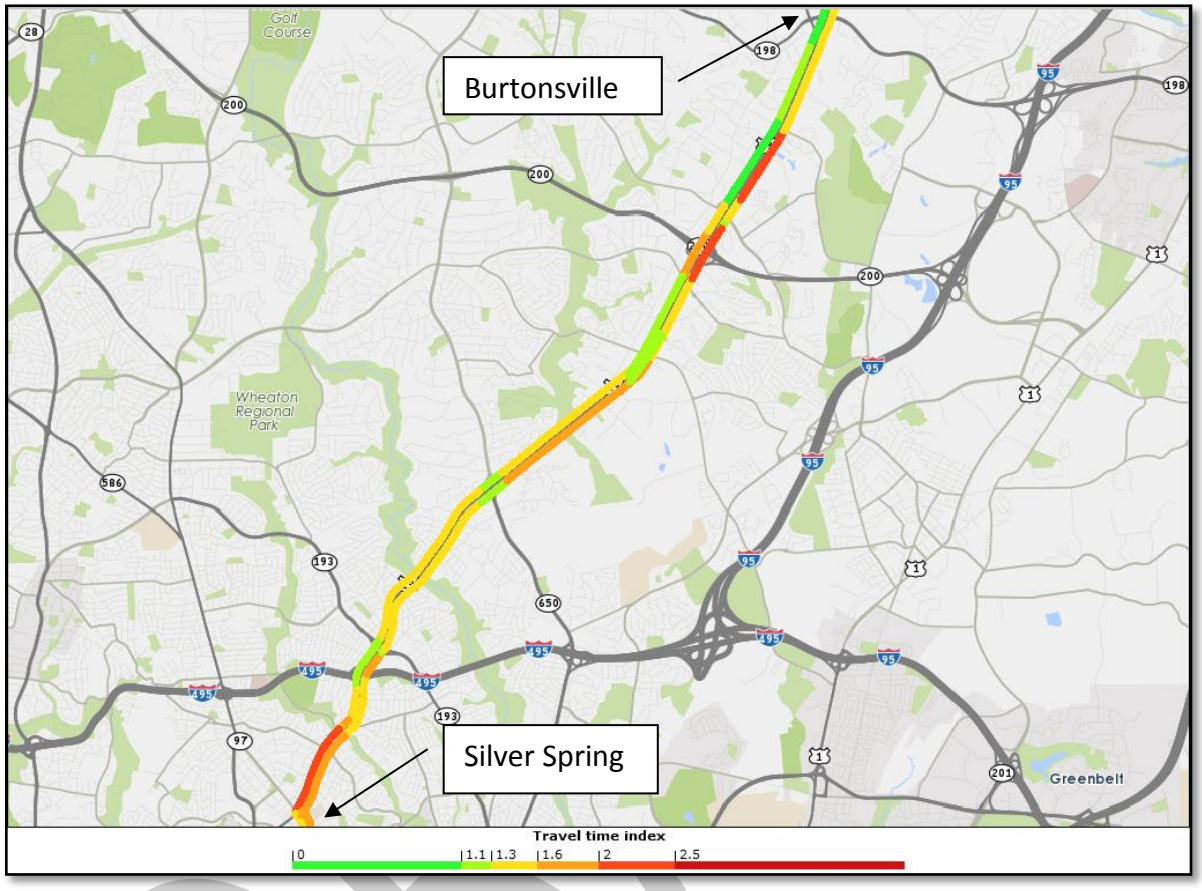
Under the afternoon peak hour congestion delays were noted throughout the US 29 corridor. The average congestion appears to be above a 1.3 TTI (yellow) with only spot locations operating between 0-1.3 TTI (green). The southbound direction of US 29 in Silver Spring also operates poorly while the northbound US 29 corridor has a larger number of segments above 1.6 TTI (orange and red). More details on TTI calculations are provided in **Appendix A**.

Figure 7: Morning Peak Hour Congestion Map in TTI



Source: RITIS.org, 2015.

Figure 8: Afternoon Peak Hour Congestion Map in TTI



Source: RITIS.org, 2015.

Congestion, when measured by Average Daily Traffic volumes and the Intersection Level of Service further demonstrate congestion problem in the US 29 Study Corridor, and the implications for bus travel times.

3.2.2 Average Daily Traffic

The Future 2040 No-Build ADT ranges from a low of approximately 41,700 vehicles south of Fenton Street to a high of 88,100 vehicles north of Crestmoor Drive (**Table 13**), an increase of 4% to 13% over existing 2015 volumes. This increase is representative of the anticipated growth in population, households, and economic development, and will exacerbate congestion In the US 29 Study Corridor.

Table 13: Existing 2015 Average Daily Traffic

Roadway Sections (North to South)	2015 Existing Average Daily Traffic (vehicles) *Lowest – Highest*	2040 No-Build Average Daily Traffic (vehicles) *Lowest - Highest*
Sandy Spring Road (MD 198) to Cherry Hill Road/E. Randolph Road	70,900 – 73,700	73,900 – 82,900
Cherry Hill Road/E. Randolph Road to New Hampshire Road (MD 650)	59,800 – 71,600	67,700 – 79,300
New Hampshire Road (MD 650) to University Boulevard (MD 193)	65,500 – 79,400	72,600 – 88,100
University Boulevard (MD 193) to Capital Beltway (I-495)	74,000	81,900
Capital Beltway (I-495) to Georgia Avenue (MD 97)	39,600 - 65,200	41,700 – 72,400

Source: 2015 Existing Data from Vehicle counts. 2040 No-Build Data from TPB/MWCOG regional transportation model Version 2.3.57, with land use forecast Round 8.3

3.2.3 Intersection Level of Service

Intersection LOS is calculated based on approach vehicular delays and has a recorded unit of seconds of delay per vehicle (sec/veh). The approach delays are weighted based on vehicular volumes and added to provide a total intersection delay, which is then translated to a LOS grade based on the latest 2010 Highway Capacity Manual (HCM).

Review of the US 29 operational results suggests two intersections fail, defined as delay greater than 80 sec/veh and also known as LOS F, under existing 2015 conditions: one in the AM peak hour and one in the PM peak hour. Additionally, four intersections operate poorly at LOS E with delays between 55 and 80 sec/veh). This happens in the PM peak hour for three out of the four intersections (see **Appendix A, Sub-Appendix C, Table 1A** for more detail).

Along US 29 alone, seven intersections are noted to fail under the AM and/or PM peak 2040 No-Build conditions. Seven intersections, associated with the US 29 corridor side streets, are also noted to fail under the AM and/or PM peak No-Build conditions. Also, eight intersections that were operating acceptably under Existing 2015 conditions now deteriorate to LOS E under 2040 No-Build conditions. The Future 2040 No-Build AM peak experiences five new major delay locations (i.e., LOS E or LOS F), while the 2040 No-Build PM peak experiences sixteen new major delay locations when compared to Existing 2015 conditions.

These poorly operating and failing intersections affect the speed with which buses could travel through the corridor.

Appendix A provides detailed LOS by intersection and arterial segment. Under these current and projected traffic conditions, motor vehicle and bus performance, including speed, reliability, and passenger comfort, are expected to decline in conjunction with these deteriorating traffic conditions.

3.2.4 Congested conditions contributing to higher than average crash rates

- *The segment of US 29 south of MD 97 has a significantly higher crash rate than the statewide average for similar state-owned roadways.*

Coinciding with high levels of roadway congestion, corridors often experience safety issues. The segment between MD 97 and Spring Street, which includes portions of US 29 closest to the Silver Spring CBD, was identified as a significantly higher than statewide average rate for similar state-owned roadways. A total of 1,088 crashes were reported along the US 29 corridor during the three-year study period from 2011 to 2013. Three (3) crashes resulted in three (3) fatalities. Four hundred forty-seven (447) of the crashes resulted in injuries to 649 vehicle occupants. There were 25 incidents involving pedestrians and/or bicyclists. Additional details related to reported crashes along US 29 are provided in **Appendix A**.

3.3 Limited connectivity for pedestrians and bicyclists

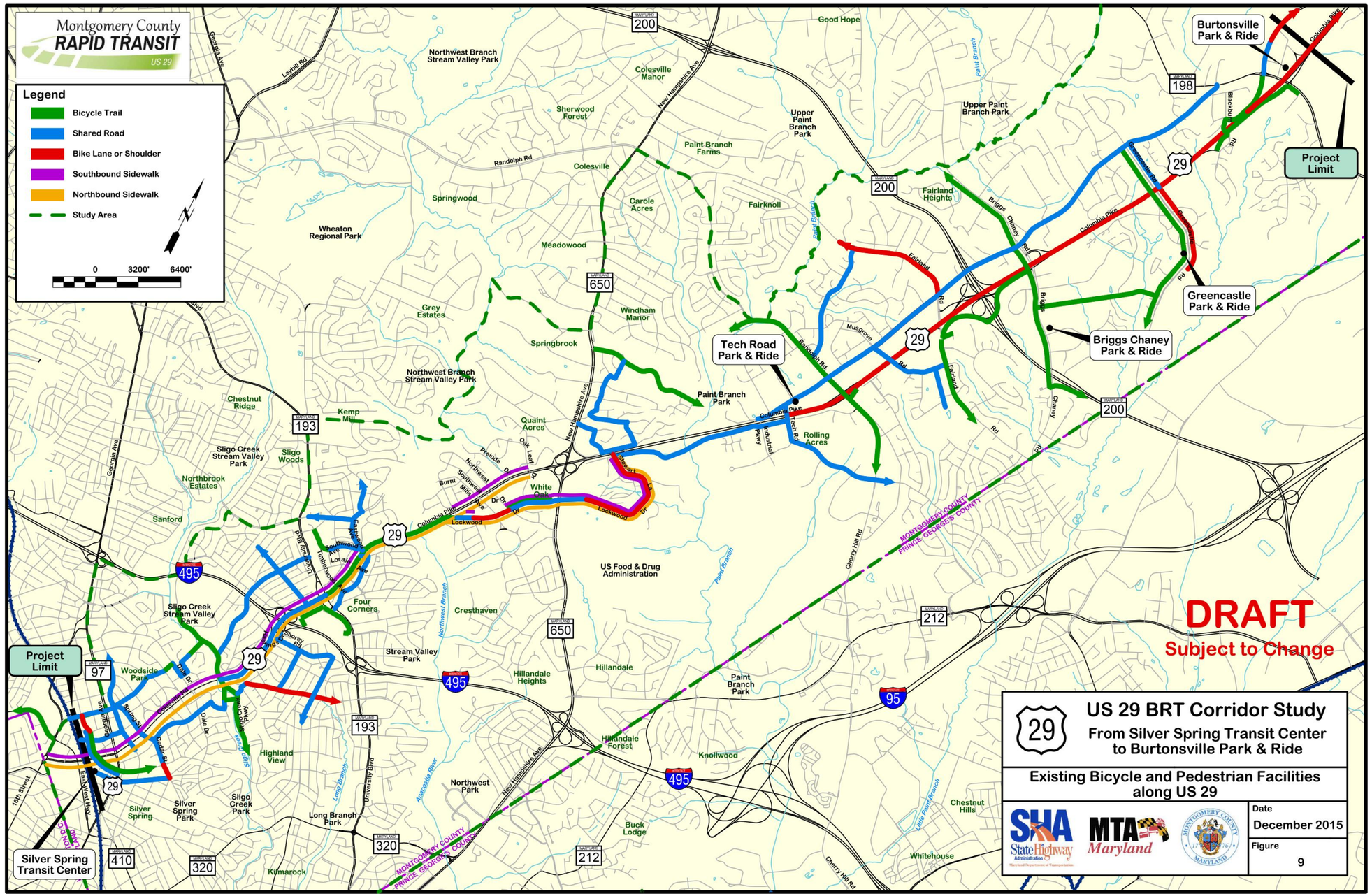
Accommodations for walking and bicycling to be an essential component of planning, design, construction, operations, and maintenance activities of any project, but they're especially important for a premium transit service. A preliminary analysis of pedestrian connections in the US 29 BRT study corridor reveal that sidewalks exist predominantly south of New Hampshire Avenue in the northbound direction from 16th Street to Oak Leaf Drive and on all of Lockwood Drive and Stewart Lane. In the southbound direction, sidewalks are intermittent between MD 650 and Southwood Ave, then continuous from Southwood Ave to the Transit Center. from The size and condition of these sidewalks must be reviewed further as these are also important determining factors for the likelihood sidewalks would be used to access transit services. There are no sidewalks on US 29 between New Hampshire Avenue and MD 198, making pedestrian movements difficult and impacting their ability to safely walk to existing bus stops.

The 2005 Montgomery County's Countywide Bikeways Functional Master Plan (currently being updated) states that "current state and county policies require that all new roads and highways be designed to accommodate bicycles and that all road improvement projects to incorporate

bicycle elements where feasible." This is in acknowledgement of the health benefits of bicycling and its role as a viable mode of transportation.

"Share the Road" signed bicycle routes exist throughout the corridor. There are signs along sections of US 29 indicating bicyclists may share the road with motorists and areas where bicyclists may use the shoulder. All other bicycle routes enter and exit the corridor at various points. Lockwood Drive and Stewart Lane have a mix of shared roadway, striped bike lanes, and shoulders provided for bicyclists. See **Figure 9** for existing pedestrian and bicycle facilities along the corridor. Similar to sidewalks, bicycle routes must be reviewed to determine how they would relate to and support connectivity to proposed transit improvements.

Further analysis of pedestrian and bicycle routes, in the context of the vehicles, existing transit services, and proposed transit improvements would support the County's goal for multi-modal transportation in the US 29 Study Corridor. This comprehensive approach will improve the Transit-Oriented Development (TOD) potential in the corridor and increase the focus on accessibility and safety for pedestrians and bicyclists.



Source: Montgomery County Department of Transportation

3.4 Growth and development within the Study Area

3.4.1 Regional, county and corridor growth will increase VMT by 2040, exacerbating congestion

Located in the most populous county in Maryland and in the second largest jurisdiction in the metropolitan area, the study area, like Montgomery County, is expected to experience growth. Growth forecasts for the study area are based on the latest land use forecasts in Round 8.3 of the National Capital Region Transportation Planning Board (TPB) and Metropolitan Washington Council of Governments (MWCOG). **Table 14** summarizes population, households, and employment for the base year 2014 and horizon year 2040 for the US 29 BRT Corridor Planning Study Area.

Table 14: Population, Household, and Employment Growth, 2014 and 2040

	Population			Households			Employment		
	2014	2040	Percent Change	2014	2040	Percent Change	2014	2040	Percent Change
Study Area	137,492	155,497	13%	52,064	60,920	17%	67,125	119,653	78%

Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

As population, households, and employment opportunities grows within the study area the following are anticipated:

- Internal trips are expected to increase by 29% in 2040, compared with those in 2014 (137,000 trips in 2014 to 176,300 trips in 2040);
- Total vehicle miles travelled are anticipated to increase by 15%
- Metrorail usage at Silver Spring and the adjacent Forest Glen and Wheaton Stations are forecasted to grow by 40%
- Metrobus Z-line ridership is expected to grow by 36%.

3.4.2 Growth and development are concentrated in Silver Spring and White Oak

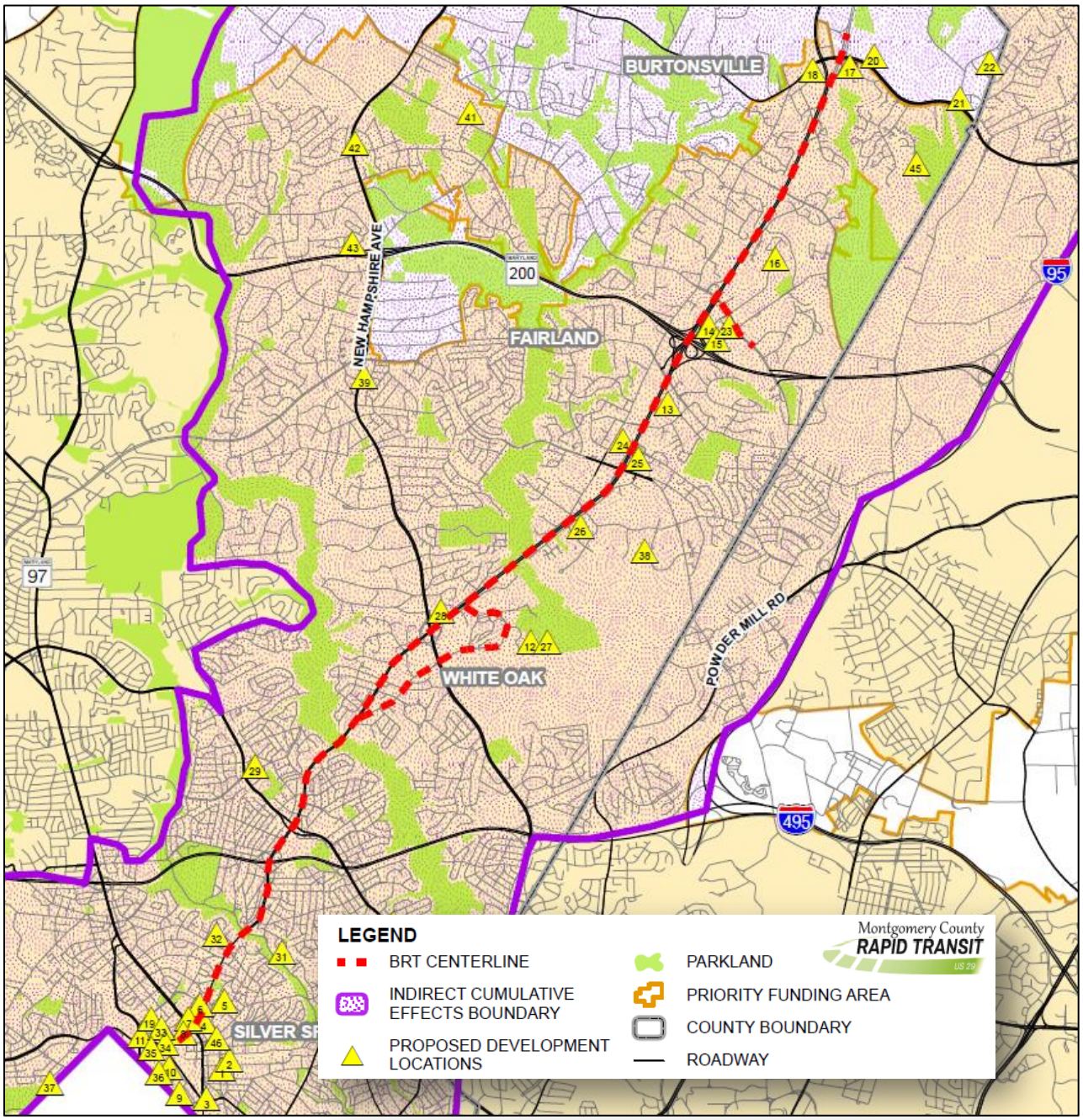
Redevelopment will drive growth in Montgomery County and the study area. Reasonably foreseeable development projects within the US 29 BRT vicinity include both pending and recently approved development projects identified by the Development Activity Information

Center (DAIC). The locations of these projects are illustrated in **Figure 10**, which shows that development activity is largely concentrated in the vicinity of Silver Spring. The County also anticipates a concentration of development, not illustrated in the map, in White Oak as envisioned in the White Oak Science Gateway Master Plan. Additional development proposed for Fairland and Burtonsville results in development projects throughout the US 29 corridor – projects that would benefit from multi-modal transportation networks with high quality transit services. Montgomery County identifies the following planned transportation facilities in the vicinity of the US 29 BRT corridor or related to the BRT project (Source: TPB/MWCOG and the 2014 Constrained Long Range Plan):

- Extension of Old Columbia Pike to Lockwood Drive
- Connector roads between Plum Orchard Court, Whitethorn Court, and Cherry Hill Road
- Provision of local grid of streets and access roads in Burtonsville
- Purple Line Transitway
- Interchange at Musgrove Road/Fairland Road

Current transportation infrastructure in the US 29 BRT study corridor between the Silver Spring Transit Center and Burtonsville Park and Ride is generally congested and unable to support continued growth in eastern Montgomery County. Based on the White Oak Gateway Master Plan, "transportation problems, and attempts to solve or relieve traffic congestion, have characterized the eastern County for 30 years." The US 29 corridor will need a substantial transit upgrade in order to handle future growth demand. Additional transit options along US 29 would support the planned development and growth radiating outward from Silver Spring, thus capitalizing on public investments in transit by producing local and regional benefits. Direct benefits of this TOD could include increased ridership, revitalization of neighborhoods, financial gains for joint development opportunities, increases in the supply of affordable housing, and profits to those who own land and businesses near transit stops. Secondary benefits include congestion relief, land conservation, reduced outlays for roads, and improved safety for pedestrians and cyclists (United States Department of Transportation (US DOT, 2012))

Figure 10: Proposed Development in the US 29 Study Corridor



Source: DAIC.

3.5 Summary of Needs for the Corridor and Study Area

Based on the problems and issues identified, four specific needs for the corridor and study area have been categorized as the following:

- *Transit demand and attractiveness* – Transit demand and ridership in the US 29 corridor continues to grow. A high-quality transit service is needed to maintain current transit riders and attract new riders.
- *Mobility* – Traffic congestion currently impedes bus and rider mobility and results in unpredictable bus service, longer travel times, and delayed schedules. Corridor-wide enhancements to address efficiency and reliability are needed to improve mobility for transit riders.
- *System connectivity* – A high-quality, continuous transit service from Silver Spring to Burtonsville that can support the surrounding mixed used development along the corridor is needed to connect transit customers to local and regional employment and activity centers.
- *Livability* – Transit improvements are needed throughout the US 29 corridor to create a transportation network that enhances choices for transportation users and promotes positive effects on the surrounding communities and residents' quality of life.

4 Purpose

4.1 Purpose of the Project

The purpose of the project is to provide a new higher speed, high frequency, premium transit service along US 29 between the Silver Spring Transit Center and the Burtonsville Park & Ride near MD 198 that will:

- Enhance transit connectivity and multi-modal integration along the corridor as part of a coordinated regional transit system;
- Improve the ability for buses to move along the corridor (bus mobility) with improved operational efficiency, on-time performance / reliability, and travel times;
- Address current and future bus ridership demands;
- Attract new riders and provide improved service options for existing riders as an alternative to congested automobile travel through the corridor;
- Support approved Master Planned residential and commercial growth along the corridor;
- Improve transit access to major employment and activity centers,
- Achieve Master Planned non-auto driver modal share,
- Provide a sustainable and cost effective transit service; and
- Improve the safety of travel for all modes along the corridor

This purpose statement has been consolidated into five distinct goals (refer back to **goals and objectives** presented in Section 1) to guide the development of alternatives and as an evaluation measure for comparing alternatives:

- **Improve the quality of transit service** by increasing travel speed, reliability, frequency and ease of use thus better serving existing riders and attracting new riders
- **Improve mobility opportunities and choices** by strengthening the north/south transit connectivity to existing and proposed transit systems and major employment and activity centers thus improving neighborhood, local and regional connectivity
- **Develop transit services that enhance quality of life** by improving access to housing and jobs and better serving transit demand and transit dependent populations
- **Develop transit services that support master planned development**
- **Support sustainable and cost effective transportation solutions**

4.2 Improve Quality of Transit Service

Dense land uses, economic activity, automobile dependency, and a lack of convenient and reliable transit service have created congested roadway conditions along segments of the US 29

corridor. Existing bus operation efficiency and reliability are hindered due to buses being confined to shared travel lanes on congested roadways, idling at failing overcrowded signalized intersections, and waiting at stops for the time-consuming process of passenger boarding and alighting at the many bus stops dotting the corridor. The current low speed of transit services, limited accessibility, and route deviation needs make transit use noncompetitive compared to automobile travel.

As noted previously, the growing demand for transit in the region, coupled with the reliability issues (adherence to schedule, bus bunching, slow travel times), creates an unacceptable level of service for those individuals who rely on public transit as their primary mode of transportation. Furthermore, the issues associated with the current bus service do not make it attractive to those individuals with access to alternate transportation modes that could elect to take transit if it offered comfort, convenience, and reliability. A higher-quality transit service is needed to increase transit ridership and attract new riders that would otherwise opt to use an automobile.

A higher level of transit service is needed to meet transit demand and serve new and existing transit riders in the corridor. The transit system must serve both those who would regularly drive between points along the study corridor and those seeking the longer trips and fewer stops typically offered by BRT. Generally, riders are attracted to transit service when travel times are reduced, reliability is increased, multi-modal connectivity is accommodated, and they feel comfortable and safe.

4.3 Improve Mobility Opportunities and Choices

US 29 is slated for major redevelopment and growth as outlines in the local Master Plans and Sector Plans. The growth that happens because of this planned development would lead to considerable increases in challenges for drivers, pedestrians, bicyclists and transit riders along the US 29 Study Corridor without changes to the current infrastructure. A multi-modal transportation plan that provides alternative options for safe transportation through and within the study corridor is requisite to support growth while maintaining – and enhancing – the quality of life.

The Corridor currently lacks a high quality, convenient and reliable transit connection from Burtonsville to Silver Spring that can support its planned growth. The existing transit options, as well utilized as they are, have deficiencies that cannot be easily addressed. The Metrorail system connects Washington D.C. with Silver Spring and adjoining areas of Montgomery County, but the high capital investment costs currently prohibits the extension of Metro lines to locations further north. Existing Metrobus Z-line routes run the length corridor, however; they

require several deviations from US 29 to travel the entire Study Area and their service is unreliable due to the roadway congestion and multiple stops.

A well-utilized transit service has the potential for a higher person throughput than a general-purpose lane for automobile users. This means that a dedicated BRT lane may move more people than a stream of single occupancy vehicles utilizing that same space. This metric allows planners to find a better balance between automobile and transit services to maximize the person throughput, utilizing limited right-of-way. This optimization of roadway usage and safety facilitates the inclusion of other roadway users, such as pedestrians and cyclists, further improving the access to multimodal facilities. The improved connectivity between automobile, transit, pedestrian, and cyclists increases the overall efficiency of a regional transportation network.

4.4 Develop Transit Services that Enhance Quality of Life

A December 2008 report from the Task Force on the Future for Growth and Development in Maryland, *Where Do We Grow From Here?,* advised that, by 2030, the state of Maryland could lose 650,000 acres of rural land to development unless growth policies change to encourage more-compact, walkable communities that are easily accessible and in close proximity to employment, retail, and services. These communities serve a wide range of citizens with interests that change over the course of their lives and depending upon their role as resident, business owner, employee, student, service provider or service recipient.

Transit, including BRT, also has numerous societal and environmental benefits. It can reduce traffic congestion, fuel consumption, and air pollution. Transit increases mobility, reduces time spent in congestion, and increases foot traffic and customers for area businesses.

Improved transit along this corridor could benefit low-income and transit-dependent households by offering additional public transit choices and generally support the potential for proximate affordable housing. This could translate to improved access to healthcare, education, and employment opportunities, as well as greater mobility and reduced commuting costs. In addition, there is evidence that fiscally and environmentally conscious younger generations are seeking communities that offer a wide range of affordable, convenient, and safe multi-modal transportation options. According to the 2006-2010 US Census Bureau data, residents of approximately five percent of households within the study area live below the poverty level. According to the May 2007 FTA and U.S. Department of Housing and Urban Development publication, Realizing the Potential: Expanding Housing Opportunities Near Transit, families that live near transit spend just nine percent of their household income on transportation compared

to 25 percent of income for families who live in auto-dependent neighborhoods, thereby reserving more of the family income for other costs.

Development of new transit services and infrastructure has the potential to improve the accessibility of businesses and communities but at the cost of some right-of-way expansion and limits on the use of the current right-of-way. Before selecting a specific solution to the challenge of providing future transit service, there is a robust conversation of the effects the changes could have on property owners and businesses. Recognizing the importance of public dialogue on these sensitive issues, the Montgomery County Council has created Corridor Advisory Committees. The mission of these CAC is to:

- Give community participants the opportunity to provide input to all planning and design.
- Provide the opportunity to discuss study assumptions and methodologies.
- Fulfill County Council requirements for transparency and community involvement.
- Provide the opportunity for interaction and information sharing among impacted residents/communities, property owners of businesses/institutions, transportation agency representatives, and transportation system users.
- Study and discuss potential community impacts in a comprehensive manner that supports cost-effective and context- and community- sensitive implementation outcomes.
- Serve as a clearinghouse for sharing of timely and accurate information on the studies and plans in each corridor.
- Share information from the CAC meetings with the community groups that you represent and share input received from them during subsequent CAC meetings; and
- Provide leadership and build consensus within the community to coalesce diverse interests and address stakeholder issues.

4.5 Develop Transit Services that Support Master Planned Development

Additional transit options along US 29 would support the planned development and growth radiating outward from Silver Spring, thus capitalizing on public investments in transit by producing local and regional benefits. Direct benefits of this transit-supported development could include increased ridership, potential revitalization of neighborhoods, financial gains for joint development opportunities, increases in the supply of affordable housing, and profits to those who own land and businesses near transit stops. Secondary benefits include congestion relief, land conservation, reduced outlays for roads, and improved safety for pedestrians and cyclists (US DOT, 2012).

Current Master Plans and Sector Plans propose TODs at the Burtonsville, White Oak, Tech Road, Four Corners, and Silver Spring planning areas.

Transit service improvements along US 29 would support the planned development and growth around the approved TODs, thus capitalizing on public investments in transit by producing local and regional benefits. Other benefits of TODs could include increased ridership, financial gains for joint development opportunities, increases in the supply of affordable housing, and profits to those who own land and businesses near transit stops. Furthermore, strategic selection of station locations for a high quality transit service may support infill and redevelopment, which serve as catalysts for revitalizing neighborhoods.

4.6 Support Sustainable and Cost Effective Transportation Solutions

Solutions are only feasible if they adequately address both physical and financial constraints. In a corridor as large as US 29, there are a number of physical constraints, such as limited right-of-way, intersection spacing, bridges and overpasses, and protected environmental and cultural resources. Financial constraints include factors such as operational cost, capital costs, and third party investment interests. The county, according to the Functional Master Plan, prioritizes transit investment along US 29 to meet physical and financial constraints, leveraging transportation innovation to support economic development in the County, prioritizing transit usage to increase the overall connectivity and mobility along the corridor.

Preserving environmental resources is a key component in enhancing the quality of life, but is also an essential metric for sustainability and can heavily influence initial capital costs. Environmental resources are in many cases activity centers for outdoor recreation and tourism. The commitment to environmental stewardship also requires stringent mitigation measures for impacts to environmental resources. A successful transit service along US 29 must incorporate these natural and cultural activity centers, and minimize their impacts to control the overall monetary, social, and ecological costs.

5 Evaluation Criteria and Measures of Effectiveness

Add text once study team coordination and adoption of measures of effectiveness are finalized

Montgomery County
RAPID TRANSIT
US 29

PRELIMINARY PURPOSE AND NEED DOCUMENT

APPENDIX A:
TRAVEL DEMAND AND OPERATIONAL ANALYSIS

– DRAFT –
SUBJECT TO CHANGE

US 29 Bus Rapid Transit Corridor Planning Study

DRAFT

Travel Demand and Operational Analysis

Maryland State Highway Administration, Maryland Transit Administration, and Montgomery County Department of Transportation

Prepared by

Maryland State Highway Administration

Data Services Engineering Division

December 2015

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Executive Summary

The Maryland State Highway Administration (SHA) and Maryland Transit Administration (MTA) have initiated the Purpose and Needs Study as part of the US 29 Bus Rapid Transit (BRT) Corridor Planning Study, in coordination with Montgomery County Department of Transportation. Travel demand analysis and ridership forecasting is an important element of the US 29 BRT Study. This report documents travel markets in the study area for existing and future conditions and provides the support to the Purpose and Needs from the travel demand perspective.

This travel demand analysis is conducted in the regional, county, and corridor context. Major findings include the following:

- Two regional activity centers, Silver Spring and White Oak/FDA, serve as an engine for activities and travel in the study area.
- Strong employment growth in these two regional activity centers were forecasted for 2040, with a growth of almost 80 percent over 2014.
- Intra-study-area trips represent a significant share of travel market for the study area, with approximately 40 percent of total trips in 2014 and expected to increase by nearly 30 percent in 2040.
- DC-bound commuting trips were a major out-flow of trips from the study area, with approximately 20,000 residents living in the study area and commuting to DC for work, based on the 2006-2010 CTPP.
- Another major DC-bound commuting flow of approximately 10,000 was from Howard County areas north of the US 29 BRT Corridor, which can use US 29 as a commuting route to DC.
- Severe congestion exists north of the beltway of the US 29 corridor and is forecast to exacerbate in the future 2040 condition.
- The study area has a strong transit market, as demonstrated by the magnitude of the existing transit ridership by different transit modes and providers, including an average weekday daily Metrorail ridership of approximately 13,000 for Silver Spring Station and more than 15,000 boardings for the Metrobus Z line buses, Ride On buses, and MTA commuter buses.
- The proposed US 29 BRT will support for the County's growth visions and the WMATA's regional transit priority on developing a strong regional transit system.

1.0 Regional Context

This chapter presents an overview of regional context, of which the US 29 BRT Corridor is a part. This regional context is important in understanding the travel markets for the study area. The following sections will discuss regional travel patterns, congestion, the County's growth visions, and long range transportation plans as related to the study area.

1.1 Growth Vision and Regional Travel Patterns

Montgomery County, where the US 29 BRT Corridor is located, is the most populous county in Maryland and the second largest jurisdiction in the Washington metropolitan area. It has over one million people based on the latest 2014 population estimate from the Census Bureau, and is expected to grow by 24 percent in households and 40 percent in employment between 2014 and 2040, based on the latest land use forecasts, Round 8.3, from the National Capital Region Transportation Planning Board (TPB) and Metropolitan Washington Council of Governments (MWCOG).

Washington, District of Columbia (DC) is a major work destination for workers around the region, and more than 100,000 workers living in Montgomery County commute to DC, representing one of the largest out-of-county commuting flows in the country and the second largest worker flow commuting to DC. Figure 1.1 and Figure 1.2 display the jurisdiction-level worker flows, as related to Montgomery County, based on the latest Census Transportation Planning Products (CTPP) 2006-2010 five year data. Figure 1.1 shows the top ten worker flows coming to Montgomery County, while Figure 1.2 demonstrates the top ten worker flows from Montgomery County to other jurisdictions. Prince George's County, Frederick County and the District of Columbia have the most workers commuting to Montgomery County to work; the District of Columbia, Prince George's County and Fairfax County are the three main workplaces for residents in Montgomery County.

In addition to the significance of the DC-bound commuting from Montgomery County, intra-county commuting is even more prominent in the overall commuting patterns, with approximately 299,000 workers living and working inside the County, nearly three times as the out-commuting to the District of Columbia. Namely, nearly 60 percent of resident workers in Montgomery County work inside the County.

Montgomery County has long established the overall growth vision with a fundamental principle of the Wedges and Corridors, which channels growth to development corridors such as I-270 while preserving wedges of open space, farmland, and lower density residential uses. The US 29 BRT Corridor study area consists of areas of "urban ring" and "suburban communities".

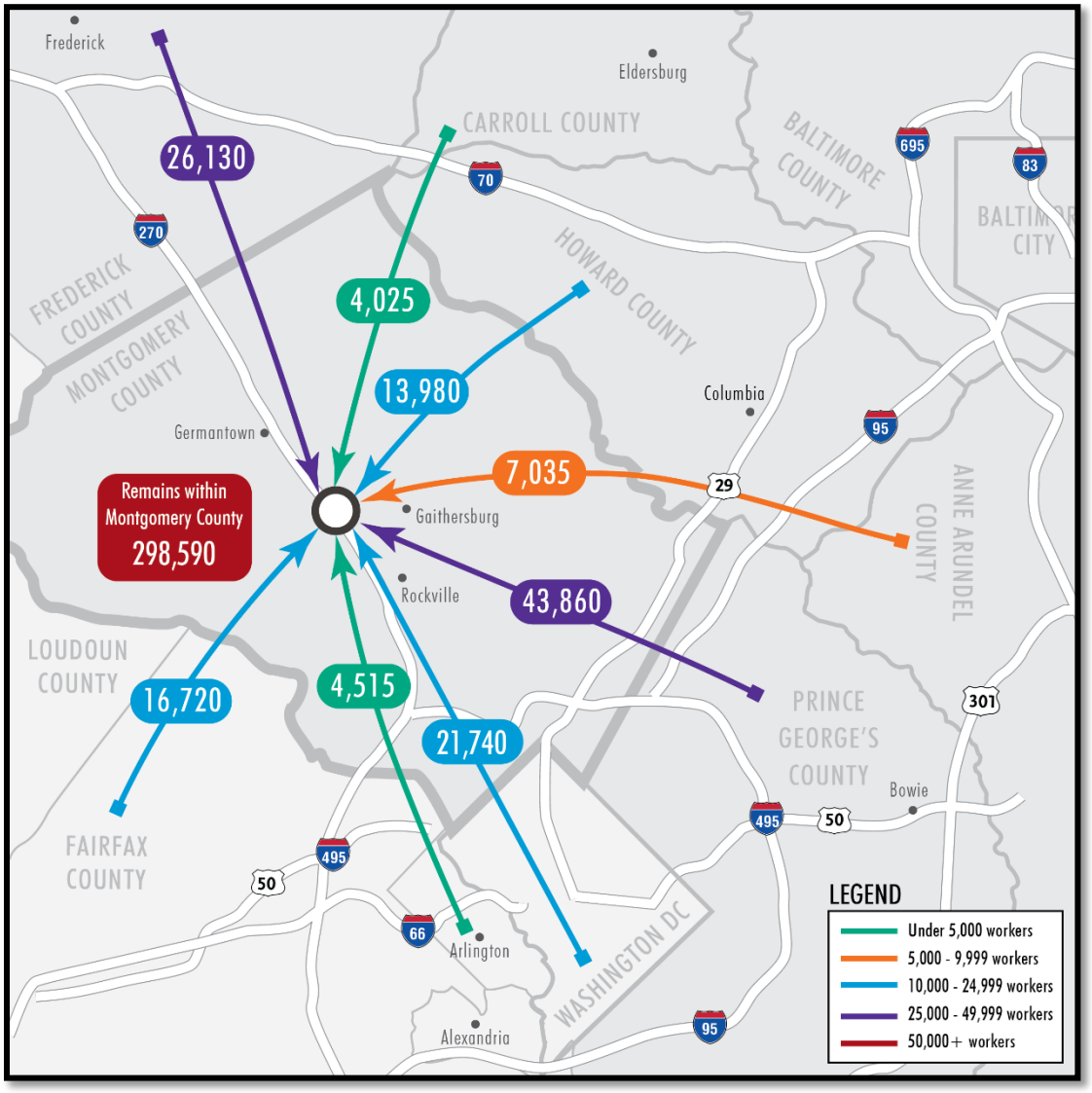
Table 1.1: County-to-County Worker Commuting Flows *(Top 10)*

1.0 Residence	Workplace	Estimate
Inflow		
Montgomery County, Maryland	Montgomery County, Maryland	298,590
Prince George's County, Maryland		43,860
Frederick County, Maryland		26,130
District of Columbia, District of Columbia		21,740
Fairfax County, Virginia		16,720
Howard County, Maryland		13,980
Anne Arundel County, Maryland		7,035
Arlington County, Virginia		4,515
Carroll County, Maryland		4,025
Outflow		
Montgomery County, Maryland	Montgomery County, Maryland	298,590
	District of Columbia, District of Columbia	107,125
	Prince George's County, Maryland	28,895
	Fairfax County, Virginia	21,860
	Arlington County, Virginia	9,240
	Howard County, Maryland	6,765
	Frederick County, Maryland	4,855
	Anne Arundel County, Maryland	4,380
	Baltimore city, Maryland	3,915
	Alexandria city, Virginia	3,400
	Baltimore County, Maryland	2,440

Data Source:2006-2010 CTPP.

Figure 1.1: County-to-County Worker Commuting Flows

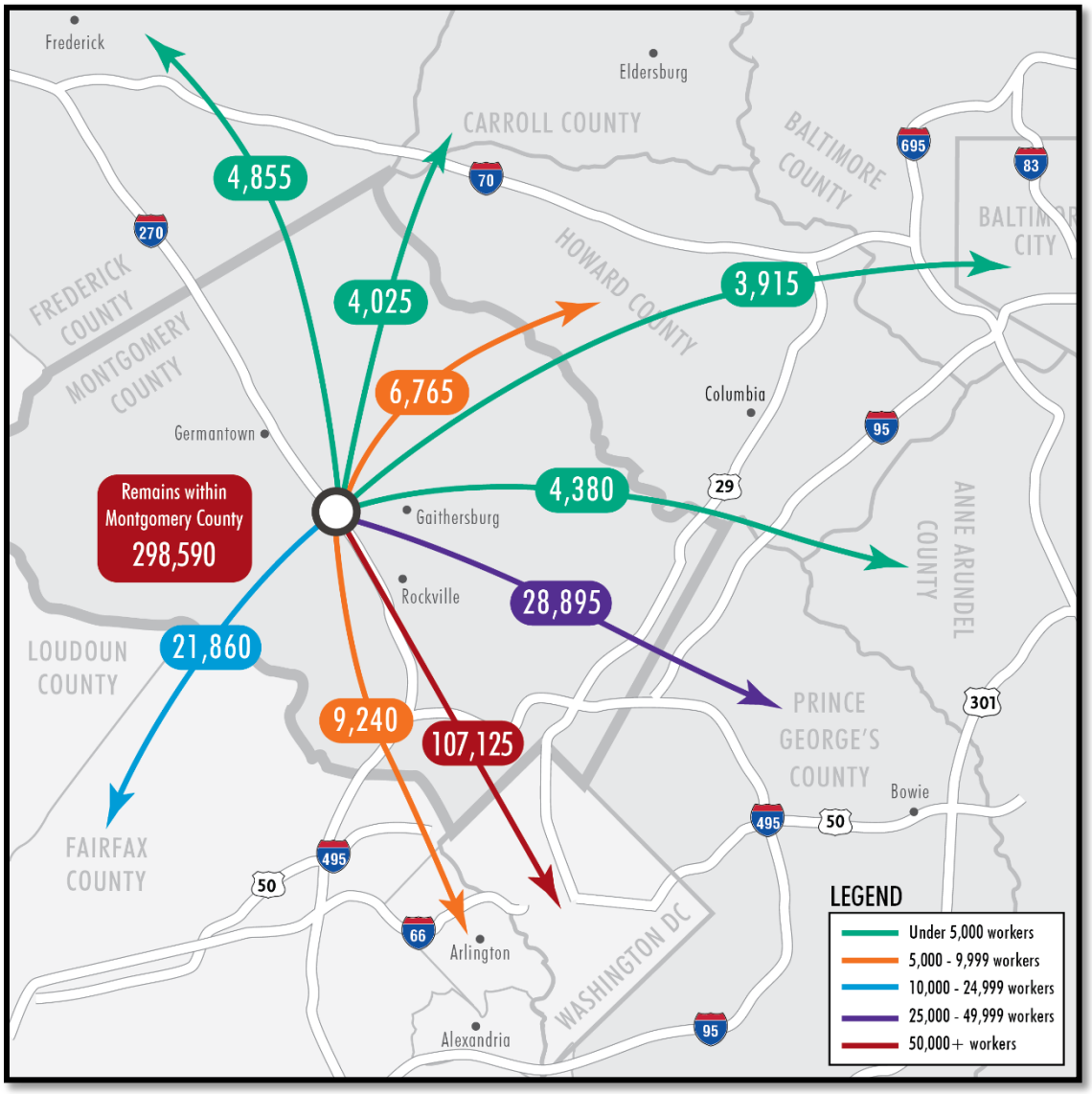
(Montgomery County As Workplace - Workers 16 & Over)



Source: 2006-2010 CTPP

Figure 1.2: County-to-County Worker Commuting Flow

(Montgomery County As Residence – Workers 16 & Over)



Source: 2006-2010 CTPP

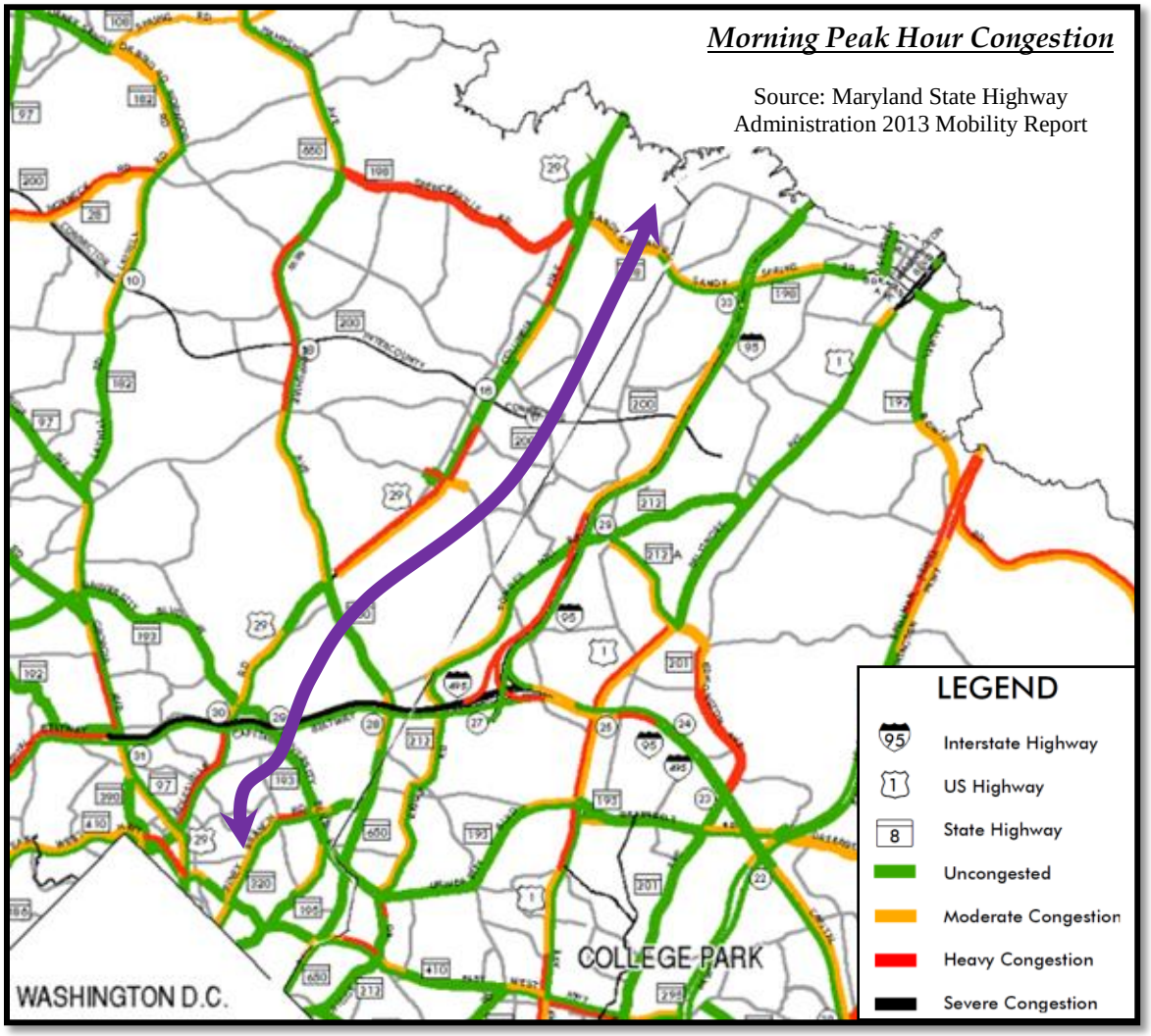
1.2 Regional Congestion

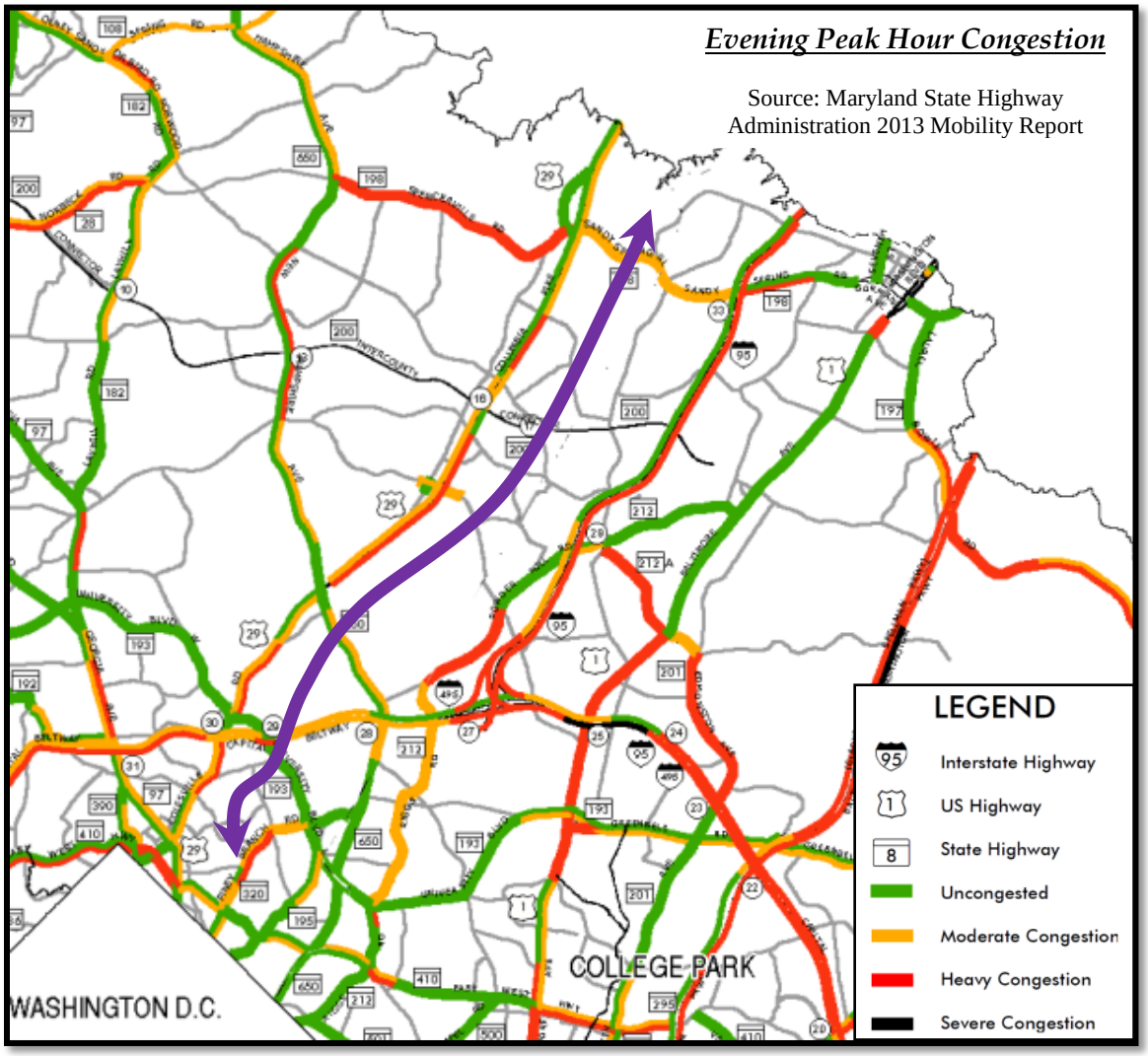
The Washington metropolitan region is among the top-ranked congested areas in the country, and Montgomery County has its share of regional congestion and bottlenecks. The 2014 Maryland State Highway Annual Mobility Report shows the 2013 most congested freeways/expressway segments for AM and PM peak hours, which include I-495 outer loop from I-95 to MD 97.

Figure 1.3 shows the regional congestion conditions, during morning peak hour (8:00 AM to 9:00 AM) and evening peak hour (5:00 PM to 6:00 PM) in 2013.

Severe congestion occurs on the top side of the Capital Beltway, US 29 near the Capital Beltway, and I-270. In the morning rush hour, southbound US 29 close to I-495 and the Capital Beltway (I-495) between I-95 and US 29 experience severe congestion. In the evening peak hour (5:00 PM to 6:00 PM), northbound US 29 near the Capital Beltway is seriously congested.

Figure 1.3: Existing AM & PM Peak Congestion in the Washington Region





In addition to knowing these locations are congested, the Travel Time Index (TTI) maps compare travel conditions in the peak period to free-flow conditions, and help establish potentially unreliable segments. The travel segments within the corridor with high congestion (red or above) are also locations where reliability becomes a concern. Reliability measures variability and dependability of roadway performances. These are also locations most likely to cause the congestion due to vehicle crashes or random events.

As a result, the need for an alternative option with reliable service compared to the existing or future conditions may support the implementation of a BRT system across this corridor. The BRT would provide known reliability, which could increase ridership throughout the corridor.

1.3 Regional Transit and Planned Projects

The Washington metropolitan region has one of the largest transit markets in the country. The Metrorail system of the Washington Metropolitan Area Transit Authority (WMATA) has the second largest rapid transit ridership in the country, with an average weekday rail ridership of 829,200 in 2014, while the Metrobus system is the fifth largest in the country, with a daily ridership of approximately 437,000 (source: WMATA).

Served with the Metrorail, Metrobus, and Ride On bus systems, Montgomery County is an important part of the regional transit market. The transit mode share for commute trips was approximately 15 percent for Montgomery County residents, an increase of 2.5 percentage points over 2000, based on the 2006-2010 CTPP.

The National Capital Region Transportation Planning Board (TPB), designated as the Metropolitan Planning Organization (MPO) for the Washington Metropolitan Area, adopted the 2014 Financially Constrained Long-Range Transportation Plan (CLRP) on October 15, 2014. This plan included more than 300 projects, which will have impacts on the region's roadways and transit networks. Major regional transit projects in the 2014 CLRP include the Silver Line, Corridor Cities Bus Rapid Transit, and Purple Line. The proposed Purple Line will have a station in Silver Spring, providing intermodal connectivity with Metrorail, Metrobus, Ride On, and the proposed US 29 BRT. Table 1.1 shows some projects related to the US 29 study area.

Table 1.2: Planned/Programmed Projects

Project	From	To	Complete Date
Construct			
Olney Transit Center	Adjacent to or north of MD 108		2015
Purple Line Transitway	Bethesda	New Carrollton	2020
Silver Spring Transit Center	Phase II		2017
US 29 (Columbia Pike)	Interchange at Musgrove/Fairland Rd.		2025
I-95/I-495 (Capital Beltway)	Branch Avenue Metro Access		2020
I-95/I-495 (Capital Beltway)	Interchange at Greenbelt Metro		2020
I-95	Contee Road Relocated w/CD Roads		2014
Intercounty Connector	I-95	US 1	2014
Study			
Countywide BRT	Various corridors		N/A
US 29, Columbia Pike	north of MD 650	Howard County Line	N/A
US 29 /MD 384 Bus Rapid Transit	MD 410	MD 198	N/A

Source: TPB/MWCOG, 2014 CLRP and FY2015-2020 TIP Air Quality Conformity Inputs.

2.0 Corridor Context

2.1 Urban Form, Activity Centers, and Accessibility

Study Area

The US 29 BRT Corridor Planning Study area, as shown in Figure 2.1, is defined as an aggregate of Transportation Analysis Zones (TAZs) of the TPB/MWCOG model and bounded by:

- The border of Montgomery County (with Prince George's County) on the east,
- The border of Montgomery County (with Howard County) on the north,
- The border of Montgomery County (with District of Columbia) on the south,
- Approximately 1 mile west of US 29.

This study area definition is intended to be used for the purpose of summarizing, analyzing and highlighting data and model results, which are closely related to the US 29 corridor. It does not mean that the current transportation network is limited to this area and the future impacts of improvement options are constrained to this area.

The proposed US 29 BRT, per the Master Plan, operates mostly on US 29 from Burtonsville Park and Ride Lot to Silver Spring Transit Center, with a total length of approximately 14 miles. The Burtonsville Park and Ride Lot serves as a stop for commuter buses between Columbia and Ellicott City areas of Howard County and Washington, DC.

Figure 2.2 summarizes major transportation features within and around the study area, including:

- Metrorail Red Line Silver Spring station, Forest Glen station, and Wheaton station;
- Metrobus, Montgomery Ride On bus, and Maryland Transit Administration (MTA) commuter bus operate along and near US 29;
- Metrorail park-and-ride lots in Forest Glen station (596 all day spaces) and Wheaton (977 all day spaces);
- I-495 runs through the south side of the study area;
- Inter County Connector (ICC) intersects with the study area on the north.

Figure 2.1: US 29 BRT Corridor Planning Study Area

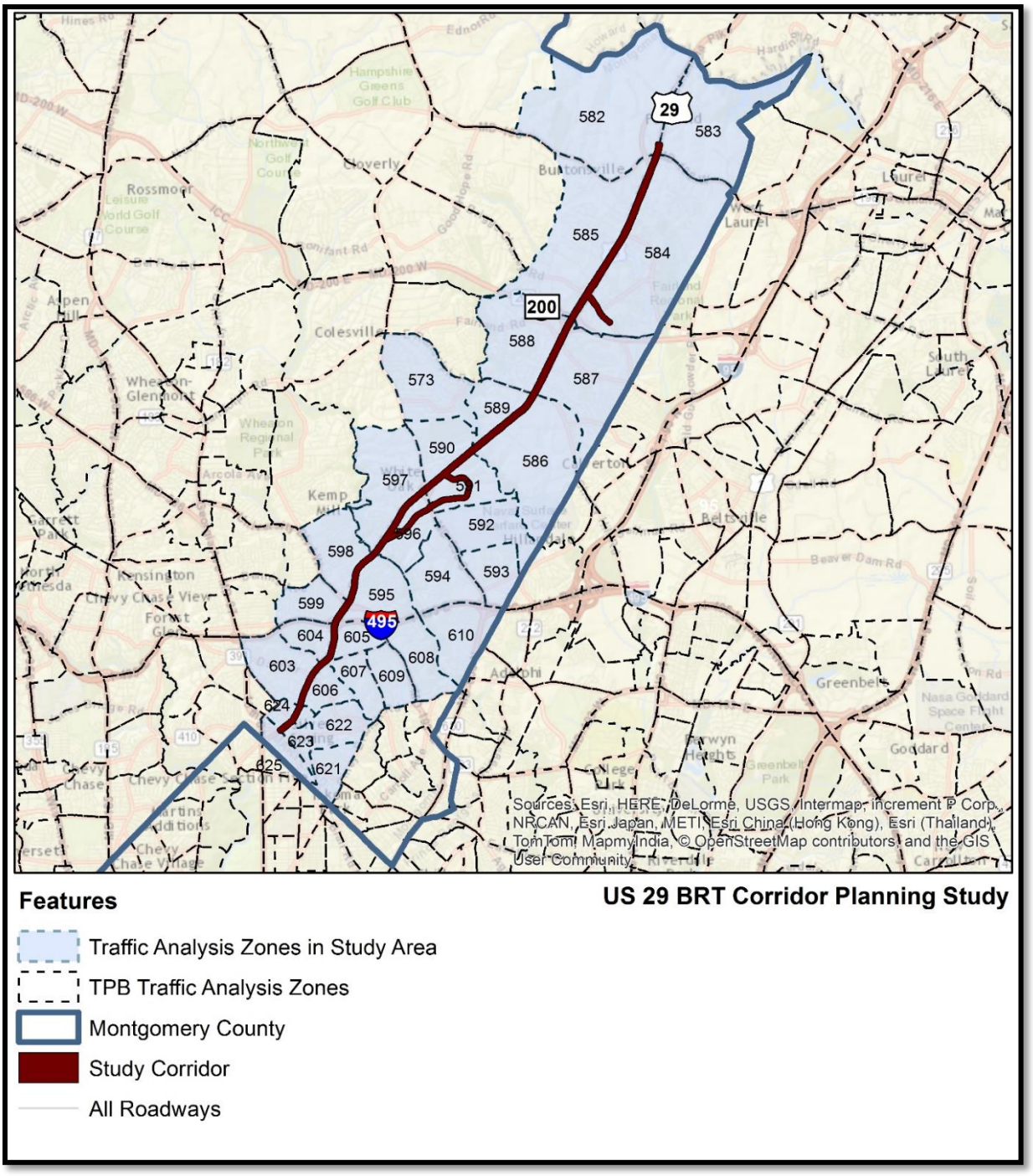
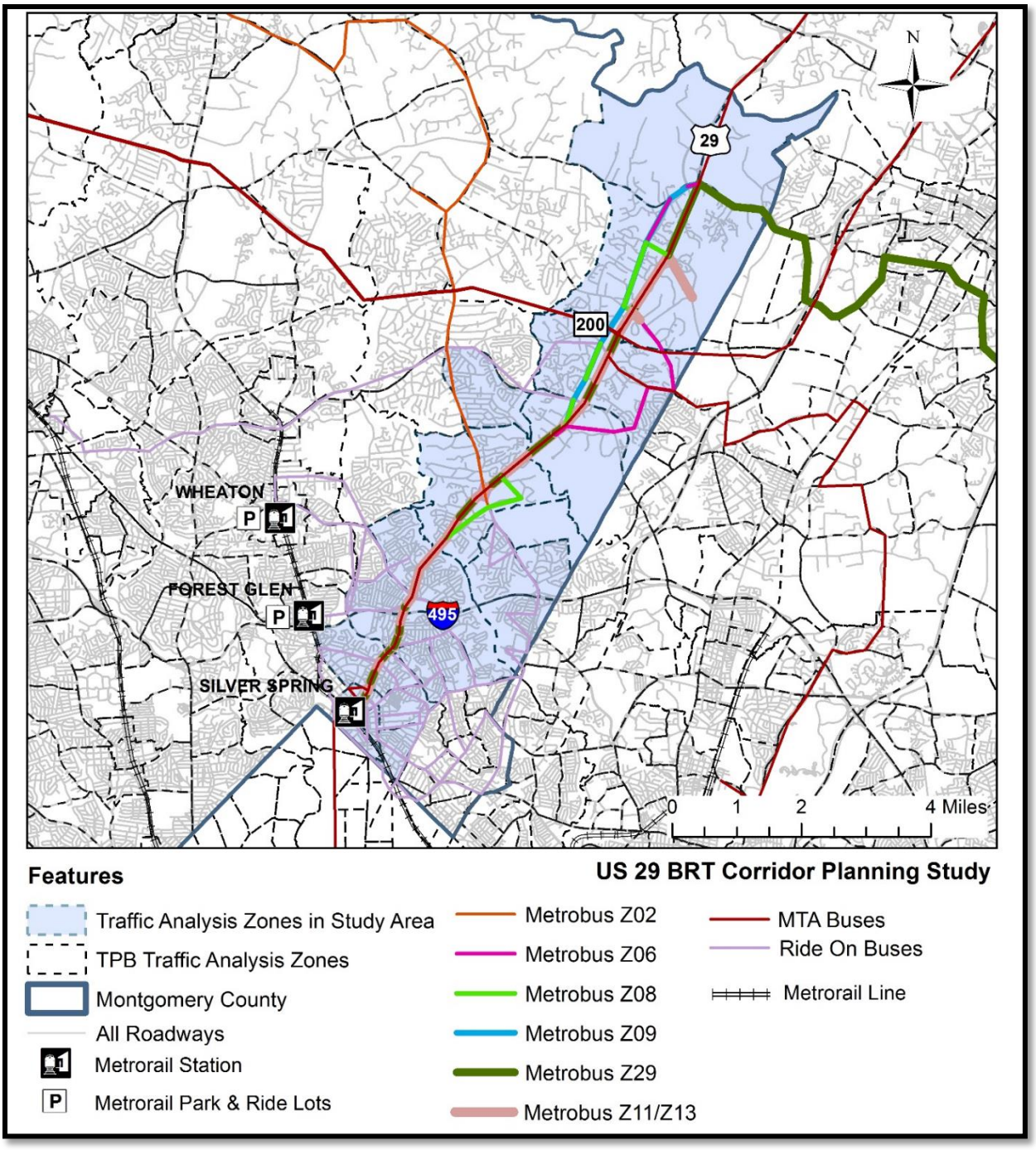


Figure 2.2: US 29 BRT Corridor Planning Study Area *(Transportation Features)*



Land Use

Land use data, including the number and spatial distribution of residents and homes, and jobs and employers, represent demographic and economic conditions. The study area has a diverse population, with approximately 86,700 non-whites, 13,300 households with income less than 50,000 dollars, and 4,800 households without a vehicle, based on the 2006-2010 CTPP.

The latest officially adopted land use forecasts, namely Round 8.3 land use forecasts, were obtained from the TPB/MWCOG, and used for the US 29 BRT Corridor Planning Study area with modification of the White Oak area based on the data provided by Montgomery County.

Table 2.1 summarizes population, households, and employment for the base year 2014 and horizon year 2040 for the US 29 BRT Corridor Planning Study area, Montgomery County and TPB model area. Figures 2.3 to 2.8 show density and growth patterns, with a focus on the US 29 BRT study area. Further detail on each Traffic Analysis Zone (TAZ) growth is provided in Appendix A.

Table 2.1: Population, Household, and Employment Growth *(2014-2040)*

	Population			Households			Employment		
	2014	2040	Percent Change	2014	2040	Percent Change	2014	2040	Percent Change
Study Area	137,492	155,497	13%	52,064	60,920	17%	67,125	119,653	78%
Montgomery County	1,010,551	1,212,774	20%	374,239	463,804	24%	527,659	738,039	40%
TPB Region	6,973,896	8,804,595	26%	2,606,657	3,376,255	30%	4,077,499	5,543,024	36%

Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

Household Growth

In 2014, there are approximately 2,607,000 households in the TPB region, and by 2040, the number of households are forecasted to increase by 30 percent, to a total of about 3,376,000 households. Meanwhile, Montgomery County households are forecast to grow by 24 percent, and households in the US 29 study area are expected to grow by 17 percent.

Households in the study area equal 14 percent of Montgomery County's total households in 2014. In 2040, households in the study area are forecasted to represent 13 percent of the County's total households.

Two activity centers, Silver Spring and White Oak, have the highest household density in the study area. Household growth will continue in these two activity centers, in areas around interchanges of US 29 and I-495, US 29 and ICC, and the north end of US 29 BRT Corridor. Overall, the study area shows less household growth from 2014 to 2040 (17 percent) than both Montgomery County (24 percent) and the TPB model region (30 percent). The study area still remains a high density area in Montgomery County in 2040, with the average household

density (2,118 households per square mile) twice that for the Montgomery County (914 households per square mile).

Employment Growth

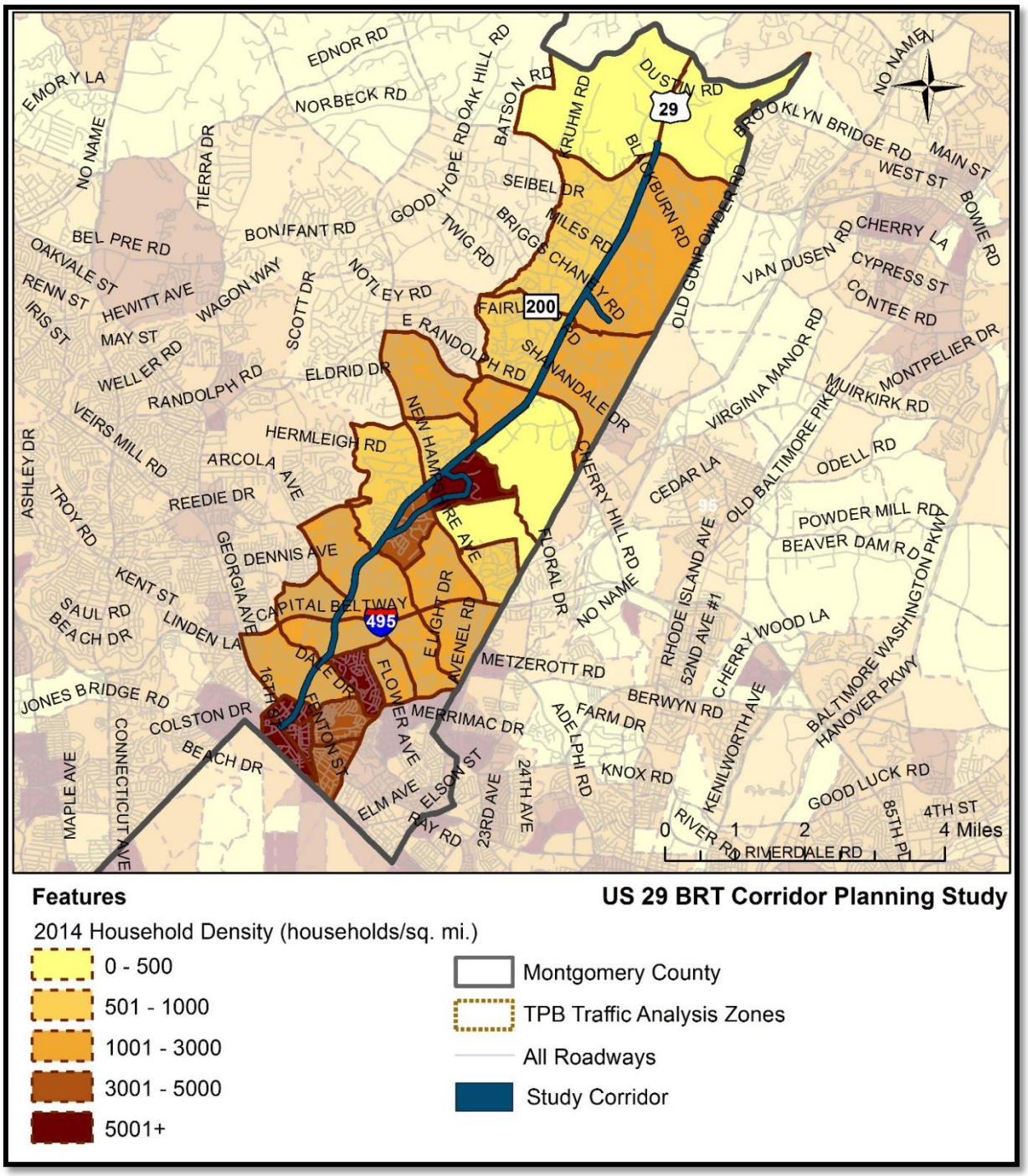
In 2014, the TPB region has approximately 4,077,000 jobs, which are expected to expand by 36 percent, to 5,543,000 jobs by 2040. The total of nearly 528,000 jobs in Montgomery County, represents 13 percent of jobs in the TPB model region, is forecasted to grow to 738,000 jobs, or 40 percent, by 2040. Growth in the US 29 study area (78 percent) exceeds regional and county growth rates. Two activity centers, Silver Spring and White Oak, have the highest employment density in the study area. The future employment growth is forecasted to continue and concentrate in these two activity centers, strengthening their positions in Montgomery County and the region.

Growth in the study area employment (78 percent), eclipses growth rates in both Montgomery County and the TPB region.

Major growth in the study area is expected to be concentrated in the two activity centers—Silver Spring and White Oak. The largest increase in household density is forecasted to occur in several TAZs in Silver Spring (e.g., TAZ 623, 624, and 625) and White Oak (e.g., TAZ 586 and 591). The largest increase in employment density is also forecasted to occur in several TAZs in Silver Spring and White Oak.

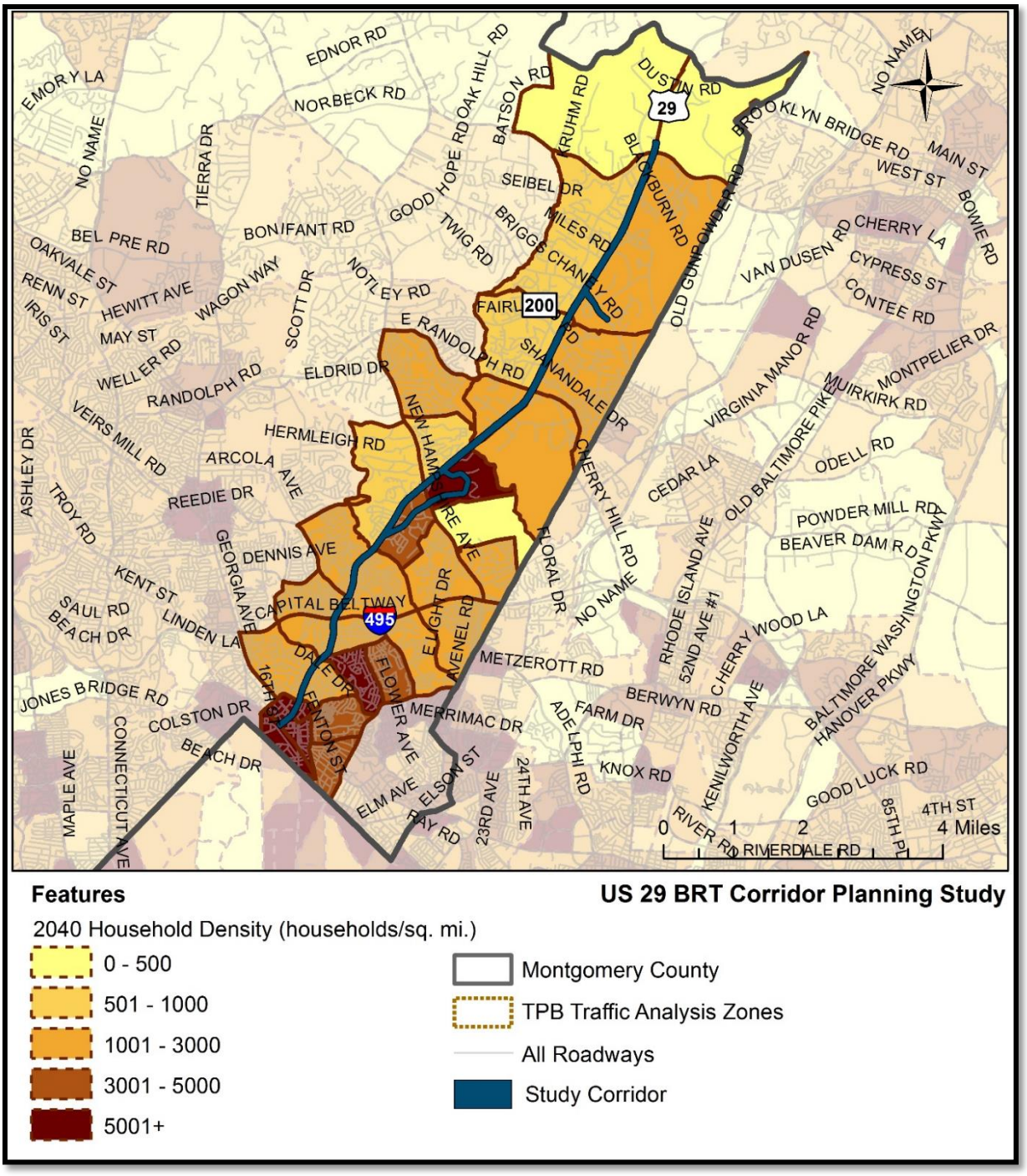
The White Oak Science Gateway Master Plan, approved by the County Council on July 29, 2014, envisions White Oak's major centers to become "vibrant, mixed-use, transit-served nodes." The master plan includes several major developments, such as the consolidation of the Food and Drug Administration (FDA) at the White Oak Federal Research Center (FRC). The FDA has now 5,500 employees on site and will have 8,900 employees once the newly constructed buildings are finished. In addition to the FDA, the area's largest employers include Seventh Day Adventist Church, Kaiser Permanente, Holy Cross and Comcast.

Figure 2.3: Household Density *(2014)*



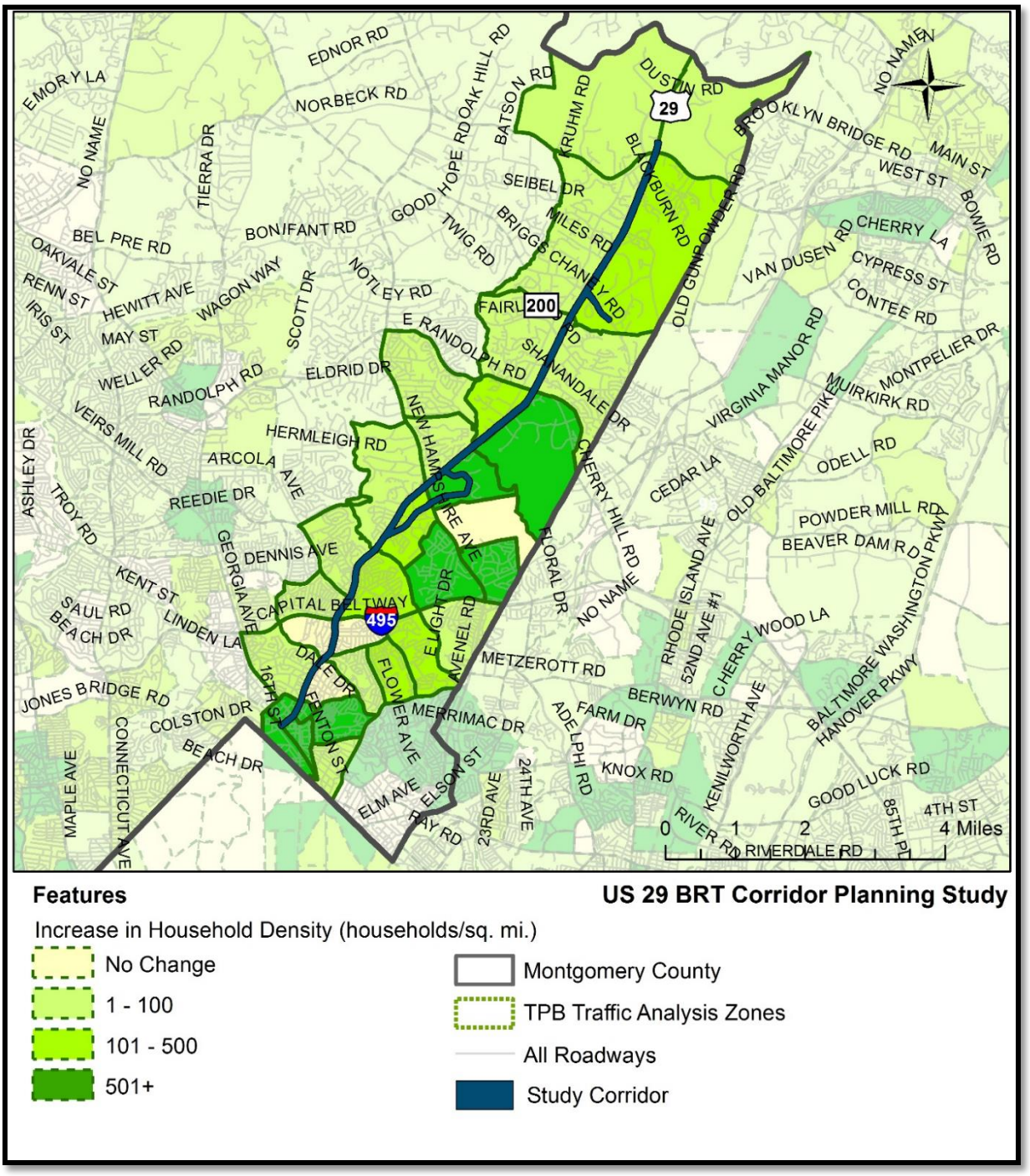
Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

Figure 2.4: Household Density *(2040)*



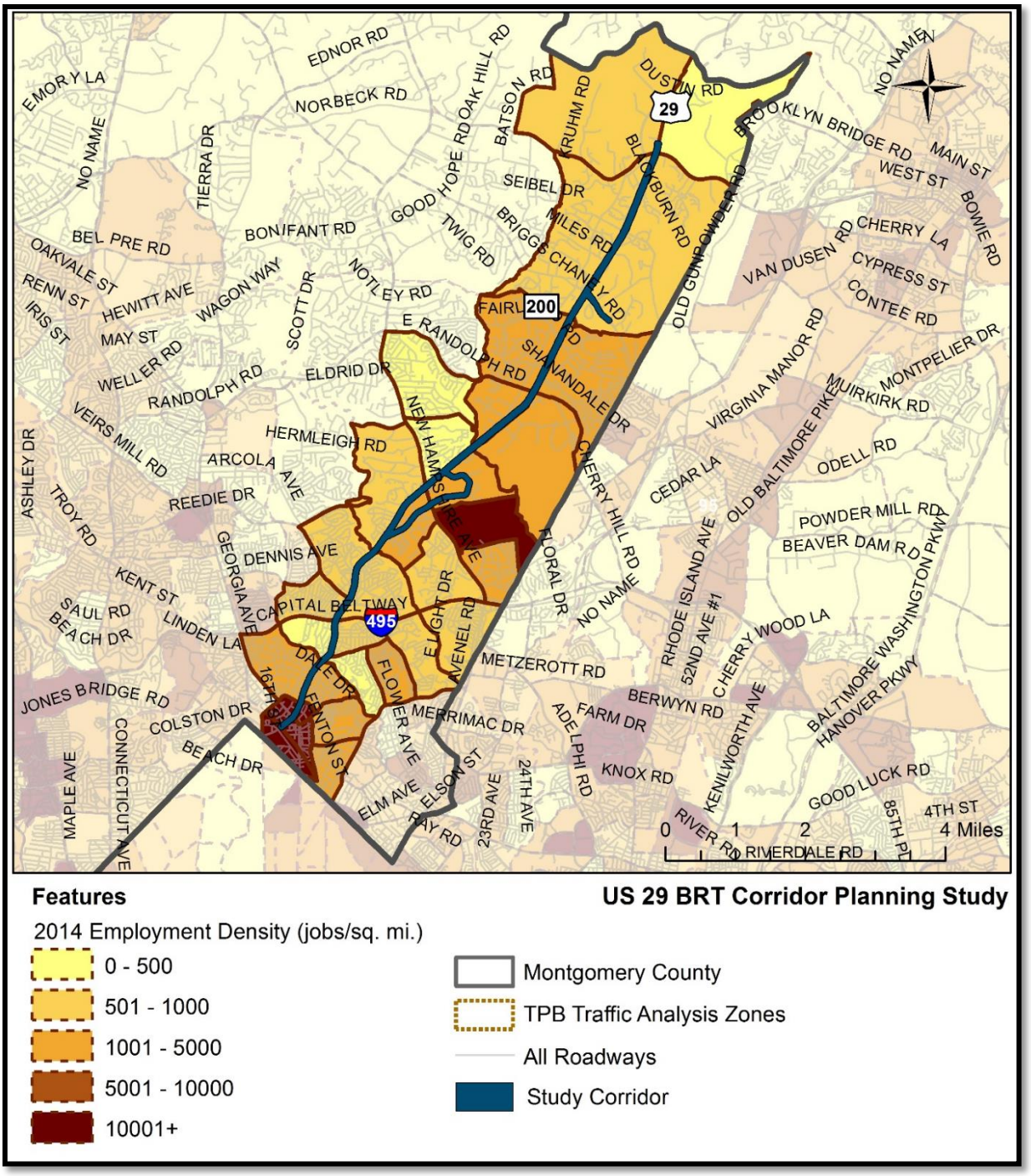
Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

Figure 2.5: Change in Household Density *(2014-2040)*



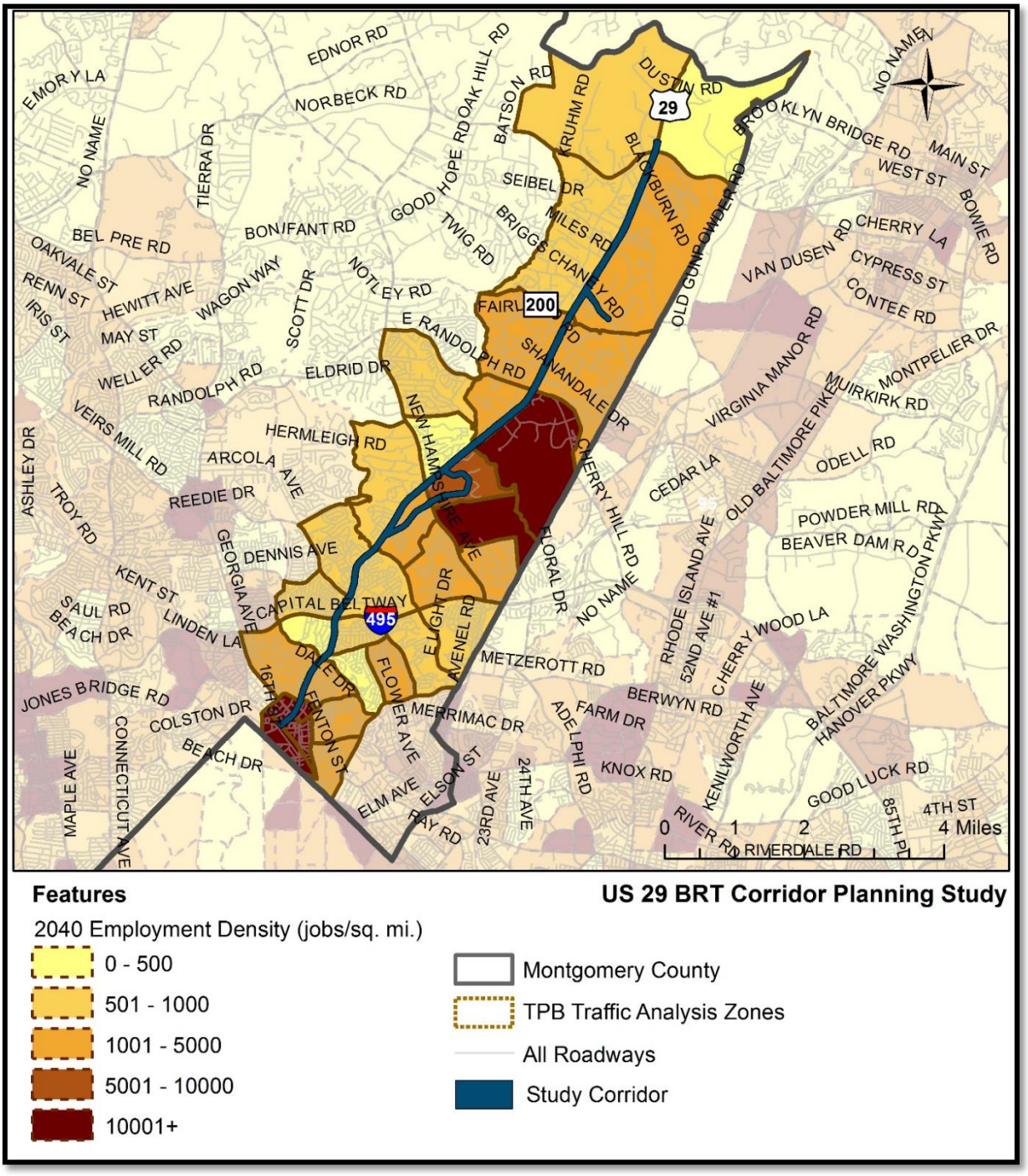
Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

Figure 2.6: Employment Density *(2014)*



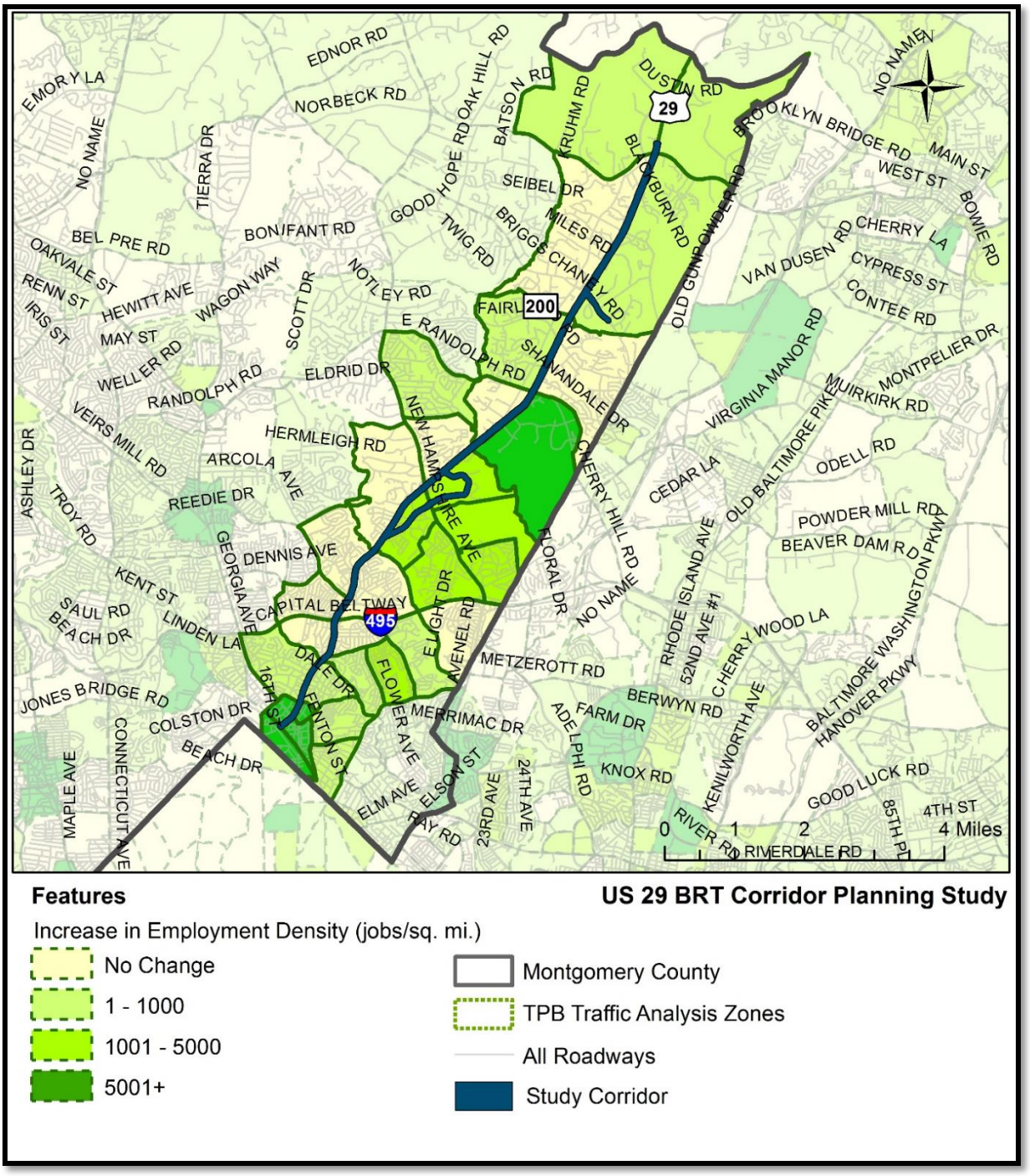
Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

Figure 2.7: Employment Density *(2040)*



Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

Figure 2.8: Change in Employment Density *(2014-2040)*



Data Source: MWCOG/TPB Round 8.3 Cooperative Forecasting.

2.2 Corridor Travel Markets

Trips by Purpose

Study Area Daily Trip Growth

In 2014, the US 29 study area had 1.3 jobs per household, which is slightly less than the regional number (1.6 jobs per household). Employment growth is forecasted to be 118 percent faster than the regional job growth, will reach 2.0 jobs per household and exceed the regional ratio at 1.6.

The study area employment is growing faster than households, leading to an increased share of workers commuting to work in the study area.

Jobs for each household in Montgomery County increase from 1.4 to 1.6 from 2014 to 2040. Like the US 29 study area, Montgomery County attracts workers outside the county.

Growth in both household and jobs in the region leads to some increase of trip productions and attractions from 2014 to 2040. As shown in Table 2.2, daily trip production increase in the study area from 2014 to 2040 is forecasted to noticeably lag behind the growth in the region and Montgomery County, while growth in trip attractions will outpace the rest of the region.

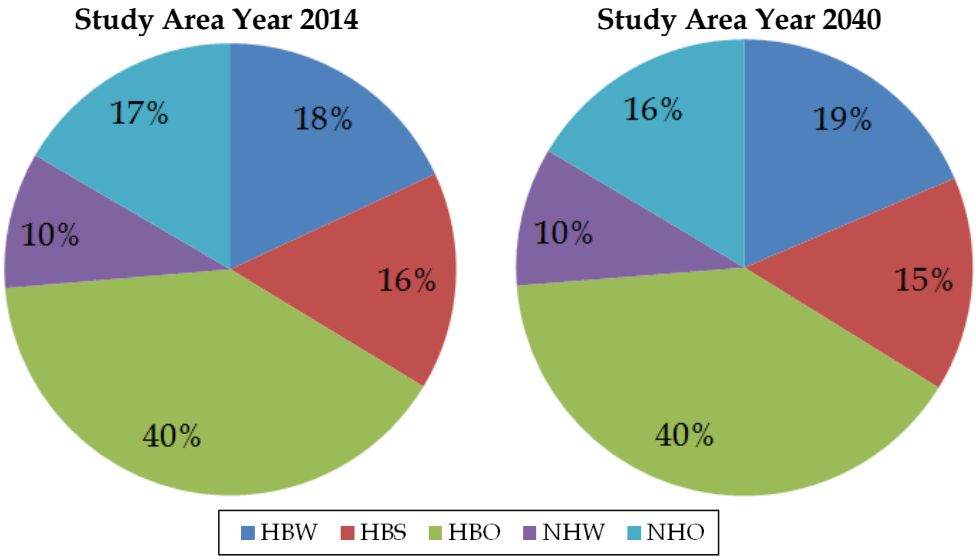
Table 2.2: Total Daily Person Trip Growth

	2014-2040	
District	Growth in Trip Productions	Growth in Trip Attractions
Study Area	13%	43%
Montgomery County	20%	30%
TPB Region	27%	33%

Data Source: MWCOG/TPB Model.

Figure 2.9 presents daily trips by person trip purposes. From 2014 to 2040, daily person trip shares by trip purposes remain almost the same. Only marginal changes will happen for Home-Based Other (HBO) and Home-Based Shopping (HBS), while Home-Based Work (HBW) and Non-Home Based (NHO) trip shares remain the same.

Figure 2.9: Share of Daily Trips by Person Trip Purposes



Data Source: MWCOG/TPB Model.

Results in Table 2.3 indicate that travel demand increases at a significantly slower pace in the US 29 study area than the rest of the region. Montgomery County also has a slower increase in travel demand compared to the TPB region.

Table 2.3: Total Daily Person Trip Growth by Trip Purposes

Change in Trips by Type, 2010-2040	Home-Based Work	Home-Based Shopping	Home-Based Other	Non-Home-Based Work	Non-Home Based Other
Study Area	17%	11%	13%	14%	5%
Montgomery	23%	19%	20%	21%	19%
Model Region	29%	26%	26%	27%	26%

Data Source: MWCOG/TPB Model.

Corridor Travel Patterns

Study Area Daily Trip Patterns

Potential travel markets for the US 29 BRT depends on travel patterns related to the US 29 BRT study area. To facilitate discussion of travel patterns, regional districts were defined for areas of the TPB model region (Figure 2.10), with a detailed focus on Montgomery County, including the five Montgomery districts (I 270 West, I 270 East, MD 97, US 29, Inside Beltway), the District of Columbia, Columbia/Ellicott City, Rest of Maryland, and Virginia.

Tables 2.4 and 2.5 show the district-level flows of daily person trips for 2014 and 2040, respectively, based on the TPB/MWCOG Version 2.3.57 model results. Figure 2.11 highlights

the major worker flows which are the potential markets for the US 29 BRT, based on the 2006-2010 CTPP. Similarly, Figure 2.12 displays the major flow patterns of outbound person trips from a home or non-home location, based on the 2014 TPB/MWCOG model results, while Figure 2.13 shows the 2040 flow patterns.

Major travel patterns shown in these tables and figures can be summarized in terms of potential markets for the proposed US 29 BRT as follows:

- Internal trips within the US 29 Study Area represent a significant share of travel market for the study area, with 37 percent of total trips of the study area in 2014;
- Internal trips are expected to increase by 29% in 2040, compared with those in 2014;
- DC-bound commuting trips were a major out-flow of trips from the study area, with 19,500 residents in the study area commuting to DC for work, based on the 2006-2010 CTPP;
- Another major DC-bound commuting flow of approximately 10,000 was from Columbia and Ellicott City areas north of the US 29 BRT Corridor, which can use US 29 as a commuting route to DC;
- A smaller number of workers also commuted to work in the study area from Columbia and Ellicott City areas (3,400) and DC (4,000);
- Major trip flows from the model results for 2014 and 2040 show patterns similar to the commuting flows described above;

Trips to the study area were forecasted to increase significantly because of strong employment growth, for example, by 29% from Columbia and Ellicott City areas and DC.

Figure 2.10: Regional District Definition

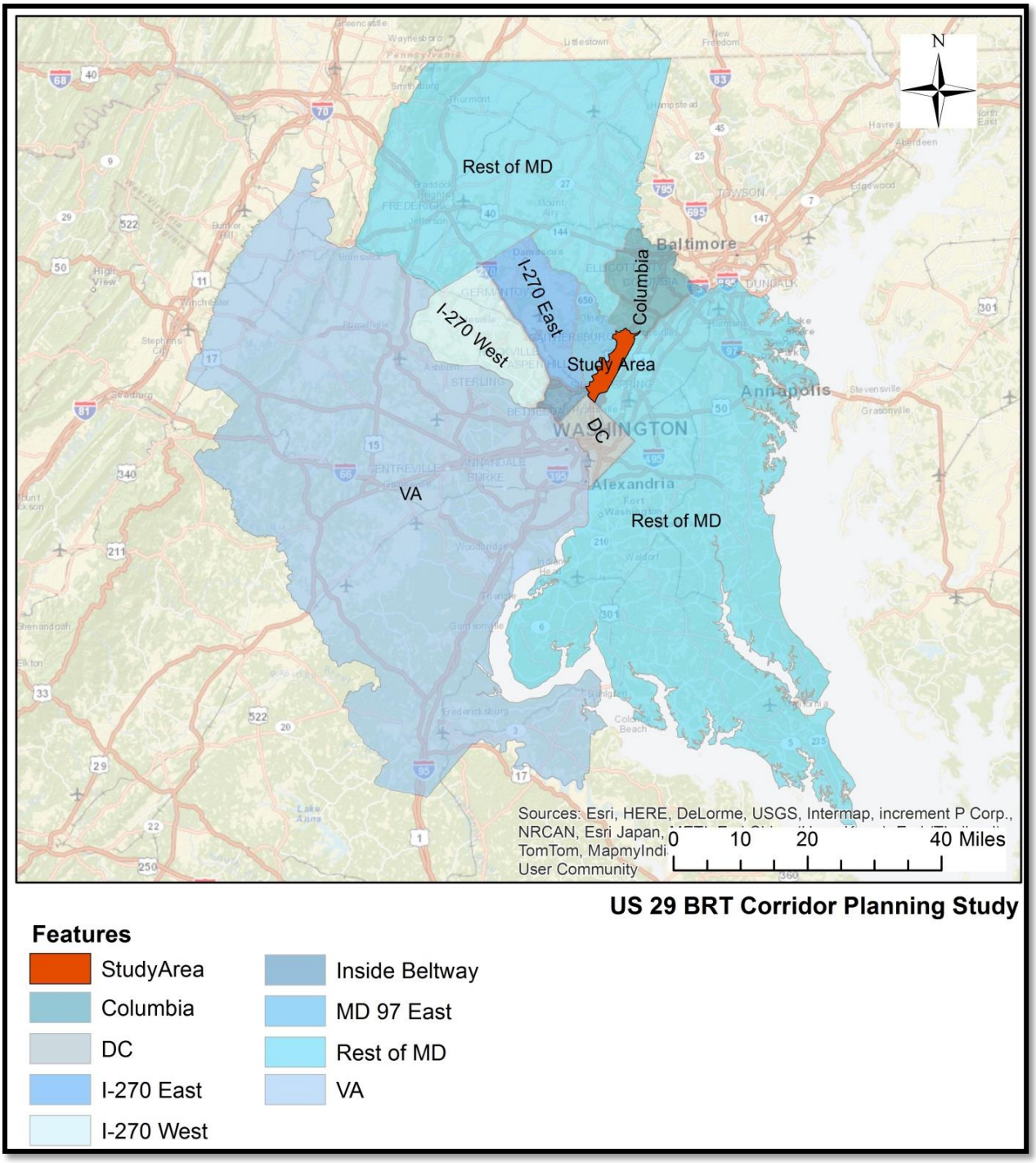


Table 2.4: Person Trips *(2014)*

From\To	DC	I-270 West	I-270 East	MD 97	Inside Beltway	Study Area	Rest of MD	VA	Columbia
DC	857,000	11,700	22,900	5,200	60,400	21,900	124,900	135,200	2,000
I-270 West	58,200	305,300	172,600	7,100	51,000	10,500	22,400	24,400	1,100
I-270 East	85,300	158,200	587,900	51,200	85,000	33,200	43,500	34,000	4,300
MD 97 East	31,800	12,800	74,500	92,900	21,100	34,300	24,400	8,200	3,500
Inside Beltway	104,800	29,400	56,100	8,900	175,600	28,600	27,400	22,600	1,000
Study Area	52,200	9,900	36,000	24,900	36,800	137,000	51,600	11,900	6,000
Rest of MD	532,400	56,200	103,200	23,900	73,200	75,600	5,129,600	266,200	127,300
VA	399,300	16,900	28,800	2,300	34,900	9,300	89,200	7,375,000	2,100
Columbia	27,600	4,500	11,900	4,600	6,100	10,200	137,700	12,000	464,800

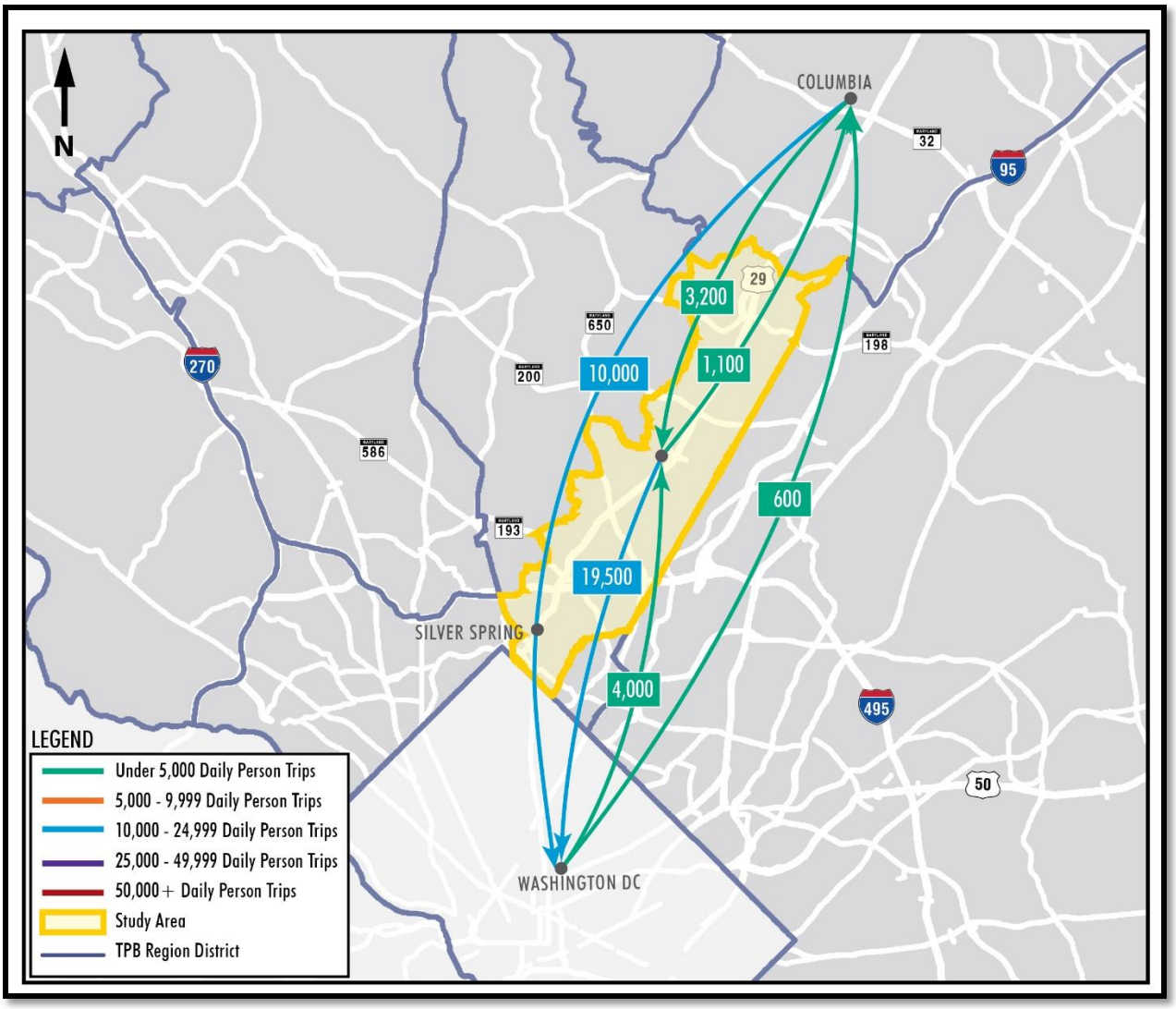
Data Source: TPB/MWCOG Model for 2014. These trips are outbound trips from a home or a non-home location, and their return trips.

Table 2.5: Person Trips *(2040)*

From\To	DC	I-270 West	I-270 East	MD 97	Inside Beltway	Study Area	Rest of MD	VA	Columbia
DC	981,300	10,700	23,700	5,500	62,300	28,500	137,000	150,800	1,700
I-270 West	62,300	385,300	211,600	8,500	53,600	15,300	24,400	31,800	1,200
I-270 East	91,300	198,500	715,700	60,300	93,500	47,000	50,100	42,000	4,400
MD 97 East	31,100	12,600	80,900	104,500	20,800	44,300	30,400	8,700	3,500
Inside Beltway	109,600	28,500	64,300	9,700	188,100	34,600	29,500	25,700	800
Study Area	54,300	9,100	38,200	27,000	37,000	176,300	66,700	12,900	5,500
Rest of MD	617,000	87,800	132,700	26,700	79,400	108,000	6,175,500	317,500	145,700
VA	428,400	22,600	37,400	2,700	40,600	15,400	92,000	9,608,900	2,100
Columbia	28,100	5,000	11,900	4,400	5,700	13,200	166,500	12,800	522,100

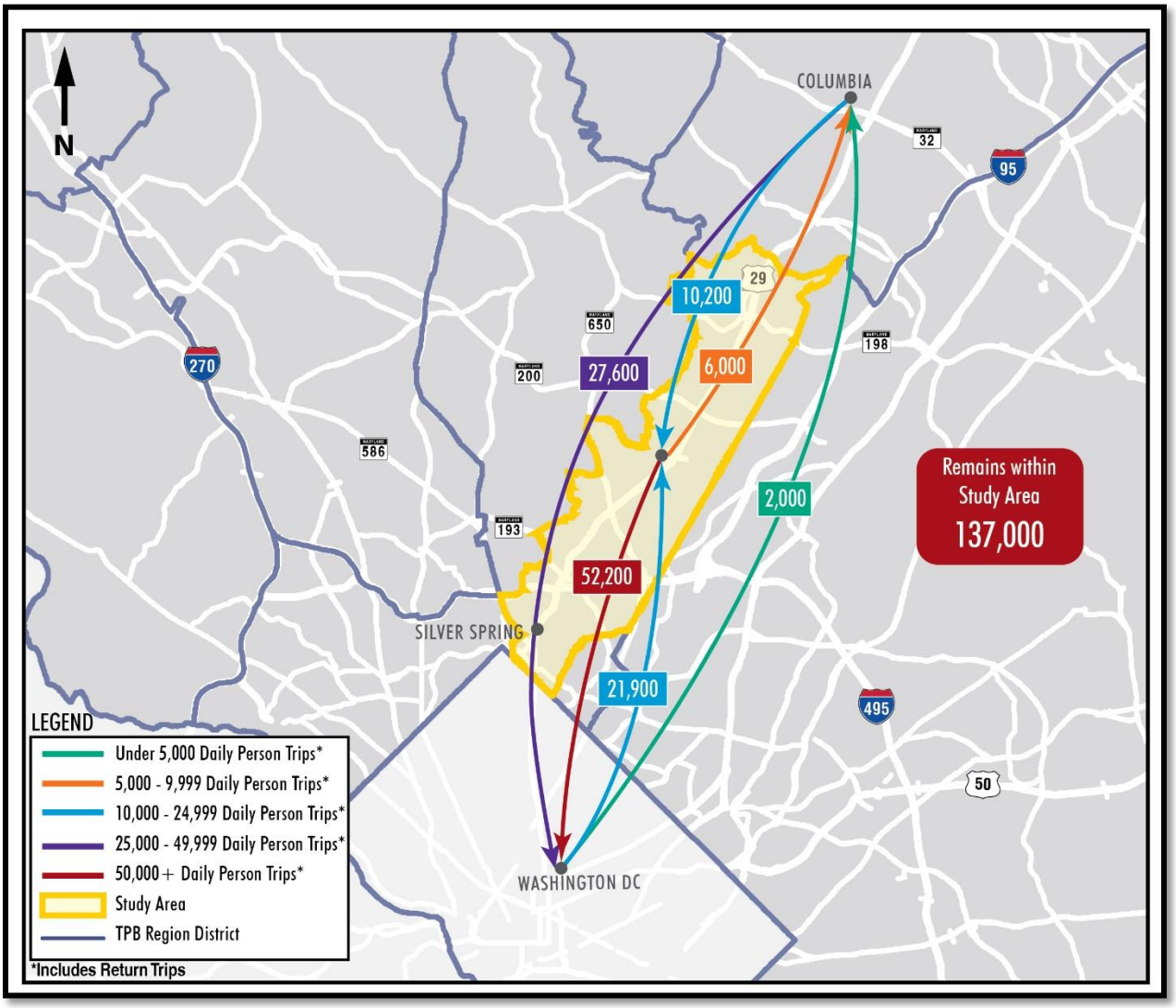
Data Source: TPB/MWCOG Model for 2014. These trips are outbound trips from a home or a non-home location, and their return trips.

Figure 2.11: Worker Commuting Flows *(2006-2010)*



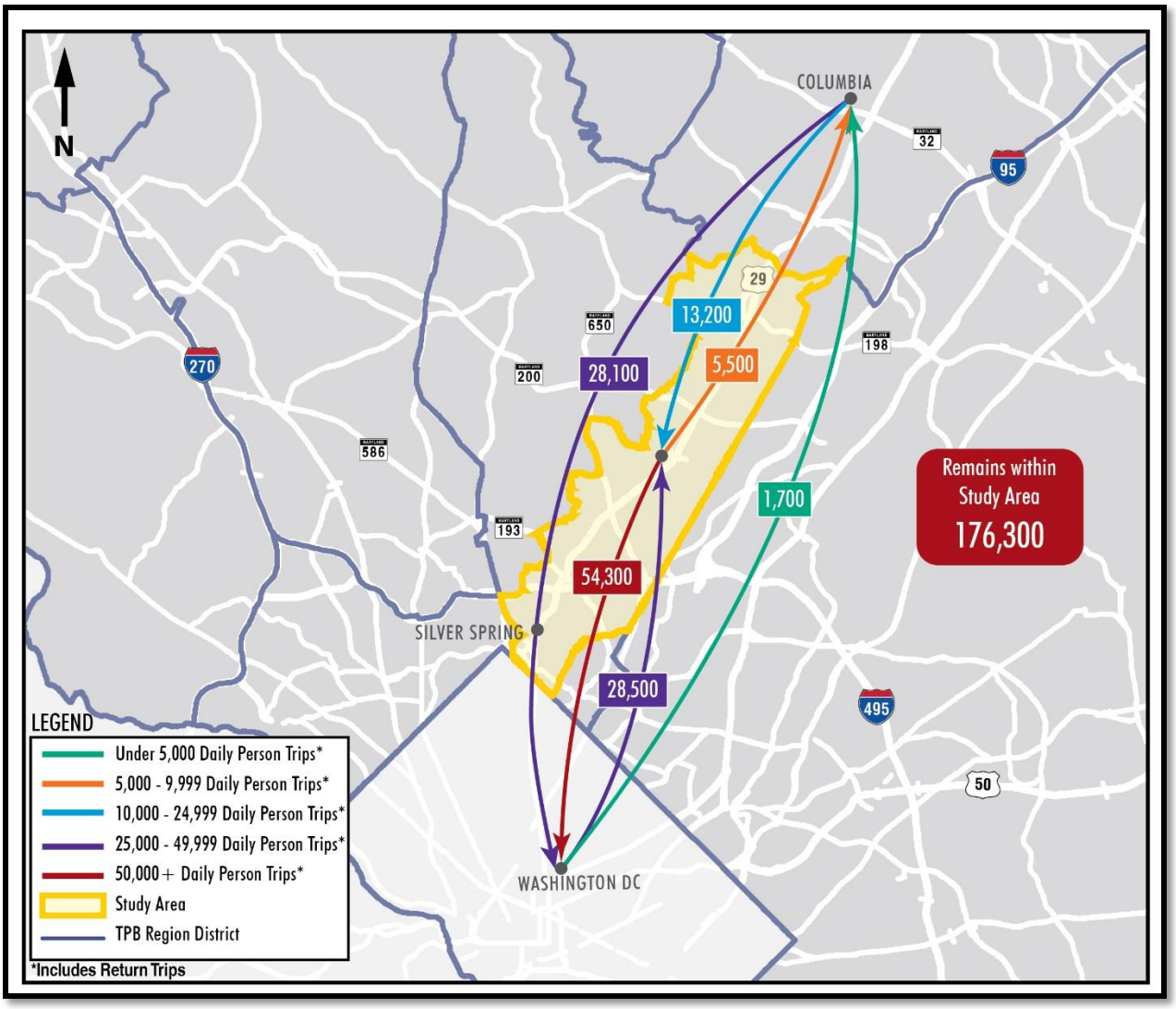
Data Source: 2006-2010 CTPP. Note that internal flows are not included.

Figure 2.12: Travel Patterns – Person Trips *(2014)*



Data Source: TPB/MWCOG Model for 2014. These trips are outbound trips from a home or a non-home location and include return trips.

Figure 2.13: Travel Patterns – Person Trips *(2040)*



Data Source: TPB/MWCOG Model for 2040. These trips are outbound trips from a home or a non-home location and include return trips.

The internal trips inside the study area are a very important market for the US 29 BRT. To better understand this market, we divided the study area into smaller districts, based on aggregation of TAZs. Figure 2.14 depicts the definition of districts, including Silver Spring, White Oak, ICC, and MD 198 north.

Tables 2.6, 2.7, and 2.8 show the internal trip flows for the internal districts for 2014 and 2040, respectively.

Figure 2.15 displays the major flow patterns of outbound person trips from a home or non-home location to a location inside the study area, based on the 2014 TPB/MWCOG model results, while Figure 2.16 shows the 2040 flow patterns. These figures depict growth in study area travel demand, particularly for trip patterns that could, in the future, be facilitated by the US 29 BRT. They represent the potential market for the US 29 BRT.

Figure 2.14: Study Area District Definition

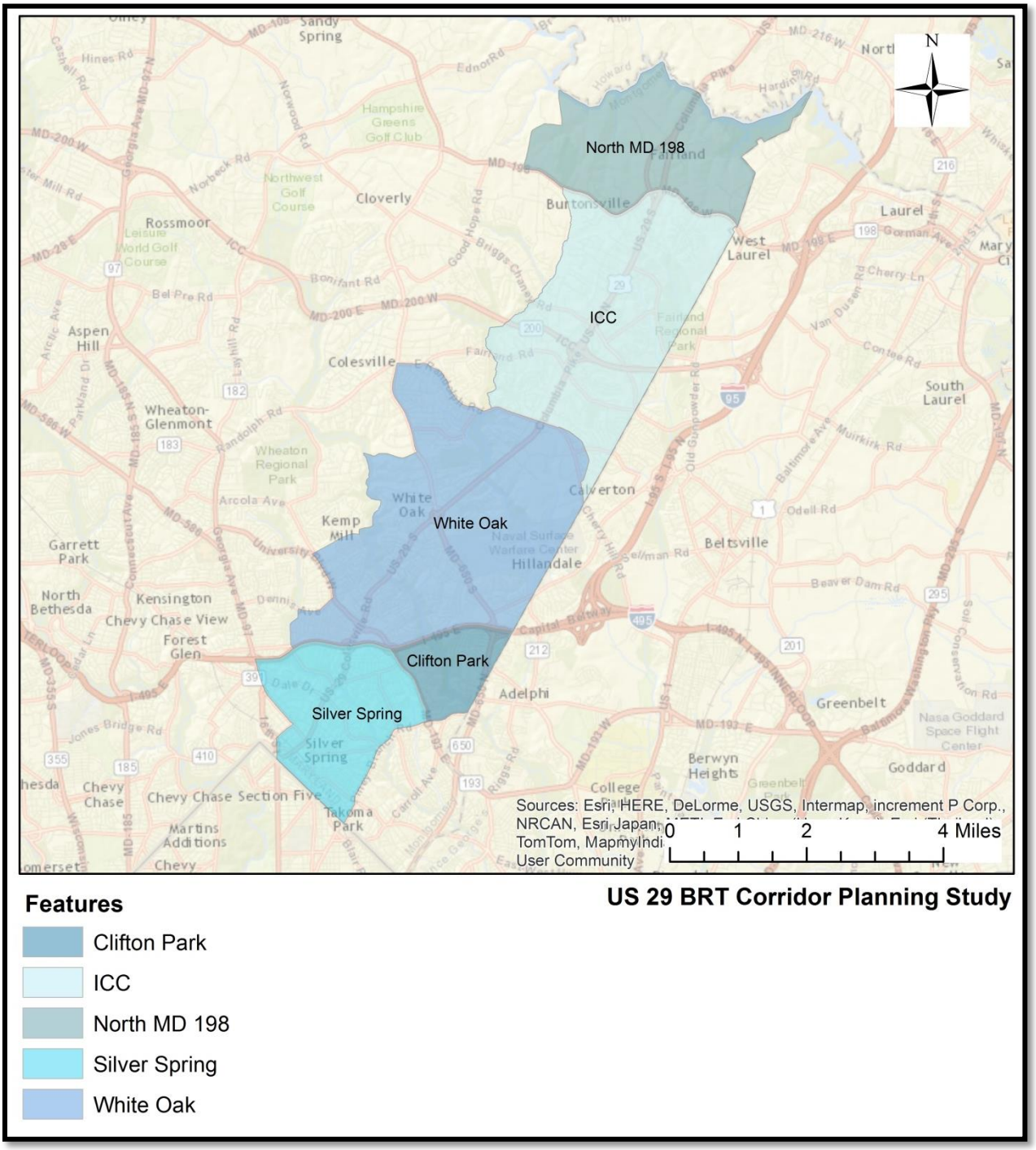


Table 2.6: Intra-Study-Area Daily Person Trips *(2014)*

From\To	Silver Spring	Clifton Park	White Oak	ICC	North MD 198
Silver Spring	24,200	1,500	5,100	900	150
Clifton Park	2,100	2,500	2,400	400	100
White Oak	6,100	1,600	36,100	5,300	400
ICC	1,800	400	9,100	33,000	1,850
North MD 198	150	100	400	950	1,200

Data Source: TPB/MWCOG Model for 2040. These trips are outbound trips from a home or a non-home location, and their return trips.

Table 2.7: Intra-Study-Area Daily Person Trips *(2040)*

From\To	Silver Spring	Clifton Park	White Oak	ICC	North MD 198
Silver Spring	31,400	1,200	6,500	800	150
Clifton Park	2,000	2,400	2,800	350	100
White Oak	7,800	1,700	61,300	6,000	700
ICC	2,000	350	12,500	31,100	2,250
North MD 198	150	100	550	1,050	1,900

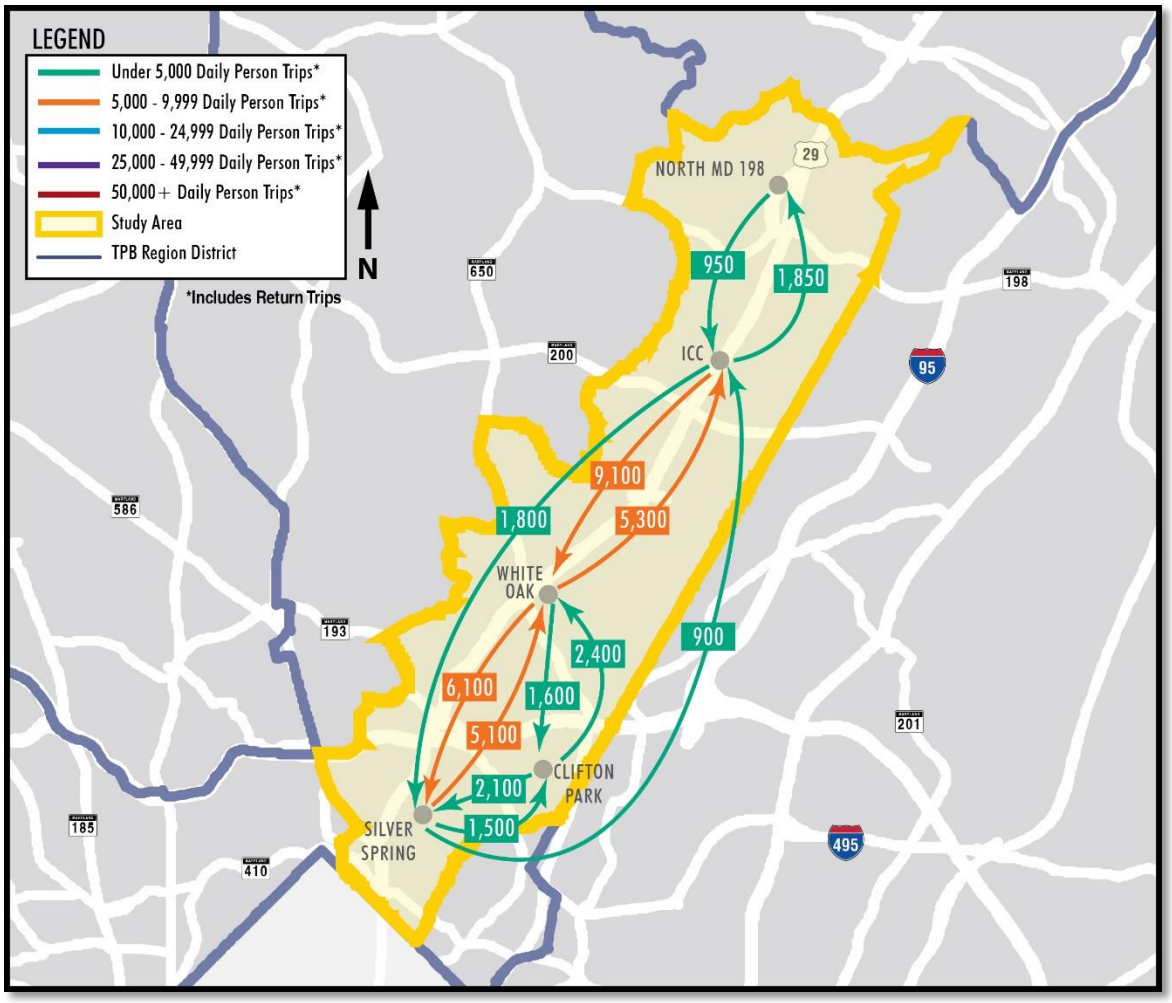
Data Source: TPB/MWCOG Model for 2040. These trips are outbound trips from a home or a non-home location, and their return trips.

Table 2.8: Intra-Study-Area Daily Person Trips – Percent Change *(2014-2040)*

From\To	Silver Spring	Clifton Park	White Oak	ICC	North MD 198
Silver Spring	30%	-20%	27%	-11%	0%
Clifton Park	-5%	-4%	17%	-13%	0%
White Oak	28%	6%	70%	13%	75%
ICC	11%	-13%	37%	-6%	22%
North MD 198	0%	0%	38%	11%	58%

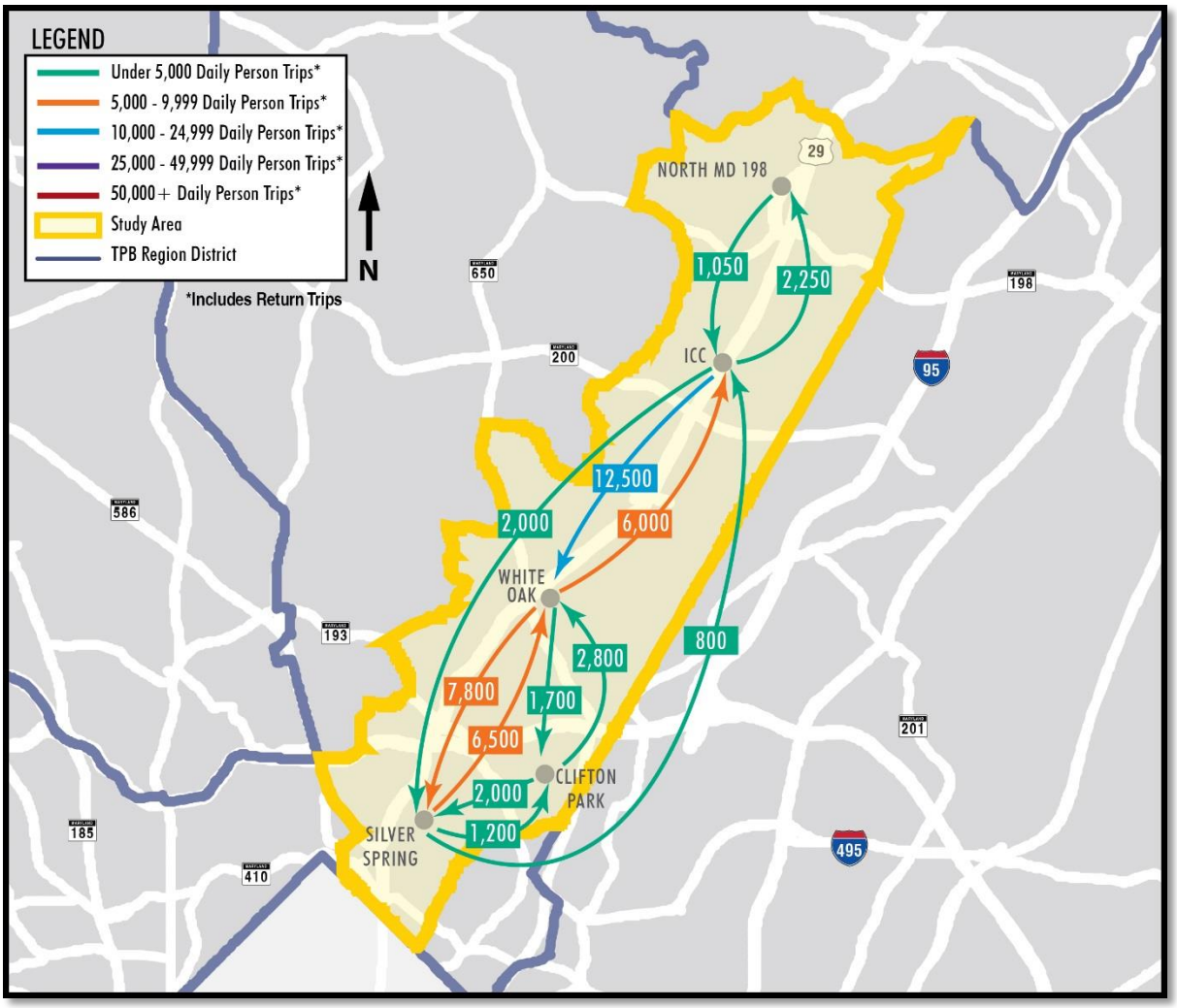
Data Source: TPB/MWCOG Model for 2040. These trips are outbound trips from a home or a non-home location.

Figure 2.15: Internal Travel Patterns – Person Trips *(2014)*



Data Source: TPB/MWCOG Model for 2014. These trips are outbound trips from a home or a non-home location and include return trips.

Figure 2.16: Internal Travel Patterns – Person Trips *(2040)*



Data Source: TPB/MWCOG Model for 2040. These trips are outbound trips from a home or a non-home location and include return trips.

Study Area Mode Share

Single-occupant vehicle is the primary travel mode for all trip purposes, accounting for almost 46% of all trips in the study area in 2014. For Home-Based Work (HBW) trips, transit plays an important role, with about 35% of modal share in the study area. For Home-Based Non-Work (HBNW) and Non Home-Based (NHB) trips, transit only accounts for about 3-4% of trips, while high-occupant vehicle shares are respectively 56% and 45%.

The transit share for all trip purposes is 10 percent, which is higher than transit share in Montgomery County on average. Transit share is forecasted to slightly increase in 2040.

Table 2.9: US 29 Corridor Study Area Mode Share *(2014)*

Mode	HBW	HBNW	NHB	All
Single-occupant vehicle (SOV)	54.6%	40.2%	51.7%	45.9%
High-occupant vehicle (2 passengers)	8.3%	30.6%	26.1%	25.1%
High-occupant vehicle (3+ passengers)	2.5%	25.0%	19.1%	19.1%
Transit	34.6%	4.2%	3.1%	10.0%
Combined	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Data Source: MWCOG/TPB Model for 2014.

Table 2.10: US 29 Corridor Study Area Mode Share *(2040)*

Mode	HBW	HBNW	NHB	All
Single-occupant vehicle (SOV)	53.7%	39.6%	44.0%	43.6%
High-occupant vehicle (2 passengers)	7.9%	30.5%	25.8%	24.8%
High-occupant vehicle (3+ passengers)	2.4%	25.3%	25.9%	21.0%
Transit	35.9%	4.7%	4.4%	10.7%
Combined	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Data Source: MWCOG/TPB Model for 2040 No-Build.

Study Area Total Vehicle Miles Traveled (VMT)

Travel demand, travel patterns, and mode choice contribute to the performance of the transportation system. Increases in travel demand in the study area leads to an overall 15 percent increase in VMT. Table 2.11 shows daily VMT by facility types, freeways, minor arterials, and collectors will have the largest increase between 2014 and 2040.

Table 2.11: US 29 Corridor Planning Study Area *(Daily Vehicle Miles Traveled)*

Facility Type	2014	2040	2014-2040 Change
Freeway	1,110,000	1,336,000	20%
Major Arterial	1,242,000	1,386,000	12%
Minor Arterial	260,000	316,000	21%
Collector	178,000	227,000	28%
Expressway	704,000	760,000	8%
Total	**3,493,000**	**4,025,000**	**15%**

Data Source: MWCOG/TPB Model.

2.3 Corridor Transit Travel

Transit Service Attributes

In the US 29 BRT Corridor Planning Study area, transit services include both rail and bus services, which are provided by three transit providers:

- Metrorail by the Washington Metropolitan Area Transit Authority (WMATA)
- Metrobus by WMATA
- Ride On buses by Montgomery County Transit
- Commuter buses by MTA

Metrorail

Silver Spring Metrorail station is located at the south end of the study area. The other Metrorail stations close to the study area include Forest Glen, Glenmont, and Wheaton as part of the Metrorail Red Line, the busiest Metrorail line running through downtown District of Columbia (DC) and connecting Montgomery County and downtown DC. The U shaped Red Line is approximately 31.9 miles from Shady Grove to Glenmont, and the US 29 study area is on its east leg. It serves twenty-seven stations from 5:00 a.m. to 12:00 a.m. on weekdays; and from 7:00 a.m. to 3:00 a.m. during weekends. As shown in Table 2.12, the Red Line has frequent service during the weekday rush hours, and it also provides reasonably frequent services during off-peak hours and weekends.

Table 2.12: Metrorail Service Frequency

Weekday	AM Peak	Midday	PM Peak	Evening	Late Night
Monday to Friday	3-6	12	3-6	6-10	15-18
Weekend	**Daytime**			**Late Night**	
Saturday	12			15	
Sunday	15			15	

Metrobus

Several buses of the Metrobus Z series line serve the US 29 Corridor and the rest of the study area. The Colesville Road/Columbia corridor consisting of these Z lines is a corridor of the WMATA's Priority Corridor Network (PCN), and WMATA recently conducted the Metrobus Z Line Study, which recommended improvements in services, bus operations, passenger facility, and traffic operations.

These Z Line buses are mostly weekday services, except for Z8. Several are peak services only, including Z2, Z9/Z29, and Z11/Z13 (Figure 2.2). Local services are provided by Z2, Z6, and Z8, while Z9/Z29 and Z11/Z13 are express services.

Most buses run on a headway of 20-30 minutes. The line segment between Silver Spring Metro and Lockwood Drive/New Hampshire Avenue is the common portion of the corridor for the Z lines and has a combined average service headway of 10 minutes in the AM peak and 6-7 minutes in the PM peak. The combined average service headway declines further north—15 minutes in the AM and 8.5 minutes in the PM from Lockwood Drive/New Hampshire Avenue to US 29 and Industrial Parkway, and 30 minutes north of Industrial Parkway.

Table 2.13: Metrobus Services Summary

Bus Routes	From	To	Headway Peak	Headway Off-peak	Span of Service
Z2	Silver Spring	Olney	6-15 min		weekday peak service
Z6	Silver Spring	Burtonsville Crossing Park and Ride	6-15 min	20-30 min	weekday service
Z8	Silver Spring	Greencastle Park and Ride	6-15 min	20-30 min	weekday and weekend service
Z11, Z13	Silver Spring	Greencastle Park and Ride	6-15 min		peak period service (weekday only)
Z9, Z29	Silver Spring	Greencastle Park and Ride	6-15 min		peak period service (weekday only)

Data Source: Washington Metropolitan Area Transit Authority.

Montgomery Ride On Bus

Montgomery County Transit offers transit services that cover part of the US 29 BRT study area, with a 20-30 minute frequency.

Table 2.14: Montgomery Ride On Bus Services Summary

Bus Routes	From	To	Headway Peak	Headway Off-peak	Span of Service
Route 8	Silver Spring	Wheaton	25-30 min	30 min	weekday and weekend
Route 9	Silver Spring	Wheaton	20-30 min	20-30 min	weekday and weekend
Route 10	Twinbrook	Station-Hillandale	20-30 min	20-30 min	weekday and weekend
Route 13	Silver Spring	Takoma	25-30 min		weekday and weekend
Route 21	Silver Spring	Briggs Chaney P&R	20-30 min		weekday peak direction and peak hours
Route 22	Silver Spring	Hillandale	20-30 min		weekday peak hours

Data Source: Montgomery county transit.

MTA Commuter Bus

MTA provides commuter bus services between Columbia/Ellicott City and District of Columbia, including Route 305, 315, and 325, replacing original Routes 915 and 929, effective September 1, 2014. These commuter buses operate in the peak direction during peak periods, with generally a 20-minute headway. In the southbound direction, Route 305 and 315 pick up passengers at and north of Burtonsville Park and Ride, and only discharge passengers beyond this point, including two locations in the study area (Colesville Road & Fenton Street, Silver Spring Metrorail Station).

Table 2.15: MTA Commuter Bus Services Summary

Bus Routes	From	To	Headway Peak	Headway Off-peak	Span of Service
Route 305	Columbia Mall	Washington DC (Library of Congress)	About 20 min		weekday peak service
Route 315	Lette Plaza in Ellicott City	Silver Spring and Washington DC (Navy Yard)	About 20 min		weekday peak service
Route 325	Harper's Farm Village Center in Columbia	Silver Spring and Washington DC (Library of Congress)	About 20 min		weekday peak service
Route 201	Gaithersburg Park & Ride	BWI Marshall Airport and Marc/Amtrak Rail Station	About 60 min	About 60 min	weekday and weekend
Route 202	Gaithersburg	DOD/FT.Meade	About 60 min		weekday peak service
Route 203	Columbia	Bethesda	About 30 min		weekday peak service
Route 204	Frederick	College Park	25 min		weekday peak service

Data Source: Maryland transit administration.

Transit Usage

Current ridership

The study area has a strong transit market, which is demonstrated by the magnitude of the existing transit ridership by different transit modes and providers, including the following:

- With a daily ridership of approximately 13,000, Silver Spring Station is one of top suburban stations for the Metrorail system.
- The combined ridership of the Z line buses, Ride On buses, and MTA commuter buses totals 15,000, with 11,000 on the US 29 Corridor.

- Local services Z6 and Z8 carry the largest ridership on the US 29 Corridor, accounting for over 60 percent of the ridership on the corridor.

- Transit travel patterns indicate the strongest transit market on the southern portion of the US 29 corridor, with the heavy boarding concentration within White Oak along Stewart Lane and Lockwood Drive for inbound and a dominant concentration of alightings south of New Hampshire Avenue and Lockwood Drive for inbound. For outbound, the boardings are predominately concentrated in the line segment between Silver Spring and New Hampshire Avenue and Lockwood Drive, while the alightings have a heavy concentration along Stewart Lane and Lockwood Drive.

- Top stops with the most activity of boardings and alightings are between New Hampshire Avenue and Lockwood Drive and Silver Spring, including Silver Spring station, New Hampshire Avenue and Lockwood Drive, Colesville Road and University Blvd, Colesville Road and Spring Street. Active stops also include stops along Tech Road, Castle Boulevard, the Briggs Chaney Park and Ride, and Burtonsville Park and Ride.

- Transit load profiles show a predominant concentration of transit rider volumes in the southern portion of the US 29 corridor and a large increase in loads along Stewart Lane and Lockwood Drive.

Table 2.16 summarizes the latest average daily boardings for stops and stations in the US 29 BRT Corridor.

Table 2.16: Ridership in the US 29 Study Corridor *(Average Daily Ridership)*

Operator	Station/Route Name	Daily Boardings
Metrorail	Silver Spring	13,195
	Forest Glen	2,442
	Wheaton	4,227
Metrobus	Z2	853
	Z6	3,330
	Z8	3,923
	Z9/29	642
	Z11/13	1172
Ride On	9	255
	10	346
	21	104
	22	260
MTA	305	155
	315	161
	325	43

Source: Metrorail: 2014 10-Year Historical Metrorail Ridership.
Metrobus: 16-JUL-14 Washington Metropolitan Area Transit Authority (WMATA) Ridership by Route and Stop.
Ride On Bus: FY13 Montgomery County US 29 Boarding and Alighting Data.
MTA: Feb 2015 MTA Average Ridership.

Forecast growth in transit ridership (2040 No-Build)

MWCOG prepared the 2040 No Build model for the US 29 BRT Corridor Planning study, based on the TPB/MWCOG Version 2.3.57. The 2040 No Build assumptions are based on the 2014 CLRP, which does not include the proposed US 29 BRT service. The 2040 land use forecasts which serve as an input to the model are a modified Round 8.3, with additional growth in the White Oak area provided by Montgomery County.

The forecast growth between base year 2014 and horizon year 2040 is summarized as follows:

- Metrorail station group of Silver Spring, Forest Glen and Wheaton is forecasted to grow their daily boardings by approximately 40 percent
- Metrobus Z line buses are forecasted to have an approximately 36% growth
- MTA commuter buses will remain stable

Transit Market of the Proposed BRT (Master Plan)

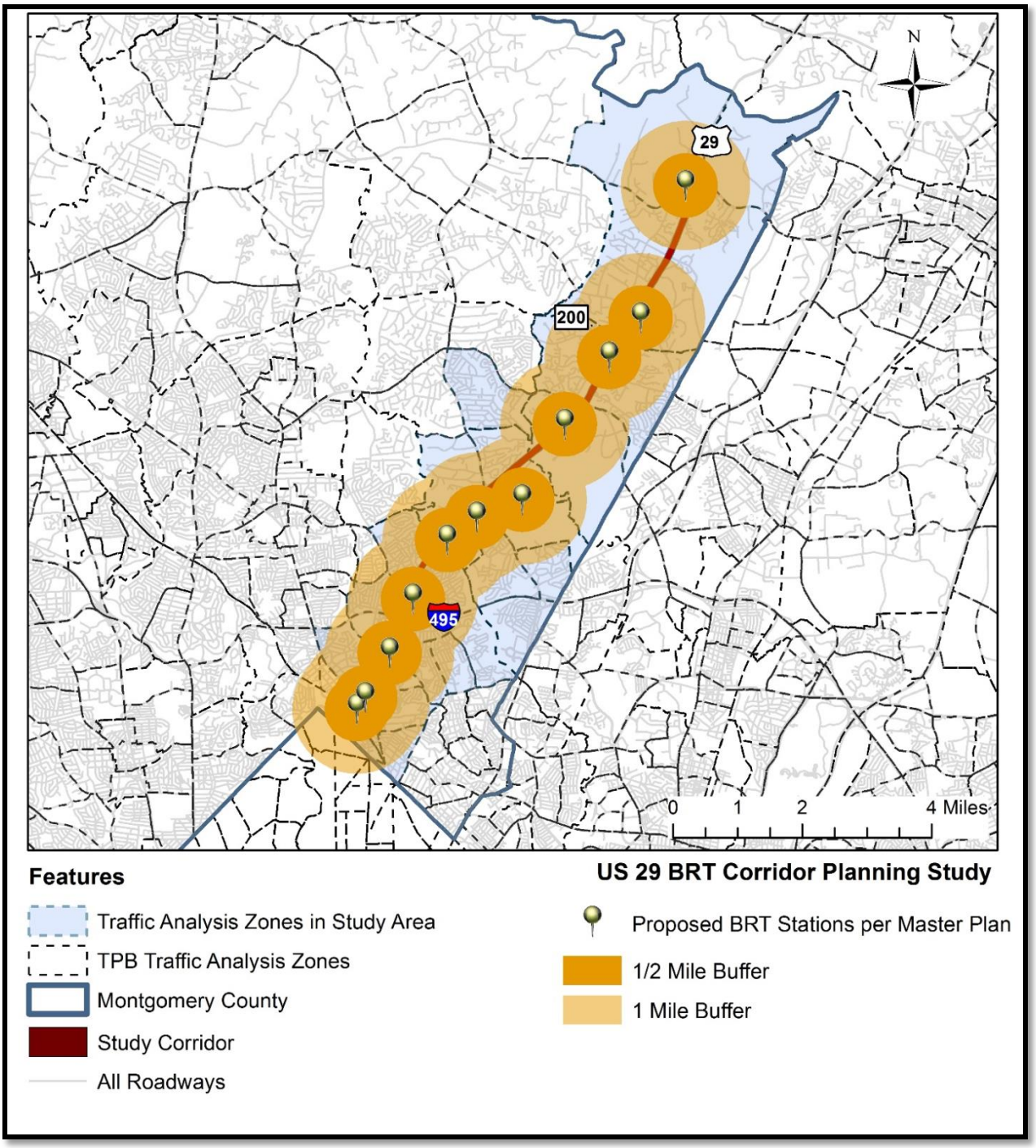
The draft conceptual alignment of the proposed US 29 BRT per the Master Plan is defined as follows:

- It operates mostly on US 29 from Burtonsville Park and Ride Lot to Silver Spring Transit Center
- The total length is approximately 14 miles
- 11 stations were proposed
- 3 Park and Ride locations provide drive access to the US 29 BRT

The proposed BRT stations will cover major service areas in the corridor. Figure 2.17 shows the service areas within ½ mile (walk shed) and 1 mile buffers (bike shed) of the proposed stations. The 1-mile buffers cover most of the study area.

The proposed BRT stations will also provide intermodal connectivity with Metrorail and the proposed Purple Line. Silver Spring Transit Center will be a regional transit hub, connecting riders from the proposed US 29 BRT, Metrorail, and the future Purple Line. Howard County is in the process of studying the BRT options on the US 29 corridor. There is a potential synergy of BRT options proposed in Montgomery and Howard Counties.

Figure 2.17: Accessibility to Proposed BRT Stations



2.4 Roadway Characteristics

Traffic operational analyses were conducted for existing and future 2040 No Build conditions along US 29 within the corridor limits. This section describes the various data sources, traffic volumes, model development methodologies, and operational analysis results of the Existing 2015 Baseline and Future 2040 No-Build traffic operations for the US 29 Bus Rapid Transit (BRT) Study.

Existing 2015 Traffic

Peak Hour Volumes and Average Daily Traffic

Existing 2015 peak hour traffic volumes were recently developed for intersections in the downtown Silver Spring area from US 29 at MD 97 to Sligo Creek Parkway; these volumes were based on 2012 and 2013 non-holiday, mid-weekday traffic counts available on the SHA Traffic Monitoring System (TMS) count database. In addition to the Silver Spring balanced network and other available count data on the SHA Traffic Monitoring System (TMS) count database, new turning movement counts for approximately 20 intersections within the rest the study area (Franklin Avenue to MD 198) were conducted in September and October 2014.

The morning peak hour was determined to be 8:00-9:00am and the afternoon peak hour was determined to be 5:00-6:00pm. All intersection counts were balanced throughout the entire network to establish the vehicle demand along US 29 for both AM and PM peaks.

Average Daily Traffic (ADT) volumes in the study corridor range from a low of approximately 39,600 vehicles south of Fenton Street to a high of 79,400 vehicles north of Crestmoor Drive. Shown in Table 2.17 below is the variation of traffic across the corridor at major crossroads.

Table 2.17: Existing 2015 Average Daily Traffic

Roadway Sections (North to South)	2015 Existing Average Daily Traffic (vehicles) *Lowest - Highest*
Sandy Spring Road (MD 198) to Cherry Hill Road/E. Randolph Road	70,900 – 73,700
Cherry Hill Road/E. Randolph Road to New Hampshire Avenue (MD 650)	59,800 – 71,600
New Hampshire Avenue (MD 650) to University Boulevard (MD 193)	65,500 – 79,400
University Boulevard (MD 193) to Capital Beltway (I-495)	74,000
Capital Beltway (I-495) to Georgia Avenue (MD 97)	39,600 - 65,200

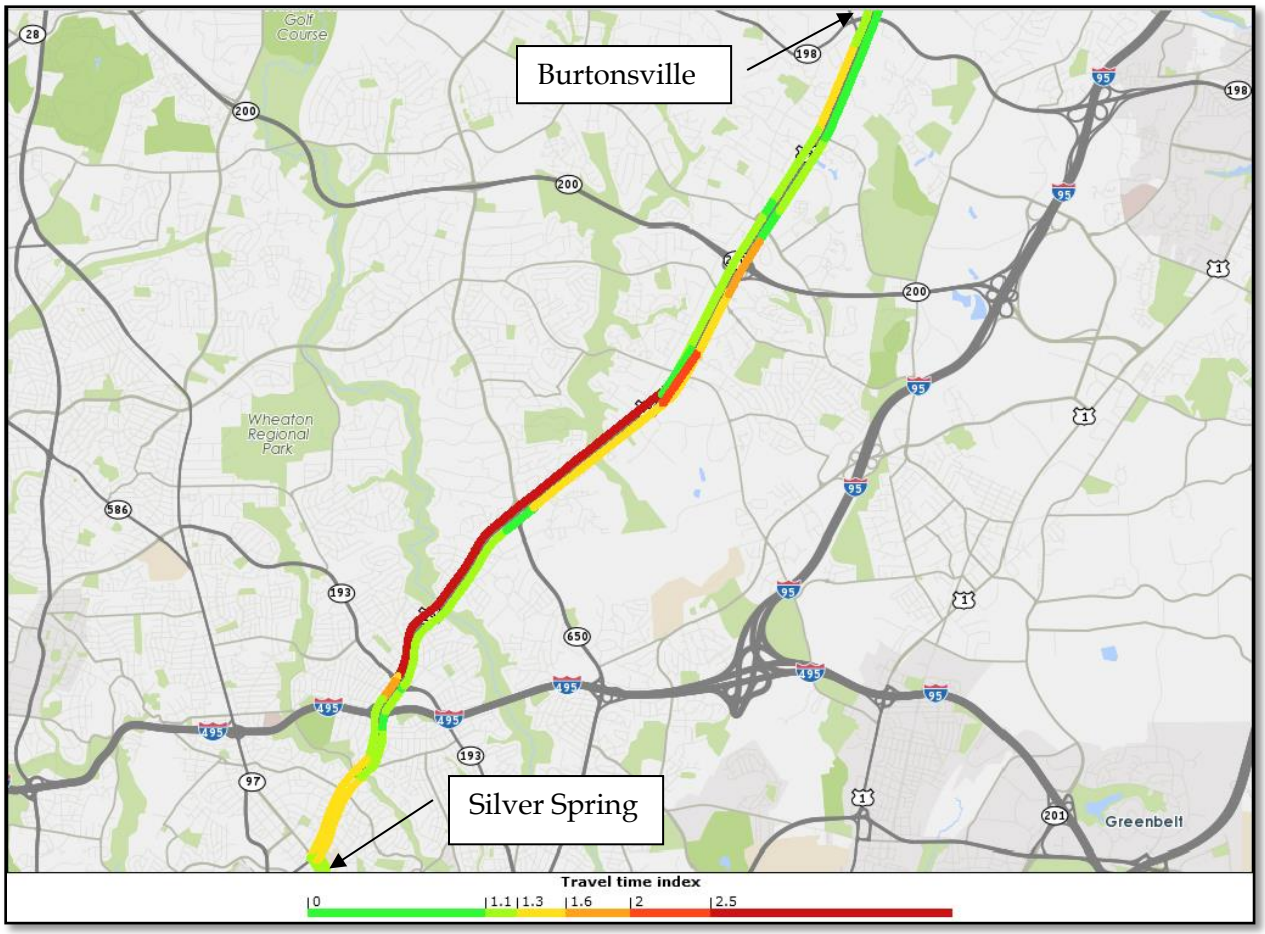
Detailed peak hour and ADT volumes for Existing 2015 conditions are provided in Appendix B.

Congestion Overview

Review of the corridor congestion was collected from the Regional Integrated Transportation Information System (RITIS) for the two selected peak hours, 8:00-9:00am and 5:00-6:00pm, and averaged over the entire 2014 year for a typical Tuesday, Wednesday, and Thursday. Shown below in Figures 2.18 and 2.19 are the Travel Time Indices (TTI) congestion maps.

TTI refers to the travel time represented as a percentage of the ideal travel time. This means the actual travel time under congestion is divided by the free-flow travel time for an estimate of the proportional time increase. The TTI value represents the travel time multiplicative needed to travel that same segment of roadway under congested conditions. Note that the color designations on the TTI maps shown below do not refer to Level of Service, which will be represented in later sections of this report.

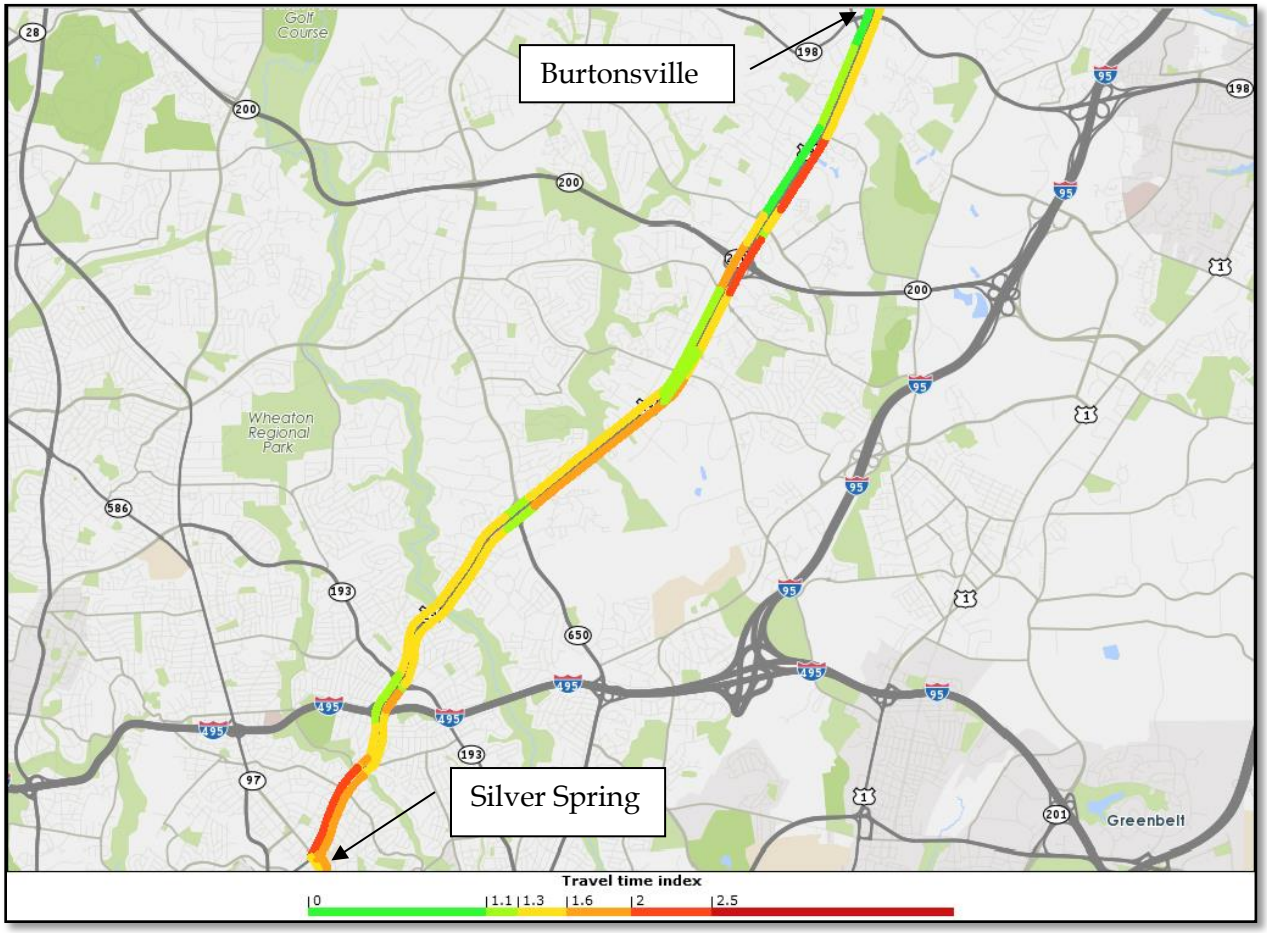
Figure 2.18: Morning Peak Hour Congestion Map (TTI)



Source: RITIS.org, 2015

The above map suggests congestion concerns for US 29 southbound in the morning peak hour, starting from Cherry Hill Road/E. Randolph Road and extending to University Boulevard (MD 193). Additionally the Silver Spring downtown area experiences some delays between Sligo Creek Parkway and Georgia Avenue (MD 97) in both northbound and southbound directions.

Figure 2.19: Afternoon Peak Hour Congestion Map (TTI)



Source: RITIS.org, 2015

Under the afternoon peak hour congestion, delays were noted throughout the US 29 corridor. The average congestion appears to be above a 1.3 TTI (yellow) with only spot locations operating between 0-1.3 TTI (green). The southbound direction of US 29 in Silver Spring also operates poorly while the northbound US 29 corridor has a larger number of segments above 1.6 TTI (orange and red).

The TTI calculations in the above figures represent a coarse overview of the congestion throughout the corridor; these values should be understood as a corridor level congestion and not intersection based or approach based levels of service or delay.

Car Travel Times

Vehicular travel time information was collected during morning peak periods of 7:00-9:00am and 4:00-6:00pm to ensure the peak hours selected during volume development were captured. These travel times were then compared to the RITIS data and used to validate the existing operational model, which is discussed in the following subsections.

Operational Model Development

Microsimulation Model Setup

VISSIM, a microsimulation modeling software, was used to develop the network based operational analysis for the US 29 corridor. VISSIM's operational analysis capabilities include, but are not limited to: car, truck and pedestrian volumes, transit routes and stops, to-scale lane geometry, and signal timings; all items were input based on field-collected or field-verified data. The microsimulation model covered the entire study corridor, with additional intersections in the Silver Spring central business district to better replicate congestion and transit movements at the end of the corridor.

For this BRT study, the model included an initialization (seed) time of 30 minutes followed by one hour of actual simulation time, representative of the established AM and PM peak hours. The approximated seeding period was determined based on the total travel time for a vehicle to travel from one end of the study area to the other. The initialization time was incorporated so that the model network reached the appropriate saturation level at the beginning of the peak hour analyzed.

Signal Timing Inputs

Signal timing data was provided by Montgomery County's Division of Traffic Engineering and Operations for all signalized intersections within the corridor. Field visits were also performed to confirm the signal operations and phasing at all intersections.

Transit Travel Times and Dwell Times

Transit boarding and alighting along the corridor was provided by the Washington Metropolitan Area Transit Authority (WMATA) of Washington D.C. for the Z-lines, Montgomery County for the Ride On buses, and Maryland Transit Administration for the Express bus lines.

Bus travel times and dwell times were also recorded via field collection for the Z9 and Z29 Metrobus lines for comparison to the future conditions. The Z9 and Z29 lines being the most active in this corridor represented the highest frequency of buses in the selected morning and afternoon peak hours.

Additionally dwell bus time distributions were based on the field-measured dwell times and boarding/alighting counts submitted by WMATA, Ride On, and MTA. A logarithmic relationship was developed between the boarding/alighting and the associated dwell times; this relationship was plotted and divided into three passenger movement levels:

"Low" activity: 0 – 4 passenger movements

"Medium" activity: 5 – 15 passenger movements

"High" activity: 16+ passenger movements

Operational Model Calibration

Model calibration and validation refers to the process that confirms the model provides a reasonable approximation of reality (validation) and makes any adjustments to the model to bring it within desired validation targets (calibration). This ensures that the model accurately represents existing traffic conditions.

Existing VISSIM models for 8:00-9:00am and 5:00-6:00pm were calibrated to match balanced intersection turning movement counts and link volume data within the study area. Validation acceptance targets included statistics such as Percent Difference at less than ±10% of actual volume, Geoffrey E. Havers (GEH) statistic less than 5, Percent Root Mean Square Error (%RMSE) less than 10, and Coefficient of Determination (R^2) greater than 0.95. Both the morning and afternoon peak hour volume calibrations were met.

Calibration of vehicle travel times were completed using speed and travel time information collected along the US 29 corridor in September 2014. Travel times simulated in the VISSIM software were considered calibrated if they fell within ±10% difference from the collected travel times across the entire corridor and ± 30 seconds from the collected travel times along the individual, smaller travel time segments (i.e., intersection-to-intersection travel times).

The collected bus travel times were also used in calibrating the microsimulation to replicate the bus trips throughout the US 29 corridor.

Existing 2015 Operational Results

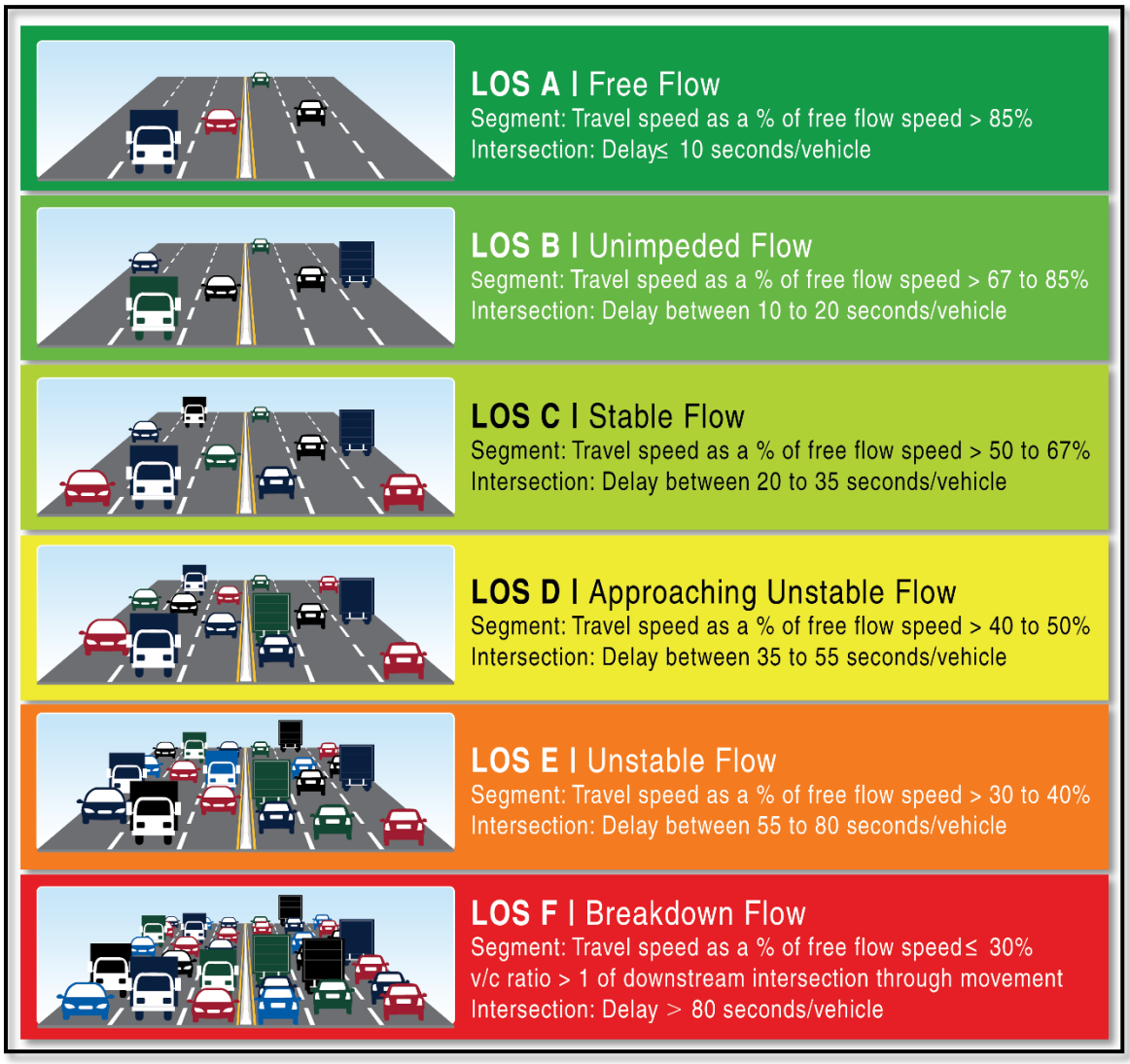
This subsection summarizes the results of the Existing 2015 VISSIM analysis based on the following measures of effectiveness. Detailed outputs from the VISSIM software are shown in Appendix C, Tables 1A through 6.

Measures of Effectiveness (MOEs)

Outputs from the VISSIM microsimulation software were compiled to produce the following Measures of Effectiveness (MOEs):

- intersection delay per vehicle, which was translated to a Level of Service (LOS) grade using the 2010 Highway Capacity Manual (HCM) (Figure 2.20),
- vehicle speeds for prominent segments along the US 29 corridor, which were translated to a LOS grade using the 2010 HCM (Figure 2.20),
- merge, weave, and diverge vehicle densities where appropriate, which were translated to a LOS grade using the 2010 HCM (Table 2.18),
- pedestrian delays between Colesville Road at Wayne Avenue/2nd Ave to Spring Street,
- bus route travel times/speeds,
- vehicles denied entry, which refers to vehicles that were not served in the microsimulation network.

Figure 2.20: Intersection and Segment 2010 HCM LOS Criteria



Intersection Levels of Service (LOS)

Intersection LOS is calculated based on approach vehicular delays and has a recorded unit of seconds of delay per vehicle (sec/veh). The approach delays are weighted based on vehicular volumes and added to provide a total intersection delay, which is then translated to a LOS grade based on the latest 2010 HCM (Figure 2.20).

Review of the US 29 operational results suggests two intersections fail under existing 2015 conditions: one in the AM peak hour and one in the PM peak hour. Additionally, four intersections operate poorly, at LOS E; three out of the four are in the PM peak hour (Appendix C, Table 1A).

Segment Levels of Service (LOS)

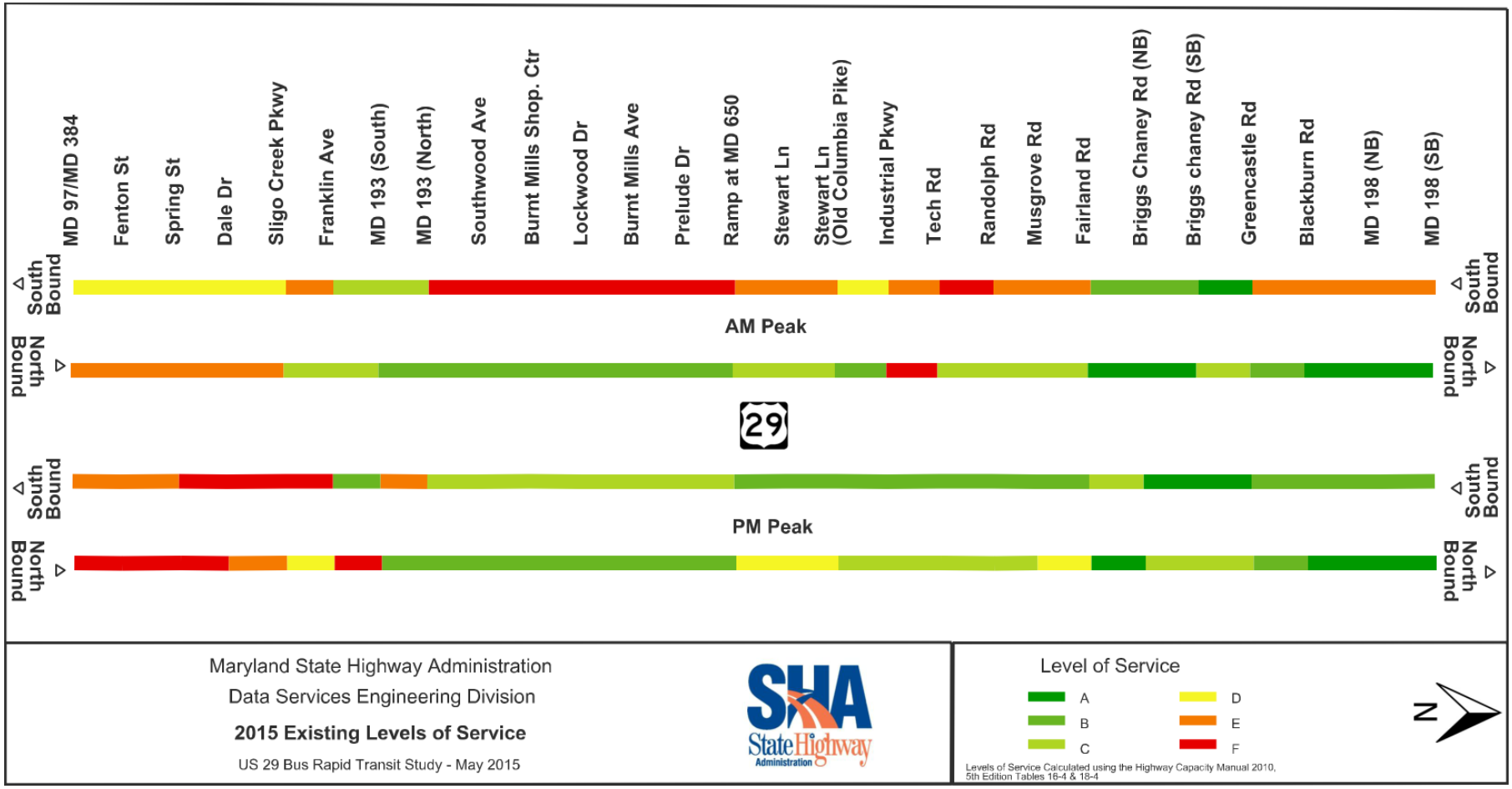
The 2010 HCM calculates travel speed of a roadway segment as a percentage of the free-flow speed on that same segment. Reported average speeds along the corridor are translated directly from the travel time outputs, which include dwell times at signalized intersections. LOS grades, as shown in Figure 2.20, are characterized by the level of congestion on the roadway segment; by the critical volume-to-capacity ratio of the downstream intersection through movement; and by the overall LOS of the downstream intersection.

Several roadway sections of US 29 operate at LOS F for cars and trucks: three in the northbound direction and three in the southbound direction during the AM and PM peak hours. Nine additional segments operate poorly, at LOS E, most of which are in the southbound direction and in the AM peak hour. Further detail on segment LOS is shown in Appendix C, Tables 1A and 3.

Shown in Figure 2.21 below, is a summarized diagram of the US 29 segment LOS for both 2015 AM and PM peak hours. The top half of the diagram shows the segment LOS for the AM peak and the bottom half of the diagram shows the segment LOS for the PM peak. Within each peak hour diagram, the top bar reports the LOS as a vehicle travels southbound, while the bottom bar reports the LOS as a vehicle travels northbound on the US 29 corridor.

The traffic delay patterns noted in the previous TTI congestion maps are reflected in Figure 2.21; however, it should be noted that the TTI congestion maps and the LOS maps below are referring to two distinctly different measures of traffic operations. The results of one analysis should reflect similar patterns, but is not necessarily the same.

Figure 2.21: 2015 AM and PM Peak Segment Levels of Service



Bus Speeds

Bus speeds along US 29 vary from 6 mph to 54 mph as shown in Appendix C, Table 4. Note that bus speeds were calculated directly from the travel times and thus include the dwell times at each stop. These values were provided for comparison purposes of future alternatives. However, the 2010 HCM does not characterize levels of service based on bus speeds; therefore, a figure similar to Figure 2.21 cannot be replicated for bus speed segment LOS independently.

Weave, Diverge, and Merge Level of Service

Weaves, diverges and merges refer specifically to interchange facilities, where vehicles exit or enter a freeway from an access controlled roadway. These facilities can be evaluated based on the vehicle density at the specific weave, diverge, or merge and translated to a LOS based on the 2010 HCM (Table 2.18).

Table 2.18: Weave, Diverge, and Merge 2010 HCM LOS Criteria

	Density (pc/mi/ln)	
LOS	Weaving Segments on Multilane Highways or C-D Roadways	Freeway and/or Multilane Highway Merge and Diverge Segments
A	0 – 12	≤ 10
B	> 12 – 24	> 10 – 20
C	> 24 – 32	> 20 – 28
D	> 32 – 36	> 28 – 35
E	> 36	> 35
F	Demand exceeds capacity	

Six weave, diverge, and merge segments operate at LOS F, all of which are in the AM peak hour; one of the six also fails in the PM peak hour. Additionally, one diverge segment operates at LOS E in the PM peak hour. Detailed results are located in Appendix C, Table 5.

Pedestrian Delays (Silver Spring)

Pedestrian per person delays in the Silver Spring downtown area (Spring Street to Wayne Avenue/2nd Avenue) shown in Appendix C, Table 2 suggest average wait times vary from 33 seconds to 69 seconds. There is no direct correlation to level of service based on average pedestrian wait times based on the 2010 HCM. These values were provided for comparison purposes of future alternatives.

Vehicles Denied Entry (Latent Demand)

Vehicles denied entry, which refers to the vehicles that could not be served in the one hour peak period analyzed, totaled at 423 vehicles under AM peak conditions and 726 vehicles under PM peak conditions. These values will be used in future analyses to evaluate the total vehicle congestion that might re-route because they could not be served during the simulation. There is no set value to indicate whether a certain amount of vehicles denied entry relates to a specific

congestion level; however, the total denied entry volume is a good indicator for comparison purposes of future alternatives.

Future 2040 No-Build Traffic Forecasts

Future 2040 No-Build traffic volumes were developed using the latest version of the TPB/MWCOG regional transportation model Version 2.3.57, with land use forecast Round 8.3, approved as of October 2014. It should also be noted that the CLRP projects (i.e., the Fairland Road interchange and Musgrove Road closure and the Purple Line) were included in the model of the No-Build conditions; however, the BRT along US 29 was not included. MWCOG calibrated the regional travel demand model to statistically acceptable standards for the US 29 corridor. SHA's Travel Forecasting and Analysis team then received the validated model to further refine the US 29 corridor and to develop intersection and interchange level ADT and peak hour traffic. The latest land use information provided in the model includes the White Oak and Silver Spring developments.

Model Output Post Processing

The modeled ADT volumes for the study area network were post processed and refined to link and intersection level daily volumes by using the NCHRP 255/765 screenline methodology. This process accounts for differences in forecasted base year volumes from the validated MWCOG model versus counted volumes (2015), and applies the resulting factors to future year modeled ADTs (2040). The Future 2040 No-Build ADT ranges from a low of approximately 41,700 vehicles south of Fenton Street to a high of 88,100 vehicles north of Crestmoor Drive (Table 2.19).

Table 2.19: Forecasted 2040 Average Daily Traffic

Roadway Sections (North to South)	2040 No-Build Average Daily Traffic (vehicles) *Lowest - Highest*	2015 Existing Average Daily Traffic (vehicles) *Lowest – Highest*
Sandy Spring Road (MD 198) to Cherry Hill Road/E. Randolph Road	73,900 – 82,900	70,900 – 73,700
Cherry Hill Road/E. Randolph Road to New Hampshire Road (MD 650)	67,700 – 79,300	59,800 – 71,600
New Hampshire Road (MD 650) to University Boulevard (MD 193)	72,600 – 88,100	65,500 – 79,400
University Boulevard (MD 193) to Capital Beltway (I-495)	81,900	74,000
Capital Beltway (I-495) to Georgia Avenue (MD 97)	41,700 – 72,400	39,600 - 65,200

Once the post-processed Future 2040 No-Build ADTs were established, the 2040 AM and PM peak hour volumes were developed across the US 29 corridor using the existing 2015 traffic distribution as well as knowledge of planned development patterns. A percentage of the Future 2040 No-Build ADT growth was applied to every 2015 AM and PM movement at every intersection and interchange within the corridor, resulting in 2040 AM and PM peak hour volumes. Due to the congested nature of this corridor, saturation of US 29 was also taken into consideration through the use of this percentage of ADT growth. Traffic volumes for the Future 2040 No-Build conditions may be found in Appendix B.

Future No-Build 2040 Operational Results

The following discussion summarizes the results of the Future 2040 No-Build VISSIM analysis. Detailed outputs from the VISSIM software are shown in Appendix C, Tables 1A through 6.

Intersection Levels of Service

Along US 29 alone, seven intersections are noted to fail (i.e., delay > 80 sec/veh) under the AM and/or PM peak No-Build conditions. Seven intersections, associated to the US 29 corridor side streets, are also noted to fail under the AM and/or PM peak No-Build conditions.

Furthermore, eight intersections that were operating acceptably under Existing 2015 conditions now deteriorate to LOS E (i.e., delay is between 55 and 80 sec/veh) under 2040 No-Build conditions.

The Future 2040 No-Build AM peak experiences five new major delay locations (i.e., LOS E or LOS F), while the 2040 No-Build PM peak experiences sixteen new major delay locations when compared to Existing 2015 conditions (Appendix C, Table 1A).

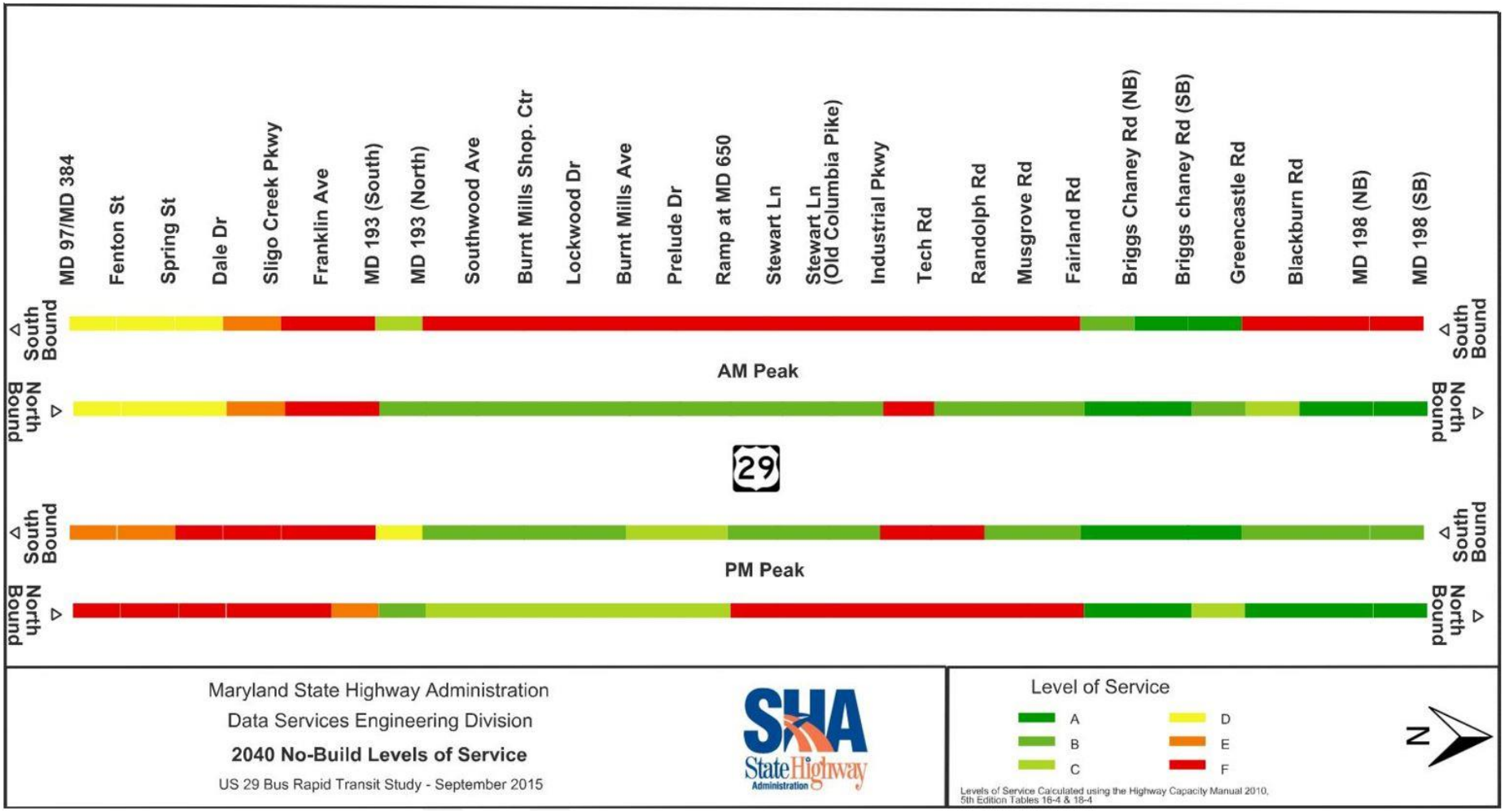
Segment Levels of Service

Increased delay throughout the corridor is also translated to a reduction in travel speeds from Existing 2015 conditions, as shown in Appendix C, Table 3. Reported speeds along the corridor were translated directly from the travel time outputs, which include dwell times at signalized intersections.

Thirteen northbound and twenty southbound segments fail (refer to Figure 2.20 for LOS grades) under 2040 No-Build conditions. Additionally, two northbound and three southbound segments of US 29 operate poorly, at LOS E (Appendix C, Tables 1A and 3).

Similar to the Existing 2015 LOS diagrams, Figure 2.22 summarizes the LOS results for the 2040 No-Build AM peak hour (top half) and the 2040 No-Build PM peak hour (bottom half).

Figure 2.22: 2040 AM and PM Peak Segment Levels of Service



Bus Speeds

Bus speeds along US 29 vary from 6 mph to 51 mph in the 2040 No-Build AM peak and from 4 mph to 54 mph in the 2040 No-Build PM peak, as shown in Appendix C, Table 4. Note that bus speeds were calculated directly from the travel times and thus include the dwell times at each stop. The 2010 HCM does not characterize levels of service based on bus speeds; therefore, a figure similar to Figure 2.22 cannot be replicated for bus speed segment LOS independently.

For the purpose of this study, the bus travel times along US 29 are increased by approximately 13 minutes in the AM southbound peak direction and by 14 minutes in the PM northbound direction. This additional time is not applicable to individual buses, but rather the average total travel time change from Existing conditions to No-Build conditions (Table 2.20).

Future 2040 No-Build network bus delays increased by a total of 13 minutes in the morning and 14 minutes in the evening peak hours.

Table 2.20: Existing 2015 vs. No-Build 2040 Bus Travel Times

	Southbound			Northbound		
	2015 Existing	2040 No-Build	Percent Increase	2015 Existing	2040 No-Build	Percent Increase
AM Cars & Trucks	34 min	45 min	32%	21 min	21 min	0%
AM Buses*	34 min	47 min	29%	25 min	25 min	0%
PM Cars & Trucks	23 min	25 min	9%	25 min	37 min	48%
PM Buses*	27 min	30 min	11%	30 min	44 min	47%

*This % increase does not affect buses individually; it is a network-wide bus miles traveled comparison.

Weave, Diverge, and Merge Level of Service

Eleven weave, diverge, and merge segments operate at LOS F (refer to Table 2.18 for LOS grades) under 2040 No-Build conditions in the AM and/or PM peak hours. One diverge segment operates at LOS E in the 2040 No-Build PM peak hour. Detailed comparison results between the Existing and Future No-Build operations may be found in Appendix C, Table 5.

Pedestrian Delays (Silver Spring)

Pedestrian per person delays in the Silver Spring downtown area (Spring Street to Wayne Avenue/2nd Avenue) shown in Appendix C, Table 2 suggest average wait times are similar to the existing 2015 wait times, varying from 33 seconds to 69 seconds. Pedestrian delay is therefore not significantly impacted under 2040 no build conditions.

Vehicles Denied Entry (Latent Demand)

Vehicles denied entry, which refers to the vehicles that could not be served in the one hour peak period analyzed, totaled at 2,369 vehicles under 2040 No-Build AM peak conditions and 4,902 vehicles under 2040 No-Build PM peak conditions (Table 2.21).

Table 2.21: Latent Demand Percent Change from 2015

Scenario	Vehicle Denied Entry (vehicles)	Percent Change from 2015
2040 No-Build AM Peak	2,369	460%
2040 No-Build PM Peak	4,902	575%

This represents a 460% increase in vehicles in the 2040 No-Build AM from Existing 2015 conditions and an increase of 575% in vehicles in the 2040 No-Build PM from Existing 2015 conditions.

Denied entry vehicles in the 2040 No-Build conditions are no longer served by the US 29 corridor in the one hour morning or evening peak period. The increase in denied entry vehicles suggests the corridor cannot sustain the traffic increase. Denied entry vehicles not served by the US 29 corridor are expected to detour to other facilities to reach their destinations.

Existing Crash Data Summary

Crash data was obtained for a three (3) year period from 2011 to 2013 for the study corridor of US 29 between Silver Spring and Burtonsville. A total of 1,088 crashes were reported along the US 29 corridor during the three-year study period from 2011 to 2013.

The number of crashes decreased from 378 crashes in 2011 to a low of 341 crashes in 2012 and then increased to 369 crashes in 2013. Three (3) crashes resulted in three (3) fatalities. One fatal crash occurred at night at the intersection of US 29 and Tech Road and was alcohol related. The second fatal crash was a rear-end crash that occurred at the intersection of US 29 and Blackburn Road due to a vehicle traveling too fast for conditions. The third fatal crash occurred at night at the intersection of US 29 and Oak Leaf Drive and involved a pedestrian. Four hundred forty-seven (447) of the crashes resulted in injuries to 649 vehicle occupants. There were 73 incidents involving alcohol, representing approximately seven percent (7%) of all crashes.

Table 2.22: Study Area Crash Summary *(2011–2013)*

Roadway Sections (North to South)	Total Crashes (2011 to 2013)	Total Pedestrian/ Bicycle Crashes (2011-2013)	3-year Total Crash Rate per Mile	High Crash Types
MD 97 to Spring Street *Includes portions of US 29 south of MD 97*	100	12	200 *High crash segment*	Sideswipe, pedestrian, parked vehicle, property damage, & parked vehicles
Spring Street to MD 193 (University Boulevard)	308	5	182	Rear end & Sideswipe
MD 193 (University Boulevard) to Lockwood Drive	131	2	117	Opposite Direction
Lockwood Drive to Stewart Lane	126	3	103	Injury, Left Turn & Night time
Stewart Lane to Musgrove Road	202	2	95	Injury, Left Turn, Angle, & Night Time
Musgrove Road to MD 198 (Sandy Spring Road)	221	1	64	Night Time

Source: SHA.

The segment between MD 97 and Spring Street, which includes portions of US 29 towards the Silver Spring Central Business District, was identified as a significantly higher than statewide average rate for similar state-owned roadways (Table 2.22).

Table 2.23 expands upon the previous table to include detailed crash information regarding the severity, collision type, time of day, etc. Such crash trends are broken down into three segments along the study corridor:

- **Southern Segment** – This 2.6 mile segment of US 29 between Burlington Avenue (MP 0.18) and University Boulevard (MP 2.75) in Silver Spring includes the I-495 (Capital Beltway) interchange.
    - **Reversible Lane Segment** – As requested, this 0.92 mile segment of US 29 between Georgia Avenue (MP 0.82) and Sligo Creek Parkway (MP 1.74) in Silver Spring is a subset of the Southern Segment where there are reversible lanes.

- **Central Segment** – This 4.5 mile segment of US 29 between University Boulevard (MP 2.75) and Musgrove Road (MP 7.25) passes through White Oak.

- **Northern Segment** – This 5.0 mile segment of US 29 between Musgrove Road (MP 7.25) and the Patuxent River (MP 12.25) includes the MD 200 interchange and passes through Burtonsville.

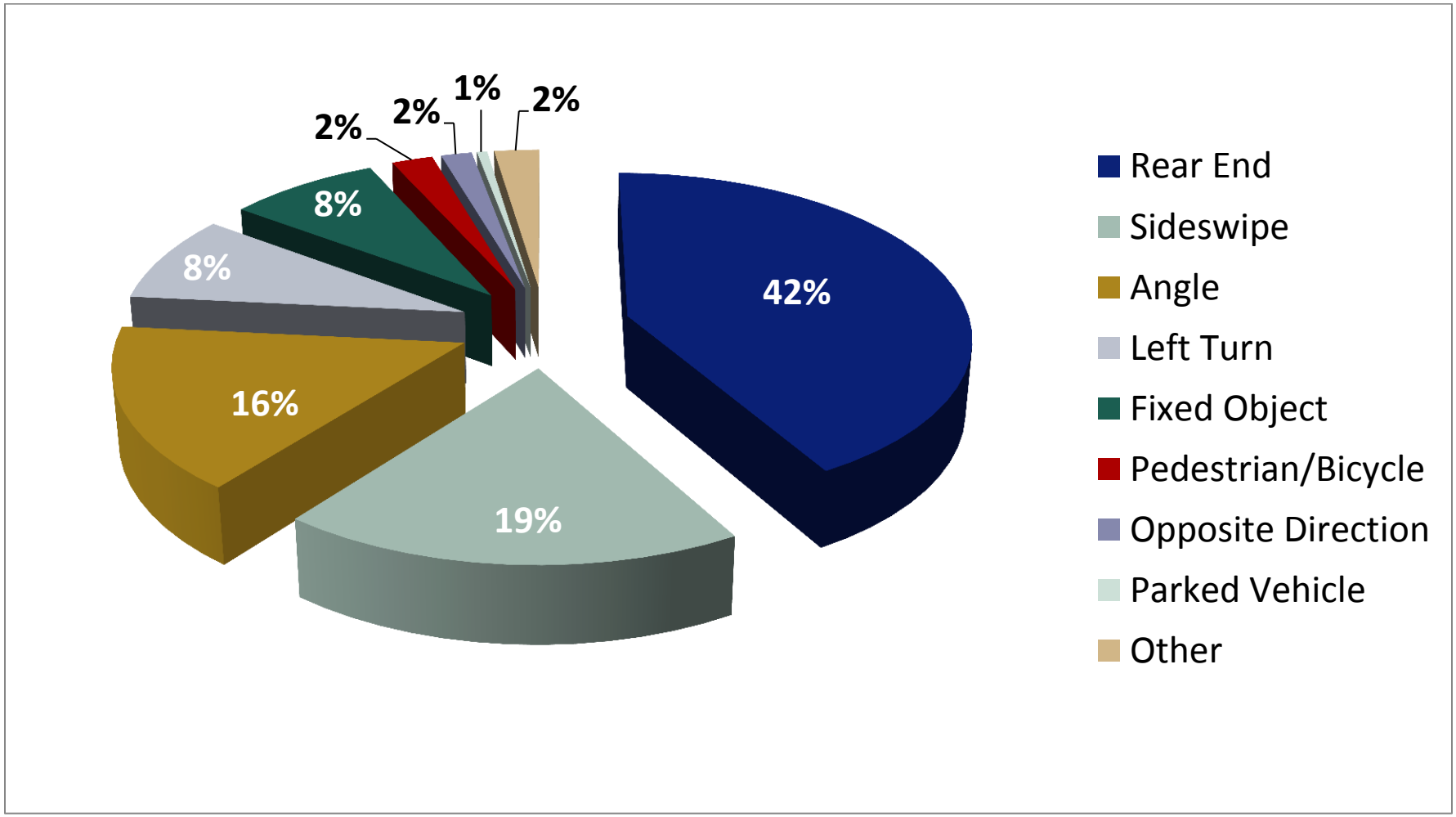
Table 2.23: US 29 (MP 0.18-12.25) Detailed Crash Summary *(2011–2013)*

Segment Name	Severity			Light		Surface Condition			Collision Type									Time of Day			Day of Week		Alcohol-Related	Crashes per Segment Mile	TOTAL
	Property Damage	Injury	Fatal	Day	Night	Dry	Wet	Snow/Ice	Rear End	Sideswipe	Angle	Left Turn	Fixed Object	Pedestrian	Opposite Direction	Parked Vehicle	Other	AM Peak	PM Peak	Off-Peak	Weekday	Weekend			
Southern Segment MP 0.18 – 2.75 (Silver Spring/I-495)	310	170	0	338	142	384	92	4	181	127	77	43	22	16	7	2	5	66	106	308	385	95	21	186.8	480
Central Segment MP 2.75 – 7.25 (White Oak)	228	183	2	268	147	349	62	4	179	56	70	45	43	7	7	2	6	46	83	286	316	99	34	92.2	415
Northern Segment MP 7.25 – 12.25 (Fairland/Burtonsville)	99	93	1	116	77	154	37	2	94	22	27	5	23	1	4	2	15	27	42	124	136	57	18	38.6	193
TOTAL	**637**	**447**	**3**	**722**	**366**	**887**	**191**	**10**	**454**	**205**	**174**	**93**	**88**	**24**	**18**	**6**	**26**	**139**	**231**	**732**	**901**	**269**	**73**	**90.1**	**1,088**
Reversible Lane Segment MP 0.82 – 1.74 (MD 97/Georgia Ave to Sligo Creek Pkwy: subset of Southern Segment)	144	73	0	167	48	179	37	1	64	75	33	27	2	9	3	1	3	26	39	152	180	37	5	235.9	217

Source: SHA.

A review of all crashes throughout the corridor is also summarized in Figure 2.23 in the following page.

Figure 2.23: Percentages by Crash Types *(Entire Corridor)*



3.0 Summary

The Maryland State Highway Administration (SHA) and Maryland Transit Administration (MTA) have initiated the Purpose and Needs Study as part of the US 29 Bus Rapid Transit (BRT) Corridor Planning Study, in coordination with Montgomery County Department of Transportation. Travel demand analysis and ridership forecasting is an important element of the US 29 BRT Study. This report documents travel markets in the study area for existing and future conditions and provides the support to the Purpose and Needs from the travel demand perspective.

This travel demand analysis is conducted in the regional, county, and corridor context. Major findings include the following:

- Two regional activity centers, Silver Spring and White Oak, serve as an engine for activities and travel in the study area.
- Strong employment growth in these two regional activity centers were forecasted for 2040, with a growth of almost 80 percent over 2014.
- Intra-study-area trips represent a significant share of travel market for the study area, with approximately 40 percent of total trips in 2014 and expected to increase by nearly 30 percent in 2040.
- DC-bound commuting trips were a major out-flow of trips from the study area, with approximately 20,000 residents living in the study area and commuting to DC for work, based on the 2006-2010 CTPP.
- Another major DC-bound commuting flow of approximately 10,000 was from Howard County areas north of the US 29 BRT Corridor, which can use US 29 as a commuting route to DC.
- Severe congestion exists north of the beltway of the US 29 corridor and is forecast to exacerbate in the future 2040 condition.
- The study area has a strong transit market, as demonstrated by the magnitude of the existing transit ridership by different transit modes and providers, including an average weekday daily Metrorail ridership of approximately 13,000 for Silver Spring Station and more than 15,000 boardings for the Metrobus Z line buses, Ride On buses, and MTA commuter buses.
- The proposed US 29 BRT will support for the County's growth visions and the regional transit priority.

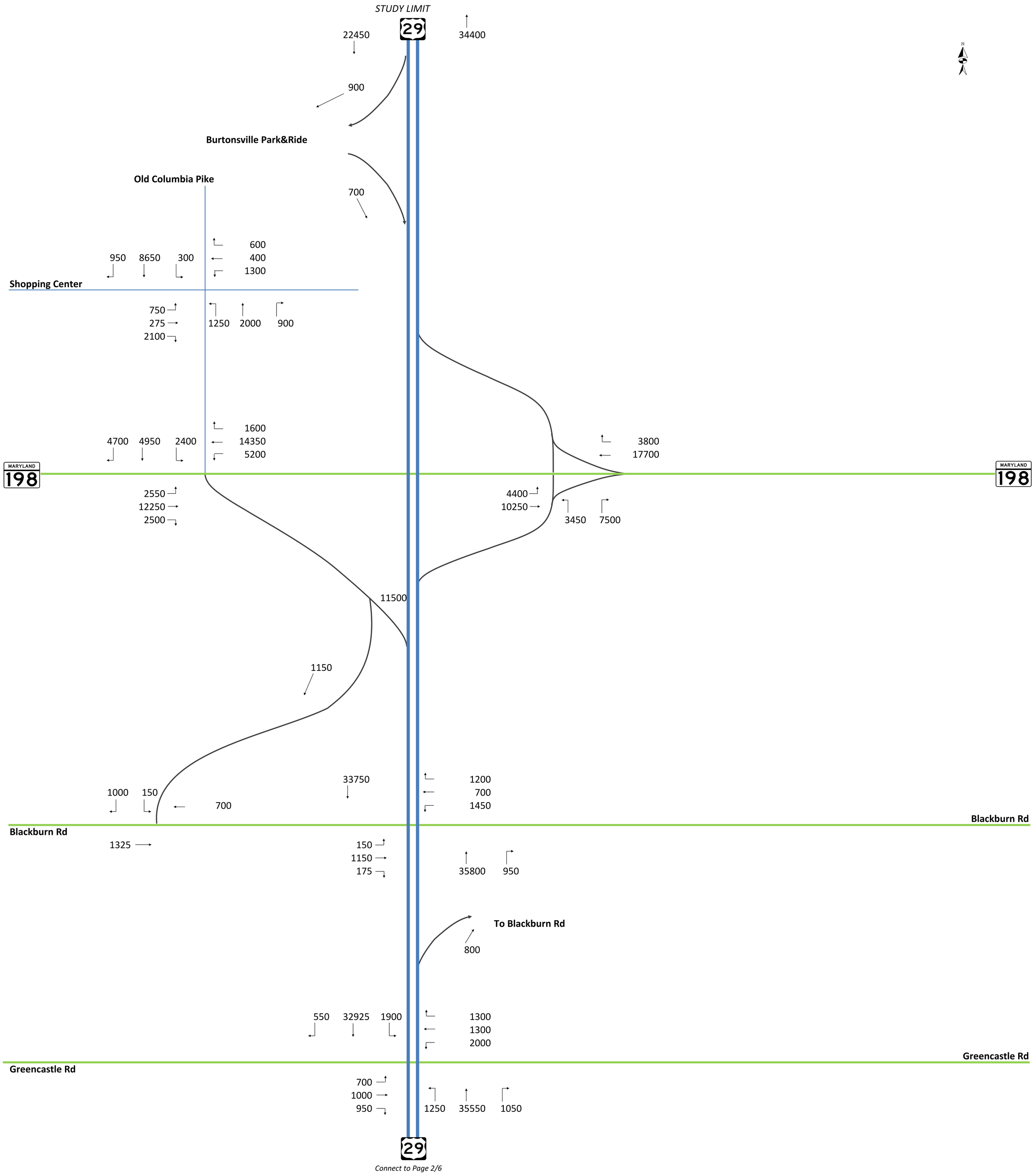
4.0 Appendices

4.1 Appendix A: Traffic Analysis Zone Growth Details

TAZ #	Households	Households	% Change	Population	Population	% Change	Total Employment	Total Employment	% Change
573	1,653	1,663	1%	5,260	5,236	0%	556	746	34%
582	226	271	20%	686	826	20%	1,654	2,564	55%
583	159	170	7%	451	484	7%	138	143	4%
584	7,634	8,096	6%	19,573	19,882	2%	2,118	2,952	39%
585	1,437	1,508	5%	5,101	5,152	1%	1,149	1,149	0%
586	877	2,461	181%	2,603	6,925	166%	6,940	32,511	368%
587	3,233	3,316	3%	9,297	9,198	-1%	3,424	3,424	0%
588	1,187	1,198	1%	3,712	3,606	-3%	2,093	2,105	1%
589	839	935	11%	1,931	1,980	3%	949	949	0%
590	535	565	6%	1,577	1,692	7%	292	292	0%
591	3,193	4,394	38%	8,465	11,511	36%	935	3,014	222%
592	4	-	-100%	15	-	-100%	11,047	14,080	27%
593	487	990	103%	1,568	3,148	101%	1,448	2,586	79%
594	949	1,371	44%	2,618	3,741	43%	499	2,418	385%
595	1,133	1,208	7%	3,588	3,749	4%	701	701	0%
596	1,694	1,900	12%	3,355	3,727	11%	769	1,513	97%
597	1,106	1,107	0%	3,078	3,052	-1%	1,011	1,011	0%
598	1,569	1,570	0%	4,074	4,092	0%	530	530	0%
599	1,137	1,139	0%	2,792	2,805	0%	402	402	0%
603	1,360	1,365	0%	4,227	4,390	4%	1,097	1,144	4%
604	353	353	0%	1,066	1,068	0%	51	51	0%
605	672	672	0%	1,963	1,970	0%	217	217	0%
606	897	897	0%	2,582	2,597	1%	513	791	54%
607	2,306	2,317	0%	5,323	5,385	1%	179	192	7%
608	1,738	1,827	5%	5,059	5,350	6%	421	450	7%
609	1,236	1,434	16%	3,513	4,397	25%	429	1,660	287%
610	2,345	2,351	0%	6,040	5,707	-6%	397	397	0%
621	1,158	1,159	0%	3,628	3,724	3%	794	806	2%
622	1,640	1,902	16%	5,193	5,926	14%	489	552	13%
623	1,477	3,281	122%	2,689	5,464	103%	5,821	11,652	100%
624	2,646	3,252	23%	6,034	6,988	16%	12,788	18,652	46%
625	5,184	6,248	21%	10,431	11,725	12%	7,274	10,000	37%
Total	**52,703**	**57,277**	**9%**	**139,018**	**145,492**	**5%**	**73,997**	**96,465**	**30%**

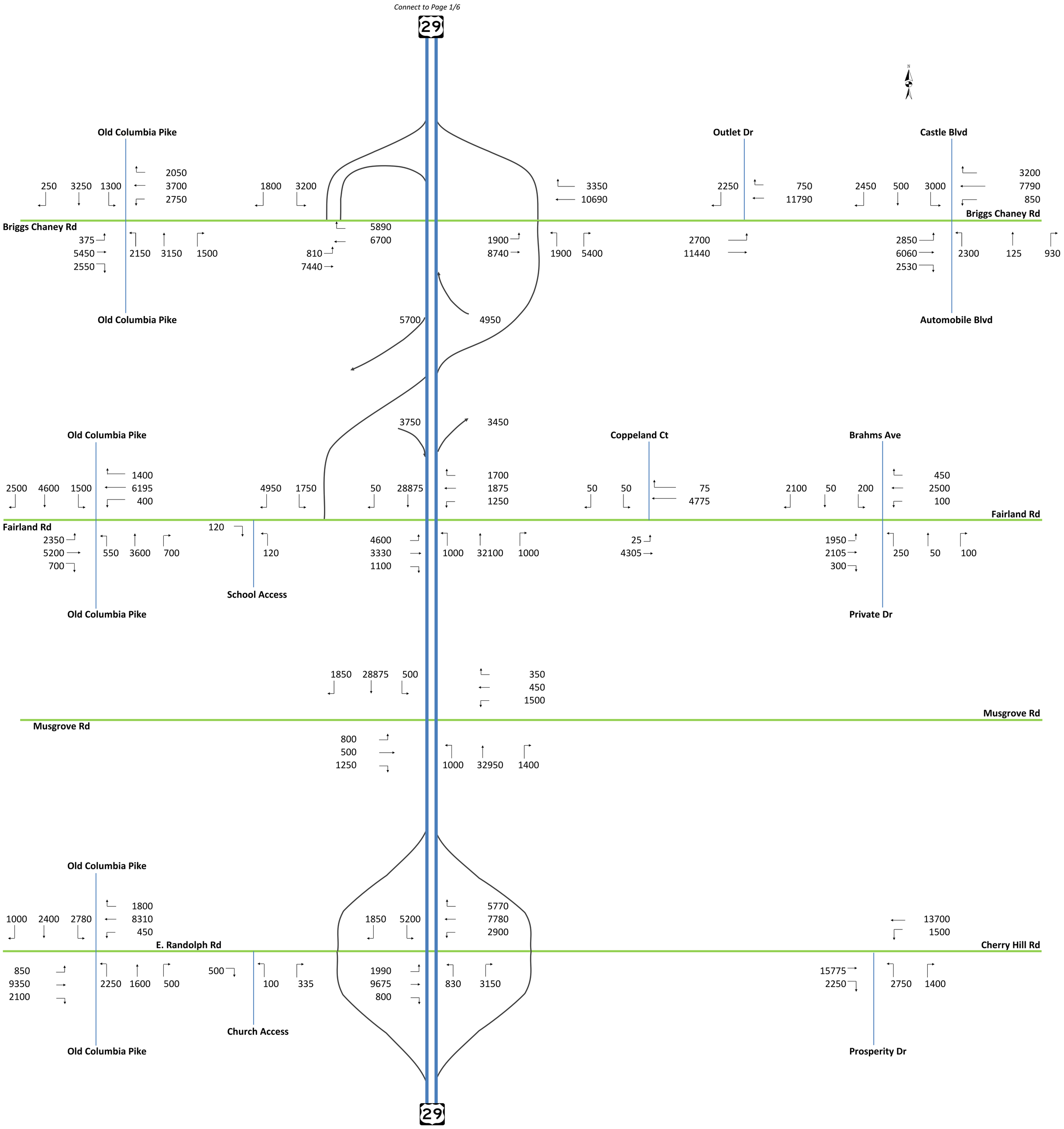
4.2 Appendix B: Existing 2015 and Future 2040 No-Build Traffic Volumes

US 29 2015 Average Daily Traffic
Bus Rapid Transit Study



US 29 2015 Average Daily Traffic
Bus Rapid Transit Study

Connect to Page 1/6



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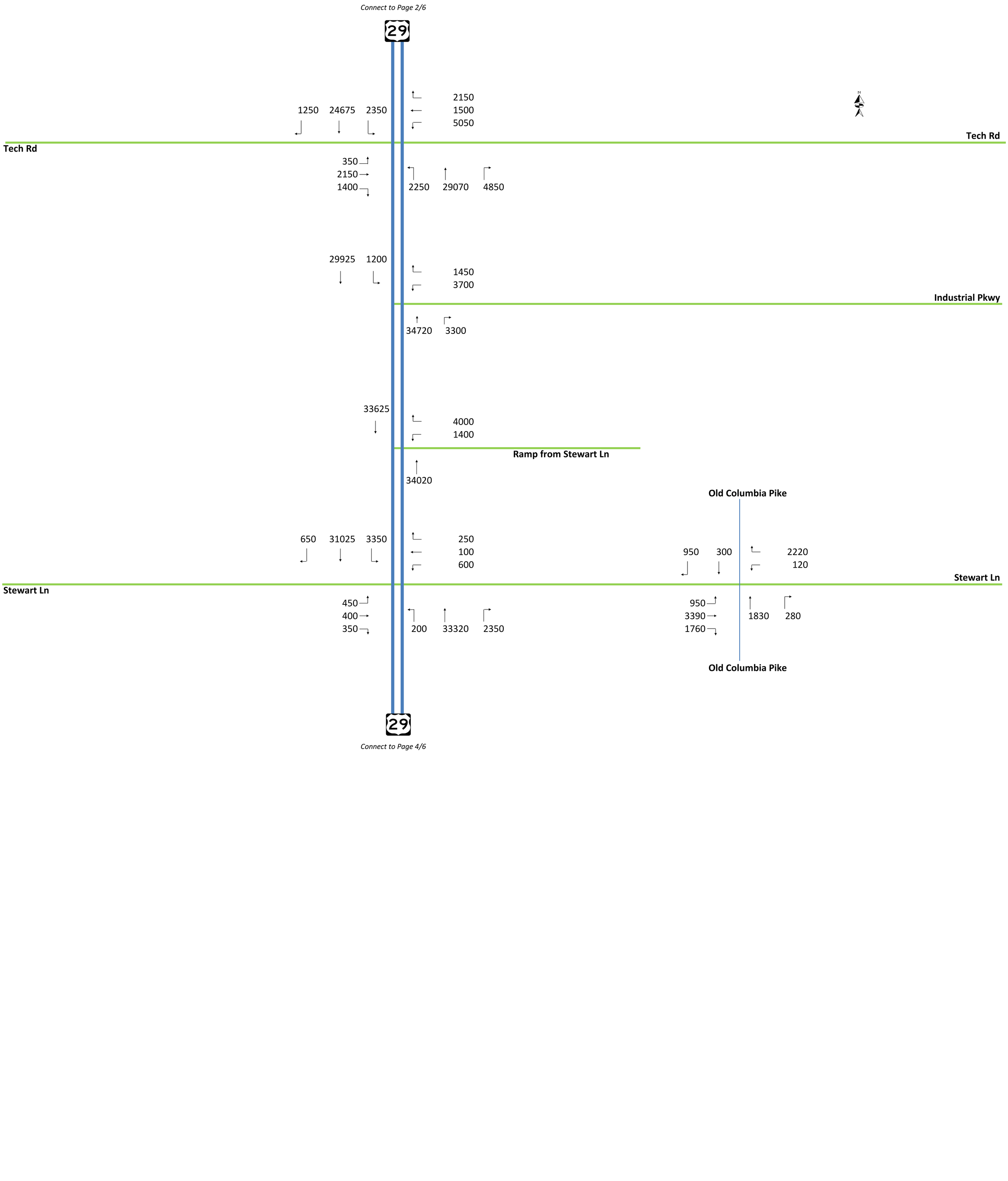
US 29 2015 Average Daily Traffic
Bus Rapid Transit Study

Connect to Page 2/6



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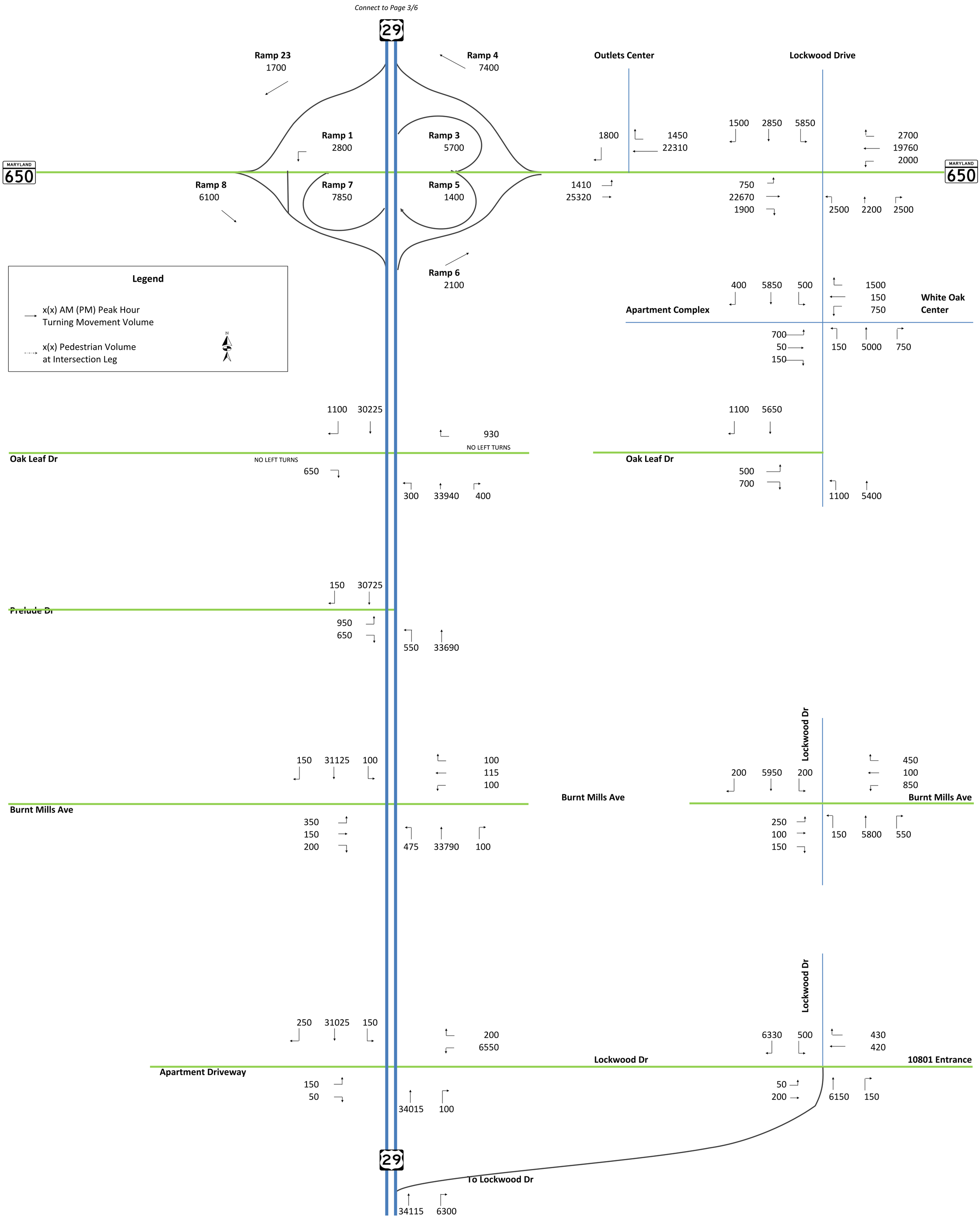
US 29 2015 Average Daily Traffic
Bus Rapid Transit Study

Connect to Page 3/6



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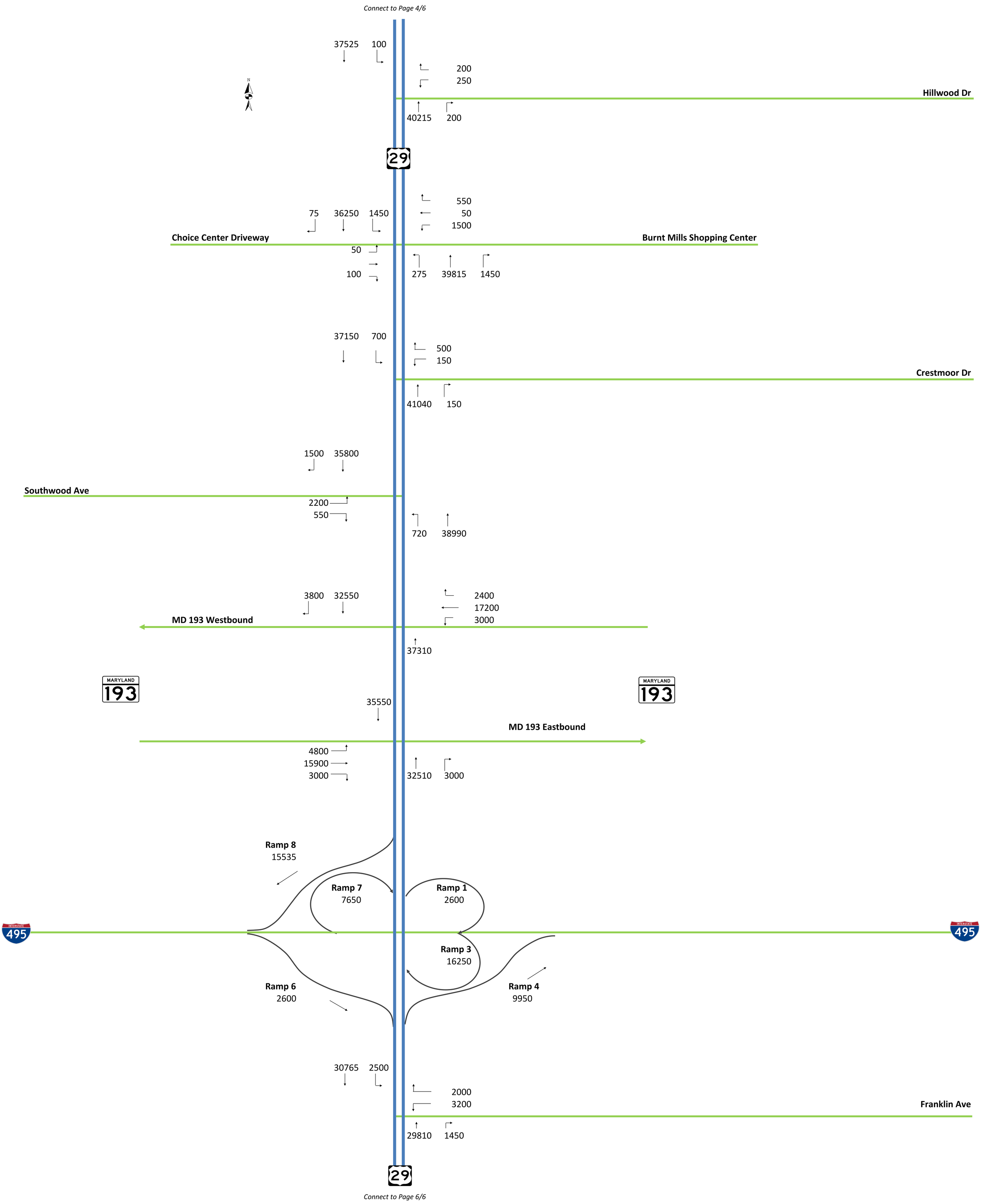
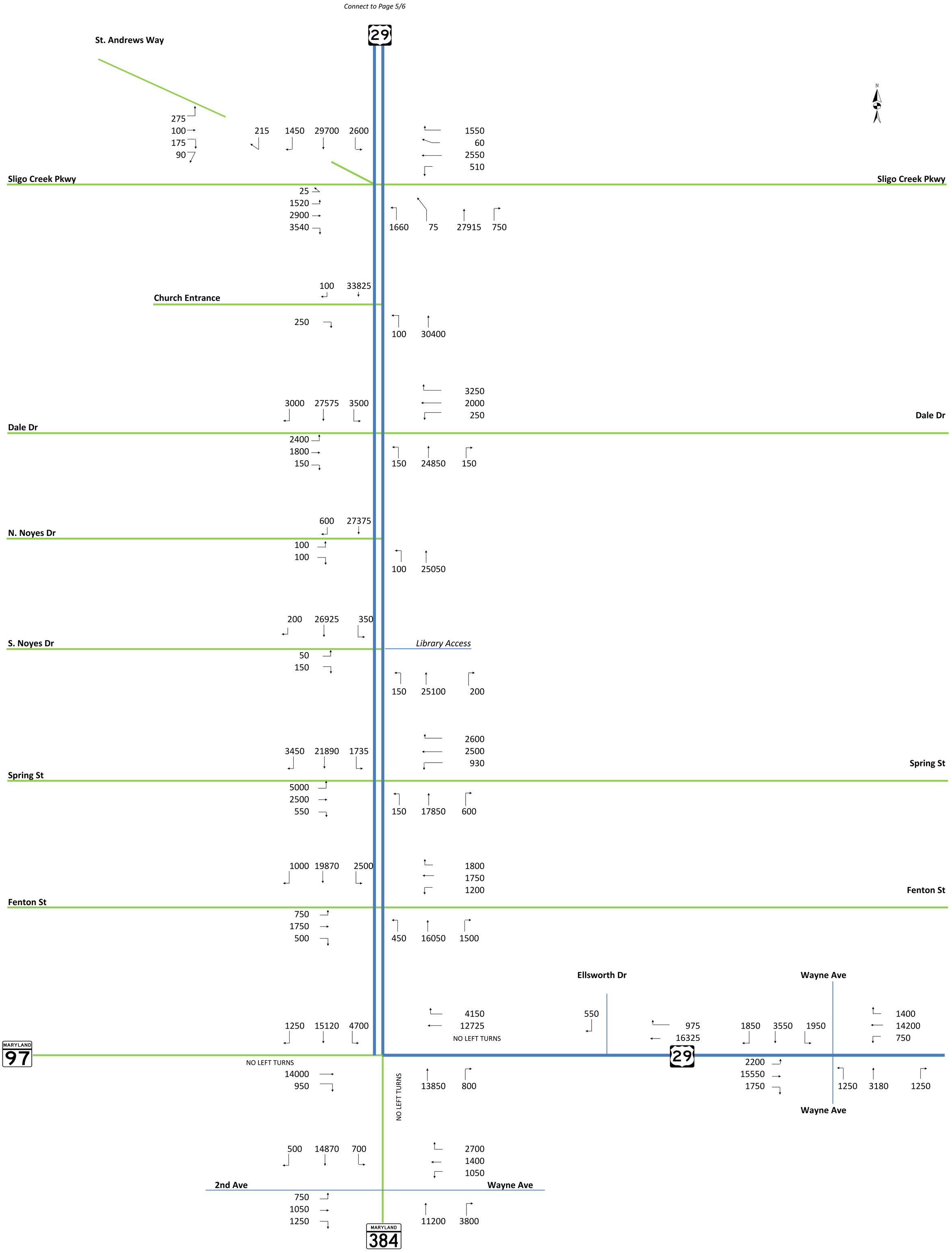
US 29 2015 Average Daily Traffic
Bus Rapid Transit Study

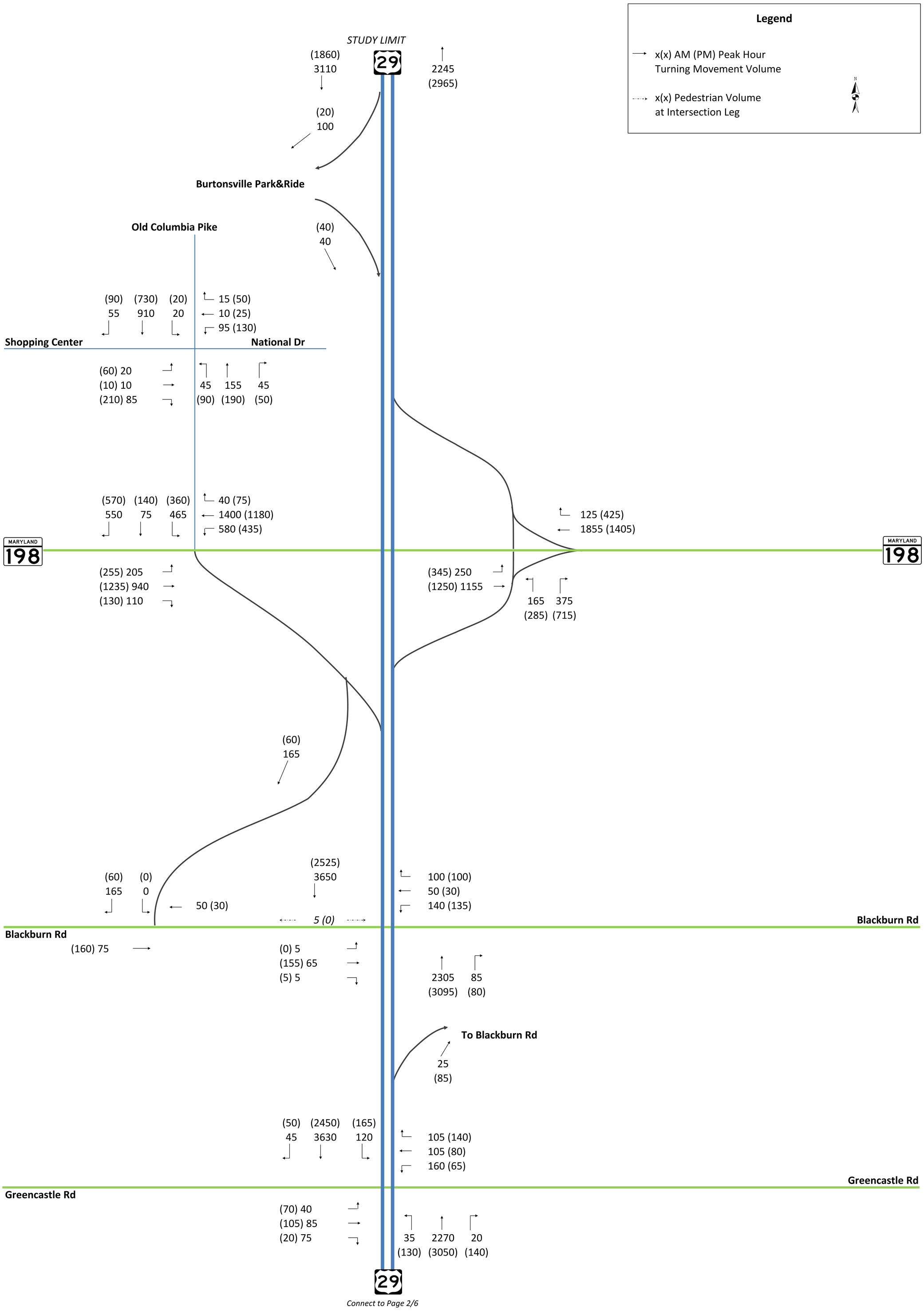


US 29 2015 Average Daily Traffic
Bus Rapid Transit Study

Connect to Page 5/6



US 29 2015 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study



US 29 2015 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

Connect to Page 1/6

Legend

x(x) AM (PM) Peak Hour Turning Movement Volume

x(x) Pedestrian Volume at Intersection Leg

N

29

Old Columbia Pike — (15) 20 | (165) 325 | (90) 110 | 205 (155) / 310 (530) / 275 (205) | (140) 65 | (205) 105

Outlet Dr — (195) 55 | 30 (45) / 1110 (1015)

Castle Blvd — (180) 185 | (25) 25 | (240) 250 | 150 (320) / 875 (670) / 85 (40)

Briggs Chaney Rd

180 (275) / 985 (935)

25 (15)

410 (340) / 725 (750)

(30) 25 / (400) 525 / (105) 255 | 95 (215) | 135 (315) | 70 (150) | (40) 55 / (600) 650

(125) 140 / (680) 615 | 150 (155) | 350 (795) | (270) 105 / (1205) 860 | (385) 120 / (725) 565 / (95) 175 | 80 (210) | 0 (10) | 25 (70)

Old Columbia Pike

(500) 845

410 (550)

Old Columbia Pike — (160) 325 | (265) 560 | (105) 140 | 80 (110) / 610 (425) / 30 (25) | (330) 485 | (120) 220 | (0) 0 | (1810) 2915

(190) 305

265 (350)

Coppeland Ct — (15) 15 | (15) 5 | 0 (0) / 455 (305)

Brahms Ave — (120) 210 | (0) 0 | (15) 20 | 15 (40) / 245 (170) / 5 (0)

Fairland Rd

170 (110) / 190 (145) / 110 (65)

(15) 10

(235) 120 / (400) 200 / (20) 40 | 15 (55) | 100 (360) | 30 (80) | 10 (0) | 0 (0) | (360) 310 / (265) 200 / (65) 70 | 35 (100) | 1880 (3200) | 20 (80) | (0) 0 / (345) 220 | (195) 55 / (160) 140 / (5) 30 | 0 (15) | 0 (0) | 0 (0)

School Access

Old Columbia Pike

Private Dr

(95) 165 | (1820) 2910 | (25) 20

35 (30) / 70 (20) / 140 (105)

0 (1)

0 (3)

Musgrove Rd

10 (3)

(110) 20 / (45) 20 / (165) 25 | 0 (1)

90 (70) | 1880 (3240) | 65 (165)

Old Columbia Pike

(85) 95 | (120) 285 | (145) 275 | 155 (130) / 1230 (870) / 50 (40) | (120) 170 | (330) 365

260 (600) / 1230 (860) / 175 (220)

1540 (1405) / 125 (70)

E. Randolph Rd

Cherry Hill Rd

(80) 80 / (635) 935 / (125) 275 | 4 (5) | 110 (270) | 80 (170) | 30 (20) | (0) 220 | 0 (0) | 0 (110) | (220) 135 / (635) 850 / (55) 35 | 35 (60) | 120 (235) | (1090) 1120 / (110) 215 | 125 (275) | 80 (165)

Church Access

Old Columbia Pike

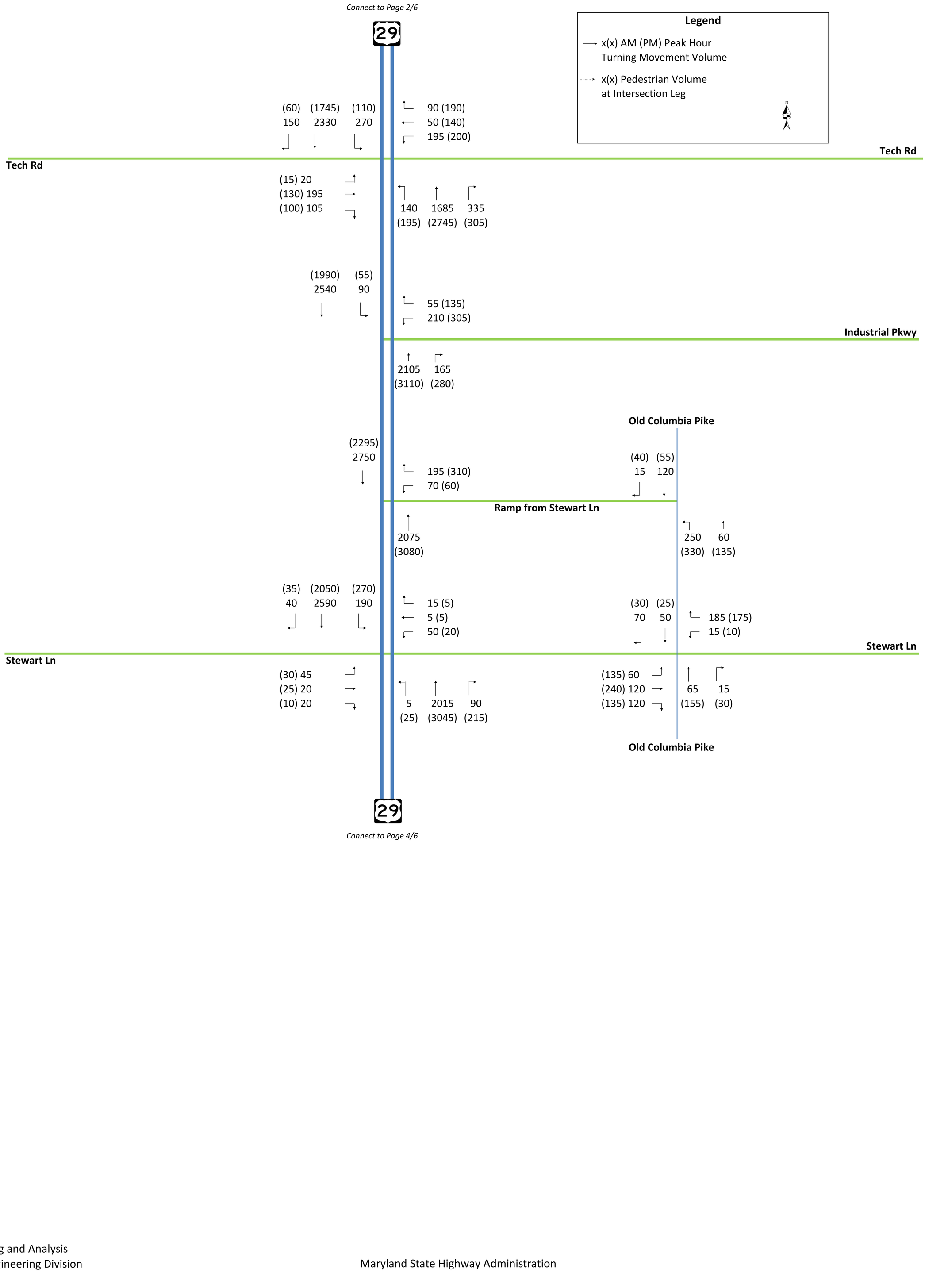
Prosperity Dr

29

Connect to Page 3/6

US 29 2015 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

Connect to Page 2/6



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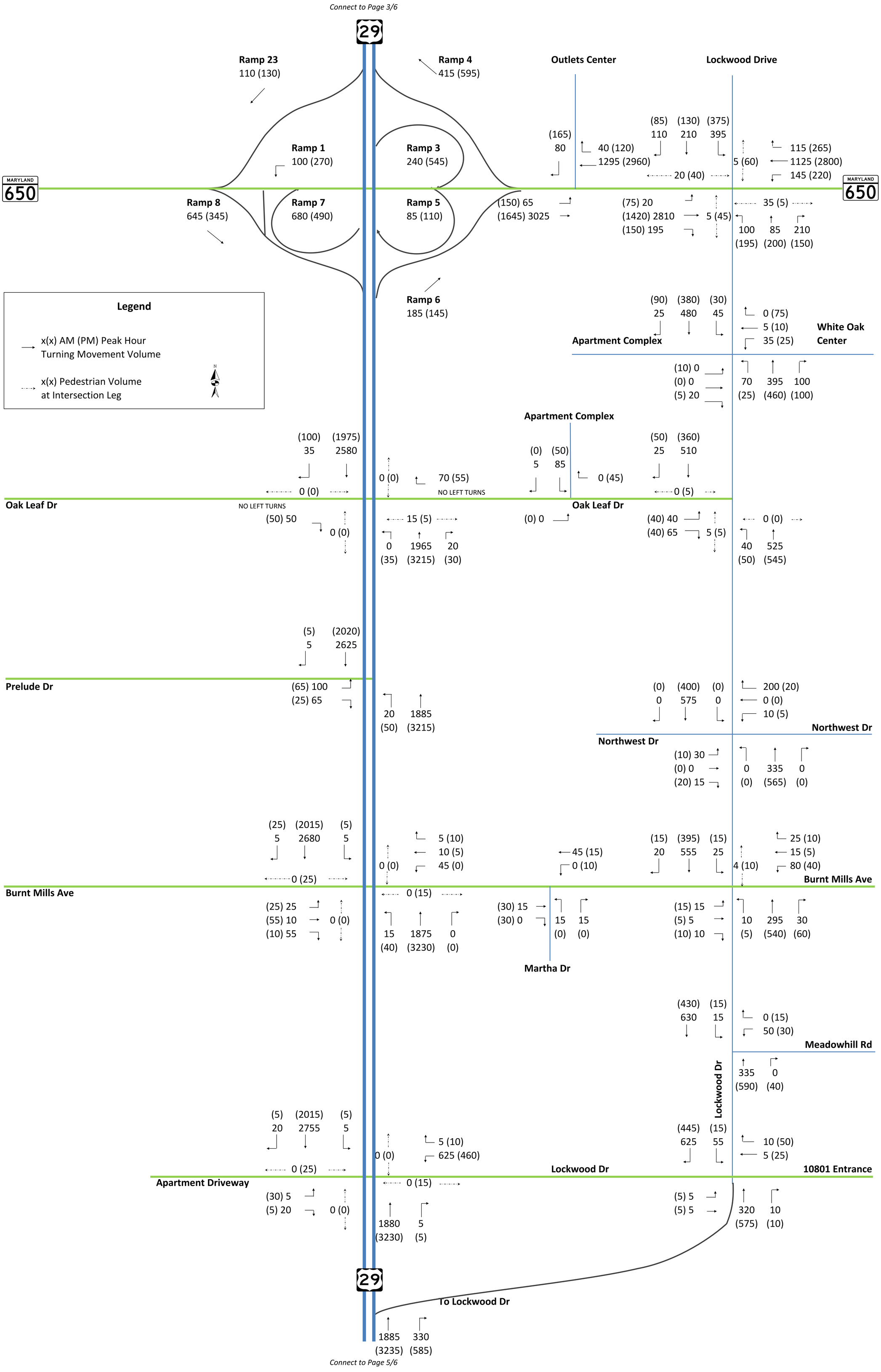
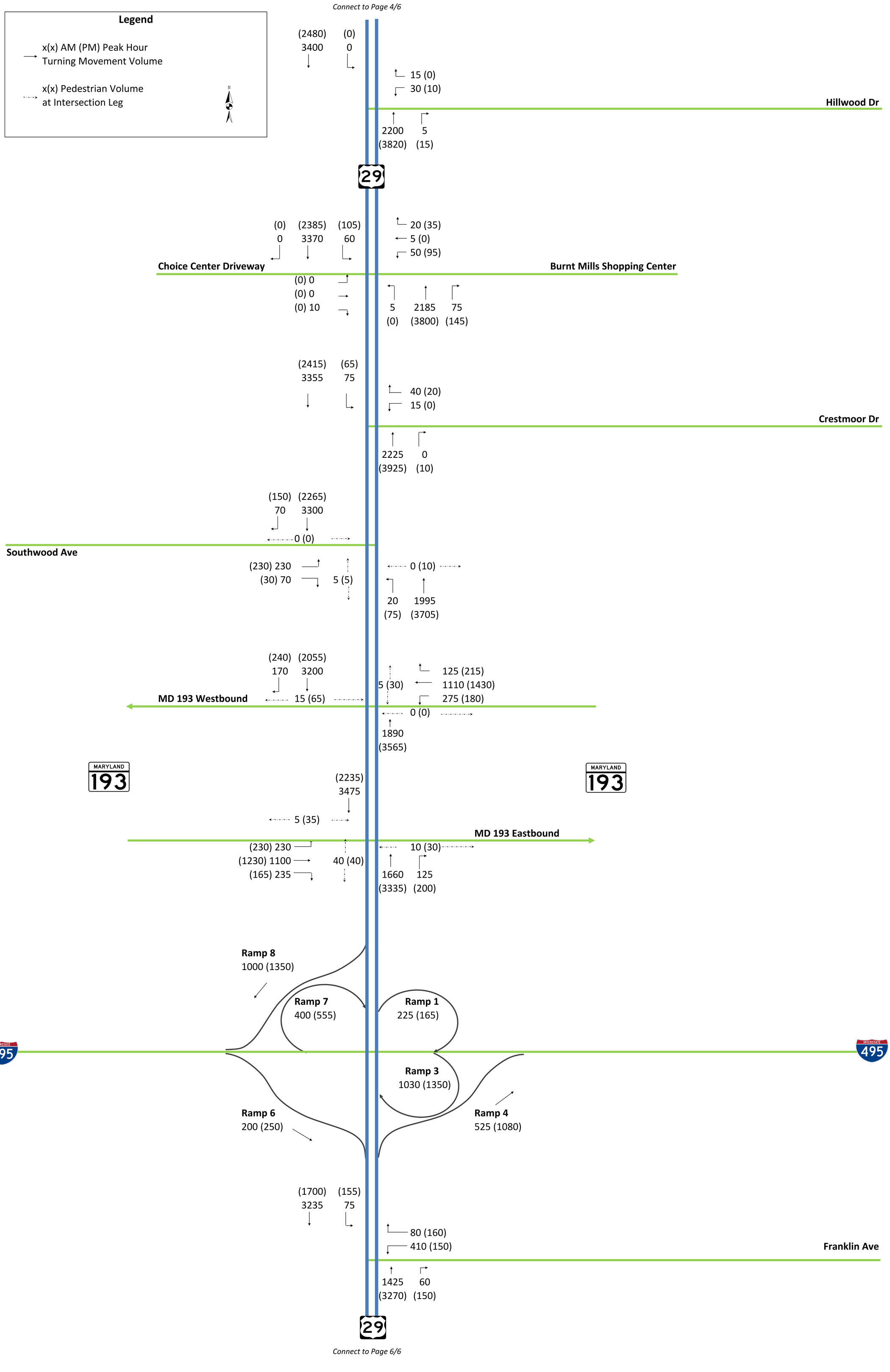
US 29 2015 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

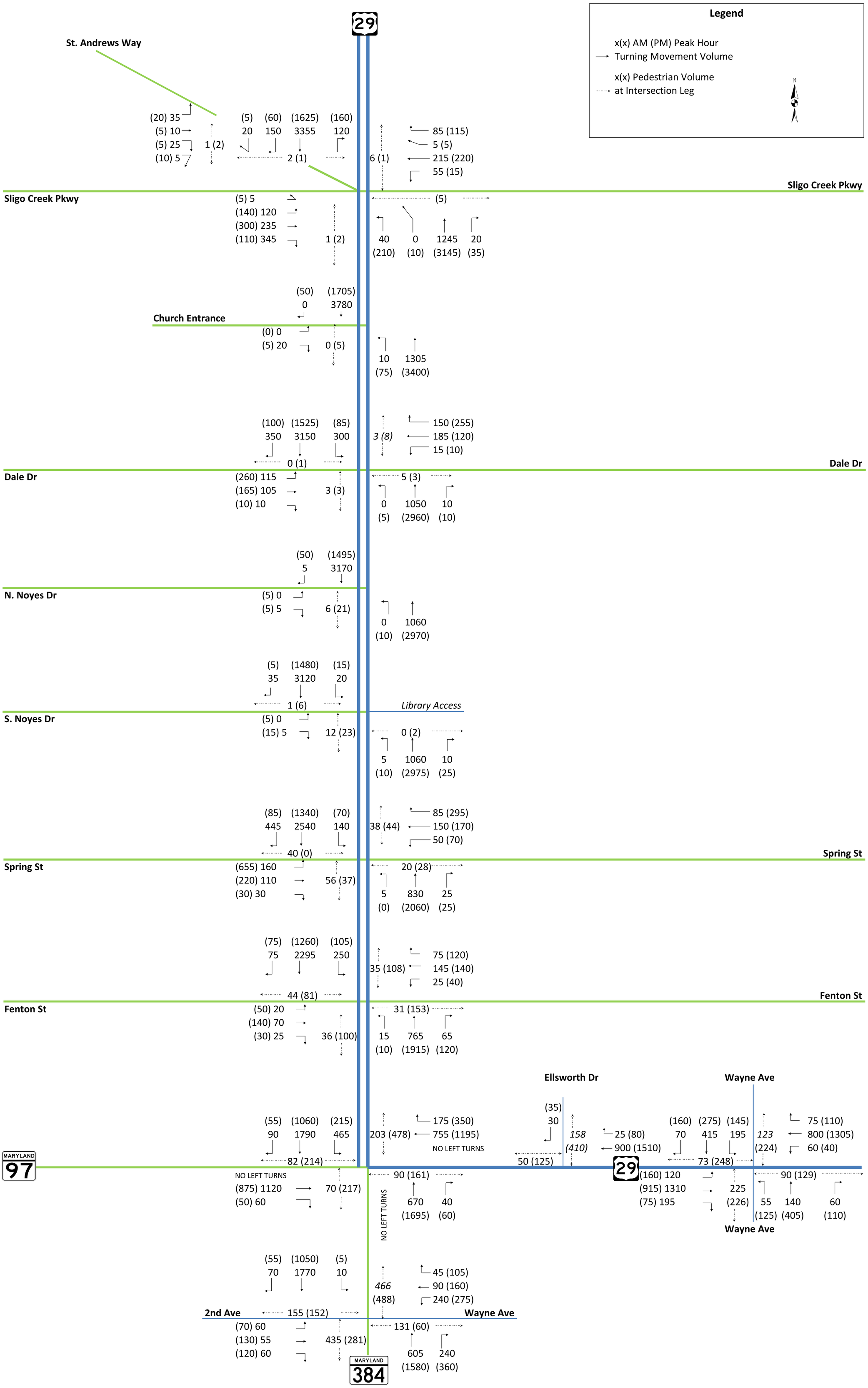


US 29 2015 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

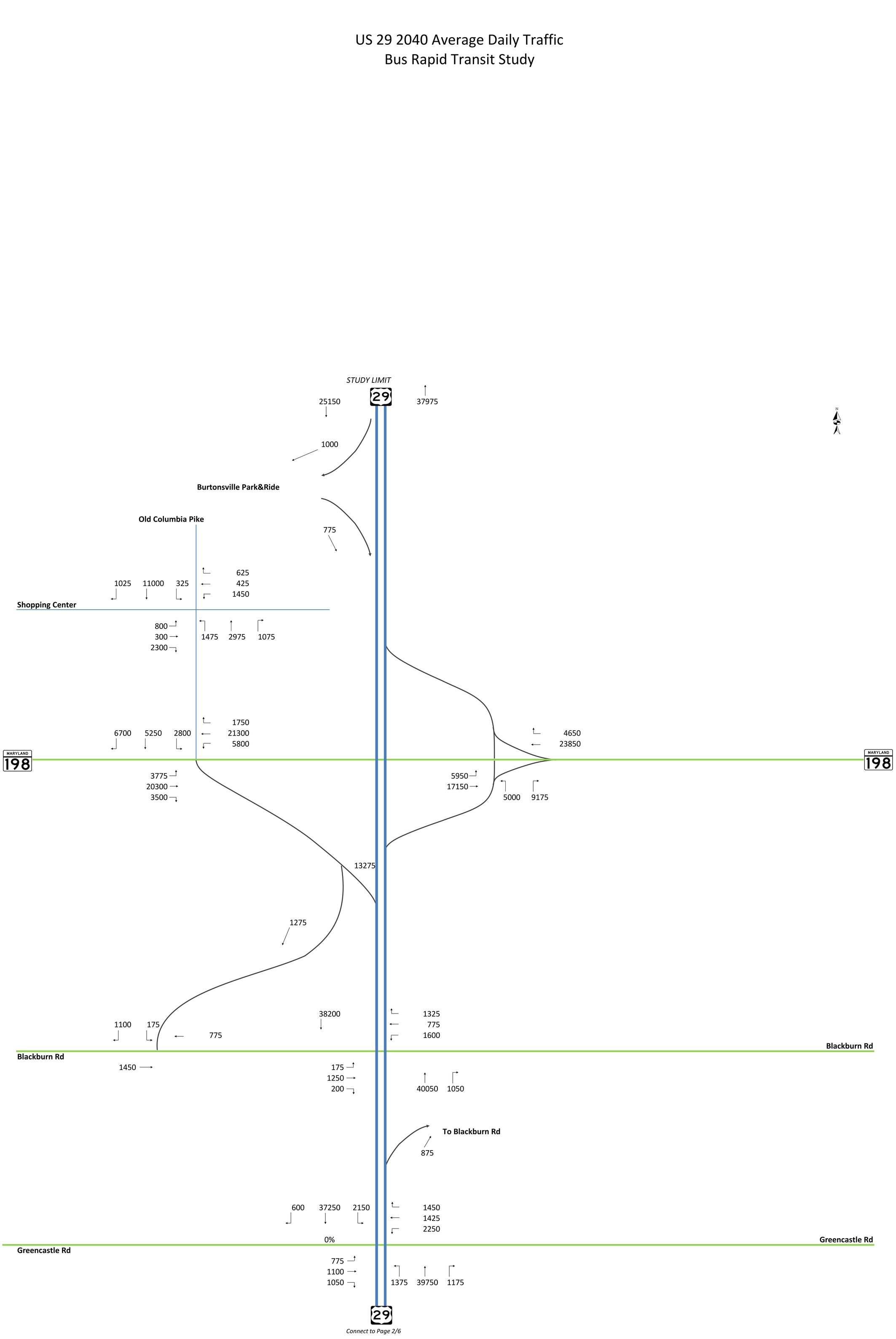


US 29 2015 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

Connect to Page 5/6

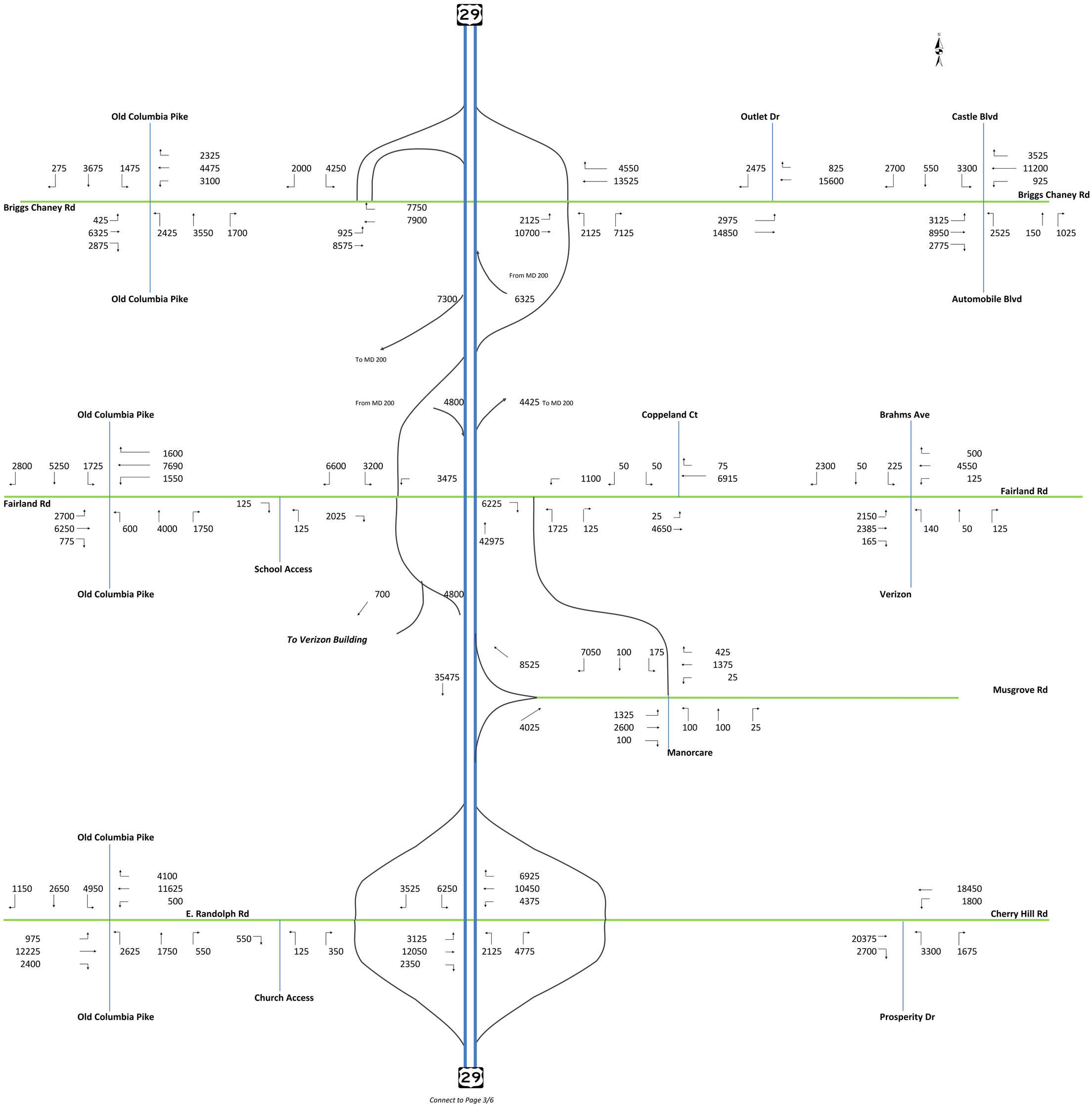


US 29 2040 Average Daily Traffic
Bus Rapid Transit Study



US 29 2040 Average Daily Traffic
Bus Rapid Transit Study

Connect to Page 1/6



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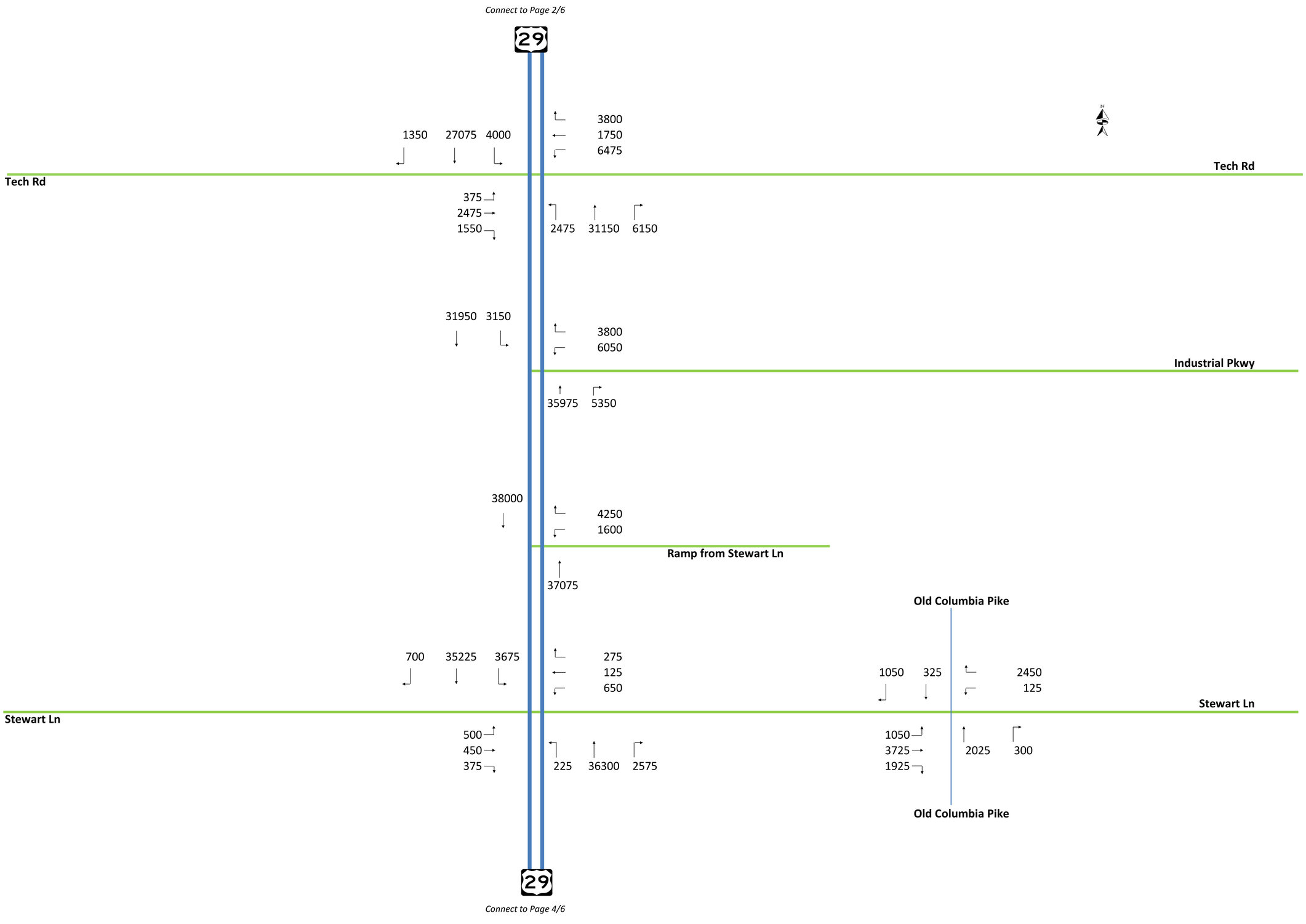
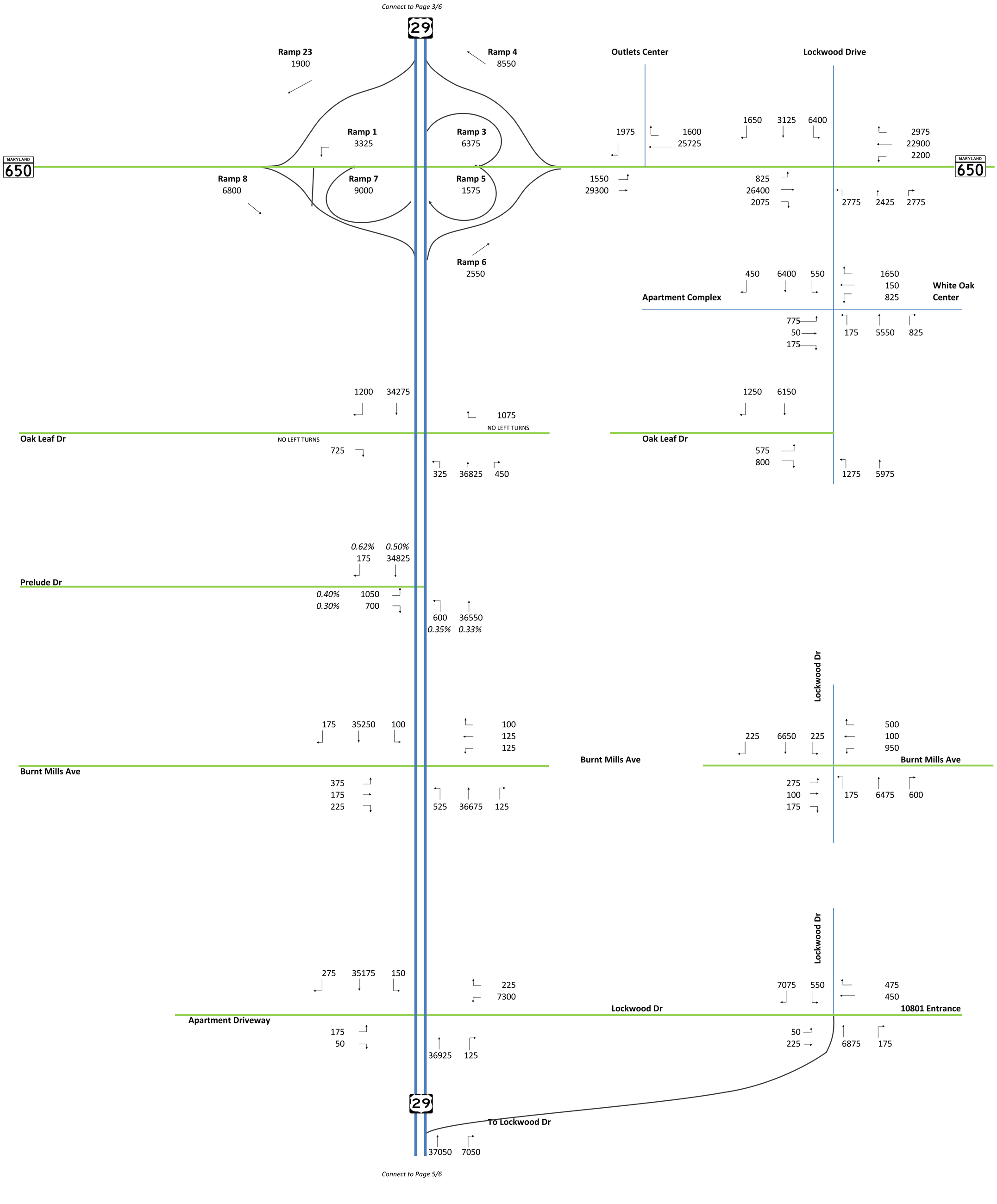
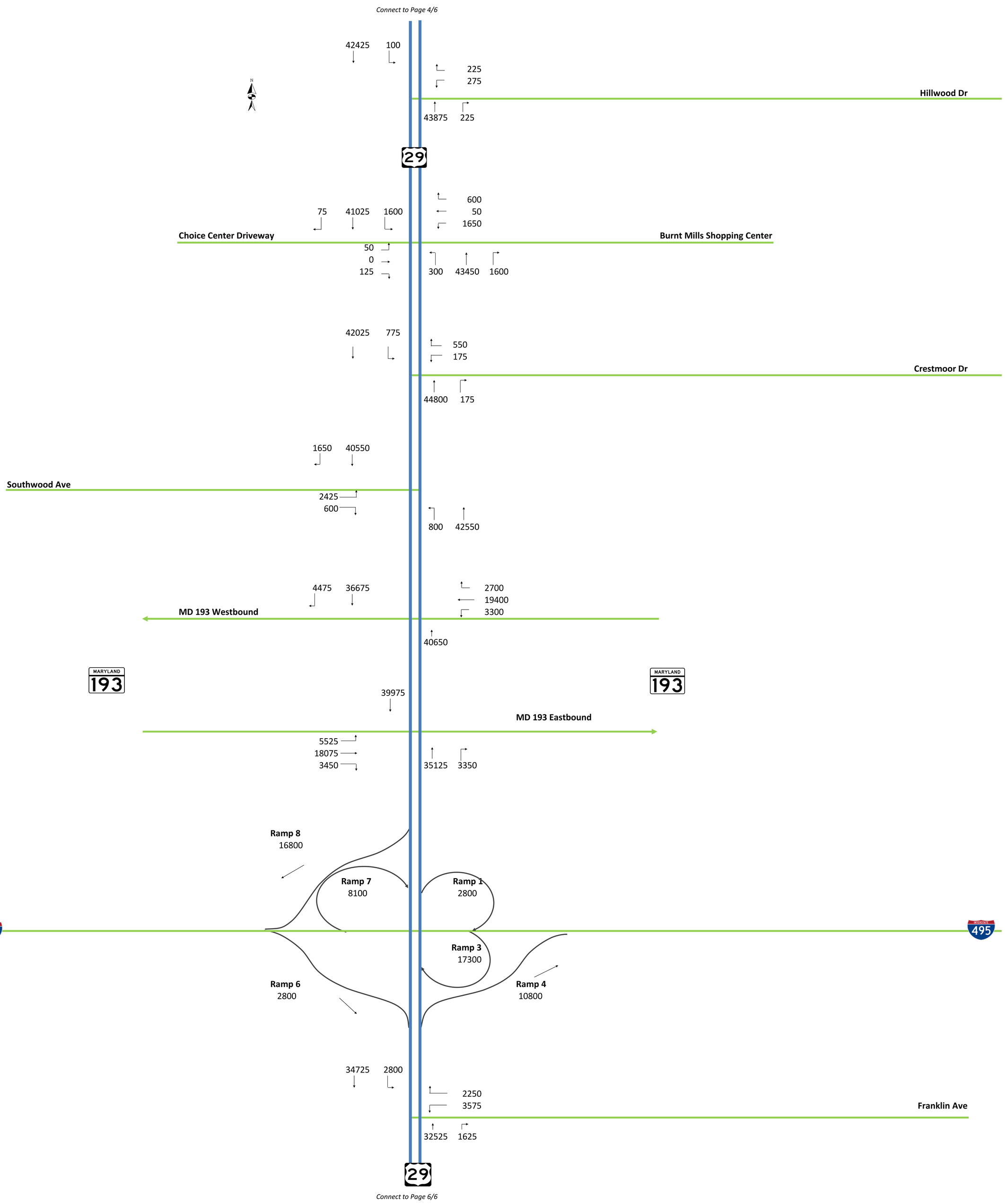
US 29 2040 Average Daily Traffic
Bus Rapid Transit Study



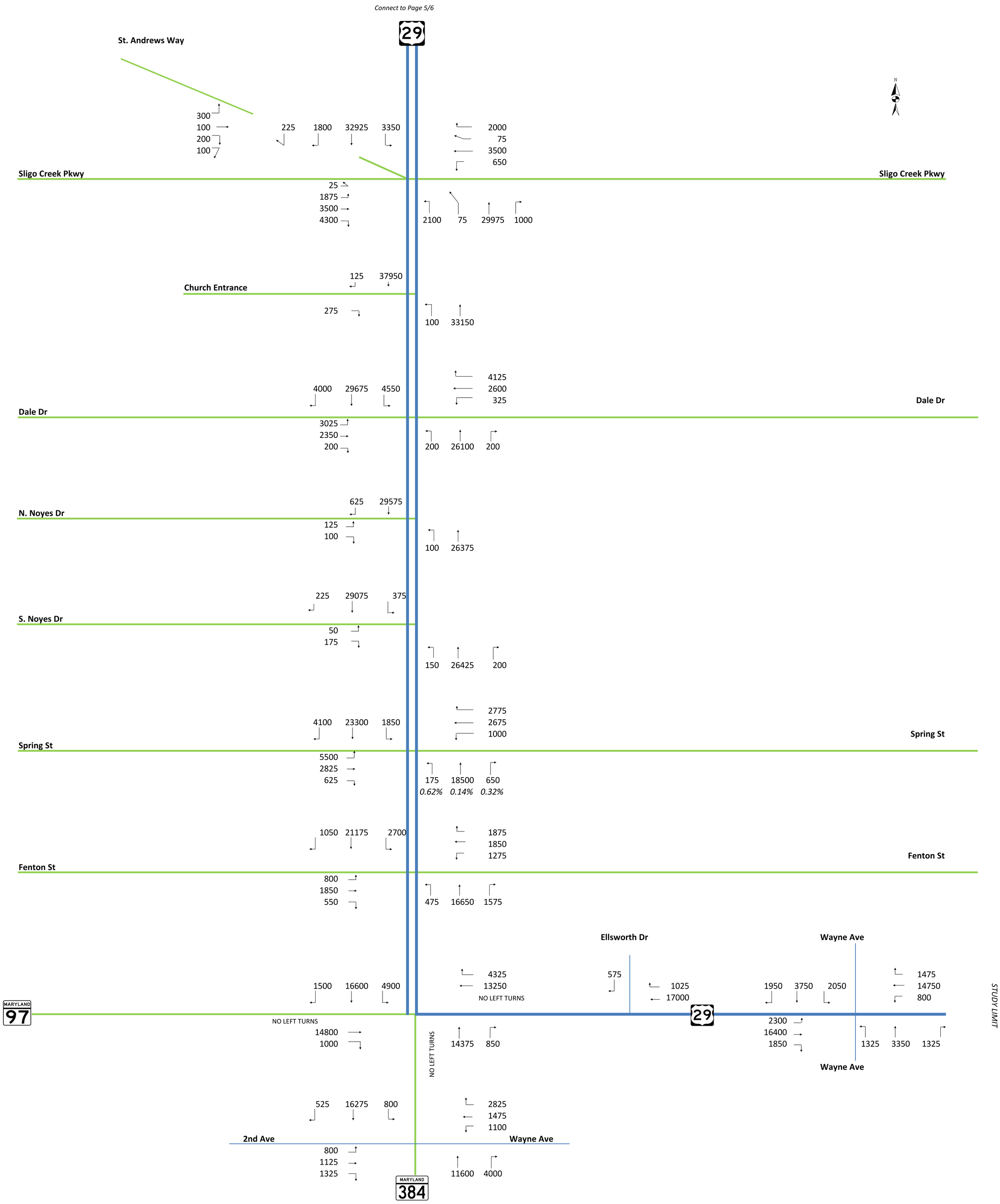
US 29 2040 Average Daily Traffic
Bus Rapid Transit Study



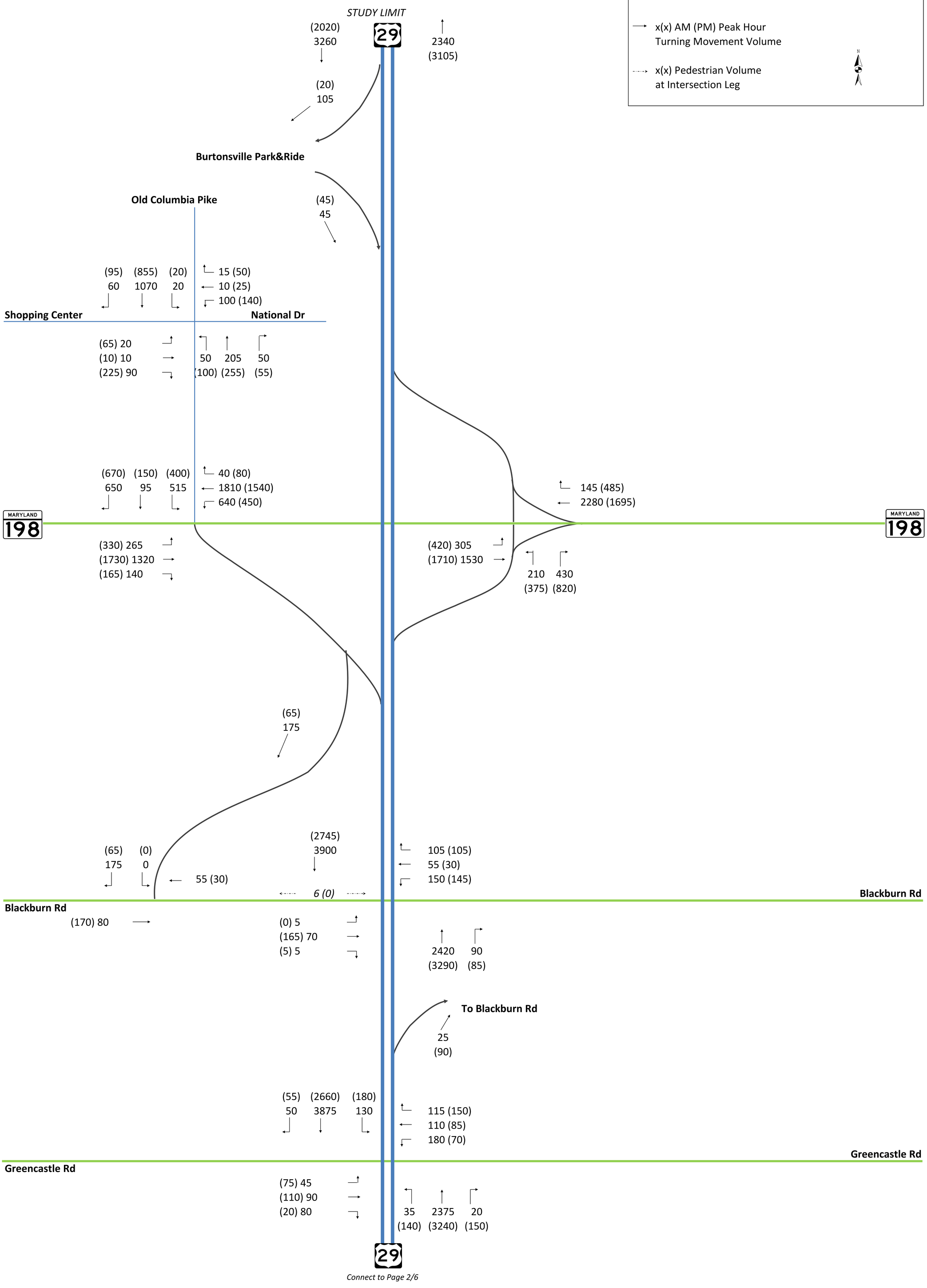
US 29 2040 Average Daily Traffic
Bus Rapid Transit Study



US 29 2040 Average Daily Traffic
Bus Rapid Transit Study



US 29 2040 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study



US 29 2040 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

Connect to Page 1/6

Legend

→ x(x) AM (PM) Peak Hour Turning Movement Volume

⇢ x(x) Pedestrian Volume at Intersection Leg

N

29

Old Columbia Pike (1st intersection)

(15) 20 | (180) 355 | (100) 120 | 225 (170) | 420 (610) | 300 (220)

(150) 70 | (250) 125

Briggs Chaney Rd

(35) 25 | (440) 585 | (115) 275 | 105 (235) | 145 (340) | 75 (165)

(45) 65 | (660) 715

500 (410) | 875 (850)

Old Columbia Pike

(590) 995 | 485 (610)

220 (335) | 1215 (1095)

28 (17)

(135) 150 | (775) 690

160 (165) | 405 (965)

Outlet Dr

(210) 60 | 30 (50) | 1375 (1220)

(290) 110 | (1450) 985

Castle Blvd

(190) 195 | (25) 25 | (255) 265 | 160 (340) | 1125 (855) | 90 (40)

Briggs Chaney Rd

(410) 130 | (940) 670 | (100) 185 | 85 (225) | 0 (10) | 25 (70)

Automobile Blvd

(285) 520 | 315 (460)

Old Columbia Pike

(175) 350 | (290) 610 | (115) 155 | 85 (120) | 520 (525) | 375 (310)

(460) 555 | (160) 335

(95) 245

Coppeland Ct

(600) 350 | (120) 170

(15) 15 | (15) 5 | 0 (0) | 590 (450)

Brahms Ave

(130) 225 | (0) 0 | (15) 20 | 15 (45) | 365 (310) | 5 (0)

Fairland Rd

Fairland Rd

(260) 130 | (650) 315 | (-80) 45 | 15 (60) | 115 (385) | 70 (250)

(15) 10 | (190) 145

School Access

Old Columbia Pike

235 (245) | 50 (160) | (0) 0 (530) 420

(210) 60 | (330) 345 | (5) 20 | 0 (10) | 0 (0) | 0 (0)

Private Dr

(5) 145

To Verizon Building

2455 (4040)

(2160) 3385

555 (720) | (680) 505 | (15) 5 | (25) 10

5 (5) | 80 (30) | 45 (35) | 5 (10)

Musgrove Rd

5 (5)

255 (515) | (340) 200 | (170) 50 | (5) 5 | *5 (5)*

5 (5) | 5 (35) | 0 (10)

Old Columbia Pike

(95) 105 | (130) 305 | (215) 405 | 270 (225) | 1495 (1085) | 55 (45)

(185) 260 | (375) 415 | 295 (680) | 1495 (1055) | 235 (290)

1885 (1715) | 140 (80)

E. Randolph Rd

Cherry Hill Rd

(90) 90 | (760) 1120 | (135) 300 | 5 (6) | 120 (300) | 85 (180) | 30 (20)

(0) 235

0 (115)

(295) 185 | (700) 1060 | (115) 75 | 65 (115) | 160 (330)

(1280) 1390 | (125) 245 | 140 (310) | 90 (185)

Church Access

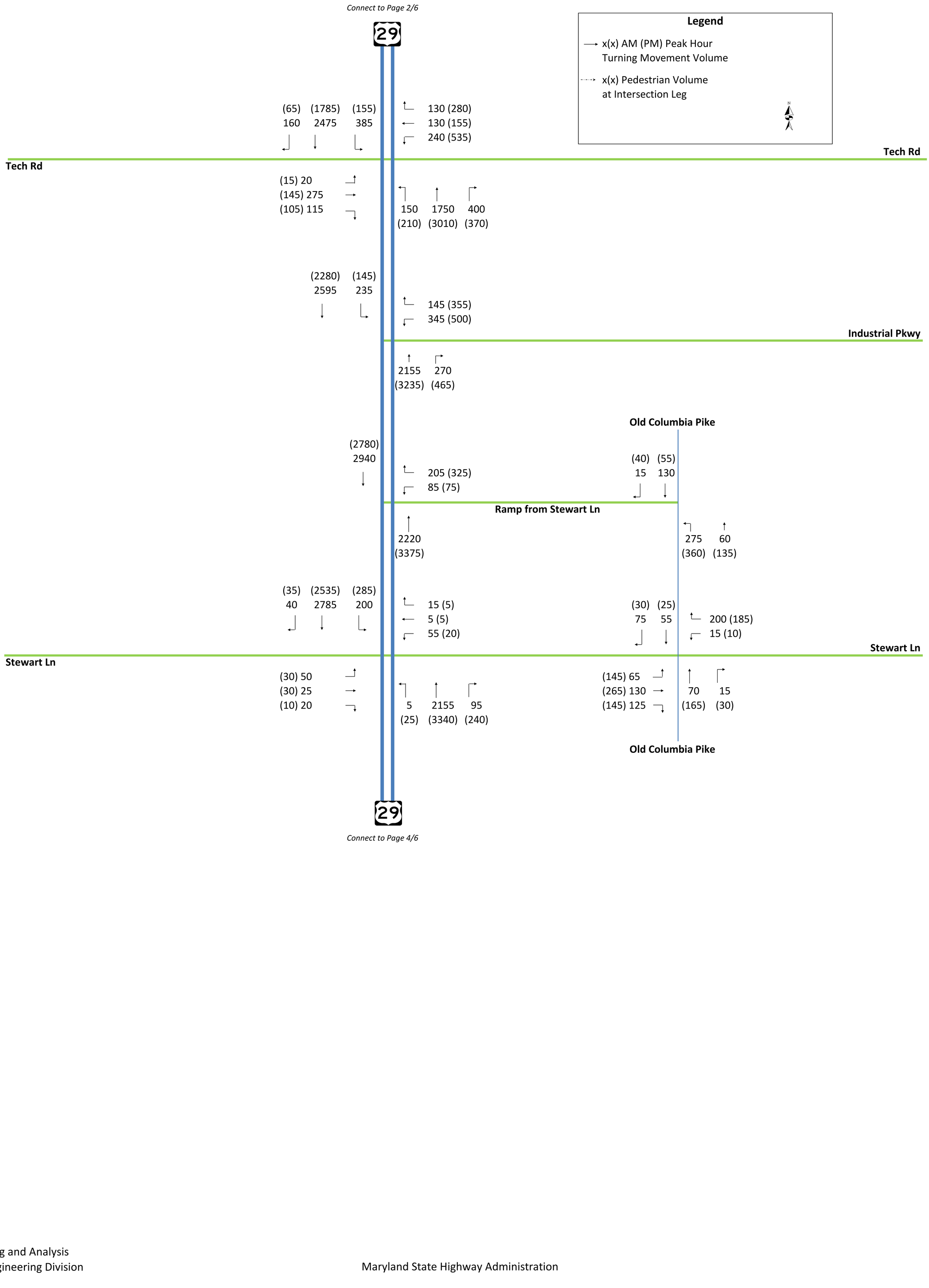
Old Columbia Pike

Prosperity Dr

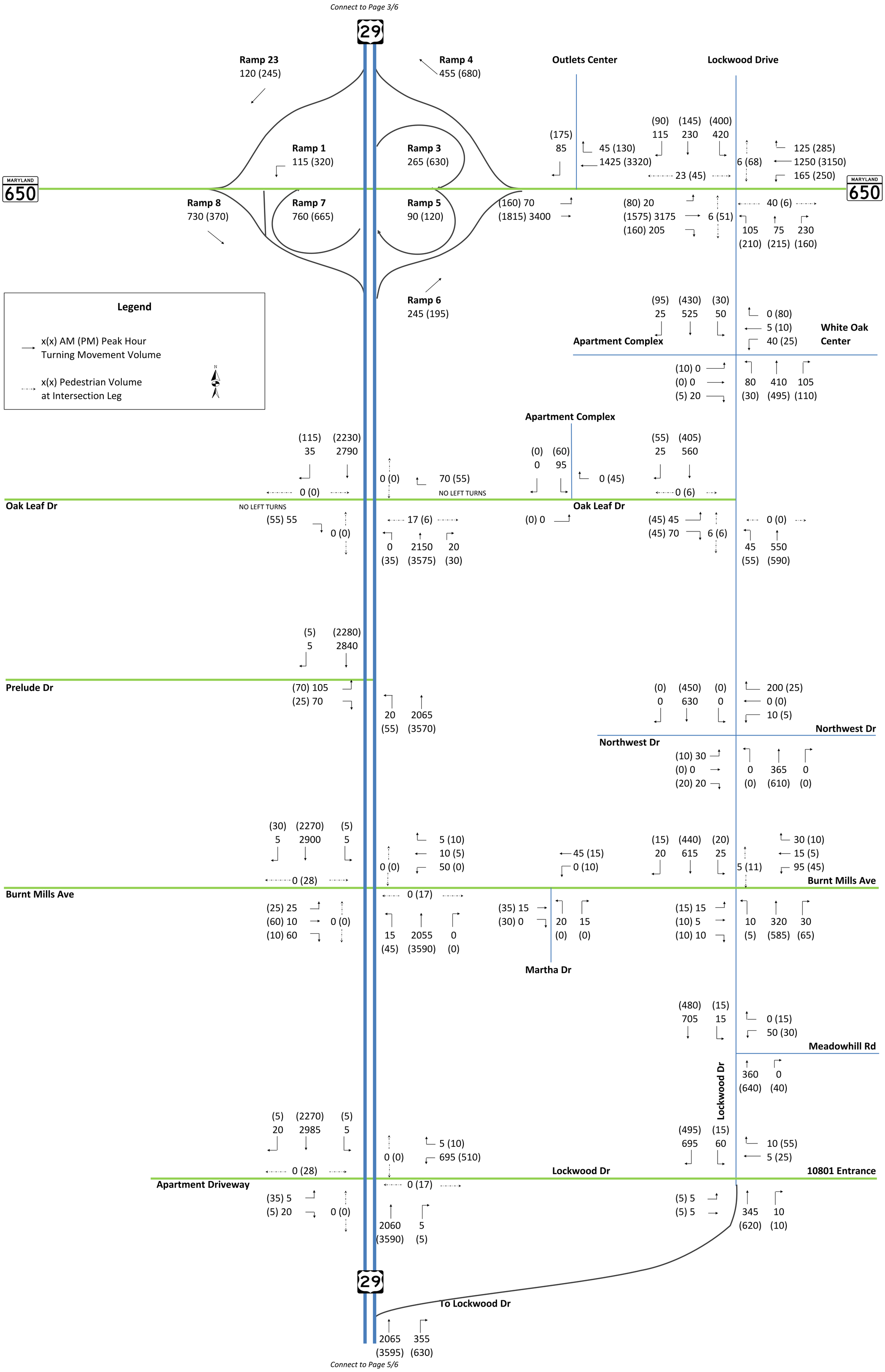
29

Connect to Page 3/6

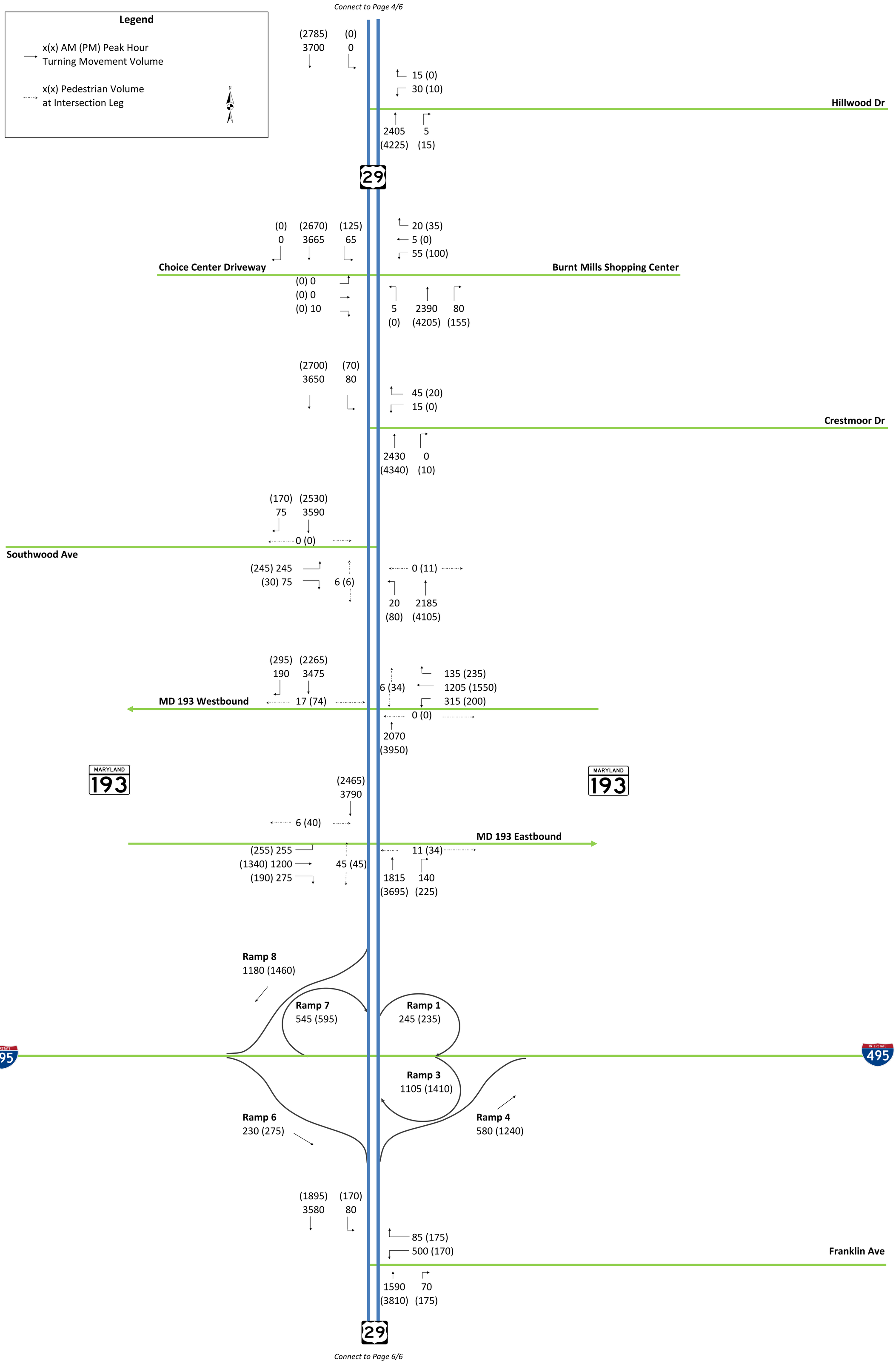
US 29 2040 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study



US 29 2040 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

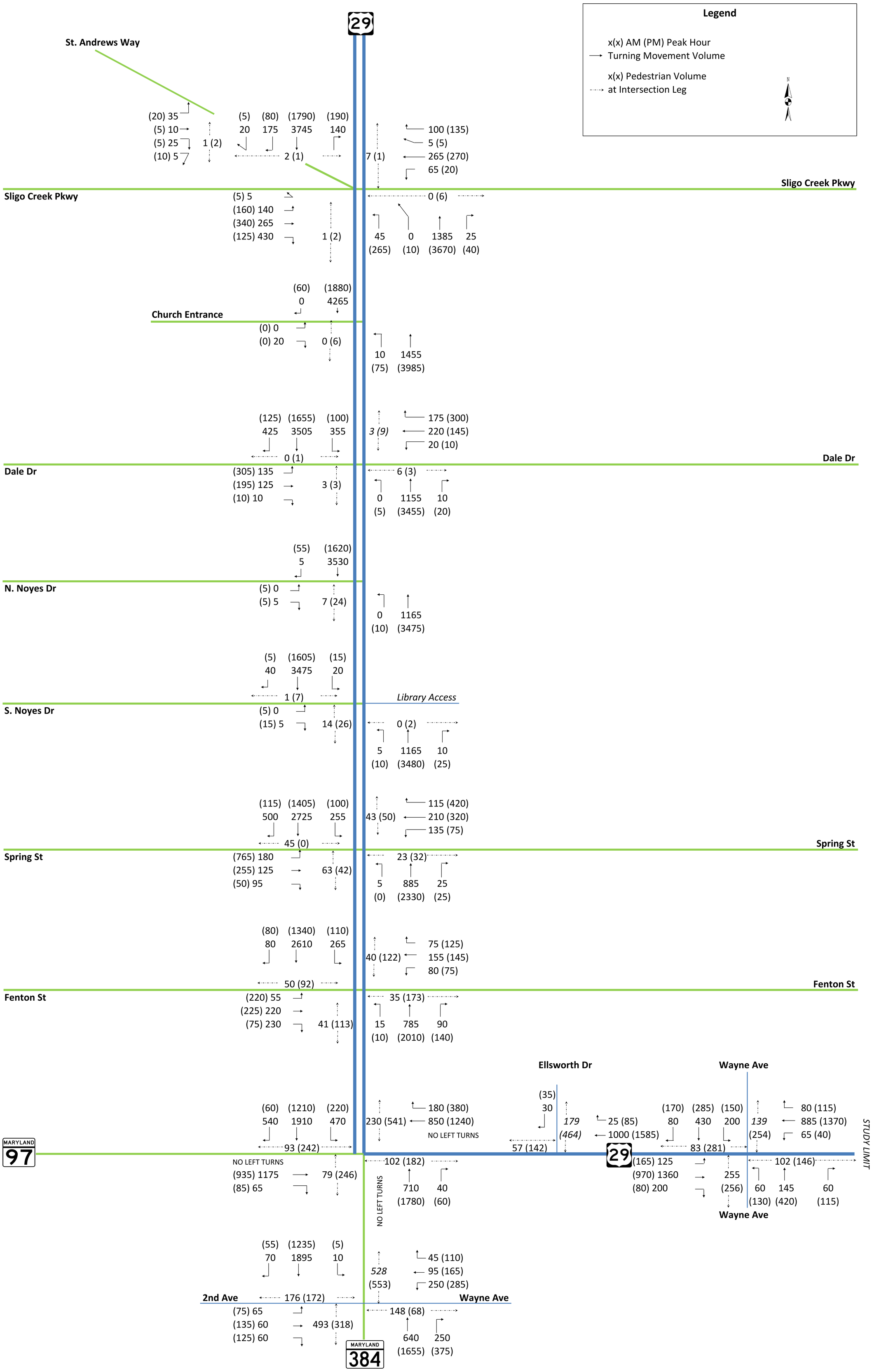


US 29 2040 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study



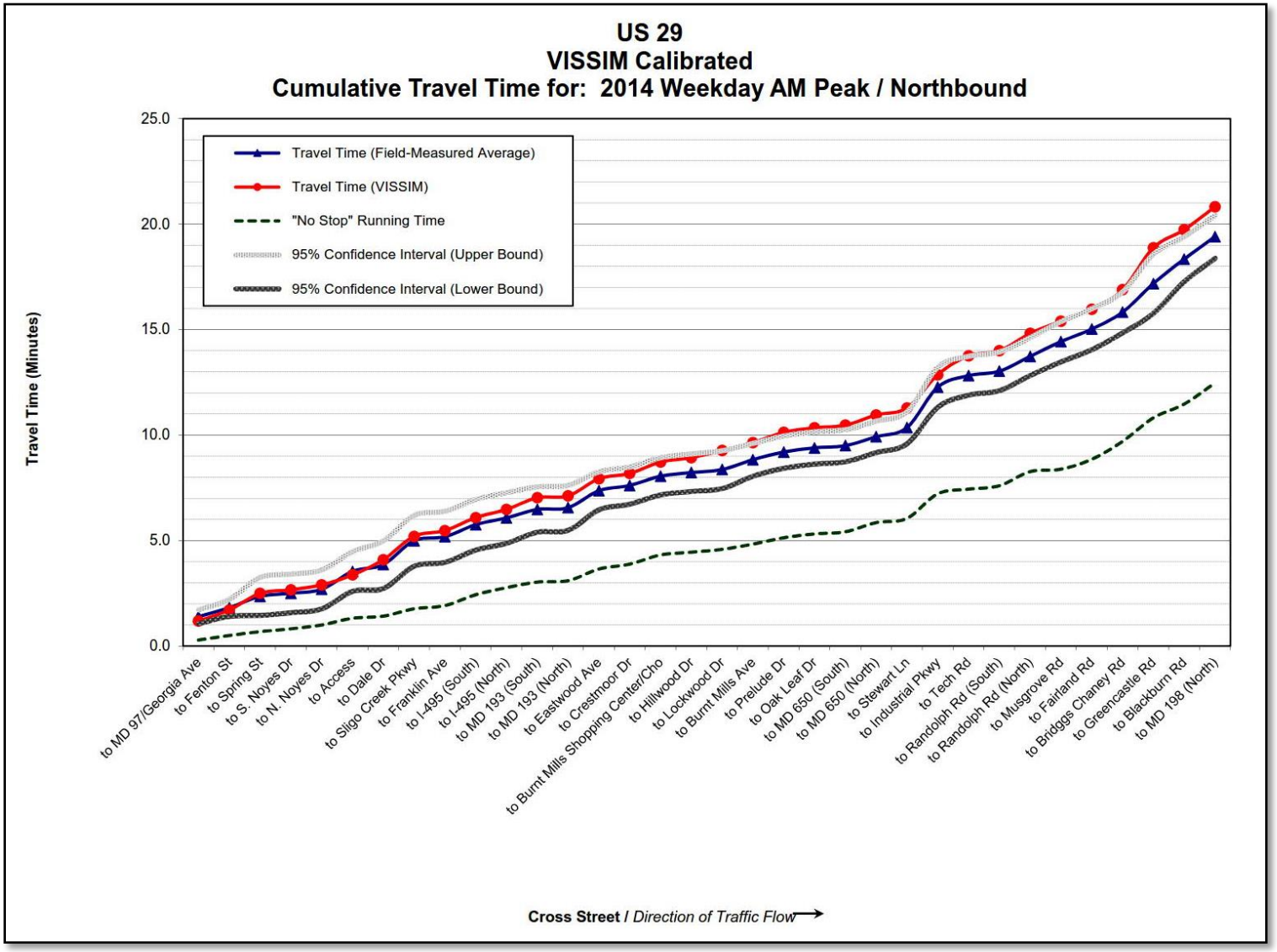
US 29 2040 AM (PM) Peak Hour Volumes
Bus Rapid Transit Study

Connect to Page 5/6

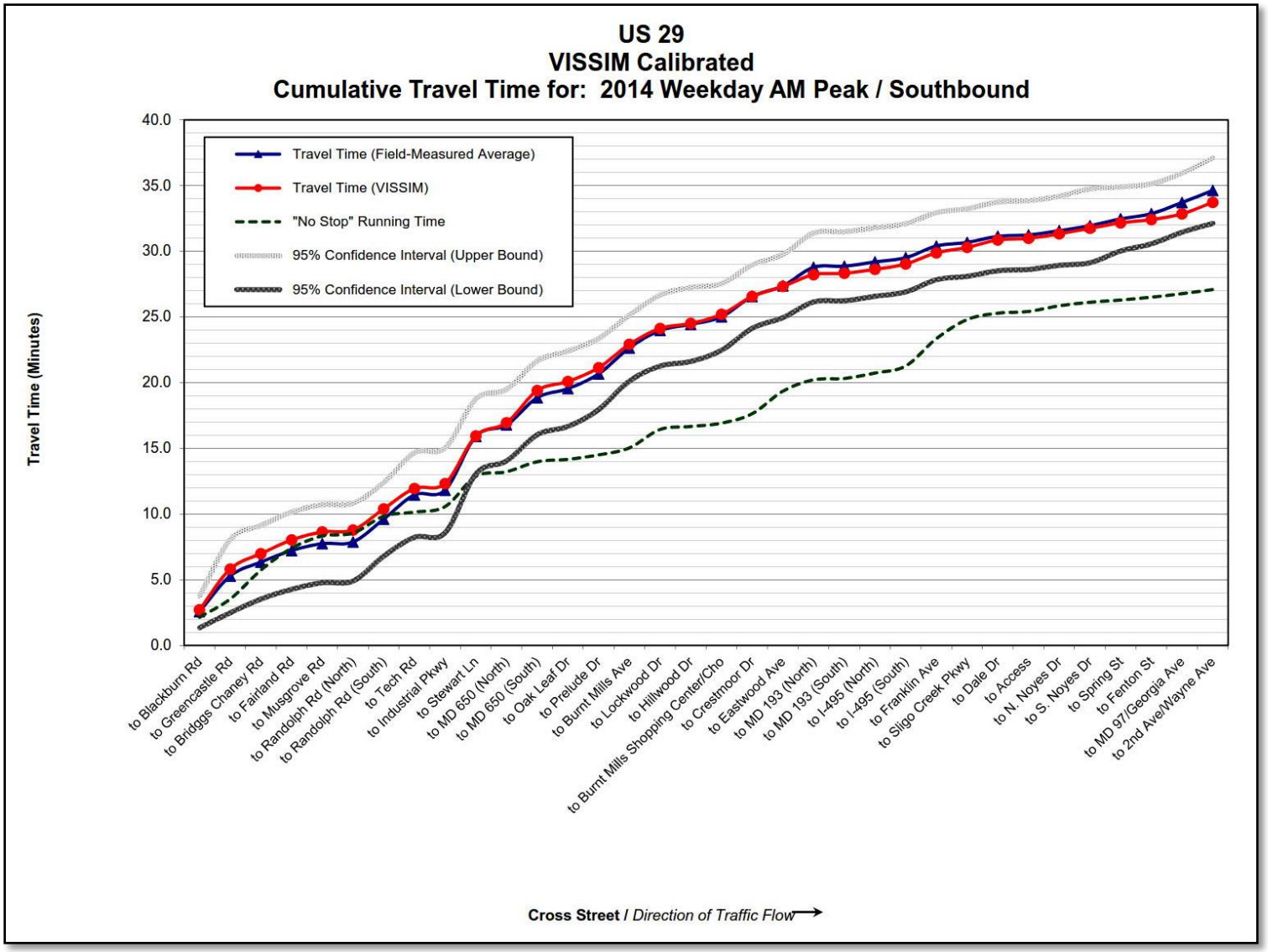


4.3 Appendix C: Existing 2015 and Future 2040 No-Build Traffic Operation Details

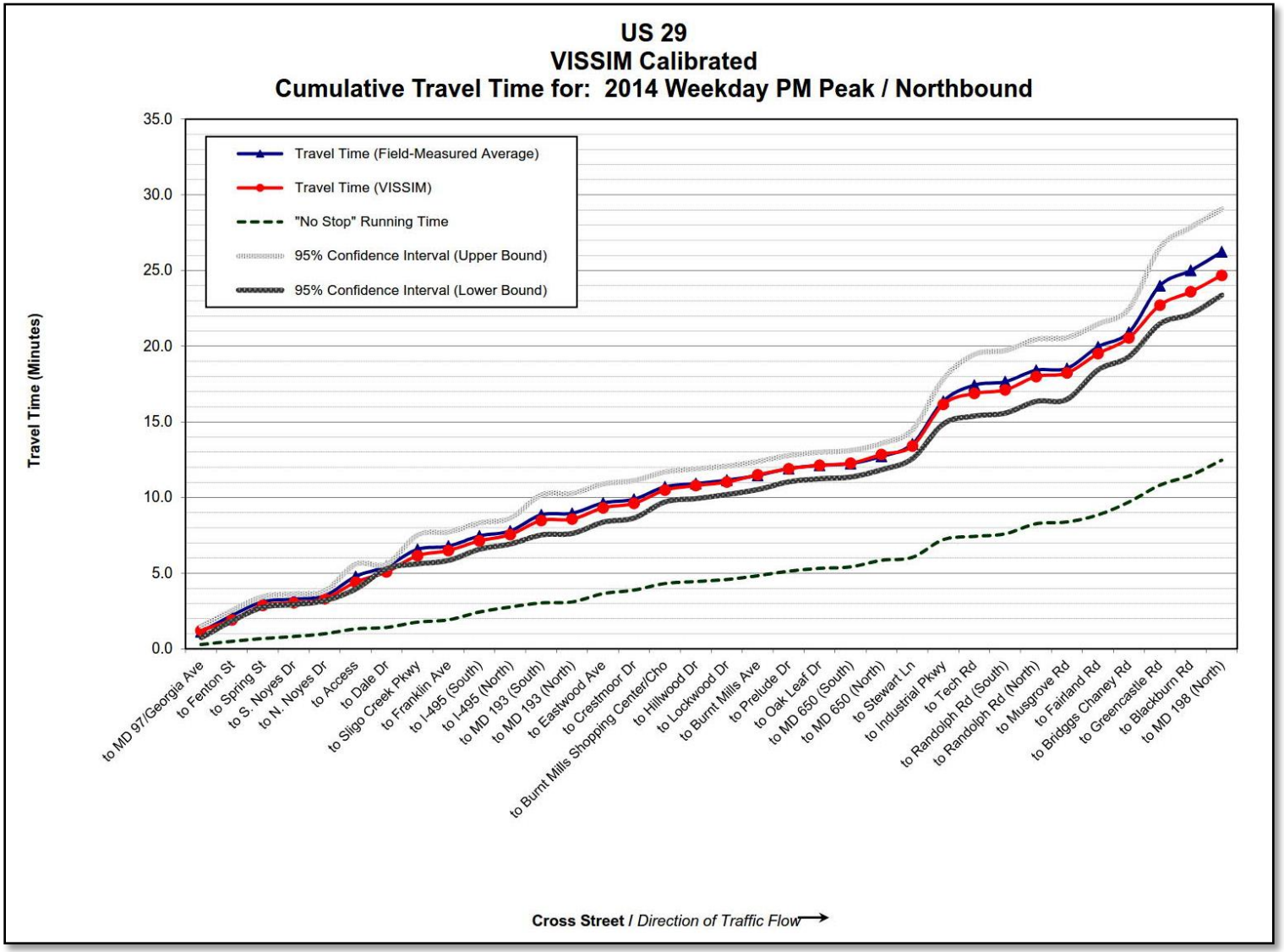
Appendix C, Figure 1: AM Peak / Northbound Cumulative Travel Time Calibration Graph



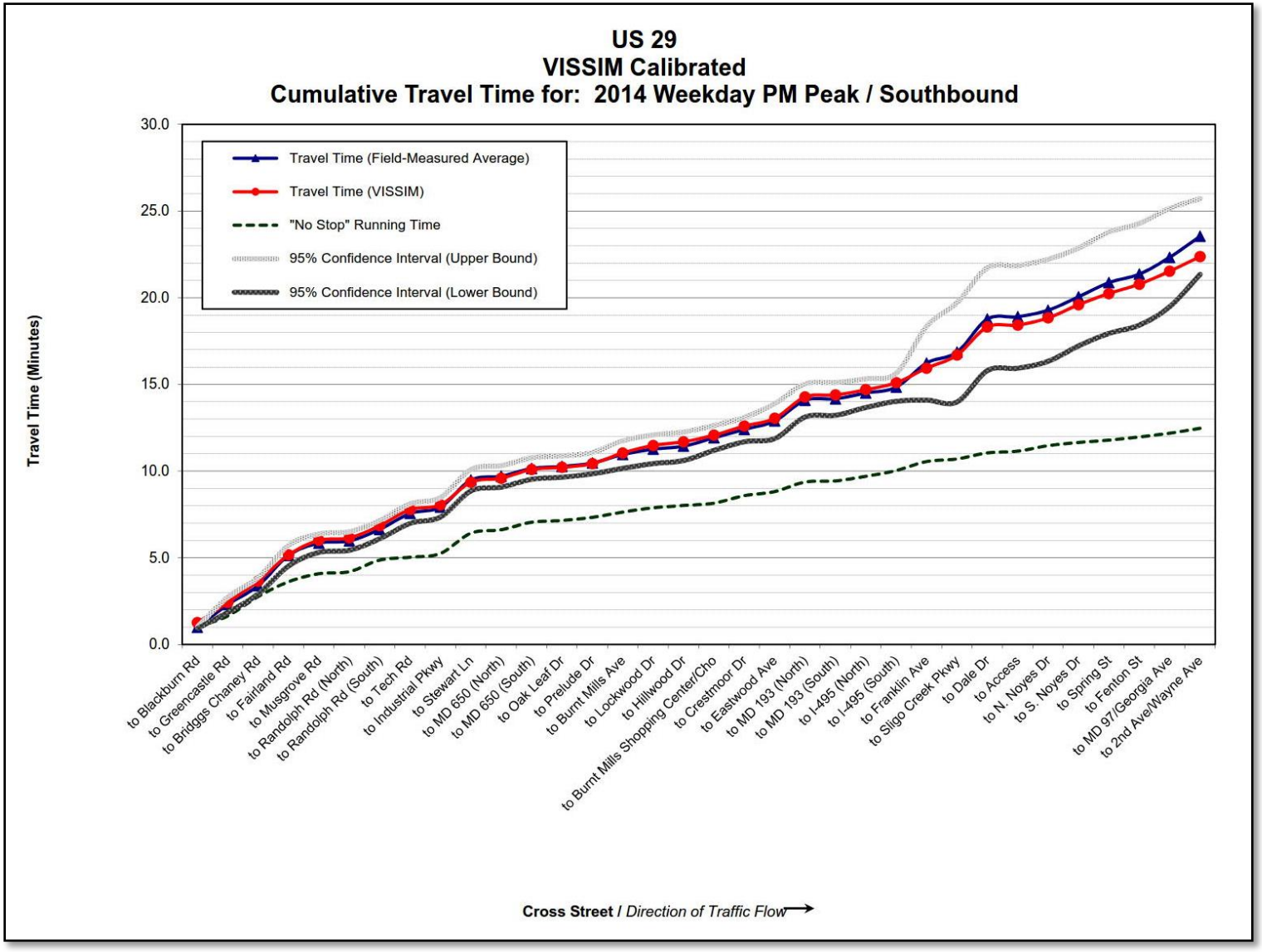
Appendix C, Figure 2: AM Peak / Southbound Cumulative Travel Time Calibration Graph



Appendix C, Figure 3: PM Peak / Northbound Cumulative Travel Time Calibration Graph



Appendix C, Figure 4: PM Peak / Southbound Cumulative Travel Time Calibration Graph



Appendix C,
Table 1A: Intersection Levels of Service

US 29 Mainline Intersections *Associated Side-street Intersections*	2015 AM		2040 AM		2015 PM		2040 PM	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
US 29 at Bonifant St	6.7	A	11.1	B	14.4	B	**111.0**	**F**
US 29 at Wayne Ave	24.2	C	38.8	D	32.9	C	64.1	E
US 29 at Ellsworth Dr	4.3	A	18.7	B	6.6	A	25.4	C
US 29 at MD 97/MD 384	23.6	C	26.7	C	27.1	C	33.4	C
Colesville Rd at Wayne Ave/2nd Ave	36.6	D	37.4	D	53.6	D	**96.9**	**F**
US 29 at Fenton St	15.0	B	28.5	C	26.8	C	60.7	E
US 29 at Spring St	26.0	C	40.9	D	44.2	D	**126.5**	**F**
US 29 at Dale Dr	23.9	C	40.0	D	70.4	E	**141.9**	**F**
US 29 at Sligo Creek Pkwy	30.5	C	40.8	D	44.0	D	**102.3**	**F**
US 29 at Franklin Ave	18.6	B	**96.0**	**F**	14.2	B	**88.2**	**F**
US 29 at MD 193 (South)	32.4	C	39.2	D	35.9	D	62.7	E
US 29 at MD 193 (North)	31.4	C	41.6	D	27.7	C	24.2	C
US 29 at Southwood Ave	19.9	B	21.4	C	13.5	B	19.2	B
US 29 at Burnt Mills Shopping Center	15.5	B	15.8	B	19.3	B	27.8	C
US 29 at Lockwood Dr	40.5	D	43.2	D	8.5	A	9.6	A
US 29 Southbound Ramp at MD 650	15.4	B	20.1	C	11.0	B	11.8	B
MD 650 at Lockwood Dr	51.7	D	47.8	D	**145.5**	**F**	**142.9**	**F**
US 29 at Burnt Mills Ave	52.7	D	50.3	D	10.9	B	16.2	B
US 29 at Prelude Dr	29.8	C	27.9	C	5.2	A	10.9	B
US 29 at Stewart Ln	14.3	B	12.7	B	20.5	C	66.4	E
US 29 at Stewart Ln./Old Col. Pike	31.5	C	14.9	B	2.8	A	16.9	B
US 29 at Industrial Pkwy	15.6	B	24.0	C	48.1	D	**115.0**	**F**
US 29 at Tech Rd	**87.4**	**F**	**141.4**	**F**	42.8	D	**80.0**	**F**
US 29 at Randolph Rd	39.4	D	47.8	D	40.6	D	44.7	D
Randolph Rd at Old Columbia Pike	32.1	C	**81.1**	**F**	29.0	C	30.3	C
Cherry Hill Rd. at Prosperity Dr	10.7	B	15.7	B	20.3	C	24.1	C
US 29 at Musgrove Rd	23.4	C	-	-	17.9	B	-	-
US 29 at Fairland Rd (West)	21.9	C	3.1	A	43.5	D	2.4	A
US 29 at Fairland Rd (East)			12.4	B			13.5	B
Fairland Rd at Old Columbia Pike	44.3	D	48.7	D	37.2	D	**111.7**	**F**
US 29 Northbound at Briggs Chaney Rd	7.4	A	7.2	A	13.9	B	20.7	C
US 29 Southbound at Briggs Chaney Rd	13.1	B	13.1	B	20.1	C	19.2	B
Briggs Chaney Rd at Castle Blvd	34.4	C	78.5	E	57.4	E	**111.6**	**F**
Briggs Chaney Rd at Outlet Dr	6.2	A	5.6	A	20.3	C	12.8	B
Briggs Chaney Rd at Old Columbia Pike	36.8	D	32.1	C	36.2	D	28.9	C
US 29 at Greencastle Rd	72.5	E	78.1	E	48.8	D	47.6	D
US 29 at Blackburn Rd	37.6	D	52.1	D	16.2	B	15.8	B
US 29 at MD 198	20.8	C	23.2	C	35.2	D	34.7	C
MD 198 at Old Columbia Pike	40.8	D	**105.9**	**F**	67.9	E	**102.8**	**F**
Old Columbia Pike at National Dr	4.3	A	**121.5**	**F**	11.7	B	63.3	E

- Intersection no longer applicable under Future No-Build

Appendix C,
Table 1B: Synchro – HCM Intersection V/C Ratios

US 29 Mainline Intersections *Associated Side-street Intersections*	2015 AM V/C Ratio	2040 AM V/C Ratio	2015 PM V/C Ratio	2040 PM V/C Ratio
US 29 at Wayne Ave	0.72	0.76	0.78	0.82
US 29 at Ellsworth Dr	0.39	0.40	0.39	0.42
US 29 at MD 97/MD 384	**1.01**	**1.07**	0.93	0.98
Colesville Rd at Wayne Ave/2nd Ave	0.67	0.71	0.82	0.85
US 29 at Fenton St	0.83	**1.11**	**1.18**	**1.43**
US 29 at Spring St	**1.00**	**1.26**	**1.44**	**1.68**
US 29 at Dale Dr	**1.03**	**1.35**	**1.42**	**1.69**
US 29 at Sligo Creek Pkwy	**1.50**	**1.58**	**1.73**	**1.99**
US 29 at Franklin Ave	0.87	0.98	0.96	**1.14**
US 29 at MD 193 (South)	0.97	**1.05**	0.94	**1.03**
US 29 at MD 193 (North)	0.92	0.99	0.93	**1.02**
US 29 at Southwood Ave	**1.05**	**1.13**	**1.00**	**1.11**
US 29 at Burnt Mills Shopping Center	**1.08**	**1.17**	0.99	**1.10**
US 29 at Lockwood Dr	**1.13**	**1.23**	0.83	0.92
US 29 Southbound Ramp at MD 650	0.89	0.99	0.72	0.80
MD 650 at Lockwood Dr	**1.23**	**1.39**	**1.01**	**1.13**
US 29 at Burnt Mills Ave	**1.20**	**1.29**	0.90	0.99
US 29 at Prelude Dr	**1.34**	**1.45**	0.85	0.94
US 29 at Stewart Ln	**1.33**	**1.42**	0.89	**1.02**
US 29 at Stewart Ln./Old Col. Pike	0.79	0.86	0.98	**1.06**
US 29 at Industrial Pkwy	0.86	0.93	**1.01**	**1.21**
US 29 at Tech Rd	0.97	**1.19**	**1.03**	**1.24**
US 29 at Randolph Rd	0.79	0.95	0.68	0.85
Randolph Rd at Old Columbia Pike	0.86	**1.15**	0.70	0.83
Cherry Hill Rd. at Prosperity Dr	0.69	0.83	0.75	0.90
US 29 at Musgrove Rd	0.81	-	0.82	-
US 29 at Fairland Rd (West)	0.82	0.50	0.95	0.43
US 29 at Fairland Rd (East)		0.41		0.45
Fairland Rd at Old Columbia Pike	**1.02**	0.87	0.92	0.85
US 29 Northbound at Briggs Chaney Rd	0.59	0.73	0.78	0.94
US 29 Southbound at Briggs Chaney Rd	0.40	0.49	0.41	0.46
Briggs Chaney Rd at Castle Blvd	0.66	0.78	0.75	0.86
Briggs Chaney Rd at Outlet Dr	0.33	0.40	0.37	0.45
Briggs Chaney Rd at Old Columbia Pike	0.76	0.85	0.60	0.67
US 29 at Greencastle Rd	**1.20**	**1.28**	**1.02**	**1.08**
US 29 at Blackburn Rd	**1.05**	**1.13**	0.98	**1.05**
US 29 at MD 198	0.66	0.81	0.63	0.77
MD 198 at Old Columbia Pike	0.88	**1.06**	0.77	0.98
Old Columbia Pike at National Dr	0.37	0.42	0.41	0.50

- Intersection no longer applicable under Future No-Build

Appendix C, Table 2: Silver Spring Pedestrian Delays (Wayne Ave/2nd St to Spring St)

Intersection	Crosswalk	Delay/Person (sec)			
		2015 AM	2040 AM	2015 PM	2040 PM
Colesville Rd and Wayne Ave	Southern Crosswalk	68.9	69.6	68.1	72.1
	Western Crosswalk	69.9	68.5	69.2	69.3
	Northern Crosswalk	69.1	69.6	67.5	69.3
	Eastern Crosswalk	68.7	69.8	68.6	69.8
	Average Ped. Delay	**69.2**	**69.3**	**68.6**	**69.7**
Colesville Rd and Georgia Ave	Southern Crosswalk	34.5	43.3	35.1	35.2
	Western Crosswalk	53.8	54.0	54.7	54.2
	Northern Crosswalk	54.3	53.4	53.4	52.0
	Eastern Crosswalk	53.8	55.1	53.9	54.2
	Average Ped. Delay	**50.0**	**52.2**	**51.1**	**50.9**
Colesville Rd and Fenton St	Southern Crosswalk	51.9	50.1	50.5	51.2
	Western Crosswalk	12.4	12.9	11.4	12.8
	Northern Crosswalk	54.0	48.6	51.4	50.7
	Eastern Crosswalk	22.9	18.4	17.3	19.7
	Average Ped. Delay	**35.8**	**32.9**	**33.7**	**34.6**
Colesville Rd and Spring St	Southern Crosswalk	51.8	51.1	56.6	61.1
	Western Crosswalk	21.5	19.7	34.6	26.7
	Northern Crosswalk	56.4	56.0	0	0
	Eastern Crosswalk	31.3	29.8	39.4	36.6
	Average Ped. Delay	**33.4**	**36.8**	**42.2**	**39.6**

Appendix C, Table 3: Directional Corridor Speeds for Cars and Trucks Only in Miles per Hour (MPH)

US 29 Northbound	Base Free Flow Speed* (mph)	2015 AM (mph)	2040 AM (mph)	2015 PM (mph)	2040 PM (mph)
MD 97/Georgia Ave to Fenton St	38	14	17	**11**	**5**
Fenton St to Spring St	38	14	17	**11**	**5**
Spring St to Dale Dr	40	14	17	**11**	**5**
Dale Dr to Sligo Creek Pkwy	40	12	13	14	**7**
Sligo Creek Pkwy to Franklin Ave	41	24	28	19	18
Franklin Ave to I-495 Southern Ramp	41	34	34	33	33
I-495 Southern Ramp to I-495 Northern Ramp	42	39	39	37	37
I-495 Northern Ramp to EB MD 193	41	21	**11**	**12**	13
EB MD 193 to WB MD 193	40	33	32	33	30
WB MD 193 to Southwood Ave	41	33	34	29	22
Southwood Ave to Burnt Mills Shopping Center	42	33	34	29	22
Burnt Mills Shopping Center to Lockwood Dr	41	33	34	29	22
Lockwood Dr to Burnt Mills Ave	41	33	34	29	22
Burnt Mills Ave to Prelude Dr	44	33	34	29	22
Prelude Dr to MD 650 Southern Ramp	44	33	34	29	22
MD 650 Southern Ramp to MD 650 Northern Ramp	44	42	42	35	**13**
MD 650 Northern Ramp to Stewart Ln	50	32	36	25	**14**
Stewart Ln to Stewart Ln Spur/Old Columbia Pike	50	32	36	25	**14**
Stewart Ln Spur to Industrial Pkwy	47	32	36	25	14
Industrial Pkwy to Tech Rd	49	32	36	25	**14**
Tech Rd to Randolph Rd/Cherry Hill Rd	49	32	36	25	**14**
Randolph Rd/Cherry Hill Rd to Musgrove Rd	49	32	36	25	**14**
Musgrove Rd to Fairland Rd	50	32	36	25	**14**
Fairland Rd to Briggs Chaney Rd	51	51	55	44	54
Briggs Chaney Rd to Greencastle Rd	51	34	34	28	29
Greencastle Rd to Blackburn Rd	53	43	49	44	47
Blackburn Rd to MD 198	52	54	54	54	55

Appendix C, Table 3 cont'd: Directional Corridor Speeds for Cars and Trucks Only in Miles per Hour (MPH)

US 29 Southbound	Base Free Flow Speed* (mph)	2015 AM (mph)	2040 AM (mph)	2015 PM (mph)	2040 PM (mph)
MD 198 to Blackburn Rd	52	17	**12**	40	37
Blackburn Rd to Greencastle Rd	53	17	**12**	40	37
Greencastle Rd to Briggs Chaney Rd	51	52	51	49	47
Briggs Chaney Rd to Fairland Rd	51	43	39	31	55
Fairland Rd to Musgrove Rd	50	19	**11**	36	39
Musgrove Rd to Randolph Rd/Cherry Hill Rd	49	19	**11**	36	39
Randolph Rd/Cherry Hill Rd to Tech Rd	49	19	**11**	36	39
Tech Rd to Industrial Pkwy	49	19	**11**	36	39
Industrial Pkwy to Stewart Ln Spur	47	19	**11**	36	39
Stewart Ln Spur/Old Columbia Pike to Stewart Ln	50	19	**11**	36	39
Stewart Ln to MD 650 Northern Ramp	50	19	**11**	36	39
MD 650 Northern Ramp to MD 650 Southern Ramp	44	**8**	**9**	42	43
MD 650 Southern Ramp to Prelude Dr	44	**12**	**12**	26	29
Prelude Dr to Burnt Mills Ave	44	**12**	**12**	26	29
Burnt Mills Ave to Lockwood Dr	41	**12**	**12**	26	29
Lockwood Dr to Burnt Mills Shopping Center	41	**12**	**12**	26	29
Burnt Mills Shopping Center to Southwood Ave	42	**12**	**12**	26	29
Southwood Ave to MD 193 Northern Ramp	41	**12**	**12**	26	29
MD 193 Northern Ramp to MD 193 Southern Ramp	40	23	22	15	20
MD 193 Southern Ramp to I-495 Northern Ramp	41	36	33	29	29
I-495 Northern Ramp to I-495 Southern Ramp	42	38	23	39	18
I-495 Southern Ramp to Franklin Ave	41	26	**10**	29	**6**
Franklin Ave to Sligo Creek Pkwy	41	16	**9**	**8**	**5**
Sligo Creek Pkwy to Dale Dr	42	20	15	**11**	**10**
Dale Dr to Spring St	41	19	18	**12**	13
Spring St to Fenton St	39	19	18	12	13
Fenton St to MD 97/Georgia Ave	38	19	18	12	13

Appendix C, Table 4: Directional Corridor Speeds for Buses Only in Miles per Hour (MPH)

US 29 Northbound	2015 AM (mph)	2040 AM (mph)	2015 PM (mph)	2040 PM (mph)
MD 97/Georgia Ave to Dale Dr	8	9	7	4
Dale Dr to Sligo Creek Pkwy	12	15	14	7
Sligo Creek Pkwy to Franklin Ave	13	14	13	13
Franklin Ave to I-495 Southern Ramp	17	20	22	23
I-495 Southern Ramp to I-495 Northern Ramp	40	40	36	37
I-495 Northern Ramp to EB MD 193	13	9	11	10
EB MD 193 to WB MD 193	27	26	27	26
WB MD 193 to MD 650 Southern Ramp	16	17	20	17
MD 650 Southern Ramp to MD 650 Northern Ramp	43	44	37	12
MD 650 Northern Ramp to Fairland Rd	29	29	24	14
Fairland Rd to Briggs Chaney Rd	-	-	45	52
Briggs Chaney Rd to Greencastle Rd	26	27	28	28
Greencastle Rd to Blackburn Rd	45	49	38	44
Blackburn Rd to MD 198	-	-	54	54

US 29 Southbound	2015 AM (mph)	2040 AM (mph)	2015 PM (mph)	2040 PM (mph)
MD 198 to Greencastle Rd	11	10	24	27
Greencastle Rd to Briggs Chaney Rd	52	51	50	41
Briggs Chaney Rd to Fairland Rd	35	40	27	54
Fairland Rd to MD 650 Northern Ramp	19	10	35	31
MD 650 Northern Ramp to MD 650 Southern Ramp	9	8	42	41
MD 650 Southern Ramp to MD 193 Northern Ramp	12	8	15	16
MD 193 Northern Ramp to MD 193 Southern Ramp	20	18	10	14
MD 193 Southern Ramp to I-495 Northern Ramp	23	18	19	15
I-495 Northern Ramp to I-495 Southern Ramp	39	21	39	19
I-495 Southern Ramp to Franklin Ave	16	8	13	6
Franklin Ave to Sligo Creek Pkwy	11	7	7	5
Sligo Creek Pkwy to Dale Dr	7	6	6	5
Dale Dr to MD 97/Georgia Ave	11	11	8	9

Note: LOS scale cannot be directly calculated for bus speeds as was done for cars and trucks in the previous table
- Not applicable

Appendix C, Table 5: Weave, Diverge, and Merge Levels of Service for Interchange Areas

Location	Facility Type	2015 AM		2040 AM		2015 PM		2040 PM	
		Avg Density (pc/mi/ln)	LOS	Avg Density (pc/mi/ln)	LOS	Avg Density (pc/mi/ln)	LOS	Avg Density (pc/mi/ln)	LOS
I-495 (Capital Beltway)									
Off-Ramp US 29 NB to I-495 EB	Diverge	20	B	18	B	40	E	34	D
On-Ramp I-495 EB to US 29 NB	Merge	17	B	18	B	25	C	26	C
Off-Ramp US 29 NB to I-495 WB	Diverge	15	B	17	B	21	C	24	C
Off-Ramp US 29 SB to I-495 WB	Diverge	25	C	28	D	34	D	34	D
On-Ramp I-495 WB to US 29 SB	Merge	22	C	**40**	**F**	11	B	26	C
On-Ramp I-495 EB to US 29 SB	Merge	28	C	**62**	**F**	15	B	**64**	**F**
MD 650 (New Hampshire Avenue)									
Off-Ramp US 29 NB to MD 650 EB	Diverge	15	B	17	B	26	C	**58**	**F**
On-Ramp MD 650 WB to US 29 NB & Off-Ramp US 29 NB to MD 650 WB	Weave	14	B	15	B	35	D	**71**	**F**
On-Ramp MD 650 to US 29 NB	Weave	14	B	14	B	35	D	**99**	**F**
Off-Ramp US 29 SB to MD 650 WB	Diverge	**65**	**F**	**53**	**F**	17	B	19	B
Off-Ramp US 29 SB to MD 650 EB	Diverge	**73**	**F**	**62**	**F**	17	B	17	B
Randolph Road/Cherry Hill Road									
Off-Ramp US 29 NB to Randolph Rd	Diverge	15	B	18	B	33	D	30	D
On-Ramp Randolph Rd to US 29 NB	Weave	17	B	11	B	20	B	18	B
Off-Ramp US 29 SB to Randolph Rd	Diverge	22	C	**113**	**F**	13	B	10	A
On-Ramp Randolph Rd to US 29 SB	Weave	**95**	**F**	**121**	**F**	26	C	18	B

Location	Facility Type	2015 AM		2040 AM		2015 PM		2040 PM	
		Avg Density (pc/mi/ln)	LOS	Avg Density (pc/mi/ln)	LOS	Avg Density (pc/mi/ln)	LOS	Avg Density (pc/mi/ln)	LOS
MD 200 (Intercounty Connector – ICC)									
Off-Ramp US 29 NB to ICC	Diverge	17	B	14	B	31	D	21	C
Off-Ramp US 29 NB to Briggs Chaney Rd	Diverge	10	A	10	A	21	C	15	B
On-Ramp ICC to US 29 NB	Merge	11	B	12	B	16	B	16	B
Off-Ramp US 29 SB to ICC & On-Ramp Briggs Chaney Rd to US 29 SB	Weave	18	B	25	C	11	A	12	B
Off-Ramp US 29 SB to Fairland Rd	Diverge	15	B	34	D	9	A	10	A
On-Ramp ICC to US 29 SB	Weave	**62**	**F**	24	C	**94**	**F**	8	A
Briggs Chaney Road									
On-Ramp Briggs Chaney Rd to US 29 NB	Merge	13	B	14	B	21	C	20	C
Off-Ramp US 29 SB to Briggs Chaney Rd	Diverge	27	C	28	D	26	C	35	E
MD 198 (Spencerville Road/Sandy Spring Road)									
Off-Ramp US 29 NB to MD 198	Diverge	16	B	17	B	20	B	21	C
Off-Ramp US 29 SB to MD 198 Park N Ride	Diverge	**43**	**F**	**97**	**F**	16	B	17	B
On-Ramp MD 198 Park N Ride to US 29 SB	Merge	**65**	**F**	**108**	**F**	17	B	18	B

Appendix C, Table 6: Queue Length Percent Change – Existing vs. Future No-Build

		AM			PM		
Intersection	**Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**
US 29 at Bonifant St	NB Left	20	17	14.6%	786	39	1903.1%
	NB Through	21	18	14.1%	785	41	1803.8%
	NB Right	20	17	15.2%	786	42	1790.4%
	SB Left	67	20	235.5%	6	42	-86.1%
	SB Through	68	21	227.1%	11	42	-75.1%
	SB Right	68	20	234.4%	10	42	-75.7%
	EB Left	2	2	0.0%	8	7	26.5%
	EB Right	2	2	0.0%	8	7	26.7%
US 29 at Wayne Ave	NB Left	118	51	133.6%	250	110	126.3%
	NB Through	120	56	112.5%	254	115	120.8%
	NB Right	120	56	113.5%	254	115	120.7%
	SB Left	151	55	173.7%	41	50	-19.5%
	SB Through	155	60	157.9%	47	52	-10.0%
	SB Right	154	60	157.5%	42	51	-17.8%
	EB Left	42	38	9.1%	173	113	53.0%
	EB Through	44	40	10.5%	173	114	52.2%
	EB Right	43	38	14.2%	173	113	52.3%
	WB Left	79	91	-12.5%	274	87	215.2%
	WB Through	77	88	-12.0%	274	88	210.1%
	WB Right	78	89	-12.1%	277	90	206.0%
US 29 at Ellsworth Dr	NB Through	40	10	294.4%	133	31	334.6%
	NB Right	40	8	371.9%	133	29	362.2%
	SB Through	70	14	415.3%	6	10	-37.6%
	WB Right	1	1	1.5%	72	2	3074.8%

		AM			PM		
Intersection	**Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**
US 29 at MD 97/MD 384	NB Through	184	146	26.1%	450	348	29.2%
	NB Right	184	146	26.1%	450	348	29.2%
	SB Left	159	212	-24.9%	103	142	-27.6%
	SB Through	163	212	-23.1%	103	142	-27.4%
	SB Right	161	208	-22.5%	100	141	-29.1%
	EB Through	127	85	48.5%	73	61	18.9%
	EB Right	127	85	48.5%	73	61	18.9%
	WB Through	72	48	49.7%	316	148	113.9%
	WB Right	71	47	52.8%	316	148	113.9%
US 29 at Fenton St	NB Left	100	69	45.6%	381	160	138.8%
	NB Through	100	68	45.7%	381	160	138.8%
	NB Right	100	68	45.7%	381	160	138.8%
	SB Left	104	113	-8.3%	137	112	21.6%
	SB Through	104	113	-8.3%	137	112	21.6%
	SB Right	104	113	-8.3%	137	112	21.6%
	EB Left	411	19	2106.1%	246	32	668.3%
	EB Through	411	19	2113.7%	246	32	669.9%
	EB Right	411	19	2109.5%	246	32	668.7%
	WB Left	44	37	19.9%	62	48	28.5%
	WB Through	45	37	19.6%	62	48	28.5%
	WB Right	45	38	19.5%	62	48	28.4%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Spring St	NB Left	63	91	-31.1%	0	0	0.0%
	NB Through	63	91	-31.1%	365	248	46.9%
	NB Right	63	91	-31.0%	364	248	46.9%
	SB Left	221	154	43.5%	171	194	-11.7%
	SB Through	222	156	42.4%	171	194	-11.7%
	SB Right	206	141	45.5%	171	194	-11.7%
	EB Left	67	42	58.6%	371	89	318.2%
	EB Through	66	40	63.9%	372	88	320.8%
	EB Right	66	40	64.1%	372	88	324.2%
	WB Left	276	40	582.7%	1253	109	1050.9%
	WB Through	276	41	577.3%	1252	116	976.5%
	WB Right	275	39	597.4%	1252	116	982.9%
US 29 at Dale Dr	NB Left	127	187	-32.1%	1213	500	142.6%
	NB Through	128	188	-32.1%	1213	501	142.1%
	NB Right	127	187	-32.1%	1213	501	142.0%
	SB Left	211	124	70.3%	687	574	19.5%
	SB Through	212	129	64.8%	686	574	19.5%
	SB Right	195	120	62.3%	687	574	19.5%
	EB Left	547	48	1028.6%	533	120	343.9%
	EB Through	548	49	1017.9%	533	121	342.4%
	EB Right	548	49	1016.2%	534	121	342.2%
	WB Left	96	71	34.5%	111	51	117.2%
	WB Through	97	72	34.0%	120	55	117.5%
	WB Right	96	72	34.3%	119	55	118.5%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Sligo Creek Pkwy	NB Left	414	93	346.3%	483	212	127.6%
	NB Left	414	92	351.5%	483	211	128.8%
	NB Through	383	146	163.1%	812	350	132.3%
	NB Right	387	148	161.6%	812	353	130.3%
	SB Left	320	131	144.6%	341	212	60.9%
	SB Through	327	139	135.8%	341	212	61.0%
	SB Right	297	116	155.4%	293	158	84.6%
	SB Right	325	138	136.2%	341	206	65.8%
	EB Left	195	185	5.3%	1042	219	376.6%
	EB Left	195	185	5.3%	1042	219	376.5%
	EB Through	195	185	5.3%	1043	220	375.0%
	EB Right	188	175	7.3%	1041	206	406.2%
	EB Left	30	25	21.3%	14	15	-5.4%
	EB Through	30	25	21.3%	14	15	-5.5%
	EB Right	30	25	21.2%	14	15	-5.4%
	EB Right	30	25	21.2%	14	15	-5.4%
	WB Left	117	128	-8.9%	194	115	69.5%
	WB Through	117	128	-8.9%	194	114	69.7%
	WB Through	116	128	-8.9%	194	114	69.7%
	WB Right	117	128	-8.9%	194	114	69.6%
US 29 at Franklin Ave	NB Through	23	21	9.6%	92	98	-6.5%
	NB Right	23	21	9.9%	92	97	-5.9%
	SB Left	1018	131	676.0%	1039	72	1352.9%
	SB Through	1018	133	667.6%	1039	72	1350.2%
	WB Left	854	108	689.2%	484	37	1191.4%
	WB Right	0	0	0.0%	19	1	2867.7%

		AM			PM		
Intersection	**Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**
US 29 at MD 193 (South)	NB Through	158	47	235.0%	323	371	-12.8%
	NB Right	156	46	242.4%	308	354	-13.0%
	SB Through	47	31	52.2%	46	55	-16.6%
	EB Left	443	395	12.1%	1254	254	394.2%
	EB Through	443	395	12.1%	1254	254	394.2%
	EB Right	443	395	12.1%	1254	254	394.2%
US 29 at MD 193 (North)	NB Through	34	87	-60.8%	64	66	-2.4%
	SB Through	323	86	274.4%	173	240	-28.0%
	SB Right	323	86	274.4%	173	240	-28.0%
	WB Left	276	275	0.5%	203	181	11.8%
	WB Through	277	276	0.5%	203	181	11.8%
	WB Right	276	273	0.9%	203	181	11.8%
US 29 at Southwood Ave	NB Left	5	35	-85.7%	151	44	244.7%
	NB Through	9	38	-75.7%	155	62	149.8%
	SB Through	254	253	0.2%	87	78	12.4%
	SB Right	254	253	0.2%	86	78	11.5%
	EB Left	249	145	71.8%	139	126	10.4%
	EB Right	248	144	72.5%	138	125	10.6%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Burnt Mills Shopping Center	NB Left	18	8	128.3%	482	224	114.6%
	NB Through	21	12	79.0%	487	244	99.5%
	NB Right	21	12	80.3%	486	243	100.1%
	SB Left	213	213	0.1%	77	99	-22.7%
	SB Through	213	213	0.1%	77	100	-22.9%
	SB Right	213	213	0.1%	47	90	-47.4%
	WB Left	33	29	13.6%	63	61	3.5%
	WB Through	33	29	14.2%	63	60	3.6%
	WB Right	33	29	14.2%	63	60	3.5%
US 29 at Lockwood Dr	NB Through	11	33	-68.5%	24	11	116.3%
	NB Right	19	43	-56.9%	31	16	91.8%
	SB Left	537	493	9.0%	9	17	-43.4%
	SB Through	537	493	9.0%	11	17	-33.8%
	SB Right	537	493	9.0%	11	17	-36.6%
	EB Left	2	2	-6.8%	13	12	12.6%
	EB Right	2	2	-8.6%	14	13	10.4%
	WB Left	170	143	18.3%	105	90	16.2%
	WB Right	170	144	18.2%	106	91	16.2%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Burnt Mills Ave	NB Left	12	18	-34.2%	140	63	123.6%
	NB Through	13	19	-31.1%	143	65	120.1%
	NB Right	13	19	-33.1%	142	64	121.2%
	SB Left	804	756	6.4%	58	46	26.1%
	SB Through	804	756	6.4%	59	46	26.8%
	SB Right	804	756	6.4%	59	46	27.1%
	EB Left	37	39	-3.3%	40	38	5.3%
	EB Through	38	39	-3.4%	41	39	5.3%
	EB Right	38	40	-3.4%	41	39	5.3%
	WB Left	23	26	-10.3%	6	6	2.6%
	WB Through	23	26	-10.4%	6	6	2.6%
	WB Right	23	26	-10.3%	6	6	2.6%
US 29 at Prelude Dr	NB Left	5	24	-77.2%	129	15	744.3%
	NB Through	7	25	-73.4%	130	20	547.1%
	SB Through	413	400	3.1%	14	20	-27.4%
	SB Right	413	400	3.1%	14	20	-27.8%
	EB Left	45	43	6.1%	30	28	6.2%
	EB Right	45	42	6.1%	29	28	6.2%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Stewart Lane	NB Left	19	34	-44.7%	759	171	344.8%
	NB Through	20	35	-42.5%	761	176	332.5%
	NB Right	20	34	-43.2%	761	175	334.8%
	SB Left	95	136	-29.7%	129	99	30.4%
	SB Through	97	137	-29.5%	129	99	30.4%
	SB Right	43	41	5.9%	62	28	122.8%
	EB Left	50	27	84.4%	36	21	71.9%
	EB Through	48	25	92.5%	35	19	78.8%
	EB Right	46	23	104.1%	31	16	90.1%
	WB Left	78	36	119.2%	17	12	38.2%
	WB Through	75	31	145.7%	14	9	46.4%
	WB Right	74	30	150.0%	12	8	58.5%
US 29 at Old Columbia Pike/Stewart Lane Spur	NB Through	9	7	19.1%	183	5	3925.9%
	SB Through	217	577	-62.4%	32	3	1079.9%
	WB Left	46	38	21.3%	49	32	53.1%
	WB Right	47	39	21.2%	50	33	50.7%
US 29 at Industrial Pkwy	NB Through	149	92	62.6%	1283	764	67.9%
	NB Right	145	90	61.8%	1283	762	68.4%
	SB Left	144	84	71.1%	182	40	350.9%
	SB Through	144	84	70.6%	182	41	349.0%
	WB Left	105	64	63.2%	540	98	450.1%
	WB Right	106	65	62.2%	541	99	445.2%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Tech Rd	NB Left	187	205	-8.8%	147	222	-33.5%
	NB Through	188	205	-8.4%	147	221	-33.7%
	NB Right	188	205	-8.4%	147	221	-33.7%
	SB Left	1445	935	54.6%	227	257	-11.7%
	SB Through	1445	935	54.6%	227	257	-11.7%
	SB Right	1445	933	55.0%	213	251	-15.2%
	EB Left	382	127	200.1%	384	96	298.3%
	EB Through	382	128	197.7%	384	98	291.7%
	EB Right	382	128	198.1%	383	98	292.4%
	WB Left	126	88	43.7%	704	134	426.2%
	WB Through	127	88	43.6%	704	134	425.5%
	WB Right	126	86	45.2%	703	133	428.9%
US 29 at Randolph Rd	NB Left	44	19	125.9%	46	37	25.1%
	NB Right	42	19	121.3%	45	36	23.3%
	SB Left	193	77	150.7%	102	76	34.2%
	SB Right	193	77	150.7%	102	76	34.3%
	EB Left	132	97	36.1%	139	98	41.8%
	EB Through	132	96	37.2%	139	98	42.2%
	EB Right	60	33	82.2%	66	34	97.7%
	WB Left	194	190	2.3%	210	179	17.4%
	WB Through	185	182	1.5%	183	155	17.7%
	WB Right	161	163	-1.7%	175	151	16.1%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Briggs Chaney Rd	NB Left	57	48	18.8%	105	308	-66.0%
	NB Right	87	71	22.2%	250	429	-41.6%
	EB Left	16	22	-27.9%	38	36	4.8%
	EB Through	18	23	-24.1%	32	32	1.6%
	WB Through	39	23	67.7%	108	56	92.8%
	WB Right	37	22	67.9%	107	55	95.0%
US 29 at Greencastle Rd	NB Left	307	283	8.3%	544	697	-22.0%
	NB Through	308	284	8.2%	545	698	-21.9%
	NB Right	307	283	8.3%	544	695	-21.7%
	SB Left	1059	991	6.8%	272	186	46.2%
	SB Through	1059	991	6.9%	271	185	46.4%
	SB Right	1059	990	6.9%	267	178	50.1%
	EB Left	59	57	3.7%	63	64	-1.7%
	EB Through	59	57	3.7%	63	64	-1.7%
	EB Right	59	57	3.7%	63	64	-1.6%
	WB Left	91	80	13.4%	47	46	2.7%
	WB Through	91	81	13.3%	48	46	2.6%
	WB Right	87	77	12.1%	47	45	3.4%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
US 29 at Blackburn Rd	NB Through	21	49	-56.9%	22	38	-42.1%
	NB Right	17	47	-63.8%	20	37	-45.9%
	SB Through	939	671	40.0%	94	80	17.3%
	EB Left	136	92	47.9%	86	78	10.4%
	EB Through	135	91	48.3%	85	76	11.5%
	EB Right	137	93	47.4%	87	78	10.5%
	WB Left	25	26	-1.8%	64	58	10.6%
	WB Through	25	25	-1.8%	64	58	10.6%
	WB Right	25	26	-1.9%	64	58	10.5%
US 29 at MD 198	NB Left	67	51	30.9%	221	116	91.0%
	NB Through	54	38	39.8%	206	101	103.8%
	NB Right	54	38	39.8%	206	101	103.8%
	EB Left	66	78	-15.4%	150	220	-31.6%
	EB Through	66	79	-15.7%	151	221	-31.8%
	WB Through	210	100	109.5%	189	105	80.4%
	WB Right	0	0	0.0%	2	1	21.4%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
Colesville Rd at Wayne Ave/2nd Ave	NB Through	51	48	4.9%	779	313	148.6%
	NB Right	51	48	4.9%	779	313	148.6%
	SB Left	163	159	2.5%	88	89	-1.0%
	SB Through	168	165	1.4%	97	98	-0.1%
	SB Right	175	172	1.8%	103	103	0.3%
	EB Left	21	20	6.0%	61	53	14.3%
	EB Through	27	25	7.4%	61	53	14.3%
	EB Right	25	23	9.3%	61	53	14.3%
	WB Left	65	61	6.5%	122	100	22.1%
	WB Through	63	59	6.8%	121	98	22.5%
	WB Right	64	60	6.7%	121	99	22.5%
MD 650 at Lockwood Dr	NB Left	422	528	-20.0%	1431	1415	1.1%
	NB Through	424	529	-19.9%	1431	1415	1.1%
	NB Right	416	528	-21.1%	1432	1416	1.1%
	SB Left	253	248	2.0%	178	189	-5.8%
	SB Through	255	250	2.0%	178	189	-5.9%
	SB Right	254	248	2.1%	175	185	-5.2%
	EB Left	72	64	12.3%	102	92	10.8%
	EB Through	73	65	12.2%	103	93	10.8%
	EB Right	30	22	34.5%	23	17	37.5%
	WB Left	171	151	13.0%	102	89	14.4%
	WB Through	171	152	12.9%	102	90	14.2%
	WB Right	172	152	12.9%	102	89	14.7%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
MD 650 at US 29 Southbound Ramp	NB Left	48	40	21.9%	64	63	2.4%
	NB Through	32	23	40.2%	47	45	3.9%
	SB Through	191	143	34.1%	30	19	54.5%
Cherry Hill Rd at Prosperity Dr	NB Left	52	47	9.7%	129	129	-0.2%
	NB Right	49	44	11.6%	128	129	-0.2%
	EB Through	42	27	54.3%	66	57	15.1%
	EB Right	40	24	63.6%	65	56	15.5%
	WB Left	98	38	158.4%	123	54	125.3%
	WB Through	99	39	157.2%	124	55	124.1%
Randolph Rd at Old Columbia Pike	NB Left	53	45	19.3%	127	117	8.7%
	NB Through	54	45	18.9%	128	118	8.7%
	NB Right	49	41	18.6%	121	112	8.1%
	SB Left	693	113	515.3%	74	51	44.7%
	SB Through	693	113	513.6%	74	51	44.4%
	SB Right	692	106	549.8%	65	43	49.7%
	EB Left	384	127	202.0%	88	69	27.9%
	EB Through	385	128	199.8%	89	70	27.4%
	EB Right	383	123	210.2%	82	61	33.4%
	WB Left	81	69	16.6%	58	43	34.0%
	WB Through	84	70	19.1%	60	44	35.0%
	WB Right	80	66	21.0%	55	38	44.5%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
Fairland Rd at Old Columbia Pike	NB Left	8	25	-65.8%	96	107	-10.8%
	NB Through	12	25	-51.1%	97	107	-9.8%
	NB Right	4	25	-83.2%	85	107	-20.9%
	SB Left	158	150	5.3%	38	31	23.3%
	SB Through	158	150	5.3%	39	31	23.6%
	SB Right	96	81	17.7%	6	7	-13.0%
	EB Left	82	19	319.6%	349	46	654.5%
	EB Through	86	21	316.3%	351	47	653.0%
	EB Right	79	19	308.1%	352	44	692.0%
	WB Left	105	259	-59.6%	140	198	-29.5%
	WB Through	110	261	-58.0%	141	200	-29.2%
	WB Right	104	261	-60.2%	135	200	-32.3%
Briggs Chaney Rd at Castle Blvd	NB Left	22	20	6.5%	59	55	7.0%
	NB Through	22	21	6.5%	59	55	7.0%
	NB Right	22	21	6.5%	59	55	7.0%
	SB Left	81	76	6.2%	82	74	11.6%
	SB Through	82	77	6.2%	84	75	11.6%
	SB Right	79	74	6.9%	80	71	13.1%
	EB Left	44	49	-9.0%	203	281	-27.6%
	EB Through	43	47	-9.1%	203	281	-27.7%
	EB Right	31	35	-12.3%	172	257	-33.0%
	WB Left	391	113	246.2%	536	114	370.0%
	WB Through	392	114	244.0%	537	116	363.9%
	WB Right	390	113	246.0%	536	115	366.7%

		AM			PM		
Intersection	Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement	No-Build Avg. Queue (feet)	Existing Avg. Queue (feet)	Queue % Change by Movement
Briggs Chaney Rd at Outlet Dr	SB Right	1	1	12.8%	6	5	23.6%
	EB Left	30	38	-20.1%	50	95	-47.2%
	EB Through	20	25	-21.5%	39	84	-53.6%
	WB Through	6	3	128.3%	38	18	111.9%
	WB Right	5	2	151.4%	38	18	112.5%
Briggs Chaney Rd at US 29 Southbound Ramp	SB Left	33	31	5.4%	62	56	11.0%
	SB Right	26	26	-0.7%	58	52	12.3%
	EB Left	20	17	15.6%	21	29	-29.3%
	EB Through	17	14	15.8%	17	27	-34.4%
	WB Through	41	34	21.5%	24	29	-17.7%
	WB Right	39	33	19.8%	22	28	-22.0%
Briggs Chaney Rd at Old Columbia Pike	NB Left	39	35	10.2%	72	83	-12.6%
	NB Through	40	37	9.8%	74	84	-12.4%
	NB Right	35	32	10.3%	71	82	-13.1%
	SB Left	135	122	10.9%	64	55	16.9%
	SB Through	135	122	10.7%	64	55	16.2%
	SB Right	135	121	11.0%	62	53	17.4%
	EB Left	66	69	-5.3%	44	51	-13.6%
	EB Through	70	73	-4.2%	48	55	-13.5%
	EB Right	70	73	-4.2%	48	55	-13.4%
	WB Left	55	71	-22.7%	40	79	-49.8%
	WB Through	56	72	-22.5%	41	80	-49.0%
	WB Right	49	69	-28.5%	40	79	-49.7%

		AM			PM		
Intersection	**Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**	**No-Build Avg. Queue (feet)**	**Existing Avg. Queue (feet)**	**Queue % Change by Movement**
MD 198 at Old Columbia Pike	SB Left	483	147	229.7%	463	234	97.8%
	SB Through	485	149	226.4%	464	236	96.7%
	SB Right	485	148	227.8%	464	236	96.9%
	EB Left	828	120	590.6%	813	322	153.0%
	EB Through	829	121	586.3%	814	322	152.6%
	WB Left	248	194	28.2%	377	265	42.2%
	WB Through	248	194	28.1%	377	265	42.2%
Old Columbia Pike at National Dr	NB Left	5	1	294.9%	9	4	115.3%
	NB Through	6	2	233.1%	11	6	96.5%
	NB Right	3	1	380.7%	6	3	97.3%
	SB Left	254	3	9814.1%	51	5	841.6%
	SB Through	259	4	6349.5%	62	8	706.4%
	SB Right	259	2	11677.3%	60	6	961.4%
	EB Left	187	6	3137.1%	186	35	439.3%
	EB Through	187	6	3215.1%	186	34	445.5%
	EB Right	187	6	2856.2%	186	35	431.1%
	WB Left	8	4	95.8%	8	11	-28.8%
	WB Through	8	4	96.3%	8	11	-28.8%
	WB Right	8	4	96.0%	8	11	-28.8%
US 29 at Briggs Chaney Rd Southbound	SB Through	5	0	0.0%	0	0	0.0%
	EB Through	0	0	-22.2%	9	10	-17.0%
	WB Through	0	0	80.0%	0	0	1600.0%

4.4 Appendix D: US 29 BRT Crash Density Figures


MARYLAND
97
MARYLAND
384
Colesville Rd
Fenton St
Spring St
S Noyes Dr
N Noyes Dr
Woodside Pkwy
Highland Dr
Dale Dr
29
Sligo Creek Pkwy
St Andrews Way
Leighton Ave
Franklin Ave
Ellsworth Dr
Rowen Rd
Wayne Ave
Ripley St
Georgia Ave
Bonifant St
Sligo Ave
Silverspring Ave
Philadelphia Ave
Burlington Ave
13th St
Begin Southern Segment
Match to Figure2 of 7
N
S
E
W
LEGEND
Number of Crashes per Location
US 29
1 - 3
4 - 8
9 - 15
16 - 35
> 35
US 29 Corridor Crash Summary
Silver Spring to Burtonsville
Crash Density (2011-2013)
SHA
State Highway Administration
Maryland Department of Transportation
March 2015
Figure 1 of 7

LEGEND

Number of Crashes per Location

US 29

- 1 - 3
- 4 - 8
- 9 - 15
- 16 - 35
- > 35

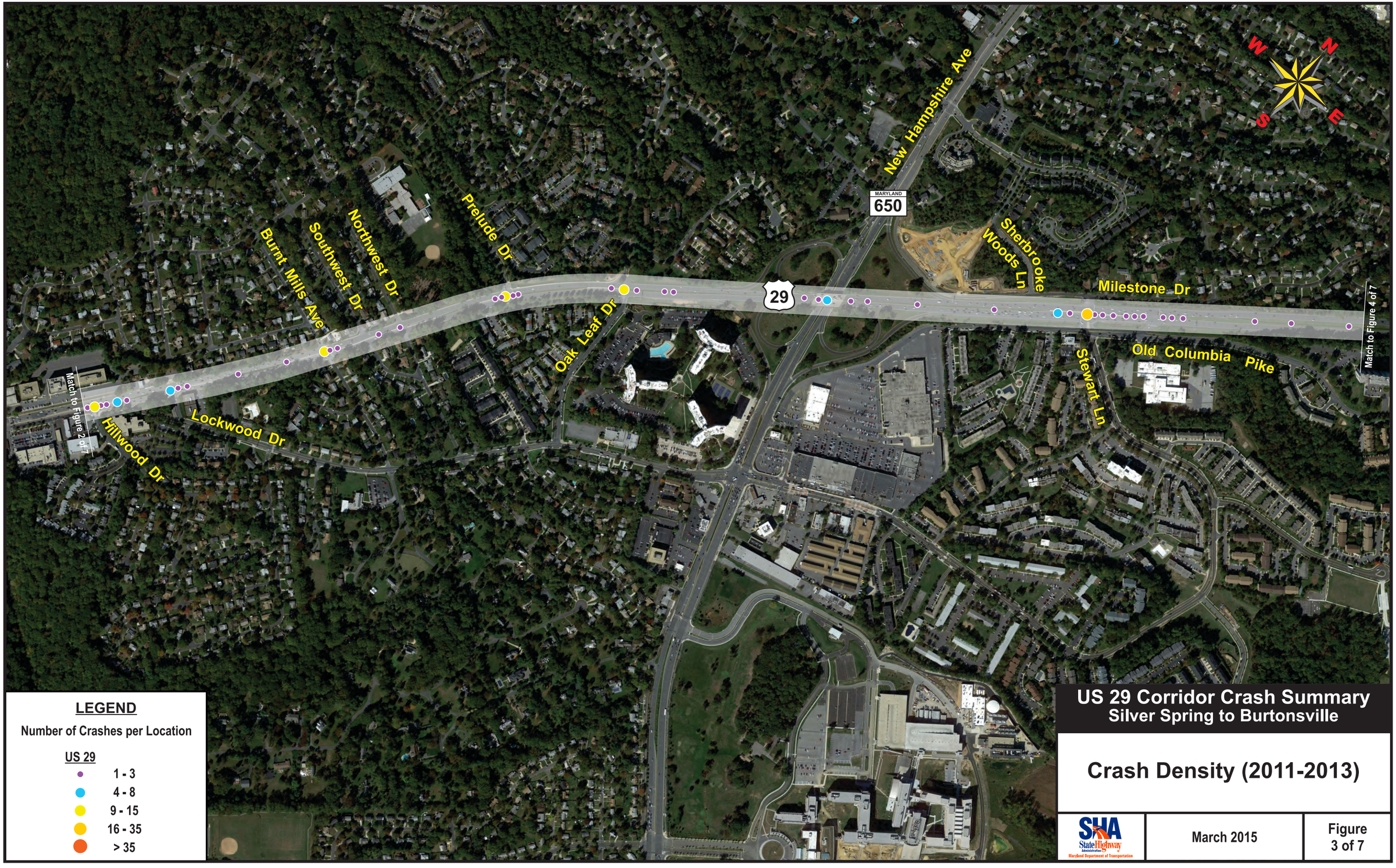
US 29 Corridor Crash Summary
Silver Spring to Burtonsville

Crash Density (2011-2013)

SHA State Highway Administration, Maryland Department of Transportation

March 2015

Figure 2 of 7



US 29 Corridor Crash Summary
Silver Spring to Burtonsville

Crash Density (2011-2013)

SHA State Highway Administration
Maryland Department of Transportation

March 2015

Figure 3 of 7

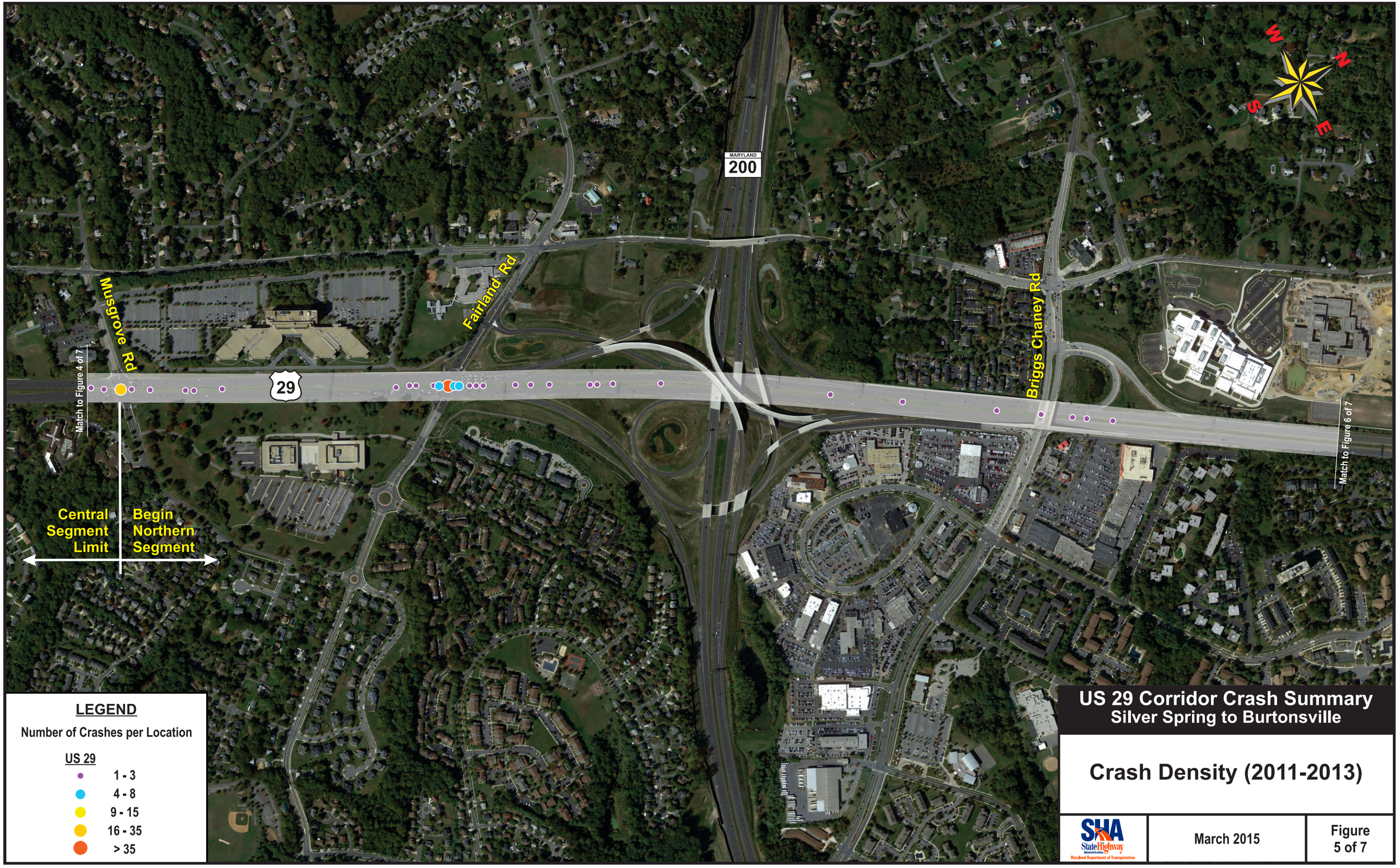
US 29 Corridor Crash Summary
Silver Spring to Burtonsville

Crash Density (2011-2013)

SHA State Highway Administration
Maryland Department of Transportation

March 2015

Figure 4 of 7



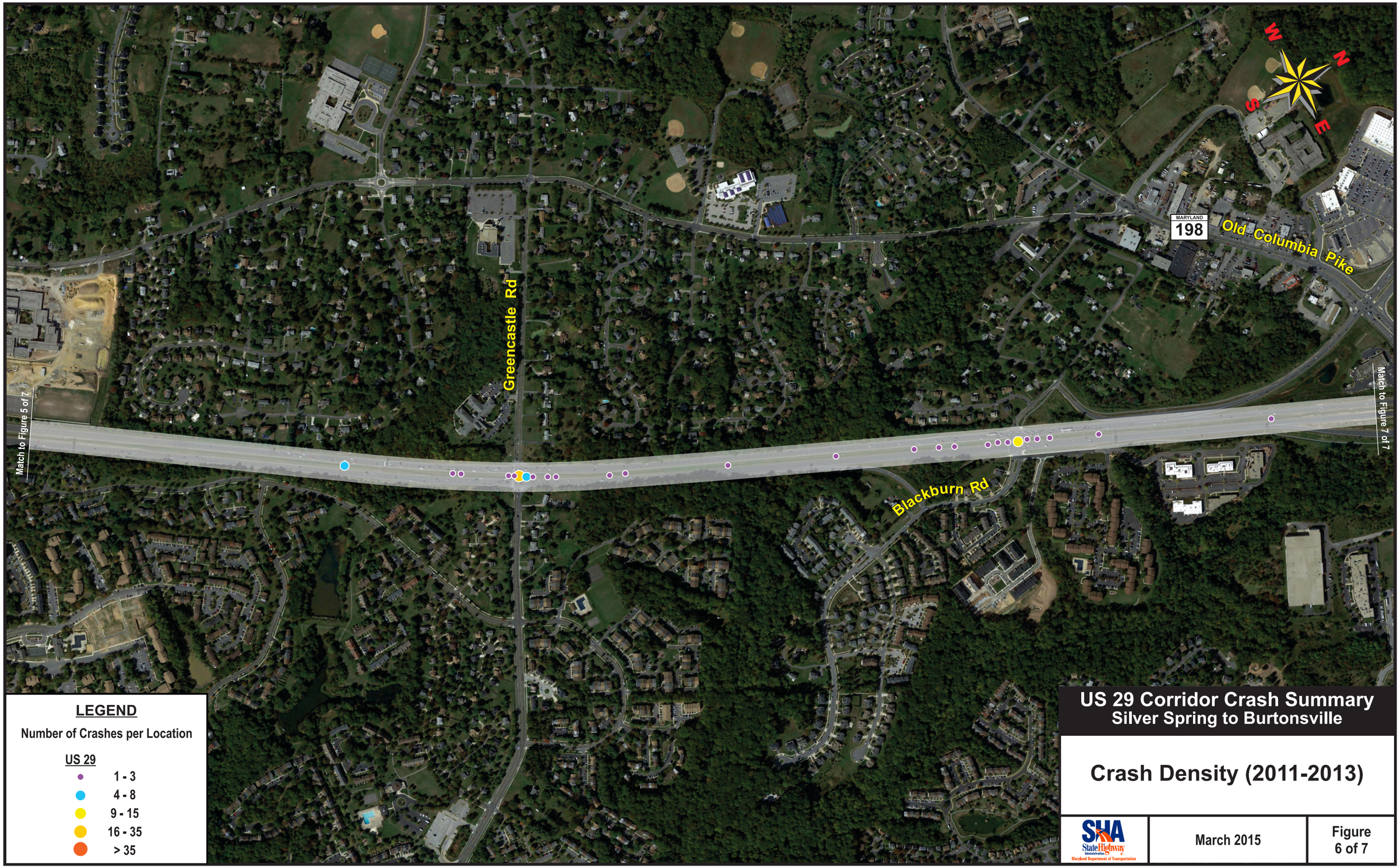
US 29 Corridor Crash Summary
Silver Spring to Burtonsville

Crash Density (2011-2013)

SHA State Highway Administration
Maryland Department of Transportation

March 2015

Figure 5 of 7



US 29 Corridor Crash Summary
Silver Spring to Burtonsville

Crash Density (2011-2013)

SHA State Highway Administration
Maryland Department of Transportation

March 2015

Figure 6 of 7

LEGEND

Number of Crashes per Location

US 29

- 1 - 3
- 4 - 8
- 9 - 15
- 16 - 35
- > 35

US 29 Corridor Crash Summary
Silver Spring to Burtonsville

Crash Density (2011-2013)

SHA State Highway Administration, Maryland Department of Transportation

March 2015

Figure 7 of 7

Montgomery County
RAPID TRANSIT
US 29

PRELIMINARY PURPOSE AND NEED DOCUMENT

APPENDIX B:
RELATED PLANS AND PROJECTS: MASTER PLAN REVIEW

– DRAFT –

SUBJECT TO CHANGE

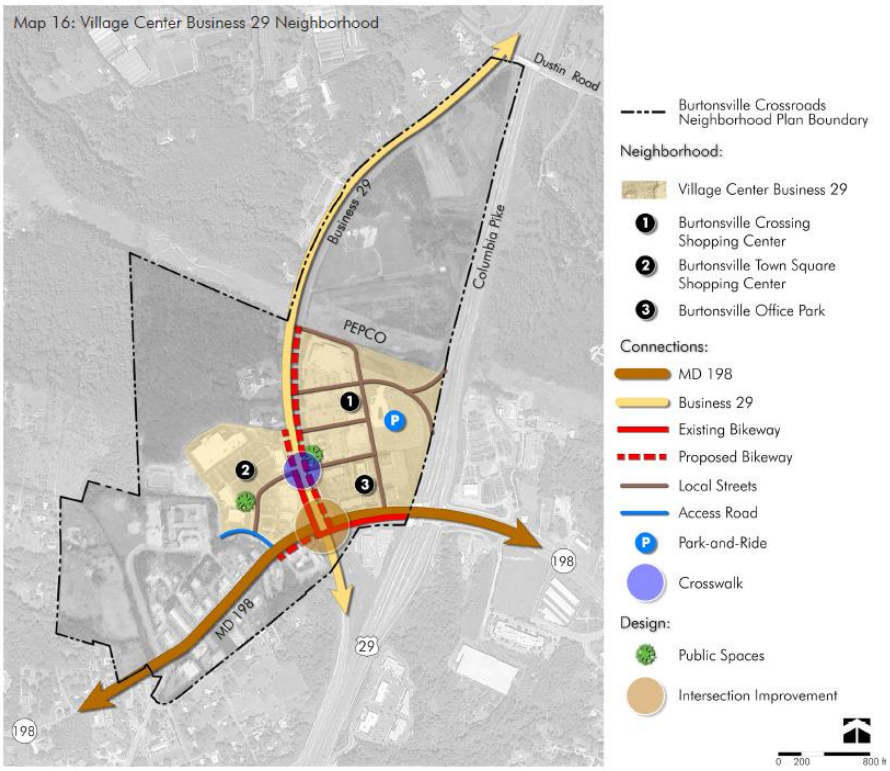
1.0 Burtonsville Crossroads Neighborhood Plan (2012)

Connect to the park-and-ride lot and regional transit

This transit facility provides an opportunity to link the local businesses in Burtonsville to the region. The park-and-ride lot is located behind the existing Burtonsville Crossing Shopping Center with access from US 29, Business 29, and MD 198. The 500 parking spaces are served by Metrobus, Maryland Transit Authority (MTA) Commuter Bus, University of Maryland Shuttle, and ICC Bus to and from Baltimore-Washington International Airport. The park-and-ride lot is also included in a Bus Rapid Transit (BRT) network under study by Montgomery County. Two Metrobus routes connect to Silver Spring and the Metro stations. The commuter bus provides daily, rush hour service to Washington D.C. and Baltimore, with stops at the Silver Spring Metro Station and National Oceanic and Atmospheric Administration, Dupont Circle, Federal Triangle, Capitol Hill, and the Washington Navy Yard. The ICC bus travels from Gaithersburg with stops at the Shady Grove Metro Station, the Georgia Avenue park-and-ride, and the Burtonsville park-and-ride before taking I-95 to the Baltimore-Washington International Thurgood Marshall Airport and Amtrak Station.

Village Center Business 29 Neighborhood

This neighborhood consists of larger properties that can be enhanced to create mixed-use residential and commercial uses with a new grid of streets, pedestrian and bicycle connections, and a more integrated park-and-ride facility. New residents would have access to jobs, housing, services, and amenities while reducing their reliance on the automobile. While commercial uses may predominate on the west side, residential uses on the east side would enliven the crossroads area. The CRT Zone is recommended to allow the existing single-use shopping center and associated surface lots to be redeveloped into a mixed-use neighborhood. In the Village Center Business 29 Neighborhood the CRT Zone will provide the opportunity to expand the range of land uses, including housing, and provide public use spaces.



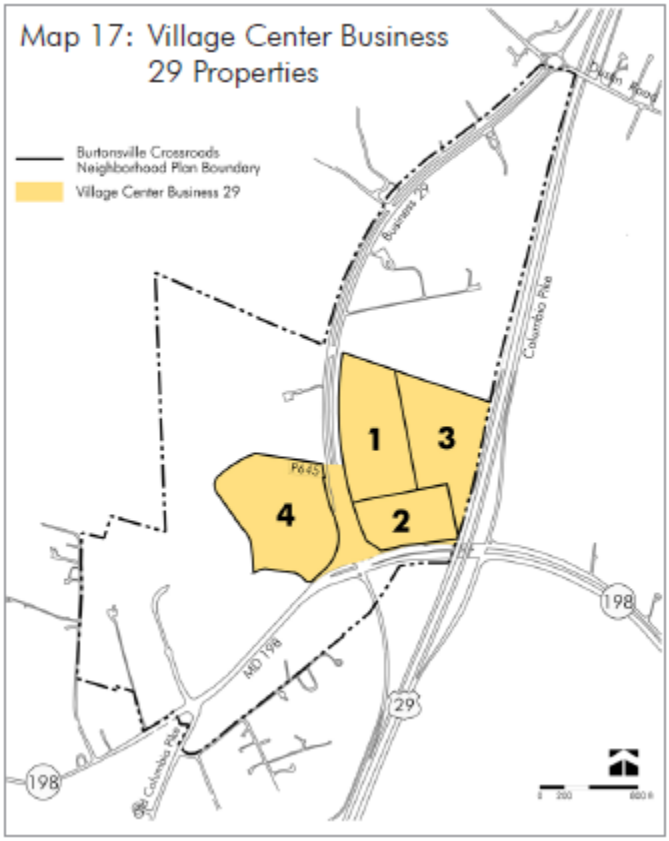
Connectivity

Redevelopment will create a local street network that connects both sides of Business 29. The local streets improve circulation between sites for vehicles, bicycles, transit users, and pedestrians. The Plan recommendations provide:

- dual bikeway along Business 29 with bike lanes and a linear greenway along Business 29 that includes a continuous lawn panel, a sidewalk on the east side, and a shared use path along the west side north to the PEPCO right-of-way.
- transit access improvements
- transit proximity points
- clearly identified crosswalks
- pedestrian connections to the park-and-ride lot and future BRT station (under study)

Park-and-ride lot (location 3)

Montgomery County and the State of Maryland own the park-and-ride lot. The CRT (Commercial Residential Town) Zone allows for redevelopment with more flexibility in land uses and development standards, as well as shared parking with adjacent properties. Neither the County nor State has plans to redevelop this four-acre, 500-space surface lot. The Plan supports a future BRT station on this site (location details in the *Countywide Transit Corridors Functional Master Plan*). The possible BRT station combined with the proposed CRT Zone would allow the site to become part of a larger redevelopment project. Redevelopment should include:

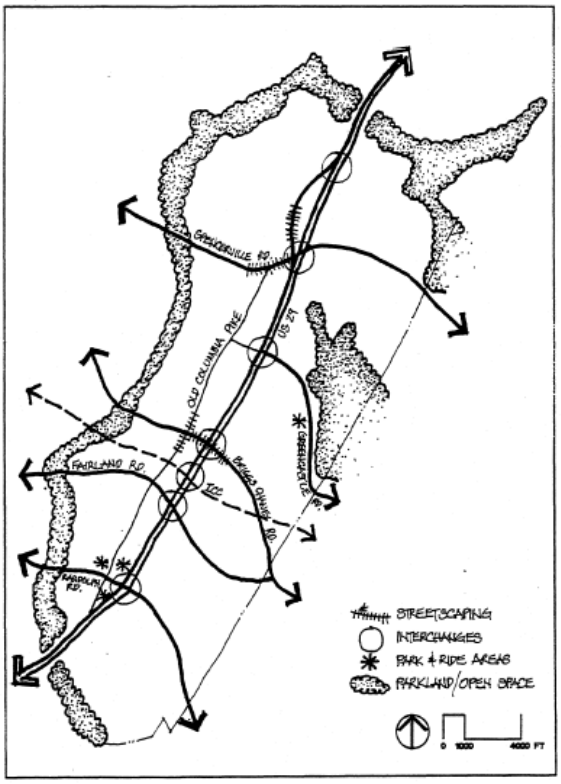


- access improvements
- landscaping including tree canopy
- shared parking
- locating the station closer to the crossroads
- joint use of the park-and-ride lot

2.0 Fairland Master Plan (1997)

Transportation Network

The Fairland Master Plan recommends enhancing mobility by providing a safe and efficient transportation system with a wide range of alternatives. The Plan identifies right-of-way for grade-separated interchange improvements on US 29 and gives priority to east-west travel. The Plan underscores the need for pedestrian safety and access to local facilities and recommends a number of sidewalk improvements in commercial centers, in the residential communities, and along the major roads. Emphasis is placed on safe and attractive transportation improvements that enhance local circulation while improving all modes of travel within and through the communities and centers of Fairland.



- Recommends extension of existing local and regional bus service.
- Recommends a Transportation Demand Management Program to encourage transportation alternatives to the single-occupancy automobile, including car pooling and mass transit.
- Expands the system of sidewalks and walkways to improve access to public transit, commercial centers, schools, parks, and places of employment.

Transportation Goal

Provide the residents of Fairland a safe and efficient means of using the facilities and services within their neighborhoods and communities while improving regional access and improving access to alternatives to single-occupant vehicle travel.

Road Network

Develop a hierarchical road network that improves traffic circulation for through and local traffic on major connecting roads, improves east-west connections across US 29, and discourages regional traffic on roads intended to serve local traffic.

The recommendations for grade separations make two assumptions: that congestion will continue to exist south of New Hampshire Avenue and that already planned improvements will be constructed.

- Reserve right-of-way through this master planning process for all improvements to provide the greatest flexibility for future roadway and transit needs.
- Evaluate bus service to see if it alleviates some of the predicted congestion.

Transit Objective

Increase the share of travel by carpool and transit within and through Fairland by providing services, facilities, and policies that encourage their use.

Recommendations:

- Work toward a long-term solution for significantly improving transit along US 29. Based on current demand projections, a substantial improvement to transit should be provided between Burtonsville at MD 198 and the Silver Spring Metro station (future Silver Spring Transit Center).
- Expand future regular bus service to include the current off-peak shuttle service. Current service operates in a circular fashion, looping around US 29 and Old Columbia Pike. Major public uses, such as schools, the library, the Fairland Aquatic Center, and other recreation facilities are logical points of connection. Other shuttles could link employment centers such as the West*Farm Technology Park and Bell Atlantic with commercial centers at Briggs Chaney and Spencerville Roads, especially at mid-day.
- Extend regional bus service to include connections between major activity centers along US 29 and Prince George's County.
- Improve access to local transit by providing sidewalks leading to and along roads served by transit.

Traffic Management Objective

To manage the transportation system demand to achieve better system efficiency and to reduce traffic for certain types of development under certain conditions.

Recommendation:

- Develop a Transportation Demand Management Program (TDM) as a voluntary public/private partnership including SHA, MCDPW &T, Maryland Mass Transit Administration (MTA), WMA TA, employers, and civic associations in the US 29 area. The

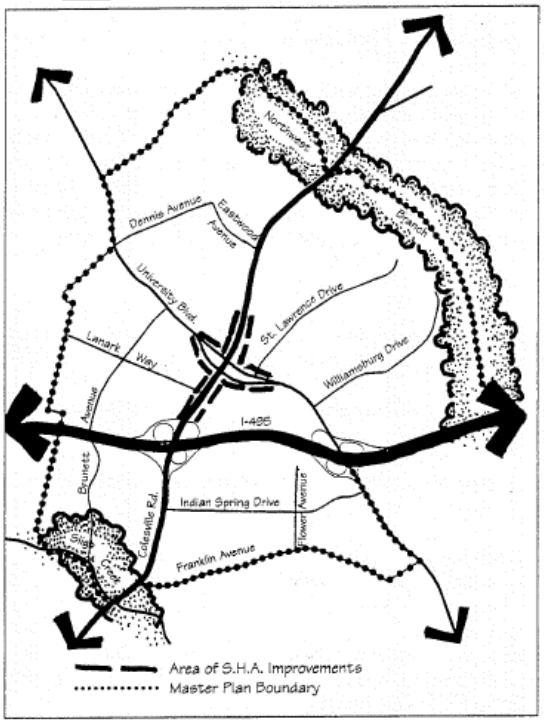
geographic extent of the TDM should extend to the Silver Spring Policy Area. The program should:

- Coordinate with the Silver Spring CBD traffic management program.
- Develop alternatives to single-occupancy vehicles for use during US 29 construction.
- Promote the use of transit, ridesharing, and other traffic mitigation measures, including compressed workweeks and telecommuting, among employees and residents in the US 29 area.
- Link the TDM with the existing impact fee legislation for the Fairland/White Oak Policy Area to coordinate road construction and transit programs.
- Coordinate bus service to park-and-ride lots.
- Coordinate replacing any park-and-ride lots that may cease operation when trip mitigation agreements expire and better use existing lots.
- Monitor all trip mitigation programs on a periodic basis to evaluate effectiveness.

3.0 Four Corners Master Plan (1996)

Transportation Network

This Master Plan balances the transportation needs of regional through traffic and local traffic by recommending a road improvement at the main intersection, neighborhood protection from cut-through traffic, and an enhanced system of sidewalks and bikeways to create an environment that is more conducive to walking, biking, and transit use.



- Encourages increased use of transit as an alternative to the car with bus service that connects Four Corners with Metro stations at Silver Spring and Forest Glen.

Enhance mobility by providing a safe and efficient transportation system, offering a wide range of transportation alternatives that serve the environmental, economic, social, and land use needs of the County and by providing a framework for development.

The Four Corners Master Plan supports many of the General Plan Refinement transportation principles, including an improved transit system, bikeway system, sidewalk network, and movement of through traffic away from local streets. The Eastern Montgomery County master plans support a long-term solution for significantly improving transit along US 29. This conforms with the General Plan Refinement objective of establishing exclusive travelways for transit serving the Urban Ring and Corridor and with the Planning Act vision of conserving resources.

Transit

Most residents in Four Comers are within a quarter-mile of a Metro bus or Ride-On bus stop. Additional transit services are necessary to help reduce traffic congestion and to provide an alternative to further expansion of roads in Four Comers. Appropriate facilities that support and enhance transit ridership are also important.

While bus service is readily available, residents are discouraged from taking it due to the difficulty of crossing Colesville Road. Improved pedestrian access to bus stops across Colesville Road from Four Comers neighborhoods would enable more residents to use transit. A pedestrian crossing at Lanark Way is critical to ensuring safe pedestrian access to Blair High School. In addition, pedestrian crossings at Granville Drive, Leighton Avenue, Timberwood Avenue, and Lorain Avenue should also be considered.

In the long-term, based on current demand projections, a substantial improvement to transit should be provided along US 29 between Burtonsville at MD 198 and the Silver Spring Metro station (future Silver Spring Transit Center). Future highway improvements along US 29 should be designed in a way that would not preclude provision of transit priority along all or portions of US29.

Encourage use of transit to move people through Four Comers rather than widening roads to move vehicles by providing high-quality, efficient public transportation.

Recommendations:

- Work toward a long-term solution for significantly improving transit along US 29. Based on current demand projections, a substantial improvement to transit should be provided between Burtonsville at MD 198 and the Silver Spring Metro station (future Silver Spring Transit Center).
- Examine, as part of the transportation facility planning project for a bus transfer center in Four Comers, the area between the divided westbound and eastbound lanes on University Boulevard, west of Colesville Road, as a possible site. The study should seek

ways to minimize the impact on, and possibly include, the existing businesses in any potential redesign. A park-and-ride facility is not recommended.

- This Plan encourages improved bus service to the Forest Glen Metro station from the Four Comers neighborhoods.
- This Plan supports the development of alternatives to single-occupancy vehicles for use during US 29 construction.
- This Plan promotes the use of transit, ridesharing, and other traffic mitigation measures, including compressed workweeks and telecommuting among employees and residents in the US 29 area.

4.0 North and West Silver Spring Master Plan (2000)

This Plan recommends major vehicular and pedestrian improvements, particularly for the Montgomery Hills area. The challenge for the Plan is to find a balance that accommodates local and regional traffic, yet provides safe pedestrian access and protects the neighborhoods from intrusive vehicular impact.

Plan Recommendations

- Protect the residential neighborhoods from commercial and through traffic.
- Enhance pedestrian access to shopping areas, transit, and community facilities by improving pedestrian safety and providing wide, tree-lined sidewalks throughout the area.
- Consider alternative designs for the intersection of Georgia Avenue and 16th Street when the State Highway Administration (SHA) studies the Georgia Avenue corridor.
- Implement the Georgetown Branch Transitway between Silver Spring and Bethesda.
- Improve and expand the inter-connected system of bikeways and trails in Silver Spring and beyond. Silver Spring can help ease mounting traffic congestion by providing substantive and user-friendly alternatives to the automobile. Without good facilities, commuters are less likely to choose a non-auto means of transportation.

Colesville Road

Transit service improvement along Colesville Road (US 29) is an important component of creating a transportation system that supports land use decisions in Silver Spring and all of Montgomery County. Consistent with prior Planning Board and County Council actions, this Plan recommends that the Maryland Department of Transportation (MOOT) and the Montgomery County Department of Public Works and Transportation (DPWT) jointly conduct a study to identify operational and minor capital improvements on US 29 that would enhance the speed and reliability of bus transit. Such improvements could include bus prioritization at traffic

signals, bus bypass lanes (queue jumpers) at a few selected locations, and additional bus service where feasible.

For the longer term, this Plan recommends that MDOT and DPWT jointly conduct a project planning study on major transit system improvements (all modes of transit) for travel demand along US 29. This study should concentrate on transit accessibility, reliability, community and environmental impacts, and time savings. Previous studies have not focused on balancing the objectives of improved transit service with the impacts of building new transit facilities.

Recommendations:
Support improvements which facilitate access to, and use of, transit along Colesville Road. Extension of the reversible lane on Colesville Road to the Beltway (1-495) could provide additional capacity and replace the need for intersection modifications along Colesville Road. However, extending the reversible lane has not received much public and political support because of the perceived impact on adjacent communities. This Plan does not recommend it, even though it would reduce the critical lane volumes (CL Vs) significantly at Colesville Road/Franklin Avenue and Colesville Road/Sligo Creek Parkway.

Lower congestion and improved levels of service (LOS) at key intersections could also result from increased transit ridership in the US 29 corridor. For example, a higher level of transit ridership could be achieved by adding a transitway to US 29, which could reduce travel time for transit patrons. At the very least, improvements which enhance access to transit and make transit use more convenient (e.g., bus shelters) must be implemented. More frequent local bus service should also be considered as a way to improve community accessibility and increase transit ridership. Also, since buses and other vehicles must share the same traffic lanes, enhanced bus speed and reliability can be achieved by modifications that increase the overall capacity at congested intersections.

Transit

Most residents of North and West Silver Spring live near transit, either Metrorail or a Metrobus or Ride-On bus stop. Additional transit services are necessary to help reduce traffic congestion, improve the level of service (LOS) at key intersections along Georgia Avenue and Colesville Road, and provide an alternative to further expansion of roads. Increased transit usage will also support the revitalization of downtown Silver Spring.

While transit service is available, some residents are discouraged from taking it due to the difficulty of crossing area roads. Transit access must be made as convenient and safe as

possible. Improved pedestrian and bicycle access throughout the area would enable more residents to use transit.

Regional road and transit improvements being examined by the on-going Capital Beltway Major Investment Study (CBMIS) could also affect this area. The Study considers various light and heavy rail options including above and below-ground routes to extend transit service, as alternatives to widening the Beltway. This Master Plan's proposed land uses and transportation network do not preclude any of the transit modes or alignments which are currently proposed in the CBMIS. (The CBMIS is in very preliminary stages. No land use, public facility, or transportation network decisions have been made based on any of its analysis.)

Improve transit accessibility and reliability along Georgia Avenue and Colesville Road. Improvements to passenger accessibility to transit such as sidewalks, crosswalks, bicycle racks, and passenger shelters will be very important if goals of increased ridership are to be met. Improvements in reliability through reduced headways, neighborhood circulator service, real time vehicle positioning and other methods to provide the most accurate route scheduling and arrival time information will make transit much more competitive with automobile use choices.

6.0 Silver Spring CBD Sector Plan (2001)

Transit-Oriented Downtown

The Plan's land use and development recommendations strive to balance the needs of commuter and local traffic, of walkers and drivers, and to maximize the investment in Silver Spring's transit infrastructure. This Sector Plan's revitalization strategy envisions Silver Spring as a lively place, and along with activity comes traffic. However, the benefits of redevelopment are great and can outweigh the inconvenience of additional traffic. A mix of development projects, office, housing, retail, and entertainment, will generate traffic at different times of the day. It is imperative that Silver Spring maximize its already considerable transportation infrastructure-roads, Metro and MARC, bus service, trails, and sidewalks-and capitalize on its high transit ridership. Focusing development around these connected transportation systems meets local goals as well as the regional transportation goals of the Metropolitan Washington Council of Governments (COG), and the goals of the State's Smart Growth initiative.

Silver Spring developed around the crossroads of Georgia A venue and Colesville Road, State roads that are and will continue to be major commuter arteries, connecting Howard and Montgomery Counties and the Capital Beltway to Washington, D.C. The challenge comes in maintaining these routes as regional arteries, while establishing a local circulation pattern that is pedestrian-friendly, supports the development of existing and proposed businesses, and provides necessary access to and throughout the CBD.

Creating a transit-oriented community is not only a transportation effort, but also a land use effort. Providing development close to the new Transit Center will encourage its use. If transit facilities are convenient to downtown activity, they will become a viable option for local and regional travelers.

- Transportation choices go beyond the car to link local and regional buses and trains, bikes and foot travel. A system of paths combined with a full complement of transportation options and sidewalks can increase mobility for the elderly, handicapped, children, and those without a car. Increased mobility can open employment, residence, and entertainment options in the CBD to more people, making downtown a useful and lively place.

Transit Center

The Silver Spring Metrorail Station will become part of a true transportation center and a gateway to downtown. The redesigned station will incorporate and connect bus, taxi, and local and regional rail service in one pedestrian-friendly facility. Including street-level convenience retail and a landscaped park will make transit a more convenient and attractive option for the CBD's residents, employees, and visitors, and will make the Transit Center a community crossroads and landmark. The following project guidance is designed to ensure that the Transit Center is accessible to pedestrians and vehicles from all parts of downtown, that it is compatible with adjacent development, and that it contributes to the CBD's revitalization.

Design and build the Transit Center to:

- integrate access to all modes of mass transit-Metrorail, MARC, buses, and a future transit line to Bethesda-in one facility on Colesville Road
- improve pedestrian safety and aesthetics in and around the Center with wide, tree-lined paths and specially paved crosswalks
- include a street-front retail component facing a tree-lined Colesville Road promenade for the convenience of transit riders and other CBD users
- meet revitalization goals by incorporating a relocated park, pedestrian and bike connections, and street-fronting retail in a landmark building
- include direct connections to the Silver Triangle site and to the Capital Crescent/Metropolitan Branch Trail
- consolidate curb cuts at the triangular comer of Colesville Road and Wayne Avenue

Public Transportation

Develop an enhanced, inter-modal public transportation system to serve both CBD residents and workers as well as those transferring between transit services.

The Silver Spring Transit Center will serve as a focus for public transportation services in the CBD, linking regional rail, local rail, local bus, intercity bus, taxi, pedestrian, and bicycle options. The Transit Center should be a downtown landmark and a gateway to Silver Spring, particularly the surrounding development in the Urban Renewal area, including the Silver Triangle and Ripley District.

- Design and construct the Transit Center as a pedestrian-friendly, landmark facility connecting riders with MARC, Metrorail, Metrobus, Ride-On bus, inter-city bus, future Georgetown Branch service, taxi, bicycle, and pedestrian options. Ensure that the early design stages include citizen input and resolve potential conflicts between alternative modes of travel.
- Improve accessibility to transit and bikeways via sidewalk connections, bus shelters, bike racks, and similar facilities.
- Provide for a fixed-guideway transit service along the Georgetown Branch and Metropolitan Branch rights-of-way between Silver Spring and Bethesda.

The Capital Beltway Corridor Transportation Study being conducted by the Maryland Department of Transportation (MDOT) is reviewing the feasibility of fixed-guideway transit and high-occupancy vehicle (HOV) facilities to serve the regional circumferential travel through areas of Montgomery and Prince George's Counties served by the Capital Beltway. The MDOT study will include a sketch-level review of several alternative routes for a new circumferential light rail or Metrorail transit route, commonly described in the aggregate as the "Purple Line." Some of the alternatives incorporate the Georgetown Branch Trolley rail alignment between the Bethesda and Silver Spring central business districts, include the Silver Spring Transit Center Station, and continue north or east towards Four Corners or Takoma Park.

The Sector Plan fully supports the implementation of transit service along the Georgetown Branch alignment between Bethesda and Silver Spring. The feasibility assessment of other fixed-guideway transit connections within the CBD has not yet been established. This Plan does not preclude the concept of continuing circumferential rail transit from the Silver Spring Transit Center north or east, should the MDOT study determine that such service would be both desirable and feasible from a regional perspective. Inthat case however, this Sector Plan should

be revisited to consider any changes to right-of-way or easement acquisition, land use, design, and zoning recommendations.

7.0 White Oak Master Plan (1997)

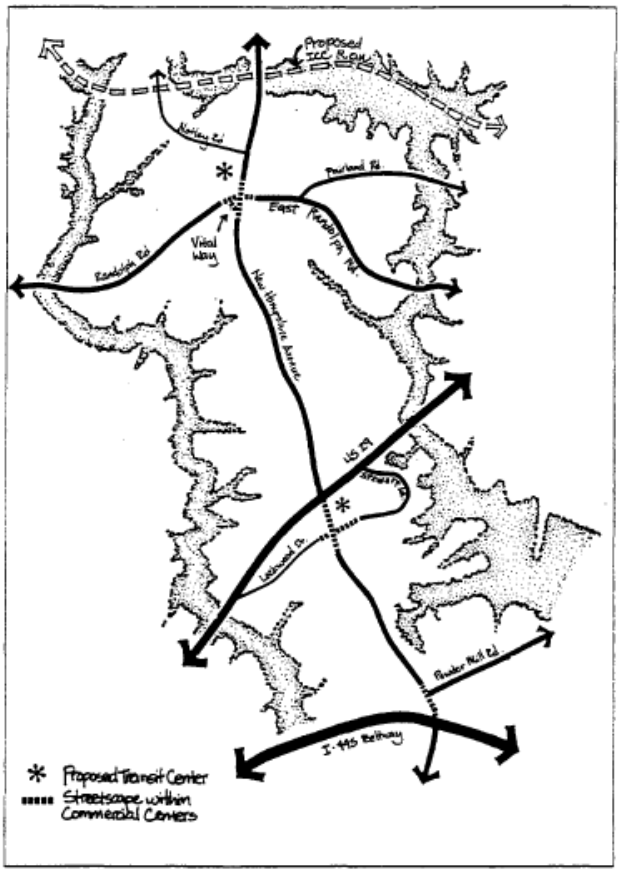
Transportation Network

This Plan recommends safe and attractive transportation improvements that enhance local circulation and convenience for all modes of travel within and through the communities of the White Oak Master Plan area.

The Transportation Goal recognizes the inherent conflict between local and through traffic in the White Oak Master Plan area due to the limited number of connecting and through streets. This Plan also recognizes that streets and their amenities contribute significantly to the character of a community. For these reasons, a great deal of attention has been given to recommending improvements that encourage alternative modes of transportation, improve local circulation without inhibiting through traffic, and enhance community character.

This Plan:

- Proposes two transit centers for consideration, one in Colesville and the other in White Oak, to provide for a more efficient, safe, and attractive transit system and reduce the dependence on the automobile.
- Supports a grade separation at the Stewart Lane/US 29 intersection. The grade separation at Stewart Lane will facilitate pedestrian and bicycle circulation in both directions across US 29 and improve vehicular access to the White Oak Center.
- Recommends intersection improvements, including a study of the need for a traffic signal, at Randolph Road and Vital Way to improve local vehicular and pedestrian



access between the Colesville Shopping Center and commercial properties along Vital Way.

- Expands the system of walkways to improve pedestrian access to and from transit stops, community retail centers, schools, parks, and employment areas.
- Provides a safe and convenient bikeway network that connects community centers and services and supports a regional recreational bikeway network.
- Recommends street trees and sidewalk improvements to enhance the pedestrian experience and improve community character.

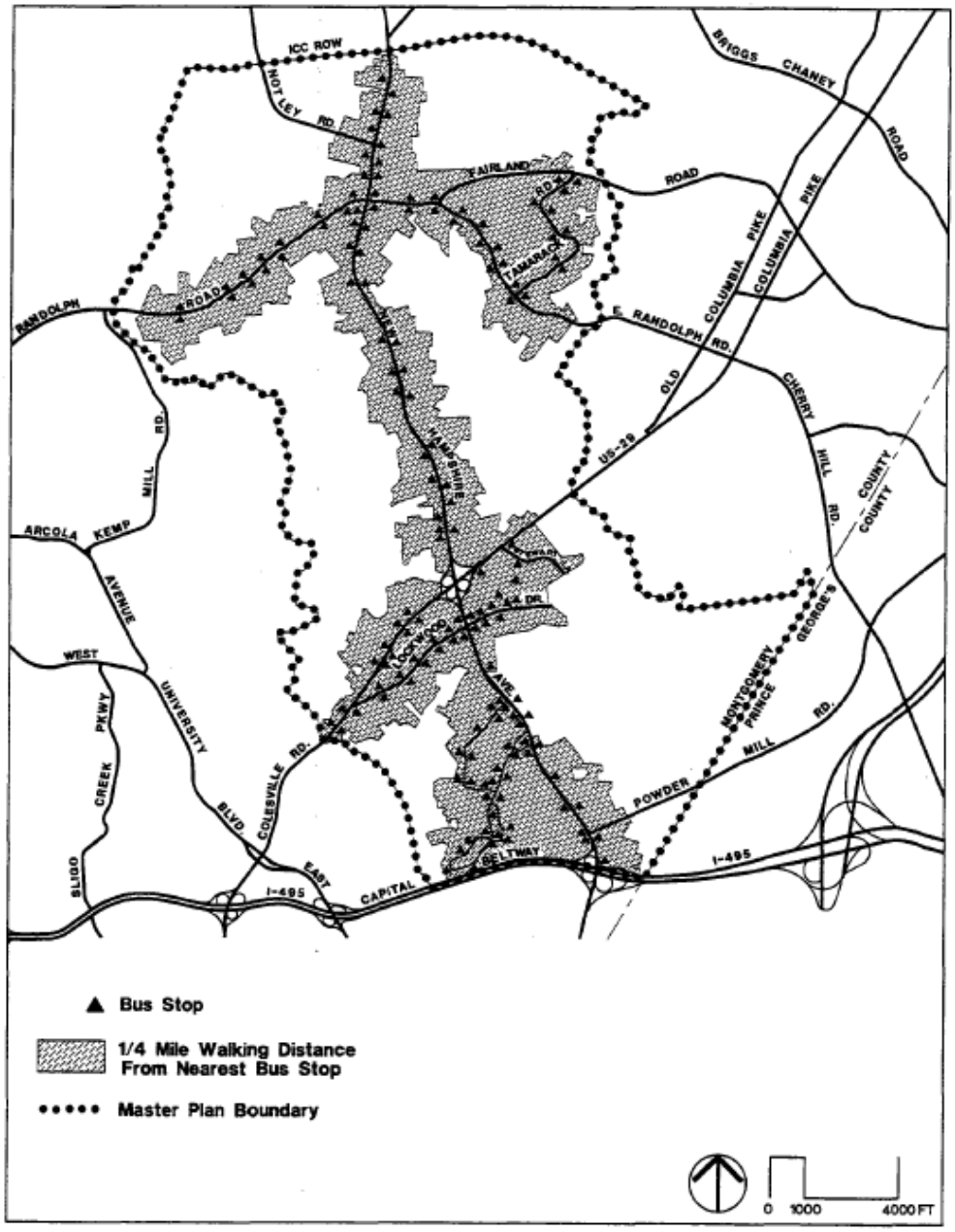
Transit Objective

Increase use of carpools and transit within and through the White Oak Master Plan area by providing services and facilities and establishing policies that encourage their use.

Recommendations:

- Work toward a long-term solution for significantly improving transit along US 29. Based on current demand projections, a substantial improvement to transit should be provided between Burtonsville at MD 198 and the Silver Spring Metro station (future Silver Spring Transit Center). (A discussion of transit and US 29 is found in the *Transportation Report for the Eastern Montgomery County Master Plan Areas.)*
- Investigate the feasibility of a transit center in the White Oak Shopping Center. A transit center provides convenient access to bus routes and other transit for nearby residents, employees, and shoppers, thus forming part of Montgomery County's strategy to provide opportunities to use transit. The White Oak Shopping Center offers substantial potential for such a facility as it would provide convenient transfers between routes on US 29 and New Hampshire Avenue. Use of the center would also increase with major transit improvements along US 29. Waiting areas, commuter parking, and other amenities could be included, depending on the scale of the project. Special design treatments such as special paving and lighting, increased landscaping, benches, and other amenities to encourage use should also be considered.
- Support a transit center at Colesville if future demand warrants construction. The DPW&T has recently completed a study indicating that the current usage is not sufficient to justify the construction of a transit center in Colesville at this time. However, as the bus and transit network develops, it may be found to be worthwhile and feasible in the future.
- Monitor, through a special study, the need to expand bus service in the White Oak Master Plan area to provide coverage for neighborhoods where residents must walk more than a quarter-mile to the nearest bus stop.

- Monitor, through a special study, the demand for express bus routes between transit centers and areas of major employment within and outside the County. Transfer points should be identified at express route crossing points where people can easily transfer among express and local feeder routes.
- Remove the 1981 Master Plan recommendation for a park and ride lot and optional office development in the northeast quadrant of US 29 and New Hampshire Avenue. The White Oak Master Plan recommends this quadrant for single-family residential use. The park and ride lot is more suited for the White Oak Shopping Center adjoining the recommended transit center. Bus routes are currently situated at the shopping center and a park and ride lot at the shopping center would allow people a convenient shopping trip on their way home. There is also a high concentration of garden and high-rise apartments within walking distance of the shopping center.
- Provide bus shelters and trash receptacles at all commercial centers and in residential areas that meet Division of Transit Services guidelines for minimum boarding and alighting. Landscaping is encouraged, where possible, to improve the users' experience while waiting for a bus and to enhance streetscape character.
- Improve access to transit by providing sidewalks leading to and along roadways served by transit. As mentioned, many White Oak Master Plan area neighborhoods are difficult to reach by bus. However, there are opportunities to improve pedestrian connections to the nearest bus stops by improving sidewalks and by constructing paths on unused rights-of-way.


ICC ROW
HOT LEY RD.
BRIGGS CHANEY ROAD
FAIRLAND RD.
TAMARACK
COLUMBIA PIKE
RANDOLPH ROAD
E. RANDOLPH RD.
OLD US-29
CHERRY HILL RD.
COUNTY
MILL RD.
ARCOLA KEMP AVENUE
WEST
UNIVERSITY BLVD.
COLESVILLE RD.
SLIGO CREEK PKWY
I-495
EAST CAPITAL
BELTWAY
POWDER MILL RD.
MONTGOMERY PRINCE GEORGE'S
Bus Stop
1/4 Mile Walking Distance From Nearest Bus Stop
Master Plan Boundary
0 1000 4000 FT

Roadway Objective

Provide an inter-connected network or roadways that allows safe and efficient movement or local and through traffic.

Recommendations:

US 29 (Columbia Pike)

US 29 is the major north-south transportation facility in the eastern part of the County. In Eastern Montgomery County it is a major conduit to the Capital Beltway (1-495) and Washington, D.C. US 29 parallels 1-95 in Prince George's County and connects Fairland south to White Oak, Silver Spring, 1-495 (Capital Beltway), and the District of Columbia, and north to Howard County. US 29 is part of the National Highway System (NHS).

Most intersections along US 29 are forecast to continue to experience high levels of congestion. The State Highway Administration (SHA) has proposed a series of intersection improvements on US 29 between University Boulevard (MD 193) and the County line. There will not be sufficient funding to construct all improvements at once. Certain improvements will be more urgently needed or more effective than others. It is important to develop an incremental approach that will maximize the benefit from public investment. One way to ensure this is through monitoring the effects of each improvement on traffic patterns, particularly downstream and upstream of each improvement.

Analysis shows that some of the proposed grade-separation improvements will somewhat relieve congestion on US 29 as well as on parallel and east-west roads and will also aid in providing safe pedestrian crossings. These improvements may, however, have negative impacts downstream and upstream. It is impossible to predict accurately this complex interaction and only experience will tell.

Improvements to US 29 should provide six general purpose lanes plus acceleration and deceleration lanes, with four lanes crossing the Patuxent River to the Howard County line, and should minimize impacts south of New Hampshire Avenue where grade separations may not be feasible. Grade separations north of New Hampshire Avenue are also intended to improve east-west crossings for vehicles and provide the communities, particularly pedestrians and bicyclists, better access to public facilities and commercial centers located on both sides of US 29.

The following recommendations for grade separations make two assumptions: that congestion will continue to exist south of New Hampshire Avenue and that already planned improvements will be constructed.

- Add grade-separated interchanges to the *Master Plan of Highways* with the following construction priority:
    - MD 198/Dustin Road Briggs Chaney Road Randolph Road
    - Tech Road/Industrial Parkway Stewart Lane
    - Musgrove Road/Fairland Road
    - Blackburn Road/Greencastle Road
- Monitor the net effects of completing each grade-separation for adverse impacts on upstream and downstream intersections as well as for east-west circulation as compared to the expected operational improvements. Monitoring may change the priorities, the cost effectiveness of the improvements, or whether other grade-separations should be constructed at all.
- Reserve right-of-way through this master planning process for all improvements to provide the greatest flexibility for future roadway and transit needs.
- Evaluate bus service to see if it alleviates some of the predicted congestion.
- Include bikeways and sidewalks in the design of all bridges over US 29.

8.0 White Oak Science Gateway Master Plan (2014)

Vision

Reimagining existing centers – and providing a framework for reinvestment - is vital to this community's longevity. This Plan seeks to leverage White Oak's assets and establish the foundation upon which the area can evolve into a community that offers more opportunities to live-work-play locally.

One of this area's greatest strengths is the consolidated headquarters of the Food and Drug Administration (FDA) at the White Oak Federal Research Center (FRC). FDA brings thousands of employees and visitors to its state-of-the art campus, presenting synergistic opportunities to reimagine and rethink the possibilities for surrounding communities. FDA could serve as a gateway to attract companies that offer high quality employment in fields such as health care, pharmaceuticals, life sciences, and advanced technology.

The Plan envisions White Oak's major centers – Hillandale, White Oak, and Life Sciences/FDA Village evolving from conventional, auto-dependent suburban shopping centers, business

parks, and light industrial areas into vibrant, mixed-use, transit-served nodes. Redevelopment of the centers must be carefully integrated with existing residential neighborhoods and designed to enhance the entire area's quality of life, appearance, walkability, and sense of place. Existing residential neighborhoods will be maintained and enhanced within a physical environment that meets the community's needs and aspirations.

This Plan provides a blueprint to connect White Oak's centers to each other and the broader region through a transit system that includes Bus Rapid Transit as an integral component. An enhanced open space, trail, and bikeway network that incorporates the area's natural environmental features will provide opportunities for a range of outdoor experiences.

Land Use Supported by Transit

A Bus Rapid Transit system is essential to achieve the vision of this Master Plan. Improving transit service within existing corridors is intended to reduce congestion and reliance on automobiles while improving transportation capacity and meeting demands for existing and future land uses. The 2013 Countywide Transit Corridors Functional Master Plan identifies the corridors and right-of-way requirements for a Bus Rapid Transit (BRT) system.

Figure 1 Overall Illustrative

Proposed BRT corridors in the WOSG Plan area include US 29, New Hampshire Avenue, and Randolph/Cherry Hill Road. This Plan's goal is for future growth to be supported by a BRT system that will serve the local area while connecting it to major destinations and to the existing and proposed transit services in the region. A BRT system with proposed stations at the

Plan's centers could help spur reinvestment and redevelopment, as well as support new growth, by providing a more efficient transit alternative in an area that has been stymied due to a lack of road capacity and underserved by high quality transit. The urban design framework combines the BRT system with the locations of the existing commercial centers to promote development within areas centered on future transit nodes.

The US 29 BRT corridor extends from the Silver Spring Transit Center to Burtonsville. The New Hampshire Avenue corridor extends from the Colesville Park and Ride Lot to the Fort Totten Metrorail Station. This Plan recommends a transit station at the White Oak Center that could serve as a transfer hub between the BRT routes on US 29 and New Hampshire Avenue. Along New Hampshire Avenue, the Plan recommends BRT stations at FDA's main entrance and at Hillandale. The BRT corridor along Randolph Road and Cherry Hill Road would connect White Oak with Glenmont and White Flint/Rockville Pike. In addition, enhanced local bus service, perhaps a circulator bus loop, is expected to link the communities of White Oak to the BRT stations to better serve the entire area.

Transportation

The White Oak area is near a number of major, regional roadways that serve both regional and local traffic. Interstate 95 parallels US 29 two and a half miles to the east in Prince George's County. I-495 forms the southern boundary of the Plan area, with an interchange at New Hampshire Avenue. The 18-mile Intercounty Connector (MD 200) runs east-west between I-95 and I-270 with access via full interchanges on US 29 and New Hampshire Avenue and a partial interchange at Briggs Chaney Road (entrance only for westbound traffic).

In the Plan area, two major highways – US 29 and New Hampshire Avenue – intersect at an interchange and connect the communities of White Oak to each other and to the surrounding region. US 29, the major north-south transportation facility in the eastern County, extends 26 miles from the Maryland/Washington, D.C. line to Howard County. New Hampshire Avenue, which originates in Washington, D.C., traverses Prince George's County before it crosses into Montgomery County where it extends about 25 miles from the County line to MD 108. US 29 is the most critical roadway for this Plan due to its potential impacts on development and the area's future.

Transportation problems, and attempts to solve or relieve traffic congestion, have characterized the eastern County for 30 years. The 1981 Master Plan for Eastern Montgomery County Planning Area devised a concept called "transit serviceability" that was deemed problematic and no longer appropriate by the 1997 Master Plans. In 1986, the County imposed

a development moratorium in the eastern County through the Adequate Public Facilities Ordinance. In 1990, the County Council adopted a Trip Reduction Amendment to the 1989 Plan. Development has continued to the north in Howard County, increasing regional travel demand and traffic volumes in the US 29 corridor.

Like many suburban locales, the White Oak area has limited options for new vehicular connections. This area is particularly constrained by existing development, ownership patterns, the large federal property, and environmental resources. These physical constraints limit opportunities to improve circulation and connectivity, which forces all local traffic onto the major highways. The federal government will not allow public access through the Federal Research Center, which could otherwise provide a local connection between New Hampshire Avenue and Cherry Hill Road.

The transportation network serving this area will require high quality transit improvements as well as additional road infrastructure to support the potential development envisioned by this Plan. The Plan recommends major infrastructure projects, including a Bus Rapid Transit network.

Transportation Standards

This Plan recommends that in light of the County's economic objectives and its ownership interest in the Life Sciences property, the Plan area be considered an economic opportunity center, similar in form and function to areas around a Metro Station or a central business district with an ultimately urban character, and that the roadway and transit adequacy standards used in the Subdivision Staging Policy for areas that are currently designated as Urban be applied to the Plan area. Currently the Urban roadway standard is a minimum 40 percent ratio of forecast speed to uncongested speed (the borderline between Levels of Service "D" and "E") averaged over all arterials and roads of higher classifications.

This Plan recommends the Local Area Transportation Review (LATR) standard be raised from 1475 critical lane volume (CLV) to 1600 CLV (1.00 volume/capacity) within the Plan area. The rationale for a 1600 CLV (1.00 volume/capacity) standard stems from the Plan-recommended BRT network that would serve the area and offer a viable alternative to automobile travel. This is consistent with the County's policy of accepting greater levels of roadway congestion in areas where high quality transit options are available.

The full complement of the un-programmed improvements assumed in support of the intersection analysis includes:

- BRT Network
- Old Columbia Pike Bridge opened to vehicular traffic
- Planned US 29 grade-separated interchanges
- New local roads proposed in the Life Sciences/FDA Village Center
- Intersection geometric improvements

This Plan includes the following intersection improvements:

- Cherry Hill Road at Broadbirch Drive/Calverton Boulevard: on Broadbirch Drive, add an eastbound left-turn lane and an eastbound through lane; on Calverton Boulevard, change the westbound right-turn lane to a westbound right-turn and through lane; and on Cherry Hill Road, add a northbound left-turn lane and a southbound right-turn lane.
- MD 650 at Powder Mill Road: from Holly Hall, add an eastbound left-turn lane; on Powder Mill Road, add a westbound right-turn lane; and on MD 650, add a southbound left-turn lane.
- MD 650 at Lockwood Drive: on Lockwood Drive, add an eastbound left-turn lane.
- Powder Mill Road at Riggs Road: on Powder Mill Road, add a second eastbound left-turn lane.
- Old Columbia Pike at Musgrove Road: on Old Columbia Pike, add a southbound left-turn lane; and on Musgrove Road, add a westbound right-turn lane.

These specific improvements are a guide to right-of-way reservations at these intersections. The need for each intersection improvement will be revisited as part of specific development plan LATR reviews.

Transit Network

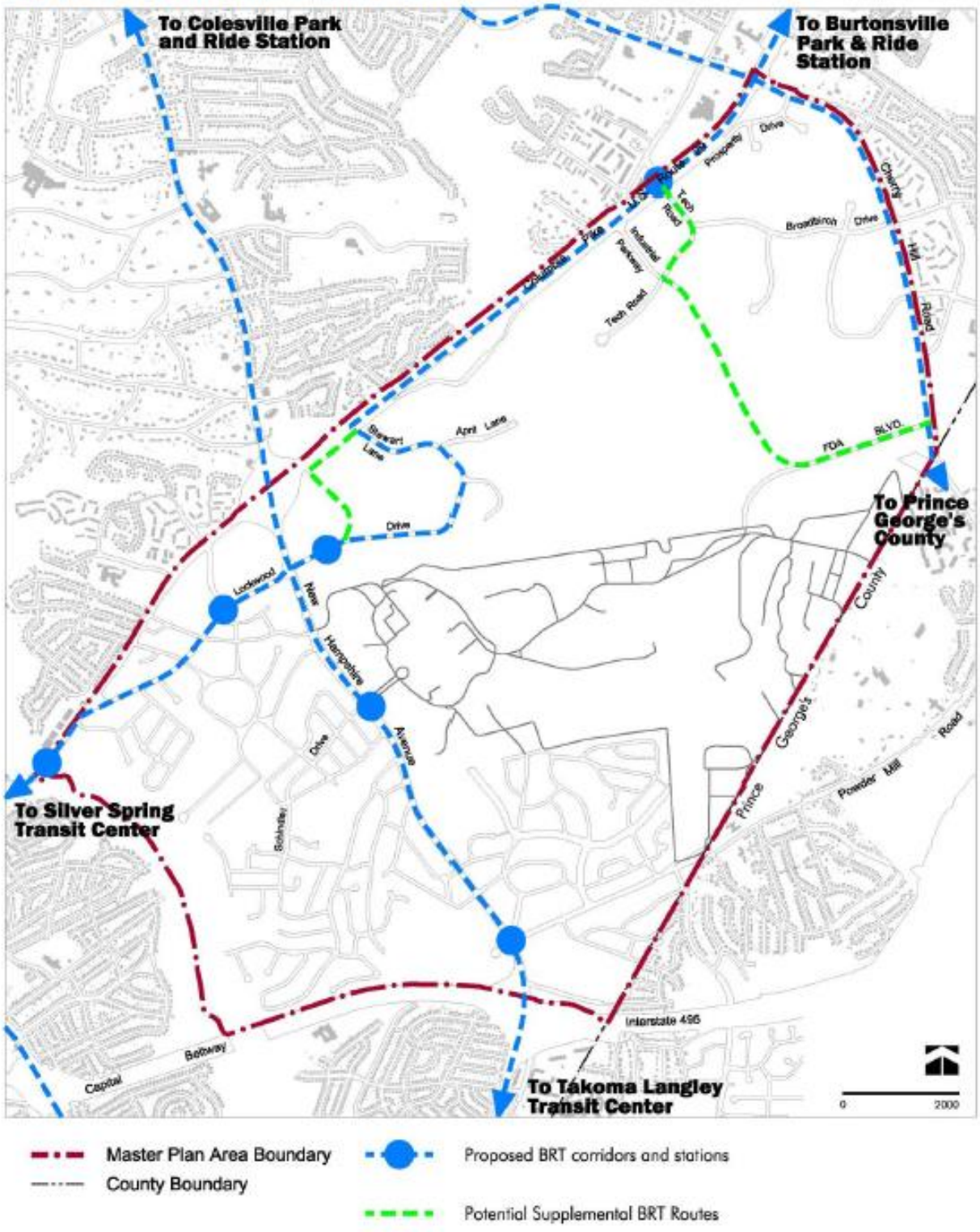
The Plan relies on an efficient and attractive transit network to achieve the vision of transforming this area into a vibrant mixed-use center. The type and level of growth needed to achieve this vision cannot be supported by road improvements alone; there must be a robust transit network that connects the area to the rest of the eastern County and the region's transit and highways.

The overall BRT network to serve the Plan area generally is described in the Countywide Transit Corridors Functional Master Plan. That network consists of the following corridors:

- US 29
- New Hampshire Avenue
- Randolph Road

This Plan includes an extension of the Randolph Road BRT from its current planned terminus at US 29/Randolph Road east along Cherry Hill Road to FDA Boulevard, with the potential to extend further into Prince George's County. It also includes a spur off of the mainline US 29 BRT route into Life Sciences/FDA Village via Tech Road/Industrial Parkway. In both cases, BRT would run in mixed traffic with no dedicated lanes, no added transit lanes, and no widening beyond the otherwise planned right-of-way. One or more stations should be planned for Life Sciences/FDA Village.

Map 13 Bus Rapid Transit Conceptual Alignments



Travel Demand Management

This Plan recommends a 25 percent Non-Auto Driver Mode Share (NADMS) goal for all new development, residential and commercial, in the White Oak Center and Hillandale Center of the Plan area based on the area's future transit service (assuming BRT) and connectivity opportunities.

This Plan recommends a 30 percent NADMS for all new development, residential and commercial, in the Life Sciences/FDA Village Center of the Plan area based on the area's future transit service and connectivity opportunities.

Mode Share Goals

Non-Auto Driver Mode Share (NADMS) is the percent of travel to work trips via transit (bus or rail), walking, biking, or carpooling during the peak travel period of a typical weekday. Urban areas typically have a high NADMS while rural areas often have a low NADMS. High NADMS numbers typically correspond to urban areas that tend to be more walkable, are better for cyclists, and have a higher level of transit service and a mix of uses.

The location of the Plan area near the edge of the County's urban ring communities is one constraint that results in an NADMS that is below that of Bethesda and Silver Spring — areas with more development density and Metrorail stations. Proposed mode share targets for employees working in the Plan area are based on analysis of observed travel behaviors in other County activity centers with a high quality of transit service. The Plan's NADMS goal is based on a gradient of NADMS, as shown below, which is highest in the urban, down-County planning areas and lower farther from the region's urban core.

Non-Auto Driver Mode Share Goals*

Area	Master Plan Goal
Germantown	25%
WOSG Master Plan	**25-30%**
Bethesda	37%
Silver Spring	50%
White Flint	50%

*With the exception of the WOSG Master Plan Area, all NADMS goals are applicable to employees working in the respective Plan area. See discussion above for the applicability of NADMS goals in the WOSG Master Plan Area.

Based on 2010 U.S. Census data, current non-single occupant vehicle travel to jobs by employees working in the Plan area is estimated at 14 percent. Based on data derived from the County's Census Update Survey, current non-single occupant vehicle travel to work trips by residents living in the Fairland planning area is estimated at roughly 20 percent. As the Plan area becomes a more vibrant mixed-use center, one objective will be to ensure that

transit, bicycling, and walking remain viable options for future residents who also choose to work in the Plan area.

Summary Tables

The following summary tables provide limits, existing and proposed right-of-way widths, and summaries of transportation recommendations for both highway and transit improvements.

US 29 Local Master Plans Existing Recommendations

Road	From	To	BRT MP R.O.W.*	Existing R.O.W.	Existing # of Through Lanes	Local Master Plan	Local Master Plan Transit Recommendation	Local Master Plan Highway Recommendation
US 29	MD 198	Stewart Lane	200’	200’ (200’ – 360’)	6 lanes	Burtonsville Crossroads Neighborhood Plan (December 2012)	- Support a future BRT station - Pedestrian connections to the park-and-ride lot and future BRT station - Transit access improvements - Transit proximity points (connectivity)	- Conduct the planning study for MD 198 using the traffic counts from the Intercounty Connector - Complete main street improvements along MD 198 - Dual bikeway along Business 29 with bike lanes and a linear greenway along Business 29 that includes a continuous lawn panel, a sidewalk on the east side, and a shared use path along the west side north to the PEPCO right-of-way. - Clearly identified crosswalks

						Fairland Master Plan (May 1997)	- Provide residents of Fairland a safe/efficient means of facility and service use within their neighborhoods while improving regional access
							- Expand future bus service to include the current off-peak shuttle service
							- Work toward a TDM Program to encourage transportation alternatives to single-occupancy automobile, including car pooling and mass transit
							- Work toward a long-term solution for significantly improving transit along US 29 between Burtonsville at MD 198 and the Silver Spring Metro station (future Silver Spring Transit Center) based on current demand projections
							- Extend regional bus service to include connections between major activity centers along US 29 and Prince George's County
							- Improve access to local transit by providing sidewalks leading to and along roads served by transit
								- Provide six general purpose lanes as well as acceleration/deceleration lanes south of MD 198
								- Provide five lanes and acceleration/deceleration lanes between MD 198 and Dustin Road
								- Provide four lanes crossing the Patuxent River to the Howard County Line
								- Include a commuter bikeway facility
								- Minimize impacts south of New Hampshire Avenue
								- Add grade separation interchanges north of New Hampshire Ave to improve east-west crossings
								  ○ MD 198/Dustin Road
								  ○ Briggs Chaney Road
								  ○ Randolph Road
								  ○ Tech Road/Industrial Parkway
								  ○ Stewart Lane
								  ○ Musgrove Road/Fairland Road
								  ○ Blackburn Road/Greencastle Road

						White Oak Science Gateway Master Plan (October 2014)	- Integrate multi-modal transportation that features elements that may include shuttles, buses, cars and car sharing, bicycles, and extensive pedestrian sidewalks and trails so that visitors can park once and then use other forms of transportation - Add structured parking that is located at the back of lots or lined with residential or office uses to enhance the pedestrian quality of the entire community	- Old Columbia Pike bridge over Paint Branch – rebuild and open to vehicular traffic - Grade-separated interchange at US 29 and Stewart Lane - Grade-separated interchange at US 29 and Industrial Parkway/Tech Road

Stewart Lane	US 29	Lockwood Dr.	80’	80’ (70’ – 80’)	2 lanes	White Oak Master Plan (March 1997)	- Recommends safe and attractive transportation improvements that enhance local circulation and convenience for all modes of travel throughout the community of White Oak
							- Improve the convenience and safety of all modes of travel
								- US 29 and Stewart Lane
								  ○ Add grade separation interchange that involves less ROW acquisition on the north and south sides of US 29
								- US 29 and New Hampshire Avenue
								  ○ Widen New Hampshire Avenue from four lanes to six lanes at the

Lockwood Dr.	Stewart Lane	New Hampshire Ave.	80’	80’ (70’ – 100’)	2 lanes			

Road	From	To	BRT MP R.O.W.*	Existing R.O.W.	Existing # of Through Lanes	Local Master Plan	Local Master Plan Transit Recommendation	Local Master Plan Highway Recommendation
Lockwood Dr.	New Hampshire Ave.	US 29	80’	80’ (60’ – 100’)	2 lanes		within White Oak and should enhance, not disrupt, neighborhood character - Investigate feasibility of transit center in the White Oak Shopping Center - Substantial improvement to transit should be provided between Burtonsville at MD 198 and Silver Spring Metro Station	US 29 interchange ○ Reconstruct existing off-ramp in northeast quadrant of the interchange to shift closer to interchange - Sidewalk improvements
US 29	Stewart Lane	Lockwood Dr.	122’	110’ (100’ – 300’)	6 lanes	White Oak Science Gateway Master Plan (October 2014)	- Integrate multi-modal transportation that features elements that may include shuttles, buses, cars and car sharing, bicycles, and extensive pedestrian sidewalks and trails so that visitors can park once and then use other forms of transportation - Add structured parking that is located at the back of lots or lined with residential or office uses to enhance the pedestrian quality of the entire community	- Reconstructed interchange at US 29 and New Hampshire Avenue to provide three continuous southbound lanes through the interchange
US 29	Lockwood Dr.	Southwood Ave.	122’	100’ (85’ – 115’)	6 lanes	Four Corners Master Plan (December 1996)	- Improve the ease and safety of movement by car, foot, transit, bicycle, or a combination of travel modes - Work toward long-term solution for significantly improving transit along US 29 - Encourage transit use to move people through Four Corners providing high quality/efficient public transportation - Examine bus transfer center ○ Four Comers ○ WB/EB lanes on University Boulevard ○ West of Colesville Rd. - Minimize the impact on existing businesses in any potential redesign	- Colesville Rd. and Silgo Creek Pkwy ○ Add a WB right-turn lane to Sligo Creek Pkwy - Colesville Rd. and Franklin Ave. ○ Prohibit left turn lanes from southbound Colesville Rd. onto Franklin Ave. during peak periods ○ DPWT should ensure signal timing is adequate for pedestrians to cross Colesville Rd. - Monitor net effects of completing each grade-separation for adverse impacts upstream and downstream intersections as well as east-west circulation - Include bikeways and sidewalks in the design of all bridges over US 29
US 29	Southwood Ave.	Sligo Creek Pkwy.	120’	105’ (100’ – 140’)	6 – 8 lanes			

Road	From	To	BRT MP R.O.W.*	Existing R.O.W.	Existing # of Through Lanes	Local Master Plan	Local Master Plan Transit Recommendation	Local Master Plan Highway Recommendation

US 29	Sligo Creek Pkwy.	Fenton St.	120’	85’ (75’ – 105’)	6 lanes (w/ reversible lanes)	North and West Silver Spring Master Plan (August 2000)	- Implement the Georgetown Branch Transitway between Silver Spring and Bethesda
							- Improve transit accessibility and reliability along Georgia Ave. and Colesville Rd.
							- Enhance pedestrian access to shopping areas, transit, and community facilities by improving pedestrian safety and providing wide, tree-lined sidewalks throughout the area
								- Accommodate local and regional traffic and provide safe pedestrian access
								- Improve and expand the inter-connected system of bikeways and trails in Silver Spring and beyond
								- Protect the residential neighborhoods from commercial and through traffic
								- Extension of the reversible lane on Colesville Rd. to I-495
								- Colesville Rd. and Dale Dr.
								  ○ Add a separate right-turn lane on WB Dale Dr.
								  ○ Widening of pavement required
								- Sligo Creek Pkwy and Colesville Rd.
								  ○ Re-strip westbound approach to Colesville Road for separate left-turn lane, thru lane, and thru/right-turn lane.
								  ○ Some widening of the pavement on Sligo Creek Parkway will be required on both sides of Colesville Rd.
								- Consider alternative designs for the intersection of Georgia Avenue and 16th Street when the State Highway Administration (SHA) studies the Georgia Avenue corridor.
								- Implement major vehicular and pedestrian improvements, particularly for the Montgomery Hills area

						Silver Spring CBD Sector Plan (March 2001)	- Include a street-front retail component facing a tree-lined Colesville Road promenade for the convenience of transit riders and other CBD users - Improve accessibility to transit and bikeways via sidewalk connections, bus shelters, bike racks, and similar facilities. - Expand Silver Spring’s existing Transportation Demand Management program	- Meet revitalization goals by incorporating a relocated park, pedestrian and bike connections, and street-fronting retail in a landmark building - Asses, and where appropriate, reuse public parking facilities - Make circulation improvements to local roads and reserve rights-of-way where needed
US 29	Fenton St.	Georgia Ave.	100’	85’ (85’ – 105’)	6 lanes (w/ reversible lanes)	Silver Spring CBD Sector Plan (March 2001)	- Integrate access to all modes of mass transit (Metrorail, MARC, buses, and a future transit line to Bethesda) in one Transit Center on Colesville Road - Improve pedestrian safety and aesthetics in and around the Transit Center with wide, tree-lined paths and specially paved crosswalks - Make connections to proposed Transit Center, the Capital Crescent/Metropolitan Branch Trail, and other CBD facilities and neighborhoods - Include a street-front retail component facing a tree-lined Colesville Road promenade for the convenience of transit riders and other CBD users - Improve accessibility to transit and bikeways via sidewalk connections, bus shelters, bike racks, and similar facilities. - Expand Silver Spring’s existing Transportation Demand Management program	- Meet revitalization goals by incorporating a relocated park, pedestrian and bike connections, and street-fronting retail in a landmark building - Asses, and where appropriate, reuse public parking facilities Make circulation improvements to local roads and reserve rights-of-way where needed - Consolidate curb cuts at the triangular corner of Colesville Road and Wayne Avenue - Include direct connections to the Silver Triangle site and to the Capital Crescent/Metropolitan Branch Trail
Colesville Road	Georgia Ave.	Silver Spring Transit Center	125’	125’ (125’ – 130’)	6 lanes			

**Reflects the minimum right-of-way, and may not include land needed for spot improvements such as turn lanes and stations.*

Montgomery County
RAPID TRANSIT
US 29

PRELIMINARY PURPOSE AND NEED DOCUMENT

APPENDIX C:
ENVIRONMENTAL INVENTORY AND MAPPING

– DRAFT –
SUBJECT TO CHANGE

US 29 Bus Rapid Transit (BRT) Study
Montgomery County, MD

DRAFT

APPENDIX C

ENVIRONMENTAL INVENTORY AND MAPPING

SOCIOECONOMIC, CULTURAL RESOURCES, AND NATURAL ENVIRONMENTAL INVENTORY SUMMARY REPORT

December 2015

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1 INTRODUCTION

The Montgomery County Department of Transportation, in cooperation with the Maryland State Highway Administration (SHA), the Maryland Transit Administration (MTA), and the Federal Transit Administration (FTA), is proposing a new Bus Rapid Transit (BRT) line along US 29 between the Silver Spring Transit Center in downtown Silver Spring to the Burtonsville Park and Ride Lot, 12 miles to the north. The project is proposed to include bus rapid transit within both mixed use and dedicated travel lanes. The BRT route would predominately be located on existing roadway. However, there is the possibility that some stations could extend beyond existing impervious surfaces. SHA is in the process of developing a Purpose and Need and preliminary alternative concepts.

This report will identify the following environmental resources in proximity to the US 29 BRT corridor:

- Social characteristics
  - Population
  - Age and gender distribution
  - Racial characteristics
  - Income levels
- Environmental justice populations
  - Low income populations
  - Minority populations
- Community facilities and services
  - Education facilities
  - Emergency services
  - Religious facilities
  - Publicly owned parks and recreational facilities
  - Public transportation
  - Other notable facilities including cemeteries and community centers/services
- Indirect and cumulative effects considerations
- Existing and proposed land use
- Regional and local economic factors and resources
- Known hazardous materials in the area

2 SOCIAL CHARACTERISTICS

2.1 Study Area

The project corridor is located along the US 29 corridor in eastern Montgomery County, MD. Montgomery County is part of the Washington, DC metropolitan area, and US 29 is a north-south highway that begins in the Howard County, MD near Ellicott City and ends in Pensacola, FL. Within Maryland, it provides the westernmost north-south route between Washington D.C. and the Baltimore

area. It also links multiple communities within Montgomery County including Silver Spring, Fairland, White Oak, and Burtonsville. The lane configuration of US 29 changes from a principal arterial with traffic signals in the southern portion of the BRT corridor around Silver Spring and White Oak to a limited-access highway in the northern portion of the BRT corridor around Fairland and Burtonsville.

2.2 Regional Demographics

The following tables detail the regional population, race, age, gender, and income demographics. The 2010 Decennial Census 100 percent data was used to determine the general population and racial demographics of the project vicinity, and the 2013 American Community Survey 1-yr and 5-yr estimates were used to determine the income demographics.

According to the 2010 Census, Maryland has a population of 5,773,552, and Montgomery County is the most populated county within Maryland. Growth throughout the state and within Montgomery County had steadily increased by about 10% since 2000. However, by 2040, approximately 30% population growth is expected throughout the state, and 38% within Montgomery County. Montgomery County's population is expected to exceed 1.2 million people by 2040.

TABLE 1: REGIONAL POPULATION AND POPULATION GROWTH

	2000	2010	2040	% Change 2000-2010	% Change 2010-2040
Maryland	5,296,486	5,773,552	6,889,700*	9%	30%
Montgomery County	873,341	971,777	1,206,800*	11%	38%
*MDP, Maryland State Data Center, July 2014					

According to the 2010 Census, the racial distribution of state population is 55% White, 29% Black or African-American, and 8% of another race or multi-racial. The state also has an 8% of its population that identify themselves as Hispanic or Latino origin, which can be of any race. Montgomery County has a lower percentage of both White and Black population, and higher percentages of Asian and Hispanic or Latino populations.

TABLE 2: REGIONAL RACIAL DISTRIBUTION

	Population	White	Black or African American	American Indian & Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
Maryland	5,773,552	55%	29%	0%	6%	0%	0%	2%	8%
Montgomery County	971,777	49%	17%	0%	14%	0%	0%	3%	17%

The gender distribution of both the state of Maryland and Montgomery County consists of 52% females and 48% males. Similarly, the age distribution of the state and the county mirror each other, with 26%

of the population under the age of 18 years, 12% over the age of 65 years, and about 52% between the ages of 18 and 64 years.

TABLE 3: REGIONAL AGE AND GENDER DISTRIBUTION

	Under 18 years	18-39 years	40-64 years	65 years and over	Male	Female
Maryland	26%	26%	35%	12%	48%	52%
Montgomery County	26%	26%	36%	12%	48%	52%

Based on the 2010 decennial Census, as well as more recent American Community Surveys, Maryland has the highest median household income in the country. The most recent 5-yr estimate is $72,483. Montgomery County is the second wealthiest county within the state, with a median household income of $98,326. The percentage of the population living below poverty for the state and the county are 10% and 7% respectively.

TABLE 4: REGIONAL INCOME DEMOGRAPHICS

	Median Household Income	% Population Living Below Poverty
Maryland	$72,483	10%
Montgomery County	$98,326	7%

2.3 Study Area Demographics

The following tables detail the population, race, age, gender, and income demographics of the study area and of the Census-designated Block Groups in the vicinity of the project corridor. There are thirty-one U.S. Census Bureau-delineated Census Tracts in the vicinity of the project corridor; ninety-nine Census-delineated Block Groups comprise the thirty-one Census Tracts (see **Figure 1**). As reported in the 2010 Census, the population of this study area was approaching 150,000. The racial distribution of the study area is notably different than that of the whole county. The White population of the study area is 38%, and the Black population is 33%, which is almost double that of the county. Within the study area, the racial distribution varies throughout the corridor. The Block Groups with the highest White population tend to be south of New Hampshire Avenue (MD 650) towards Downtown Silver Spring. The Block Groups with the highest Black or African American populations are north of New Hampshire Avenue (MD 650) and east of US 29. Although the Asian and Hispanic or Latino populations comprise 11% and 15% of the study area, respectively, there are no distinct areas of concentration.

TABLE 5: REGIONAL RACIAL DISTRIBUTION

Geography		Population	White	Black or African American	American Indian & Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
Study Area		146,422	38%	33%	0%	11%	0%	0%	3%	15%
Census Tract 7014.08	Block Group 1	1,744	59%	14%	0%	11%	0%	0%	3%	12%
	Block Group 2	1,461	34%	27%	0%	29%	0%	0%	3%	6%
	Block Group 3	1,214	58%	10%	1%	12%	0%	1%	4%	14%

TABLE 5: REGIONAL RACIAL DISTRIBUTION

Geography		Population	White	Black or African American	American Indian & Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
	Block Group 4	1,882	56%	18%	0%	12%	0%	1%	3%	10%
Census Tract 7014.09	Block Group 1	1,108	64%	15%	0%	13%	0%	0%	3%	5%
	Block Group 2	2,015	38%	22%	0%	29%	0%	1%	3%	7%
	Block Group 3	1,238	49%	20%	0%	17%	0%	1%	2%	11%
Census Tract 7014.10	Block Group 1	1,627	13%	61%	1%	13%	0%	0%	3%	9%
	Block Group 2	3,354	21%	50%	0%	20%	0%	0%	3%	7%
	Block Group 3	2,587	22%	42%	0%	22%	0%	0%	3%	11%
Census Tract 7014.14	Block Group 1	2,078	37%	30%	0%	14%	0%	0%	3%	16%
	Block Group 2	1,304	36%	33%	0%	22%	0%	1%	3%	5%
	Block Group 3	1,583	24%	44%	0%	18%	0%	0%	2%	12%
	Block Group 4	2,500	13%	49%	0%	20%	0%	1%	4%	13%
Census Tract 7014.15	Block Group 1	1,023	54%	17%	0%	17%	0%	0%	3%	10%
	Block Group 2	1,589	19%	49%	0%	18%	0%	1%	4%	10%
	Block Group 3	1,461	47%	19%	0%	16%	0%	0%	2%	15%
	Block Group 4	1,015	31%	35%	0%	13%	0%	1%	3%	18%
	Block Group 5	2,411	16%	43%	0%	18%	0%	0%	3%	18%
Census Tract 7014.17	Block Group 1	926	17%	40%	0%	32%	0%	1%	3%	8%
	Block Group 2	1,288	24%	52%	0%	10%	1%	1%	3%	10%
	Block Group 3	1,506	22%	56%	0%	10%	0%	0%	4%	8%
	Block Group 4	1,876	15%	58%	0%	9%	0%	1%	3%	14%
Census Tract 7014.18	Block Group 1	3,307	22%	46%	0%	19%	0%	0%	3%	9%
Census Tract 7014.20	Block Group 1	2,974	65%	20%	0%	7%	0%	0%	1%	6%
	Block Group 2	441	92%	4%	0%	3%	0%	0%	0%	1%
	Block Group 3	2,224	26%	37%	0%	20%	0%	1%	2%	14%
	Block Group 4	1,268	30%	26%	0%	19%	0%	0%	4%	21%
Census Tract 7014.21	Block Group 1	1,347	12%	60%	0%	7%	0%	0%	3%	18%
Census Tract 7014.22	Block Group 1	1,535	5%	71%	0%	8%	0%	0%	2%	14%
	Block Group 2	1,035	3%	78%	0%	1%	0%	0%	2%	16%
Census Tract 7014.23	Block Group 1	1,274	25%	48%	1%	15%	0%	0%	3%	8%
	Block Group 2	1,701	7%	62%	0%	12%	0%	0%	2%	17%
	Block Group 3	1,639	9%	58%	0%	11%	0%	1%	3%	17%
Census Tract 7015.03	Block Group 1	1,729	37%	21%	0%	15%	0%	0%	3%	24%
	Block Group 2	1,624	27%	37%	0%	17%	0%	0%	2%	16%
	Block Group 3	1,651	37%	27%	0%	18%	0%	1%	3%	13%

TABLE 5: REGIONAL RACIAL DISTRIBUTION

Geography		Population	White	Black or African American	American Indian & Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
	Block Group 4	1,945	32%	27%	0%	16%	0%	1%	3%	21%
Census Tract 7015.05	Block Group 1	2,064	20%	56%	0%	7%	0%	0%	3%	12%
	Block Group 2	1,479	27%	33%	0%	11%	0%	0%	1%	27%
	Block Group 3	3,228	40%	32%	0%	9%	0%	1%	2%	16%
Census Tract 7015.06	Block Group 1	1,589	58%	17%	0%	11%	0%	1%	2%	10%
	Block Group 2	2,508	41%	37%	0%	8%	0%	1%	3%	11%
	Block Group 3	889	53%	17%	0%	15%	0%	0%	3%	12%
Census Tract 7015.08	Block Group 1	1,033	8%	73%	0%	4%	0%	1%	2%	12%
	Block Group 2	675	16%	57%	0%	14%	0%	0%	5%	8%
	Block Group 3	1,979	10%	60%	0%	10%	0%	0%	3%	16%
Census Tract 7015.09	Block Group 1	1,365	48%	19%	0%	12%	0%	0%	2%	19%
	Block Group 2	1,318	7%	51%	0%	7%	0%	0%	2%	32%
	Block Group 3	1,444	9%	51%	0%	9%	0%	0%	2%	29%
	Block Group 4	2,142	4%	51%	0%	7%	0%	1%	1%	37%
Census Tract 7021.02	Block Group 1	1,188	68%	11%	0%	6%	0%	1%	3%	12%
	Block Group 2	1,036	81%	6%	0%	3%	0%	1%	3%	6%
	Block Group 3	973	84%	4%	0%	3%	0%	0%	2%	6%
Census Tract 7022	Block Group 1	1,790	35%	16%	0%	8%	0%	0%	3%	37%
	Block Group 2	789	80%	6%	0%	5%	0%	1%	1%	8%
	Block Group 3	1,037	72%	8%	0%	5%	0%	1%	3%	13%
	Block Group 4	722	72%	7%	0%	6%	0%	0%	4%	11%
Census Tract 7023.01	Block Group 1	2,041	29%	40%	0%	6%	0%	1%	2%	22%
	Block Group 2	1,679	13%	19%	0%	5%	0%	0%	1%	61%
Census Tract 7023.02	Block Group 1	1,217	33%	37%	0%	5%	0%	1%	3%	21%
	Block Group 2	985	75%	9%	0%	3%	0%	0%	4%	9%
	Block Group 3	1,824	38%	33%	0%	2%	0%	0%	3%	24%
Census Tract 7024.01	Block Group 1	879	69%	10%	0%	7%	0%	0%	4%	10%
	Block Group 2	1,637	57%	23%	0%	4%	0%	0%	3%	12%
Census Tract 7024.02	Block Group 1	1,340	38%	41%	0%	4%	0%	0%	2%	14%
	Block Group 2	914	48%	26%	0%	8%	0%	1%	4%	14%
	Block Group 3	2,252	36%	40%	0%	7%	0%	0%	3%	14%
Census Tract 7025	Block Group 1	1,162	25%	51%	0%	5%	0%	0%	2%	15%
	Block Group 2	752	39%	33%	0%	12%	0%	1%	3%	12%
	Block Group 3	908	31%	45%	0%	8%	0%	1%	5%	9%
	Block Group 4	2,165	41%	37%	0%	8%	0%	0%	3%	10%

TABLE 5: REGIONAL RACIAL DISTRIBUTION

Geography		Population	White	Black or African American	American Indian & Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
Census Tract 7026.01	Block Group 1	561	35%	42%	0%	11%	0%	1%	3%	7%
	Block Group 2	1,154	50%	31%	0%	7%	0%	0%	4%	8%
	Block Group 3	620	45%	32%	0%	8%	0%	0%	3%	11%
	Block Group 4	1,596	49%	27%	0%	11%	0%	0%	4%	9%
Census Tract 7026.02	Block Group 1	1,312	61%	19%	0%	5%	0%	0%	3%	11%
	Block Group 2	3,170	36%	40%	0%	9%	0%	0%	3%	12%
Census Tract 7028	Block Group 1	1,223	63%	21%	0%	4%	0%	0%	4%	7%
	Block Group 2	1,249	39%	41%	0%	8%	0%	1%	4%	8%
	Block Group 3	994	70%	13%	0%	6%	0%	0%	3%	8%
	Block Group 4	1,154	62%	15%	0%	6%	0%	0%	2%	15%
Census Tract 7029	Block Group 1	817	80%	6%	0%	3%	0%	1%	2%	8%
	Block Group 2	1,503	69%	14%	0%	4%	0%	0%	2%	10%
	Block Group 3	1,053	64%	18%	0%	8%	0%	0%	2%	7%
	Block Group 4	1,226	55%	24%	0%	9%	0%	0%	3%	8%
	Block Group 5	593	82%	7%	0%	3%	0%	0%	3%	5%
Census Tract 7030	Block Group 1	778	61%	13%	0%	5%	0%	1%	2%	18%
	Block Group 2	977	68%	9%	0%	8%	0%	0%	5%	9%
Census Tract 7031	Block Group 1	1,310	36%	14%	0%	15%	0%	0%	2%	32%
	Block Group 2	794	53%	7%	0%	5%	0%	1%	3%	31%
	Block Group 3	1,379	54%	11%	0%	5%	0%	1%	3%	28%
	Block Group 4	889	53%	16%	0%	6%	0%	0%	2%	23%
Census Tract 7032.08	Block Group 1	1,253	80%	7%	0%	5%	0%	0%	2%	5%
	Block Group 2	980	86%	7%	0%	2%	0%	0%	0%	4%
	Block Group 3	1,756	53%	18%	0%	9%	0%	1%	2%	17%
	Block Group 4	1,312	52%	22%	0%	7%	0%	0%	4%	15%
Census Tract 7032.10	Block Group 1	2,158	39%	20%	0%	12%	0%	0%	2%	26%
	Block Group 2	1,124	45%	15%	0%	10%	0%	0%	2%	28%

The gender distribution within the study area is 47% Male and 53% Female. Two of the Block Groups (1 and 2) that comprise Census Tract 7014.20 are the only Block Groups within the study area that are not within a normal gender distribution, which tends to be relatively close to 50/50. The age distribution within the study area are similar to that of Montgomery County as a whole, except there are about 3% less of the population under 18 years. Census Tract 7014.20 contains an elderly community; Block Groups 1 and 2 have the majority of the population over 65 years. Also, multiple Block Groups within

downtown Silver Spring have a lower population of under 18 years and a higher population of 18-64 years.

TABLE 6: STUDY AREA AGE AND GENDER DISTRIBUTION

Geography		Total Pop	Male	Female	Under 18	18-39 Years	40-64 Years	Over >64
Study Area		146,422	47%	53%	23%	32%	34%	12%
Census Tract 7014.08	Block Group 1	1,744	49%	51%	23%	21%	40%	16%
	Block Group 2	1,461	50%	50%	24%	21%	44%	11%
	Block Group 3	1,214	51%	49%	26%	20%	41%	12%
	Block Group 4	1,882	50%	50%	21%	22%	40%	17%
Census Tract 7014.09	Block Group 1	1,108	50%	50%	21%	20%	45%	14%
	Block Group 2	2,015	49%	51%	23%	19%	45%	13%
	Block Group 3	1,238	46%	54%	21%	20%	38%	20%
Census Tract 7014.10	Block Group 1	1,627	46%	54%	29%	33%	35%	4%
	Block Group 2	3,354	46%	54%	29%	30%	36%	5%
	Block Group 3	2,587	47%	53%	27%	30%	38%	6%
Census Tract 7014.14	Block Group 1	2,078	47%	53%	25%	24%	38%	14%
	Block Group 2	1,304	48%	52%	21%	23%	40%	16%
	Block Group 3	1,583	45%	55%	25%	24%	35%	16%
	Block Group 4	2,500	47%	53%	28%	33%	32%	8%
Census Tract 7014.15	Block Group 1	1,023	48%	52%	23%	19%	41%	17%
	Block Group 2	1,589	48%	52%	20%	24%	37%	19%
	Block Group 3	1,461	47%	53%	21%	25%	42%	12%
	Block Group 4	1,015	50%	50%	21%	23%	35%	20%
	Block Group 5	2,411	47%	53%	28%	30%	36%	6%
Census Tract 7014.17	Block Group 1	926	48%	52%	26%	36%	33%	5%
	Block Group 2	1,288	46%	54%	15%	58%	24%	3%
	Block Group 3	1,506	41%	59%	18%	52%	26%	3%
	Block Group 4	1,876	44%	56%	27%	38%	31%	5%
Census Tract 7014.18	Block Group 1	3,307	46%	54%	28%	28%	37%	7%
Census Tract 7014.20	Block Group 1	2,974	38%	62%	9%	11%	13%	67%
	Block Group 2	441	33%	67%	0%	0%	1%	99%
	Block Group 3	2,224	46%	54%	22%	23%	37%	17%
	Block Group 4	1,268	50%	50%	25%	25%	35%	16%
Census Tract 7014.21	Block Group 1	1,347	46%	54%	24%	34%	34%	8%
Census Tract 7014.22	Block Group 1	1,535	44%	56%	29%	45%	24%	1%
	Block Group 2	1,035	45%	55%	30%	42%	26%	2%
Census Tract	Block Group 1	1,274	46%	54%	27%	30%	39%	5%

TABLE 6: STUDY AREA AGE AND GENDER DISTRIBUTION

Geography		Total Pop	Male	Female	Under 18	18-39 Years	40-64 Years	Over >64
7014.23	Block Group 2	1,701	44%	56%	29%	36%	31%	4%
	Block Group 3	1,639	46%	54%	33%	37%	27%	3%
Census Tract 7015.03	Block Group 1	1,729	50%	50%	24%	24%	35%	18%
	Block Group 2	1,624	46%	54%	22%	23%	36%	19%
	Block Group 3	1,651	49%	51%	20%	24%	39%	17%
	Block Group 4	1,945	48%	52%	23%	26%	37%	14%
Census Tract 7015.05	Block Group 1	2,064	48%	52%	20%	53%	22%	5%
	Block Group 2	1,479	48%	52%	22%	29%	37%	12%
	Block Group 3	3,228	47%	53%	24%	23%	35%	17%
Census Tract 7015.06	Block Group 1	1,589	51%	49%	21%	18%	40%	21%
	Block Group 2	2,508	47%	53%	25%	25%	40%	10%
	Block Group 3	889	50%	50%	19%	21%	40%	20%
Census Tract 7015.08	Block Group 1	1,033	47%	53%	27%	41%	27%	5%
	Block Group 2	675	46%	54%	21%	43%	33%	2%
	Block Group 3	1,979	45%	55%	28%	39%	29%	4%
Census Tract 7015.09	Block Group 1	1,365	50%	50%	22%	21%	40%	17%
	Block Group 2	1,318	44%	56%	30%	41%	25%	4%
	Block Group 3	1,444	46%	54%	27%	36%	30%	7%
	Block Group 4	2,142	47%	53%	31%	38%	27%	4%
Census Tract 7021.02	Block Group 1	1,188	48%	52%	26%	29%	35%	10%
	Block Group 2	1,036	48%	52%	32%	21%	38%	9%
	Block Group 3	973	48%	52%	31%	21%	38%	10%
Census Tract 7022	Block Group 1	1,790	49%	51%	27%	32%	34%	8%
	Block Group 2	789	51%	49%	27%	24%	40%	9%
	Block Group 3	1,037	48%	52%	26%	22%	43%	9%
	Block Group 4	722	47%	53%	26%	20%	44%	10%
Census Tract 7023.01	Block Group 1	2,041	47%	53%	20%	41%	33%	7%
	Block Group 2	1,679	57%	43%	26%	48%	22%	5%
Census Tract 7023.02	Block Group 1	1,217	48%	52%	24%	36%	34%	6%
	Block Group 2	985	48%	52%	26%	21%	42%	11%
	Block Group 3	1,824	49%	51%	23%	33%	34%	10%
Census Tract 7024.01	Block Group 1	879	48%	52%	24%	25%	40%	11%
	Block Group 2	1,637	48%	52%	21%	28%	41%	10%
Census Tract 7024.02	Block Group 1	1,340	48%	52%	24%	35%	35%	6%
	Block Group 2	914	48%	52%	10%	53%	30%	7%
	Block Group 3	2,252	47%	53%	22%	35%	36%	7%

TABLE 6: STUDY AREA AGE AND GENDER DISTRIBUTION

Geography		Total Pop	Male	Female	Under 18	18-39 Years	40-64 Years	Over >64
Census Tract 7025	Block Group 1	1,162	47%	53%	12%	53%	28%	7%
	Block Group 2	752	50%	50%	9%	57%	29%	6%
	Block Group 3	908	40%	60%	5%	33%	27%	35%
	Block Group 4	2,165	48%	52%	11%	61%	25%	3%
Census Tract 7026.01	Block Group 1	561	40%	60%	6%	60%	21%	14%
	Block Group 2	1,154	46%	54%	9%	62%	25%	5%
	Block Group 3	620	48%	52%	7%	64%	26%	3%
	Block Group 4	1,596	42%	58%	10%	62%	21%	7%
Census Tract 7026.02	Block Group 1	1,312	42%	58%	11%	45%	34%	11%
	Block Group 2	3,170	47%	53%	14%	64%	18%	4%
Census Tract 7028	Block Group 1	1,223	45%	55%	19%	28%	42%	11%
	Block Group 2	1,249	44%	56%	7%	64%	23%	6%
	Block Group 3	994	49%	51%	23%	20%	43%	14%
	Block Group 4	1,154	49%	51%	23%	27%	38%	12%
Census Tract 7029	Block Group 1	817	49%	51%	26%	15%	43%	15%
	Block Group 2	1,503	49%	51%	25%	19%	43%	14%
	Block Group 3	1,053	48%	52%	18%	27%	41%	14%
	Block Group 4	1,226	44%	56%	17%	31%	34%	18%
	Block Group 5	593	53%	47%	21%	17%	50%	12%
Census Tract 7030	Block Group 1	778	48%	52%	24%	29%	38%	10%
	Block Group 2	977	48%	52%	24%	27%	40%	9%
Census Tract 7031	Block Group 1	1,310	49%	51%	25%	29%	34%	13%
	Block Group 2	794	48%	52%	24%	30%	36%	10%
	Block Group 3	1,379	48%	52%	25%	29%	34%	12%
	Block Group 4	889	46%	54%	19%	23%	36%	21%
Census Tract 7032.08	Block Group 1	1,253	48%	52%	29%	18%	36%	17%
	Block Group 2	980	48%	52%	29%	16%	36%	19%
	Block Group 3	1,756	47%	53%	23%	21%	33%	23%
	Block Group 4	1,312	49%	51%	26%	23%	35%	16%
Census Tract 7032.10	Block Group 1	2,158	48%	52%	25%	26%	34%	15%
	Block Group 2	1,124	47%	53%	24%	29%	35%	12%

The average median household income in the study area is $95,292, which is about 3% lower than the County's median income. The percentage of the population living below poverty in the study area is 5%, which is 2% less than the County's population living below poverty. There are concentrations of the population with the highest median household incomes in the northwest portion of the study area and

the northern Silver Spring Area in the vicinity of US 29 and University Boulevard (MD 193). The areas with the lowest median household incomes are in the northeast of the study area, as well as the southern portion of the study area around downtown Silver Spring.

TABLE 7: STUDY AREA INCOME DISTRIBUTION

Geography		Median Household Income	% Below Poverty
Study Area		$95,292*	5%
Census Tract 7014.08	Block Group 1	$126,071	0%
	Block Group 2	$178,203	3%
	Block Group 3	$115,172	7%
	Block Group 4	$138,203	0%
Census Tract 7014.09	Block Group 1	$111,759	0%
	Block Group 2	$165,192	0%
	Block Group 3	$136,250	0%
Census Tract 7014.10	Block Group 1	$88,629	3%
	Block Group 2	$76,948	6%
	Block Group 3	$111,875	0%
Census Tract 7014.14	Block Group 1	$79,821	10%
	Block Group 2	$107,083	7%
	Block Group 3	$68,472	6%
	Block Group 4	$61,577	3%
Census Tract 7014.15	Block Group 1	$124,250	0%
	Block Group 2	$87,008	0%
	Block Group 3	$133,056	0%
	Block Group 4	$125,238	1%
	Block Group 5	$75,284	3%
Census Tract 7014.17	Block Group 1	$78,349	7%
	Block Group 2	$60,259	7%
	Block Group 3	$57,216	9%
	Block Group 4	$63,429	20%
Census Tract 7014.18	Block Group 1	$103,750	2%
Census Tract 7014.20	Block Group 1	$57,051	9%
	Block Group 2	$48,125	0%
	Block Group 3	$82,849	0%
	Block Group 4	$115,096	7%
Census Tract 7014.21	Block Group 1	$75,525	3%
Census Tract	Block Group 1	$40,379	35%
Census Tract 7021.02	Block Group 1	$129,167	3%
	Block Group 2	$151,750	0%
	Block Group 3	$153,281	0%
Census Tract 7022	Block Group 1	$107,875	2%
	Block Group 2	$136,563	0%
	Block Group 3	$175,363	0%
	Block Group 4	$136,125	0%
Census Tract 7023.01	Block Group 1	$65,179	19%
	Block Group 2	$47,254	11%
Census Tract 7023.02	Block Group 1	$61,902	2%
	Block Group 2	$148,194	0%
	Block Group 3	$66,490	2%
Census Tract 7024.01	Block Group 1	$119,821	7%
	Block Group 2	$113,571	2%
Census Tract 7024.02	Block Group 1	$80,125	0%
	Block Group 2	$62,000	0%
	Block Group 3	$71,625	19%
Census Tract 7025	Block Group 1	$64,551	5%
	Block Group 2	$54,926	0%
	Block Group 3	$31,495	41%
	Block Group 4	$83,125	7%
Census Tract 7026.01	Block Group 1	$55,600	0%
	Block Group 2	$62,134	0%
	Block Group 3	$70,556	0%
	Block Group 4	$71,111	0%
Census Tract 7026.02	Block Group 1	$81,103	12%
	Block Group 2	$59,071	16%
Census Tract 7028	Block Group 1	$133,000	2%
	Block Group 2	$70,533	11%
	Block Group 3	$127,386	0%
	Block Group 4	$139,219	6%

TABLE 7: STUDY AREA INCOME DISTRIBUTION

Geography		Median Household Income	% Below Poverty
7014.22	Block Group 2	$45,146	4%
Census Tract 7014.23	Block Group 1	$69,412	0%
	Block Group 2	$61,250	13%
	Block Group 3	$48,707	12%
Census Tract 7015.03	Block Group 1	$109,375	0%
	Block Group 2	$87,961	4%
	Block Group 3	$97,143	0%
	Block Group 4	$86,638	3%
Census Tract 7015.05	Block Group 1	$49,282	20%
	Block Group 2	$91,442	0%
	Block Group 3	$105,885	5%
Census Tract 7015.06	Block Group 1	$138,438	8%
	Block Group 2	$133,977	4%
	Block Group 3	$119,861	0%
Census Tract 7015.08	Block Group 1	$31,726	31%
	Block Group 2	$75,795	0%
	Block Group 3	$61,921	12%
Census Tract 7015.09	Block Group 1	$140,893	0%
	Block Group 2	$47,670	6%
	Block Group 3	$38,764	3%
	Block Group 4	$46,486	19%
Census Tract 7029	Block Group 1	$137,308	0%
	Block Group 2	$160,069	0%
	Block Group 3	$84,444	0%
	Block Group 4	$90,191	0%
	Block Group 5	$162,656	0%
Census Tract 7030	Block Group 1	$98,500	0%
	Block Group 2	$121,471	2%
Census Tract 7031	Block Group 1	$119,968	4%
	Block Group 2	$82,500	0%
	Block Group 3	$128,542	4%
	Block Group 4	$54,107	0%
Census Tract 7032.08	Block Group 1	$166,719	0%
	Block Group 2	$99,211	0%
	Block Group 3	$116,339	5%
	Block Group 4	$125,824	2%
Census Tract 7032.10	Block Group 1	$87,917	10%
	Block Group 2	$88,125	3%

* average of the median household incomes for each block group

3 ENVIRONMENTAL JUSTICE

Executive Order 12898 directs federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. The Environmental Justice considerations in proximity of the project corridor were assessed in compliance with the *Environmental Justice Guidelines for Maryland State Highway Administration Projects* (2001).

U.S. Census data was used in determining potential minority or low-income populations (see **Table 8**). Consistent with SHA's guidelines, minority populations are identified as Block Groups with a meaningfully greater percentage of minorities than that of a greater geographic region. For this planning study, Block Groups with minority populations greater than or equal to that of Montgomery County are considered potential environmental justice populations. Minority populations will include persons who identify themselves as Black or African-American, Asian, American Indian/Alaskan Native, Native Hawaiian/Pacific Islander, Other, Two or More Races, or any person of Hispanic descent. Likewise, low-income populations will include Block Groups with meaningfully greater percentage of

persons living below the federal poverty level than that of a greater geographic region. For this planning study, Block Groups with the percentage of persons living below poverty greater than or equal to that of Montgomery County are considered potential environmental justice populations.

Based on the 100 percent count data from the 2010 U.S. Census, 48 of the 99 Block Groups within the project vicinity are potential minority populations. Based on the 2009-2013 U.S. Census American Community Survey Estimates, 19 of the 99 Block Groups are potentially low-income populations (see **Figure 1**). The Block Groups with potential minority populations are concentrated immediately along either side of US 29 north of New Hampshire Avenue (MD 650), as well as the southern portion of the study area near downtown Silver Spring. The Block Groups with potential low-income populations are dispersed throughout the study area with the only concentration just northeast of the US 29 and Intercounty Connector (MD 200) interchange.

TABLE 8: POTENTIAL ENVIRONMENTAL JUSTICE POPULATIONS

Geography		Minority (%)	EJ	Below Poverty (%)	EJ
Study Area		62%	--	5%	--
Census Tract 7014.08	Block Group 1	41%	NO	0%	NO
	Block Group 2	66%	YES	3%	NO
	Block Group 3	42%	NO	7%	NO
	Block Group 4	44%	NO	0%	NO
Census Tract 7014.09	Block Group 1	36%	NO	0%	NO
	Block Group 2	62%	YES	0%	NO
	Block Group 3	51%	NO	0%	NO
Census Tract 7014.10	Block Group 1	87%	YES	3%	NO
	Block Group 2	79%	YES	6%	NO
	Block Group 3	78%	YES	0%	NO
Census Tract 7014.14	Block Group 1	63%	YES	10%	YES
	Block Group 2	64%	YES	7%	NO
	Block Group 3	76%	YES	6%	NO
	Block Group 4	87%	YES	3%	NO
Census Tract 7014.15	Block Group 1	46%	NO	0%	NO
	Block Group 2	81%	YES	0%	NO
	Block Group 3	53%	NO	0%	NO
	Block Group 4	69%	YES	1%	NO
	Block Group 5	84%	YES	3%	NO
Census Tract 7014.17	Block Group 1	83%	YES	7%	NO
	Block Group 2	76%	YES	7%	NO
	Block Group 3	78%	YES	9%	YES
	Block Group 4	85%	YES	20%	YES
Census Tract 7021.02	Block Group 1	32%	NO	3%	NO
	Block Group 2	19%	NO	0%	NO
	Block Group 3	16%	NO	0%	NO
Census Tract 7022	Block Group 1	65%	YES	2%	NO
	Block Group 2	20%	NO	0%	NO
	Block Group 3	28%	NO	0%	NO
	Block Group 4	28%	NO	0%	NO
Census Tract 7023.01	Block Group 1	71%	YES	19%	YES
	Block Group 2	87%	YES	11%	YES
Census Tract 7023.02	Block Group 1	67%	YES	2%	NO
	Block Group 2	25%	NO	0%	NO
	Block Group 3	62%	YES	2%	NO
Census Tract 7024.01	Block Group 1	31%	NO	7%	NO
	Block Group 2	43%	NO	2%	NO
Census Tract 7024.02	Block Group 1	62%	YES	0%	NO
	Block Group 2	52%	NO	0%	NO
	Block Group 3	64%	YES	19%	YES
Census Tract 7025	Block Group 1	75%	YES	5%	NO
	Block Group 2	61%	NO	0%	NO
	Block Group 3	69%	YES	41%	YES
	Block Group 4	59%	NO	7%	NO
Census Tract 7026.01	Block Group 1	65%	YES	0%	NO
	Block Group 2	50%	NO	0%	NO
	Block Group 3	55%	NO	0%	NO

TABLE 8: POTENTIAL ENVIRONMENTAL JUSTICE POPULATIONS

Geography		Minority (%)	EJ	Below Poverty (%)	EJ
Census Tract 7014.18	Block Group 1	78%	YES	2%	NO
Census Tract 7014.20	Block Group 1	35%	NO	9%	YES
	Block Group 2	8%	NO	0%	NO
	Block Group 3	74%	YES	0%	NO
	Block Group 4	70%	YES	7%	NO
Census Tract 7014.21	Block Group 1	88%	YES	3%	NO
Census Tract 7014.22	Block Group 1	95%	YES	35%	YES
	Block Group 2	97%	YES	4%	NO
Census Tract 7014.23	Block Group 1	75%	YES	0%	NO
	Block Group 2	93%	YES	13%	YES
	Block Group 3	91%	YES	12%	YES
Census Tract 7015.03	Block Group 1	63%	YES	0%	NO
	Block Group 2	73%	YES	4%	NO
	Block Group 3	63%	YES	0%	NO
	Block Group 4	68%	YES	3%	NO
Census Tract 7015.05	Block Group 1	80%	YES	20%	YES
	Block Group 2	73%	YES	0%	NO
	Block Group 3	60%	NO	5%	NO
Census Tract 7015.06	Block Group 1	42%	NO	8%	NO
	Block Group 2	59%	NO	4%	NO
	Block Group 3	47%	NO	0%	NO
Census Tract 7015.08	Block Group 1	92%	YES	31%	YES
	Block Group 2	84%	YES	0%	NO
	Block Group 3	90%	YES	12%	YES
Census Tract 7015.09	Block Group 1	52%	NO	0%	NO
	Block Group 2	93%	YES	6%	NO
	Block Group 3	91%	YES	3%	NO
	Block Group 4	96%	YES	19%	YES
	Block Group 4	51%	NO	0%	NO
Census Tract 7026.02	Block Group 1	39%	NO	12%	YES
	Block Group 2	64%	YES	16%	YES
Census Tract 7028	Block Group 1	37%	NO	2%	NO
	Block Group 2	61%	NO	11%	YES
	Block Group 3	30%	NO	0%	NO
	Block Group 4	38%	NO	6%	NO
Census Tract 7029	Block Group 1	20%	NO	0%	NO
	Block Group 2	31%	NO	0%	NO
	Block Group 3	36%	NO	0%	NO
	Block Group 4	45%	NO	0%	NO
	Block Group 5	18%	NO	0%	NO
Census Tract 7030	Block Group 1	39%	NO	0%	NO
	Block Group 2	32%	NO	2%	NO
Census Tract 7031	Block Group 1	64%	YES	4%	NO
	Block Group 2	47%	NO	0%	NO
	Block Group 3	46%	NO	4%	NO
	Block Group 4	47%	NO	0%	NO
Census Tract 7032.08	Block Group 1	20%	NO	0%	NO
	Block Group 2	14%	NO	0%	NO
	Block Group 3	47%	NO	5%	NO
	Block Group 4	48%	NO	2%	NO
Census Tract 7032.10	Block Group 1	61%	NO	10%	YES
	Block Group 2	55%	NO	3%	NO

4 COMMUNITY FACILITIES AND SERVICES

There are multiple community facilities within the project vicinity, as listed on **Table 9** and shown on **Figures 2a through 2d**.

TABLE 9: COMMUNITY FACILITIES

CEMETERIES	
Union Cemetery*	3001 Spencerville Road, MD Burtonsville, MD 20866
RELIGIOUS FACILITIES	
New Dimensions King Ministries*	7612 Georgia Avenue NW, Washington DC, 20012
Northminster Presbyterian Church*	7720 Alaska Avenue NW, Washington DC, 20012
Shepherd Park Christian Church*	7900 Eastern Avenue NW, Washington DC, 20012
International Ethiopian Evangelical Church*	7930 Eastern Avenue NW, Washington, DC 20012
St. Mary's Baptist Church*	8008 Eastern Avenue NW, Washington, DC 20012
RCCG Jesus House DC	919/921 Philadelphia Ave, Silver Spring, MD 20910
Agape World Center Church International	501 Sligo Ave, Silver Spring, MD 20910
First Baptist Church of Silver Spring	8415 Fenton Street, Silver Spring, 20910
St. Luke Lutheran Church	9100 Colesville Road, Silver Spring, MD
Seventh-Day Adventist Church	8900 Colesville Road, Silver Spring, MD 20910
Iglesia Evangelica Apostoles Y Profetas	9006 Colesville Road, Silver Spring, MD
Memorial First India United Methodist Church	9226 Colesville Road, Silver Spring, MD 20910
Christ Congressional Church	9525 Colesville Road, Silver Spring, MD 20901
Silver Spring United Methodist Cooperative Parish	33 University Blvd East, Silver Spring, MD 20901
Saint Bernadette Roman Catholic Church	70 University Blvd East, Silver Spring, MD 20901
The Revelations Universal Evangelical Ministries	9902 Columbia Pike, Silver Spring, MD 20901
Knox Orthodox Presbyterian Church	410 Granville Drive, Silver Spring, MD 20901
Nichiren Shoshu Myosenji Budist Temple	310 University Blvd West, Silver Spring, MD 20901
Southeast Hebrew Congregation	10900 Lockwood Drive, Silver Spring, MD 20901
Jesus Christ is The Lord Universal Church	11120 Lockwood Drive, Silver Spring, MD 20901
Kingdom Hall of Jehovah Witnesses	815 Milestone Drive, Silver Spring, MD 20904
St. Stephen Lutheran Church	11612 New Hampshire Ave, Silver Spring, MD 20904
Our Lady of Vietnam Parish	11812 New Hampshire Ave. NE, Silver Spring, MD 20904
Burnt Mills Seventh-Day Adventist Church	10915 Lockwood Drive, Silver Spring, MD 20901
Reid Temple AME Church	12101 Tech Road, Silver Spring, MD 20904
Casa Del Alfarero Asemblea De	12050 Tech Road, Silver Spring, MD 20904
General Conference of Seventh-Day Adventists	12501 Old Columbia Pike, Silver Spring, MD 20904
Forcey Bible Church and Christian School	2130 East Randolph Road, Silver Spring, MD 20904
Southern Asian Seventh-Day Adventist Church	2001 East Randolph Road, Silver Spring, MD 20904
St. Gregorios Indian Orthodox Church	2337 Fairland Road, Silver Spring, MD 20904
Allen Chapel AME Church	2518 Fairland Road, Silver Spring, MD 20904
Nations United Baptist Church	2408 Fairland Road, Silver Spring, MD 20904

TABLE 9: COMMUNITY FACILITIES

Calverton Baptist Church	12625 Galway Drive, Silver Spring, MD 20904
Abyssinia Baptist Church, GIC*	3106 Fairland Road, Silver Spring, MD 20904
Islamic Society of the Washington Area	2701 Briggs Chaney Road, Silver Spring, MD 20905
Korean Religious Facility	2607 Briggs Chaney Road, Silver Spring, MD 20905
Epiphany Lutheran Church	14411 Old Columbia Pike, Burtonsville, MD 20866
Resurrection Catholic Church	3315 Greencastle Road, Burtonsville, MD 20866
Liberty Grove United Methodist Church	15225 Old Columbia Pike, Burtonsville, MD 20866
Burtonsville Baptist Church	3400 Spencerville Road, Spencerville, MD 20868
Redemption Community Church	4515 Sandy Spring Road, Burtonsville, MD 20866
True Holiness Church of Jesus Christ	4140 Sandy Spring Road, Burtonsville, MD 20866
Ministerio Puerta de Paz	15206 Dino Drive, Burtonsville, MD 20866
Abundant Grace Church	15210 Dino Drive, Burtonsville, MD 20866
New Hope Korean Church	15121 McKnew Road, Burtonsville, MD 20866
Christ Apostolic Church	15200 McKnew Road, Burtonsville, MD 20866
Montgomery Chinese Christian Church	15201 McKnew Road, Burtonsville, MD 20866
Charis Worship Center Ministries	4040 Blackburn Lane #150, Burtonsville, MD 20866
Renaissance Baptist Church	3411 Spencerville Road, Burtonsville, MD 20866
Silver Spring United Methodist Church	8900 Georgia Avenue, Silver Spring, MD 20901
COMMUNITY RECREATIONAL FACILITIES	
Silver Spring Civic Center at Veterans Place	1 Veterans Place, Silver Spring, MD 20910
White Oak Community Recreation Center	1700 April Lane, Silver Spring, MD 20904
East County Community Center	3310 Gateshead Manor Way, Silver Spring, MD 20904
Eastern Montgomery Regional Center	3300 Briggs Chaney Road, Silver Spring, MD 20904
Marilyn J. Praisner Community Recreation Center	14906 Old Columbia Pike, Burtonsville, MD 20866
EMERGENCY SERVICES	
Silver Spring Volunteer Fire Station 16	111 University Blvd East, Silver Spring, MD 20901
Montgomery Co 3rd District Police Station	1002 Milestone Drive, Silver Spring, MD 20904
Hillandale Volunteer Fire Department Station 12	10617 New Hampshire Ave NE, Silver Spring, MD 20903
Burtonsville Volunteer Fire Department	13900 Old Columbia Pike, Silver Spring, MD 20904
Montgomery Co. 3rd District Police Dept.	801 Sligo Avenue, Silver Spring, MD 20910
Montgomery County Department of Police	3300 Briggs Chaney Road, Silver Spring, MD 20904
Silver Spring Fire Department - Station 1	8110 Georgia Ave, Silver Spring, MD 20910
LIBRARIES	
Silver Spring Library	8901 Colesville Road, Silver Spring, MD 20910
White Oak Library	11701 New Hampshire Ave, Silver Spring, MD 20904
Marilyn J. Praisner Library	14910 Old Columbia Pike, Burtonsville, MD 20866
Rachel Carson Council, Inc. Library	11701 Berwick Road, Silver Spring, MD 20904
PARK AND RIDES	
Park and Ride	Old Columbia Pike and Tech Road
Briggs Chaney Park and Ride	Gateshead Manor Way & Briggs Chaney Road

TABLE 9: COMMUNITY FACILITIES

Greencastle Park and Ride	Greencastle Road and Turbridge Drive
POST OFFICES	
US Post Office - Woodmoor Station	110 University Blvd West, Silver Spring, MD 20901
USPS - Silver Spring Carrier Annex	12010 Plum Orchard Drive, Silver Spring, MD 20904
USPS - Burtonsville	15210 Dino Drive, Burtonsville, MD 20866
EDUCATIONAL FACILITIES	
MCPS West Farm Depot and Vehicle Maintenance Facility	11920 Bournefield Way, Silver Spring, MD 20904
Montgomery College Cultural Arts Center*	7995 Georgia Avenue, Silver Spring, MD 20910
Montgomery Blair High School	51 University Blvd East, Silver Spring, MD 20901
Eastern Middle School*	300 University Blvd Eaast, Silver Spring, MD 20901
Pine Crest Elementary School	201 Woodmoor Drive, Silver Spring, MD 20901
Burnt Mills Elementary School	11211 Childs Street, Silver Spring, MD 20901
Cresthaven Elementary School	1234 Cresthaven Drive, Silver Spring, MD 20903
Francis Scott Key Middle School	910 Schindler Drive, Silver Spring, MD 20903
Glenallen Elementary School	12520 Heurich Road, Silver Spring, MD 20904
Galway Elementary School	12612 Galway Drive, Silver Spring, MD 20904
Greencastle Elementary School	13611 Robey Road, Silver Spring, MD 20904
Fairland Elem School	14315 Fairdale Road, Fairland, MD 20905
Paint Branch High School	14121 Old Columbia Pike, Burtonsville, MD 20866
Benjamin Banneker Middle School	14800 Perrywood Drive, Burtonsville, MD 20866
Burtonsville Elementary School	15516 Old Columbia Pike, Burtonsville, MD 20866
Sligo Creek Elementary School	500 Schuyler Road, Silver Spring, MD 20910
St. Bernadette School	80 University Blvd East, Silver Spring, MD 20901
The Greater Washington Community Kollel	10900 Lockwood Drive, Silver Spring, MD 20901
Providence Christian School	4515 Sandy Spring Road, Burtonsville, MD 20866
Academia De La Porta Christian Day School*	7612 Georgia Ave, Washington, DC 20012
Montgomery College - Takoma Park/Silver Spring Campus*	7600 Takoma Park, MD 20912
Jackson Road Elementary School	900 Jackson Road, Silver Spring, MD 20904
White Oak Middle School	12201 New Hampshire Ave, Silver Spring, MD 20904
Forest Knolls Elementary School*	10830 Eastwood Ave, Silver Spring, MD 20901
Northwood High School*	919 University Blvd West, Silver Spring, MD 20901
Sligo Middle School*	1401 Dennis Ave, Silver Spring, MD 20902
High School and View Elementary School	9010 Providence Ave, Silver Spring, MD 20901
Silver Spring International Middle School	313 Wayne Ave, Silver Spring, MD 20907
East Silver Spring Elementary School*	631 Silver Spring Ave, Silver Spring, MD 20910
POINTS OF INTEREST	
City Place Mall	8661 Colesville Road, Silver Spring, MD 20910
YMCA Youth & Family Services	9601 Colesville Road, Silver Spring, MD 20901
YMCA Silver Spring Youth Services	1102 Forest Glen Road, Silver Spring, MD 20901
National Children's Center - Silver Spring	410 University Blvd West, Silver Spring, MD 20901

TABLE 9: COMMUNITY FACILITIES

Masonic Temple	
Northwest Branch Swim Club - Rec Center	10850 Lockwood Drive, Silver Spring, MD 20901
Martin L. King Jr. Swim Center	1201 Jackson Road, Silver Spring, MD 20904
Calverton Swim Club	12615 Galway Drive, Silver Spring, MD 20904
Idara-e-Jaferia Community Center	3140 Spencerville Road, Burtonsville, MD 20866
West Hillandale Swim Club	915 Schindler Drive, Silver Spring, MD 20903
Montgomery County Department of Health & Housing Services	8818 Georgia Avenue, Silver Spring, MD 20910

* Notes community facilities that fall outside of current mapping limits shown on Figures 2a-2d

There is no Federal or state parkland located within the vicinity of the US 29 study area. One water supply park, the T. Howard Duckett Watershed is owned by the Washington Suburban Sanitary Commission (WSSC) and is located just north of the study limits along the Patuxent River. All other parkland within the vicinity is owned by the Maryland – National Capital Park and Planning Commission (MNCPPC). **Table 10** provides a comprehensive list of parks within the vicinity of the study area, and **Figures 2a-2d** illustrate park locations.

TABLE 10: PARKLAND

Park Name	Facility #	Park Type	Acres	Owner
Acorn Urban Park	A01	Urban	0.1	M-NCPPC
Argyle Local Park	D04	Local	8.8	M-NCPPC
Birch Drive Neighborhood Conservation Area	C03	Neighborhood Conservation	0.1	M-NCPPC
Blair Local Park	F20	Local	10.2	M-NCPPC
Breewood Neighborhood Park	B02	Neighborhood	5.0	M-NCPPC
Browns Corner Neighborhood Conservation Area	C46	Neighborhood Conservation	8.2	M-NCPPC
Bullis Local Park	E57	Local	4.3	M-NCPPC
Burnt Mills East Special Park	N31	Special	2.6	M-NCPPC
Burnt Mills West Special Park	N34	Special	2.7	M-NCPPC
Burtonsville Local Park	D18	Local	33.3	M-NCPPC
Calverton Neighborhood Conservation Area	B05	Neighborhood Conservation	1.3	M-NCPPC
Calverton-Galway Local Park	F03	Local	61.0	M-NCPPC
Cannon Road Local Park	D20	Local	26.8	M-NCPPC
Cloverly Local Park	D29	Local	14.8	M-NCPPC
Colesville Local Park	D30	Local	5.8	M-NCPPC
Columbia Local Park	F02	Local	25.0	M-NCPPC
Countryside Neighborhood Park	B08	Neighborhood	20.8	M-NCPPC
Cross Creek Club Local Park*	E74	Local	16.2	M-NCPPC
Dale Drive Neighborhood Park	B09	Neighborhood	3.3	M-NCPPC
Dartmouth Neighborhood Conservation Area	A06	Neighborhood Conservation	0.3	M-NCPPC
Duvall Road Neighborhood Conservation Area	C43	Neighborhood Conservation	6.2	M-NCPPC
East Silver Special Parking Urban Park*	A07	Urban	0.3	M-NCPPC

TABLE 10: PARKLAND

Park Name	Facility #	Park Type	Acres	Owner
Edgewood Neighborhood Park	B69	Neighborhood	9.4	M-NCPPC
Ednor Local Park	D36	Local	24.3	M-NCPPC
Ellsworth Urban Park	A09	Urban	3.6	M-NCPPC
Fairdale Road Neighborhood Conservation Area	C41	Neighborhood Conservation	4.5	M-NCPPC
Fairland Recreational Park	G04	Recreational	372.0	M-NCPPC
Fairview Urban Park	A11	Urban	1.9	M-NCPPC
Fenton Street Urban Park	A12	Urban	0.8	M-NCPPC
Flower Avenue Urban Park*	A13	Urban	0.6	M-NCPPC
Forest Grove Neighborhood Park	B16	Neighborhood	7.0	M-NCPPC
Gene Lynch Urban Park	A33	Urban	0.3	M-NCPPC
Good Hope Local Park	D49	Local	13.2	M-NCPPC
Hastings Neighborhood Conservation Area	C13	Neighborhood Conservation	0.4	M-NCPPC
Hillandale Local Park	D54	Local	23.8	M-NCPPC
Hopefield Neighborhood Park	B84	Neighborhood	6.5	M-NCPPC
Indian Spring Terrace Local Park	D55	Local	10.9	M-NCPPC
Jesup-Blair Local Park	D56	Local	14.1	M-NCPPC
Juniper-Blair Neighborhood Park	E67	Neighborhood	0.7	M-NCPPC
Kemp Mill Estates Local Park	D57	Local	10.9	M-NCPPC
Kramer Urban Park	A15	Urban	0.1	M-NCPPC
Long Branch Local Park*	D65	Local	13.1	M-NCPPC
Long Branch Stream Valley Park Area 2*	P24	Stream Valley	16.1	M-NCPPC
Long Branch-Arliss Neighborhood Park*	B66	Neighborhood	6.2	M-NCPPC
Long Branch-Wayne Local Park*	D66	Local	6.3	M-NCPPC
Martin Luther King Jr. Recreational Park	H02	Recreational	91.4	M-NCPPC
Maydale Conservation Park	S04	Conservation	24.5	M-NCPPC
McKnew Conservation Park	S08	Conservation	80.6	M-NCPPC
McKnew Local Park*	E36	Local	22.7	M-NCPPC
Meadowood Local Park	D72	Local	17.3	M-NCPPC
Miles Road Neighborhood Conservation Area	C42	Neighborhood Conservation	5.3	M-NCPPC
Montgomery Hills Neighborhood Park	B36	Neighborhood	2.1	M-NCPPC
MRO Building	N05	Misc. Non-Recreational Facility	2.9	M-NCPPC
Nolte Local Park	D78	Local	16.3	M-NCPPC
North Four Corners Local Park	D80	Local	13.8	M-NCPPC
Northwest Branch Stream Valley Park Area 3	P34	Stream Valley	326.5	M-NCPPC
Northwest Branch Stream Valley Park Area 4	P35	Stream Valley	403.9	M-NCPPC
Northwest Branch Stream Valley Park Area 7	P37	Stream Valley	229.6	M-NCPPC
Paint Branch Neighborhood Park	B43	Neighborhood	5.5	M-NCPPC
Paint Branch Stream Valley Park Area 4	P38	Stream Valley	165.6	M-NCPPC
Paint Branch Stream Valley Park Area 5	P39	Stream Valley	129.2	M-NCPPC
Paint Branch Stream Valley Park Area 6	P40	Stream Valley	89.7	M-NCPPC
Parkside HQ	N09	Misc. Non-	6.2	M-NCPPC

TABLE 10: PARKLAND

Park Name	Facility #	Park Type	Acres	Owner
		Recreational Facility		
Patuxent River Watershed Conservation Park	S07	Conservation	328.1	M-NCPPC
Philadelphia Avenue Urban Park	A17	Urban	0.2	M-NCPPC
Pilgrim Hill Local Park	D88	Local	15.7	M-NCPPC
Pinecrest Local Park	D89	Local	5.1	M-NCPPC
Royce Hanson Urban Park	A18	Urban	0.2	M-NCPPC
Santini Road Local Park	D16	Local	16.5	M-NCPPC
Seven Oaks Neighborhood Park	B49	Neighborhood	0.8	M-NCPPC
Silver Special Parking Transit Center Plaza Urban Park	A32	Urban	0.3	M-NCPPC
Sligo Avenue Neighborhood Park*	B51	Neighborhood	4.1	M-NCPPC
Sligo Cabin Neighborhood Park	B52	Neighborhood	1.3	M-NCPPC
Sligo Creek Stream Valley Park Area 1	P57	Stream Valley	43.8	M-NCPPC
Sligo Creek Stream Valley Park Area 2	P58	Stream Valley	45.3	M-NCPPC
Sligo Creek Stream Valley Park Area 3	P59	Stream Valley	76.1	M-NCPPC
Sligo Creek Stream Valley Park Area 4	P60	Stream Valley	113.0	M-NCPPC
Sligo Golf Course	L04	Stream Valley	65.4	M-NCPPC
Sligo-Bennington Neighborhood Park	B53	Neighborhood	6.1	M-NCPPC
Sligo-Dennis Avenue Local Park	E01	Local	6.8	M-NCPPC
South Four Corners Neighborhood Park	B15	Neighborhood	2.0	M-NCPPC
Spencerville Local Park	E04	Local	18.3	M-NCPPC
Stonecrest Neighborhood Conservation Area	C25	Neighborhood Conservation	19.7	M-NCPPC
Stonehedge Local Park	E66	Local	4.1	M-NCPPC
T. Howard Duckett Watershed		Water Supply	1001.9	WSSC
Tamarack Neighborhood Park	B55	Neighborhood	6.9	M-NCPPC
Tanglewood Neighborhood Park	E51	Neighborhood	22.3	M-NCPPC
Twinponds Neighborhood Conservation Area	C28	Neighborhood Conservation	5.5	M-NCPPC
Upper Long Branch Neighborhood Park	B68	Neighborhood	1.4	M-NCPPC
Upper Paint Branch Stream Valley Park	P41	Stream Valley	1218.0	M-NCPPC
Valley Mill Special Park	L05	Special	24.7	M-NCPPC
Wembrough Neighborhood Park	B61	Neighborhood	9.2	M-NCPPC
West Fairland Local Park	E15	Local	18.4	M-NCPPC
Woodside Urban Park	A21	Urban	2.5	M-NCPPC

* Notes parkland that falls outside of current mapping limits shown on Figures 2a-2d

5 HISTORIC RESOURCES

Historic resources that are eligible for or listed in the National Register of Historic Places are protected by the provisions of Section 106 of the National Historic Preservation Act (36 CFR Part 800) and the Maryland Historical Trust Act of 1985 (as amended, §§ 5A-325 and 5A-326 of the Annotated Code of Maryland). These state and federal regulations require that agencies identify and evaluate historic properties listed or eligible for listing in the National Register of Historic Places (NRHP) with potential to be affected by their undertakings, and consult with the stakeholders including the Maryland Historical

Trust (the State Historic Preservation Office) to take steps to avoid, minimize, and mitigate the adverse effects of undertakings on these resources.

US 29 from Silver Spring to the Howard County Line runs primarily in a northeast direction and through highly built-out suburban development. The surrounding development is generally older the closer to the District of Columbia, with early twentieth century development in Silver Spring. US 29 is known as Colesville Road in Silver Spring and the roadway and surrounding development has an urban in character. North of Noyes Drive, US 29, still known as Colesville Road, becomes more suburban. North of Northwest Branch Park, US 29 is known as Columbia Pike and it is a divided highway with grass median.

The US 29 BRT study area contains multiple properties that have been inventoried during historic resource surveys and entered into the Maryland Inventory of Historic Properties. Of the historic resources on the Maryland Inventory of Historic Properties, some resources have not been evaluated for National Register of Historic Places eligibility, but most have had eligibility determinations and have been listed, determined eligible, or determined not eligible for the NRHP. Two of the resources (the Silver Spring Theater and Shopping Center, M:36-7-1) have preservation easements on the property.

TABLE 11. MARYLAND INVENTORY OF HISTORIC PROPERTIES (MIHP) RESOURCES AND PRESERVATION EASEMENTS

MIHP Number	Resource Name	Town	NRHP Eligibility
M: 15-88	Henry S. Krusen House (Bricefield Property)	Burtonsville	Not Eligible (demolished)
M: 32-05	Polychrome Historic District (Polychrome Houses)	Woodmoor	Listed NR-1169
M: 32-7	Argyle Park Neighborhood	Silver Spring	Not Eligible
M: 32-11	North Hills of Sligo Park	Silver Spring	Not Eligible
M: 32-12	Indian Spring Club Estates/Indian Spring Terrace/Indian Spring Manor	Silver Spring	Not Eligible
M: 32-15	Sligo Creek Parkway	Silver Spring, Takoma Park, Hyattsville	Eligible
M: 32-16	Fairway, Chalfonte, Country Club Park, Country Club View	Silver Spring	Not Eligible
M: 32-21	Choi Property	Silver Spring	Not Eligible
M: 33-22	Robert B. Morse Water Filtration Plant	Woodmoor	Eligible
M: 33-26	Bridge 15035	Silver Spring	Eligible
M: 33-27	Bridge 15009, Burnt Mills Bridge	Woodmoor	Not Eligible
M: 34-3	Pease House (Duvall House)	Burtonsville	Not Evaluated (demolished)
M: 34-18	Carroll House (John Hardesty Property)	Burtonsville	Not Eligible

TABLE 11. MARYLAND INVENTORY OF HISTORIC PROPERTIES (MIHP) RESOURCES AND PRESERVATION EASEMENTS

M: 34-19	Samuel S. Aitcheson House (Walter Fehr Property)	Burtonsville	Not Eligible
M: 34-21	Willard Marlow House I & II (William Ellin Property)	Colesville	Not Eligible
M: 34-39	John Hardisty House	Burtonsville	Not Eligible (demolished)
M: 34-40	Jackson Yang Property	Burtonsville	Not Eligible
M: 34-41	Carroll and V.E. Ricketts Property	Burtonsville	Not Eligible
M: 34-43	Stephen C. Beaver III House	Silver Spring	Not Eligible
M: 34-53	Fairland Data Center	Silver Spring	Not Eligible
M: 35-142	Georgetown Branch, B&O Railroad	Chevy Chase	Not Eligible
M: 36-7	Old Silver Spring Commercial Area	Silver Spring	
M: 36-7-1	Silver Theatre and Silver Spring Shopping Center	Silver Spring	Eligible
M: 36-7-1	Preservation Easement, Silver Spring Shopping Center (E-568)	Silver Spring	not applicable (n/a)
M: 36-7-1	Preservation Easement, Silver Theatre (E-581)	Silver Spring	n/a
M: 36-7-2	Montgomery Arms	Silver Spring	Eligible
M: 36-7-3	J.C. Penney Co. Building	Silver Spring	Facadectomy
M: 36-7-4	City Springs (No Documentation on File)	Silver Spring	Not Evaluated
M: 36-9	Mrs. K's Toll House	Silver Spring	Not Evaluated
M: 36-18	Woodside Park Historic District	Silver Spring	Not Evaluated

In addition, many other properties over forty-five years of age are located adjacent the project limits that have not been previously inventoried or evaluated for the National Register of Historic Places. Depending on the scope of the BRT project, it is possible that these would be included in the APE. These unevaluated properties include, but are not limited to, the following:

- Calverton Neighborhood
- 12721 Deer Park Drive
- Rolling Acres, Section 1
- Springbrook Village
- 1302 Milestone Drive
- Burnt Mills Townhouses (1968)
- Burnt Mills Village
- Burnt Mills Manor

- Woodmoor
- Northwood Park View
- Northwood Park
- Indian Spring View
- Four Corners Commercial Area
- Seven Oaks
- South Woodside Park
- Bridge 151010
- First India United Methodist, formerly Memorial Evangelical Brethren, 9226 Colesville Road
- Silver Spring Library
- 8915 Colesville Road
- Colesville Towers Road
- 1000 Noyes Drive
- 8808 Colesville Road
- Colespring Plaza, 1001 Spring Street
- Spring-Colesville Parking Garage, 1000 Spring Street
- 8728 Colesville Road
- 8727 Colesville Road
- 8501 Colesville Road

6 LAND USE

Figure 3 shows the existing land use within the US 29 BRT project vicinity. The proposed BRT corridor passes through miles of suburban development with a variety of land uses. Residential land uses are located throughout the study area; the majority of the residential land use is medium density. High Density Residential Land Use areas are concentrated near downtown Silver Spring, around the US 29 and MD 650 intersection, and northeast of the US 29 and MD 200 interchange. Low Density Residential Land Use is located northwest of the US 29 and MD 200 interchange. Commercial, Industrial, and Institutional land uses are dispersed throughout the study area, but are concentrated along the major arterial roadways – US 29, University Boulevard (MD 193), New Hampshire Avenue (MD 650), East Randolph Road, Cherry Hill Road, Fairland Road, and Spencerville Road (MD 198). Three stream valley parks cross the corridor, and other Forest Land Use areas are intermittent.

The following community and regional master plans developed by the Montgomery County Planning Department guide future land use and development within the US 29 BRT vicinity. These documents provide long-term planning goals and recommendations, generally for a 20-year time frame and support the determination of the design year as the future time frame. Each of the master plans recommends substantial improvements in bus transit between the Silver Spring Transit Center and Burtonsville. The White Oak Science Gateway Master Plan and Countywide Transit Corridors Functional Master Plan are more specific, recommending BRT in dedicated and mixed traffic lanes along US 29. The master plans covering the US 29 BRT study area are listed below. The proposed US 29 BRT project is consistent with these master plans.

- *Silver Spring Central Business District and Vicinity Sector Plan*, 2000
- *North and West Silver Spring Master Plan*, 2000
- *Four Corners Master Plan*, 1996
- *White Oak Science Gateway Master Plan*, 2013
- *White Oak Master Plan*, 1997
- *Fairland Master Plan*, 1997
- *Burtonsville Crossroads Neighborhood Plan*, 2012
- *Countywide Transit Corridors Functional Master Plan*, 2013

Table 12 includes a list of pending and recently approved development projects within the US 29 BRT vicinity. The implementation of those projects would affect the future land use.

7 REGIONAL AND LOCAL ECONOMY

The US 29 BRT project corridor supports both the local and the regional economy. It not only serves as a link between neighborhoods within the Burtonsville, Fairland, White Oak, and Silver Spring, but it also links the Baltimore and Washington, DC metropolitan areas. The income characteristics within the project vicinity are on **Table 7**, and the local commercial areas are shown on **Figure 3**. The project corridor is a located within a Maryland Priority Funding Area (see **Figure 4**), which are areas where state and local governments want to target their efforts to encourage and support economic development and new growth. A more detailed examination and community effects analysis will occur during project development.

8 INDIRECT AND CUMULATIVE EFFECTS SCOPING

This Indirect and Cumulative Effects (ICE) scoping was completed according to guidance provided by the Maryland State Highway Administration in Section 1, "Scoping/Initial ICE Analysis Activities" in the 2007 *Indirect and Cumulative Effects Analysis Guidelines*. Indirect effects are defined as, "Effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR § 1508.8(b)). Cumulative effects are defined as, "Impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7).

This pre-scoping consideration of indirect and cumulative effects will evaluate socioeconomic, cultural, and environmental resources of concern; the geographical and temporal boundaries to be included during future stages of the US 29 BRT Study; and the past, present, and reasonably foreseeable future development actions. Proposed improvements associated with the US 29 BRT project would affect capacity along the US 29 corridor, which could encourage development within the study area.

The environmental resources of concern for an indirect and cumulative effects analysis are typically the environmental resources that would be directly affected by the project. The proposed US 29 BRT project would predominately occur on existing roadway and other paved surfaces, and there would be limited direct environmental effects on natural resources. However, potential direct effects of the

proposed project are listed below. These resources must be considered in the indirect and cumulative effects analysis.

- Right-of-way acquisition
- Business or residential displacement
- Effects to access or mobility for residents and businesses in the corridor vicinity
- Effects to community facilities
- Historic Properties
- Parks
- Forested Areas
- Waters of the US and Wetlands

8.1 Geographic and Temporal Boundary

The geographic area of potential indirect and cumulative effects is larger than the area of direct effects anticipated with the design. The ICE geographic boundary was established through a synthesis of resource sub-boundaries into one overall boundary that includes the Area of Traffic Influence, U.S. Census boundaries, 12-digit subwatersheds, Priority Funding Areas, Montgomery County master planning boundaries, and historic property/district boundaries. The ICE boundary is formed by major north-south roadways to the east, and barriers to traffic movement on the north and west. On the east side, the ICE boundary is formed by three major roadways – I-95 north of the I-495 beltway, a small segment of the beltway, and then Maryland Route 650 on the south side of the beltway, southwards to the Washington, DC line. The DC line forms the southern ICE boundary. The western boundary is formed by waterways that form geographic barriers to traffic flow. South of the I-495 beltway, Rock Creek forms this barrier. North of the beltway, Sligo Creek, Northwest Branch forms a barrier. To the northwest, the boundary follows the headwaters of Northwest Branch, crosses MD 650 just south of the MD 650/Ednor Road intersection, and follows an unnamed tributary of the Patuxent River to the northern ICE boundary, which is formed by the Rocky Gorge Reservoir. The Rocky Gorge Reservoir forms this boundary between the tributary and the I-95 crossing of the reservoir.

The temporal boundary selected for the US 29 BRT Study is from 1966 to the US 29 BRT project design year. This past time frame is being considered because it marks the date that US 29 was constructed/widened.

8.2 Reasonable Foreseeable Development Project

Table 12 and **Figure 4** include reasonably foreseeable development projects within the US 29 BRT vicinity. It includes pending and recently approved development projects identified by Development Activity Information Center (DAIC). The Montgomery County Atlas is an online atlas maintained by the Montgomery County Planning Department. Information on planned development and infrastructure projects was obtained from the following GIS layers:

- Planned Transportation Facilities, including Transit Facilities and Master Plan Highways
- Planning Department's DAIC

Additionally, Montgomery County identifies the following planned transportation facilities in the vicinity of the US 29 BRT corridor:

- Extension of Glenview Avenue between Domer Avenue and Piney Branch Road
- Extension of Old Columbia Pike to Lockwood Drive
- Connector roads between Plum Orchard Court, Whitethorn Court, and Cherry Hill Road
- Provision of local grid of streets and access roads in Burtonsville
- Purple Line in Central Business District

TABLE 12: REASONABLY FORESEEABLE DEVELOPMENT PROJECTS

Map ID	Development Name	Description	Size	Plan Number
1	Silver Spring Park	Condo, Hotel, Retail, Office	1.57 ac	82010012A
2	819 Silver Spring Avenue	Office, Residential	0.19 ac	820140090
3	8021 Georgia Avenue	Condo	1.34 ac	82006038D
4	City Place	Office, Retail	2.48 ac	81988046E
5	Chelsea Court	Residential, Single Family	5.25 ac	82013004A
6	United Therapeutics	Office, R&D, Retail	2.2 ac	82007020B
7	8621 Georgia Avenue	Condo, Office, Retail	0.69 ac	82011006B
8	Silver Spring Center	Office	0.74 ac	81982069A
9	8001 Newell Street	Condo, Retail	1.22 ac	820140020
10	The Blairs Buildings F1/F2	Condo	3.79 ac	820140170
11	Falkland North	Commercial, Condo	3.5 ac	82012005A
12	White Oak Property	Single Family Attached	29.34 ac	82005018C
13	Fairland Data Center	General - Solar Panels	35.5 ac	81991030A
14	Montgomery Auto Sales Park Lot 17	Automobile Related	4.78 ac	820140130
15	Montgomery Auto Sales Park Lot 18	Automobile Related	3.32 ac	820140140
16	Woodlake	Condo	32.7 ac	81971011B
17	Star Pointe Plaza	Retail, Office, Restaurant	1.53 ac	82010002A
18	Burtonsville McDonalds	Restaurant	2.4 ac	820150020
19	Fenwick Station	Single Family	2.84 ac	82012008A
20	Korean Antioch Church	Religious Worship	8.85 ac	120120260
21	Snowden's New Birmingham Manor	Church, Single Family Detached	4.55 ac	120130010
22	Boswell's Addition to Riding Stable Estates	Single Family Detached	5.89 ac	12008008A
23	Montgomery Auto Sales Park Lot 14	Automobile, Industrial, Retail	8.1 ac	11985027A
24	Guru Nanak Foundation of America	Religious/Institutional	11.07 ac	120120160
25	Deer Park	Single Family Detached	2.8 ac	120100020
26	White Oak Town Center	Retail, Condo	6.98 ac	120150100
27	White Oak Property	Single Family Detached	29.34 ac	11991099A
28	Victory Crossing	Religious/Institutional	12.79 ac	120140210
29	Northwood Knolls	Single Family Detached	0.77 ac	120140200
30	Mt. Jezreel Senior Housing	Religious/Institutional	9.73 ac	120150020
31	Gough Property	Single Family Detached	0.71	120140010
32	Woodside Park	Single Family Detached	1.48 ac	120070230
33	Elizabeth Square	Retail, Condo, Restaurant	3.12 ac	120150030
34	Metro Plaza - Silver Spring	Condo, Office, Retail	1.44 ac	12009038A

TABLE 12: REASONABLY FORESEEABLE DEVELOPMENT PROJECTS

Map ID	Development Name	Description	Size	Plan Number
35	Falkland North	Retail, Condo	9.77 ac	12007056A
36	The Blairs Master Plan	Condo, Hotel, Office, Restaurant, Retail	30.37	120130220
37	Rock Creek Forest (Hickey & Offut's Sub.)	Single Family Detached	1.56 ac	120070550
38	Washington Adventist Hospital	Hospital	48.86 ac	82008021C
39	Colesville Eckerd Drug Store #6328	Commercial, Office	2.04 ac	82002032B
40	PMG Silver Spring	Commercial	1.25 ac	120140100
41	Eco Estates	Single Family Detached	12.83 ac	120080430
42	Shiloh Christian Fellowship Church	Single Family Detached, Religious/Institutional	2.58 ac	120110230
43	Beall's Manor	Single Family Detached	2 ac	120140030
44	No Gain	Single Family Detached	0.85 ac	120130170
45	Fairland Park Community	Single Family Detached/Attached	130.45 ac	12005020A /82005006C
46	Silver Spring Library	Library	<1 ac	unknown

9 HAZARDOUS MATERIALS

A review of federal and state database records was conducted to identify, to the extent feasible, recognized environmental conditions (RECs) in connection with properties in or within close proximity to the US 29 BRT study area. RECs include regulated facilities and past releases of hazardous substances or petroleum products, and the study area is defined as 250 feet from the centerline of US 29. A regulatory database research report was obtained from Environmental Data Resources (EDR) (See **Appendix B** for attached report), a vendor that specializes in identifying potential hazardous waste sites within the approximate search distances specified by American Society for Testing and Materials ASTM guidelines (see **Table 13**). Those sites not located within distances specified by ASTM guidelines are not discussed in the text of this report.

TABLE 13: HAZARDOUS WASTE SITE DATABASES

Database	Acronym	Approximate Search Distance (miles)
Federal National Priorities List	NPL	1.0
Federal Comprehensive Environmental Response, Compensation, and Liability Information System List	CERCLIS	0.5
Federal CERCLIS No Further Remedial Action Planned Sites	CERCLIS NFRAP	0.5
Records of Decision (pertaining to a NPL site)	RODS	1.0
Federal Resource Conservation and Recovery Information	RCRIS-SQG/LQG/TSD	Study area and adjoining

TABLE 13: HAZARDOUS WASTE SITE DATABASES

Database	Acronym	Approximate Search Distance (miles)
System Generators (small and large quantity) and Federal RCRIS Treatment, Storage, and Disposal Sites		properties
RCRA Corrective Action Facilities	CORRACTS	1.0
Federal Emergency Response Notification System	ERNS	Study area only
Facility Index System/Facility Registry System	FINDS	Study area only
Integrated Compliance Information System	ICIS	Study area only
RCRA Administrative Action Tracking System	RAATS	1.0
Toxic Chemical Release Inventory System	TRIS	Study area only
PCB Activity Database System	PADS	Study area only
State-equivalent NPL	SHWS	1.0
State-equivalent CERCLIS / State-Notice of Potential Hazardous Waste Sites	SHWS	0.5
State Voluntary Control Programs (VCPs)	VCP	1.0
State Permitted Solid Waste Disposal Facilities/Recycling Facilities	SWF/SWRCY	0.5
Institutional/Engineering Control Registries	INST CONTROL/ ENG CONTROLS	Study area and adjoining properties
State Brownsfields Properties	BROWNSFIELDS	0.5
State Registered Storage Tanks	UST/Historical UST	Study area and adjoining properties
Maryland Oil Control Program	MD OCPCASES	0.5
State Leaking Storage Tanks	LUST/Historical LUST	0.5
Registered Drycleaning Facilities	Drycleaners	Study area only
Permitted Aboveground Storage Tanks	AST	Study area only

Properties identified in the EDR report were given a ranking based on their potential to contain RECs. Using the criteria listed in **Table 13**, each identified site was assigned a numeric ranking of 1 through 4. Properties assigned the ranking of 1 are deemed to have a relatively high potential for impact based on the data evaluated. Properties assigned the ranking of 2 are deemed to have medium to high potential for impact and include sites listed on environmental regulatory databases but could not be otherwise classified due to insufficient data, and are conservatively presumed to warrant further inquiry and/or investigation. Sites assigned a ranking of 3 are considered to have a moderate potential for impact. Rankings of 4 are assumed to have a relatively low potential for impact to the study area. In addition, sites with previous spills/releases with an open case (ongoing investigation of the incident) were ranked

1. Sites with previous spills/releases that were identified as having a cleanup, tank closure, or the case was closed were ranked 2 (see **Table 14**).

TABLE 14: POTENTIAL FOR IMPACT-RANKING CRITERIA

1	**High**	• Industrial facilities • Gasoline stations • Auto repair facilities • Paint manufacturing facilities • Above-ground storage tanks (AST) with a large amount of staining • Underground Storage Tank (UST) containing gasoline, jet fuel, kerosene, diesel fuel, waste oil or solvents	• Landfills • Remediation system • Pits and lagoons • Dry cleaners (on-site) • PCB containing transformers with large amounts of staining • Surface dumps with drums or other hazardous materials
2	**Medium/High**	• USTs containing materials other than listed above • Surface dumps with empty drums or other materials of concern • Mounds	• AST with several medium stains • Polychlorinated Biphenyls (PCB) containing transformers with minor stains
3	**Medium**	• Small amounts of surface staining • Slightly discolored water • PCB containing transformers, no staining • AST with no-few small stains, but of questionable integrity	• Stressed vegetation • Unmarked transformers • Large surface dumps containing household wastes
4	**Low**	• Small surface dumps containing household wastes • AST (relatively new) with no staining or evidence of poor structural integrity	• Septic systems • Non-PCB containing transformers with no stains

One hundred sixty five properties with the potential to contain RECs were identified in the vicinity of the US 29 BRT corridor through review of regulatory databases compiled in the EDR report. Of the 165 properties identified, 74 properties were determined to have a relatively high potential to contain RECs (i.e. a rank of 1 or 2) and are located within or in close proximity (within ¼-mile) of the study area. These properties include active and former automobile service stations, active and former cleaners, businesses that handle hazardous materials, and businesses and private residences where previous spills or releases have occurred (See **Table 15**). Several properties are listed more than once due to multiple occurrences of spills or hazardous waste issues, changes in ownership, or changes in use.

During the course of project planning, properties with a high potential for concern should be avoided to the extent possible. Contamination due to contact with RECs is considered relatively low because subsurface construction is not anticipated for this project. However, care should be taken to avoid areas with RECs especially those within the study area. The intent of this table is to support improvements to US 29; it is not intended to directly support any potential future property, easement, or right-of-way acquisitions, and does not constitute a Phase I Environmental Site Assessment as defined by ASTM.

TABLE 15: POTENTIAL HAZARDOUS MATERIALS SITES

Site Name (Former or Alternative Listing)	EDR ID	Rank	Description	Address	Distance from the Corridor
Zimmerman & Sons, Inc., R.A. (Zimmermans Home Center)	6	2	Past release; Case closed 2006	3801 Sandy Spring Rd	Study Area
Burn Brae Property	18	2	Past release; Case closed 2011	3811 Blackburn Lane	Study Area
Briggs Chaney Cleaners	29	1	Drycleaners Handles Hazardous Materials – Large Quantity Generator	13828 Outlet Drive	< ¼ mile
Briggs Chaney Exxon (Exxon S/S #2-8327, Exxon #28327)	29,30	1	Gas Station UST currently in use Past release; Case closed 1998	3050 Briggs Chaney Rd	< ¼ mile
Covington Buick GMC Truck Inc	36	2	Handles Hazardous Materials – Small Quantity Generator Past release; Case closed 2000	3311 Briggs Chaney Rd	< ¼ mile
Fairland Center	45	2	Past release; Case closed 1999	2600 Fairland Ave	Study Area
Briggs Chaney Shopping Center	46	2	Well/Ground water contamination; Case closed 2000	13300 Columbia Pike	< ¼ mile
Verizon-Chesapeake Complex (MD05119) (Chesapeake Complex (GLC05119))	47	1	Former Cleaners Handles Hazardous Materials – Small Quantity Generator ASTs in use	13100 Columbia Pike	Study Area
Verizon Maryland, Inc (Fairland Data Center (10138), Verizon: Fairland Data Center)	47	2	Past releases; Cases closed 1997, 1998, 2002, 2004 USTs in use	13101 Columbia Pike	Study Area
Manor Care Silver Spring (Manor Case Silver Spring)	48	1	UST in use	2501 Musgrove Rd	Study Area
Meadows Corp/Cary Winston (Meadows Corporate Ctr, Bldg #3)	57	2	Past release; Case closed 1997	12501 Prosperity Dr	< ¼ mile
Bytegrid Silver Spring, LLC (Quotron Systems, Inc)	58	2	Surface spill and AST leak; Cases closed 1997, 2006 USTs in use	12401 Prosperity Dr	< ¼ mile
Henry Waters Residence	64	2	Tank removal, no spill; Case open	12224 Cedar Hill Dr	< ¼ mile
AT&T	65	2	Past release; Case closed 1997	12401 Columbia Pike	Study Area
Dow Jones & Co, Inc. (Dow Jones Co)	74, 77	2	Handles Hazardous Materials – Small Quantity Generator	11501 Old Columbia Pike	Study Area
Oak Hill Apartments	77	2	Past release; Case closed 1997	11497 Columbia Pike	< ¼ mile
Montgomery White Oak Apartments (Grady Management)	79	2	Past dumping; Case closed 2000 UST in use	11526 Stewart Lane	< ¼ mile
B & B Furniture Cleaner	80	1	Former Cleaner	11339 Columbia Pike	Study Area

TABLE 15: POTENTIAL HAZARDOUS MATERIALS SITES

Site Name (Former or Alternative Listing)	EDR ID	Rank	Description	Address	Distance from the Corridor
Bell Atlantic	80	2	Case closed, no release	11301 Columbia Avenue	Study Area
Montgomery White Oak Apartments	83	2	Past release; Case closed 2002 UST in use	11530 Lockwood Drive	< ¼ mile
The Enclave (Building B) (Oak Leaf Drive 11235; The Point Apartments)	84	2	Former UST, removed no release	11235 Oak Leaf Drive	Study Area
The Enclave (The Point Apartments)	84	2	USTs in use	11200 Oak Leaf Drive	Study Area
The Enclave Apartments	84	2	Case closed, no release 2011	11215 Oak Leaf Drive	Study Area
The Enclave	84	2	USTs in use	11225 Oak Leaf Drive	Study Area
Montgomery White Oak (Apartments)	85	2	Case closed, no release 1993 USTs in use	11434 Lockwood Drive	Study Area
Pepco Spill	85	2	Past dumping; Case closed 2003	11467 Lockwood Drive	Study Area
Waste Management Spill - @White Oak Park Apartments	85	2	Past dumping and tank closure; Cases closed 1998, 2004	11431 Lockwood Drive	Study Area
Pepco Spill	86	2	Case closed, no release 2003	Lockwood Dr & New Hampshire Ave	Study Area
WMATA Spill	86	2	Past dumping; Cases closed 2003	Lockwood Dr & New Hampshire Ave	Study Area
Sears Auto Center	86	1	Multiple UST cases closed, no releases 1999 latest closed case	11255 New Hampshire Ave	< ¼ mile
The Point Apts The Enclave	87	2	Multiple UST cases closed, no releases 1995	11215 Oak Leaf Dr (Lockwood)	< ¼ mile
Pepco Spill	87	2	Past dumping; Cases closed 1999	11207 Lockwood Dr	Study Area
Exxon Ras 25404	88	1	Gas Station Two USTs with past releases; Cases closed 1998, 2003	11177 New Hampshire Ave	< ¼ mile
Pepco Spill - @White Oak Professional Park	90	2	Past dumping; Cases closed 2003	11200 Lockwood Dr	Study Area
Burnt Mills Church	91	2	Case closed, no reported release 1993	10915 Lockwood Dr	Study Area
Sunoco (Sunoco #0451-0970)	94	1	Gas Station Well/Ground Water Contaminations; Case Closed 2001. 2006 USTs in use	10810 Columbia Pike	Study Area
Mobil Station #16EKJ (16EKJ)	96	2	Former Gas Station Closed case, no release reported	10755 Colesville Rd	Study Area
Manor Care, Inc	96	2	Closed case, no release reported	10750 Columbia Pike	Study Area

TABLE 15: POTENTIAL HAZARDOUS MATERIALS SITES

Site Name (Former or Alternative Listing)	EDR ID	Rank	Description	Address	Distance from the Corridor
Burnt Mills Auto Body	97	1	Handles Hazardous Materials – Small Quantity Generator	10753 Columbia Pike	Study Area
Burnt Mills Exxon (Mobil, Burnt Mills BP)	99	1	Gas Station Past releases; Cases closed 2002, 2003 USTs in use	10711 Columbia Pike	Study Area
Woodmoor Cleaners	102	1	Cleaners Handles Hazardous Materials – Small Quantity Generator	10119 Colesville Rd	Study Area
Woodmoor Automotive (Woodmoor Amoco, Woodmoor Getty #890, Jay's Amoco #1630-Tanks)	102	1	Gas Station USTs in use Well/Ground Water Contaminations	10144 Colesville Rd	Study Area
Amoco	102	1	Handles Hazardous Materials – Small Quantity Generator Leaking Underground Storage Tank 1999 Case is still Open	10155 Colesville Rd	Study Area
CVS Pharmacy 1468	102	2	Handles Hazardous Materials – Small Quantity Generator	10141 Colesville Rd	Study Area
Steuart Petroleum (Woodmore Xtra-Mart, Steuart Self Serve)	102	1	Former Gas Station Well/Ground Water Contaminations; Case Closed 2005 USTs in use	10101 Colesville Rd	Study Area
Pak Sunoco	102	2	Former Gas Station	10128 Colesville Rd	Study Area
Woodmoor Shopping Center	102	1	Past releases from cleaners and gas station Voluntary Cleanup & Land Restoration Programs	10117 Colesville Rd	Study Area
Woodmoor Service Center	104	1	Former Auto Shop	16 University Blvd.	Study Area
7-Eleven	104	1	Past releases; Case closed 2002	2 W University Blvd	Study Area
Shell (PEH, LLC #871, Four Corners Shell)	104	1	Gas Station USTs in use Past releases; Case closed 2005	100 W University Blvd	Study Area
Danny's Auto Repair	119	2	Former Auto Shop	9226 Colesville Rd	Study Area
St. Luke Lutheran Church & Christian Day School (3)	120	2	Past releases; Case closed 2013	9100 Colesville Rd	Study Area

TABLE 15: POTENTIAL HAZARDOUS MATERIALS SITES

Site Name (Former or Alternative Listing)	EDR ID	Rank	Description	Address	Distance from the Corridor
Stevens Exxon Servicenter	123	2	Former Gas Station	1013 Woodside Pkwy	< ¼ mile
United Therapeutics Corporation	128	2	Handles Hazardous Materials – Large Quantity Generator	1040 Spring St	< ¼ mile
Colesville Towers (Colesville Towers Apartments)	130	2	Handles Hazardous Materials – Small Quantity Generator Past release; Case closed 1993	8811 Colesville Rd	Study Area
Cole Spring Plaza (Cole Spring Plaza Apts)	130	2	Handles Hazardous Materials – Small Quantity Generator Past release; Case closed 1995	1001 Spring St	Study Area
Douglas Development	136	2	Past release; Case closed 1996	8728 Colesville Rd	Study Area
Montgomery Arms	138	2	Handles Hazardous Materials – Small Quantity Generator	8708 Colesville Rd	Study Area
Cellco - Silver Spring (2) (United States)	138	2	Listed on FINDS; no additional info	8630 Fenton St	< ¼ mile
175 Cleaners & Depot	138	2	Former Cleaners	8555 Fenton St	< ¼ mile
Safford Lincoln Mercury	143	2	Handles Hazardous Materials – Small Quantity Generator	8507 Colesville Rd	Study Area
Crown Central Petroleum Corp (Gulf Station MD-092) (2)	143	1	Handles Hazardous Materials – Small Quantity Generator Well/Ground Water Contaminations; Case Closed 2008	8600 Georgia Avenue	Study Area
Former Naval Security And Investigative Command Silver Spring (Wolfe Building Limited Partnership) (4)	143	2	Former Toxic Substance Handler	8621 Georgia Avenue	Study Area
Lee Plaza (2)	143	2	Past release; Case closed 2005	8601 Georgia Ave	Study Area
City Place (2)	143	2	Past releases; Cases closed 1998	8661 Colesville Rd	Study Area
Silver Spring Health Center (2)	143	2	Past release; Case closed 1997	8500 Colesville Rd	Study Area
Delbe Realty (Delbe Real Estate Co Inc)	143	2	Past release; Case closed 2000	8619 Colesville Rd	Study Area
Old Silver Theatre (Old Silver Spring Theatre)	143	2	Past release; Case closed 2002	8633 Colesville Rd	Study Area
Redevelopment Project (Silver Spring Redevelopment)	143	2	Past release; Case closed 2006	8555 Colesville Rd	Study Area
Exxon S\S #2-5099 (3)	150	1	Gas Station USTs in use	8560 Georgia Ave	Study Area
Silver Triangle Site (former Safford Lincoln Mercury)	150, 154	2	Past release; Closed case 1997	1106 Trinity Place	< ¼ mile
American International Pathology Labs	156	2	Handles Hazardous Materials – Small Quantity Generator	8403 Colesville Rd	Study Area

TABLE 15: POTENTIAL HAZARDOUS MATERIALS SITES

Site Name (Former or Alternative Listing)	EDR ID	Rank	Description	Address	Distance from the Corridor
Petro Spill	156	2	Past release; Closed case 2002	8401 Colesville Rd	Study Area
VIP Cleaners	161	2	Former Cleaners	8401 Colesville Rd	Study Area

10 NATURAL ENVIRONMENTAL INVENTORY

This Natural Resources Inventory has been prepared for the Bus Rapid Transit (BRT) study currently proposed along US 29 between the Silver Spring Transit Center and the Burtonsville Park & Ride in Montgomery County, Maryland. The study limits for natural resources is approximately 200 feet parallel to each side of US 29. The aforementioned study area limits have been determined to be adequate for assessment of natural resources with respect to potential effects of proposed alternatives.

10.1 Topography, Geology and Soils

The study area is located within the Upland Section, or northern division of the Piedmont Plateau physiographic province. The Piedmont Region is further divided into sub regions, with the US 29 BRT study area falling within the Major Land Resource Area (MLRA) 148 of Land Resource Region (LRR) south (S) (USACE, 2012). The study area is underlain by older metamorphic and igneous formations. MLRA regions are used by the USACE in the determination of wetland indicators in conjunction with delineation methodologies and are largely affected by climatic conditions and the physical and biological characteristics of the landscape.

The study area is characterized by gently to strongly rolling topography. Soil parent material is derived mainly from the weathering of local rock formations, as well as deposits of wind-blown material and alluvial deposits along the rivers and streams; however most of the region is dominated by forest soils (ie. Alfisols and Ultisols) (NRCS, 2006). Soil associations present within the study area include: Glenelg-Gaila-Occoquan; Chillum-Croom-Beltsville; and Urban Land-Wheaton-Glenelg. The Glenelg-Gaila-Occoquan association is described as areas of nearly level to strongly sloping, well drained, deep and very deep soils that are loamy throughout and found on uplands. The Chillum-Croom-Beltsville association is described as areas of nearly level to steep, well drained and moderately well drained, very deep soils on uplands. Much of this soil unit is well suited and utilized for cultivated crops, hay, or pasture. Existing land use in the study area is not represented by agricultural activities, but rather urban development, for which this association has its limitations. The Urban Land-Wheaton-Glenelg association is described as urban land that is nearly level to strongly sloping, with well-drained, very deep soils that are loamy throughout and found on uplands (NRCS, 1995).

Twenty different soil map units are present within the approximate 10 mile US 29 BRT study area. Two of these soils are on the Hydric Soils of the US (USDA SCS, 1991) and include Hatboro silt loam and Baile silt loam. These soils can be found within the study limits along the Paint Branch and Little Paint Branch stream crossings. These hydric soils have formed under conditions of saturation, flooding, or ponding for periods during the growing season leading to development of anaerobic conditions in the upper soil

profile (USACE, 2012). Erodibility is expressed as a K-value, which ranges from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to water erosion. **Table 16** summarizes the soil map units present in the study area and physical characteristics. **Appendix B** mapping illustrates the location of each of the soil map units identified.

TABLE 16: MAP UNIT CHARACTERISTICS OF SOILS OCCURRING WITHIN THE STUDY AREA

Map Unit	Map Unit Name	% Slope	Erodibility	Hydric (Y or N)
1B	Gaila silt loam	3-8	0.24-.037	N
1C		8-15		
2B	Glenelg silt loam	3-8	0.32-0.49	N
2C		8-15		
2UB	Glenelg-Urban land complex	0-8	0.32-0.49	N
2UC		8-15		
5A	Glenville silt loam	0-3	0.24-0.32	N
5B		3-8		
6A	Baile silt loam	15-25	0.43	Y
16D	Brinklow-Blocktown channery silt loams	0-3	0.28	N
53A	Codorus silt loam occasionally flooded	0-3	0.49	N
54A	Hatboro silt loam frequently flooded	0-3	0.49	Y
55C	Evesboro loamy sand	3-15	0.17	N
57B	Chillum silt loam	3-8	0.17-0.43	N
57C		8-15		
57D		15-25		
57UB	Chillum-Urban land complex	0-8	0.43	N
58B	Sassafras loam	3-8	0.17-0.37	N
58C		8-15		

TABLE 16: MAP UNIT CHARACTERISTICS OF SOILS OCCURRING WITHIN THE STUDY AREA				
Map Unit	**Map Unit Name**	**% Slope**	**Erodibility**	**Hydric (Y or N)**
59A	Beltsville silt loam	0-3	0.32-0.43	N
59B		3-8		
61B	Croom gravelly loam	3-8	0.17-0.43	N
61C		8-15		
61D		15-25		
61E		25-40		
61UB	Croom-Urban land complex	0-8	0.43	N
65B	Wheaton silt loam	0-8	0.49	N
66UB	Wheaton-Urban land complex	0-8	0.37-0.49	N
66UC		8-15		N
67UB	Urban land-Wheaton complex	0-8	0.49	N
116D	Blocktown channery silt loam, very rocky	15-25	N/A	N
116E		25-45		
400	Urban land	N/A	N/A	N

10.2 Groundwater and Hydrogeology

The US 29 BRT study area lies between two principle aquifers, the Piedmont and Blue Ridge Crystalline-Rock Aquifer and the Northern Atlantic Coastal Plain Aquifer System (illustrated on **Figure A**) (USGS, 2003). Generally, these aquifers are the underground layer of permeable rock or unconsolidated material from which groundwater is extracted. The western boundary of the Northern Atlantic Coastal Plain Aquifer system is the landward edge of Coastal Plain strata where it is taken over by crystalline rocks of the Piedmont Physiographic Province (USGS, 1997).

10.3 Surface Water Resources, Water Quality & Aquatic Habitat

The main source of surface water in the study area is from the Potomac and the Patuxent River basins. The study area is located entirely within the Anacostia River watershed, spanning from the watershed's

northern most boundary to the southern limit. There are four main tributaries of the Patuxent River and sub-basins of the Anacostia that cross through the US 29 study area including Sligo Creek, Northwest Branch, Paint Branch, and Little Paint Branch. **Figure A** illustrates the location of these watersheds.

Sligo Creek is the southernmost stream that crosses the US 29 study area, just north of downtown Silver Spring and south of I-495. Sligo Creek is designated a Use I stream (i.e., suitable for water recreation and support of aquatic life) by the Maryland Department of the Environment (MDE). The condition of fish and macroinvertebrate populations in Sligo Creek has improved due to restoration efforts, however aquatic resources still remain heavily impacted. Sligo Creek is one of the most urbanized subwatersheds within the Maryland portion of the Anacostia watershed; with approximately 90 percent of the total subwatershed area being developed and only about 35 percent of the stream corridor characterized by riparian forest buffer. In general, the overall health of the macroinvertebrate and fish communities in Sligo Creek can be characterized as poor to good (MWCG, 2009).

The Northwest Branch crosses the US 29 study area north of I-495 and south of Route 650 (New Hampshire Ave), and it is designated as a Use IV stream (recreational trout waters) by the MDE. Many efforts to stock the stream and provide an established brown trout population are ongoing by the Maryland Department of Natural Resources (DNR), and joint efforts by the DNR and the Maryland-National Capital Park and Planning Commission (M-NCPPC) have now introduced fingerling smallmouth bass in the vicinity of the Capital Beltway (I-495) and the US 29 BRT study area portion of the Northwest Branch. Today this waterway supports a self-reproducing smallmouth bass fishery (MWCG, 2009).

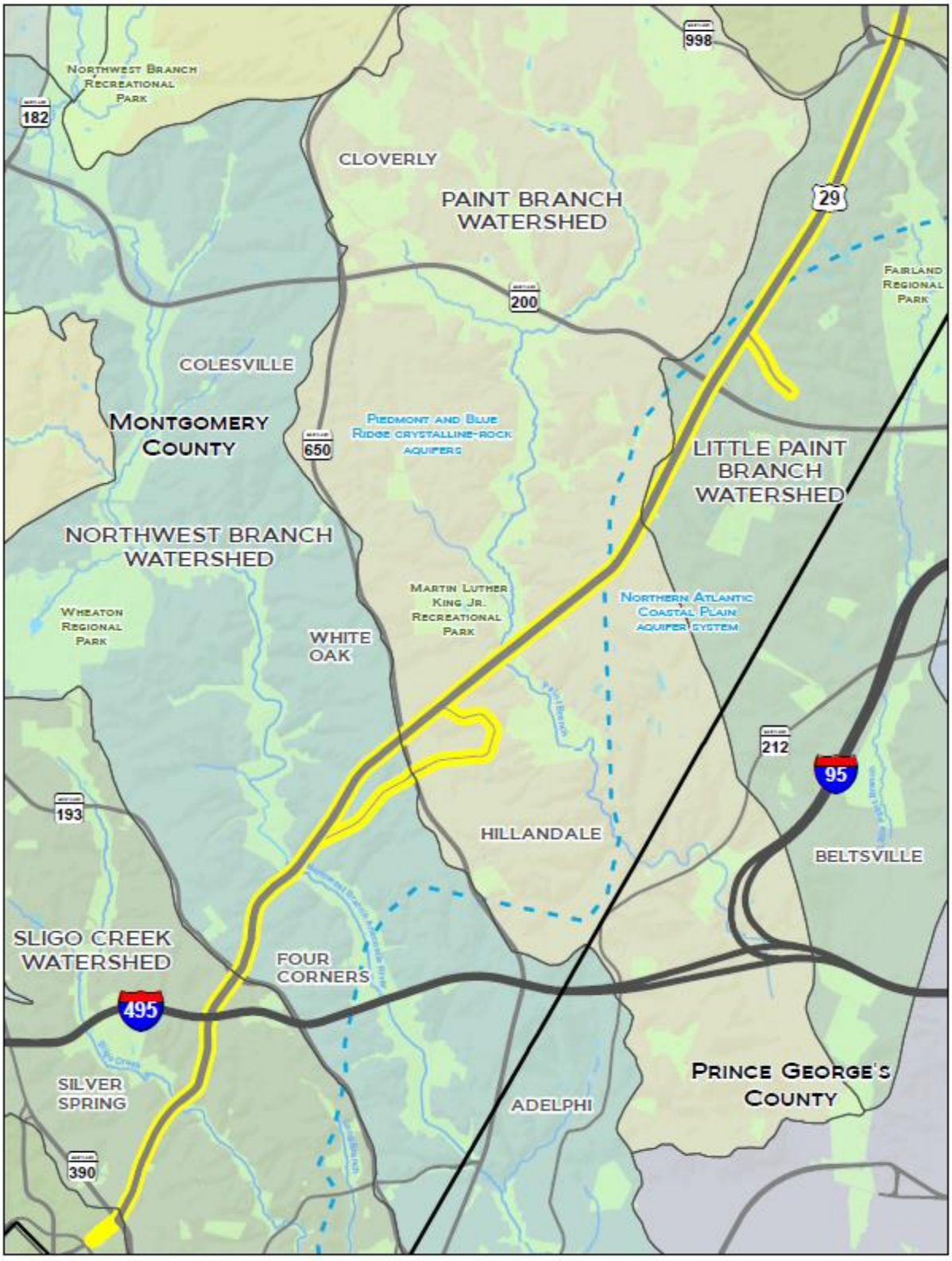


Figure A: Watershed and Aquifer Boundaries

The Paint Branch subwatershed is generally bound by Spencerville Road (MD Route 198) to the north, U.S. Route 29 and Cherry Hill Road to the east, U.S. Route 1 and College Park Airport to the southeast, and New Hampshire Avenue (MD Route 650) to the west. The entire Paint Branch subwatershed upstream of the Capital Beltway and within the study area has been designated by MDE as Use III (natural trout waters). The Paint Branch is often considered the Anacostia's highest quality Piedmont stream system, and it has supported a naturally reproducing brown trout population since the 1930's. In general, the overall health of the aquatic community in the Paint Branch can be characterized as being poor to good for macroinvertebrates and poor to excellent for fish (MWCG, 2009).

The Little Paint Branch subwatershed is primarily located in the Coastal Plain physiographic province, with only the northern most tributaries located in the Piedmont and crossing the northern most portion of the study area. Little Paint Branch is designated a Use I stream, suitable for water recreation and support of aquatic life. In general, the overall health of the macroinvertebrate and fish communities in Little Paint Branch can be characterized as ranging from very poor to good. It has been know to support sensitive species such as mayflies, stoneflies, and caddisflies (MWCG, 2009).

The MDNR Scenic and Wild Rivers program was developed to protect the scenic, recreational, and aquatic habitat values of the State's scenic and wild rivers (SSWR) under the National Wild and Scenic River Act (16 U.S.C Sections 1271–1287). Although the Potomac and the Patuxent Rivers are considered a SSWR, its tributaries within the study area are not and thus coordination under this Act would not be necessary.

10.4 Total Maximum Daily Loads (TMDLs)

A Total Maximum Daily Load (TMDL) calculates the maximum amount of a pollutant that a waterbody can receive while still meeting water quality standards. Section 303(d) of the Clean Water Act requires that a TMDL be developed for the pollutant(s) responsible for impairing a waterbody. Each state compiles a list, which identifies the impaired waterbodies contained within their state, and further broken down into Counties. Currently 733 waters are identified as impaired in the State of Maryland. Since 2004 listing, 109 TMDLs have been completed and 48 waters have met water quality standards and have been removed from the list, while 145 waters have been added to the list (MDE, 2006).

10.5 Waters of the U.S. including Wetlands

According to published resources of the National Wetlands Inventory (NWI) and U.S. Geological Survey (USGS), several wetland systems are identified within and surrounding the US 29 BRT study area (**Appendix B**). A wetland corridor "windshield" identification study was conducted throughout the entire study area to field verify the presence of wetlands and waters identified by the NWI and USGS databases. Additionally, any areas where potential jurisdictional wetlands or waters were identified, the features were sketched onto field mapping and illustrated in **Appendix B** mapping as Observed Wetlands. North of MD 650, and within the 200-foot wide study area, there are several small NWI wetland systems. Four of these wetlands no longer existed and therefore were removed from the mapping. Based on the field survey, an additional nine potential wetland systems were identified within the study area. Hydric soils, hydrophytic vegetation, and hydrology were all noted at each location. Three of these potential palustrine forested wetland (PFO) systems were identified along the west side of Wexhall Drive, parallel to US 29. Another system was identified near US 29 within an existing forest

conservation easement. Two other potential palustrine emergent (PEM) wetlands were identified on the east side of US 29 in the vicinity of Randolph Road. A potential linear PEM was identified along northbound US 29 just north of Stewart Lane. Finally, two potential PFO wetlands were identified along southbound US 29, one at Prelude Drive and one within Sligo Creek Stream Valley Park.

In addition to readily available published wetland information and field observed wetlands, surveyed wetlands are also located on the attached mapping (**Appendix B**). These surveyed wetlands have been completed by the SHA or other consultant firms, for other various projects whose study areas coincide with the US 29 BRT study.

A total of six streams were identified by DNR as crossing under US 29; Sligo Creek, Northwest Branch, Paint Branch, and three small tributaries associated with Little Paint Branch. Field investigations confirmed all of these perennial stream crossings. Several potential intermittent and ephemeral streams associated with these large perennial waters are also located within the study area (**Appendix B**). Areas of roadside grass swales and channels that were not connected to waters of the U.S. were not mapped.

Field delineations completed in accordance with the Regional Supplement to the Corps of Engineers *Wetland Delineation Manual: Eastern Mountains and Piedmont Region, Version 2.0* (USACE, November 2012) would be required to confirm the exact limits of all waters of the U.S., including wetlands, in the study area. Waters of the U.S., including wetlands, are regulated under Sections 401 and 404 of the CWA, the Maryland Tidal Wetlands Act, and the State of Maryland Nontidal Wetlands Protection Act. Any impacts to regulated waters of the U.S., including wetlands, will require authorization from the MDE and the U.S. Army Corps of Engineers (USACE). There are no Wetlands of Special State Concern (WSSC) or associated 100-foot buffers located within the study area.

10.6 Floodplains

Data from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps was obtained to identify 100-year floodplains within the study area (FEMA, 2011). The study area crosses the 100-year floodplain associated with Sligo Creek, Northwest Branch, and Paint Branch. Authorization from MDE is required for project activities that occur within floodplains, including bridges or culverts and temporary construction impacts. Any construction in nontidal floodplains would require a Waterway Construction Permit from the MDE.

10.7 Vegetation and Wildlife

Much of the US 29 BRT study area is occupied by residential land uses, with areas of commercial centers focused around the major intersections and towns. The existing forest within and immediately adjacent to the study area is largely associated with the major stream crossings within existing M-NCPPC parkland: Sligo Creek Stream Valley Park; Northwest Branch Stream Valley Park; and the Upper Paint Branch Stream Valley Park. The forested stream buffers associated with these systems consist of largely mid to late successional deciduous forest of the Oak-Northern Hardwoods Forest Association and are dominated by white oak (*Quercus alba*), northern red oak (*Quercus rubra*), black oak (*Quercus nigra*), tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), American sycamore (*Platanus occidentalis*), and American beech (*Fagus granifolia*).

The canopy species in the mid-successional forest are primarily within the 16 to 28 inch diameter at breast height (dbh) size class throughout the study area with larger trees scattered throughout. Approximately two dozen specimen trees (trees greater than 30 inches dbh or 75 percent of the state champion) were observed during the windshield survey; however, there is the potential for specimen trees within the forest interior that was not visible during the survey, and in private residential areas. Many of these specimen trees were identified in the southern portion of the study area. A moderately diverse understory of shrubs and saplings is present within these larger forest tracts.

In addition to the parkland forest areas, street trees, forest fragments and naturally regenerating areas are present in several locations. Several of these areas contain early to mid-successional forests dominated by tulip poplar, red maple, silver maple (*Acer saccharinum*), American beech, and black cherry (*Prunus serotina*), of approximately 12 to 18" dbh. Additional common tree species include persimmon (*Diospyros virginiana*), white pine (*Pinus strobus*), Virginia pine (*Pinus virginiana*), and along several roadway edges, tree-of-heaven (*Ailanthus altissima*), hawthorne (*Crataegus sp*.), Bradford pear (*Pyrus calleryana*), and black locust (*Robinia pseudoacacia*).

Japanese honeysuckle (*Lonicera japonica*) and greenbrier (*Smilax rotundifolia*) are prevalent in almost all forested locations throughout the study area. Oriental bittersweet (*Celastrus orbiculatus*), poison ivy (*toxicodendron radicans*), and English ivy (*Hedera helix*) are also commonly found. All of the observed forested areas contain a high percentage of invasive plants, particularly vines that in some cases have grown into the canopy layer. The abundance of vines suggests a high amount of light availability, which often results from forest fragmentation.

If this project will require the cutting or clearing of forest greater than one acre, the Maryland Reforestation Law requires that these trees be replaced on an acre-for-acre, one to one ratio on public lands and within two years, or three growing seasons of the completion of the project. If the project will require less than one acre of tree clearing, information will need to be provided to the DNR identifying trees to be impacted and documented under their existing Roadside Tree Blanket Permit.

According to Maryland DNR GIS information, there are several locations of Forest Interior Dwelling Species (FIDS) habitat identified within the study area. FIDS typically require large tracts of forest in which to maintain viable populations. FIDS habitat was identified on the west side of US 29 within the forested stream buffer in Sligo Creek Stream Valley Park; both the east and west of US 29 within the Northwest Branch Stream Valley Park and the Paint Branch Stream Valley Park; and a small portion adjacent to the east side of US 29 along the Little Paint Branch. Coordination with the Maryland DNR Wildlife and Heritage Service is necessary if any impacts to FIDS are proposed.

The US 29 BRT study area is a very densely populated area, especially in the southern portion of the study area; therefore the opportunity for wildlife use is limited, and largely confined to relatively narrow corridors. The existing parkland provides the most abundant habitat available for wildlife, as well as additional local parks in the vicinity of the study area. However the local parks also play host to community activities thus limiting wildlife. Observed wildlife include squirrels, song birds, and falcons, with other evidence of beavers and raccoons.

APPENDIX A

SOCIOECONOMIC FIGURES

INDEX MAP

1 IN = 1,500 FT

WASHINGTON DC

SEE INDEX MAP

WASHINGTON DC

SILVER SPRING

WHITE OAK

FAIRLAND

BURTONSVILLE

SPENCERVILLE RD

INTERCOUNTY CONNECTOR

NEW HAMPSHIRE AVE

POWDER MILL RD

RIGGS RD

UNIVERSITY BL

HIGH ST

MARYLAND 97

29

95

495

1 INCH = 4,500 FEET

0 2,250 4,500 9,000 FEET

LEGEND

- BRT CENTERLINE
- CENSUS BLOCK GROUP
- MINORITY
- POVERTY
- ROADWAY

Montgomery County RAPID TRANSIT US 29

MTA Maryland

SHA State Highway Administration

MONTGOMERY COUNTY 1776 MARYLAND

SOURCES

Maryland Department of Planning. 2014. *Census Blocks 2010*. MD iMap.
Maryland Department of Planning. 2014. *Census Tracts*. MD iMap
Study Area and BRT Centerline created by
Straughan Environmental, Inc.

SHA. 2005. *major_roads*. Baltimore, MD.
SHA. 2012. *SHA Centerline MD All*. Baltimore, MD.

US Route 29 Bus Rapid Transit (BRT)

CENSUS TRACTS AND POTENTIAL ENVIRONMENTAL JUSTICE POPULATIONS

FIGURE 1

FIGURE 1 OF 1

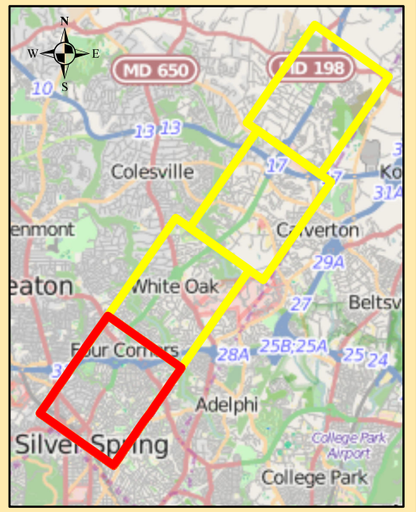
MARCH 2015

US Route 29 Bus Rapid Transit (BRT)

Project Overview Figure 2A

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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Legend

- Study Area
- Federal Land
- NWI Wetlands
- USGS Waters
- Forest Conservation Easements (FCE)
- Historical Districts or Easements (Hist)
- Archeological Sites (Site)
- Floodplain
- Parks (Park)
- Observed Wetland
- Observed Stream
- Specimen Tree

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

Community Facilities

- C-1. Mont. Co. Department of Health & Housing Services
- C-2. City Place Mall
- C-3. Silver Spring Civic Center at Veterans Place
- C-4. Silver Spring Library
- C-5. YMCA Youth & Family Services
- C-6. YMCA Silver Spring Youth Services
- C-7. U.S. Post Office - Woodmoor Station
- C-8. National Children's Center - Silver Spring Masonic Temple

Educational Facilities

- E-1. Sligo Creek Elementary School
- E-2. Silver Spring International Middle School
- E-3. High School and View Elementary School
- E-4. Montgomery Blair High School
- E-5. St. Bernadette School
- E-6. Pine Crest Elementary School

Religious Facilities

- R-1. RCCG Jesus House DC
- R-2. First Baptist Church Of Silver Spring
- R-3. Seventh Day Adventist Church
- R-4. Silver Spring United Methodist Church
- R-5. Iglesia Evangelica Apostoles Y Profetas
- R-6. St Luke Lutheran Church
- R-7. Memorial First India United Methodist Church
- R-8. Christ Congressional Church
- R-9. Knox Orthodox Presbyterian Church
- R-10. The Revelation Universal Evangelical Ministries
- R-11. Silver Spring United Methodist Cooperative Parish
- R-12. Saint Bernadette Roman Catholic Church
- R-13. Nichiren Shosu Myosenji Buddist Temple

Emergency Facilities

- X-1. Silver Spring Fire Department - Station 1
- X-2. Montgomery Co. 3rd District Police Dept.
- X-3. Silver Spring Volunteer Fire Station 16

Historic Sites

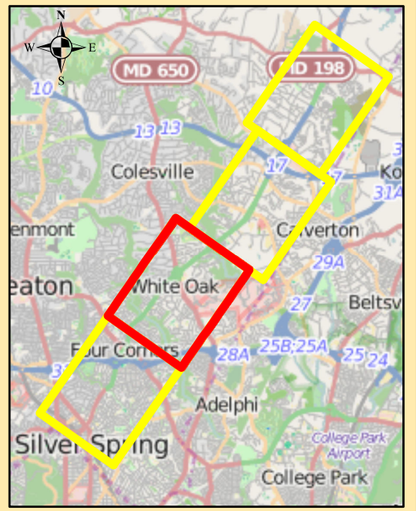
- H-1. Falkland Apartments
- H-2. Canada Dry Bottling Plant
- H-3. Silver Spring B&O Railroad Station
- H-4. Silver Spring Volunteer Fire Department
- H-5. Unknown
- H-6. Little Tavern
- H-7. Old Silver Spring Post Office
- H-8. Old Masonic Temple
- H-9. Tastee Diner
- H-10. J.C. Penny Co. Building
- H-11. Silver Theatre and Silver Spring Shopping Center
- H-12. Armory Place
- H-13. City Place Site
- H-14. Talbot Avenue Bridge
- H-15. Montgomery Arms
- H-16. Grace Episcopal Church Cemetary & Confederate Monument
- H-17. Riggs-Thompson House
- H-18. Unknown
- H-19. Ertter's Market
- H-20. Montgomery Blair High School
- H-21. Wilbur House
- H-22. Watson House
- H-23. Dr. Condict House
- H-24. Mrs. K's Toll House
- H-25. Louis L. Brunett House
- H-26. Sligo Hills Apartments
- H-27. Greater Washington Boy's and Girl's Club
- H-28. Choi Property
- H-29. Gallagher House
- H-30. Williwam Read, Jr. House

US Route 29 Bus Rapid Transit (BRT)

Project Overview Figure 2B

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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Legend

- Study Area
- Federal Land
- NWI Wetlands
- USGS Waters
- Forest Conservation Easements (FCE)
- Historical Districts or Easements (Hist)
- Archeological Sites (Site)
- Floodplain
- Parks (Park)
- Observed Wetland
- Observed Stream
- Specimen Tree

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

Community Facilities
C-1. West Hillandale Swim Club
C-2. Northwest Branch Swim Club - Rec Center
C-3. Rachel Carson Council, Inc. Library
C-4. White Oak Library
C-5. White Oak Community Recreation Center
C-6. Martin L. King Jr. Swim Center

Educational Facilities
E-1. Francis Scott Key Middle School

Educational Facilities Continued
E-2. Cresthaven Elementary School
E-3. The Greater Washington Community Kollel
E-4. Burnt Mills Elementary School
E-5. White Oak Middle School
E-6. Jackson Road Elementary School

Religious Facilities
R-1. Southeast Hebrew Congregation
R-2. Burnt Mills Seventh-Day Adventist Church

Religious Facilities Continued
R-3. Jesus Christ is The Lord Universal Church
R-4. Kingdom Hall of Jehovah Witnesses
R-5. St Stephen Lutheran Church
R-6. Our Lady of Vietnam Parish

Emergency Facilities
X-1. Hillandale Volunteer Fire Department Station 12
X-2. Montgomery County 3rd District Police Station

Historic Sites
H-1. Holly View
H-2. Burnt Mills Bridge
H-3. Robert B. Morse Water Filtration Plant
H-4. George McCeney House
H-5. McCeney Farmhouse
H-6. White Oak Explosives Laboratory
H-7. White Oak Marine Barracks
H-8. White Oak Administration/Lab Building

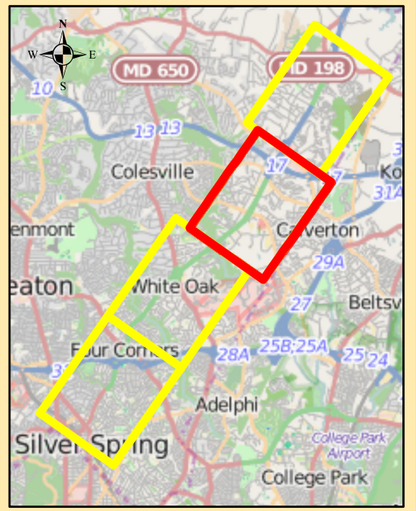
Historic Sites Continued
H-9. White Oak Cafeteria/Auditorium
H-10. White Oak Ordnance Environmental Lab
H-11. White Oak Techical-Public Works Shop
H-12. White Oak Laboratory-Technical Shop
H-13. White Oak X-Ray and Plastics Lab
H-14. Rachel Carson House
H-15. Shaw House
H-16. Bridge 15035

US Route 29 Bus Rapid Transit (BRT)

Project Overview
Figure 2C

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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Legend

- Study Area
- Federal Land
- NWI Wetlands
- USGS Waters
- FCE — Forest Conservation Easements
- Hist — Historical Districts or Easements
- Site — Archeological Sites
- Floodplain
- Park — Parks
- Observed Wetland
- Observed Stream
- Specimen Tree

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

Community Facilities
C-1. Park and Ride
C-2. Calverton Swim Club
C-3. Briggs Chaney Park and Ride
C-4. Eastern Montgomery Regional Center

Educational Facilities
E-1. MCPS West Farm Depot and Vehicle Maintenance Facility
E-2. Galway Elementary School
E-3. Glenallen Elementary School

Religious Facilities
R-1. Casa Del Alfarero Asemblea De
R-2. Reid Temple AME Church
R-3. General Conference of Seventh-Day Adventists
R-4. Forcey Bible Church and Christian School
R-5. Southern Asian Seventh Day Adventist Church
R-6. Calverton Baptist Church
R-7. St Gregorios Indian Orthodox Church
R-8. Nations United Baptist Church
R-9. Allen Chapel AME Church
R-10. Korean Religious Facility

Emergency Facilities
X-1. Montgomery County Department of Police

Historic Sites
H-1. Valley Mill House
H-2. Conley House (Green Ridge)
H-3. St. Mark's Chapel (Paint Chapel)
H-4. Walter Ramsburg Property
H-5. Charles Ramsburg Property
H-6. Julius Marlow House
H-7. Elbert Beckwith House

Historic Sites Continued
H-8. Donald Carle Property
H-9. Robert Hoffman Property
H-10. Willard Marlow House I & II
H-11. Fairland School
H-12. Howard Marlow Property
H-13. Lacy Shaw House
H-14. Fairland Schoolhouse
H-15. Edgar Roby Property
H-16. Ben Petree Property

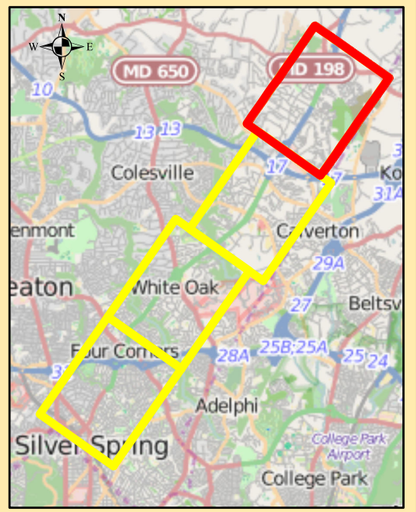
Historic Sites Continued
H-17. Roy Wilson Property
H-18. Joseph Edwards Property
H-19. Hollen House
H-20. Edwards House
H-21. John Norton House
H-22. Joseph Smith Property
H-23. Odorian Robey Property
H-24. Richard Bryant Property

US Route 29 Bus Rapid Transit (BRT)

Project Overview Figure 2D

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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Legend

- Study Area
- Federal Land
- NWI Wetlands
- USGS Waters
- Forest Conservation Easements (FCE)
- Historical Districts or Easements (Hist)
- Archeological Sites (Site)
- Floodplain
- Parks (Park)
- Observed Wetland
- Observed Stream
- Specimen Tree

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

SHA State Highway Administration

Montgomery County Maryland 1776

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Community Facilities

- C-1. East County Community Center
- C-2. Greencastle Park and Ride
- C-3. Marilyn J. Praisner Comm Recreation Center
- C-4. Marilyn J. Praisner Library
- C-5. Idara-e-Jaferia Comm Center
- C-6. USPS Burtonsville

Educational Facilities

- E-1. Greencastle Elementary School
- E-2. Fairland Elementary School
- E-3. Paint Branch High School
- E-4. Benjamin Banneker Middle School
- E-5. Burtonsville Elementary School
- E-6. Providence Christian School

Religious Facilities

- R-1. Islamic Society of the Washington Area
- R-2. Epiphany Lutheran Church
- R-3. Resurrection Catholic Church
- R-4. Renassaince Baptist Church
- R-5. Burtonsville Baptist Church
- R-6. Liberty Grove United Methodist Church
- R-7. Charis Worship Center Ministries
- R-8. Ministerio Puerta de Paz
- R-9. Abundant Grace Church
- R-10. True Holiness Church of Jesus Christ
- R-11. Christ Apostolic Church

Religious Facilities Continued

- R-12. New Hope Korean Church
- R-13. Montgomery Chinese Christian Church
- R-14. Redemption Community Church

Emergency Facilities

- X-1. Burtonsville Volunteer Fire Department

Historic Sites

- H-1. Clarence & Catherine Wright Property
- H-2. Snowden J. Athey Farmhouse
- H-3. William Rich House
- H-4. Burtonsville Schoolhouse
- H-5. Liberty Grove U.M. Church
- H-6. Franklin Gates House

Historic Sites Continued

- H-7. Knox Property
- H-8. Collins Property
- H-9. Josiah Bell House
- H-10. Thomas Waters House
- H-11. Columbia Primitive Baptist Church
- H-12. Pease House
- H-13. Samuel S. Aitcheson House
- H-14. Carroll House
- H-15. John Hardisty House
- H-16. Jackson Yang Property
- H-17. Carroll and V.E. Ricketts Property
- H-18. Stephen C. Beaver House I
- H-19. Stephen C. Beaver House II

Historic Sites Continued

- H-20. Stephen C. Beaver House III
- H-21. Henry S. Krusen House
- H-22. Howard Wooten Property
- H-23. Thomas Connell Property
- H-24. Warren Hoover Property
- H-25. Scott Erbele Property
- H-26. Calverton BPO Elks Property
- H-27. Leroy Snyder House
- H-28. Covenant Orthodox Presbyterian Church Property
- H-29. Itzhak Allal Property
- H-30. Brussard Property
- H-31. Harry T. Burton House

EXISTING LAND USE:

- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Institutional
- Other Developed Lands
- Agriculture
- Forest
- Water
- Wetlands
- Barren Land
- Transportation

MD 198
BURTONSVILLE
29
MD 200
FAIRLAND RD
FAIRLAND
E. RANDOLPH RD
MD 650
CHERRY HILL RD
MD 212
95
WHITE OAK
MD 193
495
MARYLAND 97
SILVER SPRING

N
W E
S

1 INCH = 4,500 FEET

0 2,250 4,500 9,000 FEET

LEGEND:

200-FT STUDY AREA

ROADWAY

Montgomery County RAPID TRANSIT US 29

MTA Maryland

SHA State Highway Administration

MONTGOMERY COUNTY 1776 MARYLAND

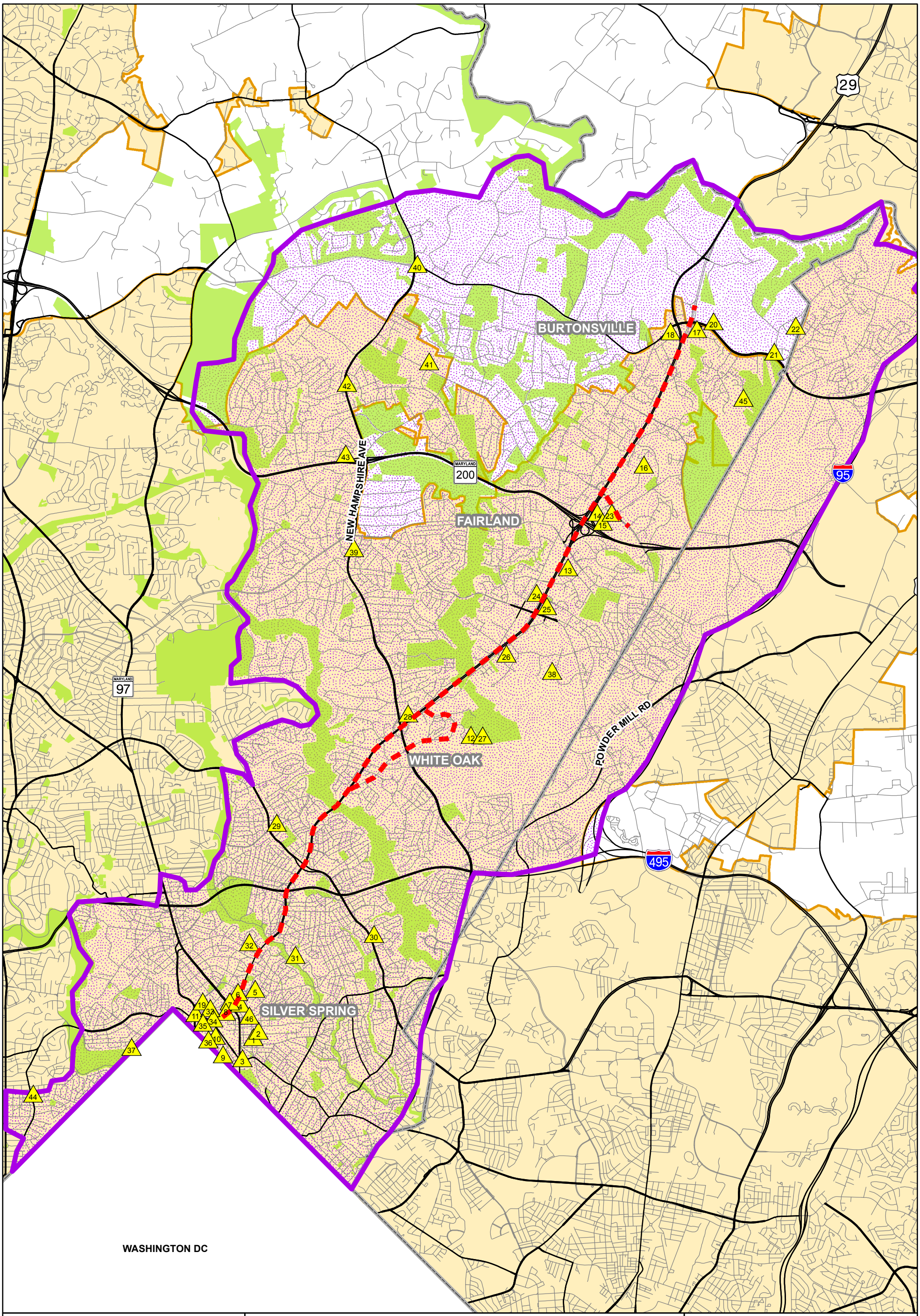
SOURCES

Maryland Department of Planning. 2010. *Maryland Land Use Land Cover*.
SHA. 2012. *SHA Centerline MD All*. Baltimore, MD.
Study Area created by Straughan Environmental, Inc.

US Route 29 Bus Rapid Transit (BRT)

EXISTING LAND USE
FIGURE 3
SHEET 1 OF 1

MARCH 2015



SOURCES

Development file was created using data from The Montgomery Planning Department, Development Activity Information Center (DAIC) and field visits conducted by Straughan Environmental, Inc.
Ice Boundary and BRT Centerline created by Straughan Environmental, Inc.

Maryland Department of Planning. *Maryland Priority Funding Areas*. 2014. MD iMap.
Parkland recieved by Montgomery County
SHA. 2012. *SHA Centerline MD All*. Baltimore, MD.
SHA. 2006. *MDCounties*. Baltimore, MD.
SHA. 2005. *major_roads*. Baltimore, MD.

US Route 29 Bus Rapid Transit (BRT)

INDIRECT CUMULATIVE EFFECTS / PRIORITY FUNDING AREAS

FIGURE 4

SHEET 1 OF 1

MARCH 2015

APPENDIX B

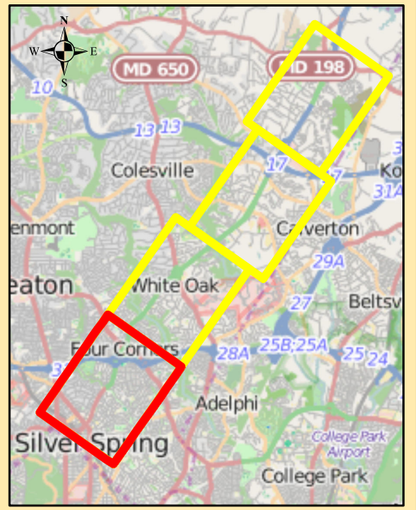
NATURAL ENVIRONMENTAL FIGURES

US Route 29 Bus Rapid Transit (BRT)

Environmental Resources
Sheet 1 of 4

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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Legend

- Study Area
- Federal Land
- NWI Wetlands
- USGS Waters
- Forest Conservation Easements (FCE)
- Watershed SPA
- Potential FIDS
- Floodplain
- Observed Wetland
- Observed Stream
- Soil Map Unit (Soil)
- Specimen Tree

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

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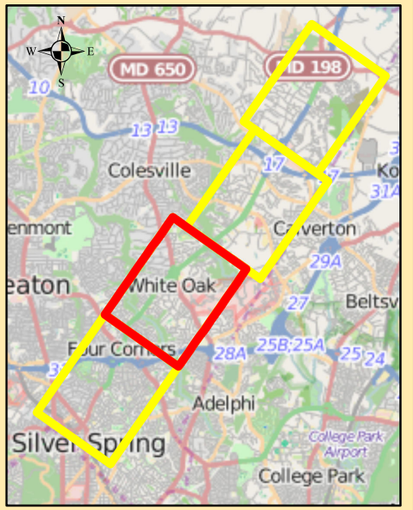
US Route 29 Bus Rapid Transit (BRT)

Environmental Resources Sheet 2 of 4

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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Legend

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- Federal Land / Federal Land
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- Observed Stream
- Soil Map Unit (Soil)
- Specimen Tree

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

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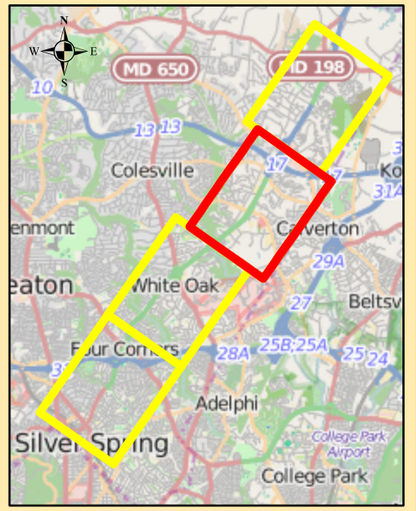
US Route 29 Bus Rapid Transit (BRT)

Environmental Resources
Sheet 3 of 4

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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- Observed Stream
- Soil Map Unit (Soil)
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0 500 1,000 2,000 Feet

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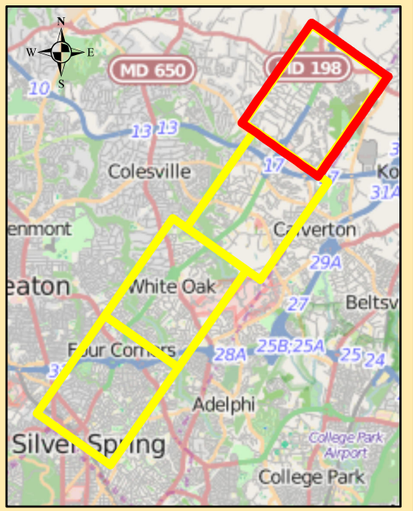
US Route 29 Bus Rapid Transit (BRT)

Environmental Resources
Sheet 4 of 4

Montgomery County RAPID TRANSIT US 29

Vicinity Map



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