FBI HQ
Consolidation

GSA

FBI Headquarters
Consolidation

Appendix C: Draft Transportation Impact Assessment: Greenbelt

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Appendix C

Federal Bureau of Investigation Headquarters Consolidation

Draft Transportation Impact Assessment

Greenbelt Site Alternative

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for

GSA

October 2015

Table of Contents

List of Appendices

List of Tables

List of Figures

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1.0 Introduction

This report presents the findings of the transportation impact assessment (TIA) prepared as part of the Environmental Impact Statement (EIS) that will guide the evaluation of alternatives for a new permanent location for a proposed consolidated Federal Bureau of Investigation (FBI) Headquarters (HQ).

This TIA was performed to determine whether the proposed exchange action of the existing FBI HQ and development of a new consolidated FBI HQ is likely to have a significant impact on transportation, as defined under the National Environmental Policy Act (NEPA).

Three site alternatives in the National Capital Region (NCR) are under consideration for the location of FBI's consolidated HQ. These sites include the Greenbelt site known as Greenbelt Metro Station, and the Landover site known as the former Landover Mall, both in Prince George's County, Maryland, and the Springfield site known as the United States (U.S.) General Services Administration (GSA) Franconia Warehouse Complex located in Fairfax County, Virginia. This study analyzes the transportation impacts of development of a new consolidated FBI HQ in Greenbelt, Maryland. Related TIAs examine the transportation impacts of developing a consolidated FBI HQ at two other alternative sites, while a third TIA examines the indirect impacts of the proposed exchange and future redevelopment of the existing FBI HQ at the J. Edgar Hoover (JEH) parcel in Northwest Washington, D.C. (see Appendices D, E, and B of the EIS). Future developers of the consolidated FBI HQ would likely be required to conduct additional traffic impact studies according to the standards of the jurisdiction that result from changes to the proposed action and/or specific studies required for site plan approval and building or construction permits.

GSA proposes to convey its rights, title, and interests in a parcel (JEH parcel) located in Northwest Washington, D.C., in exchange for development of a new consolidated HQ at an alternative site. The proposed action constitutes a major Federal action that must be analyzed under the provisions of NEPA and Section 106 of the National Historic Preservation Act. Under NEPA, GSA must analyze the direct and indirect impacts of the proposed action.

To adequately analyze the direct impacts, GSA developed a conceptual site plan for the Greenbelt site that best meets and accommodates the purpose of and need for the project. The proposed conceptual site plan describes the nature and possible form of future development that may occur on the Greenbelt site to determine impacts of the proposed action. However, the final form and layout of the future HQ will be decided later in the process, after several other steps are completed.

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2.0 Background

Sections 2.1 and 2.2, respectively, introduce the proposed action and the purpose and need that have warranted this TIA. Section 2.3 outlines the NEPA requirements that initiated the evaluation of transportation impacts for the Greenbelt site, and the framework for evaluating the transportation impacts at this site under each alternative. Section 2.4 summarizes local land use plans within the study area. These plans establish a background for the remainder of the report and provide context for the evaluation of each alternative.

2.1 Proposed Action

The proposed action for the accompanying EIS encompasses two parts:

- acquisition of a consolidated FBI HQ at a new permanent location, and
- exchange of the JEH parcel.

The proposed action would allow GSA to leverage its current assets in exchange for property and services to support the space consolidation efforts of GSA and FBI. The exchange would convey the JEH parcel to the private sector consistent with local land use controls and redevelopment goals for Pennsylvania Avenue.

2.2 Purpose and Need

The purpose of the proposed action is to consolidate the existing FBI HQ offices into one location in the NCR and provide the FBI with an HQ that meets the Interagency Security Committee (ISC) Level V security standards. This standard is reserved for agencies with mission functions critical to national security or the continuation of government.

A consolidated FBI HQ is needed to support information sharing, collaboration, and integration of strategic priorities. Currently, the aging JEH building houses only 52 percent of HQ staff with the remainder dispersed over multiple locations in the NCR. Fragmentation resulting from FBI HQ's multiple locations diverts time and resources from investigations, hampers interoffice coordination, and decreases flexibility. Dispersion across multiple locations also gives rise to redundancy in operations and inefficient use of space. The consolidation is needed to eliminate redundancies and provide for significant space savings.

The proposed action is also needed to provide an FBI HQ that meets ISC Level V security standards. Currently, FBI HQ elements are housed in the JEH building and in multiple locations in the NCR that do not meet the ISC Level V security standards. The FBI needs a complex that supports the mission of the agency and allows it to defend against terrorists, weapons of mass destruction, and other threats. Additionally, as an integral agency for the management of intelligence and national security programs, the FBI needs an HQ that provides highly reliable utilities and infrastructure.

2.3 NEPA Requirements

Council on Environmental Quality (CEQ) regulations require that agencies analyze the potential direct and indirect impacts of the proposed action on the natural and human environment for each alternative, including a No-action Alternative. CEQ regulations define direct impacts as those "which are caused by the action and occur at the same time and place," and indirect impacts as those "caused by the action and are later in time... but are still reasonably foreseeable" (see 40 CFR § 1508.8[b]). Therefore, the EIS accompanying this TIA evaluates the direct and indirect impacts of the proposed action for each action alternative (Greenbelt, Landover, and Springfield) and for the No-action Alternative, which provides a baseline for evaluating the impacts of each action alternative. The four alternatives evaluated in the EIS are as follows:

No-action Alternative: FBI HQ would not consolidate, and its staff and operations would remain dispersed throughout the NCR at JEH and other leased facilities.

Greenbelt Action Alternative: FBI HQ staff and operations would be consolidated at the Greenbelt site, and the JEH parcel would be exchanged to an exchange partner. The range of indirect impacts resulting from the exchange of the JEH parcel are evaluated based on two reasonably foreseeable development scenarios (RFDSs).

Landover Action Alternative: FBI HQ staff and operations would be consolidated at the Landover site, and the JEH parcel would be exchanged to an exchange partner. The range of indirect impacts resulting from the exchange of the JEH parcel is evaluated based on two RFDSs.

Springfield Action Alternative: FBI HQ staff and operations would be consolidated at the Springfield site, and the JEH parcel would be exchanged to an exchange partner. The range of indirect impacts resulting from the exchange of the JEH parcel is evaluated based on two RFDSs. RFDSs are defined and described in detail in Section 2.5 of the EIS.

The exchange of the JEH parcel would be required to consolidate the FBI HQ at any of the sites under consideration; therefore, the exchange of the JEH parcel is a component of the proposed action common to each action alternative. This TIA analyzes the transportation conditions associated with the Greenbelt site only; an assessment of the impacts under the Greenbelt Action Alternative, which would include the exchange of the JEH parcel, is found in Section 4.2.9 of the EIS. To comprehensively evaluate transportation impacts for the Greenbelt site, this TIA evaluates the following conditions:

- Existing Condition: existing transportation system conditions, current to the year 2014.
- No-build Conditions: future transportation system conditions assuming FBI HQ *is not* consolidated at the Greenbelt site for the horizon year of 2022. There is more than one No-build Condition for Greenbelt, and further details are found in Section 4 of this TIA.
- Build Condition: future transportation system conditions assuming FBI HQ *is* consolidated at the Greenbelt site for the horizon year of 2022.
- Build with Mitigation Condition: future transportation system conditions assuming FBI HQ *is* consolidated at the Greenbelt site for the horizon year of 2022 *and including* mitigation measures that would avoid or minimize adverse impacts on, or enhance the quality of, the natural and human environment.

The analysis presented in this TIA and summarized in Sections 5.2.9 of the EIS details the evaluation of each condition for the Greenbelt site.

The No-build Conditions and Build Conditions at the Greenbelt site correspond to different alternatives, as shown in table 2-1. The No-build Conditions at Greenbelt correspond to the EIS No-action Alternative. The No-build Conditions at Greenbelt also correspond to the Landover Action Alternative and the Springfield Action Alternative because FBI HQ would not be consolidated at Greenbelt if either the Landover site or the Springfield sites are chosen. The Build Condition for Greenbelt corresponds to the EIS Greenbelt Action Alternative.

Table 2-1: Greenbelt Site Conditions Corresponding to Each Alternative

Alternatives Evaluated in the EIS	Greenbelt Site	
	TIA No-build Conditions	TIA Build Condition
No-action Alternative	x	
Greenbelt Action Alternative		x
Landover Action Alternative	x	
Springfield Action Alternative	x	

The analysis of the transportation impacts associated with the Landover and Springfield sites is found in Section 6.2.9 and Section 7.2.9 of the EIS, respectively, as well as in the corresponding TIAs. Indirect transportation impacts associated with the future development of the JEH parcel are found in Section 4.2.9 of the EIS and in the corresponding TIA.

Impacts associated with the alternatives are analyzed in the No-build and Build Condition sections. Potential impacts are described in terms of:

- **Type**: the positive or negative effects of an action – ***beneficial***, reducing congestion or barriers and/or improving travel patterns, safety, or travel time; ***adverse*,** increasing congestion or barriers and/or degrading travel patterns, safety, or travel time.
- **Category**: the type of effects – ***direct effects*** are caused by the action and occur at the same time and place; ***indirect effects*** are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.
- **Duration**: the length of time of the effects – ***short-term***, lasting during construction or up to one year after; ***long-term***, lasting more than one year.
- **Intensity**: see below

The thresholds for determining the intensity of effects on local pedestrian, bicycle, transit, parking, traffic networks, and truck access are guided by the following definitions:

- **Not Measureable** – a localized impact that is barely perceptible to most users.
- **Beneficial or Adverse** - a localized impact that is measurable to most users.
- **Adverse Major** – a broad area impact that is highly noticeable and would substantially affect a large numbers of network users.

Because both traffic and transit entail extensive analysis, more detailed impact thresholds have been established for these transportation modes. See table 2-2 for these specific impact thresholds. Any impact thresholds included in table 2-2 would be compared to the previous condition or the No-action/No-build Condition, or against the corresponding condition of another site.

Table 2-2: Traffic and Transit Impact Thresholds

Impact Thresholds	Traffic	Transit
Adverse Major	Delays impact corridors of the study area creating more of a regional impact dealing with several intersections that are key to the operation of the roadway. A corridor can be defined as several adjacent intersections along the same roadway providing a vital connection between roadways or important passage through a highly congested area.	An increase in transit ridership that creates modest passenger delays, measured as increasing volumes above Washington Metropolitan Area Transportation Authority (WMATA) thresholds for capacity at any combination of two of the following: individual Metrorail facility elements (vertical elements, faregate aisles, or platform capacity) or bus routes (including substantial delays from roadway operations.
Adverse	Delays are localized, such as at independent intersections.	An increase in transit ridership that creates minimal passenger delays, measured as increasing volumes above WMATA thresholds for capacity at any one of the following: individual Metrorail facility elements (farecard vending machines) or bus routes (including substantial delays from roadway operations).
Not Measurable	Delays are not perceptible to most users and the number of users is within capacity. Improvements to traffic operations (travel time, throughput, or delays) are also not perceptible to most users.	Condition would not degrade or improve transit capacity or change the overall transit level of service provided to users.
Beneficial	Improvements to traffic operations (travel time, throughput, or delays)	An increase in transit service or capacity for Metrorail facility elements (farecard vending machines) and/or bus routes (including reduced delays from roadway operational improvements).

2.4 Local Land Use Plans

2.4.1 Existing Land Use

The site is bordered by a wooded area on south, Cherrywood Lane and a residential neighborhood to the east, a rail corridor on the west, and an Interstate highway to the north. Development near the site includes single family housing, low-rise apartment complexes, suburban office parks, a WMATA rail yard, and a Federal courthouse. Commercial strips and agricultural land use occur approximately 1 mile from the site. The site is situated in a fairly populated suburb of Washington, D.C. Figure 2-1 illustrates the land uses, within a quarter mile radius of the site, according Maryland Department of Planning Anderson Level II land use/land cover categories.

Figure 2-1: Existing land Use Map

2.4.2 Planning Context

The Greenbelt Metro Station, which is located in Prince George's County, Maryland, was completed in 1993. The site itself contains the Metro platform and station serving the Green and Yellow lines on the Washington Metro system, surface parking lots with more than 3,300 parking spaces, two sets of automated parking payment facilities, a Kiss & Ride/bus drop-off/pick-up area, and wetlands and open space on the southern side of the site. The site is bounded by Greenbelt Metro Drive to the east and Greenbelt Station Road to the north, west, and south. Adjacent to the Greenbelt site is a Maryland Area Regional Commuter (MARC) rail station and railway right-of-way and tracks running from the southwest to the northeast (CSX and metro), wetlands and open space to the south, residential communities to the east, and the Capital Beltway (Interstate [I]-495) to the north.

The area surrounding the Greenbelt site was originally developed as agricultural land in the eighteenth and nineteenth centuries (M-NCPPC 2013). In the 1830s, the Washington line of the Baltimore and Ohio Railroad (now CSX) was built in the stream valley adjacent to the Greenbelt site. Suburban residential development began in earnest in the area in the twentieth century starting with the planned community of Greenbelt to the east, just outside of what is now the Capital Beltway. The Capital Beltway itself was planned in the 1950s and opened in the early 1960s. Major roadway improvements during this time period spurred suburban growth along their corridors, including Springhill Lake apartment complex adjacent to the Beltway, now known as Franklin Park at Greenbelt Station (just east of the site adjacent to Cherrywood Lane). Springhill Lake was the largest garden apartment complex on the East Coast at the time it was constructed, and when completed included nearly 2,900 apartment and townhouse units, social and retail services for its residents to help build a spirit of community, and later an elementary school and shopping center within walking distance along with parking lots located at the perimeter of each section to maximize green space. The Greenbelt Metro Station completed its parking infrastructure that exists today by 1998, and the site and surrounding property has remained relatively unchanged since that time (GSA 2015). Ongoing projects continue to shape the area surrounding the Greenbelt site including the Greenbelt Sector Plan and Sectional Map Amendment and the City of Greenbelt Pedestrian and Bicyclist Master Plan. Both plans envision Greenbelt as an interconnected, vibrant, and diverse mixed-use, transit-oriented eco-community (City of Greenbelt January 2014).

2.4.3 Federal Elements of the Comprehensive Plan for the National Capital

The Federal Elements of the Comprehensive Plan for the National Capital address matters related to Federal properties and interests in the NCR, which include the District of Columbia; Montgomery and Prince George's Counties in Maryland; Arlington, Fairfax, Loudoun, and Prince William Counties in Virginia; and all cities within the boundaries of those counties. The Federal Elements were prepared pursuant to Section 4(a) of the National Capital Planning Act of 1952. The seven Federal Elements presented in the Comprehensive Plan are (1) Federal workplace, (2) foreign missions and international organizations, (3) transportation, (4) parks and open space, (5) Federal environment, (6) preservation and historic features, and (7) visitors. The National Capital Planning Commission (NCPC) develops and administers these Federal Elements, which were last updated in 2004 (NCPC 2004; GSA 2008).

The Federal Elements of the Comprehensive Plan for the NCR provide criteria for the location of Federal facilities and policies on Federal employment in the NCR. The goals of the elements regarding land use include:

- Maintain Washington, D.C. as the seat of the national government by enhancing the Federal workforce through efficiency, productivity, and economic well-being.
- Ensure Federal developments are compatible with adjacent neighborhood uses.

- Develop and maintain a multi-modal regional transportation system that meets the travel needs of residents, workers, and visitors.
- Conserve and enhance the park and open space system of the NCR.
- Promote an appropriate balance between open space resources and the built environment.
- Preserve and enhance upon the guiding principles of the L'Enfant and McMillan Plans.

The transportation policies included in the Federal Elements of the Comprehensive Plan are built upon the principles of transit-oriented development and smart growth (NCPC 2004). In conjunction with the location and design policies of the Federal Element, the transportation policies focus on maximizing the access of federal facilities to the region's extensive transit system. Goals regarding transportation for the NCR area include increased capacity and connectivity, congestion management and improved air quality, balanced land use and smart growth, and transportation options beyond the private automobile.

2.4.4 Plan Prince George's 2035

Plan Prince George's 2035 was initiated by the Maryland-National Capital Park and Planning Commission (M-NCPPC) to examine recommendations for guiding future development in Prince George's County. The plan designates eight regional transit centers as the focus of the county's planned growth and mixed-use development that have the capacity to become major economic generators (M-NCPPC 2014a). The plan contains recommended goals, policies, and strategies for a multitude of elements, including transportation and mobility.

Plan Prince George's 2035 policies are shaped by a desire to create a transportation network that provides convenient and equitable multi-modal access to jobs and services. The Purple line, a proposed 16-mile, 21-station east-west light rail transit line extending inside the Capital Beltway from New Carrollton to Bethesda in Montgomery County, is one of several planning efforts to realize a connected, equitable, and multi-modal transportation system. The Purple line would connect the major central business districts and activity centers of Takoma/Langley Park, College Park/University of Maryland (one stop from Greenbelt on the Green line), New Carrolton, Bethesda, and Silver Spring. The new line would provide direct connections to Metrorail at New Carrollton, College Park, Silver Spring, and Bethesda which would link the Orange, Green, and Red lines.

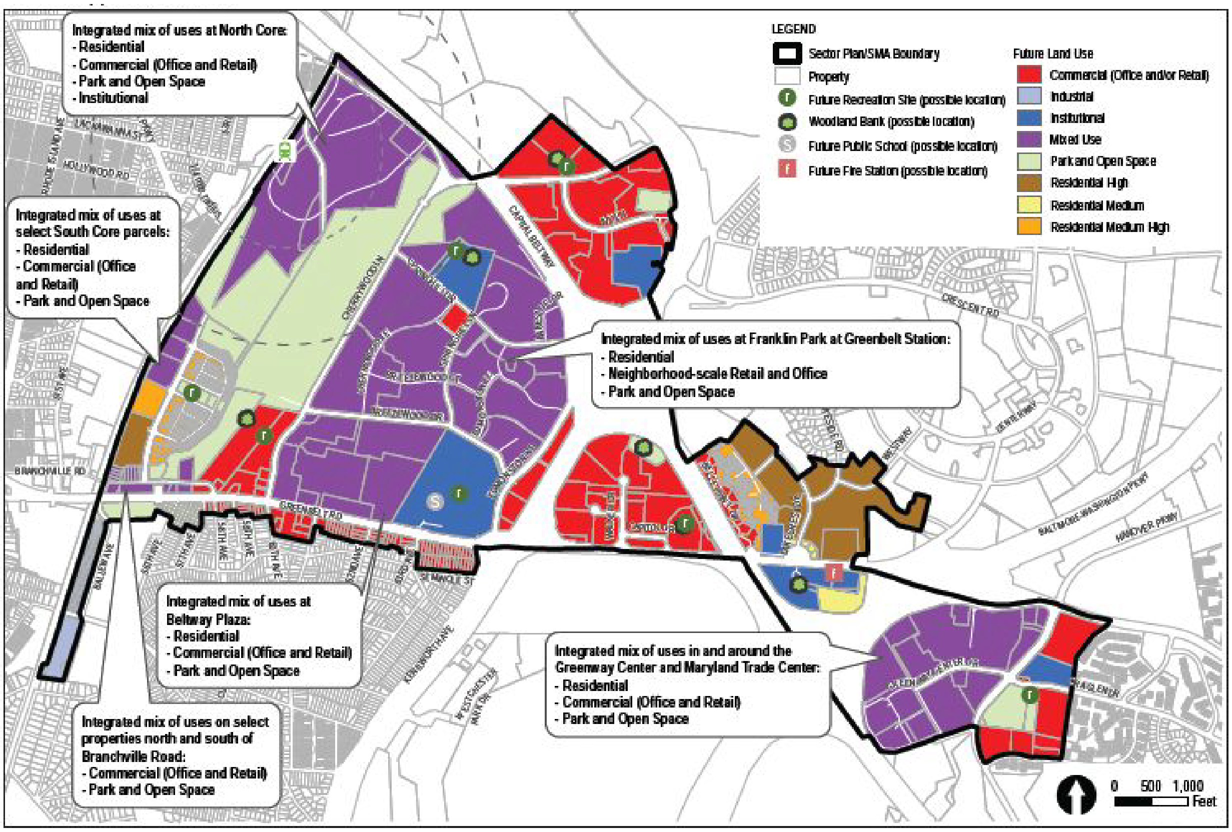
To ensure the vision of a strong, multi-modal transportation network, the Plan Prince George's 2035 developed a variety of policies and strategies to move the project forward. The county plans to ensure that countywide transportation improvements are integrated with and support the 2035 vision and land use pattern through capital road improvements and streetscape enhancements, designated bicycle-pedestrian priority areas (BPPAs), bike and car sharing programs, physical connections between new and existing developments, and the conversion of existing arterial roadways to multi-way boulevards where feasible.

The plan also envisions an expanded and improved transit service that would invest in existing bus service and new bus and light rail service. In addition, the plan would identify new transitway corridors to support the 2035 guidelines and priorities, implement the recommendations for MetroBus priority Corridor Networks recommended in Momentum – The Next Generation of Metro (Strategic Plan 2013–2015) (WMATA 2014a), use complete street practices to design and operate the transportation network to improve travel conditions, improve overall safety levels within the country's transportation network, and ensure that minimum and maximum parking requirements for transit-accessible areas are appropriate to advance the overall goals of Plan Prince George's 2035. Complete street policies and designs call for streets to be planned, built, operated, and maintained to enable safe, convenient transportation options for all users regardless of the mode of transportation or the age and abilities of the person.

2.4.5 Greenbelt Sector Plan and Sectional Map Amendment

The Greenbelt Sector Plan and Sectional Map Amendment (SMA) was initiated by the Prince George's County Planning Department in March 2014 and envisions the development of the Greenbelt Metro Metropolitan Center as an interconnected vibrant, and diverse mixed-use, transit-oriented eco-community that builds on the historic commitment to sustainability of the City of Greenbelt and Town of Berwyn Heights (Prince George's County Planning Department 2014). The study designates goals and objectives for multiple components of planning for the City of Greenbelt including land use and urban design, environmental infrastructure, transportation, economic development, and housing and neighborhood preservation. The approved land use plan for the Greenbelt site and surrounding area, shown in figure 2-2, indicates the desired mix of land uses that may occur on a given property.

Figure 2-2: Greenbelt Sector Plan and SMA Approved Land Uses



The sector plan's goals and objectives for transportation, including safety, connectivity, mobility, and access, include:

- Facilitate alternative forms of transportation by providing a continuous network of sidewalks, bikeways, and trails.
- Implement reconfigured road lanes, dedicated bicycle facilities, and wide sidewalks along MD 193 to maximize pedestrian friendliness.
- Construct additional trail connections and facilities to connect neighborhoods with Greenbelt Metro Station, the Indian Creek stream valley, and regional trail networks.
- Consider a new alignment of the Greenbelt Station Parkway that minimizes impacts.

- Run the potential realignment of Narragansett Run while ensuring any additional temporary impacts on the waterway would accommodate the construction of the Greenbelt Station Parkway Bridge.
- Provide full interchange movements from Greenbelt Metro Station to and from the Capital Beltway (I-95/I-495).
- Redesign the MD 193 Bridge over Kenilworth Avenue to eliminate dangerous left-hand turns, streamline traffic flow, and enhance pedestrian and cyclist safety.
- Implement a comprehensive wayfinding system for orientation and to help direct people and traffic to major destinations and attractions.
- Recommend a comprehensive managed parking program.
- Explore the use of alternative means of addressing comprehensive transportation networks and traditional measurements of adequate public facilities for transportation.

2.4.6 City of Greenbelt Pedestrian and Bicyclist Master Plan

The Pedestrian and Bicyclist Master Plan initiated by the Greenbelt Planning Office in January 2014 guides improvements in the conditions for walking and cycling throughout the City of Greenbelt by providing a series of recommendations (City of Greenbelt 2014). Recommendations are divided into five sections: general recommendations, location-specific recommendations, location-specific concepts, pedestrian recommendations, and bicyclist recommendations.

Overall, the plan has the following goals:

- Establish a long-range vision that prioritizes pedestrian and bicycle travel and specific goals for improving conditions for bicycling and walking.
- Establish a safe street environment for pedestrians, bicyclists, and drivers.
- Establish a pedestrian and bicycle network accessible by all.
- Establish an easy-to-use pedestrian and bicycle network with direct connections to destinations.
- Establish a safe environment that feels comforting and inviting to pedestrians and bicyclists.
- Coordinate with Prince George's County M-NCPPC to amend the county zoning code and other development requirements to ensure safer, more comfortable, and more convenient bicycle and pedestrian access and accommodations for new and renovated commercial and retail establishments.
- Slow vehicular speeds, and improve visibility at locations where paths intersect streets.
- Improve bicyclist comfort and safety on the existing bicycling network, and clarify its location and extent, by adding on-road bicycling facilities and improving paths designated for shared use.
- Take steps to ensure an adequate supply of well-designed and conveniently located bicycle parking facilities at shopping centers, office buildings, community facilities, and multi-family residences.

2.5 Regulatory Requirement and Transportation Assumption Agreement

2.5.1 National Capital Planning Commission Requirements

There a number of other assumptions that are considered in transportation analysis including those determined by regulatory requirement. An example of one assumption of this nature is the parking ratios developed for each alternative site as stated in the Federal Elements section of the Comprehensive Plan for the National Capital (NCPC 2004). In response to regional congestion and air quality levels, NCPC has recommended that parking be provided only for those federal employees who are unable to use other travel modes. To accomplish this policy, NCPC has created parking ratio goals for federal facilities based on their location to available transit services, walking distances and conditions in the surrounding area, and other criteria. Parking ratios are the number of parking spaces available per employee population. Suburban facilities within 2,000 feet of Metrorail should have one parking space for every three employees (1:3) according to NCPC; therefore, the amount of parking at the Greenbelt site has been determined based on this requirement.

2.5.2 Jurisdictional Agreement

Prior to initiating the transportation analysis, it was essential to determine what analysis tools, data parameters, and assumptions would provide the basis of the analysis. In coordination with GSA, the project team met with Maryland State Highway Administrative (Maryland SHA), M-NCPPC, Prince George's County, and the City of Greenbelt to come to an agreement on the assumptions to follow for each site.

M-NCPPC, through its scoping process (M-NCPPC 2012a), requires that a scoping form be approved prior to analysis outlining the agreed upon level of detail, the data parameters, and type of analysis. These parameters and assumptions include a study area, trip generation, trip distribution, modal split, analysis years, analysis methods, and No-action/No-build transportation assumptions (background growth, planned developments, and planned roadway improvements).

Because access to the site was available by Interstate, the site agreements included guidance to analyze the Interstate facilities. This include which software to use, the specific facilities to study, the time period and EIS Condition, and pass/fail analysis threshold.

Appendix C1 contains the Greenbelt Site Transportation Agreement.

3.0 Existing Condition: Greenbelt Study Area

This chapter introduces the study area for the Greenbelt site in Prince George's County, Maryland. The chapter provides a summary of the existing transportation conditions within the study area as of March 2015. Data were collected between November 2014 and March 2015 with traffic counts obtained as early as March 2014 and include descriptions and include descriptions of the study area, pedestrian network, bicycle network, public transit system, parking conditions, truck access, traffic operations, and crash analysis. Separate TIA documents have been written for the other two site alternatives (Landover and Springfield) and the exchange of the JEH parcel in Washington, D.C.

3.1 Introduction

This section describes the transportation study area and the roadways serving it, followed by a summary of the data collection process.

3.1.1 Study Area Description

The proposed Greenbelt site includes approximately 65 acres and is located within a fairly populated suburb of Washington, D.C., in Prince George's County, Maryland. The Greenbelt site is bordered by a wooded area on the east and south adjacent to Cherrywood Lane, the Greenbelt Metro Station and the Washington, D.C. Metrorail corridor on the west, and the Capital Beltway to the north. Development in proximity to the site includes low-rise apartment complexes, suburban office parks, a local park, a WMATA rail yard, an elementary school, and a Federal court facility. There are also nearby commercial strips and agricultural-use land approximately one mile from the site.

The larger vehicular transportation study area, as shown in figure 3-1, is generally bounded by the CSX and Metrorail lines on the west of the site, Greenbelt Road (MD 193) to the south, Edmonston Road (MD 201) on the east, and Cherrywood Lane and Greenbelt Metro Drive to the north. Two additional intersections are studied to the north of this described area, extending north to Edmonston Road (MD 201). The vehicular study area incorporates all of the intersections agreed upon for detailed study by GSA and the local and state transportation agencies, as well as the adjacent merge/diverge/weaves along I-95 for the existing ramps that would serve the proposed FBI vehicle trips. The vehicular traffic study area includes intersections between the proposed sites and regional highway network or last major decision point before entering a freeway facility. The determination of intersections to include for detailed study further considered the intersections along roadways reasonably anticipated to carry a substantial portion of employee vehicle traffic percent based on trip generation data. The study area only includes the selected intersections, but it does not have a clearly defined study boundary; it was established in consultation with M-NCPPC, City of Greenbelt, and Maryland SHA and includes a total of 13 intersections for the Existing Condition analysis.

The study area analyzed for the other transportation modes generally includes all areas within a 0.5-mile buffer of the site. A 0.5-mile radius was chosen in consultation with the WMATA and is an industry standard for analyzing those pedestrian trips which are comfortably accessible to transit, and is commonly used as a typical walk-shed. To be consistent among non-vehicular traffic modes, the bicycle and parking impacts were also evaluated within a 0.5-mile radius from the site.

Figure 3-1: Greenbelt Transportation Study Area

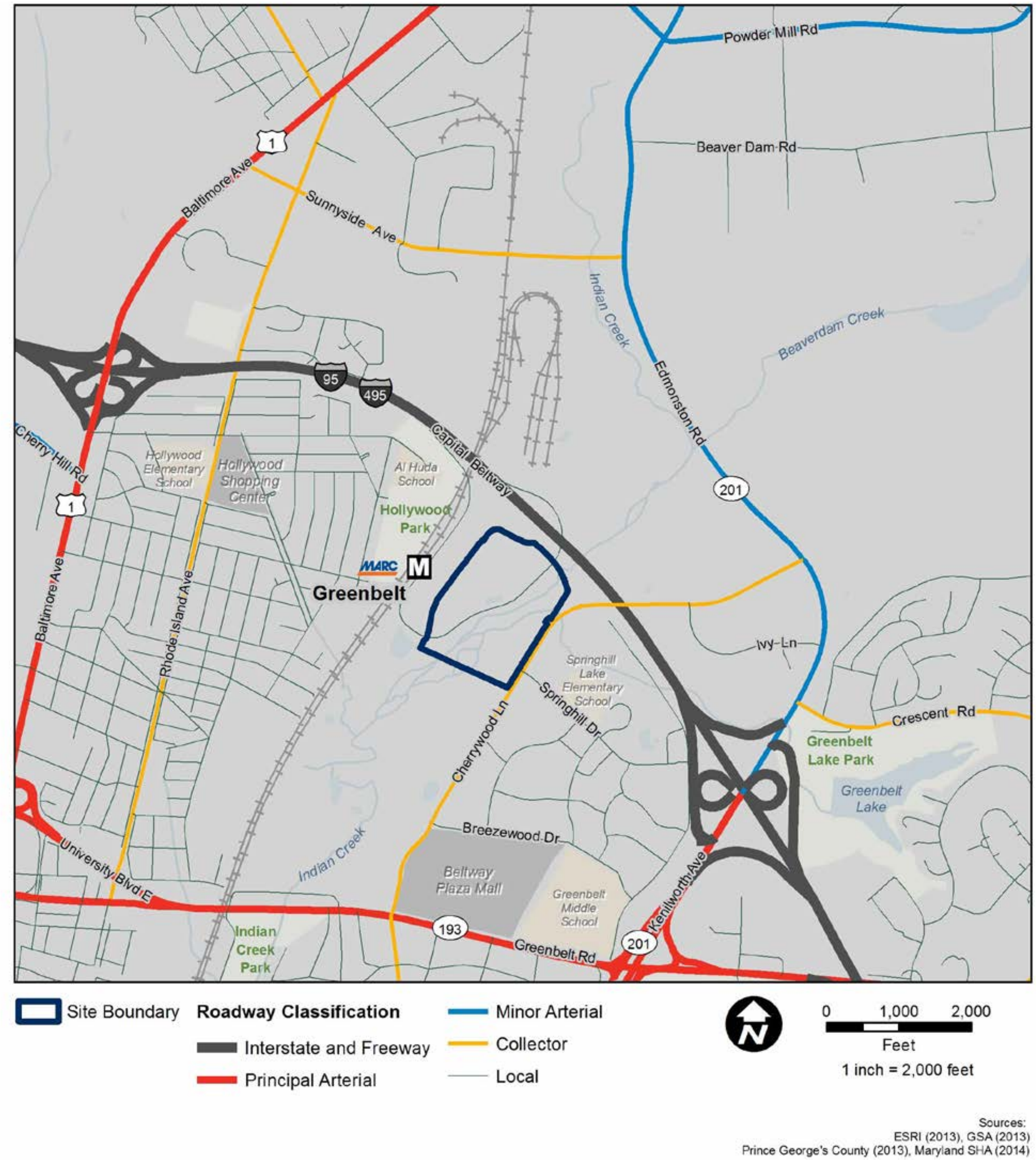
3.1.2 Project Area Accessibility and Roadway Functional Classification

The Greenbelt site is primarily served by the Capital Beltway (also known as Interstate 495 [I-495]) and Cherrywood Lane, both of which lie north and southeast of the parcel, respectively. The Capital Beltway is classified as an interstate, according to the Maryland SHA (Maryland SHA 2014a), and provides direct inbound access to the site via the I-495 south/eastbound ramp and outbound access to I-495 via the I-495 north/westbound ramp. The Greenbelt site does not have inbound access from I-495 north or outbound access from I-495 south, therefore points south of Greenbelt must access the site via local arterial and collector roadways, typically after existing at the I-495/MD-201 Interchange just south of the site. Cherrywood Lane provides north-south access to Kenilworth Avenue/Edmonston Road (MD 201) to the north and Greenbelt Road (MD 193) to the south.

The Greenbelt site is served by transit including Metrorail, rail, local bus, intercity bus, and several shuttles, as well as carsharing services. The site has wide sidewalks along parts of Greenbelt Metro Drive to serve pedestrians walking to and from their vehicles or from buses and shuttles. Apart from Greenbelt Metro Drive, sidewalks are found on Cherrywood Lane, Ivy Lane, along some of the residential streets to the northwest and southeast of the Greenbelt site, and on Greenbelt Road. Some bicycle facilities exist including bike parking stations and bike lanes that traverse Rhode Island Avenue and parts of Cherrywood Lane, as well as a mixed-use path along Greenbelt Metro Drive.

The roadway functional classifications within the study area according to Maryland SHA are shown in figure 3-2 (2014a). The functional classification is the process by which public streets and highways are grouped into classes according to the character of service they are intended to provide. Interstates, freeways, and expressways provide the highest level of service at the greatest speed for the longest uninterrupted distance, followed by principal arterials, minor arterials, collector roads, and finally local roads. The primary interstate within the study area providing regional access is I-495. The study area includes several arterials, Kenilworth Avenue or Edmonston Road (MD 201) and Greenbelt Road (MD 193), as well as Route 1 (Baltimore Avenue) to the west of the study area and Powder Mill Road at the northern edge of the study area. In addition to Cherrywood Lane, Rhode Island Avenue, Sunnyside Avenue, and Crescent Road are also classified as collector roadways that collect traffic from local roads and connect then with arterials. Local roadways in the study area include Greenbelt Metro Drive, Breezewood Drive, Springhill Drive, and Ivy Lane.

Figure 3-2: Roadway Hierarchy and Classification



3.1.3 Roadway Descriptions

The following section describes the roadways within the study area, including the roadway classification (arterials, collectors, local roads, etc.) assigned by Maryland SHA in their latest roadway functional classification from 2013, the number of lanes in each direction, the latest Annual Average Daily Traffic (AADT) volumes (12-months of traffic volumes averaged) available from Maryland SHA from 2013, and any noteworthy characteristics such as the roadway's role within the transportation network and if bike lanes are present. The information was collected from Maryland SHA's 2013 Functional Class GIS data (Maryland SHA 2014a), observations in the field, aerial imagery, and Maryland SHA's AADT's of stations for the years 2007-2013 (Maryland SHA 2014b).

Capital Beltway, also known as I-495, travels northeast of the study area, and forms a circle around Washington, D.C. It is a two-way roadway that is classified by Maryland SHA as an Interstate (2014a). The roadway is northwest-southeast oriented at the location of the Greenbelt site and connects Maryland to Virginia. The roadway ranges between four to six lanes in each of the northbound and southbound directions. In the vicinity of the Greenbelt parcel, the Capital Beltway connects to Greenbelt Metro Drive (a local roadway serving the Greenbelt Metro Station), Baltimore Avenue/Route 1 (a principle arterial), and Kenilworth Avenue (also an arterial road). The Capital Beltway serves as a major regional and commuter route between Maryland, Virginia, and Washington, D.C. The Capital Beltway speed limit is 55 mph. In 2013, the AADT for the Capital Beltway when traversing through the study area was 216,900 vehicles (Maryland SHA 2014b).

Cherrywood Lane is a southwest –northeast oriented roadway that is classified by Maryland SHA as a major collector road (2014a). The road connects to Greenbelt Metro Drive, and travels over the Capital Beltway, but does not connect to it. The road travels from Greenbelt Road on the southwest side of the site northeast towards Edmonston Road (MD 201). In addition this road connects to secondary residential roadways such as Breezewood Drive, Cherrywood Court, and Springhill Drive. The road varies between one lane in each direction near the Greenbelt site to two lanes in each direction near its ends points with Edmonston Road and Greenbelt Road. The roadway has a shared center left turn lane and striped median along most of its length in the study area with periodic on-street parking on the eastern (northbound) side of the street. Cherrywood Lane has a speed limit of 30 mph south of Springhill Drive and 35 mph north of Springhill Drive. According to Maryland SHA, the AADT for Cherrywood Lane in 2013 was 8,500 vehicles (Maryland SHA 2014b). Cherrywood Lane also has bicycle lanes on either side of the street between Edmonston Road to the north and Breezewood Drive to the south.

Rhode Island Avenue is north-south oriented, and is classified as a major collector roadway by Maryland SHA (2014a). Within the study area the road connects to Greenbelt Road/University Boulevard East (MD 193) on the south, but does not connect to the Capital Beltway further north. There is one through lane of traffic in each direction with access roads bordering the perimeter from start to finish. Rhode Island Avenue serves as a connector to residential neighborhoods in Hollywood, a subsidiary neighborhood of Greenbelt. Rhode Island Avenue also has a bike path that travels along the road in both directions throughout most of the study area. The speed limit of Rhode Island Avenue in the study area varies between 30 and 35 mph. In 2013, the AADT for Rhode Island Avenue traversing through greenbelt was 17,200 vehicles (Maryland SHA 2014b).

Edmonston Road / Kenilworth Avenue (MD 201) travels southwest to northeast and connects to both the Capital Beltway and Greenbelt Road. The roadway contains two to three through lanes in each direction, but north of Cherrywood Lane the road eventually becomes one through lane in each direction. The roadway is classified by Maryland SHA as a minor arterial road north of I-495 and a principal arterial road south of I-495 (2014a). The roadway has a speed limit of 40 mph within the study area. In 2013, on Kenilworth Avenue from Greenbelt Road (MD 193) to I-95 the AADT was 43,981 vehicles, whereas from I-95 to Sunnyside Avenue the 2013 AADT was 32,800 vehicles (Maryland SHA 2014b).

Greenbelt Road (MD 193) is east-west oriented and is classified by Maryland SHA as a principal arterial road (2014a). The roadway is a section of MD 193 and contains both commercial and residential development. The roadway has three through lanes in each direction, additional left turn lanes periodically, and a protected median. Greenbelt Road connects to Baltimore Avenue (U.S. Route 1) and Rhode Island Avenue on the west side and Kenilworth Avenue (MD 202) on the east side. Greenbelt Road has a speed limit of 40 mph through the study area. In 2013, the AADT on Greenbelt Road was 16,600 vehicles (Maryland SHA 2014b).

Greenbelt Metro Drive is currently classified by Maryland SHA as a local roadway (2014a). This roadway provides access to the Greenbelt site and the Greenbelt Metro Station and parking lot. The road is accessed by Cherrywood Lane. The roadway has one through lane in each direction. Greenbelt Metro Drive has a speed limit of 30 mph.

Ivy Lane is classified by Maryland SHA as a local road (2014a). This roadway has a curvilinear shape that connects Cherrywood Lane to Edmonston Road (MD 201). Ivy Lane primarily has one lane in each direction with a shared center left turn lane. The roadway has a speed limit of 30 mph. Ivy Lane also has bicycle lanes on both sides of the street.

Breezewood Drive is classified by Maryland SHA as a local road. The roadway is east-west oriented and contains one through lane going in each direction. The road has on-street parking except at intersections, where the curb narrows the physical roadway width. The roadway serves residential development and connects to other residential roadways such as Cherrywood Terrace, Springhill Lane, and Edmonston Terrace. Breezewood Drive feeds traffic onto Cherrywood Lane which is the main roadway connector to other non-residential areas. Breezewood Drive has a speed limit of 25 mph.

Springhill Drive is classified by Maryland SHA as a local road (2014a). The roadway is generally northeast-southwest oriented, primarily serves residential neighborhoods and an elementary school, and connects to other roadways such as Springhill Lane, Cherrywood Terrace, and Springhill Court. The roadway has some on-street parking along designated stretches except during school hours on school days. Springhill Drive feeds local traffic onto Cherrywood Lane, the main roadway connector to other non-residential areas. Springhill Drive has a speed limit of 25 mph, although some sections have a 15 mph speed limit when lights are flashing because of the adjacent elementary school.

Powder Mill Road, (MD 212), is an east-west oriented road that is classified as a minor arterial roadway by Maryland SHA (2014a). The road connects to Old Gunpowder Road and Baltimore Avenue (U.S. Route 1) to the west, and the Baltimore-Washington Parkway and Laurel Bowie Road (MD 197) to the east. The roadway has one lane in each direction, with intermediary left and right turn lanes towards its east side at intersections. The speed limit for Powder Mill Road is 35 mph as it crosses through the study area. In 2013, the AADT for Powder Mill Road, traversing through Greenbelt, was 19,200 vehicles (Maryland SHA 2014b).

Sunnyside Avenue is an east-west oriented road that is classified as a collector roadway by Maryland SHA (2014a). The road connects Baltimore Avenue (U.S. Route 1) and Rhode Island Avenue to Edmonston Road. The roadway has two lanes in each direction for a majority of its length; however, on the east side of the road where it intersects Edmonston Road there is one lane in each direction. Where Sunnyside Avenue has two lanes in each direction on its western end, the road also has periodic left turn lanes and pedestrian sidewalks on both sides. The speed limit for Sunnyside Avenue is 30 mph. In 2013, the AADT for Sunnyside Avenue was 8,900 (Maryland SHA 2014b).

As part of the field data collected, a detailed inventory of the lane geometry was conducted through field reconnaissance and a study of aerial imagery. Based on this information, the existing lane geometry and traffic control type (signalized or unsignalized) of intersections in the study area is shown in figure 3-3.

Figure 3-3: Existing Lane Geometry and Traffic Control Type

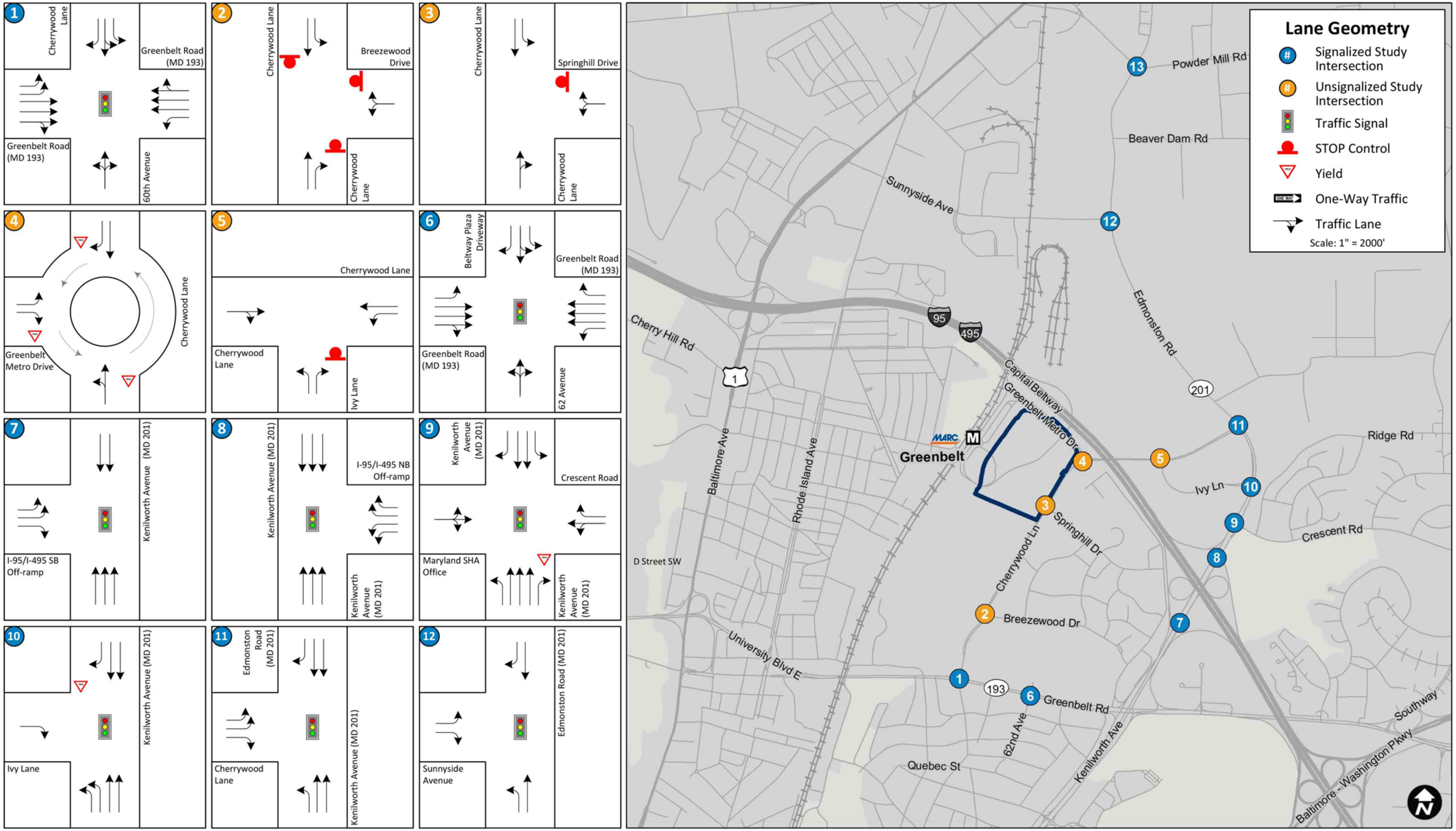
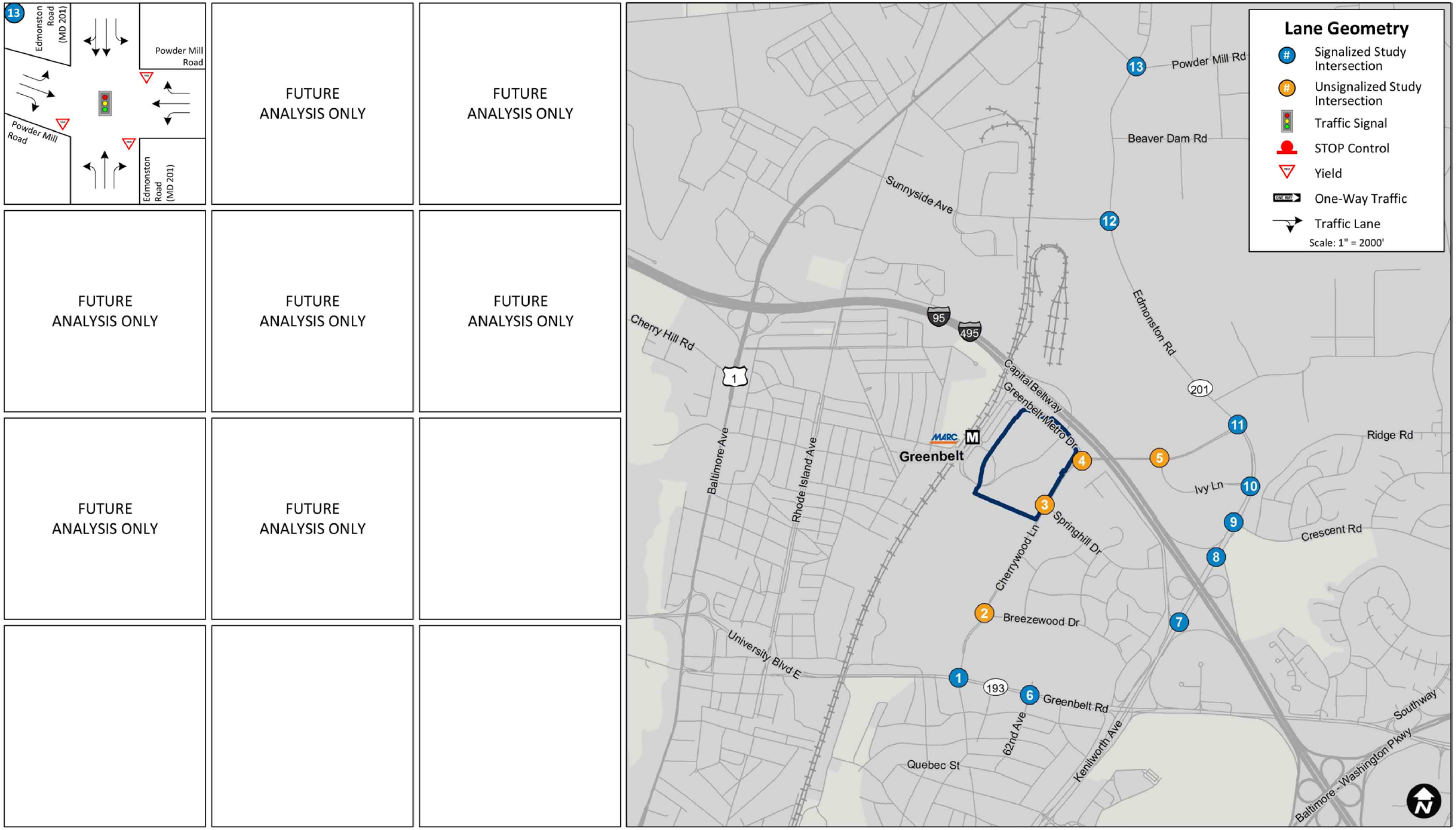


Figure 3-3: Existing Lane Geometry and Traffic Control Type (continued)



3.1.4 Data Collection

Intersection counts were obtained in spring 2014 and November 2014, with one additional intersection count taken in February 2015. The counts were obtained between the hours of 6:30 AM and 9:30 AM and 4:00 PM and 7:00 PM (Appendix C2). Intersection counts include vehicular, truck, bicycles, and pedestrian volumes. Automated Traffic Recorder (ATR) counts were collected for interchange ramps and other select roadway segments over at least a 24-hour weekday period in November 2014 and January 2015. The traffic counts collected were used in combination with signal timings from Maryland SHA and observations in the study area.

After examining the count collection data for the study area, the peak AM and PM traffic hours were determined for both the arterial transportation system (intersection counts) and the interstate system (ATR counts). These peak hours are shown in yellow on figures 3-4 through 3-6. The determination of a peak hour relied on the arterial system peak hour because the arterial system would be most impacted by the addition of a consolidated FBI HQ facility. In addition, the Interstate system morning peak hour is within 15 minutes of the arterial system and afternoon flows remain near the peak through the arterial system peak hour. The overall AM peak hour occurs between 7:45 AM and 8:45 AM, and the PM peak hour occurs between 5:00 PM and 6:00 PM. Figure 3-7, further below, shows the existing AM and PM weekday peak hour turning movement volumes occurring in the study area. Volumes between intersections were compared to ensure volumes departing one intersection were no more than a 10 percent difference from the next downstream intersection, except if there were driveways between intersections serving retail (VDOT 2013).

Figure 3-4: Greenbelt Intersection (Arterial) Cumulative AM Volumes

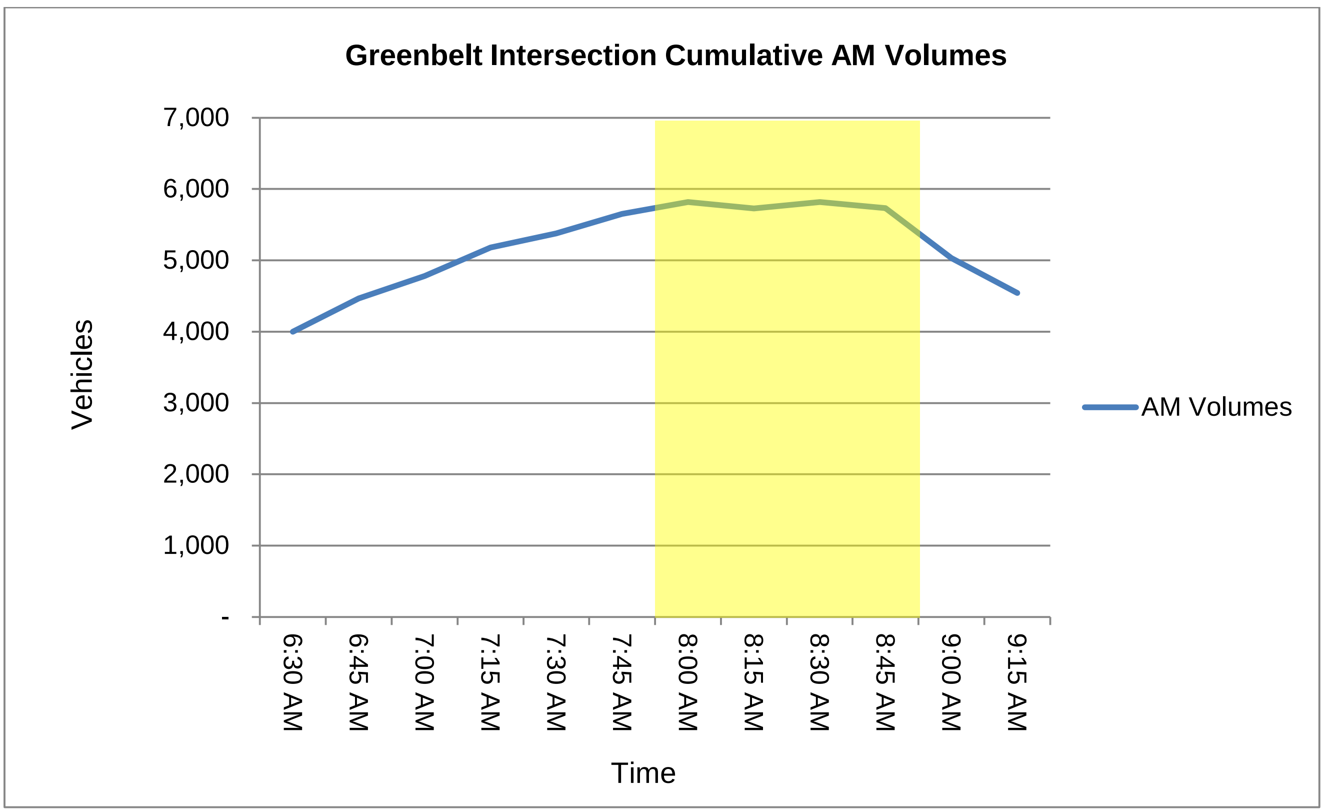


Figure 3-5: Greenbelt Intersection (Arterial) Cumulative PM Volumes

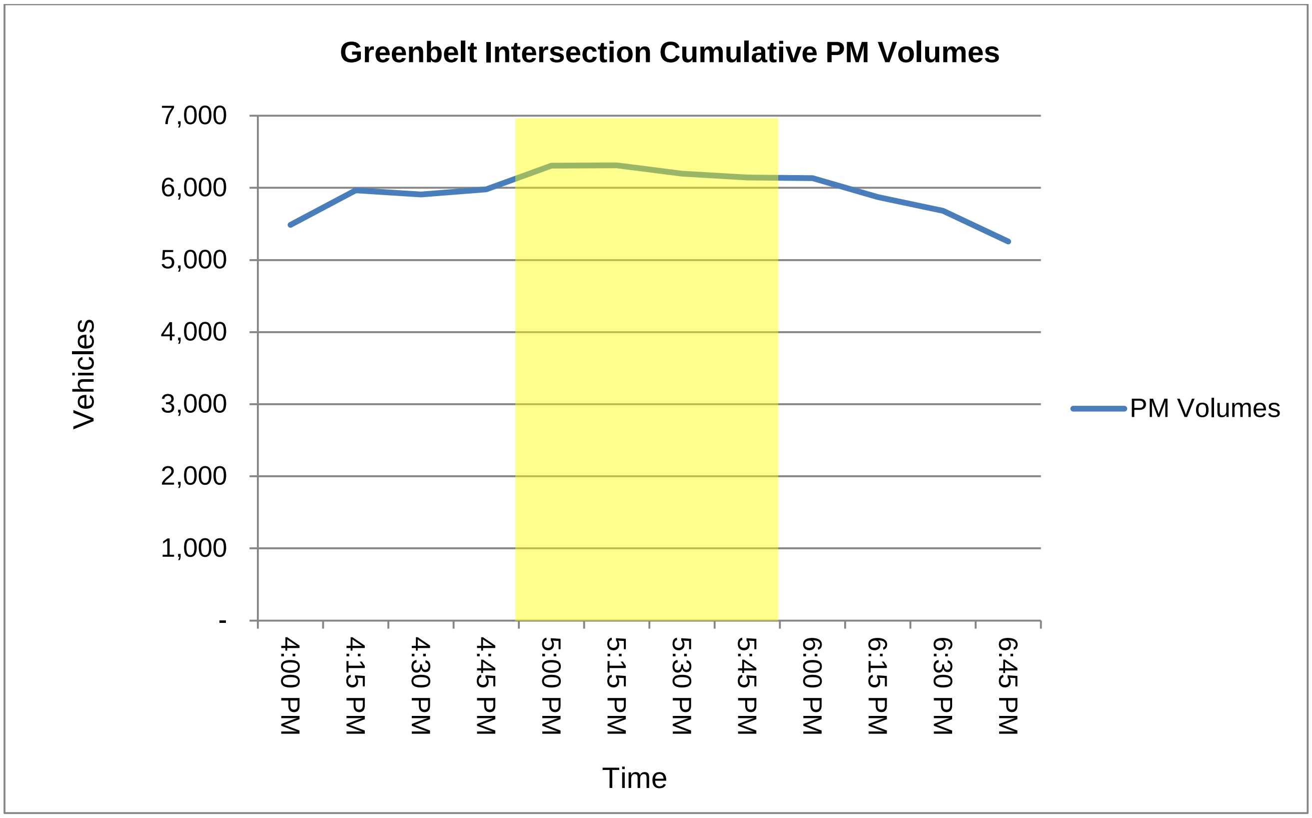


Figure 3-6: Greenbelt Interstate Volumes

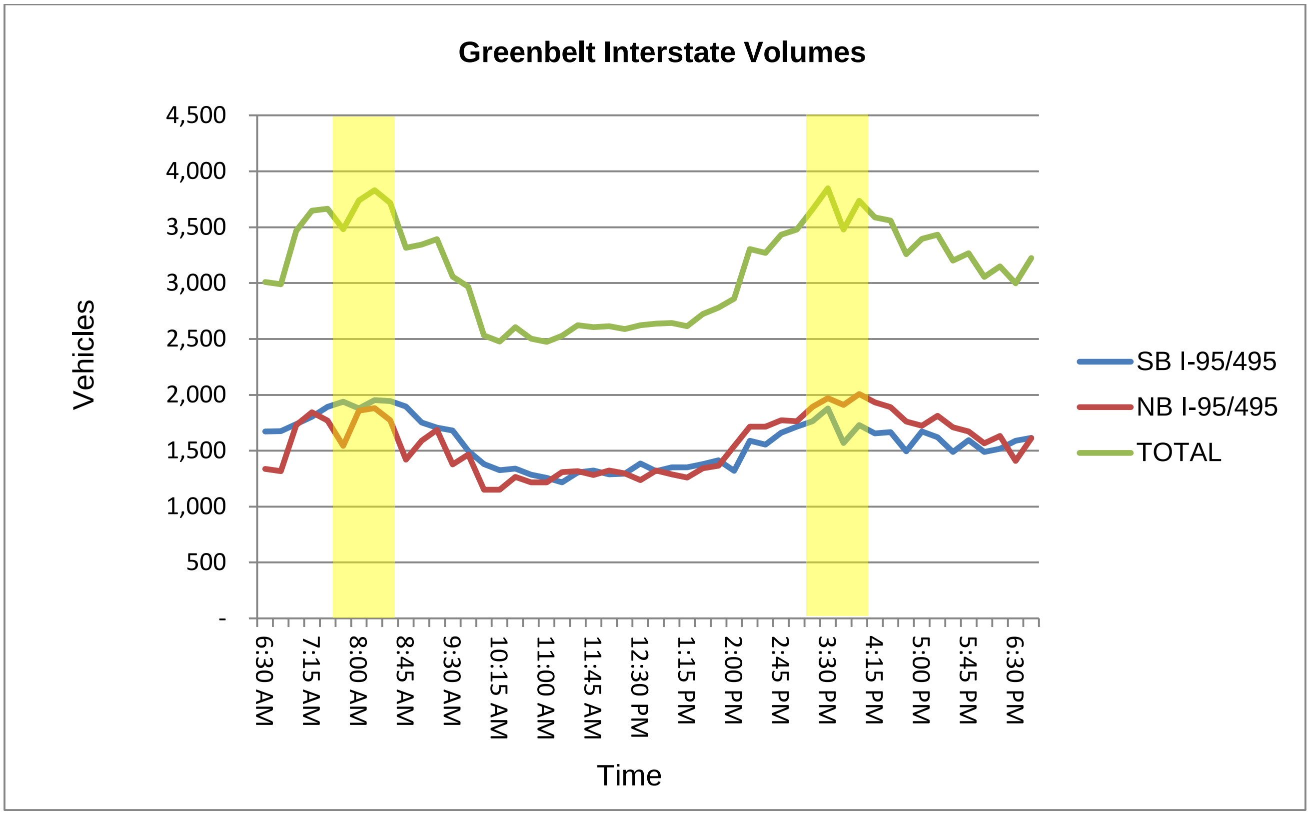


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Figure 3-7: Existing AM and PM Peak Hour Turning Movement Volumes

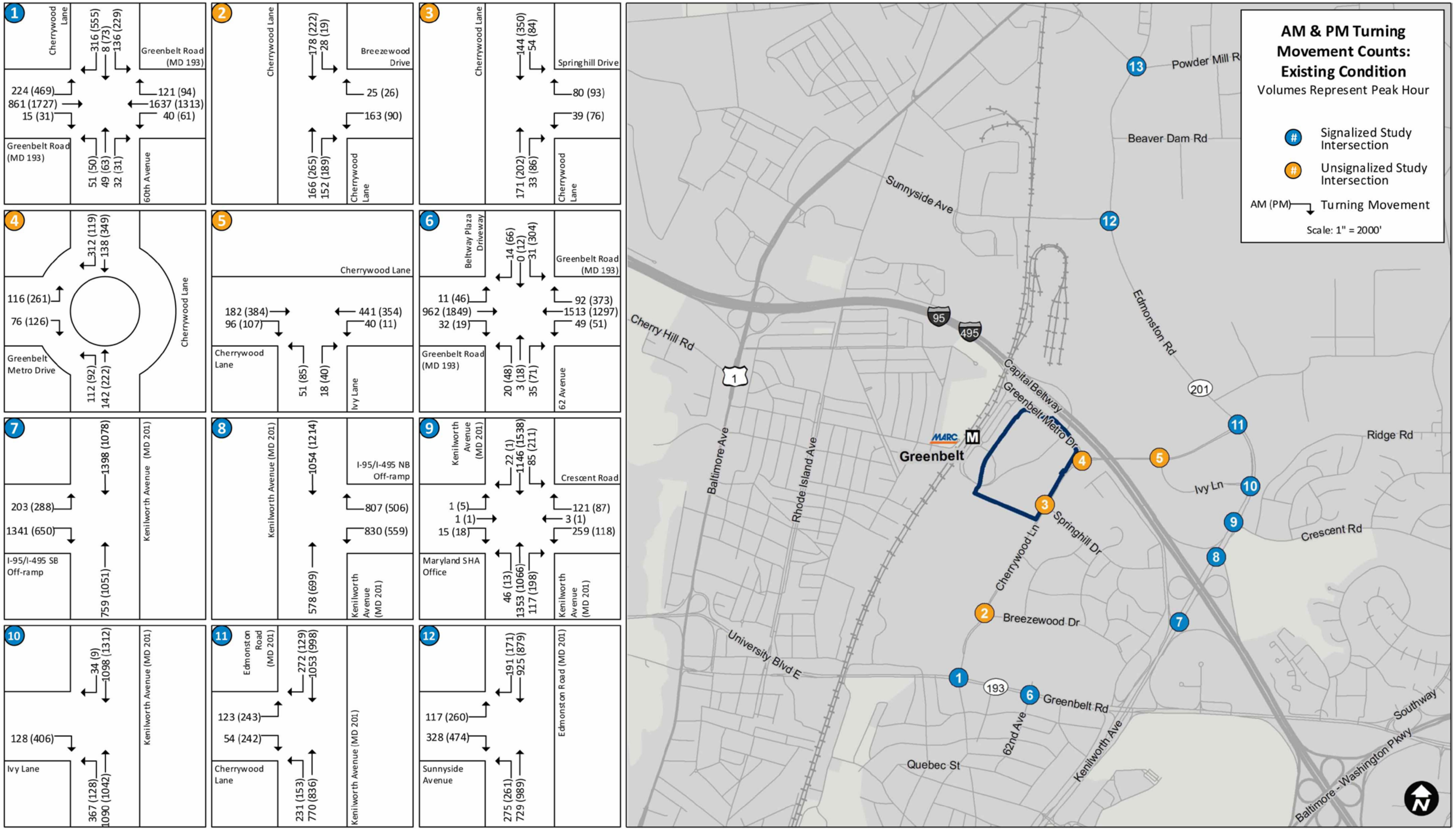
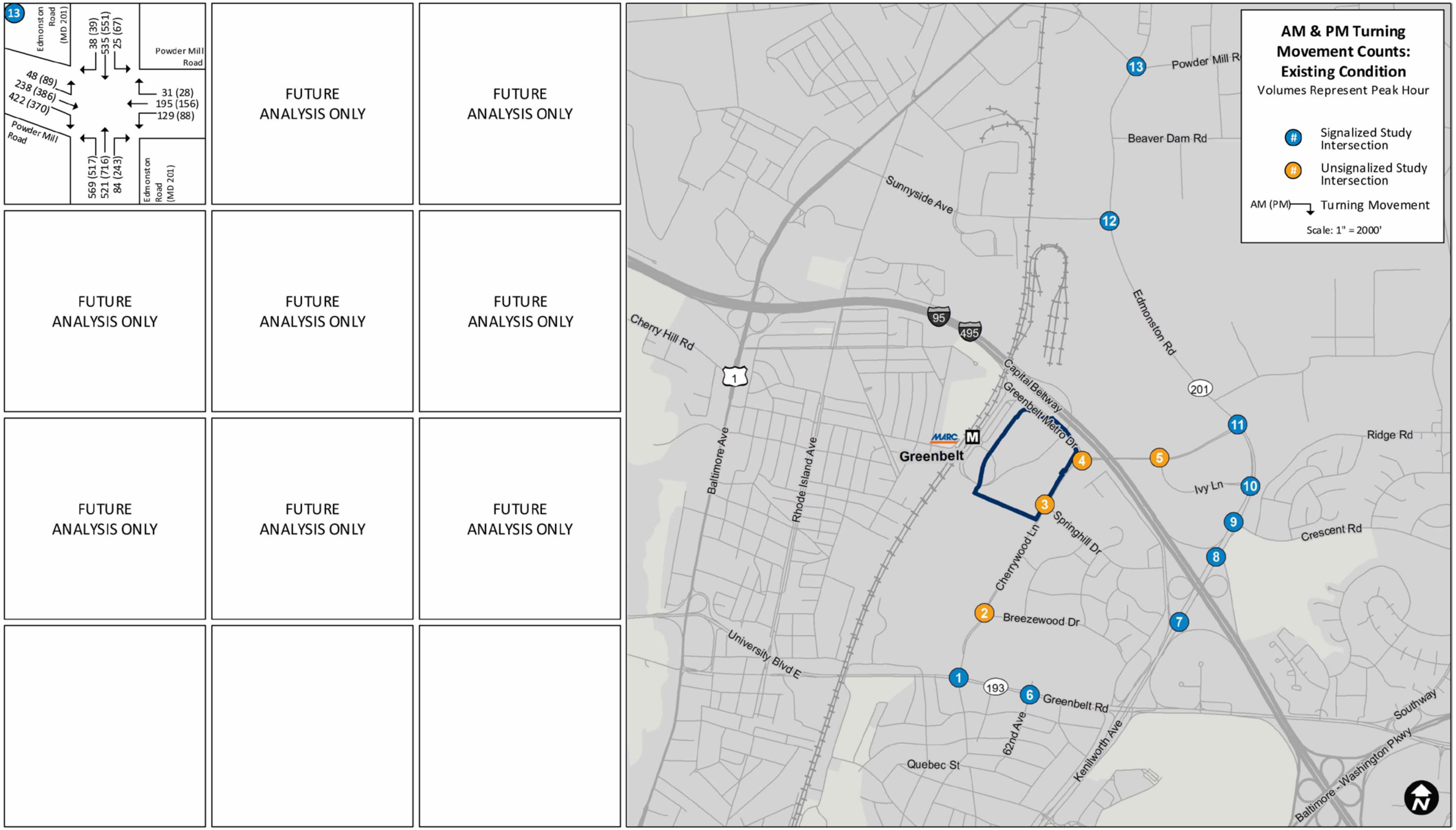


Figure 3-7: Existing AM and PM Peak Hour Turning Movement Volumes (continued)



3.2 Pedestrian Network

Analysis of the pedestrian network for the Greenbelt site includes observations and measurements of sidewalk widths within the 0.5-mile non-traffic study area. Sidewalk measurements and other observations were recorded in the field in April 2015 (Site Visit, April 29, 2015) and via imagery from Google maps. Measurements were recorded from the edge of the sidewalk to the edge of the curb. This section includes a description of where sidewalks are present, origin and destination points of pedestrians and/or commonly used sidewalks in the study area, disruptions or obstacles in the pedestrian environment, and general Americans with Disabilities Act (ADA) compliance.

3.2.1 Overall Sidewalk Observations

Basic sidewalk accommodations are provided along a majority of roads throughout the study area, including along Greenbelt Metro Drive and Cherrywood Lane where the sidewalks appear to be well maintained, but the quality of the sidewalks may not support moderate usage due to issues with width and/or accessibility compliance at intersections. Sidewalks are also provided along the residential streets in the neighborhoods to the northwest and southeast of the site. There are sections of road along Cherrywood Lane that do not have walkways on one or both sides of the roadway, but at least one side of the roadway has a sidewalk between Ivy Lane, north of the site, and Greenbelt Road, south of the site.

The intersections located on Cherrywood Lane that intersect with Breezewood Drive, Springhill Drive, and Ivy Lane provide crosswalks parallel to Cherrywood Lane, but no pedestrian signals. Minimal crosswalks across Cherrywood Lane are provided in the study area, with the primary crossing at the intersection of Cherrywood Lane and Greenbelt Metro Drive and one each east and west of that intersection, for the U.S. District Court facility and a Metrobus stop, respectively. Along the length of Greenbelt Metro Drive there is only one pedestrian crossing location near the Metro Station for the Kiss & Ride and short-term parking area.

The origins and destinations of pedestrian trips in the project area are primarily a mix of residential and transportation oriented. Within the nearby neighborhoods, there are additional pedestrian trips to the various supporting land uses in the neighborhood including the schools, recreation amenities, and the village (small retail) and fitness center (Franklin Park only) (Franklin Park at Greenbelt Station 2015). The Beltway Plaza Mall is located south of the Greenbelt site and receives localized foot traffic from the surrounding residential regions throughout the day. Throughout the residential sites surrounding the Greenbelt site, there are bus stops for the local bus routes as well as stops for a private resident shuttle to the Greenbelt Metro Station and a University of Maryland shuttle bus within the Franklin Park neighborhood according to the Franklin Park at Greenbelt Station website (2015). The immediate vicinity of the Greenbelt site has a moderate amount of foot traffic due to the nearby Greenbelt Metro Station.

Commonly used walkways around the Greenbelt site include paths used to navigate to the Greenbelt Metro Station, including Greenbelt Metro Drive and the residential Lackawanna Street. A walkway extension that leads to the Greenbelt Metro Station via an underground pedestrian tunnel underneath the Metrorail and CSX rail lines connects Lackawanna Street with the Metrorail station.

In addition to those places where the sidewalk network is fragmented or not accommodated, the Metrorail and rail tracks and wide expanses of parking and parkland on the site divide the area and make nonmotorized transportation difficult. Overall the sidewalks in the study area are in decent condition, but there are a few areas within the study area that lack connecting walkways at intersections and sidewalks that are not the recommended minimum width of 5.0 feet wide (FHWA 2006).

Figure 3-8 shows the existing pedestrian network.

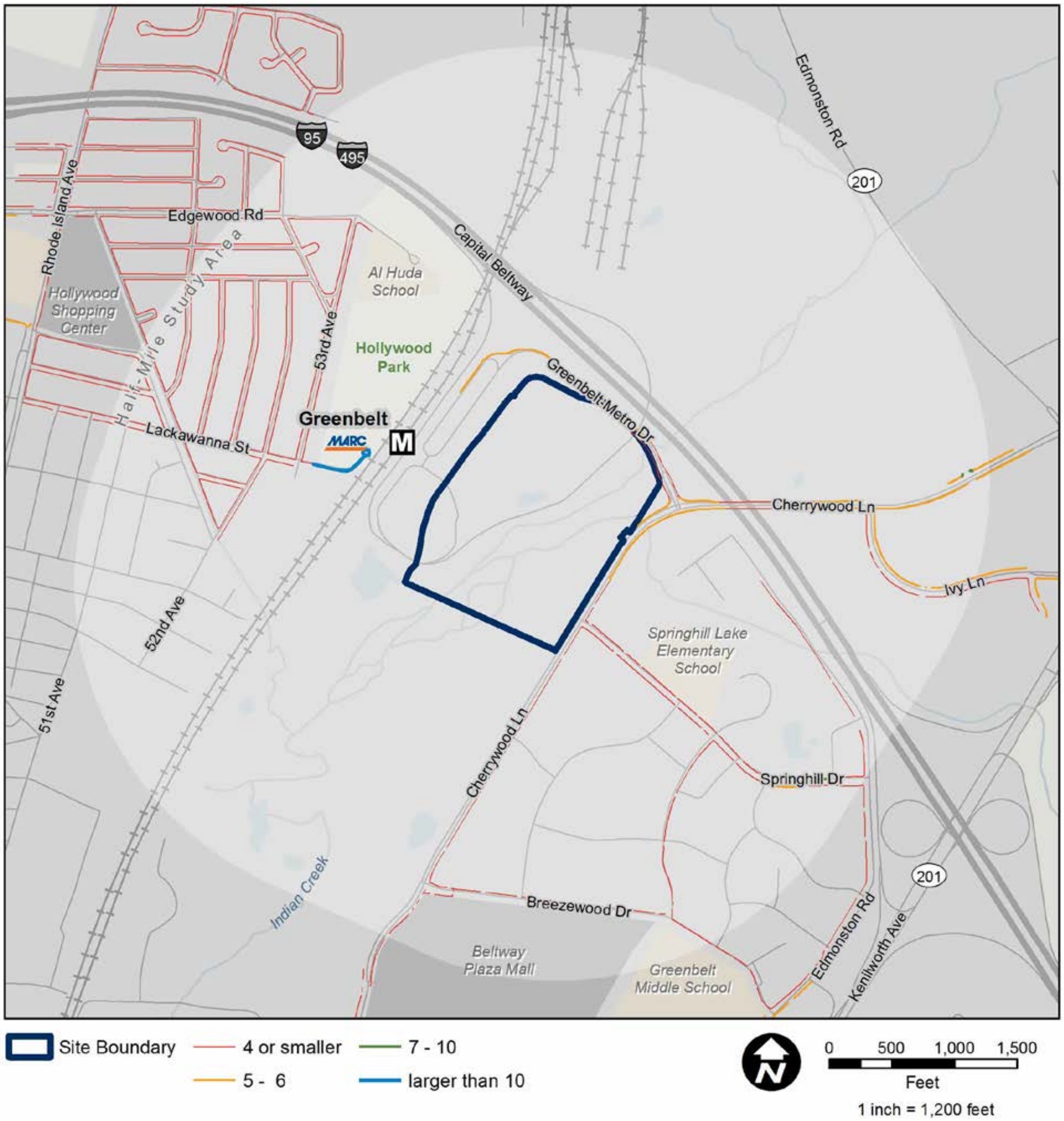
3.2.2 Accessibility Compliance

According to ADA, there is a minimum requirement of 3-foot clearances on street curb ramps, as well as minimal slopes and detectable warnings (i.e., dome-shaped bumps) (United States Department of Justice [USDOJ] USDOJ 2007). Due to long blocks and generally consistent sidewalk widths along each block, ADA compliance focused on sidewalk widths and less on intersection ramp compliance.

The Federal Highway Administration (FHWA) guidelines recommend that sidewalks have a minimum width of 5.0 feet if setback from the curb or 6.0 feet if at the curb face (FHWA 2014). Any sidewalk width less than 5.0 feet must be 3.0 feet wide with 5–foot turn-around locations every 200 feet to meet the minimum requirements for people with disabilities (USDOJ 2010). Based on the FHWA guidelines, the minimum sidewalk width requirement was adhered to for a large majority of the study area; however, residential community sidewalks, including all sidewalks within Hollywood Park, Cherrywood Lane, Breezewood Drive, and Springhill Lane, were less than 5.0 feet wide and therefore do not meet FHWA guidelines. Depending on turn-around locations, these narrower sidewalks also may not meet ADA requirements.

Based on the ADA guidelines, the intersection of Greenbelt Metro Drive and Cherrywood Lane, now a roundabout, was recently improved and meets all ADA regulations but does not provide pedestrian crossings on the eastern side of the roundabout. The remaining intersections that have pedestrian facilities, such as crosswalks, ramps, and signs/signals, are not ADA compliant due to a lack of detectable warnings (i.e., dome-shaped bumps) (USDOJ 2007).

Figure 3-8: Existing Pedestrian Network



Sources:
ESRI (2013), GSA (2013)
Prince George's County (2013), Google Maps (2015), Louis Berger (2015)

3.3 Bicycle Network

There are several multi-use paths and roadways with bicycle accommodations in the Greenbelt study area (see table 3-1 and figure 3-9). Cherrywood Lane and Ivy Lane both have bicycle lanes, although they do not extend the full length of the roadways. Greenbelt Metro Drive has a multi-use path along its northern side leading to the Greenbelt Metro Station, and an additional multi-use path connects Lackawanna Drive with the Greenbelt

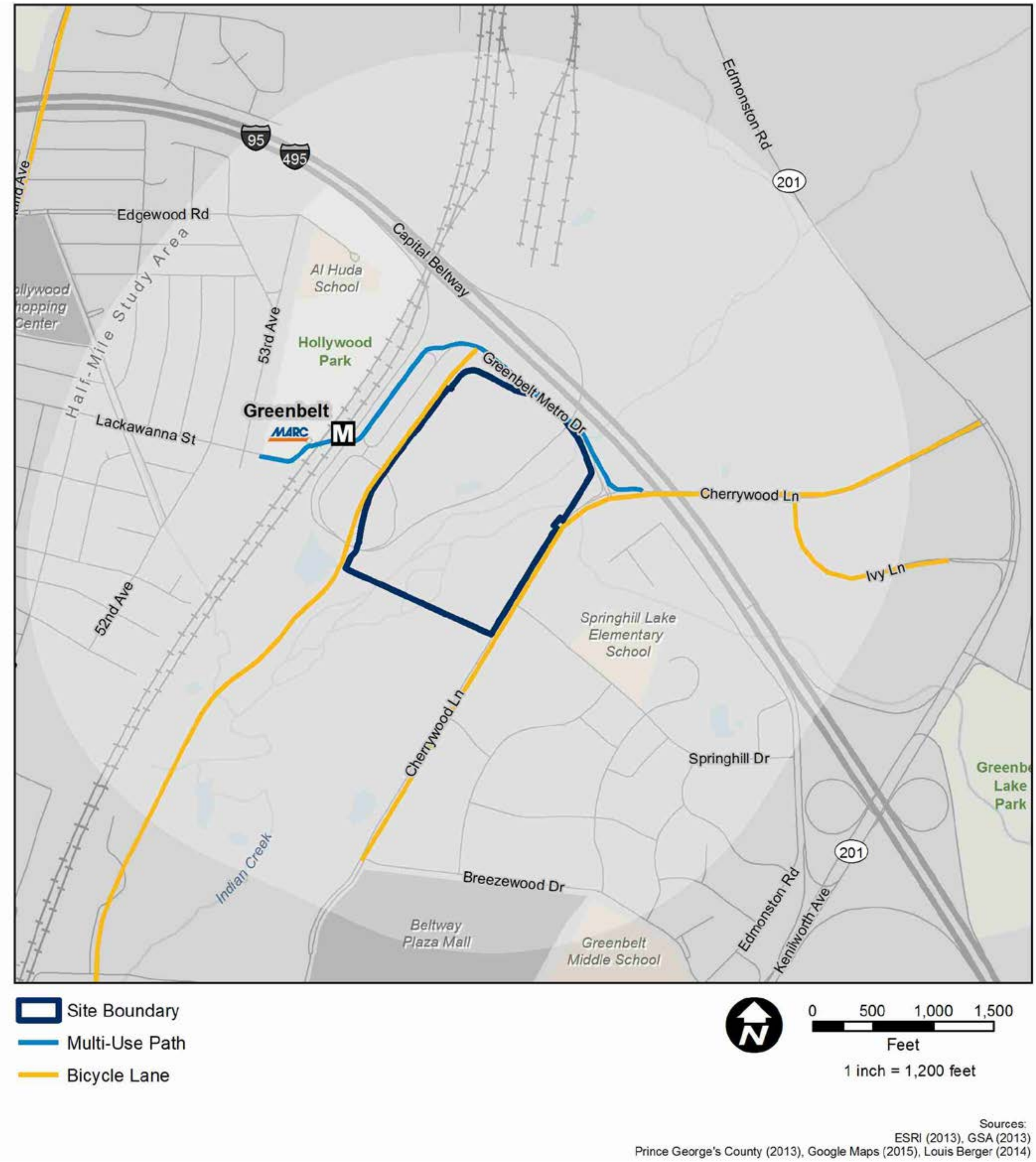
Maryland Area Regional Commuter (MARC) Station and adjacent Greenbelt Metro Station from the west. There is no bikeshare service in the non-vehicular study area.

Table 3-1: Bicycle Facilities in the Site Study Area

Name	To/From	Type
Cherrywood Lane	Edmonston Road to Breezewood Drive	Bicycle Lanes
Ivy Lane	From Cherrywood Lane to Turner Place	Bicycle Lanes
Greenbelt Metro Drive	From Cherrywood Lane to Greenbelt Metro Station	Multi-Use Path
Lackawanna Street Connector	From Lackawanna Street to Greenbelt Metro Station	Multi-Use Path

Source: Greenbelt Station Site Visit (December 19, 2014); Google maps (https://maps.google.com/) accessed on January 20, 2015.

Figure 3-9: Existing Bicycle Facilities



Additionally, just outside the study area there are bicycle lanes along Rhode Island Avenue between Paducah Road (two blocks north of the road's intersection with I-495) and MD 193 (University Boulevard) and intermittent bicycle lanes between Paducah Road and Sunnyside Avenue. There are also several multi-use paths just outside the study area including the Indian Creek Trail (south of the study area), the College Park Trolley Trail (south of MD 193), and the Paint Branch Trail (west of Rhode Island Avenue).

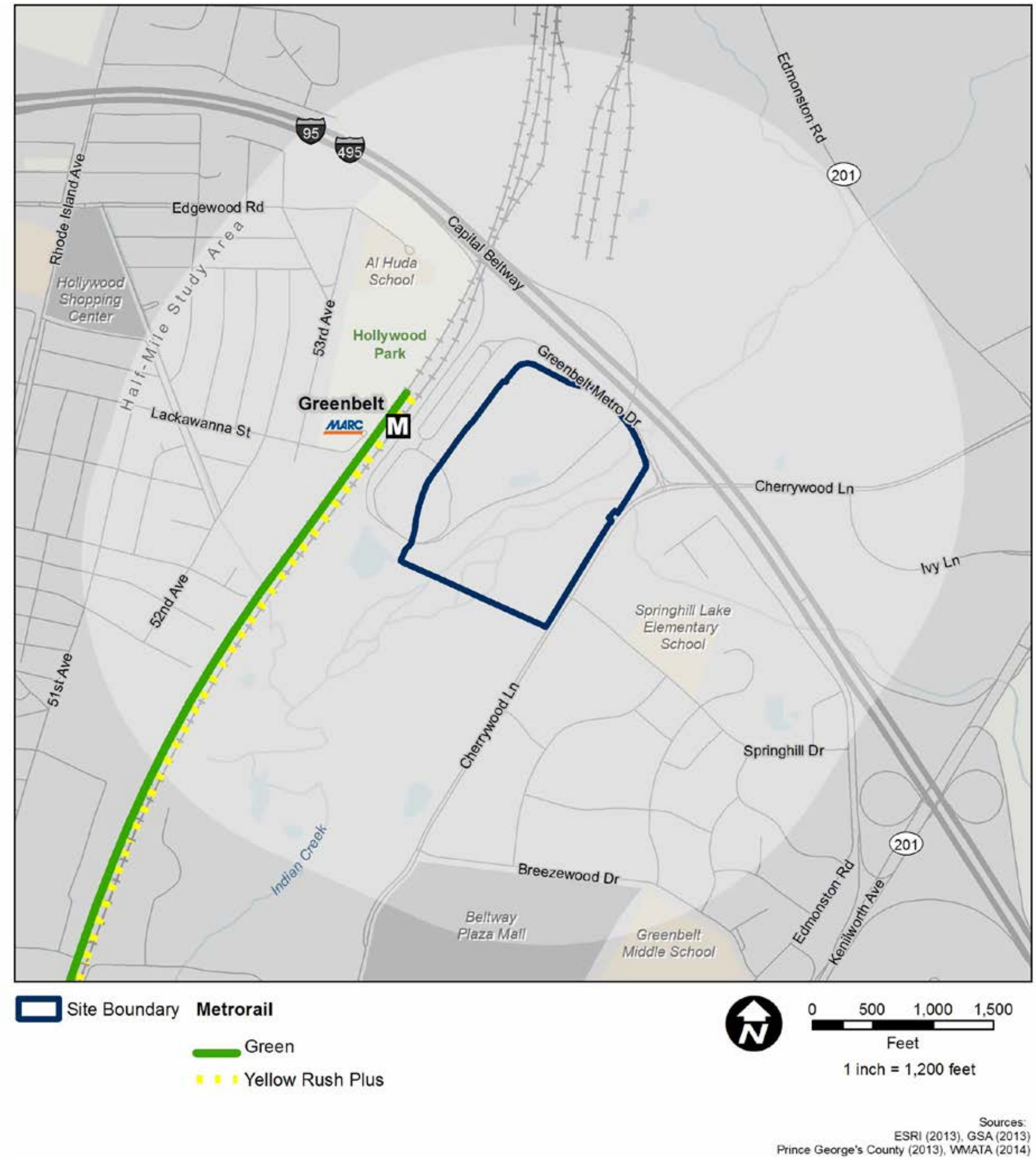
3.4 Public Transit

This section describes the Existing Condition of Metrorail, rail, local and commuter bus, shuttles, ridesharing (slugging), and carsharing within the Greenbelt study area. Note that the station and bus analysis results throughout the TIA include rounding; therefore, values may not add up to the precise value indicated.

3.4.1 Metrorail

The Greenbelt site is located adjacent to the Greenbelt Metro Station (figure 3-10). The WMATA Metrorail Green line serves the Greenbelt Metro Station during all operating hours, and the Yellow line serves the station during peak periods.

Figure 3-10: Greenbelt Metro Station Location



3.4.1.1 Greenbelt Station Frequency of Service

During peak periods, a Green line train serves Greenbelt every 6 minutes and a Yellow line train serves Greenbelt every 10 minutes, effectively making the wait time for a train only 4 minutes (16 trains per hour). During midday and evening hours, trains serve the station every 12 minutes, but after 9:30 PM, trains serve the station every 20 minutes. On weekends, Green line trains serve the station every 12 to 20 minutes. Table 3-2 summarizes frequencies and spans of service by line at Greenbelt Metro Station.

Table 3-2: Metrorail Frequency of Service at Greenbelt Metro Station

Day	Period	Span of Service	Headway (Minutes)		
			Green	Yellow Rush +	Effective Headway
Weekday	Peak	5:00 AM to 9:30 AM / 3:00 PM to 7:00 PM	6	10	4
	Midday	9:30 AM to 3:00 PM	12	-	-
	Evening	7:00 PM to 9:30 PM	12	-	-
	Late Night	9:30 PM to 12:00 AM [a]	20	-	-
Saturday	Daytime	7:00 AM to 9:30 PM	12	-	-
	Late Night	9:30 PM to 3:00 AM	20	-	-
Sunday	Daytime	7:00 AM to 9:30 PM	15	-	-
	Late Night	9:30 PM to 12:00 AM	20	-	-

[a] Service is extended to 3:00 AM on Fridays

Note: Effective headways are only necessary when two Metrorail lines serve the station. Effective headways are calculated by dividing an hour (60 minutes) by the total number of trains that are scheduled to serve the station during an hour (6 minute headway = 10 trains/hour, 10 minute headway = 6 trains/hour, 10+16 = 16 trains/hour and 60 ÷ 16 = 3.75 minute headways).

Source: WMATA (2014b)

3.4.1.2 Greenbelt Metro Station Mode of Access, 2012

The *2012 Metrorail Passenger Survey* (WMATA 2013a) details mode of access to all Metrorail stations in the system. The majority of passengers (62 percent) access Greenbelt Metro Station by driving and parking. Sixteen percent of passengers use a bus to access the station, while 13 percent are dropped off using the Kiss & Ride lot. Table 3-3 summarizes all modes of access to the station used in 2012.

Table 3-3: Mode of Access to Greenbelt Metro Station, 2012

Mode	Percent of Passengers
Drove and Parked	61.9%
Metrobus	14.5%
Kiss & Ride	13.1%
Walked	6.2%
Bicycle	1.3%
MARC	0.9%
TheBus	0.9%
Other Bus	0.4%
Shuttle	0.4%
Taxi	0.2%

Source: WMATA (2013a)

3.4.1.3 Greenbelt Metro Station Infrastructure

The entrance to the Greenbelt Metro Station is located off Greenbelt Metro Drive to the east and via a pedestrian sidewalk from Lackawanna Street to the west. The east entrance is accessible via pedestrian sidewalks from the Park & Ride lots and bus loop at the station. Both entrances converge beneath the Metrorail tracks into a single mezzanine at ground level. A separate walkway connects the Metrorail mezzanine to the Greenbelt MARC platforms (discussed further in Section 3.4.2 *Commuter Rail*).

The station has several large parking lots that can accommodate nearly 3,858 cars. It also has more than 100 bicycle parking spaces, in the form of bicycle racks or bicycle lockers. Table 3-4 summarizes parking infrastructure at the station.

Table 3-4: Automobile and Bicycle Parking Details at Greenbelt Metro Station

Type	Number
All-Day Parking Spaces	3,579
Long-Term Parking Spaces	17
Short-Term Metered Spaces	262
Bicycle Racks	60
Bicycle Lockers	52

Source: WMATA (2014c)

Other infrastructure at the station include vertical elements and fare elements. Because there is no vertical separation between the ground level and the mezzanine level, there are no street-to-mezzanine vertical elements. Between the mezzanine and the platform, however, there are two escalators, two staircases, and a single elevator. The escalators and staircases are paired, with the escalator typically operating in the upward direction toward the platform and the staircases used in the downward direction toward the mezzanine. The station mezzanine has eight faregate aisles (including one ADA aisle) and several farecard vending machines. Table 3-5 summarizes the vertical infrastructure elements at Greenbelt Metro Station.

Table 3-5: Greenbelt Metro Station Vertical and Fare Infrastructure

Infrastructure	Location	Element	Number of Existing Elements
Vertical Circulation	Street to Mezzanine	Escalators	-
		Elevators	-
		Stairs	-
	Mezzanine to Platform	Escalators	2
		Elevators	1
		Stairs	2
Farecard Vendors		Passes Only	0
		Farecards and Passes	8
		SmarTrips	2
		Exit Fare	2
Faregate Aisles		Standard	7
		ADA	1
		Total	8

Source: Greenbelt Metro Station Site Visit (12/19/14)

3.4.1.4 Greenbelt Metro Station Bus Loop

There are two bus loops at the Greenbelt Metro Station located on the east side of the station, one between the station entrance and the Park & Ride lots (north) and another between the station entrance and the Kiss & Ride lot (south). The north loop has seven bus bays while the south loop has four. Bolt Bus, a regional intercity transportation provider, uses the only occupied bay at the south loop, Bay H. At the north loop, all three TheBus routes use a single bay (Bay A), while Metrobus routes use all other bays. The Central Maryland RTA Route G, which only operates to the station on Saturdays, shares Bay C with Metrobus Routes 87, 89, and 89M (none of which operate on weekends).

WMATA standards call for a maximum of six buses per hour per bay (WMATA 2008). Overall, this standard is met by every occupied bay at the station (see table 3-6). The peak hour for buses serving the station is between 7:00 AM and 8:00 AM. One bus bay, Bay A, is served by six buses per hour. This bay is served by three TheBus routes. Overall, the station bus loop is served by 23 buses during the peak hour. Including unoccupied bays, the bus loops at the station have a combined capacity of 66 buses per hour, while the WMATA standard capacity is 60 buses per hour and the maximum acceptable capacity is 120 buses per hour. The maximum acceptable capacity (based on a two minute loading/unloading time and a three minute layover time), however, is 12 buses per hour (WMATA 2013b).

Therefore, the station bus loop is currently well below capacity.

Table 3-6: Station Bus Loop Bus Bay Assignments and Capacity at Greenbelt Metro Station

Bay	Metrobus	TheBus	RTA	Other	Peak Buses/Hour
A	-	11, 15X, 16	-	-	6
B	R3	-	-	-	2
C	87, 89, 89M	-	G (Saturday Only)	-	5
D	B30	-	-	-	1
E	G12	-	-	-	2
F	G13, G14, G16, R11, R12	-	-	-	4
G	81, C2	-	-	-	3
H	-	-	-	Bolt Bus	varies
Empty	-	-	-	-	
Empty	-	-	-		
Empty	-	-	-		
				Total	23
				WMATA Standard Capacity	66
				Maximum Acceptable Capacity	132
				Average Buses per Bay	2

Source: Greenbelt Metro Station Site Visit (12/19/14); WMATA (2014d)

3.4.1.5 Greenbelt Metro Station Ridership

Ridership details for Greenbelt Metro Station were obtained for October 2014 (WMATA 2014e). Average weekday boardings (entries) at the station during this period totaled 6,098 passengers, and average weekday alightings (exits) totaled 6,031.

3.4.1.6 Ridership by Hour

The majority of entries at Greenbelt occur during the morning hours, with the highest amount occurring between 7:00 AM and 8:00 AM (1,234 entries), and 8:00 AM and 9:00 AM (1,068 entries). By 9:00 AM, entries drop to 495. The number of entries continues to drop steadily into the afternoon, evening, and late-night hours. These patterns indicate that Greenbelt Metro Station primarily serves suburban commuters who work in the District or other jurisdictions south of the station.

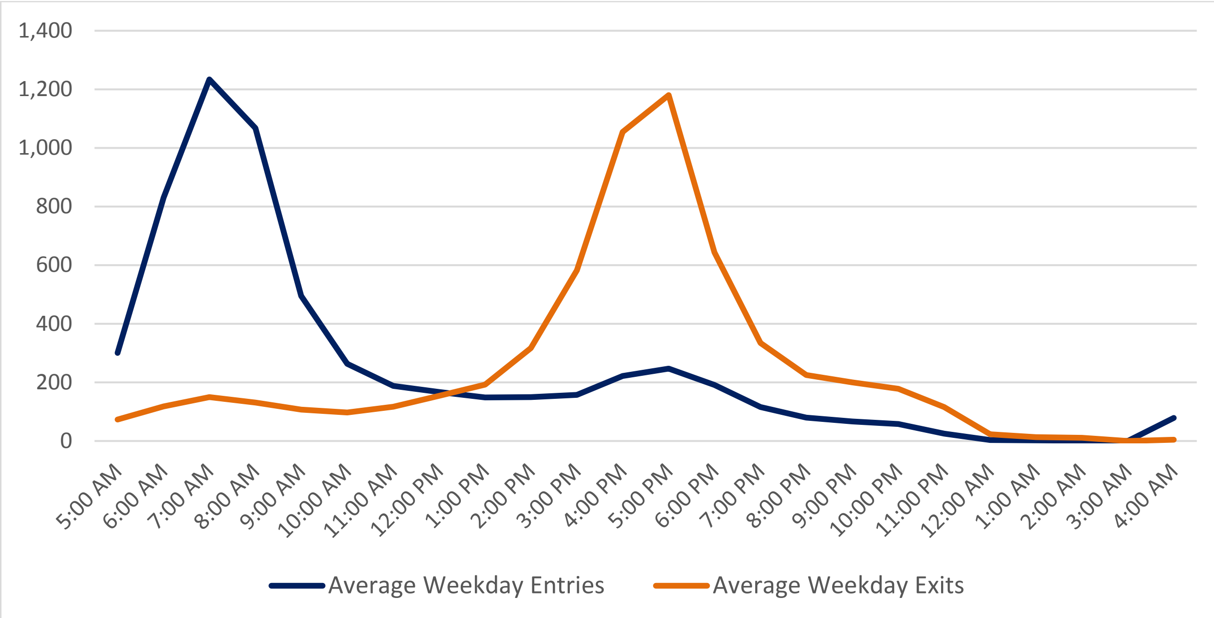
The majority of exits from the Greenbelt Metro Station occur between 4:00 PM and 5:00 PM (1,055 exits) and between 5:00 PM and 6:00 PM (1,181 exits). By 6:00 PM, exits drop to 644. Exits total around 100 passengers between 5:00 AM and 3:00 PM and then steadily increase before peaking between 5:00 PM and 6:00 PM. They then steadily drop into the evening and late night periods. Like entries, exit patterns are consistent with Greenbelt serving suburban commuters into the District or other jurisdictions to the south. Table 3-7 and figure 3-11 summarize average weekday entries and exits at Greenbelt Metro Station by hour.

Table 3-7: Average Weekday Entries and Exits by Hour at Greenbelt Metro Station

Hour	Average Weekday Entries	Average Weekday Exits
5 AM	301	74
6 AM	830	119
7 AM	1,234	150
8 AM	1,068	131
9 AM	495	107
10 AM	264	98
11 AM	188	117
12 PM	168	155
1 PM	149	193
2 PM	150	317
3 PM	157	583
4 PM	222	1,055
5 PM	248	1,181
6 PM	192	644
7 PM	116	335
8 PM	81	225
9 PM	66	200
10 PM	58	179
11 PM	26	116
12 AM	4	23
1 AM	2	14
2 AM	1	12
3 AM	0	1
4 AM	79	5
Total	**6,098**	**6,031**

Source: WMATA (2014e)

Figure 3-11: Average Weekday Entries and Exits by Hour at Greenbelt Metro Station



Source: WMATA (2014e)

3.4.1.7 Peak Hour and Peak 15 Minute Ridership

The peak 15-minute period for entries at Greenbelt Metro Station is between 7:15 AM and 7:30 AM (361 entries), while the peak 15-minute period for exits is between 5:00 PM and 5:15 PM (353 exits). Both of these periods fall within the peak hours for entries and exits and are consistent with the station serving suburban commuters to the District or other jurisdictions to the south. Table 3-8 summarizes the peak 15-minute periods for entries and exits at Greenbelt Metro Station.

Table 3-8: Greenbelt Metro Station Weekday Peak Hour and Peak 15-Minute Ridership

	Period	Time	Passengers
Entering	Peak 15-Min	7:15 AM	361
Entering	Peak Hour	7:00 AM	1,234
Exiting	Peak 15-Min	5:00 PM	353
Exiting	Peak Hour	5:00 PM	1,181

Source: WMATA (2014e)

3.4.1.8 Metrorail Origin-Destination at Greenbelt Metro Station

The majority of passengers who enter at Greenbelt Metro Station exit at stations within Washington, D.C. (see table 3-9). Almost all of the top 10 destination stations are located in Washington with the exception of Prince George's Plaza Station in Prince George's County, Maryland, and Silver Spring Station in Montgomery County, Maryland. The top three destination stations for Greenbelt passengers are all in downtown Washington and are served by the Green and Yellow lines, including Gallery Place-Chinatown, L'Enfant Plaza, and Archives-Navy Memorial.

Table 3-9: Top Ten Destinations for Passengers Entering at Greenbelt Metro Station

Rank	To Station	Jurisdiction	Metrorail Lines	From Greenbelt	Percent of Total
1	Gallery Place-Chinatown	Washington	Green, Yellow, Red	525	9%
2	L'Enfant Plaza	Washington	Green, Yellow, Blue, Orange, Silver	481	8%
3	Archives-Navy Memorial	Washington	Green, Yellow	327	5%
4	Farragut North	Washington	Red	323	5%
5	Union Station	Washington	Red	209	3%
6	Columbia Heights	Washington	Green, Yellow	200	3%
7	Prince George's Plaza	Prince George's County, MD	Green, Yellow +	181	3%
8	Metro Center	Washington	Blue, Orange, Silver, Red	181	3%
9	Mt. Vernon Square-UDC	Washington	Green, Yellow	168	3%
10	Silver Spring	Montgomery County, MD	Red	158	3%
	Total From Greenbelt			**6,098**	

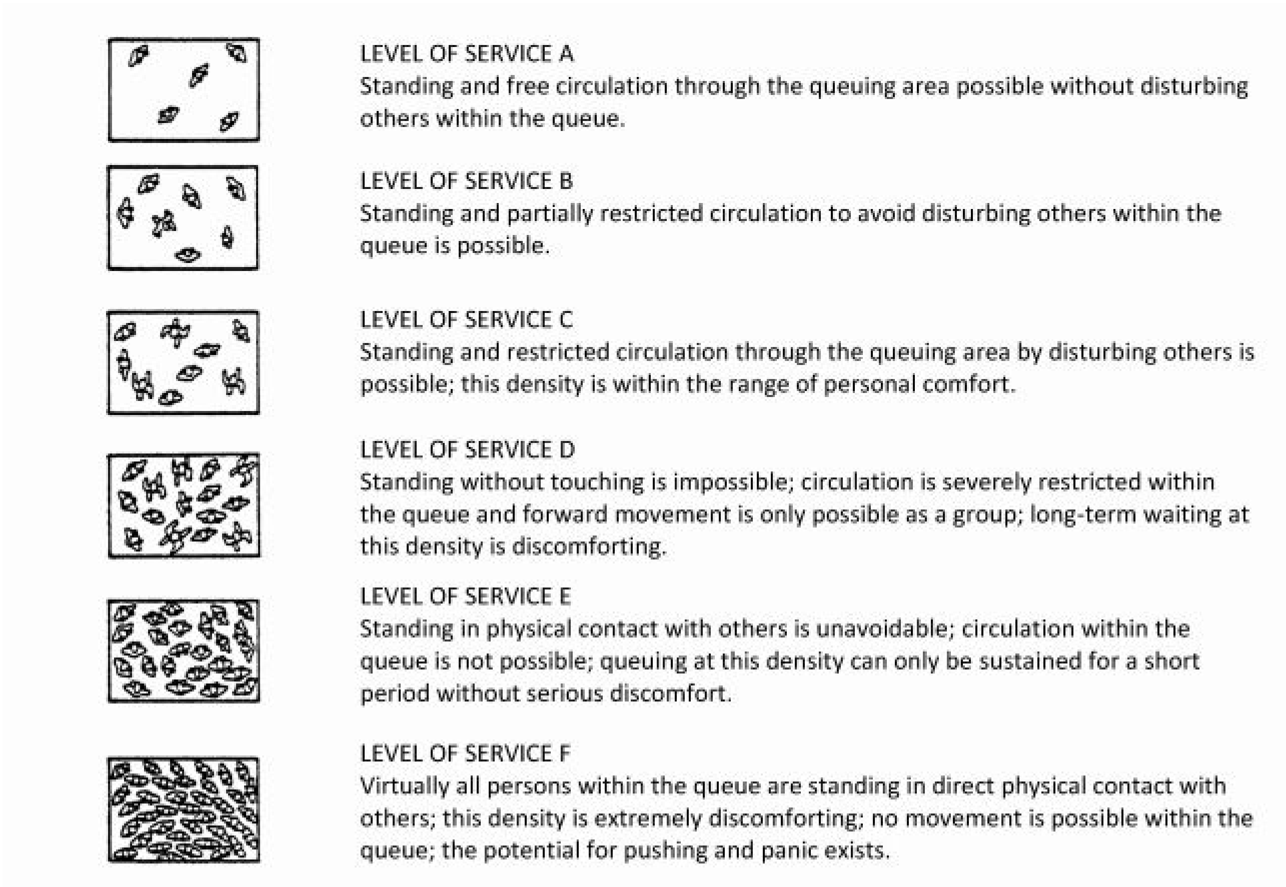
Source: WMATA (2014e)

3.4.1.9 Greenbelt Metro Station Capacity Analysis

A capacity analysis was conducted for the vertical elements which includes escalators and stairs at the station as well as the station's faregate aisles, fare vending machines, and platform size. The platform area analysis and fare vending analysis used projected ridership from the peak entering period at the station – the time period when the most passengers would likely use fare vending machines and the highest number of passengers would be waiting on the platform. The remaining analyses, for vertical elements and faregate aisles, used the peak 15-minute period of ridership at the station. October 2014 faregate data provided by WMATA was used for all the capacity analyses (WMATA 2014e). October data were used in the analysis because October is commonly used by transit agencies for analysis: it is considered a stable month that is affected less by tourism, weather, and holidays when compared to other months. At Greenbelt Metro Station, the peak 15-minute period of total ridership activity (entries and exits) was between 5:00 PM and 5:15 PM and the peak 15-minute entering period was between 7:15 AM and 7:30 AM.

At Greenbelt Metro Station, there is a single set of vertical elements, those between the Metrorail platform and the mezzanine, which is located at street level. During the peak 15-minute analysis period none of the vertical elements, faregate aisles, or fare vending machines are above capacity, defined at a volume-to-capacity (v/c) ratio of 0.7 (see table 3-10). Additionally, there is sufficient capacity to accommodate the peak number of passengers simultaneously on the platform at pedestrian level of service (LOS) B. Figure 3-12 illustrates the range of pedestrian level of service conditions. Appendix C3 has further details on the Greenbelt Metro Station capacity analysis.

Figure 3-12: Pedestrian Level of Service Illustration



Source: TRB 2013

Table 3-10: Greenbelt Metro Station Capacity Analysis Summary

Element		Volume to Capacity (V/C) Ratio
Mezzanine/ Platform	Entry Escalators	0.02
	Exit Escalators	-
	Stairs	0.40
Faregate Aisles		0.14
Fare Vending		0.10
Platform Peak LOS		B

3.4.1.10 Greenbelt Metro Station Emergency Evacuation Analysis

Using the peak 15-minute ridership period and NFPA 130 assumptions and guidelines, the platform at Greenbelt Metro Station could be evacuated in 1.7 minutes, and the entire station could be evacuated to a point of safety within 3.7 minutes (TRB 2013). See Appendix C4 for further details on the Greenbelt Metro Station emergency evacuation analysis.

3.4.2 Commuter Rail

The MARC train serves the Greenbelt Station on the Camden line. The Camden line connects Baltimore, Maryland, at Camden Station to Washington, D.C., at Union Station. Northbound trips (Washington to Baltimore) serve the station seven times each weekday: three times during the AM peak period and four times during the PM peak period (MTA 2015a). Southbound trips (Baltimore to Washington) also serve the station seven times each weekday: four times during the AM peak period and three times during the PM peak period. Northbound trips serve the station between 6:49 AM and 8:16 AM and again between 5:01 PM and 8:01 PM. Southbound trips serve the station between 5:42 AM and 8:50 AM and again between 4:10 PM and 6:57 PM.

The MARC platforms are at ground level just to the west of the Greenbelt Metro Station. A walkway connects the Metrorail station mezzanine with the northbound platform, and a tunnel beneath the tracks connects the northbound platform to the southbound platform. A pedestrian sidewalk also connects the southbound platform and tunnel to Lackawanna Street. The MARC Greenbelt Station has no buildings, restrooms, or ticket kiosks and is unstaffed.

3.4.3 Bus: Local

The Greenbelt site is served by many Metrobus lines, Prince George's County TheBus service, and the Regional Transit Authority of Central Maryland (RTA) service. All bus routes stop at the Greenbelt Metro Station bus loop, allowing for easy transfers between bus and rail. Most of the bus routes serve the City of Greenbelt and other surrounding areas of Prince George's County. Metrobus routes 87, 89, and 89M connect Greenbelt to the City of Laurel, and Metrobus routes G12, G14, and G16 connect Greenbelt to the City of New Carrollton. Metrobus route B30 connects Greenbelt with BWI Thurgood Marshall International Airport in Anne Arundel County, Maryland, and the Maryland Transit Administration's Light Rail, which serves the Baltimore Metropolitan Area. Table 3-11 summarizes the major characteristics of bus routes serving the study area. Figure 3-13 illustrates bus routes serving the study area.

Table 3-11: Major Service Characteristics of Bus Routes Serving the Study Area

Route	Agency	Description	Stop Serving Greenbelt Site	Route Type	Major Destinations
11	TheBus	Greenbelt	Greenbelt Metro Station	Feeder	Greenbelt Metro Station/Ivy Lane, Federal Courthouse, Greenway Center, Mandan Road
15X	TheBus	Goddard Space Flight Center	Greenbelt Metro Station	Express	Greenbelt Metro Station/Goddard Space Flight Center/New Carrolton Metro Station
16	TheBus	Greenbelt to New Carrolton	Greenbelt Metro Station	Feeder	New Carrollton Metro Station, Doctors Community Hospital, Beltway Plaza, Greenbelt Metro Station
81	WMATA	College Park Line	Greenbelt Metro Station	Feeder	Greenbelt Metro Station, University of Maryland, Rhode Island Avenue Metro Station
87	WMATA	Laurel Express	Greenbelt Metro Station	Express	Laurel Plaza, Greenbelt Metro Station, New Carrollton Metro Station
89	WMATA	Laurel	Greenbelt Metro Station	Feeder	Laurel Plaza, Laurel Mall, Greenbelt Metro Station

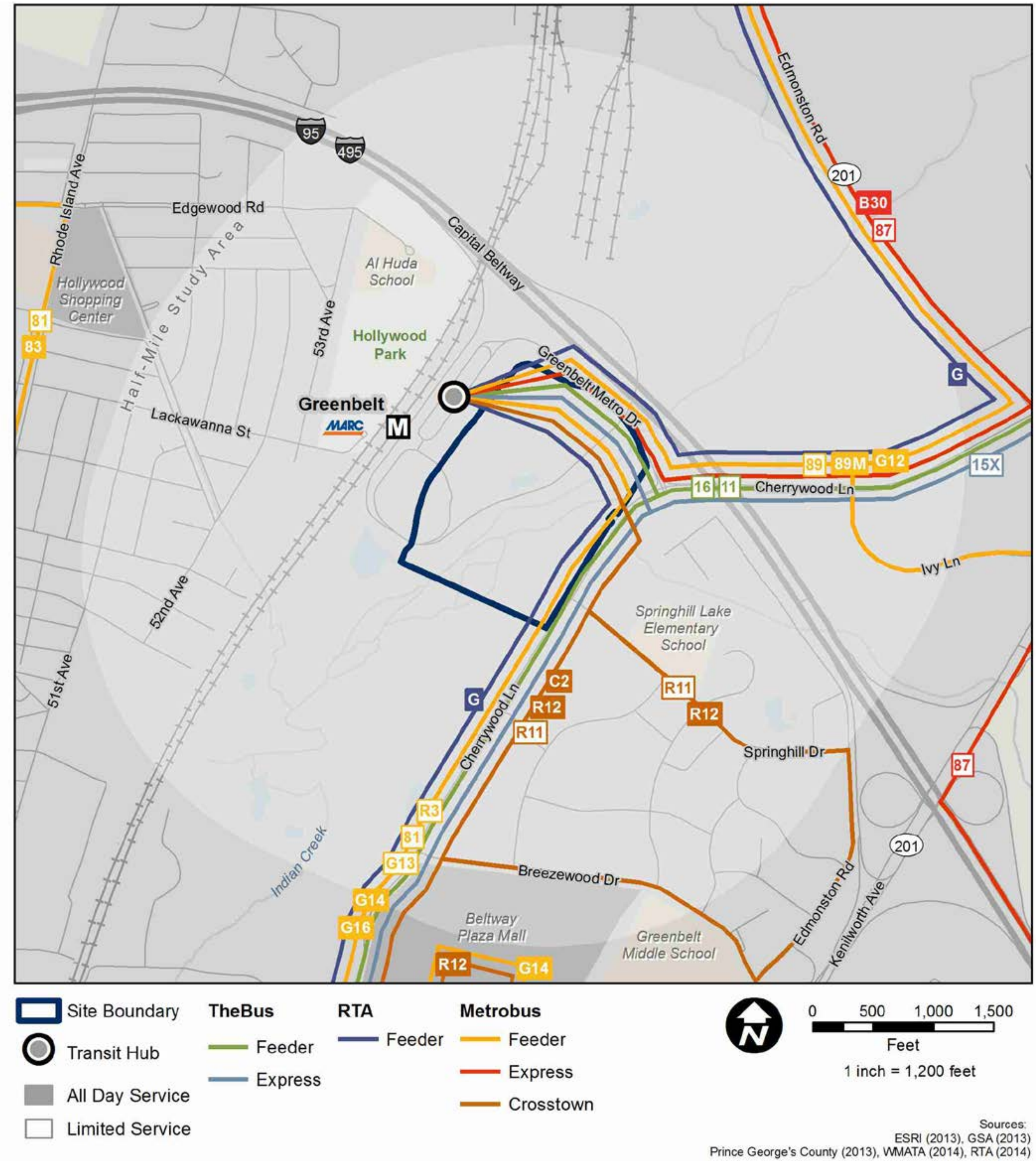
Route	Agency	Description	Stop Serving Greenbelt Site	Route Type	Major Destinations
89M	WMATA	Laurel	Greenbelt Metro Station	Feeder	Laurel Park and Ride Lot, Laurel Plaza, Laurel Mall, Greenbelt Metro Station
B30	WMATA	BWI Marshall Express	Greenbelt Metro Station	Express	Greenbelt Metro Station, BWI Marshall Airport, BWI Business District Light Rail
C2	WMATA	Greenbelt-Twinbrook	Greenbelt Metro Station	Crosstown	Greenbelt Metro Station, Prince George's Plaza Metro Station, Twinbrook Metro Station
G12	WMATA	Greenbelt-New Carrollton	Greenbelt Metro Station	Feeder	Greenbelt Metro Station, Goddard Corporate Park, Doctors Community Hospital, New Carrollton Metro Station
G13	WMATA	Greenbelt-New Carrollton	Greenbelt Metro Station	Feeder	Greenbelt Metro Station, Goddard Corporate Park, Doctors Community Hospital, New Carrollton Metro Station
G14	WMATA	Greenbelt-New Carrollton	Greenbelt Metro Station	Feeder	Greenbelt Metro Station, Goddard Corporate Park, Doctors Community Hospital, New Carrollton Metro Station
G16	WMATA	Greenbelt-New Carrollton	Greenbelt Metro Station	Feeder	Greenbelt Metro Station, Goddard Corporate Park, Doctors Community Hospital, New Carrollton Metro Station
R11	WMATA	Kenilworth Avenue	Greenbelt Metro Station	Crosstown	Greenbelt Metro Station, Westchester Park, College Park Metro Station, Kenilworth Towers, Deanwood Metro Station

Table 3-11: Major Service Characteristics of Bus Routes Serving the Study Area (continued)

Route	Agency	Description	Stop Serving Greenbelt Site	Route Type	Major Destinations
R12	WMATA	Kenilworth Avenue	Greenbelt Metro Station	Crosstown	Greenbelt Metro Station, Beltway Plaza, Westchester Park, College Park Metro Station, Deanwood Metro Station
R3	WMATA	Greenbelt-Prince George's Plaza	Greenbelt Metro Station	Feeder	Greenbelt Metro Station, Beltway Plaza, Archives II, Prince George's Plaza Metro Station
302/G	RTA	Laurel-College Park	Greenbelt Metro Station	Feeder	Towne Centre Laurel, Centre at Laurel, FDA Muirkirk Campus, College Park Metro Station, Greenbelt Metro Station

Source: WMATA (2014f); PGC DPWT (2014); Regional Transit Agency (2014)

Figure 3-13: Bus Routes Serving the Study Area



3.4.3.1 Bus Frequency of Service

Table 3-12 summarizes weekday headways and spans of service on routes that serve Greenbelt site. Headways represent the time between buses in minutes. Most routes operate throughout the day with peak service during the morning and evening rush hours, which fall between 6:00 AM and 9:00 AM and 3:00 PM and 7:00 PM, respectively. Some routes have limited or reduced service during the midday period (from 9:00 AM to 3:00 PM), including Metrobus Routes 87, 89, G13, G16, R11, and R3 which do not operate at all during this period. Metrobus Routes G12 eastbound and G16 westbound are the only routes that operate after 11:00 PM with each route operating one trip between 11:00 PM and 4:00 AM. Metrobus Route C2 provides the most frequent service, with peak headways between 18 and 26 minutes. Several other routes provide 30-minute peak headways, including TheBus Routes 11 and 16 and Metrobus Routes 87 and G12.

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Table 3-12: Frequency of Service on Bus Routes Serving the Greenbelt Study Area

Route & Direction	Agency	Weekday								Saturday		Sunday	
		Headway (Minutes)						Number of Trips	Span of Service	Headway (Minutes)	Span of Service	Headway (Minutes)	Span of Service
		4AM to 6AM	6AM to 9AM	9AM to 3PM	3PM to 7PM	7PM to 11PM	11PM to 4AM						
11 Loop	TheBus	60	30	30	30	2 trips	-	30	5:18 AM to 8:29 PM	-	-	-	-
15X North	TheBus	-	36	2 trips	40	1 trip	-	14	6:00 AM to 7:35 PM	-	-	-	-
15X South	TheBus	-	36	2 trips	40	1 trip	-	14	6:00 AM to 7:35 PM	-	-	-	-
16 North	TheBus	-	30	51	30	2 trips	-	23	6:00 AM to 8:18 PM	-	-	-	-
16 South	TheBus	1 trip	30	51	30	2 trips	-	24	5:30 AM to 8:17 PM	-	-	-	-
87 North	WMATA	1 trip	36	-	30	1 trip	-	15	5:50 AM to 7:47 PM	-	-	-	-
87 South	WMATA	40	30	-	48	1 trip	-	15	4:46 AM to 7:45 PM	-	-	-	-
89 North	WMATA	1 trip	45	-	48	80	-	13	5:59 AM to 10:50 PM	-	-	-	-
89 South	WMATA	1 trip	45	1 trip	60	80	-	13	5:50 AM to 11:25 PM	-	-	-	-
89M North	WMATA	-	-	60	-	-	-	6	9:30 AM to 3:21 PM	-	-	-	-
89M South	WMATA	-	-	72	2 trips	-	-	6	10:26 AM to 4:13 PM	-	-	-	-
B30 North	WMATA	-	36	40	40	48	-	25	6:10 AM to 10:38 PM	40	8:45 AM to 10:35 PM	40	8:45 AM to 10:35 PM
B30 South	WMATA	-	45	40	40	40	-	25	6:54 AM to 11:19 PM	40	9:35 AM to 11:21 PM	40	9:35 AM to 11:21 PM
C2 East	WMATA	60	26	26	18	40	-	42	5:12 AM to 10:15 PM	27	6:10 AM to 9:39 PM	-	-
C2 West	WMATA	30	18	26	24	34	-	45	5:09 AM to 11:27 PM	27	6:50 AM to 11:02 PM	-	-
G12 East	WMATA	60	30	51	30	48	1 trip	29	5:15 AM to 11:54 PM	60	6:40 AM to 10:18 PM	-	-
G12 West	WMATA	60	30	51	27	2 trips	-	26	5:07 AM to 9:32 PM	60	6:32 AM to 10:22 PM	-	-
G13 East	WMATA	-	36	-	-	-	-	5	6:05 AM to 9:01 AM	-	-	-	-
G13 West	WMATA	60	45	-	-	-	-	6	5:04 AM to 8:21 AM	-	-	-	-
G14 East	WMATA	1 trip	90	60	40	-	-	15	5:48 AM to 6:31 PM	-	-	-	-

Table 3-12: Frequency of Service on Bus Routes Serving the Greenbelt Study Area (continued)

Route & Direction	Agency	Weekday								Saturday		Sunday	
		Headway (Minutes)						Number of Trips	Span of Service	Headway (Minutes)	Span of Service	Headway (Minutes)	Span of Service
		4AM to 6AM	6AM to 9AM	9AM to 3PM	3PM to 7PM	7PM to 11PM	11PM to 4AM						
G14 West	WMATA	-	90	45	40	-	-	16	7:58 AM to 6:54 PM	-	-	-	-
G16 East	WMATA	-	-	-	120	60	-	6	6:00 PM to 10:25 PM	60	6:40 AM to 10:13 PM	-	-
G16 West	WMATA	-	-	-	1 trip	2 trips	1 trip	4	6:51 PM to 11:25 PM	60	6:39 AM to 10:20 PM	-	-
R11 North	WMATA	60	45	-	-	-	-	6	5:02 AM to 8:13 AM	-	-	-	-
R11 South	WMATA	40	36	-	-	-	-	8	4:59 AM to 9:12 AM	-	-	-	-
R12 North	WMATA	-	60	51	30	60	-	22	7:53 AM to 10:02 PM	60	8:10 AM to 9:53 PM	-	-
R12 South	WMATA	-	180	51	30	2 trips	-	18	8:53 AM to 9:13 PM	60	8:00 AM to 10:43 PM	-	-
R3 North	WMATA	1 trip	36	-	40	1 trip	-	13	5:48 AM to 7:45 PM	-	-	-	-
R3 South	WMATA	1 trip	36	-	40	-	-	12	5:46 AM to 6:54 PM	-	-	-	-
81 North	WMATA	-	-	-	-	-	-	-	-	-	-	60	8:21 AM to 7:11 PM
81 South	WMATA	-	-	-	-	-	-	-	-	-	-	60	8:52 AM to 5:40 PM
G North	RTA	-	-	-	-	-	-	0	-	45	9:42 AM to 6:35 PM	60	10:25 AM to 6:50 PM
G South	RTA	-	-	-	-	-	-	0	-	45	9:00 AM to 5:49 PM	60	10:00 AM to 6:24 PM

Source: WMATA (2014f); PGC DPWT (2014); Regional Transit Agency (2014)

3.4.3.2 Ridership by Route

Table 3-13 shows that Metrobus Route C2 (connecting Greenbelt with Prince George's Plaza and Twinbrook Stations) is the busiest route serving Greenbelt, carrying 5,271 passengers on an average weekday. Other busy routes include Metrobus Routes G14, G12, and R12, all of which connect Greenbelt to areas of Prince George's County that require a transfer between Metrorail lines in Washington in order to be accessed by rail from Greenbelt. The Metrobus routes that connect Greenbelt with Laurel (87, 89, and 89M) all have lower ridership. TheBus and RTA did not have ridership data available for this report.

Table 3-13: Average Weekday Ridership by Bus Route Serving the Greenbelt Study Area

Route	Agency	Description	Average Weekday Boardings
C2	WMATA	Greenbelt-Twinbrook	5,271
G14	WMATA	Greenbelt-New Carrollton	1,598
R12	WMATA	Kenilworth Avenue	1,419
G12	WMATA	Greenbelt-New Carrollton	1,400
87	WMATA	Laurel Express	894
89	WMATA	Laurel	666
R11	WMATA	Kenilworth Avenue	560
B30	WMATA	BWI Marshall Express	554
G13	WMATA	Greenbelt-New Carrollton	490
89M	WMATA	Laurel	437
G16	WMATA	Greenbelt-New Carrollton	356
R3	WMATA	Greenbelt-Prince George's Plaza	309
11	TheBus	Greenbelt	NA
15X	TheBus	Goddard Space Flight Center	NA
16	TheBus	Greenbelt to New Carrolton	NA
302/G	RTA	Laurel-College Park	NA

Source: WMATA (2014g)

3.4.3.3 Ridership by Route and Direction

Ridership by route, direction and time period was available for Metrobus routes only, and is summarized in table 3-14. Ridership on most routes is highest during the midday period or the PM Peak period. Routes with midday service typically see the highest amount of ridership during this period, primarily due to its longer, six hour span (9:00 AM to 3:00 PM). Metrobus Routes C2, B30, G14, and R12 all follow this pattern. Ridership during the AM Peak and PM Peak periods is fairly consistent by route in each direction. This is likely due to the fact that most routes connect to multiple Metrorail stations (with the exceptions of 89 and 89M) on opposite ends of the route.

Table 3-14: Metrobus Ridership by Route, Direction, and Time Period in the Study Area

Route & Direction	Agency	AM Early	AM Peak	Midday	PM Peak	Early Night	Late Night	Weekday Total
87 North	WMATA	16	95	-	318	30	-	460
87 South	WMATA	118	226	-	76	14	-	434
89 North	WMATA	27	149	-	144	74	-	394
89 South	WMATA	17	100	23	96	36	-	272
89M North	WMATA	-	-	226	-	-	-	226
89M South	WMATA	-	-	167	44		-	210
B30 North	WMATA	-	53	106	87	35	-	282
B30 South	WMATA	-	37	93	74	68	-	272
C2 East	WMATA	99	405	946	860	285	-	2,595
C2 West	WMATA	111	560	969	717	319	-	2,676
G12 East	WMATA	42	172	193	218	88	6	720
G12 West	WMATA	38	192	170	237	43	-	681
G13 East	WMATA	-	245	-	-	-	-	245
G13 West	WMATA	67	177	-	-	-	-	245
G14 East	WMATA	46	78	340	274	-	-	738
G14 West	WMATA	-	104	438	318	-	-	860
G16 East	WMATA	-	-	-	86	152	-	238
G16 West	WMATA	-	-	-	39	76	3	117
R11 North	WMATA	71	214	-	-	-	-	285
R11 South	WMATA	101	174	-	-	-	-	275
R12 North	WMATA	-	106	252	273	74	-	705
R12 South	WMATA	-	26	251	383	54	-	714
R3 North	WMATA	12	78	-	66	6	-	161
R3 South	WMATA	11	46	-	90	-	-	148

Note: AM Early = 4 AM to 6 AM; AM Peak = 6 AM to 9 AM; Midday = 9 AM to 3 PM; PM Peak = 3 PM to 7 PM; Evening = 7 PM to 11 PM; Late Night = 11 PM to 4 AM
Source: WMATA (2014g)

Maximum passenger loads represent the maximum number of passengers on a given at one time. Maximum passenger loads on routes serving the study area indicate the potential for overcrowding on several routes. Typical capacity is around 43 to 46 passengers on a 40-foot bus, and 30 to 34 passengers on a 30-foot bus. Routes with buses over capacity at some point during the day include 87, 89, 89M, C2, G13, and G14. C2 has the most overcrowded buses with 47 passengers in both directions during the AM peak, 54 passengers eastbound and 52 westbound during midday, and 48 westbound during the PM peak. Buses serving Greenbelt rarely have more than 50 passengers on a bus at any given time. Routes B30, G12, G16, R11, R12, and R3 typically do not experience overcrowding.

Table 3-15 summarizes maximum passenger loads by time period, with loads in excess of capacity highlighted.

Table 3-15: Metrobus Maximum Passenger Loads by Route and Direction in the Study Area

Route & Direction	Agency	AM Early	AM Peak	Midday	PM Peak	Early Night	Late Night	Capacity/Trip
87 North	WMATA	16	25	-	**47**	28	-	46
87 South	WMATA	45	44	-	22	14	-	46
89 North	WMATA	25	**46**	-	27	25	-	45
89 South	WMATA	15	25	22	32	20	-	45
89M North	WMATA	-	-	33	-	-	-	44
89M South	WMATA	-	-	42	**44**	-	-	44
B30 North	WMATA	-	12	13	16	8	-	43
B30 South	WMATA	-	11	12	15	17	-	43
C2 East	WMATA	38	**47**	**54**	43	44	-	47
C2 West	WMATA	28	**47**	**52**	**48**	33	-	47
G12 East	WMATA	23	31	26	26	19	7	46
G12 West	WMATA	20	30	21	25	17	-	45
G13 East	WMATA	-	**46**	-	-	-	-	44
G13 West	WMATA	27	33	-	-	-	-	46
G14 East	WMATA	45	31	**47**	35	-	-	46
G14 West	WMATA	-	41	**44**	38	-	-	44
G16 East	WMATA	-	-	-	32	32	-	45
G16 West	WMATA	-	-	-	29	34	5	45
R11 North	WMATA	27	43	-	-	-	-	44
R11 South	WMATA	33	31	-	-	-	-	44
R12 North	WMATA	-	29	28	30	18	-	44
R12 South	WMATA	-	20	25	37	20	-	44
R3 North	WMATA	7	14	-	11	5	-	33
R3 South	WMATA	9	10	-	18	-	-	33

Note: AM Early = 4 AM to 6 AM; AM Peak = 6 AM to 9 AM; Midday = 9A M to 3 PM; PM Peak = 3 PM to 7 PM; Evening = 7 PM to 11 PM; Late Night = 11 PM to 4 AM
Source: WMATA (2014g)

As shown in table 3-16, Route C2 has the highest number of overcrowded bus trips of any route, with 10 on an average weekday. Routes G14 and 87 also experience overcrowded trips, with three and two, respectively.

Table 3-16: Metrobus Total Number of Overcrowded Trips per Weekday in the Study Area

Route	Weekday Overcrowded Trips	Total Weekday Trips
C2	10	87
G14	3	31
87	2	30
89	1	26
G13	1	11

Source: WMATA (2014g)

3.4.3.4 Stop Level Ridership

Ridership at the stop level was available for Metrobus routes only. Bus stops located at the Greenbelt Metro Station experience the highest ridership activity (boardings and alightings) overall. Greenbelt Metro Station/Bus Bay C experiences the highest total activity, with 1,431 passengers on an average weekday. Bus Bay C is served by Metrobus Routes 87, 89, and 89M. Greenbelt Metro Station/Bus Bay F has the second highest total activity, with 1,367 passengers on an average weekday. This stop is served by Metrobus Routes G13, G14, G16, R11, and R12. Greenbelt Metro Station/Bus Bay G (served by Metrobus Route C2) has the third highest ridership activity, with 786 passengers on an average weekday.

Outside of the Greenbelt Metro Station, stops along Cherrywood Lane have the highest ridership activity. Cherrywood Lane is adjacent to dense residential development and the Beltway Plaza Mall. The Breezewood Drive/Cherrywood Lane stop has only seven boardings and alightings per weekday, the fewest of any stop. Table 3-17 summarize average weekday ridership at each bus stop in the Greenbelt study area.

Table 3-17: Weekday Metrobus Ridership by Stop for Routes Serving the Study Area

Stop ID	Stop Name	Direction	Routes	Average Weekday		
				Boardings	Alightings	Total Activity
3002573	Greenbelt Metro Station / Bus Bay C	NA	87, 89, 89M	736	695	1,431
3003302	Greenbelt Metro Station / Bus Bay F	NA	G13, G14, G16, R11, R12	556	811	1,367
3002572	Greenbelt Metro Station / Bus Bay G	NA	C2	333	454	786
3003354	Greenbelt Metro Station / Bus Bay E	NA	G12	242	316	558
3003037	Greenbelt Metro Station / Bus Bay D	NA	B30	212	200	412
3002579	Greenbelt Metro Drive / Cherrywood Lane	EB	87, 89, 89M, B30, C2, G12, G13, G14, G16, R11, R12, R3	157	28	185
3002574	Cherrywood Lane / Springhill Lk Rec Ctr	NA	C2, G13, G14, G16, R11, R12, R3	103	35	138
3002578	Greenbelt Metro Drive / Cherrywood Lane	WB	87, 89, 89M, B30, C2, G12, G13, G14, G16, R11, R12, R3	5	118	123
3002386	Cherrywood Lane / Springhill Dr	NB	C2, G13, G14, G16, R3	53	57	110
3002694	Greenbelt Metro Station / Bus Bay B	NA	R3	37	61	99
3002372	Cherrywood Lane / Cherrywood Ct	NB	C2, G13, G14, G16, R3	38	19	57
3002337	Cherrywood Lane / Breezewood Dr	NB	C2, G13, G14, G16, R3	28	24	53

Table 3-17: Weekday Metrobus Ridership by Stop for Routes Serving the Study Area (continued)

Stop ID	Stop Name	Direction	Routes	Average Weekday		
				Boardings	Alightings	Total Activity
3004160	Springhill Drive / Cherrywood Terr	EB	R11, R12	20	23	43
3003565	Springhill Drive / Cherrywood Terr	WB	R11, R12	23	8	31
3003463	Springhill Drive / Springhill Lane	WB	R11, R12	18	12	30
3002328	Breezewood Drive / Cherrywood Terr	WB	R11, R12	15	13	28
3003787	Springhill Drive / Cherrywood Lane	NB	R11, R12	22	5	27
3002362	Springhill Drive / Market Lane	WB	R11, R12	18	7	25
3003788	Springhill Drive / Cherrywood Lane	EB	R11, R12	11	14	25
3004151	Breezewood Drive / Springhill Lane	WB	R11, R12	14	9	23
3004152	Breezewood Drive / Springhill Lane	EB	R11, R12	11	11	22
3002326	Breezewood Drive / Cherrywood Terr	EB	R11, R12	14	7	21
3002409	Cherrywood La / Ivy Lane	EB	87, 89, 89M, G12	13	5	17
3002361	Springhill Drive / Market Lane	EB	R11, R12	10	8	17
3002411	Cherrywood La / Ivy Lane	WB	87, 89, 89M, G13	3	7	10
3002330	Breezewood Drive / Cherrywood Lane	EB	R11, R12	7	3	10
3004157	Ivy Lane / #6303	NA	G12	2	7	10
3003488	Springhill Drive / Springhill Lane	EB	R11, R12	4	4	9
3002404	Ivy Lane / #6301	NB	89, 89M, G12	6	2	8
3002331	Breezewood Drive / Cherrywood Lane	WB	R11, R12	2	6	7

NA = Not Applicable
Source: WMATA (2014g)

Weekday maximum passenger loads by stop indicate the potential for overcrowding at several stops in the study area. Maximum passenger loads at the stop level represent the maximum number of passengers on a single bus after leaving that stop location. Buses traveling along Greenbelt Metro Drive, Cherrywood Lane, and Ivy Lane generally have the highest maximum passenger loads, with the Greenbelt Metro Drive/Cherrywood Lane and Cherrywood Lane/Ivy Lane stops having the highest at 47 passengers. Routes operating on these roads include Routes 87, 89, and 89M. Routes R11 and R12 also have high maximum passenger loads on Springhill Road and

Greenbelt Metro Drive, varying from 31 passengers to 38 passengers. Route 87 is the only route on which passenger loads exceed capacity at stops within the study area (capacity is 46 passengers). Table 3-18 summarize bus stops with the highest maximum passenger loads in the study area by route and direction.

Table 3-18: Metrobus Stops with Highest Passenger Loads (Greater than 20) by Route and Direction in Study Area

Stop ID	Route	Direction	Stop Name	Weekday Maximum Passenger Load
3002409	87	North	Cherrywood La / Ivy La	47
3002579	87	North	Greenbelt Metro Dr / Cherrywood La	47
3002573	87	North	Greenbelt Metro Station / Bus Bay C	46
3002578	87	South	Greenbelt Metro Dr / Cherrywood La	45
3002411	87	South	Cherrywood La / Ivy La	45
3002409	89	North	Cherrywood La / Ivy La	44
3002579	89	North	Greenbelt Metro Dr / Cherrywood La	44
3002411	89M	South	Cherrywood La / Ivy La	43
3002404	89M	South	Ivy La / #6301	43
3002578	89M	South	Greenbelt Metro Dr / Cherrywood La	41
3002573	89	North	Greenbelt Metro Station / Bus Bay C	38
3003787	R11	North	Springhill Dr / Cherrywood La	35
3002578	R11	North	Greenbelt Metro Dr / Cherrywood La	35
3002579	R12	South	Greenbelt Metro Dr / Cherrywood La	31
3002578	G14	West	Greenbelt Metro Dr / Cherrywood La	31
3003565	R11	North	Springhill Dr / Cherrywood Terr	31
3002404	89	South	Ivy La / #6301	31
3002411	89	South	Cherrywood La / Ivy La	31
3002579	89M	North	Greenbelt Metro Dr / Cherrywood La	31
3002574	R12	South	Cherrywood La / Springhill Lake Rec Ctr	31
3002409	89M	North	Cherrywood La / Ivy La	31
3003302	R12	South	Greenbelt Metro Station / Bus Bay F	31
3002386	C2	East	Cherrywood La / Springhill Dr	30
3002386	G13	West	Cherrywood La / Springhill Dr	30
3002578	G13	West	Greenbelt Metro Dr / Cherrywood La	30
3002372	G13	West	Cherrywood La / Cherrywood Ct	30
3002386	G14	West	Cherrywood La / Springhill Dr	30
3002372	G14	West	Cherrywood La / Cherrywood Ct	30
3003463	R11	North	Springhill Dr / Springhill La	30
3002578	89	South	Greenbelt Metro Dr / Cherrywood La	30
3002578	C2	East	Greenbelt Metro Dr / Cherrywood La	30
3002337	G14	West	Cherrywood La / Breezewood Dr	29
3003788	R12	South	Springhill Dr / Cherrywood La	29
3002337	G13	West	Cherrywood La / Breezewood Dr	29
3002362	R11	North	Springhill Drive / Market Lane	29
3002573	87	South	Greenbelt Metro Station / Bus Bay C	29
3002372	C2	East	Cherrywood Lane / Cherrywood Court	28

Table 3-18: Metrobus Stops with Highest Passenger Loads (Greater than 20) by Route and Direction in Study Area (continued)

Stop ID	Route	Direction	Stop Name	Weekday Maximum Passenger Load
3002573	89M	North	Greenbelt Metro Station / Bus Bay C	28
3002337	C2	East	Cherrywood Lane / Breezewood Dr	28
3004160	R12	South	Springhill Drive / Cherrywood Terr	27
3003488	R12	South	Springhill Drive / Springhill Lane	27
3002361	R12	South	Springhill Drive / Market Lane	26
3002404	G12	West	Ivy Lane / #6301	26
3002411	G12	West	Cherrywood Lane / Ivy Lane	25
3002578	G12	West	Greenbelt Metro Drive / Cherrywood Lane	25
3003787	R12	North	Springhill Drive / Cherrywood Lane	24
3002578	R12	North	Greenbelt Metro Drive / Cherrywood Lane	24
3003565	R12	North	Springhill Drive / Cherrywood Terr	24
3002409	87	South	Cherrywood Lane / Ivy Lane	24
3002579	87	South	Greenbelt Metro Drive / Cherrywood Lane	24
3002579	G16	East	Greenbelt Metro Drive / Cherrywood Lane	24
3002362	R12	North	Springhill Drive / Market Lane	24
3003463	R12	North	Springhill Drive / Springhill Lane	24
3002574	G16	East	Cherrywood Lane / Springhill Lake Rec Ctr	23
3003302	G16	East	Greenbelt Metro Station / Bus Bay F	23
3004152	R12	North	Breezewood Drive / Springhill Lane	22
3004157	G12	East	Ivy Lane / #6303	22
3002409	G12	East	Cherrywood Lane / Ivy Lane	22
3002579	G12	East	Greenbelt Metro Drive / Cherrywood Lane	22
3002326	R12	North	Breezewood Drive / Cherrywood Terrace	22
3002330	R12	North	Breezewood Drive / Cherrywood Lane	22
3002579	G14	East	Greenbelt Metro Drive / Cherrywood Lane	22
3002574	G14	East	Cherrywood Lane / Springhill Lake Rec Ctr	22
3004151	R12	South	Breezewood Drive / Springhill Lane	22
3004152	R11	North	Breezewood Drive / Springhill Lane	22
3003302	G14	East	Greenbelt Metro Station / Bus Bay F	22
3003354	G12	East	Greenbelt Metro Station / Bus Bay E	21
3002328	R12	South	Breezewood Drive / Cherrywood Terrace	21
3002326	R11	North	Breezewood Drive / Cherrywood Terrace	21
3002331	R12	South	Breezewood Drive / Cherrywood Lane	20
3002330	R11	North	Breezewood Drive / Cherrywood Lane	20
3002411	87	North	Cherrywood Lane / Ivy Lane	20
3002578	87	North	Greenbelt Metro Drive / Cherrywood Lane	20

Source: WMATA (2014g)

3.4.4 Bus: Intercity

Currently, Bolt Bus provides intercity bus service between Greenbelt Metro Station Bus Bay H and New York, New York (Bolt Bus 2015). Levels of service vary; however, six roundtrips are typically offered on weekdays, eight are typically offered on Saturdays, and nine are typically offered on Sundays.

3.4.5 Bus: Commuter

There is currently no commuter bus service to the Greenbelt site.

3.4.6 Shuttles

There are several shuttles that serve the Greenbelt study area, including University of Maryland (UMD) shuttles, U.S. Department of Agriculture (USDA) shuttles, and shuttles for local area residential developments (UMD 2015; USDA, 2015; Franklin Park at Greenbelt Station 2015). UMD provides two shuttles, one directly serving the Greenbelt Metro Station. A UMD identification card must be presented in order to use these shuttles. USDA provides a single shuttle between its facilities in Beltsville and the Greenbelt Metro Station. Passengers must present a USDA identification card. Table 3-19 provides details on shuttle service in the Greenbelt study area.

Table 3-19: Shuttles Serving the Greenbelt Study Area

Agency/ Group	Route Name	Locations Served	Headway (Minutes)	Span of Service
UMD	129	College Park, Berwyn Heights, Greenbelt Metro Station	70	6:40 AM to 11:00 PM (Mon-Thurs); 6:40 AM to 10:00 PM (Friday)
UMD	130	College Park, Goddard Space Flight Center	95	6:25 AM to 11:25 PM (Mon-Thurs); 6:25 AM to 10:15 PM (Friday)
USDA	Beltsville	Greenbelt Metro Station, USDA Offices, Beltsville Agricultural Center	30-60	6:42 AM to 6:08 PM (Mon-Fri)
Franklin Park	Resident Shuttle	Franklin Park at Greenbelt Metro Station neighborhood, Greenbelt Metro Station	unknown	unknown

Source: UMD (2015); USDA (2015); Franklin Park at Greenbelt Station (2015)

3.4.7 Ridesharing (Slugging)

There are no slugging routes in the study area.

3.4.8 Carsharing

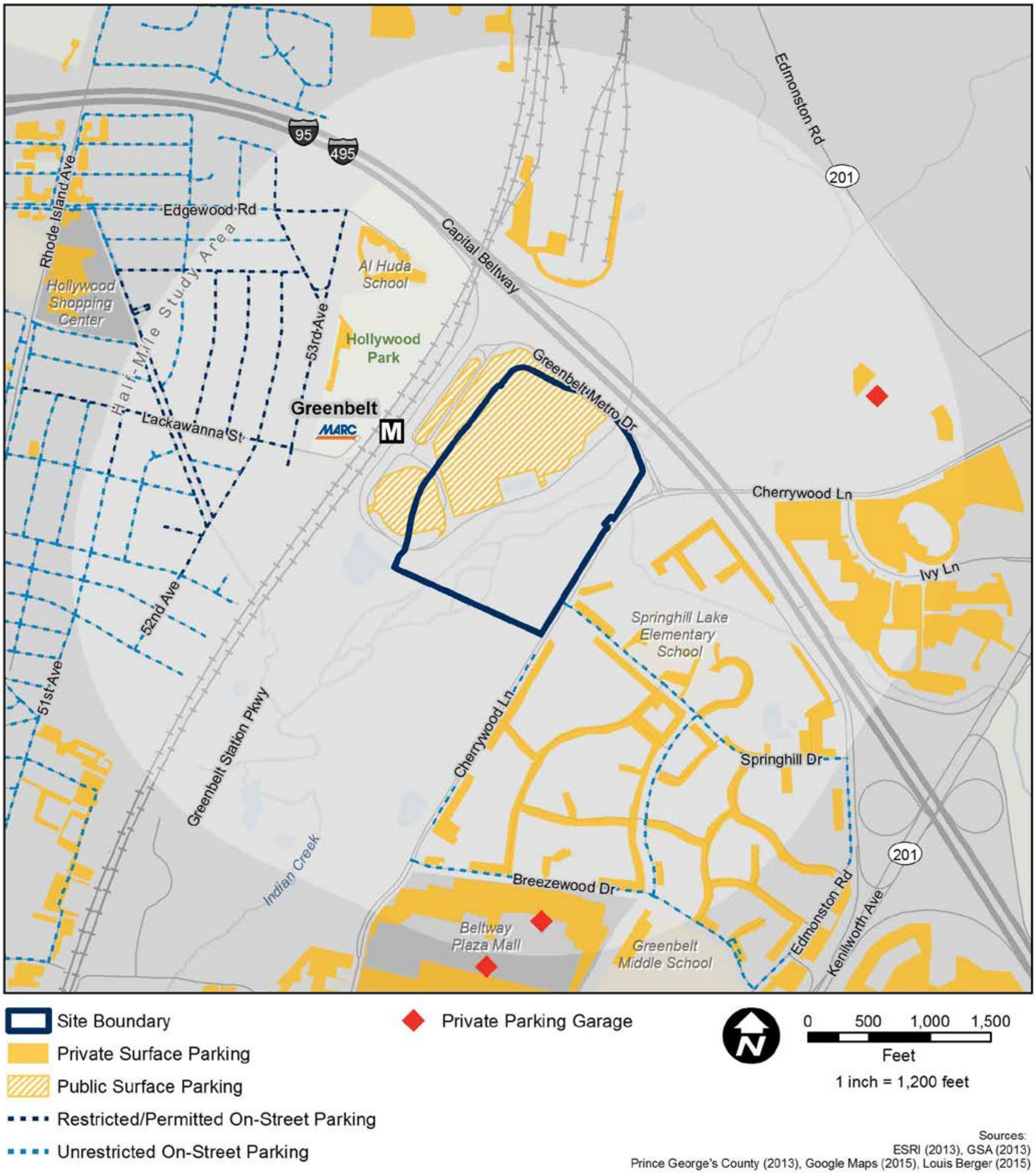
Previously, Zipcar was the only carshare company servicing the Greenbelt site, with three cars parked in the Greenbelt Metro Station Park & Ride lot (Zipcar 2015). Beginning on June 1, 2015, WMATA began a new partnership with Enterprise CarShare and ended its partnership with Zipcar (WMATA, 2015). Enterprise currently has two vehicles available at the Greenbelt Metro Station (Enterprise, 2015).

3.5 Parking

Parking near the Greenbelt site includes the publicly accessible pay-to-park Greenbelt Metrorail parking lot, restricted surface lots, one parking garage, and on-street parking, as shown in figure 3-14. On-street parking, as noted below, is limited to parallel parking in the study area and includes permit-only on-street parking and non-restricted on-street parking. Information about parking in the study area was gathered through the use of Google

Maps that consisted of images from summer 2012 as well as onsite observations (Louis Berger Site Visit April 29, 2015).

Figure 3-14: Parking in the Greenbelt Study Area



Within 0.5 mile of the Greenbelt site, there are a variety of restricted surface parking lots. The closest surface parking is the Greenbelt Metro Station lot on the Greenbelt site. There are more than 3,300 surface parking spaces available, although all spots are reserved for those intending to use the Metrorail or Metrobus services, or other transit that leaves from this area including the MARC commuter rail, other local buses, local shuttles, and intercity bus service (Bolt Bus; WMATA 2015). Individuals parking at the Greenbelt Metro Station surface lot must pay for parking during the week, but weekend parking is free.

Due east of the Greenbelt site and south of Cherrywood Lane are private and permitted surface parking lots for Capital Office Park. North of Cherrywood Lane are two private parking lots and one private parking garage for the U.S. District Court for the District of Maryland. The surface lots have approximately 180 spaces in total; the parking garage has several hundred spaces available. All of this parking off of Cherrywood Lane and east of the Capital Beltway is approximately 0.5 mile from the Greenbelt site.

Located due north of the Greenbelt site is the WMATA Greenbelt Rail Yard. There are several surface parking lots throughout the Rail Yard which contain more than 300 parking spots combined. The Rail Yard is 0.2 to 0.5 mile away as the crow flies from the Greenbelt site; however, the Capital Beltway acts as a barrier, making the travelling distance between the sites farther than 0.5 mile. Furthermore, parking at the Rail Yard is restricted and is not accessible unless the driver has clearance into the WMATA Greenbelt Rail Yard.

There are primarily two neighborhoods with street parking surrounding the Greenbelt site: Hollywood in College Park to the west and Franklin Park at Greenbelt Metro Station in Greenbelt to the east. Although Hollywood in College Park is separated from the Greenbelt site by the Metrorail, it is only approximately a 0.1-mile walk from the Greenbelt site due to the walkway extension via an underground pedestrian tunnel underneath the Metrorail and CSX rail lines. Street parking in the neighborhood west of the Greenbelt Metro Station, along Lackawanna Street, Wichita Avenue, 51st Place, 52nd Avenue, 52nd Place, 53rd Avenue, Mangum Road, Narragansett Parkway, and surrounding streets, is permit parking only and is enforced differently depending on the permit restrictions in the area. The different permits are presented in table 3-20. There is open parking along Mineola Road, 51st Avenue, Hollywood Road, 50th Avenue, 50th Place, Kenesaw Street, Iroquois Street, Huron Street, and surrounding streets farther out from the Greenbelt Metro Station. Franklin Park, east of the Greenbelt site, has a mixture of public parking, permit parking, and restricted parking. The lots for the apartment complexes require a permit, while the majority of on-street parking allows public parking. There also appears to be available street parking on Springhill Lane, Breezewood Drive, and portions of Springhill Drive. Parking on the school properties within both the Hollywood neighborhood and Franklin Park is intended for the users of the school during school hours and are not public parking lots during those times. There is also some limited on-street parking on the eastern (northbound) side of Cherrywood Lane.

Table 3-20: Permit Types in Hollywood Neighborhood in College Park

Permit Type	Restriction	Associated Roads
2	Monday – Friday 6:30 AM – 9:30 AM 4:00 PM – 7:00 PM	51st Place, 52nd Place, 52nd Avenue, Wichita Ave, Mangum Road, Narragansett Parkway
2A	Monday – Friday 6:30 AM – Midnight	53rd Avenue, Narragansett Parkway
2B	Monday – Friday 6:30 AM – 7:00 PM	53rd Avenue, Lackawanna Street, Narragansett Parkway, Kennebunk Terrance
3	Monday – Saturday 6:30 AM – Midnight	52nd Avenue, Lackawanna Street
3A	Daily 6:00 AM – Midnight	52nd Avenue, 53rd Avenue, Lackawanna Street
4	May 1 – September 1 Monday – Friday: 5:00 PM – 10:00 PM Saturday: 10:00 AM – 10:00 PM	Cree Lane, Cheyenne Place

Note: Permit types changed in the middle of roads; therefore, associated roads can be listed multiple times under different permit types.
Source: Louis Berger Site Visit on April 29, 2015.

To the south of the Greenbelt site, a portion of the Beltway Plaza Mall is located within 0.5 mile of the site. There are more than 1,000 parking spots available at this location in both surface parking lots and two parking garages. The Beltway Plaza Mall parking is meant for use to those using the mall; however, there are no parking permits in use or posted restrictions for the lot.

3.6 Truck Access

Due to the nature of the site use, trucks rarely access the Greenbelt Metro Station site. Therefore there are no specific truck access routes established for the site.

3.7 Traffic Analysis

This section explains the tools, concepts, and definitions for analyzing the traffic operations; the process used to analyze the study area intersections; and the traffic analysis results. Although the Existing Condition will present the existing freeway mainline and ramp peak hour volumes in Section 3.7.6, the analysis for the freeways will be done in the Build scenarios as agreed to by M-NCPPC and Maryland SHA in the Greenbelt Site Transportation Agreement (Appendix C1).

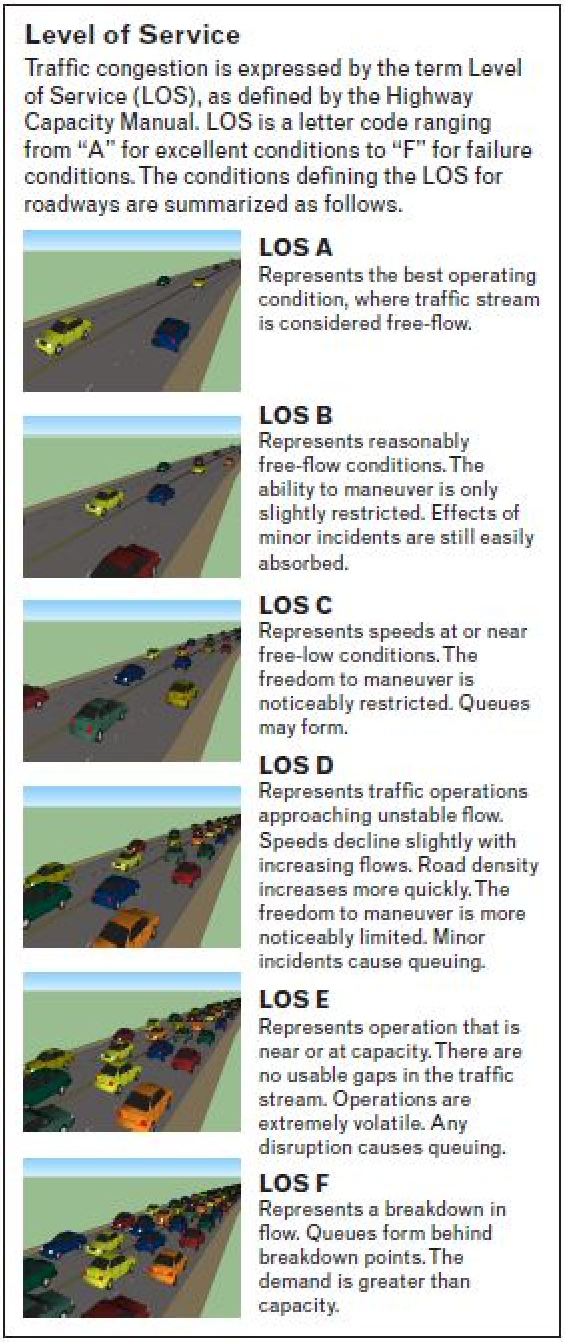
3.7.1 Analysis Tools

The study analyzed the study area intersections using Synchro™ Traffic Signal Coordination Software Version 8.0 (Build 805, Revision 878) and SimTraffic™ Version 8.0 (Build 805, Revision 878). Two main analyses are performed for traffic, an intersection capacity analysis and an intersection queueing analysis. The intersection capacity analysis uses the Synchro™ software tool and various input values as described below in Section 3.7.2 to determine the Level of Service (LOS), or driver perception of an intersection's operation. The intersection capacity analysis determining LOS is described in Section 3.7.2 and the study area results are presented in Section 3.7.4. The intersection queuing analysis uses both the Synchro™ and SimTraffic™ tools to determine different levels of queuing, or the length that vehicles may back up at an intersection. SimTraffic was used in addition to the standard Synchro tool to analyze queueing because it provides a more robust analysis of 95th percentile queuing than Synchro and it was agreed to in the Site Transportation Agreement (Appendix C1).The intersection queuing analysis process is described more in Section 3.7.3, while the study area results of the queuing analysis are presented in Section 3.7.5.

3.7.2 Intersection Operations Analysis Method

The LOS is the primary measure of traffic operations for both signalized and unsignalized intersections, as well as freeway facilities. LOS is a performance measure developed by the transportation profession to quantify driver perception for such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles. The LOS provides a scale that is intended to match the perception by motorists of the operation of the transportation facility and to provide a scale to compare different facilities. Detailed LOS descriptions are presented in figure 3-15.

Figure 3-15: Level of Service Diagram



Source: TRB (2000)

3.7.2.1 Signalized Intersection Level of Service

The LOS for signalized intersections in Maryland is guided by both the Highway Capacity Manual (HCM) 2000 method and the Critical Lane Volume (CLV) method.

3.7.2.2 ***HCM 2000 Method***

The HCM 2000 method requires several inputs to determine an accurate LOS (TRB 2000). The primary inputs include:

- vehicular volumes,
- pedestrian volumes,
- traffic signal timings,
- roadway geometry,
- speed limits,
- truck percentages, and
- peak hour factor (measure of vehicle 15-minute flow rate).

The average vehicle control delay, measured in seconds per vehicle, is calculated using these parameters with the Synchro procedures. This represents the average extra delay in seconds per vehicle caused by the presence of a traffic control device or traffic signal and includes the time required to decelerate, stop, and accelerate. LOS can be characterized for the entire intersection, each intersection approach, and each lane group. Control delay is used to characterize LOS for the entire intersection or an approach. Control delay and volume-to-capacity ratio are used to characterize LOS for a lane group. Delay quantifies the increase in travel time due to a traffic signal control. It is also a surrogate measure for driver discomfort and fuel consumption (TRB 2010). Signalized intersections or approaches that exceed a delay of 50 seconds have LOS E and 80 seconds have LOS F. Table 3-21 shows the average control delay and corresponding LOS for signalized intersections. Using the HCM 2000 method, LOS E and LOS F constitute failing operations.

Table 3-21: Signalized Intersection Control Delay and LOS Thresholds – HCM 2000 Method

LOS	Average Control Delay (seconds/vehicle)	Description
A	Less than or equal to 10	Stable conditions
B	>10-20	
C	>20-35	
D	>35-55	
E	>55-80	Unstable conditions
F	More than 80	Above capacity and unstable conditions

Source: TRB (2000)

To determine the LOS of an intersection, the critical input values were entered into the analysis software (Synchro™), and the average vehicle delay (seconds per vehicle) was calculated. Based on the average vehicle delay, the LOS was determined for all movements (left, through, and right), approaches, and the intersection as a whole. The 13 Existing Condition intersections analyzed consisted of nine signalized intersections and four unsignalized intersections.

3.7.2.3 CLV Method

The CLV method also requires several inputs to determine LOS; these inputs include vehicular volumes and roadway geometry. Using these parameters, the CLV method measures the conflicted vehicle movements through an intersection (usually through volumes plus opposing left-turn volumes). The critical volume is determined by adding the highest vehicle conflicting movements along two perpendicular approaches (one east-west volume plus one north-south volume). Volumes are adjusted to reflect the number of lanes serving each vehicle move. Table 3-22 shows the CLV and corresponding LOS for signalized intersections. Using the CLV method, LOS F constitutes failing operations.

Table 3-22: Signalized Intersection Critical Lane Volume (CLV) and LOS Thresholds – CLV Method

LOS	Critical Lane Volume (vehicles)	Description
A	Less than or equal to 1,000	Passing operation
B	>1,000 – 1,150	
C	> 1,150 – 1,300	
D	> 1,300 – 1,450	
E	< 1,450 – 1,600	
F	>1600	Above capacity and unstable conditions

Source: M-NCPPC (2012a)

As noted above, acceptable operation of a signalized intersection for HCM 2000 method is LOS D and above, while acceptable or passing operation of signalized intersection for the CLV method is LOS E and above.

3.7.2.4 Unsignalized Intersection Levels of Service

The LOS for unsignalized intersections (STOP-Controlled intersections or roundabouts) is based on the Highway Capacity Manual (HCM) 2000 method and requires several inputs to determine an accurate LOS, including:

- vehicular volumes,
- pedestrian volumes,
- roadway geometry,
- speed limits,
- truck percentages, and
- peak hour factor.

The average vehicle control delay, in seconds per vehicle, is calculated using these parameters with the HCM 2000 procedures (TRB 2000). This represents the average delay, caused by the presence of a stop sign or roundabout, and includes the time required to decelerate, stop, and accelerate.

LOS for a two-way STOP-Controlled (TWSC) intersection (i.e., unsignalized intersection) is determined for each minor-street movement (or shared movement) as well as the major-street left turns. LOS F is assigned to the movement if the v/c ratio for the movement exceeds 1.0 or if the movement's control delay exceeds 50 seconds. The LOS for TWSC intersections are different from the criteria used for signalized intersections primarily because user perceptions differ among transportation facility types. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Unsignalized intersections are also associated with more uncertainty for users because delays are less predictable than at signals, which can reduce user's delay tolerance. LOS is not defined for the TWSC intersection as a whole or for major-street approaches for three primary reasons: (a) major-street through-vehicles are assumed to experience zero delay; (b) the disproportionate number of major-street through-vehicles at a typical TWSC intersection skews the weighted average of all movements, resulting in a very low overall average delay for all vehicles; and (c) the resulting low delay can mask important LOS deficiencies for minor movements (TRB 2010).

The capacity of the controlled intersection legs is based primarily on three factors: the conflicting volume, the critical gap time, defined as the number of seconds between vehicles passing the same point along the major street approach, and the follow up time, defined as the number of seconds between the departure of the first and second vehicle in queue along the minor street approach. The HCM-based capacity analysis procedure assumes consistency for driver's critical gap time. Critical gap times are based on many factors including delay experienced by drivers on the approaches controlled by STOP signs. As delay increases, drivers become less patient and will accept shorter gaps, which results in higher capacities for unsignalized intersections that are operating at LOS D or worse. The unsignalized intersection procedure uses fixed critical gap times. Unless the critical gap times are adjusted, the procedure will have a tendency to overestimate the delay at unsignalized intersections that are operating at LOS D or worse. Also, poor operations at an unsignalized intersection will encourage some drivers to turn right and make a U-turn on the mainline or accept shorter critical gaps (safety issue) rather than attempt a turn left (TRB 2010).

Table 3-23 shows the average control delay and corresponding LOS for unsignalized intersections. It should be noted that the worst LOS at one-way and two-way STOP-Controlled intersections represents the delay for the minor approach only. Using the HCM 2000 method, LOS E and F constitute failing operations.

Table 3-23: Unsignalized Intersection Control Delay and LOS Thresholds – HCM 2000 Method

LOS	Average Control Delay (seconds/vehicle)	Description
A	Less than or equal to 10	Stable conditions
B	>10-15	
C	>15-25	
D	>25-35	
E	>35-50	Unstable conditions
F	More than 50	Above capacity and unstable conditions

Source: TRB (2000)

3.7.2.5 Freeway Facilities

The LOS for freeway facilities is based on the HCM 2010 procedures and requires several inputs to determine an accurate LOS (TRB 2010), including:

- vehicular volumes,
- roadway geometry,
- speed limits, and
- truck percentages.

Based on the HCM 2010 procedures, the average vehicle density, in passenger cars per mile per lane, is calculated. Table 3-24 shows the vehicle density and corresponding LOS. Freeway facilities will only be analyzed for the Build Condition, however, the existing freeway volumes will be provided in the Existing Condition and No–

build Conditions sections to allow a comparison with future freeway volumes of the proposed action or Build Condition. Using the HCM 2010 method, LOS E and F constitute failing operations.

Table 3-24: HCM Weaving Segments, Merge, and Diverge Facilities Level of Service

LOS	Density (passenger cars/mile/lane)	Description
A	Less than or equal to 10	Passing operation
B	>10-20	
C	>20-28	
D	>28-35	
E	>35	Unstable conditions
F	Demand Exceeds Capacity	Above capacity and unstable conditions

Source: TRB (2010)

3.7.3 Intersection Queuing Analysis Method

In addition to analyzing the vehicle delay, the vehicle queue lengths were calculated for each approach. The 50th percentile queue length is average queue length, calculated as the queue expected during 50 percent of the analysis period. The 95th percentile queue length is the worst-case scenario, calculated as the queue that has a 5 percent probability of being exceeded. A failing queue length is determined by a queue length exceeding the intersection approach storage capacity. As the available storage for each intersection approach differs, these values reflect whether the existing storage provides enough space for vehicles waiting to pass through the intersection without blocking another lane or another intersection. Because failing queues might occur along the same approach as a failing LOS, these values are calculated independently and might result in one approach receiving a failing LOS score, while another approach has a failing queue length. The study used Synchro™ to calculate the 50th percentile queue lengths and SimTraffic™ to calculate 95th percentile queue lengths for the nine signalized intersections, and only the 95th percentile queue lengths in SimTraffic™ for the four unsignalized intersections (50th percentile not reported in SimTraffic or Synchro for unsignalized intersections).

As previously mentioned, SimTraffic was used to calculate the 95th percentile queue length for each approach at each study area intersection because it provides a more robust analysis than Synchro, and this tool was agreed to in the Site Transportation Agreement. The use of SimTraffic involved calibrating the model, ensuring the model runs for the appropriate amount of time, and determining the number of simulation runs to be statistically within a plus or minus 5 percent error. The model was calibrated by adjusting link speeds, turning speeds, and vehicle positioning decision points (distance prior to decision point when vehicles position themselves in the correct lane for upcoming moves). The goal was to adjust the model to resemble a simulation closely representing the Existing Condition. Running the model included a seeding time (time for vehicles to completely travel the network) plus four 15-minute recording times (totaling 60 minutes). Based on the distance from the farthest points on the network, an 8-minute seed time was applied. The minimum number of simulation runs was calculated by running the simulation 10 runs. Based on the results of the 10 runs, the standard deviation was calculated using the vehicle hours of travel (VHT) metric. VHT provides a good indication of vehicle delays by requiring more simulations given facility operation and queuing issues. Using the calculated standard deviation, the number of simulations required was calculated to be within plus or minus 5 percent at the 95th percentile confidence level. Because SimTraffic varies quite a bit between runs in terms of VHT, even for small networks, a plus or minus 5 percent error was established. The number of simulation runs to reduce the error to 4 percent would require dozens of runs for little gain in accuracy. In some cases where little congestion occurred, 10 runs achieved better than a plus or minus 5 percent error. Appendix C5 contains the statistical Excel sheets used to determine the appropriate number of simulation runs.

3.7.4 Existing Condition Intersection Operations Analysis

Synchro™ was used to calculate the vehicle delay and LOS operation based on the HCM 2000 method for each study area intersection. Custom designed Excel sheets were used to calculate the LOS operation based on the CLV method.

3.7.4.1 Signalized Intersection Operations Analysis

Based on the Synchro™ and CLV-based Excel worksheet analysis, the majority of study intersections operate at acceptable overall conditions during the morning and afternoon peak hours. However, the following intersection in the study area operates with overall unacceptable conditions (LOS E or LOS F) using the HCM 2000 method unless noted below:

- Edmonston Road (MD 201) and Powder Mill Road during PM peak hour (using CLV method with CLV LOS F)

Using the HCM 2000 method, a total of five signalized intersection lane groups or overall approaches operate under unacceptable conditions (LOS E or LOS F) during the morning or afternoon peak hours. The lane group within the approach that is operating under unacceptable conditions is noted in parentheses; when “overall” is noted, the overall approach movements operate under unacceptable conditions.

- Greenbelt Road (MD 193) and Cherrywood Lane/60th Avenue (Intersection #1)
    - Eastbound Greenbelt Road (left turns), during the AM peak hour
    - Westbound Greenbelt Road (left turns), northbound 60th Avenue (overall) and southbound Cherrywood Lane (overall) for the AM and PM peak hours
- Greenbelt Road (MD 193) and 62nd Avenue/Beltway Plaza Driveway (Intersection #6)
    - Northbound 62nd Ave (overall) and southbound Beltway Plaza Dr (overall) during AM and PM peak hours
- Kenilworth Avenue (MD 201) and Crescent Road/Maryland SHA Office (Intersection #9)
    - Westbound Crescent Rd (combined left turns and through movements) and southbound Kenilworth Avenue (left turns) during AM peak hour
- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12)
    - Eastbound Sunnyside Avenue (overall) during the AM peak hour
    - Eastbound Sunnyside Avenue (left turns), northbound Edmonston Road (left turns) and southbound Edmonston Road (overall) during the PM peak hour
- Edmonston Road (MD 201) and Powder Mill Road (Intersection #13)
    - Northbound Edmonston Road (overall) during the AM peak hour
    - Eastbound Powder Mill Road (overall) and northbound Edmonston Road (left turns) during the PM peak hour

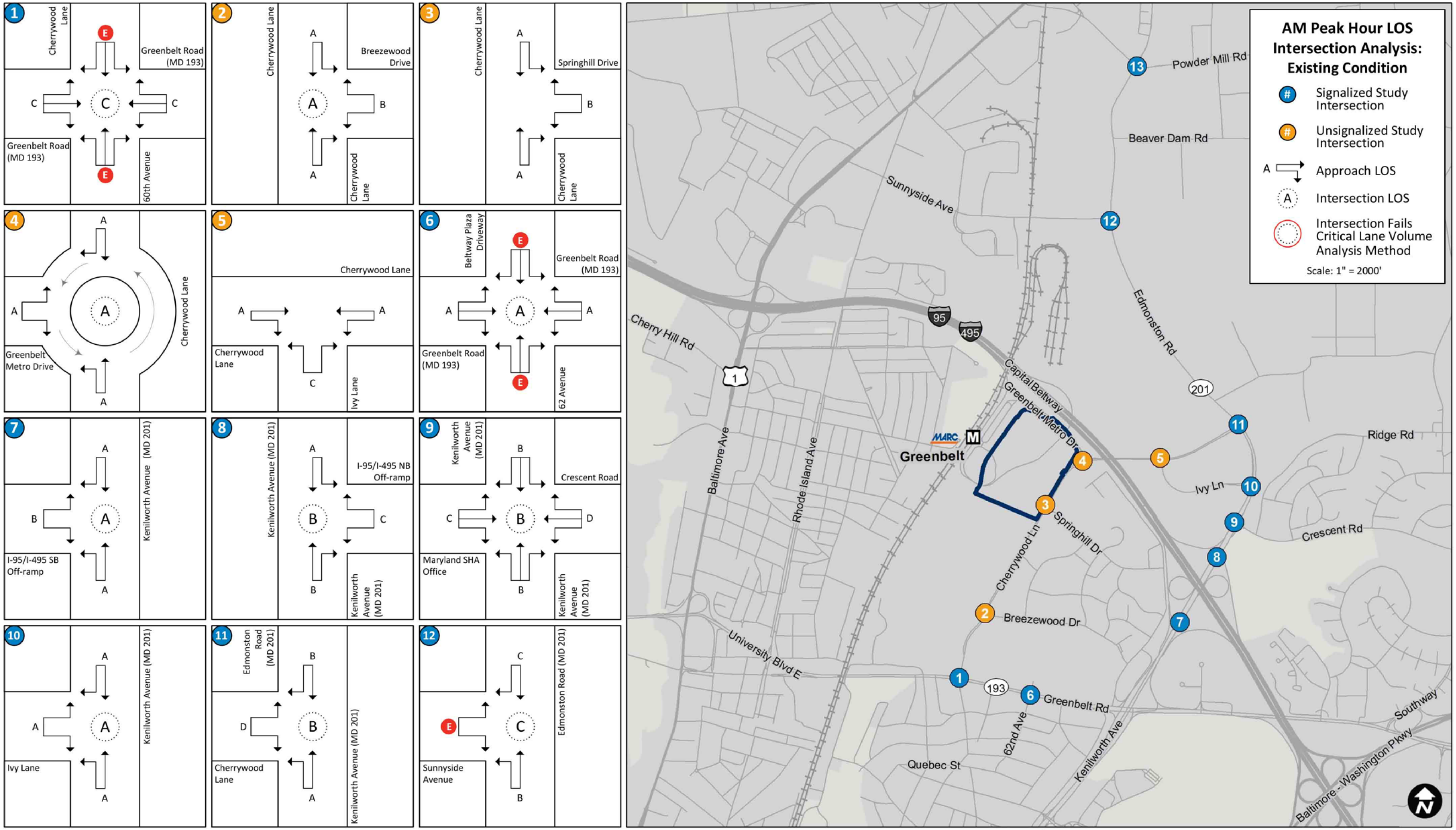
3.7.4.2 Unsignalized Intersection Operations Analysis

Based on the unsignalized intersection analysis, all unsignalized intersections and approaches in the study area operate at acceptable overall conditions during the AM and PM peak hours.

3.7.4.3 Complete Intersection Operations Analysis

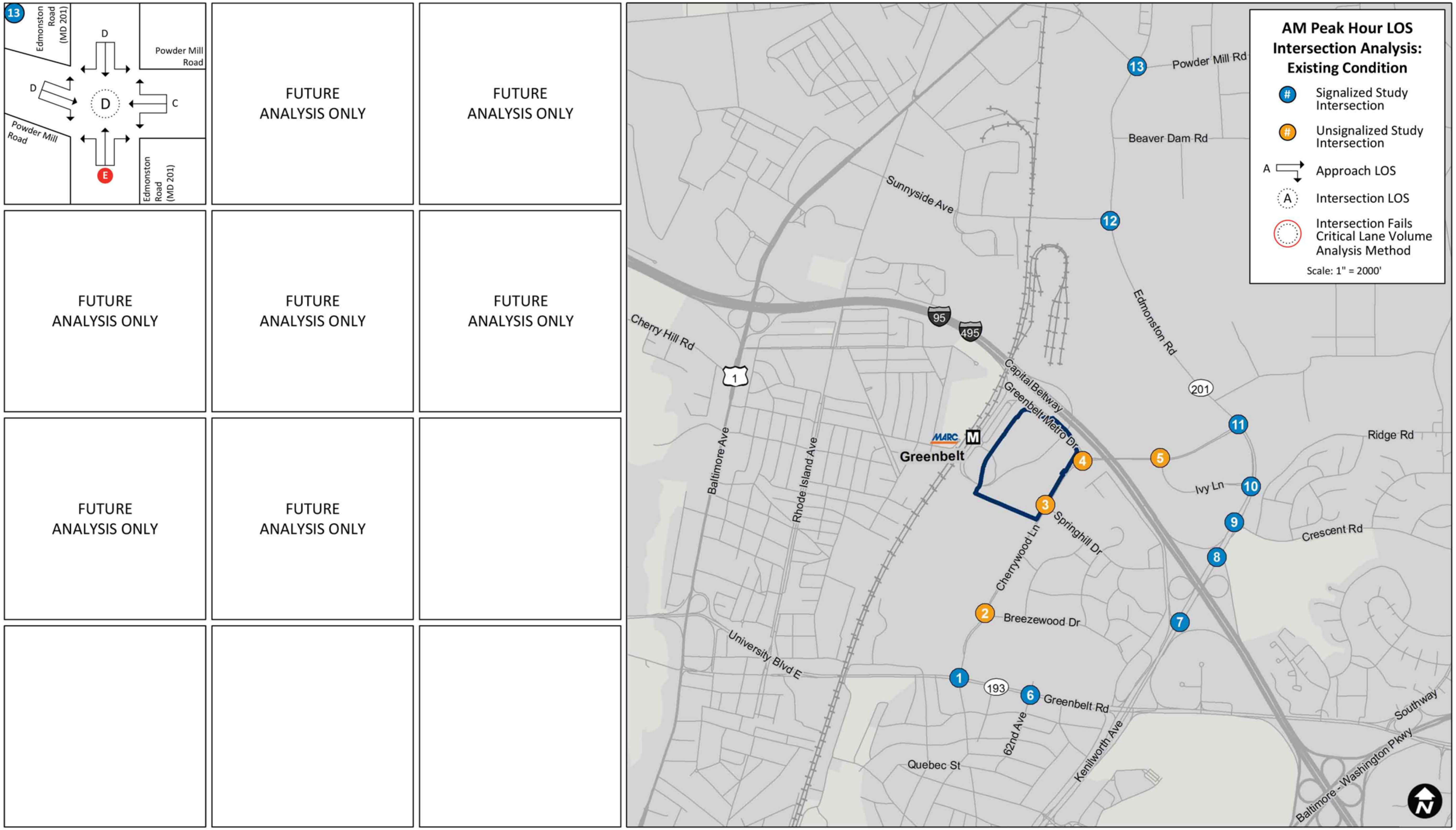
The average LOS for the various approaches to the intersection and the overall intersection LOS grade are depicted in figures 3-16 and 3-17 for AM and PM peak hours, respectively. Table 3-25 shows the results of the LOS capacity analysis and the intersection vehicle delay for the existing conditions during the AM and PM peak hours.

Figure 3-16: Existing Condition Intersection LOS for AM Peak Hour



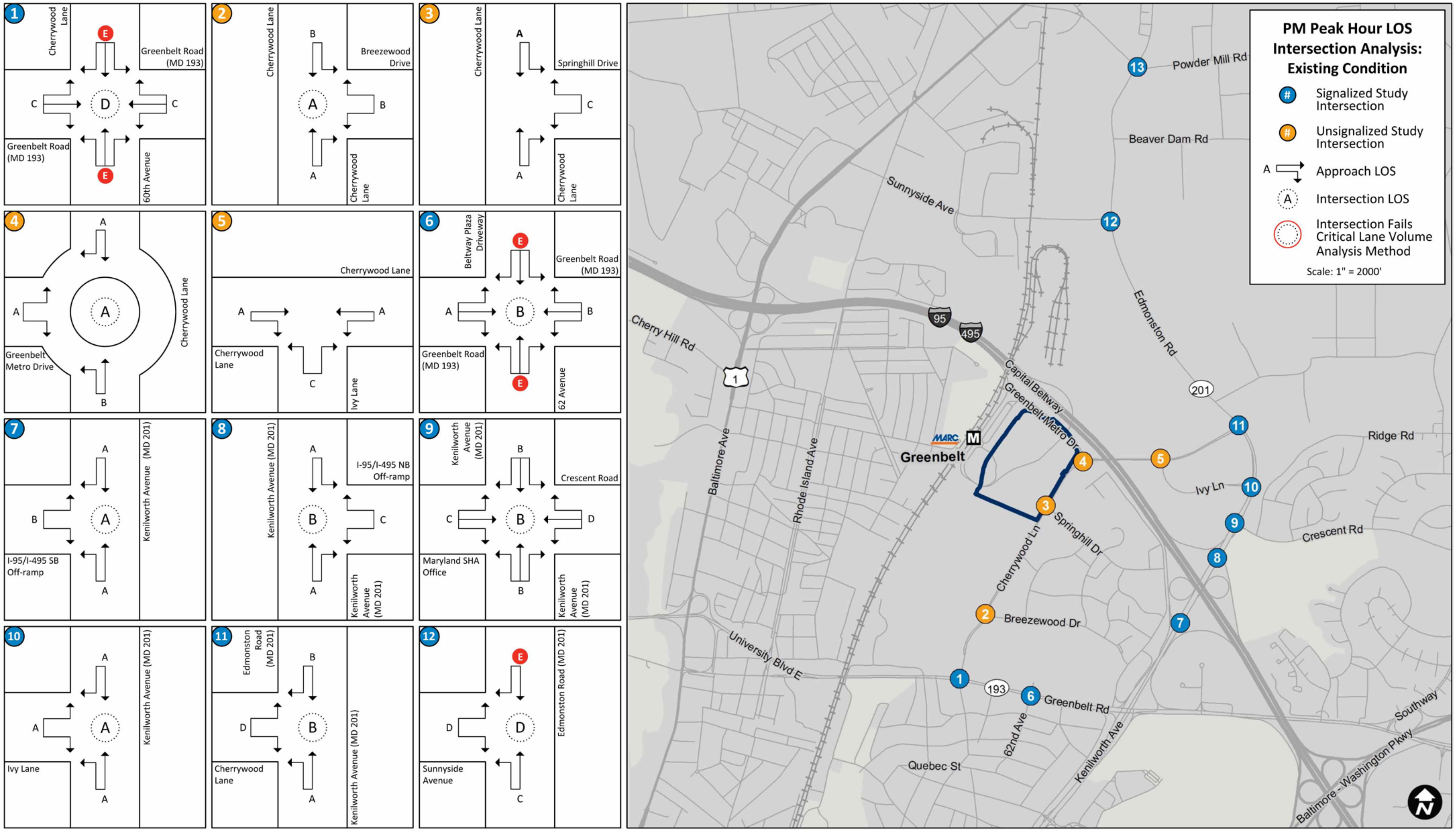
Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.

Figure 3-16: Existing Condition Intersection LOS for AM Peak Hour (continued)



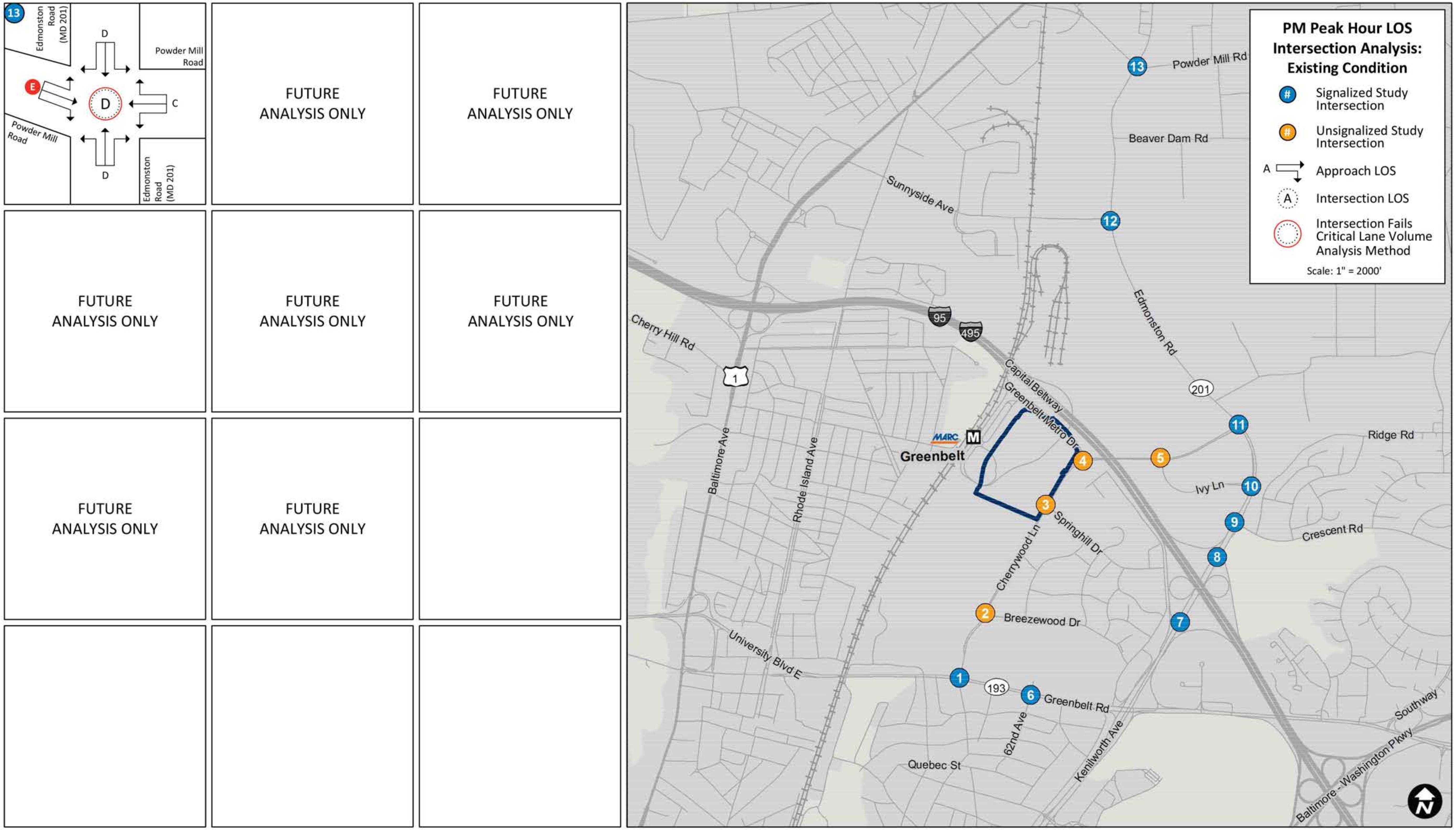
Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.

Figure 3-17: Existing Condition Intersection LOS for PM Peak Hour



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.

Figure 3-17: Existing Condition Intersection LOS for PM Peak Hour (continued)



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.

Table 3-25: Existing Condition AM and PM Peak Hour Operations Analysis

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/veh)	LOS	Critical Lane Volume	LOS		Delay (sec/veh)	LOS	Critical Lane Volume	LOS	
1	**Greenbelt Road (MD 193) & Cherrywood Lane/60th Avenue (Signalized)**											
	EB (Greenbelt Rd)	L	63.4	E				54.3	D			
	EB (Greenbelt Rd)	TR	14.6	B				26.1	C			
	EB Overall (Greenbelt Rd)		**24.5**	**C**				**32.3**	**C**			
	WB (Greenbelt Rd)	L	85.2	F				74.7	E			
	WB (Greenbelt Rd)	TR	23.1	C				27.0	C			
	WB Overall (Greenbelt Rd)		**24.5**	**C**				**29.1**	**C**			
	NB (60th Ave)	LTR	66.6	E				68.7	E			
	NB Overall (60th Ave)		**66.6**	**E**				**68.7**	**E**			
	SB (Cherrywood Ln)	L	66.1	E				68.5	E			
	SB (Cherrywood Ln)	LT	66.0	E				68.5	E			
	SB (Cherrywood Ln)	R	55.8	E				51.8	D			
	SB Overall (Cherrywood Ln)		**59.0**	**E**				**57.7**	**E**			
	Overall		**30.6**	**C**	**1,175**	**C**	**Pass**	**37.4**	**D**	**1,279**	**C**	**Pass**
2	**Cherrywood Lane & Breezewood Drive (AWSC)**											
	WB (Breezewood Dr)	LR	11.0	-				10.1	-			
	WB Overall (Breezewood Dr)		**11.0**	**B**				**10.1**	**B**			
	NB (Cherrywood Ln)	T	9.3	-				10.8	-			
	NB (Cherrywood Ln)	R	8.0	-				8.1	-			
	NB Overall (Cherrywood Ln)		**8.7**	**A**				**9.6**	**A**			
	SB (Cherrywood Ln)	L	8.2	-				8.0	-			
	SB (Cherrywood Ln)	T	10.0	-				10.8	-			
	SB Overall (Cherrywood Ln)		**9.8**	**A**				**10.6**	**B**			
	Overall		**9.6**	**A**	**N/A**	**N/A**	**Pass**	**10.0**	**A**	**N/A**	**N/A**	**Pass**
3	**Cherrywood Lane & Springhill Drive (TWSC)**											
	WB (Springhill Dr)	LR	11.5	B				19.7	C			
	WB Overall (Springhill Dr)		**11.5**	**B**				**19.7**	**C**			
	SB (Cherrywood Ln)	L	7.8	A				8.2	A			
	SB Overall (Cherrywood Ln)		**2.1**	**-**				**1.6**	**-**			
	Overall		**3.5**	**-**	**N/A**	**N/A**	**Pass**	**4.6**	**-**	**N/A**	**N/A**	**Pass**
4	**Cherrywood Lane & Greenbelt Metro Drive (Roundabout)** [a]											
	EB (Greenbelt Metro Dr)	LR	5.2	A				10.6	B			
	EB Overall (Greenbelt Metro Dr)		**3.2**	**A**				**7.2**	**A**			
	NB (Cherrywood Ln)	LT	7.0	A				10.4	B			
	NB Overall (Cherrywood Ln)		**7.0**	**A**				**10.4**	**B**			
	SB (Cherrywood Ln)	T	5.3	A				8.3	A			
	SB Overall (Cherrywood Ln)		**1.6**	**A**				**6.2**	**A**			
	Overall		**3.5**	**A**	**N/A**	**N/A**	**Pass**	**7.6**	**A**	**N/A**	**N/A**	**Pass**

Table 3-25: Existing Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
5	**Cherrywood Lane & Ivy Lane (TWSC)**											
	WB (Cherrywood Ln)	L	8.0	A				8.6	A			
	WB Overall (Cherrywood Ln)		**0.6**	**-**				**0.3**	**-**			
	NB (Ivy Ln)	L	19.7	C				22.5	C			
	NB (Ivy Ln)	R	9.9	A				12.0	B			
	NB Overall (Ivy Ln)		**17.1**	**C**				**19.1**	**C**			
	Overall		**1.8**	**-**	**N/A**	**N/A**	**Pass**	**2.7**	**-**	**N/A**	**N/A**	**Pass**
6	**Greenbelt Road (MD 193) & 62 Avenue/Beltway Plaza Driveway (Signalized)**											
	EB (Greenbelt Rd)	L	3.4	A				5.0	A			
	EB (Greenbelt Rd)	TR	3.7	A				7.2	A			
	EB Overall (Greenbelt Rd)		**3.7**	**A**				**7.1**	**A**			
	WB (Greenbelt Rd)	L	4.0	A				19.8	B			
	WB (Greenbelt Rd)	T	7.3	A				18.4	B			
	WB (Greenbelt Rd)	R	5.0	A				16.7	B			
	WB Overall (Greenbelt Rd)		**7.1**	**A**				**18.1**	**B**			
	NB (62th Ave)	LTR	66.9	E				71.4	E			
	NB Overall (62th Ave)		**66.9**	**E**				**71.4**	**E**			
	SB (Beltway Plaza Drwy)	L	68.3	E				65.4	E			
	SB (Beltway Plaza Drwy)	LT	68.3	E				65.3	E			
	SB (Beltway Plaza Drwy)	R	66.7	E				54.4	D			
	SB Overall (Beltway Plaza Drwy)		**67.8**	**E**				**63.3**	**E**			
	Overall		**8.2**	**A**	**648**	**A**	**Pass**	**19.1**	**B**	**1,085**	**B**	**Pass**
7	**Kenilworth Avenue (MD 201) & I-95/I-495 SB Off-ramp (Signalized)**											
	EB (I-95/I-495 SB Off-ramp)	L	40.2	D				39.4	D			
	EB (I-95/I-495 SB Off-ramp)	R	11.3	B				0.9	A			
	EB Overall (I-95/I-495 SB Off-ramp)		**15.3**	**B**				**13.4**	**B**			
	NB (Kenilworth Ave)	T	3.1	A				4.3	A			
	NB Overall (Kenilworth Ave)		**3.1**	**A**				**4.3**	**A**			
	SB (Kenilworth Ave)	T	3.9	A				7.0	A			
	SB Overall (Kenilworth Ave)		**3.9**	**A**				**7.0**	**A**			
	Overall		**8.5**	**A**	**639**	**A**	**Pass**	**8.0**	**A**	**572**	**A**	**Pass**

Table 3-25: Existing Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
8	**Kenilworth Avenue (MD 201) & I-95/I-495 NB Off-ramp (Signalized)**											
	WB (I-95/I-495 NB Off-ramp)	L	27.5	C				32.6	C			
	WB (I-95/I-495 NB Off-ramp)	R	26.1	C				30.2	C			
	WB Overall (I-95/I-495 NB Off-ramp)		**26.8**	**C**				**31.4**	**C**			
	NB (Kenilworth Ave)	T	10.2	B				9.0	A			
	NB Overall (Kenilworth Ave)		**10.2**	**B**				**9.0**	**A**			
	SB (Kenilworth Ave)	T	8.4	A				4.0	A			
	SB Overall (Kenilworth Ave)		**8.4**	**A**				**4.0**	**A**			
	Overall		**17.9**	**B**	**888**	**A**	**Pass**	**15.4**	**B**	**784**	**A**	**Pass**
9	**Kenilworth Avenue (MD 201) & Crescent Road/Maryland SHA Office (Signalized)**											
	EB (Maryland SHA Office)	LTR	28.1	C				34.7	C			
	EB Overall (Maryland SHA Office)		**28.1**	**C**				**34.7**	**C**			
	WB (Crescent Rd)	LT	59.3	E				43.7	D			
	WB (Crescent Rd)	R	28.7	C				34.8	C			
	WB Overall (Crescent Rd)		**49.7**	**D**				**40.0**	**D**			
	NB (Kenilworth Ave)	L	46.5	D				45.5	D			
	NB (Kenilworth Ave)	T	14.5	B				15.3	B			
	NB (Kenilworth Ave)	R	14.2	B				21.5	C			
	NB Overall (Kenilworth Ave)		**15.5**	**B**				**16.5**	**B**			
	SB (Kenilworth Ave)	L	73.2	E				52.4	D			
	SB (Kenilworth Ave)	T	8.5	A				8.6	A			
	SB (Kenilworth Ave)	R	10.9	B				6.2	A			
	SB Overall (Kenilworth Ave)		**13.1**	**B**				**14.1**	**B**			
	Overall		**18.9**	**B**	**875**	**A**	**Pass**	**16.9**	**B**	**748**	**A**	**Pass**
10	**Kenilworth Avenue (MD 201) & Ivy Lane (Signalized)**											
	EB (Ivy Ln)	R	0.1	A				0.5	A			
	EB Overall (Ivy Ln)		**0.1**	**A**				**0.5**	**A**			
	NB (Kenilworth Ave)	L	27.7	C				28.1	C			
	NB (Kenilworth Ave)	T	0.2	A				0.2	A			
	NB Overall (Kenilworth Ave)		**7.4**	**A**				**3.4**	**A**			
	SB (Kenilworth Ave)	T	0.8	A				1.5	A			
	SB (Kenilworth Ave)	R	0.0	A				0.0	A			
	SB Overall (Kenilworth Ave)		**0.8**	**A**				**1.5**	**A**			
	Overall		**4.4**	**A**	**824**	**A**	**Pass**	**2.2**	**A**	**799**	**A**	**Pass**

Table 3-25: Existing Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
11	**Kenilworth Avenue/Edmonston Road (MD 201) & Cherrywood Lane (Signalized)**											
	EB (Cherrywood Ln)	L	41.2	D				39.6	D			
	EB (Cherrywood Ln)	R	39.2	D				37.3	D			
	EB Overall (Cherrywood Ln)		**40.5**	**D**				**38.5**	**D**			
	NB (Kenilworth Ave)	L	16.3	B				12.0	B			
	NB (Kenilworth Ave)	T	1.2	A				1.1	A			
	NB Overall (Kenilworth Ave)		**4.8**	**A**				**2.8**	**A**			
	SB (Edmonston Rd)	T	10.8	B				11.1	B			
	SB (Edmonston Rd)	R	8.1	A				7.7	A			
	SB Overall (Edmonston Rd)		**10.2**	**B**				**10.7**	**B**			
	Overall		**10.3**	**B**	**884**	**A**	**Pass**	**13.0**	**B**	**848**	**A**	**Pass**
12	**Edmonston Road (MD 201) & Sunnyside Avenue (Signalized)**											
	EB (Sunnyside Ave)	L	77.5	E				72.5	E			
	EB (Sunnyside Ave)	R	48.2	D				38.3	D			
	EB Overall (Sunnyside Ave)		**56.3**	**E**				**50.5**	**D**			
	NB (Edmonston Rd)	L	49.9	D				56.3	E			
	NB (Edmonston Rd)	T	4.9	A				14.9	B			
	NB Overall (Edmonston Rd)		**16.9**	**B**				**24.3**	**C**			
	SB (Edmonston Rd)	T	34.2	C				83.6	F			
	SB (Edmonston Rd)	R	6.3	A				8.2	A			
	SB Overall (Edmonston Rd)		**29.0**	**C**				**70.5**	**E**			
	Overall		**29.3**	**C**	**1,317**	**D**	**Pass**	**46.8**	**D**	**1,510**	**E**	**Pass**

Table 3-25: Existing Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
13	**Edmonston Road (MD 201) & Powder Mill Road (Signalized)**											
	EB (Powder Mill Rd)	L	38.3	D				42.0	D			
	EB (Powder Mill Rd)	T	50.4	D				111.7	F			
	EB (Powder Mill Rd)	R	41.1	D				40.7	D			
	EB Overall (Powder Mill Rd)		**44.1**	**D**				**73.3**	**E**			
	WB (Powder Mill Rd)	L	28.3	C				33.8	C			
	WB (Powder Mill Rd)	T	27.8	C				30.2	C			
	WB (Powder Mill Rd)	R	23.7	C				26.7	C			
	WB Overall (Powder Mill Rd)		**27.6**	**C**				**31.0**	**C**			
	NB (Edmonston Rd)	L	133.2	F				99.7	F			
	NB (Edmonston Rd)	T	17.5	B				34.1	C			
	NB (Edmonston Rd)	R	11.4	B				13.5	B			
	NB Overall (Edmonston Rd)		**72.4**	**E**				**53.6**	**D**			
	SB (Edmonston Rd)	L	29.7	C				37.6	D			
	SB (Edmonston Rd)	TR	36.0	D				35.3	D			
	SB Overall (Edmonston Rd)		**35.7**	**D**				**35.6**	**D**			
	Overall		**51.9**	**D**	**1,487**	**E**	**Pass**	**53.3**	**D**	**1,685**	**F**	**Fail**

Notes:

AWSC = All-way STOP-Controlled intersection

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LOS = Level of Service

LTR = left / through / right lanes

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

Delay is Measured in Seconds Per Vehicle.

Red cells denote intersections or approaches operating at unacceptable conditions.

[a] Highway Capacity Software 2010 Roundabout results

3.7.5 Existing Condition Intersection Queue Analysis

Synchro™ was used to calculate the 50th percentile queue lengths, and SimTraffic™ was used to calculate the 95th percentile queue lengths. The SimTraffic™ simulations have a statistical error of plus or minus 3.3 percent error for the AM peak hour and 5.0 percent error for the PM peak hour simulations. Based on the Synchro™ and SimTraffic™ analysis, the following signalized intersection approaches experience failing queue lengths in Synchro™ or SimTraffic™. The lane group within the approach that is operating under unacceptable conditions is noted in parentheses.

- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12)
  - Southbound Edmonston Road (right turns) during AM peak hour
  - Eastbound Sunnyside Avenue (right turns), southbound Edmonston Road (through movements and right turns) during PM peak hour
- Edmonston Road (MD 201) and Powder Mill Road (Intersection #13)
  - Northbound Edmonston Road (left turns and through movements) during AM peak hour
  - Eastbound Powder Mill Road (through movements, left turns and right turns), and northbound Edmonston Road (left turns and right turns) during PM peak hour

None of the unsignalized intersections would experience failing queue lengths for the 95th percentile.

The remaining intersections in the study area have acceptable queue lengths. See table 3-26 for more details on the percentile values observed at each intersection. The percentile values are expressed in feet, and an average car plus space between the next vehicle requires roughly 25 feet of space.

Table 3-26: Existing Condition AM and PM Peak Hours Queuing Analysis

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
1	**Greenbelt Road (MD 193) & Cherrywood Lane/60th Avenue (Signalized)**						
	EB (Greenbelt Rd)	L	350	126	150	256	267
	EB (Greenbelt Rd)	TR	2,725	177	141	513	413
	WB (Greenbelt Rd)	L	200	48	121	70	157
	WB (Greenbelt Rd)	TR	1,324	560	306	180	330
	NB (60th Ave)	LTR	267	137	187	149	200
	SB (Cherrywood Ln)	L	350	84	104	172	197
	SB (Cherrywood Ln)	LT	1,300	83	132	176	234
	SB (Cherrywood Ln)	R	1,300	168	176	386	323
2	**Cherrywood Lane & Breezewood Drive (AWSC)**						
	WB (Breezewood Dr)	LR	565	-	67	-	54
	NB (Cherrywood Ln)	T	1,300	-	89	-	141
	NB (Cherrywood Ln)	R	1,300	-	76	-	88
	SB (Cherrywood Ln)	L	175	-	47	-	40
	SB (Cherrywood Ln)	T	2,410	-	69	-	70
3	**Cherrywood Lane & Springhill Drive (TWSC)**						
	WB (Springhill Dr)	LR	339	-	60	-	87
	NB (Cherrywood Ln)	TR	-	-	-	-	-
	SB (Cherrywood Ln)	L	350	-	34	-	46
4	**Cherrywood Lane & Greenbelt Metro Drive (Roundabout)**						
	EB (Greenbelt Metro Dr)	L	477	-	37	-	80
	EB (Greenbelt Metro Dr)	R	150	-	13	-	20
	NB (Cherrywood Ln)	LT	116	-	51	-	75
	SB (Cherrywood Ln)	T	1,438	-	33	-	51
	SB (Cherrywood Ln)	R	150	-	20	-	11
5	**Cherrywood Lane & Ivy Lane (TWSC)**						
	EB (Cherrywood Ln)	TR	1,438	-	-	-	2
	WB (Cherrywood Ln)	L	226	-	33	-	24
	NB (Ivy Ln)	L	467	-	55	-	63
	NB (Ivy Ln)	R	467	-	37	-	50

Table 3-26: Existing Condition AM and PM Peak Hours Queuing Analysis (continued)

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
6	**Greenbelt Road (MD 193) & 62 Avenue/Beltway Plaza Driveway (Signalized)**						
	EB (Greenbelt Rd)	L	250	1	24	8	60
	EB (Greenbelt Rd)	TR	1,324	47	58	138	186
	WB (Greenbelt Rd)	L	250	10	48	20	105
	WB (Greenbelt Rd)	T	1,160	154	143	291	271
	WB (Greenbelt Rd)	R	1,160	1	35	23	90
	NB (62th Ave)	LTR	697	26	91	124	196
	SB (Beltway Plaza Drwy)	L	350	17	15	162	244
	SB (Beltway Plaza Drwy)	LT	472	17	64	163	274
	SB (Beltway Plaza Drwy)	R	350	0	23	0	47
7	**Kenilworth Avenue (MD 201) & I-95/I-495 SB Off-ramp (Signalized)**						
	EB (I-95/I-495 SB Off-ramp)	L	555	73	259	103	195
	EB (I-95/I-495 SB Off-ramp)	R	-	0	488	0	-
	NB (Kenilworth Ave)	T	1,259	45	86	75	124
	SB (Kenilworth Ave)	T	529	75	150	137	156
8	**Kenilworth Avenue (MD 201) & I-95/I-495 NB Off-ramp (Signalized)**						
	WB (I-95/I-495 NB Off-ramp)	L	863	236	245	176	234
	WB (I-95/I-495 NB Off-ramp)	R	813	148	126	93	102
	NB (Kenilworth Ave)	T	255	73	103	53	120
	SB (Kenilworth Ave)	T	202	83	138	47	126
9	**Kenilworth Avenue (MD 201) & Crescent Road/Maryland SHA Office (Signalized)**						
	EB (Maryland SHA Office)	LTR	251	1	37	4	47
	WB (Crescent Rd)	LT	441	181	255	83	143
	WB (Crescent Rd)	R	250	0	109	0	73
	NB (Kenilworth Ave)	L	250	33	85	9	36
	NB (Kenilworth Ave)	T	251	200	185	184	166
	NB (Kenilworth Ave)	R	250	8	12	7	34
	SB (Kenilworth Ave)	L	300	47	104	121	211
	SB (Kenilworth Ave)	T	785	283	143	62	268
	SB (Kenilworth Ave)	R	785	0	8	0	1
10	**Kenilworth Avenue (MD 201) & Ivy Lane (Signalized)**						
	EB (Ivy Ln)	R	-	0	-	0	-
	NB (Kenilworth Ave)	L	543	135	165	50	85
	NB (Kenilworth Ave)	T	-	14	18	66	-
	SB (Kenilworth Ave)	T	1,206	4	127	14	100
	SB (Kenilworth Ave)	R	-	0	-	0	-

Table 3-26: Existing Condition AM and PM Peak Hours Queuing Analysis (continued)

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
11	**Kenilworth Avenue/Edmonston Road (MD 201) & Cherrywood Lane (Signalized)**						
	EB (Cherrywood Ln)	L	780	44	76	87	122
	EB (Cherrywood Ln)	R	1,310	0	68	9	88
	NB (Kenilworth Ave)	L	750	50	192	20	125
	NB (Kenilworth Ave)	T	1,206	3	51	6	85
	SB (Edmonston Rd)	T	588	186	201	181	178
	SB (Edmonston Rd)	R	250	0	104	0	54
12	**Edmonston Road (MD 201) & Sunnyside Avenue (Signalized)**						
	EB (Sunnyside Ave)	L	964	184	237	296	401
	EB (Sunnyside Ave)	R	350	268	345	375	#389
	NB (Edmonston Rd)	L	450	174	355	242	350
	NB (Edmonston Rd)	T	961	243	248	594	482
	SB (Edmonston Rd)	T	1,554	982	906	~1114	#1936
	SB (Edmonston Rd)	R	250	8	#308	6	#358
13	**Edmonston Road (MD 201) & Powder Mill Road (Signalized)**						
	EB (Powder Mill Rd)	L	250	35	98	80	#322
	EB (Powder Mill Rd)	T	935	197	266	~470	#964
	EB (Powder Mill Rd)	R	500	41	24	0	#613
	WB (Powder Mill Rd)	L	250	78	152	64	113
	WB (Powder Mill Rd)	T	1,038	123	199	118	171
	WB (Powder Mill Rd)	R	100	0	79	0	59
	NB (Edmonston Rd)	L	400	~486	#492	~419	#456
	NB (Edmonston Rd)	T	640	279	#696	546	603
	NB (Edmonston Rd)	R	275	0	77	14	#324
	SB (Edmonston Rd)	L	275	16	46	51	127
	SB (Edmonston Rd)	TR	983	213	253	201	292

Notes:

~ 50th percentile volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal. Due to upstream metering, the 95th percentile queue.

AWSC = All-way STOP-Controlled intersection

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left / through / right lanes

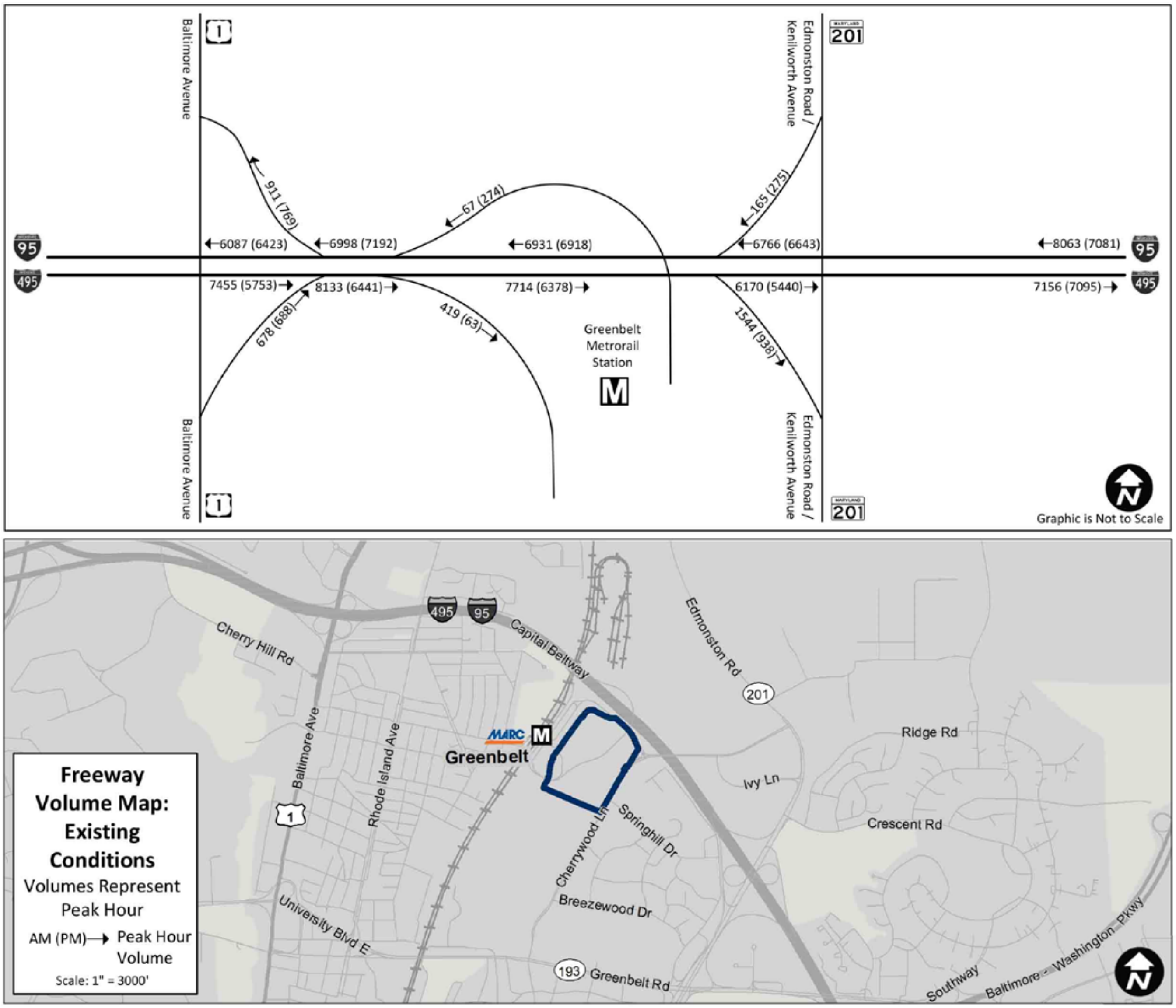
TWSC = Two-way STOP-Controlled intersection

Red cells denote approaches and lane groups whose queuing length exceeds capacity.

3.7.6 Freeway Volumes Results

Although freeway analysis was not performed for the Existing Condition, freeway ramp volumes are included in figure 3-18 to allow a comparison to the No-build, Build, and Build with Mitigation Condition freeway ramp volumes presented in Sections 4.8, 5.8, and 6.6. Full analysis of the freeway volumes is included in the Build with Mitigation Condition, in Section 6.6.

Figure 3-18: Existing Condition Freeway Volumes



3.8 Crash Analysis

Crash ratings are used in transportation analyses to help determine where additional attention or examination of safety should be undertaken. Crash ratings are evaluated based on recorded crash information collected by a jurisdiction, in this case three years of data from Maryland SHA (2011–2013), and calculated using the accident information and the daily volume of vehicles that travel through the intersection (Maryland SHA 2015a). Crash ratings are calculated based on the number of crashes that would occur per million entering vehicles (MEV) using the following formula:

$$\text{Rate} = \frac{C * 1{,}000{,}000}{n * 365 * V}$$

In this formula, C is the total number of intersection-related crashes in the study period, *n* is the number of years of data (i.e., study period), and *V* is the traffic volumes entering the intersection daily. Daily traffic volumes were calculated from an average of the AM and PM peak hour traffic volumes (due to the large differences between AM and PM volumes for some intersections) and adjusted based on the percent of daily traffic that would likely use the intersection during the peak hour. Similar to the a recent DC transportation study, the Maryland Avenue SW Transportation Study, it was assumed the peak hour accounted for 8 percent of the daily volumes based on common assumptions that peak hour traffic volumes account for 8–12 percent of daily traffic depending on the surrounding land use pattern (DDOT 2013), with urban areas being higher and suburban areas being lower within that range. The 8 percent factor was also used because it brought the overall traffic volumes of intersections the closest to intersection volumes calculated from Maryland SHA AADT roadway volumes in the study area (Maryland SHA 2014b).

Crash and injury ratings for the intersections in the study area are presented in table 3-27. The intersection with the highest crash rating is MD 201 and Crescent Road/Maryland SHA Office, with a crash rating of 0.34 crashes per MEV. According to the Institute of Transportation Engineers (ITE) *Transportation Impact Analyses for Site Development* (ITE 2010), an accident rate of 1.0 or higher is an indication that further study is needed. Since no study area intersections had an accident or crash rating of 1.0 or higher, no further safety analysis was performed for the study area for these intersections.

Table 3-27: Intersection Crash Summary

Intersection Number	Intersection Name (Cross Streets)	Crash Rate (crashes/MEV)	Injury Rate (crashes/MEV)
1	Greenbelt Road and Cherrywood Lane	0.21	0.07
2	Cherrywood Lane and Breezewood Drive	0.19	0.10
3	Cherrywood Lane and Springhill Drive	0.10	0.00
4	Cherrywood Lane and Metro Access Drive/Greenbelt Metro Drive	0.21	0.21
5	Cherrywood Lane and Ivy Lane	0.24	0.24
6	Greenbelt Road and 62nd Avenue	0.27	0.30
7	MD 201 and I-95/I-495 SB off-ramp	0.09	0.06
8	MD 201 and I-95/I-495 NB off ramp	0.30	0.33
9	MD 201 and Crescent Road/ Maryland SHA Office	0.34	0.41
10	MD 201 and Ivy Lane	0.08	0.05
11	MD 201 and Cherrywood Lane	0.29	0.40
12	MD 201 and Sunnyside Avenue	NA	NA
13	MD 201/Edmonston Road and MD 212/Powder Mill Road	0.31	0.34

Notes:
MEV = million entering vehicles
NA = crash data not available for this intersection
Intersections depicted in light blue have a crash rating over 1.0 and may warrant further analysis.
Source: Maryland SHA (2015a); traffic counts.

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4.0 Analysis of No-build Condition

This chapter introduces the No-build Condition for the Greenbelt site and summarizes the potential impacts on the pedestrian network, bicycle network, public transit system, parking conditions, truck access, and traffic operations if the consolidation of FBI HQ at the Greenbelt site does not occur.

The Greenbelt No-build Condition is unique from the No-action Alternative described in the FBI HQ Consolidation DEIS because it only analyzes the conditions at the Greenbelt site and does not factor in the impacts from the exchange of the JEH parcel in Washington, D.C. Under the No-build Condition, FBI HQ staff and operations would remain dispersed at JEH and other leased facilities without consolidation at a permanent location, or one of the other two sites would be selected. Under this condition, the Greenbelt site would not be redeveloped as a consolidated FBI HQ and instead would be redeveloped as a sizable mixed-use development, as described below.

The Greenbelt site is currently part of a larger two-part development collectively referred to as Greenbelt Station development. It is composed of the North Core and South Core. The South Core is located south of Narragansett Run, east of the CSX/Metrorail Green line tracks, north of Branchville Road, and west of Indian Creek (M-NCPPC 2012b and PGPD 2012) and is currently being developed into a medium-density residential community with possible future commercial retail facilities; this portion of Greenbelt Station would stay consistent whether the FBI HQ is consolidated at the Greenbelt site or not. Under the No-build Condition, the North Core would be located north of Narragansett Run, east of the CSX/Metrorail Green line tracks, south of the Capital Beltway (I-95/495), and west of the state preservation parcel containing Indian Creek, west of Cherrywood Lane (M-NCCPC and PGPD 2012). It is envisioned as a mixed-use town center with office, retail, hotel, and residential uses. There are key differences in the characteristics of the North Core under the No-build Condition as compared to the Build Condition that limit the ability to evaluate the transportation impacts of the FBI HQ consolidation at Greenbelt. These differences are as follows:

- Under the No-build Condition at the Greenbelt site, the configuration of the street network and the location of intersections in the North Core portion is substantially different than what is anticipated under the Build Condition.
- The total square footage of new development under the No-build Condition is substantially higher than under the Build Condition. Therefore, the amount of development proposed for the No-build Condition as part of the North Core would have a higher number of trips generated than assumed for the FBI HQ consolidation, making it difficult to understand the traffic impacts that would result from the proposed action alone.
- The locations of different portions of the development and their respective parking access locations within the No-build Condition would produce different internal trip distribution patterns within the North Core than what is anticipated under the Build Condition.

To fully evaluate the transportation impacts associated with the FBI HQ consolidation at Greenbelt, the No-build Condition was revised to better analyze the impacts associated with the FBI HQ consolidation. The No-build Condition developed for the analysis uses the same street network and intersection locations as the Build Condition and only incorporates the square footage associated with the portion of North Core development that would be implemented if FBI HQ were consolidated at the Greenbelt site, west of Greenbelt Station Parkway and east of the rail line. These adjustments allow an “apples to apples” comparison of the transportation impacts for the Greenbelt site between the No-build and Build Conditions. Table 4-1 compares the amount and type of development analyzed under the Greenbelt No-build analysis to the total amount of proposed development. In addition, the No-action Alternative refers to what is analyzed by all other resource topics.

Table 4-1: Greenbelt No-action Alternative and No-build Condition Comparison

Use	Condition	
	No-action Alternative (All other EIS Resources Areas)	No-Build (Transportation)
Office (GSF)	1.86 million	350,000
Retail (GSF)	1.4 million	100,000
Residential (Units)	800	800
Hotel (keys)	550	300

4.1 No-action Alternative (All Other EIS Resource Areas)

The future plans for the North Core portion of the Greenbelt Station development envision a high-density mixed-use development around the Greenbelt Metro Station with a variety of uses consistent with the Mixed-Use Transportation Oriented (MXT) zone, including residential, retail, office, and hotel uses. The development would be accessible by a reconstructed Greenbelt Metro Drive off of Cherrywood Lane, a new north-south oriented roadway through both the North and South Core developments accessible by Greenbelt Road (Maryland Route 193), and a new interchange with the Capital Beltway. The proposed No-action Alternative is shown in figure 4-1 and described in more detail below.