Georgetown Nonmotorized Boathouse Zone Transportation Impact Assessment

Appendix B of the Georgetown Nonmotorized Boathouse Zone Environmental Assessment

Submitted to the National Park Service

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Attachments

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ACRONYMNS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway Transportation Officials
ADA	Americans with Disabilities Act
AWSC	All-way STOP-Controlled
BID	Business Improvement District
CaBi	Capital Bikeshare
CCT	Capital Crescent Trail
C&O	Chesapeake and Ohio
DCOP	District of Columbia Office of Planning
DDOT	District Department of Transportation
EA	Environmental Assessment
GIS	Geographic Information Systems
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
Key Bridge	Francis Scott Key Bridge
LOS	level of service
MARC	Maryland Area Regional Commuter
MEV	million entering vehicles
MPH	miles per hour
MWCOG	Metropolitan Washington Council of Governments
NCPC	National Capital Planning Commission
NHP	National Historic Park
NPS	National Park Service
SF	square feet
TBC	Thompson's Boat Center
TDP	Transit Development Plan
TIA	Transportation Impact Assessment
TWSC	Two-way STOP-Controlled
v/c	volume-to-capacity ratio
VRE	Virginia Railway Express
WCC	Washington Canoe Club
WMATA	Washington Metropolitan Area Transit Authority
zone	nonmotorized boathouse zone

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1.0 INTRODUCTION

The findings of this Transportation Impact Assessment (TIA) were prepared as part of the Environmental Assessment (EA) to study implementation of a nonmotorized boathouse zone located along the District of Columbia side of the Potomac River in northwest Washington, DC. Developed for the National Park Service (NPS), this EA will establish a maximum program for the zone that is appropriate to the constraints of the project area and evaluate the impacts of the program. The purpose of this TIA is to support the transportation section of the EA and determine whether the worst-case scenario or the highest proposed density alternative presented in the EA would have an impact on transportation, what these impacts would be compared to a no-action alternative, and what mitigation would be necessary to preclude adverse impacts.

The proposed nonmotorized boathouse zone (zone) extends from 34th Street NW at the western edge of Georgetown Waterfront Park to approximately a quarter mile upriver from Francis Scott Key Bridge (Key Bridge) in the District of Columbia. The zone encompasses both public and private lands, including portions of the Chesapeake and Ohio Canal (C&O Canal), Georgetown Waterfront Park, and several private parcels. Because there is a strong interest in nonmotorized boating in Washington, DC, the overarching purpose of the EA is to establish a Potomac River recreation zone that more fully supports nonmotorized recreation; increases the public's access to the river; improves functionality of the Capital Crescent Trail (CCT) as it connects to the Georgetown Waterfront Park; and respects the historic character, natural resources, and existing recreational use of the nearby parks.

This TIA includes a description of the original development scenarios developed in consultation with NPS and the District Department of Transportation (DDOT) in December 2015, including both a high-density development scenario and a minimal development scenario, both including the option for additional development on Site D. Of these two original alternatives, only the high-density alternative is examined in detail in this TIA. Subsequent revisions to the EA in the spring of 2016 eliminated one of the alternatives; the remaining sole alternative that is examined in the EA proposes less development than the alternative analyzed in this TIA. The TIA alternatives remain as originally developed (i.e., were not updated to match the EA) reflecting the worst case scenario of impacts possible from development of the zone. Because the TIA does not represent the final approved development program for the zone, additional traffic study/studies that follow DDOT's Comprehensive Transportation Review Process will be required to finalize the mitigations necessary to preclude adverse impacts of the final program.

The following provides a description of the contents of the main sections of this draft impact assessment.

Chapter 1 – Introduction: Describes the purpose of the TIA and a description of the project purpose and site or project area.

Chapter 2 – Regulatory Framework: Describes the proposed action being analyzed, planning context for the project as provided in local land use plans, and the jurisdictional agreement with DDOT.

Chapter 3 – Existing Conditions: Describes the existing conditions of the area that may be affected by the proposed action.

Chapter 4 – Analysis of No-Action Alternative: Describes the impacts of transportation in the study area as a result of the no-action alternative, representing the future condition if the proposed action is not implemented.

Chapter 5 – Analysis of Action Alternatives: Describes the alternatives being analyzed in the EA and the impacts of transportation in the study area as a result of the worst case action alternative.

Chapter 6 – Proposed Mitigations and Recommendations by Mode: Provides a summary of the proposed mitigation measures and recommendations.

Chapter 7 – Conclusion: Provides a summary of the analysis impacts and main mitigation measures and recommendations for the proposed action.

Chapter 8 – References: Contains references cited in the TIA.

2.0 REGULATORY FRAMEWORK

2.1 Proposed Action

The purpose of this project is to establish a Potomac River recreation zone that more fully supports nonmotorized recreation; increases the public's access to the river, improves functionality of the CCT as it connects to the Georgetown Waterfront Park; and respects the historic character, natural resources, and existing recreational use of the C&O Canal National Historical Park (NHP) and Rock Creek Park.

Nonmotorized boating facilities are needed in Georgetown because:

- there are limited public access points for nonmotorized boating and paddle sports along the Georgetown waterfront and the popularity of nonmotorized water sports (canoeing, kayaking, rowing, paddle boarding) is increasing
- there is insufficient capacity at current boathouse facilities that provide access to the river and related amenities (boat storage, concessions, access facilities, boat rentals, beach, and docks)
- the current configuration of the CCT and its connection to Georgetown does not provide safe and compatible access for pedestrians and bicyclists with motorized vehicles to and through the "zone"

The zone was established as part of the Master Plan for Georgetown Waterfront Park and C&O Canal NHP (Georgetown Sector) approved and adopted in 1987. The plan designates a general area of land within which new boathouses and river access can be built along the Potomac River in Georgetown. The zone (figure 2-1) is bounded on the south by the Potomac River shoreline and includes a segment of Rock Creek Park between the Alexandria Aqueduct and Georgetown Waterfront Park and a segment of the C&O Canal NHP upstream of the Alexandria Aqueduct. The eastern (or downriver) boundary of the zone is at 34th Street NW. The western (upriver) boundary of the zone is approximately 1,100 feet upstream of Key Bridge. The northern boundary of the zone is Water Street NW, east of the Alexandria Aqueduct, and the CCT right-of-way, west of the Alexandria Aqueduct. The western limit reflects an NPS policy to preserve the natural appearance of the Potomac Palisades. Several privately owned parcels are located within these boundaries: Potomac Boat Club, three townhouses, and a small parcel without street access that is located inside the NPS-managed parcel currently leased to Key Bridge Boathouse.

There are two alternatives under consideration, plus the no-action alternative in which the nonmotorized boathouse zone would not be implemented. In the action alternatives, several options are presented for the configuration of the public realm east of the Alexandria Aqueduct, but both alternatives include proposed development of two boathouse facilities in this area, reconfiguration of the streetscape to improve the connections of the CCT and Georgetown Waterfront Park, and allow access to the private properties east of the aqueduct. The action alternatives differ in the facilities proposed west of the aqueduct in C&O Canal NHP, where one alternative proposes more facilities than the other.

The river access facilities or boathouses would serve all user groups including athletes from area high schools (Washington, DC, Maryland, and Virginia) and universities (Georgetown and George Washington Universities), public users (launching their own boats on the river and/or privately stored at a future boathouse), and recreational boat renters.

Once an actual facility is planned at any of the sites, a transportation study based on a site plan would be conducted to ensure appropriate mitigations are developed to preclude adverse impacts.

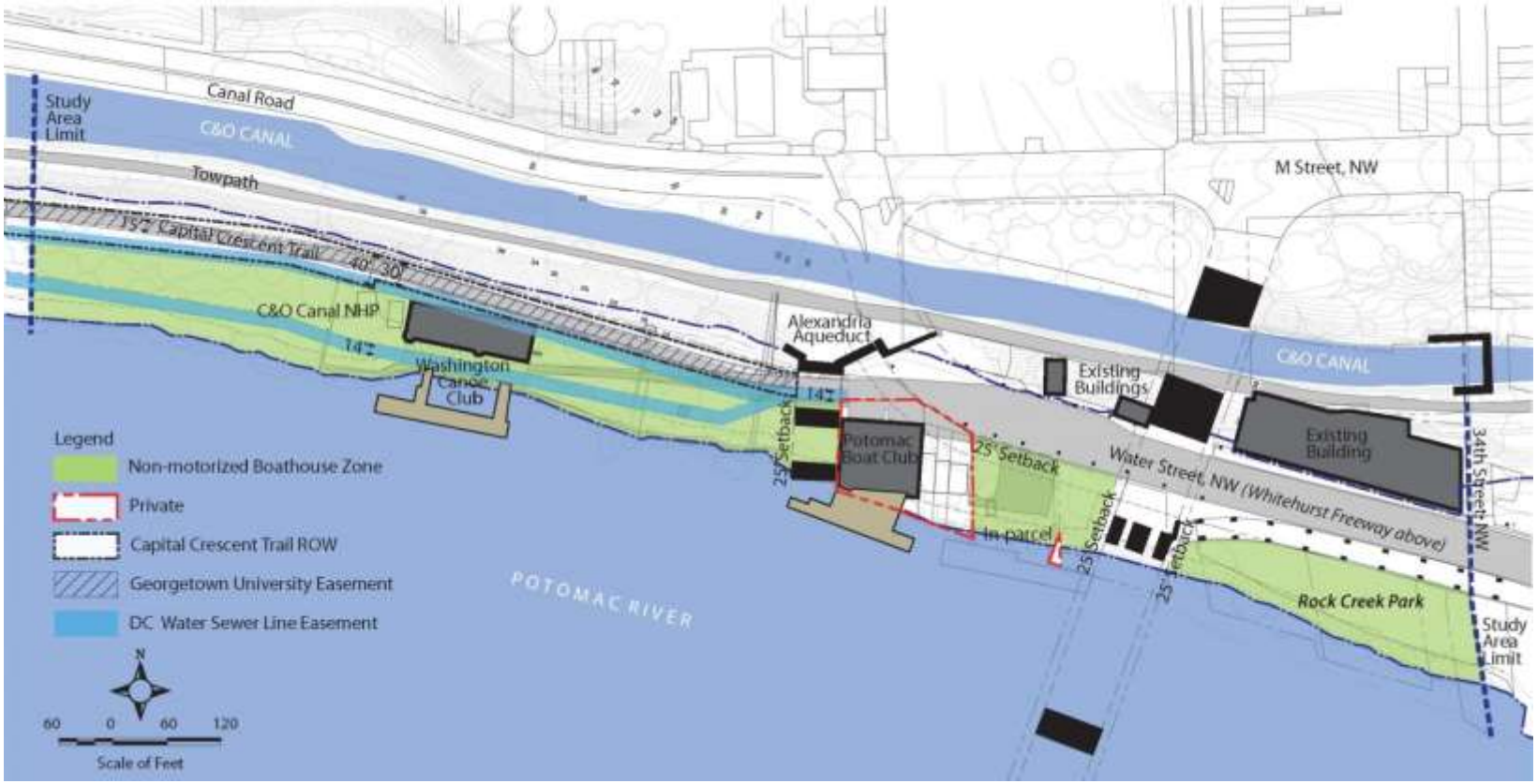

FIGURE 2-1. LAND OWNERSHIP AND EASEMENTS IN THE ZONE

2.2 Planning Context

This section summarizes the local land use and regulatory plans that apply to the study area; these plans serve as background for the remainder of the report and provide context for the evaluation of the alternatives.

2.2.1 District of Columbia Bicycle Master Plan

The District of Columbia Bicycle Master Plan was prepared by DDOT in 2005 with a focus on more and better bicycling facilities; more bicycle friendly policies; and more bicycle-related education, promotion, and enforcement (DDOT 2005). The plan serves as a guide to establish high-quality bicycle facilities and programs as a part of a broader initiative to create a sustainable, multi-modal transportation system in the nation's capital. In order to achieve the goal for more and better bicycle facilities, the plan includes recommendations for closing trail gaps, specifically the Georgetown Waterfront to connect the CCT to the Rock Creek Trail. It also is recommended that DDOT should support and facilitate the development of regional and national trail routes.

The Bicycle Master Plan recommends that bicycle issues should be included in all federal initiatives planned and implemented in Washington, DC. NPS has an important role in this recommendation, as most of the District's bike trails are located in national parks. Specifically, NPS is assigned the responsibility for providing trails and bicycle access to parks. The C&O Canal towpath and Rock Creek Park are specifically recommended as parks where NPS should develop or continue to maintain bike trails. It also is recommended that NPS work with DDOT to promote and market Washington, DC, as a destination for outdoor recreation.

2.2.2 District of Columbia Pedestrian Master Plan

DDOT prepared the District of Columbia Pedestrian Master Plan in 2009. It lays out a vision of Washington, DC, becoming a place where any trip can be taken on foot safely and comfortably, and where pedestrians, bicyclists, transit users, and motorists are all equally served (DDOT 2009a). The two primary goals laid out in the plan include:

1. Reduce the number of pedestrians killed and injured in crashes with motor vehicles.
2. Increase pedestrian activity by making walking a comfortable and accessible mode of travel throughout all parts of the District.

A general assessment was conducted concerning the quality of the pedestrian network in the District by gathering data on roadway characteristics such as street width, number of lanes, destinations that attract pedestrian activity, and the presence of sidewalks. Portions of the network with high volumes of pedestrians but poor conditions for walking were identified as priority pedestrian corridors. The analysis assigned the Key Bridge a moderate to poor score for roadways with high volumes of pedestrians and poor conditions for walking. In addition, the assessment identified sidewalk gaps on both sides of K Street NW from the bridge east to 30th Street NW.

The following three objectives were developed based on the results of the analysis in order to meet the vision and goals defined in the plan.

1. Provide accessible, safe, and well-maintained pedestrian facilities along and across all streets.
2. Institute policies and practices to ensure that every street in the District meets the needs of pedestrians of all abilities.
3. Establish education, enforcement, and encouragement programs that support pedestrian travel.

These overarching objectives are to be measured by pedestrian deaths and injuries and number of people using walking and transit to get to work.

2.2.3 GEORGETOWN 2028 15-YEAR ACTION PLAN

The Georgetown 2028 15-Year Action Plan was released in 2014 based on findings from an eight month long planning process studying the vision of Georgetown Business Improvement District (BID). The plan provides community leaders with guidance on how to achieve the goal of building an economically strong and more sustainable Georgetown commercial district by preserving what is great about Georgetown, fixing what is broken, and creating what is missing (Georgetown BID 2014). Specific actions are listed to improve the commercial district, many of which involve improving the internal transportation network of the community, while a second set of actions focuses on improving transportation connectivity with the rest of District and the region.

The plan provides guidance for how the community can work with the transportation agencies and organizations to support these recommended actions. Specific actions to improve transportation connectivity within the commercial district include developing a blueprint to reactivate the C&O Canal, improve its trails, and create a pedestrian friendly waterfront retail district along K Street NW. With regard to actions to improve connectivity to the region, the plan recognizes that there are many barriers to traveling to Georgetown, including the lack of a Metro station and limited parking access. Specific actions to alleviate this problem include working with the Washington Metropolitan Area Transit Authority (WMATA) to accelerate the creation of a Metro station in Georgetown, ensuring the planned streetcar route to Georgetown will feature fast and reliable service, performing a feasibility study for an aerial gondola between the Georgetown commercial district and the Rosslyn Metro Station, creating a bicycle connection between the CCT and Rock Creek Parkway, studying methods of improving traffic flow, developing a parking management strategy, and developing bus enhancements to improve the reliability and public understanding of the system.

2.2.4 GEORGETOWN TRANSPORTATION STUDY

The Georgetown Transportation Study was prepared for DDOT by HNTB in 2008 in response to citizen concerns over pedestrian safety due to the volume of pedestrians and vehicles in the Georgetown area (HNTB 2008). The study team conducted meetings with area residents, local business owners, and representatives from local agencies, including WMATA and NPS, to identify existing transportation issues. Future traffic conditions were then projected to examine effects on pedestrian and bicycle safety. Based on these inputs, the study recommended short- (up to 12 months), mid- (up to 6 years), and long-term (more than 6 years) transportation improvements to implement in the Georgetown area.

The recommendations of the study are intended to improve access for pedestrians, bicyclists, and transit users; incorporate residents' suggestions; promote transportation safety for all modes of travel; and manage personal vehicle traffic. Issues identified in the study that would be addressed by the recommendations included inadequate bicycle access, a lack of transit service, lack of sidewalks, poor condition of Americans with Disability Act (ADA) access, lack of bicycle connections to Metro stations, congestion along major roadways, and unsafe intersection geometry. Specific recommendations include bicycle and pedestrian signing, improved bicycle and pedestrian facilities, transit enhancements, improvements to traffic signal operations, alterations to traffic flow, and increased enforcement.

Recommendations include a new bicycle trail along K Street NW, new bicycle warning signs to alleviate the bicycle conflicts with traffic identified at the Key Bridge/Whitehurst Freeway intersection and K Street NW/Rock Creek Park, safety improvements at key intersections, and lane configuration changes along K Street NW and optimization of signal timings (HNTB 2008).

2.2.5 UNION STATION TO GEORGETOWN ALTERNATIVES ANALYSIS FOR PREMIUM TRANSPORTATION SERVICE

The Union Station to Georgetown Alternatives Analysis for Premium Transportation Service, completed in September of 2013, was prepared by DDOT and the Federal Transit Administration to evaluate high quality transit alternatives over the 3-mile transit corridor between the area of Union Station and

Georgetown. This analysis determined a recommended mode of transit and routes, and also evaluated alternative methods of powering the service. The goals are to provide efficient east-west transit connectivity in the corridor, improve transportation system mobility, improve the reliability of transit in the corridor, improve transit system capacity, reduce congestion, and support existing and future land use. Three alternatives were developed to be evaluated was based on the study area and its existing transportation networks; the purpose and need, as defined by stakeholder and public input; guiding principles for station locations; and an initial screening of 11 end-to-end alignments.

The recommended alternative would begin at Union Station, travel east along K Street NW toward Georgetown, continue underneath the elevated Whitehurst Freeway, and end at the intersection of K Street and Wisconsin Avenue NW in Georgetown. This alternative specifies streetcar operation along K Street NW between Wisconsin Avenue to 26th Street NW, including tail tracks to allow the streetcar to change direction. This alternative would remove 75 parking spaces along K Street NW between Wisconsin Avenue and 29th Street NW. Of the two non-preferred alternatives, one would provide a streetcar and the other would use premium bus service both along M Street NW. The study also states that it will likely be feasible to power the route without overhead catenary lines within the next three to five years; however, it does not make any recommendations for alternate power sources (DDOT 2013a).

2.2.6 DISTRICT OF COLUMBIA COMPREHENSIVE PLAN

The Comprehensive Plan for the National Capital, initiated by the National Capital Park and Planning Commission (NCPC) and the District of Columbia, is a statement of principles, goals, and planning policies to guide the growth and development in Washington, DC, for the next 20 years.

In 1973, the federal Home Rule Act designated the Mayor of the District of Columbia as the city's principal planner. At this time the Comprehensive Plan was divided into "District" Elements to be prepared by the District's Office of Planning, and "Federal" Elements to be prepared by NCPC (DCOP 2010). The first Comprehensive Plan of the post-Home Rule era, containing both District and Federal Elements, was completed in 1984. The most recent DC Comprehensive Plan was begun in 2006 and became official after several amendment cycles in 2011 (DCOP n.d.).

District Elements. The District Elements include both Citywide Elements and Area Elements. Citywide Elements provide goals, objectives, and policies for land use issues that impact the whole city (DCOP 2010). Area Elements provide goals, objectives, and policies that are specific to geographic areas of the city. Georgetown lies within the Near Northwest Area Element of the Comprehensive Plan, at its western end. The study area is addressed in several of the policies and actions for the Near Northwest Area Element. Policies relevant to the study area include:

- Parking Management – Continue to develop and implement programs to improve parking management in the commercial districts along Wisconsin Avenue and M Street.
- Pedestrian Connections – Improve pedestrian connections along the waterfronts in the Georgetown and Foggy Bottom area.
- Manage Transportation Demand – Support buses, private shuttles, and other transit solutions, including connections between Metrorail and the Georgetown commercial district.
- Transit to Georgetown – Connect Georgetown to the regional Metrorail system via light rail/streetcar or bus rapid transit, consistent with WMATA's long range plans.
- Expanding Mass Transit – Alleviate parking and traffic congestion by providing a dedicated lane for mass transit on K Street NW and study the feasibility of expanding the DC Circulator bus to Georgetown. This action is also included in the implementation section of the District Elements with a mid-term time frame and WMATA and DDOT as the responsible agencies.
- Heritage Tourism – Encourage heritage trails that create a greater awareness of cultural resources.

- Shoreline Access – Improve access between the shoreline and adjacent neighborhoods such as Georgetown.

The Area Elements of the Comprehensive Plan are detailed in selected locations through the use of Policy Focus Areas. Within the study area, the Near Northwest Area Element includes the Georgetown Waterfront as a Policy Focus Area. Policies in this Focus Area include:

- Provide a continuous linear park connection along the Potomac River waterfront in Georgetown for pedestrians and bicyclists.
- Provide new nonmotorized boating facilities along the Potomac River waterfront in Georgetown.

The Citywide Elements of the District Elements in the Comprehensive Plan include a Transportation section. This Transportation Element puts forward citywide transportation policies and actions focused on linking land use and transportation, including a focus on transit-oriented development, context sensitive transportation, and ensuring transportation impacts of development projects are focused on multi-modal standards rather than on vehicular standards. Citywide transportation policies also address regional smart growth transportation solutions and transportation system efficiency and management, including transportation demand management strategies. The Comprehensive Plan also puts a strong focus on multi-modal transportation choices, especially exploring the use of lower cost options such as streetcars and bus rapid transit instead of Metrorail. Also emphasized is the need to ensure that new mass transit routes will connect seamlessly with existing ones, thus increasing the utilization of existing systems. Improvements to bicycle and pedestrian safety and networks are also emphasized in the policies of the plan in response to concerns over above average accidents and below average levels of service.

A number of conditions and policies specific to the study area are included in the Citywide Elements. Most notable is that Georgetown is one of the few areas within the District which is not within 0.5 mile of a Metrorail station. The proposed K Street Busway is noted as a potential solution to this lack of mass transit within the study area (now superseded by the Union Station to Georgetown Premium Transportation Alternatives Analysis Study). The Key Bridge over the Potomac River in Georgetown is also listed as an example of how the limited number of road bridges into the District from the south lead to high volumes and congestion at those crossings.

Federal Elements. The Federal Elements of the Comprehensive Plan for the National Capital are initiated by NCPC and provide a policy framework for the federal government to manage its operations in the National Capital Region. A Transportation Element is included to guide the federal government towards achieving its goal of "developing and maintaining a multi-modal regional transportation system that meets the travel needs of residents, workers, and visitors, while improving regional mobility and air quality through expanded transportation alternatives and transit-oriented development" (NCPC 2004). The Transportation Element of the plan states that as the largest employer in the region, the federal government, recognizes that it is in a unique position of being able to expand the transit system, while simultaneously using transportation demand management to mitigate crowding and peak hour volumes. It also recognizes that effective transportation solutions are critical to its interest, since roads and transit systems in the region are already operating at capacity or overcapacity and this has a negative impact on the productivity of the federal workforce. Policies in the Transportation Element of the Federal Elements include:

- Commuter Rail, Rail Transit, and Bus Transit – A stronger focus on transit will be necessary to address transportation demands.
- Parking – To maximize carpooling and mass transit use to federal workplaces, only provide parking for single occupancy vehicles to those who have no choice but to drive alone and base parking ratios on urban character and proximity to Metrorail stations.

- Transportation Management Plans – Utilize transportation management plans to outline strategies for meeting prescribed employee parking ratios.
- Transportation Demand Management – Employ methods to manage demand for transportation to reduce the need for new infrastructure, including encouraging ridesharing, telecommuting, flexible work schedules, and live near work programs.
- Bicycle Facilities – Provide bicycle facilities at federal workplaces to encourage employees to use the regions bike networks to commute to work.

The Action Plan Matrix for the Federal Elements of The Comprehensive Plan for the National Capital includes a few projects specific to the study area. These projects include:

- Georgetown Waterfront Park Design and Construction – Develop the public park linking the Potomac Palisades with Rock Creek Parkway.
- Blue Trail Study – Study the potential for increased nonmotorized recreational boating along the Potomac River.

2.2.7 MOVEDC

DDOT officially completed and initiated moveDC, the District of Columbia's Multimodal Long-Range Transportation Plan, in October 2014 to provide a vision and clear set of goals for the future of the District's transportation (DDOT 2014a). The vision for the District is to have a world-class transportation system that services the people who live, work, and visit the city to make the city more livable, sustainable, prosperous, and attractive.

The goals and objectives identified to achieve this vision are broken down into areas of sustainability and health, citywide accessibility and mobility, neighborhood accessibility and connectivity, safety and security, public space, preservation, and funding and financing. The implementation of the plan will be coordinated among many partner organizations. DDOT will lead several of the recommended projects but will also look to WMATA, NPS, the Architect of the Capitol, the Metropolitan Washington Council of Governments (MWCOG), and other partners in the region for support in implementing the plan's vision.

The moveDC plan is intended to be a starting point for coordinated transportation investments for the District in the next 25 years. The plan is based on the understanding that there has been and will continue to be significant growth within the District and region, and investment in transportation, along with coordinated land use planning, are necessary to maintain the quality of life in the District. The plan notes that transportation plays a significant role in the city achieving its goals related to shared prosperity, neighborhood vitality, environmental stewardship, and competitiveness, which is why the plan is built not just on transportation infrastructure recommendations but also service and policy recommendations organized into 10 categories. Some of these categories include: using placemaking to create a dynamic public realm, identifying sustainable funding strategies, connecting transportation technology with users, prioritizing pedestrians, and improving bicycling safety and convenience.

Specific recommendations from the plan relevant to the study area include:

- Pedestrian – Increase access to parks and green space by creating new trails to access parks, improve the safety of pedestrian crossings at unsignalized intersections, and increase the capacity of the existing pedestrian network and integrate the District's transportation system with the region's transportation network. The sidewalks along K Street and Water Street NW in the study area received a tier 2 (high priority) level prioritization for improvements, based on safety (vehicle speeds and volumes) and usefulness (connections to parks and transit) ratings.
- Bicycle – Increase access to parks and green space by creating new trails, cycle tracks, and bicycle lanes accessing parks and encourage active transportation for health; integrate the District's transportation system with the region's transportation; and increase the coverage of all

modal networks throughout the District, especially access to protected facilities. The plan gives improvements in the study area a tier 4 (low priority) based on need and safety, including potential installation of a cycle track on the Whitehurst Freeway and bike lanes on M Street NW.

- Transit – Integrate the District's transportation system with the region's transportation network, increase the coverage of all modal networks throughout the District by providing 45% of the future population with access to a high capacity surface transit, and increase transportation availability to population centers by adding Metrorail or streetcars. The plan estimates that the study area population will have access to Metrorail and high-capacity surface transit within a 7.5 minute walk once recommendations are implemented, with Metrorail designated a tier 2 (high priority) and the streetcar designated a tier 1 (very high priority) based on needs.
- Vehicle – Increase the person carrying capacity of the transportation system among all modes reducing peak period vehicular capacity by 7% as capacity is allocated to other modes; improve safety for all users and make streets functional, beautiful, and walkable by optimizing signaling; manage vehicle speeds; and flex the use rights of pedestrians and bicycles. The only prioritized recommendation for the study area is a tier 2 (high priority) addition of managed lanes on the Key Bridge and its ramp intersection with M Street NW.
- Parking – Tailor parking management tools to local context, understanding that the District's overall goals can be met while adapting to the local character of the area by linking curbside management to land use.

The moveDC plan also provides updates on progress made implementing the elements of the Bicycle and Pedestrian Master Plans and revised recommendations for continuing implementation. Those elements implemented within the study area include improvements to the junction of the CCT with Water Street NW in 2013, bike parking added in many private buildings, and DDOT is working with NPS on the provision of bicycle and pedestrian projects on NPS properties. The revised recommendations in the moveDC plan that are applicable to the study area include:

- Provide bike facilities on roadways.
- Complete ongoing trail development and improvement projects.
- Improve bridge access for cyclists.
- Provide bicycle parking in public space and encourage bicycle parking in private space.
- Policy coordination with NPS.
- Review all District projects to ensure they provide bicycle accommodation.
- Ensure all real estate and transportation projects include safe and convenient pedestrian facilities.
- Improve pedestrian access and safety at uncontrolled crossings and intersections.
- Improve pedestrian access and safety at bus stops while maximizing transit efficiency.

2.3 Transportation Assumption 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 NPS, the project team met with DDOT to come to an agreement on the assumptions to follow.

DDOT, through its comprehensive transportation review process (DDOT 2012), 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 transportation assumptions (background growth, planned developments, and planned roadway improvements). Attachment 1 contains the DDOT scoping form.

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3.0 EXISTING CONDITIONS

3.1 Introduction

3.1.1 STUDY AREA DESCRIPTION

Transportation is examined in this report within the project and study areas. The existing conditions within the project area are shown in figure 3-1, below. Two study areas are proposed for transportation, a primary study area covering the analysis of all transportation modes and a secondary study area only covering traffic analysis. The primary study area includes the K Street NW corridor between 27th Street NW and the end of Water Street/driveway access to the Washington Canoe Club (WCC) and includes six intersections. The secondary study area for traffic analysis includes the primary study area intersections plus four intersections serving Thompson Boat Center (TBC) access (27th Street NW/I Street NW/Virginia Avenue NW/Rock Creek Parkway) and three intersections on M Street NW (31st Street NW, Wisconsin Avenue NW, and 34th Street NW), for a total of 13 intersections. These two study areas and the study area intersections are shown below in figure 3-2. Note that per the DDOT scoping form, Attachment 1, analysis of non-transportation modes sometimes includes varying distances beyond the primary study area: a 1-mile radius for bicycles, a 0.25-mile radius for transit, and a 0.25-mile radius for parking garages.

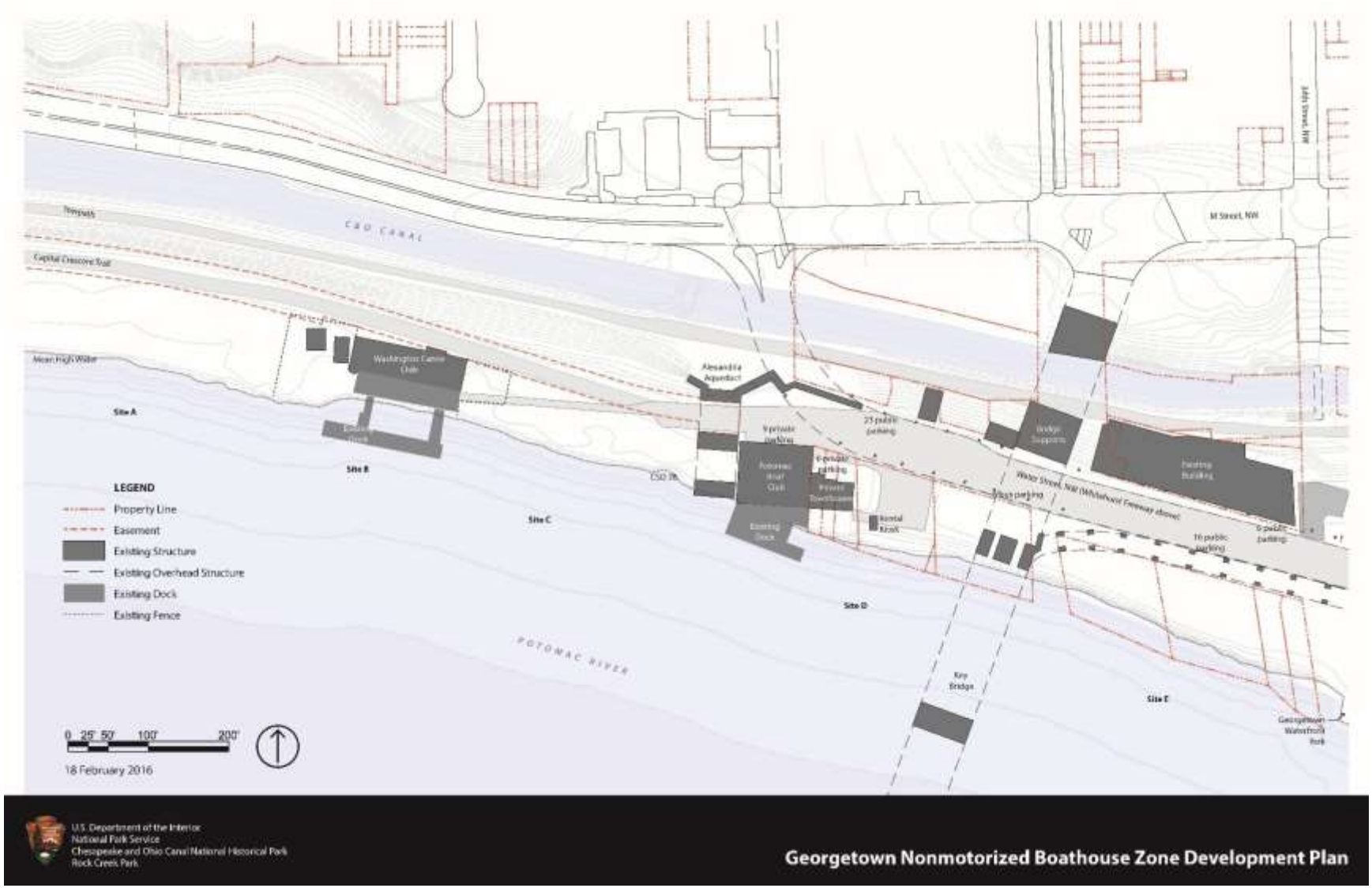
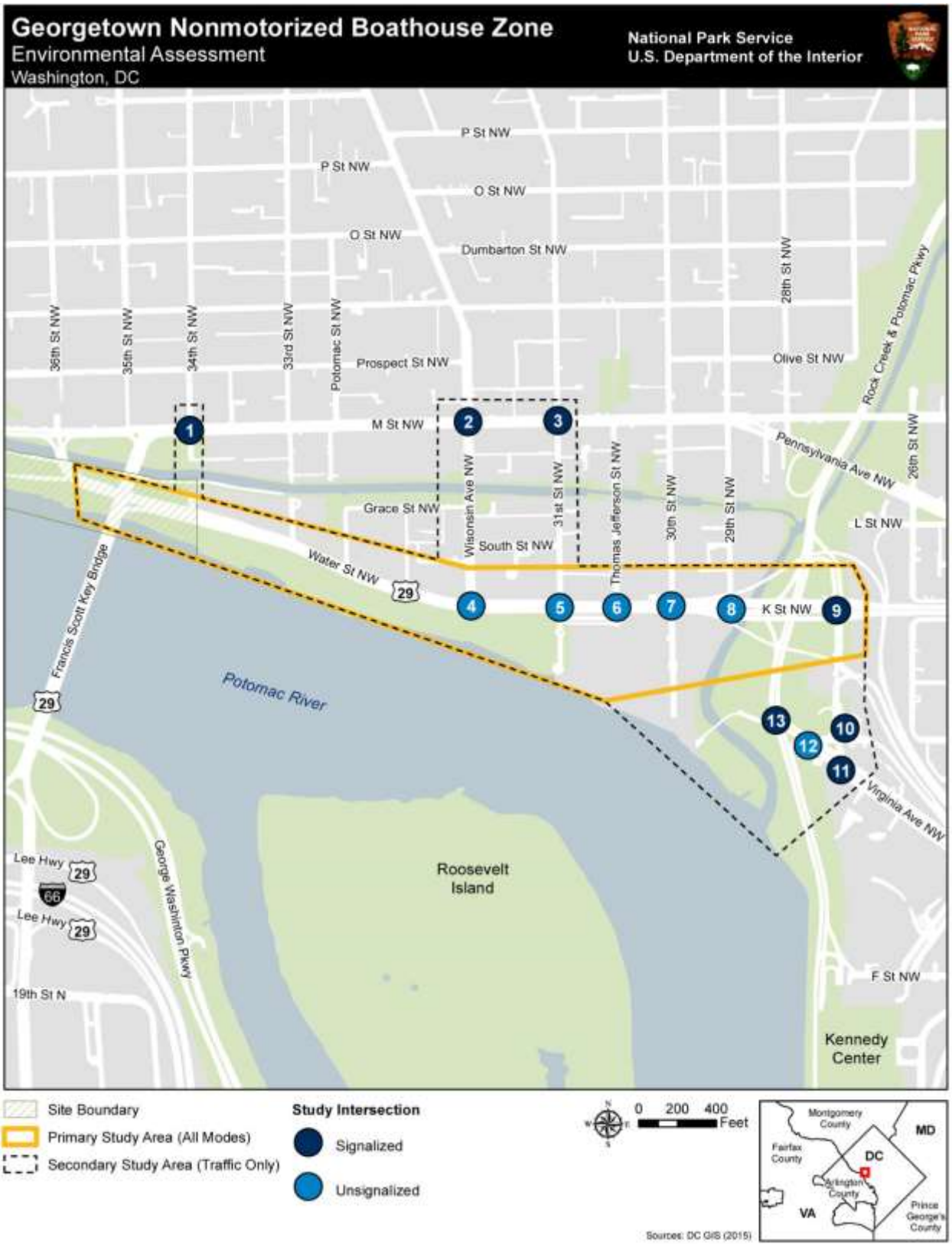


FIGURE 3-1. PROJECT AREA EXISTING CONDITIONS



1 **FIGURE 3-2. PRIMARY AND SECONDARY TRANSPORTATION STUDY AREAS**

3.1.2 ROADWAY DESCRIPTIONS

The following section describes the roadways within the study area, including the DDOT roadway functional classification, the number of lanes in each direction, the latest average annual daily traffic (AADT) volumes available from DDOT 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 a DC Roadway Functional Classification map (DDOT 2014b), observations in the field, aerial imagery, and DDOT's 2013 Traffic Volume Map (DDOT 2014c). The number of lanes of traffic indicated below are for mid-day and weekend conditions. AM and PM rush hour conditions may have additional travel lanes because on-street parking is not often allowed during peak hours in certain directions. A more detailed discussion of the lane operations of Virginia Avenue and Rock Creek and Potomac Parkway are discussed in Section 3.7.1 because their lane operations change to accommodate AM and PM peak hour traffic flows.

K Street NW/Water Street NW travels east to west along the Potomac River and the Georgetown Waterfront, with the K Street section east of Wisconsin Avenue and Water Street west of Wisconsin Avenue. The following section includes details of both roadways if information is different for different sections. K Street NW, east of Wisconsin Avenue NW, is classified by DDOT as a minor arterial, while Water Street NW is classified as a local road (DDOT 2014b). Water Street has one lane in both directions and has on-street parking, composed of both parallel on-street parking and pull-in parking. K Street NW has two lanes in both directions, a middle left-turn lane, and a speed limit of 30 miles per hour (MPH). Travelling in both directions, the second lane provides metered on-street parking between Wisconsin Avenue NW and Thomas Jefferson Street NW. K Street NW had an AADT of 36,700 in 2013; there are no AADT data available for Water Street NW (DDOT 2014c).

34th Street NW is classified by DDOT as a collector road with a speed limit of 25 MPH (DDOT 2014b). This north-south oriented roadway is one way with one lane travelling south, and on-street parking on both sides of the street. 34th Street NW connects Wisconsin Ave NW in north Georgetown with M Street NW in southern Georgetown. The roadway splits at M Street NW, and south of M Street NW, the roadway is a dead end off of Water Street NW. There are no AADT data available for 34th Street NW.

Wisconsin Avenue NW is north to south oriented and is located east of the Georgetown project area. DDOT classified the roadway as a minor arterial road, and it includes one lane in each direction for a majority of the roadway (DDOT 2014b). Towards the northern portion of the roadway, there are two lanes in both directions, including a left-turn lane travelling north, connecting to M Street NW. Wisconsin Avenue NW connects K Street NW/Water Street NW to M Street NW. Wisconsin Avenue NW has a 25 MPH speed limit and had an AADT of 10,100 in 2013 (DDOT 2014c).

31st Street NW is classified as a local road by DDOT and has a north-south orientation (DDOT 2014b). There is one lane that allows for travel in both directions with street parking flanking both sides of the street. 31st Street connects K Street NW with M Street NW and has a speed limit of 25 MPH. There are no AADT data available for 31st Street NW.

27th Street NW has a north to south orientation and is classified as a local road by DDOT (DDOT 2014b). 27th Street NW connects to Virginia Avenue NW, K Street NW, Interstate 66 (I-66), Whitehurst Freeway NW, and Rock Creek and Potomac Parkway NW. The northern half of the roadway has one lane of traffic in the southbound direction and two lanes of traffic in the northbound direction. The southern half of 27th Street NW is one-way southbound; the roadway transitions from one lane southbound to four lanes southbound at the intersection with Virginia Avenue NW. Travelling north, the roadway connects I-66 to K Street NW, Whitehurst Freeway NW, and Rock Creek and Potomac Parkway NW. 27th Street NW has a speed limit of 25 MPH and in 2013, had an AADT of 12,400 (DDOT 2013c).

Virginia Avenue NW has a northwest to southeast orientation, and is classified by DDOT as a minor arterial roadway (DDOT 2014b). The roadway has three lanes travelling in both directions with

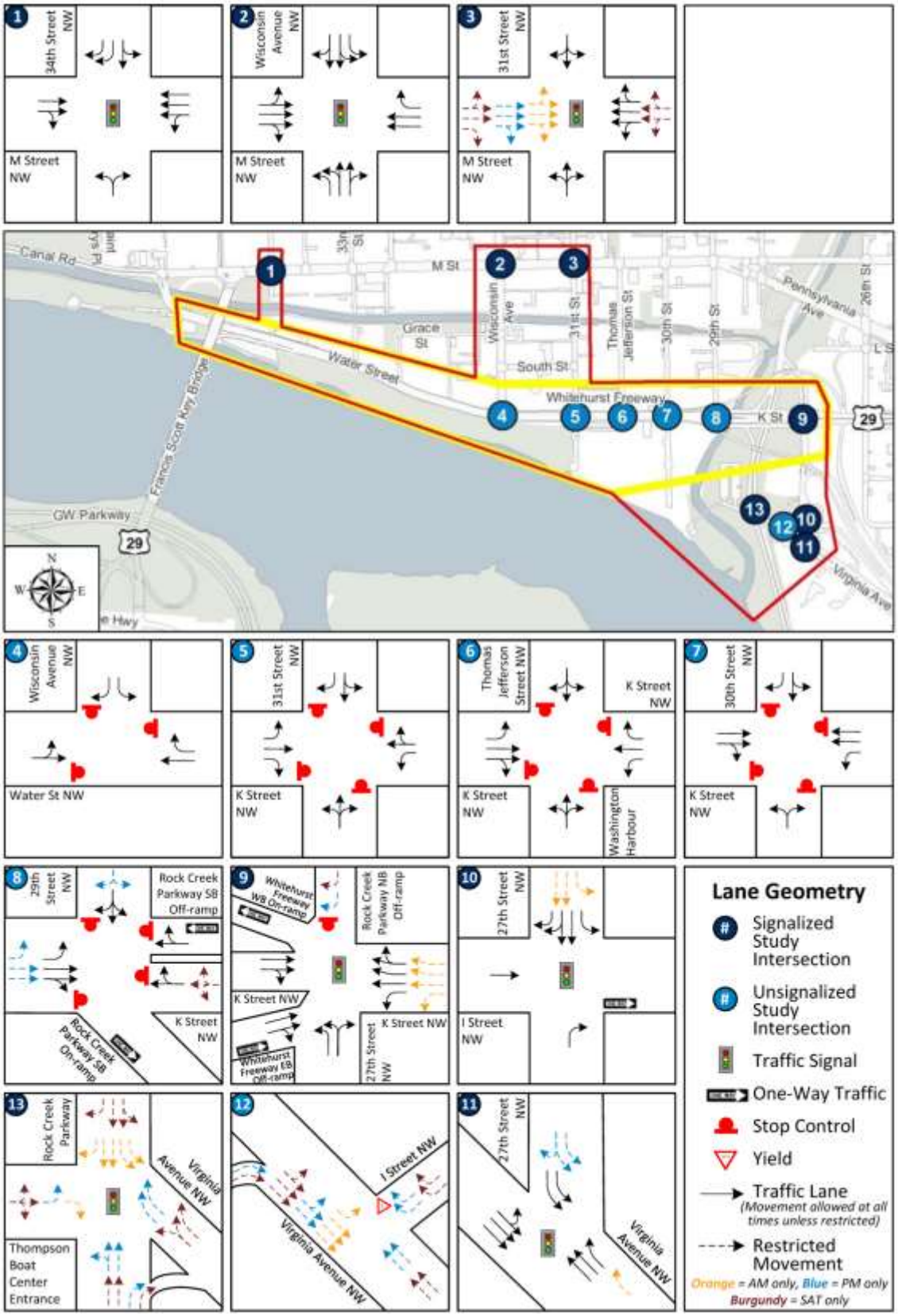
interspersed left turn lanes and periodic protected service lanes flanking each side of the roadway. There is a center median for a majority of the roadway, and during off-peak hours the third lane, travelling in both directions, allows street parking. Virginia Avenue NW connects Constitution Avenue to Rock Creek and Potomac Parkway. Virginia Avenue NW had an AADT of 15,300 in 2013 (DDOT 2013c).

Rock Creek and Potomac Parkway NW is classified by DDOT as a principle arterial roadway that meanders through Rock Creek Park connecting downtown Washington, DC, with multiple neighborhoods in northwest Washington, DC. (DDOT 2014b). The north-south roadway has two lanes travelling in both directions towards the southern end and toggles between two lanes and one lane throughout the northern portion of the road. Additionally, the northern portion of the road has a median that separates the two flows of traffic. During peak hours, certain sections of the roadway become one-way to allow the egress and ingress of commuter traffic in and out of the city (see Section 3.7.1 for more details). Rock Creek and Potomac Parkway has a 35 MPH speed limit, and in 2013 had an AADT of 29,700 (DDOT 2013c).

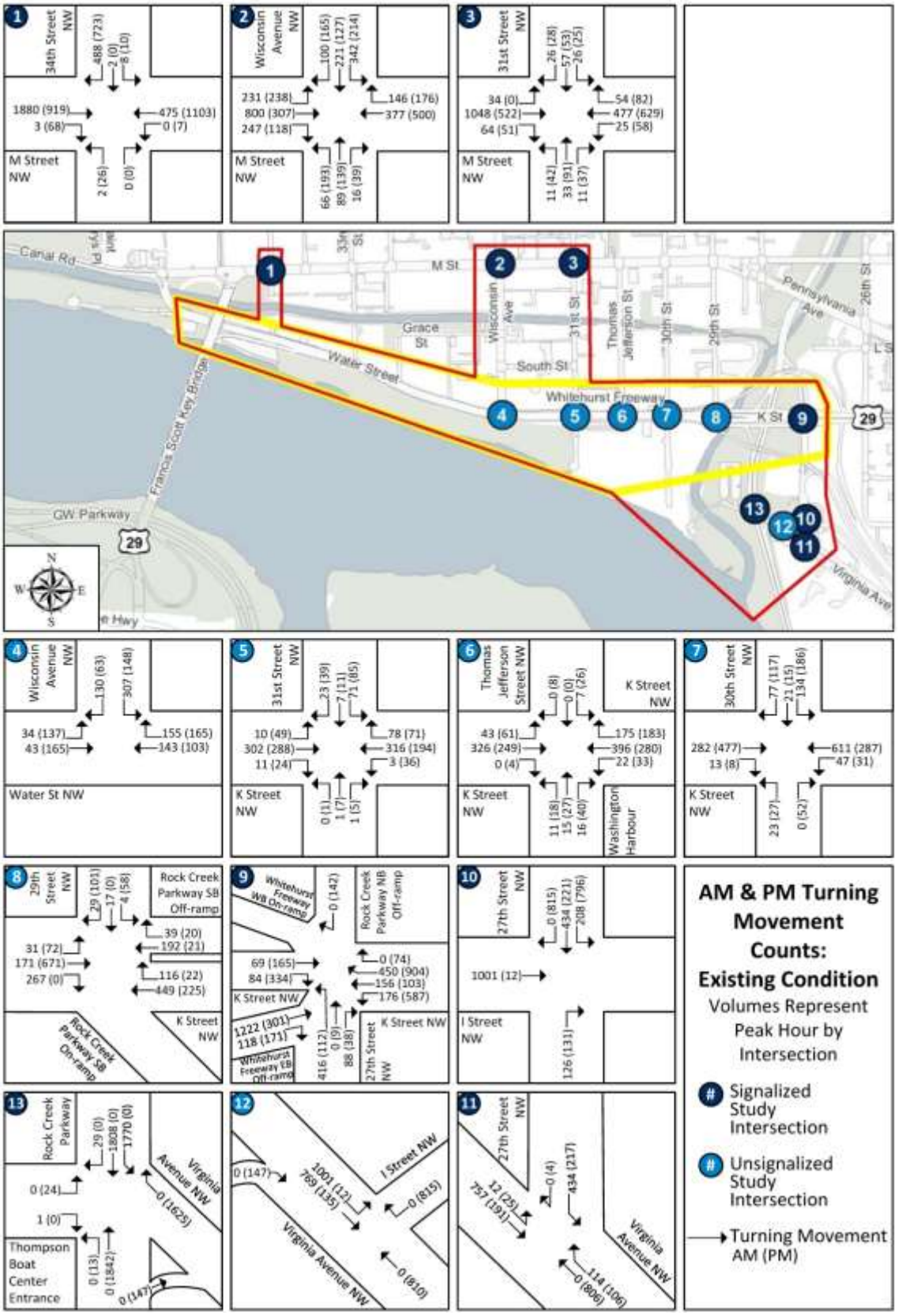
As part of the field data collected, a detailed inventory of the lane geometry was conducted through field reconnaissance and a study of aerial imagery. Based on this information, the existing lane geometry and traffic control type (signalized or unsignalized) is shown in figure 3-3.

3.1.3 DATA COLLECTION

The team collected vehicular turning movement counts during weekday AM and PM peak hours (7:00 AM–0:00 AM and 4:00 PM–7:00 PM) on a non-holiday week in October 2015 (K Street NW and Virginia Avenue NW) and November 2015 (M Street NW). Vehicular turning movement counts were also collected on a typical Saturday during August 2015 on K Street NW/Water Street NW to represent the peak summer activity and during October 2015 on Virginia Avenue NW to represent the peak fall activity near TBC along the Potomac River. Based on information provided by Key Bridge Boathouse, the Saturday peak period is between 2:00 PM and 4:00 PM; therefore, therefore Saturday data was collected between 1:00 PM and 5:00 PM. Saturday counts were also obtained for M Street NW in November 2015. The time periods for traffic data collection (August for Saturday data versus October for most of the weekday data versus November for M Street NW data) differ based on count requirements increasing during the internal and external scoping process. Figure 3-4 shows the existing AM and PM weekday peak hour turning movement volumes occurring in the study area, and figure 3-5 shows the Saturday peak hour turning movement volumes. Traffic counts are included in Attachment 2.



1 **FIGURE 3-3. EXISTING CONDITIONS LANE GEOMETRY**



1 **FIGURE 3-4. EXISTING CONDITION AM AND PM PEAK HOUR TURNING MOVEMENT VOLUMES**

1 **FIGURE 3-5. EXISTING CONDITION SATURDAY PEAK HOUR TURNING MOVEMENT VOLUMES**

3.1.4 ANALYSIS PERIODS

All modes of transportation were studied for the Water Street/K Street NW corridor between the WCC and 27th Street NW covering the AM and PM weekday peak hours and the Saturday peak hour.

The addition of the Virginia Avenue intersections to the study reflect the action alternative analysis assuming that some existing users of TBC (i.e., Virginia-based high schools, Georgetown and George Washington University) might relocate to a new facility in Georgetown or Arlington and would be replaced by new athletic users from high schools or universities. To be conservative, it was assumed that a high school would replace a university slot at TBC and thus convert some walking trips to vehicle trips for the Virginia Avenue NW and 27th Street NW at I Street NW intersections during the weekdays. The Saturday peak period also was studied for these intersections to reflect new rental users accessing TBC as access to the waterfront is improved along both sides of the Potomac River. No change to private users storing their boats at TBC would occur from the present conditions.

3.2 Pedestrian Network

This section includes a description of the location and condition of sidewalks in the project area and primary study area, origin and destination points of pedestrians and/or commonly used sidewalks in the study area, disruptions or obstacles in the pedestrian environment especially those between the project area and adjacent bus stops, general ADA curb ramp compliance, and compliance of sidewalks and crosswalks with DDOT standards. Pedestrian conditions were generally analyzed for the primary study area, including along Water Street/K Street NW from Water Street NW to 27th Street NW and all intersecting streets along Water and K Streets NW up to 150 feet from Water/K Streets. The C&O Canal network of paths and bridges is described generally and displayed on the pedestrian maps, but width and ADA compliance are not be provided for these facilities. Existing conditions were evaluated with site visits in December 2015 and January 2016, DC Geographic Information Systems (GIS) data, and aerial and streetview imagery from Google Maps. Additional observations of pedestrian patterns in November 2015 are included in the Traffic section, Section 3.7.2.

Within the primary study area, sidewalks only exist between 34th Street NW and approximately the Key Bridge overpass. Outside of those sidewalks, pedestrians must share the pavement with vehicles, trucks, buses, and bicyclists without any definition of who should be where. The Water Street NW pavement starts to narrow approximately halfway between the Key Bridge overpass and the Alexandria Aqueduct. At the aqueduct, the pavement takes up almost the entire area under the aqueduct and then continues to narrow until it becomes the 16-foot-wide CCT.

Sidewalks are located along all streets within the primary study area except for the western sidewalk on 33rd Street NW, the south and north sides of Water Street NW from approximately 35th Street NW or the Key Bridge overpass to the CCT, and the north side of K Street NW from 29th Street NW to 27th Street NW, as shown in figure 3-6. There are no street trees along the majority of K/Water Streets NW because the elevated Whitehurst Freeway runs over the street providing shade to the street. Sidewalks in the primary study area are in generally good condition except for sidewalks on 27th Street just south of K Street that are severely overgrown. Also within the primary study area, north of K/Water Streets NW, sidewalks are mostly brick with the exception of east of 30th Street NW and west of 33rd Street where sidewalks are concrete. Sidewalks on the southern side of K/Water Streets NW are mostly concrete except for between 31st and 30th Streets NW where sidewalks are brick. In addition to the curb-side sidewalk on the south side of K/Water Street NW, there is another multiuse trail just south that parallels the sidewalk and provides an alternate path for pedestrians and cyclists.

Outside of the primary study area but within a 0.25-mile buffer, sidewalks are typically located along both sides of the street and tend to be primarily brick within Georgetown. In addition to the street-lined sidewalks, there are several multiuse paths in the study area. Extending west from the end of Water Street NW is the CCT and along the C&O Canal between K/Water Streets NW and M Street NW is the C&O

Canal towpath. There are also many paths circulating through the Georgetown Waterfront Park between 34th and 31st Streets NW, multiuse paths along the Potomac River heading east, and multiuse paths along the Rock Creek and Potomac Parkway. These pedestrian networks are illustrated in figure 3-6.

While the most of the sidewalks in the primary study area are in good condition, many sidewalks along K/Water Streets NW are obstructed by vertical columns supporting the elevated Whitehurst Freeway above. Within the primary study area, the sidewalk is uneven on the north side of K Street NW between 31st and 30th Streets NW, the crosswalk paint is chipping away at more than one intersection, and the crosswalks and the curb ramps at the south side of Water/K Streets NW at the intersection with Wisconsin Avenue do not line up. Outside of the primary study area, sidewalks along M Street NW are narrow and do not always adequately accommodate the volumes of pedestrians that typically frequent Georgetown. The trails along the C&O Canal are gravel and not paved, while the CCT and the trail along the Rock Creek and Potomac Parkway are asphalt paved trails. A more detailed description of the C&O Canal Trail is included in the Bicycle section, Section 3.3.

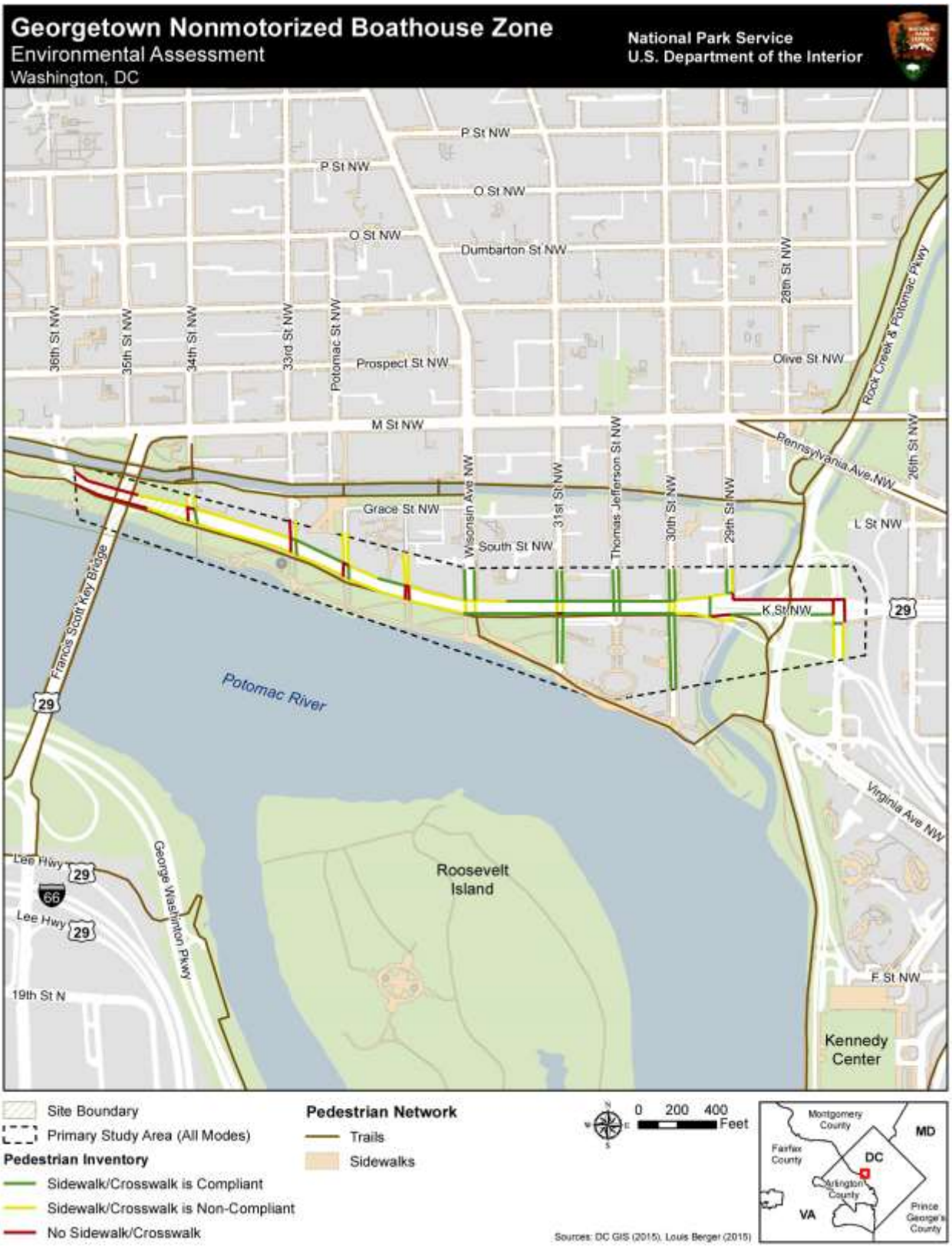
Pedestrians walking along K Street NW generally come from the Metro or local buses, the core retail section of Georgetown (i.e., M Street NW), schools or universities in the area, or walk or use bicycles from nearby trails such as the CCT, the multiuse trails along the Georgetown Waterfront, and the Rock Creek Parkway Trail. Pedestrians also originate from offices, residences, and parking garages in and around the study area. Prime destinations in the primary study area include retail locations (restaurants, the Washington Harbor development, and the Georgetown Lowe's movie theatre), the existing boathouses (WCC, Potomac Boat Club), the CCT, and the Georgetown Waterfront Park.

Within the primary study area, the lack of sidewalks between the western end of the project area and the CCT terminus and where sidewalks resume on Water Street NW at approximately the Key Bridge overpass create unsafe conditions for pedestrians, as they must walk among vehicles on the roadway. This lack of sidewalks is the primary obstacle for pedestrians between the project area and the closest bus stop to the project area at the corner of Water/K Streets NW and Wisconsin Avenue NW.

3.2.1 WATER/K STREETS PEDESTRIAN ENVIRONMENT ANALYSIS

Sidewalks in the pedestrian network range from approximately 3 feet wide through upwards of 15 feet in within the primary study area. Federal Highway Administration (FHWA) guidelines state that sidewalks should have a minimum of 5.0 feet of clear space (FHWA 2001). Any width less than 5.0 feet must be 3.0 feet wide with 5.0 feet turn-around locations every 200 feet to meet the minimum requirements for people with disabilities (U.S. DOJ 2010). Based on a review of DC GIS data and site observations, most locations throughout the primary study area adhere to the minimum 3.0-foot-wide sidewalk requirement.

As requested by DDOT, a more detailed inventory of pedestrian conditions along the Water/K Streets NW corridor was completed. Sidewalks, crosswalks, and curb ramps are evaluated based on the guidelines set forth by DDOT's *Public Realm Design Manual* and *Design and Engineering Manual* in addition to ADA standards. The minimum sidewalk width prescribed by DDOT is 6 feet; a full list of applicable sidewalk widths and requirements for the study area are shown in table 3-1 (DCOP and DDOT 2011; DDOT 2009b). DDOT also prescribes that crosswalks must have parallel edge lines with proper width depending on street classifications (i.e., 10 feet for local streets, 15 feet for collectors, and 20 feet for major arterials) (DDOT 2009b).



1 **FIGURE 3-6. PEDESTRIAN INVENTORY AND PEDESTRIAN NETWORK**

TABLE 3-1. DDOT MINIMUM SIDEWALK AND CROSSWALK REQUIREMENTS

Street Type	Treebox Area Minimum	Sidewalk Area Minimum (does not include treebox)		
		Residential	Commercial	Crosswalks
Local	4 feet	6 feet	10 feet	10 feet
Collector	4 feet	6 feet	10 feet	15 feet
Principal and secondary arterials	6 feet	8 feet	10 feet	20 feet (major arterials)

Source: DCOP and DDOT 2011; DDOT 2009b

Given the high volume of pedestrians and bicyclists in the primary study area, the fact that several multiuse trails connect to this area, and that the park or open space land use does not have a minimum sidewalk or crosswalk requirement, this analysis considered all properties as commercial to ensure wider widths to accommodate pedestrians. Based on this assumption that all sidewalks and crosswalks should be compliant with commercial DDOT widths, about half of the sidewalks within the primary study area are not compliant because they do not meet the minimum sidewalk widths of 10 feet, as shown in figure 3-6, above. Furthermore, sidewalks in the following locations do not meet the minimum DDOT 6-foot width requirements: the eastern side of 29th Street NW north of K Street NW, the eastern side of Cecil Place (between Grace Street and Wisconsin Avenue), and the western side of Grace Street.

Similar to the sidewalk compliance analysis along Water/K Streets NW, along this same stretch some crosswalks comply with DDOT standards and others do not. One or more crosswalks at the intersection of K Street NW and Wisconsin Avenue NW, 31st Street NW, 30th Street NW, the on-ramp to Rock Creek and Potomac Parkway at 29th Street NW, and 27th Street NW are not compliant because they do not meet the minimum width requirements (figure 3-6, above). Crosswalks do not exist on both sides of the cross street at 34th Street NW, 33rd Street NW, and Potomac Street NW; and no crosswalks exist across Water/K Streets NW at Cecil Place (between Potomac Street and Wisconsin Avenue NW) and 27th Street NW. Several cross streets also do not have crosswalks at 34th Street NW, Grace Street, and 31st Street NW. The missing crosswalk on the south side of K Street NW at 29th Street NW is intentional because a more direct crosswalk is provided in a north-south orientation across the off-ramp to Rock Creek and Potomac Parkway NW. Similarly, the missing crosswalks at the intersection of 27th and K Streets NW are intentional because the only safe and available pedestrian connections are on the south side of K Street NW.

3.2.2 ADA AND DDOT COMPLIANCE

In addition to sidewalks, curb ramps at intersection crossings are also required to be ADA compliant, with the exception of those curb ramps built prior to the initiation of ADA legislation for which the local jurisdiction must have a plan to retrofit curb ramps to ADA compliance. Within the primary study area, curb ramps were analyzed with a combination of national ADA standards and DDOT standards, whichever was more stringent. Therefore, curb ramps were evaluated for a minimum 4-foot width (DDOT 2009b) and were required to have minimal slopes and detectable warnings (i.e., dome-shaped bumps) (U.S. DOJ 2007). Curb ramps were also required to be installed in pairs on each corner, one for each direction or travel (DDOT 2009b).

Figure 3-7 presents a detailed depiction of the state of ADA compliance of curb ramps in the primary study area sidewalk network based on site visits in January 2016. As seen in this map, more than one-third of the curbs within the primary study area are ADA compliant. Of those curb ramps that are not ADA compliant, the majority were missing detectable warnings. Curb ramps do not exist at a minimum of one crosswalk at many of the study area intersections including at 33rd Street NW, Cecil Place (between Grace Street and Wisconsin Avenue NW), 31st Street NW, Thomas Jefferson Street NW,

30th Street NW, and 29th Street NW. Seven of the curb ramps within the primary study area are shared curb ramps, meaning one ramp is used for pedestrians who cross the adjacent roads in two different directions. These seven shared curb ramps are not DDOT compliant. If pedestrians walk along the south side of Water Street NW between the project area and the nearest bus stop at the northeast corner of the intersection of Wisconsin Avenue NW and Water/K Streets NW, they will encounter only one non-compliant curb ramp at the same corner as the bus stop.

3.3 Bicycle Network

Existing bicycle facilities within the project area, primary study area, and a 1-mile radius from the primary study area are described in this section, with a focus on bicycle facilities in Washington, DC. Data was collected from DC GIS trail data, local bicycle plans, and verified with aerial imagery and field visits as needed. Gaps or deficiencies in the bicycle network are also identified. Additional observations of bicycle traffic in November 2015 are included in the Traffic section, Section 3.7.2. The bicycle network within the primary study area and a 1-mile buffer of this study area is shown in figure 3-8.

It is worthwhile to note that the Georgetown Transportation Study notes that there were high volumes of bicyclists on K Street NW (HNTB 2008). The study also notes that there is a need for wayfinding signage in the area.

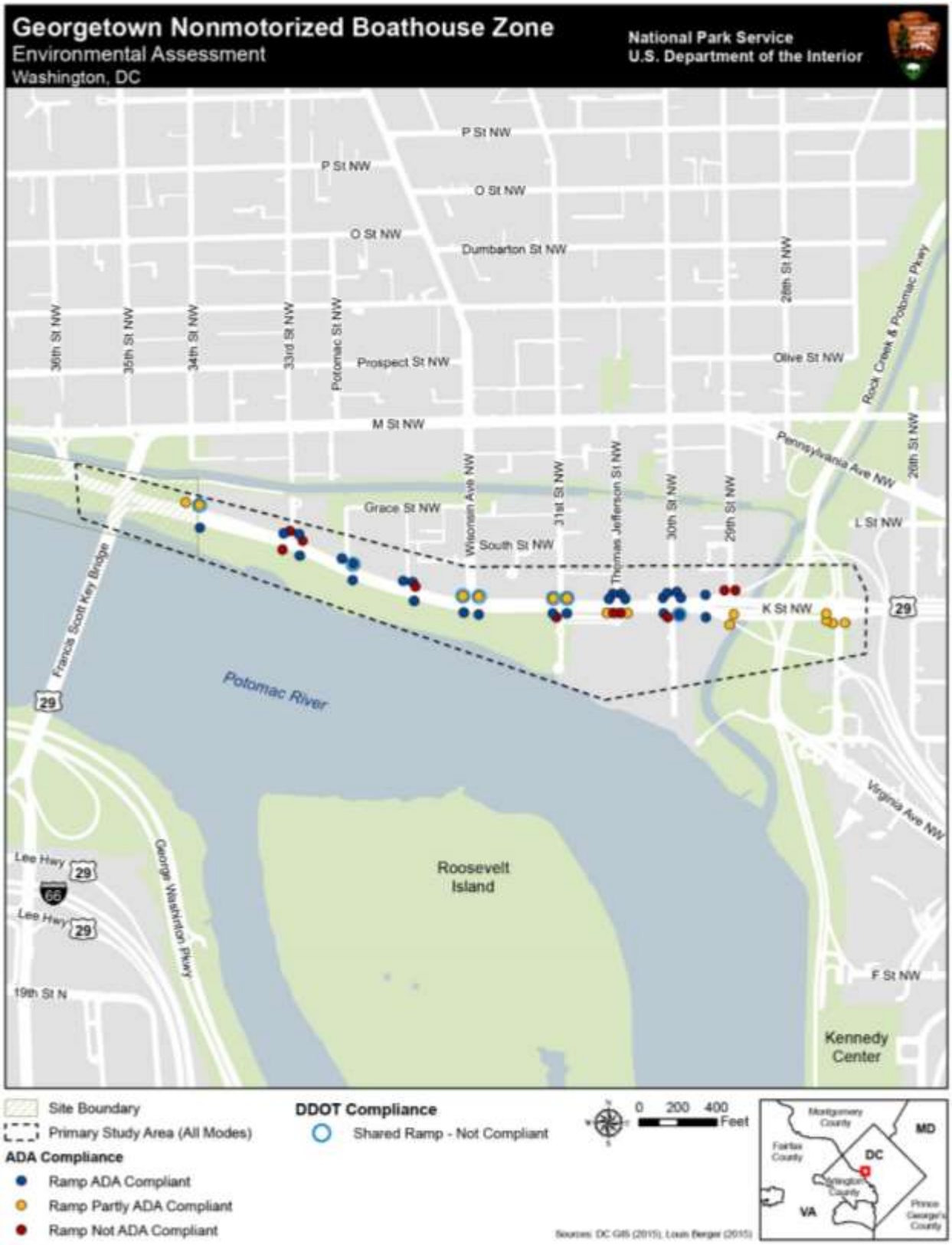
3.3.1 Bicycle Network Description

The CCT, a mixed-use trail that runs along the Potomac River in northwest, DC, terminates in the project area at the Alexandria Aqueduct. Besides the CCT, there are no other bicycle facilities within the project area. Therefore, within the project area, bicyclists must share the unmarked expanse of pavement that is Water Street NW between the aqueduct and 34th Street NW.

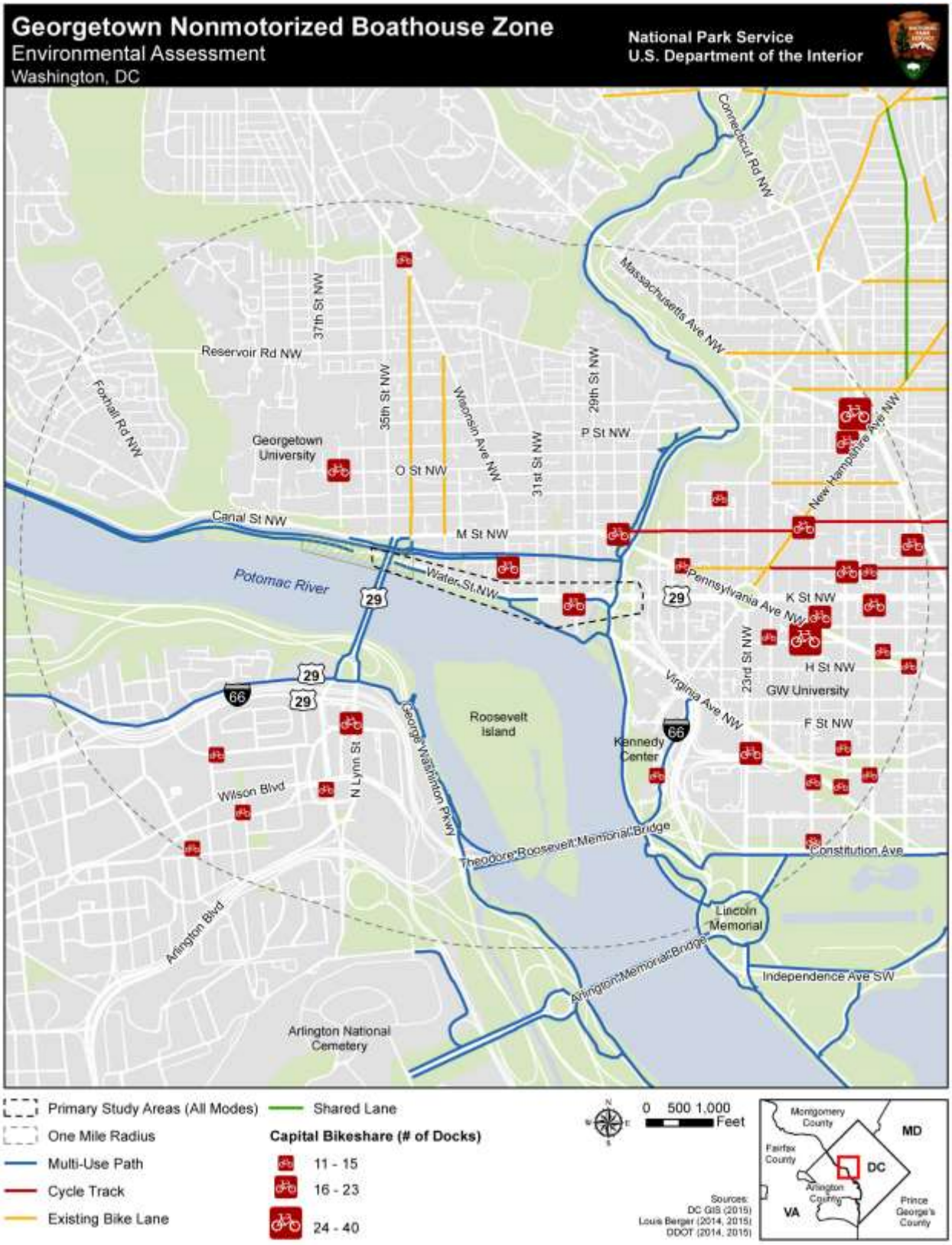
However, the primary study area and the 1-mile surrounding area are at or near the terminus of a number of long distance, multiuse trails that extend well outside the primary study area, like the C&O Canal towpath, CCT, Custis Trail, Mount Vernon Trail, and Rock Creek Trail. A number of shorter distance trails can also be found in the area immediately surrounding the primary study area, including the Georgetown Waterfront Park Trail, Rose Park Trail, and several multiuse trails that cross area bridges, including the Key Bridge Crossing and the Roosevelt Bridge Crossing. The western edge of the National Mall Trails system also lies just southeast of the primary study area. While there are no bicycle lanes within the primary study area, a few bicycle lanes and cycle tracks exist within the 1-mile buffer of the primary study area, as described below.

Rock Creek Trail is a multiuse trail with an 8-foot-wide asphalt surface maintained by NPS. It begins about 3 miles north of the study area in Rock Creek Park and follows the Rock Creek and Potomac Parkway south to the Potomac River in Georgetown, continuing south of the study area about 0.5 mile to the Roosevelt Bridge where it connects to the National Mall Trails. Passing through the eastern edge of the study area, the Rock Creek Park Trail has junctions with the C&O Canal towpath near Pennsylvania Avenue and the Georgetown Waterfront Trail near K Street (HNTB 2008).

C&O Canal Towpath or Trail is an unpaved, hard-packed dirt trail on the towpath of the C&O Canal extending 184.5 miles from Georgetown to Cumberland, Maryland, maintained by NPS (NPS 2016a; HNTB 2008). Within the study area, the towpath begins at the Rock Creek Trail near the eastern edge of the study area and travels west through the study area, just south of M Street NW, either on one or both sides of the canal with connections to local streets. At the west end of the study area near the Key Bridge, the towpath nears Water Street, but is separated by grade and then is closely paralleled by the CCT as it heads west along the canal.



1 **FIGURE 3-7. PRIMARY STUDY AREA CURB RAMP COMPLIANCE**



1 **FIGURE 3-8. BICYCLE NETWORK WITHIN PRIMARY STUDY AREA AND 1-MILE BUFFER**

Capital Crescent Trail (CCT) is built on the right-of-way of the former Baltimore and Ohio Railroad Georgetown Branch, connecting Georgetown with Bethesda and Silver Spring. It begins near the west side of the study area at the west end of Water Street NW and closely follows the Potomac River and the C&O Canal and its towpath. Near the study area, NPS maintains the trail, and it consists of a 9-foot-wide paved surface with no at-grade road crossings (BikeWashington.org n.d.a). The 2014 update to the Bicycle Master Plan notes that NPS recently upgraded the junction between Water Street NW and the trail (DDOT 2014a).

Martha Custis Trail provides a multiuse trail link between the Washington and Old Dominion Rail Trail in Fairfax County, Virginia, and the Mount Vernon Trail and Key Bridge in Rosslyn, which can be used to access Georgetown. The Custis Trail follows the right-of-way of I-66 for its length, which encompasses steeper grades than the rail and canal trails near the study area; however, it is paved and mostly free of at-grade crossings with roads (BikeWashington.org n.d.b).

Mount Vernon Trail runs 18 miles in Virginia from George Washington's Mount Vernon Estate to the Key Bridge is Rosslyn, which can be used to access Georgetown. NPS maintains this paved, multiuse trail (NPS n.d.).

National Mall Trails can be used by bicyclist to access the National Mall and Memorial Parks. Trails begin about 0.5 mile south of the primary study area. From Georgetown they can be reached by using the Rock Creek Trail (NPS 2016b).

Georgetown Waterfront Trail is a multiuse trail maintained by the NPS along the Georgetown Waterfront, extending from just east of the Key Bridge at K Street NW to a connection with the Rock Creek Trail. Although this trail can bring cyclists within a quarter mile of the terminal of the CCT and access to the C&O Canal Trail, the trails must be reached via Water Street NW and existing sidewalks because there is no direct connection.

Rose Park Trail is a 0.5-mile long paved, multiuse trail maintained by NPS between P Street NW and M Street NW, just northeast of the primary study area. It closely follows the Rock Creek Trail through Rose Park and does not provide links to other multiuse trails (Courtney 2011).

Francis Scott Key Bridge is the only crossing of the Potomac River within the primary study area, and it is equipped with wide multiuse trails on each side that provide connections between Georgetown and Rosslyn, Virginia. On the Virginia side of the river, connections are made directly with Custis Trail and the Mount Vernon Trail. In Georgetown, the bridge crosses over the C&O Canal Trail and near the CCT and Georgetown Waterfront Trail, but no direct connections are made. The Bicycle Master Plan 2014 Update notes that the trails on the bridge are crowded with pedestrians, making bicycle use difficult (DDOT 2014d).

Roosevelt Bridge provides a multiuse trail crossing of the Potomac River within the 1-mile buffer around the primary study area, about 0.5 mile south of Georgetown. The multiuse trial is located on the north side of the bridge and uses the entrance ramps to connect directly with the Mount Vernon Trail on the Virginia side and 25th Street NW on the District side. The 25th Street NW end of the bridge trail is near the Rock Creek Trail and the National Mall Trails; however, no direct connection is made. This lack of direct trail connections is noted in the 2014 update to the Bicycle Master Plan, which also notes that the side path is narrow (DDOT 2014d).

Bicycle Lanes can be found on a number of streets within the 1-mile buffer around the primary study area and contribute to the overall bicycle network. Bicycle lanes are marked lanes that allow one-way bicycle travel, typically in the same direction as adjacent vehicle travel lanes. Bicycle lanes may or may not be separated from vehicle travel lanes by physical barriers. In Georgetown, close to the primary study area there is a pair of one-way bicycle lanes that connect M Street NW near the Key Bridge to Wisconsin Avenue NW to the north. The southbound lane is on 34th Street NW and the northbound lane is on 33rd Street NW to match the vehicle direction of travel on these one-way streets. More bicycle lanes are

located closer to downtown toward the east of the 1-mile buffer. An eastbound bicycle lane exists on L Street NW just east of the primary study area; this bicycle lane becomes a cycle track east of New Hampshire Avenue NW. Bicycle lanes are located on New Hampshire Avenue NW between Washington Circle and Dupont Circle for both directions of travel, as well as on N Street NW in the westbound direction between Connecticut Avenue NW and 22nd Street NW. A pair of bicycle lanes for travel between Massachusetts Avenue NW and downtown are located on Q Street NW and R Street NW, with the eastbound lane on Q Street NW and the westbound lane on R Street NW.

Cycle tracks also make up part of the bicycle network within the 1-mile buffer. Cycle tracks allow one- or two-way bicycle travel in a marked lane that is typically separated from vehicle travel lanes by a physical barrier. No cycle tracks are found within the primary study area, but there is a pair of cycle tracks located closer to downtown—one eastbound on L Street NW and one westbound on M Street NW. The cycle track on L Street NW runs eastbound between New Hampshire Avenue NW and 12th Street NW. The westbound cycle track begins at Thomas Circle and extends to Pennsylvania Avenue NW, just northeast of the primary study area (DDOT 2014e).

3.3.2 Bicycle Network Gaps and Barriers

DDOT and NPS have made recent improvements to the bicycle network to close gaps and barriers. Multiuse trail improvements include upgrading of the junction between the CCT and Water Street NW by NPS in 2013 (DDOT 2014d). Upgrades to separated facilities include the new westbound cycle track on M Street NW between just east of Pennsylvania Avenue NW and Thomas Circle and a new bicycle lane on New Hampshire Avenue NW between Dupont Circle and Washington Circle (DDOT 2014e).

Multiuse trails, gaps, and barriers within the 1-mile buffer occur on the Washington, DC, side of the Potomac River near bridge crossings where trails on the bridge do not directly connect to nearby multiuse trails. The Roosevelt Bridge Trail does not have direct connections to the Rock Creek Trail or the National Mall Trails, instead ending at G Street and 25th Street, creating a trail gap for bicyclist traveling trails between Virginia and Washington, DC. The Key Bridge Trail ends at its intersection with M Street in Georgetown, and bicyclists must use local roads to reach the C&O Canal Trail, Georgetown Waterfront Trail, or CCT. The 2014 update to the Bicycle Master Plan of 2005 notes that the trail on the Roosevelt Bridge is narrow and the trail on the Key Bridge has high pedestrian volumes on sidewalks the create conflicts with bicycle use (DDOT 2014d). As noted in both the Georgetown 2028 Plan and the 2005 Bicycle Master Plan, at the Georgetown Waterfront the CCT is separated from both the Georgetown Waterfront Trail and the Rock Creek Trail by Water Street NW, creating a break in this long trail system (DDOT 2005; Georgetown BID 2014).

Roads in the study area and 1-mile buffer were evaluated for Bicycle Level of Service (LOS) for the 2005 Bicycle Master Plan. This model used roadway lane and shoulder widths, speed limits, pavement conditions, and the presence of on-street parking to rank streets from best (LOS A) to worst (LOS F) level of comfort for bicyclists. Only major collectors and arterials were evaluated since it was assumed that limited access roads would not be used by bicyclists and local roads would have a good LOS (DDOT 2005). The bicycle element of move DC, DDOT's Long Range Intermodal Transportation Plan, updated the Bicycle LOS rankings in 2013. Roads within or immediately adjacent to the primary study area were found to have poor conditions for bicyclists. Roads in or near the study area with poor Bicycle LOS (score of E or F) include M Street NW west of Pennsylvania Avenue NW, K Street NW east of Wisconsin Avenue NW, Wisconsin Avenue NW itself south of Prospect Street NW, Rock Creek and Potomac Parkway south of Virginia Avenue NW, Canal Road, and the Key Bridge. Within the 1-mile buffer area, roads to the north of the study area and those closer to downtown have LOS of D or better (DDOT 2014f).

According to the DC Bicycle Master Plan of 2005, there are no large barriers to bicycling within the primary study area, but there are barriers to bicycling near the John F. Kennedy Center for the Performing Arts (DDOT 2005). This indicates that safe and convenient bicycle connections are not available because

of freeways, grade separations, and heavy traffic. All of these factors are present in some way around the John F. Kennedy Center for the Performing Arts and prevent bicyclists from easily reaching nearby multiuse trails and roads with less traffic.

3.3.3 BIKESHARE FACILITIES

Capital Bikeshare (CaBi) is an automated bicycle-sharing system serving Washington, DC; Arlington and Alexandria, Virginia; and Montgomery County, Maryland. Note that the CaBi facilities shown on the bicycle facilities map (figure 3-8) based on DC GIS data downloaded in December 2015 do not match the latest information on the CaBi website. The information below describes the information presented on the CaBi website unless noted. CaBi has two bike stations in the primary study area, located at Washington Harbour on 30th Street NW and the intersection of K and 34th Streets NW (Capital Bikeshare n.d.), with one additional CaBi station located just north at the intersection of Wisconsin Avenue NW and the C&O Canal towpath. Outside the primary study area, but within 1 mile, bike stations are distributed fairly evenly throughout populated areas, with the exception of the areas north of M Street NW, which have fewer stations. On the Virginia side of the Potomac River, DC GIS data shows CaBi has five bike stations in Rosslyn, Virginia, with two stations near the Custis Trail. However, Arlington County's bike map shows more than five CaBi stations within a 1-mile buffer of the primary study area in Virginia (Arlington Virginia 2016). North of the primary study area, the CaBi website map shows three stations on Wisconsin Avenue NW, including the one near the C&O Canal towpath and one at Georgetown University. East of the primary study area, the stations are located closer together than in Georgetown or Virginia. As of January 2016, CaBi was operating approximately 31 bikeshare stations within the 1-mile buffer around the study area (Capital Bikeshare n.d.). In 2012, total arrivals and departures of bicycle trips at the two CaBi stations operating in or adjacent to the primary study area (Washington Harbour at 30th Street NW and the intersection of Wisconsin Avenue NW and the C&O Canal) was 2,500 to 4,000 per station (DDOT 2014f) stations at. These stations experience utilization that is within the range of the typical Capital Bikeshare stations in the District, but is only about one-half to one-third the volume of some of the busier downtown stations.

3.4 Transit

Transit within the primary study area and larger 0.25-mile buffer area is primarily limited to local buses. Therefore, this section evaluates the existing Metrobus and Circulator routes within this area in terms of stop locations, peak hour headway, and peak hour use. The assessment also includes an assessment of the existing condition of all transit stops within a 0.25-mile radius of the study area; this assessment evaluates general ADA compliance and what features are available at the bus stop. There are no transit facilities within the project area to evaluate. Data for this section were collected from WMATA, the DC Circulator website, carsharing websites, street imagery from Google Maps in July 2015, and Georgetown BID reports. This section concludes with a brief description of carsharing locations within the transit study area.

3.4.1 METRO ACCESS

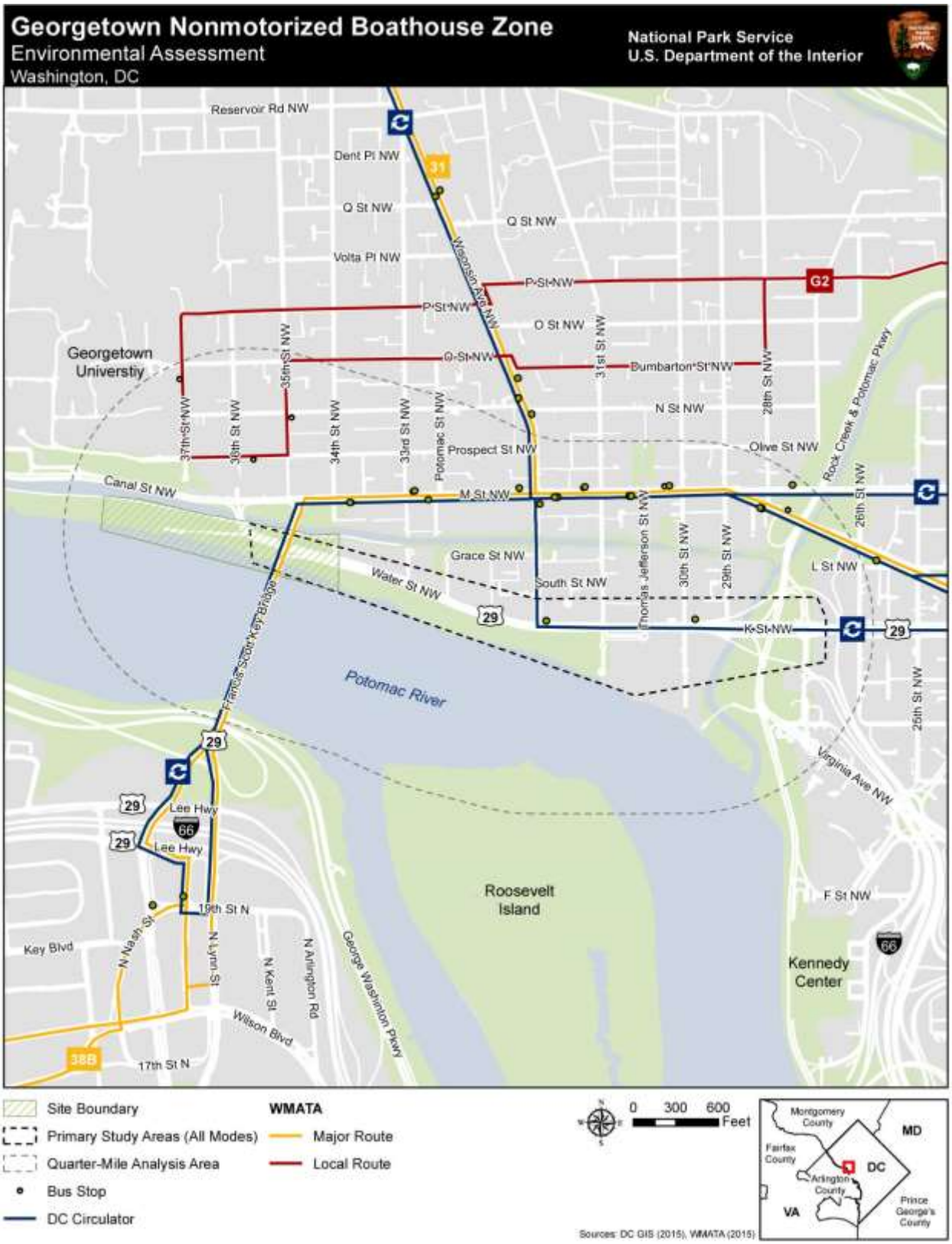
Georgetown is not served directly by Metrorail, so travelers must either walk or take a Metrobus to a nearby station. Two Metrorail stations are located near the study area: Foggy Bottom-GWU and Rosslyn. Foggy Bottom-GWU is located just over 2,000 feet from the east end of the study area and Rosslyn is located just under 3,500 feet from the west end of the study area. Despite being farther from the study area, Rosslyn is the closer station for travel to the west side of the study area. Both stations are served by the same lines: the Orange Line from Vienna to New Carrolton, the Blue Line from Franconia-Springfield to Largo Town Center, and the Silver Line from Wiehle-Reston East to Largo Town Center (WMATA 2014a). All three lines serve downtown, providing travelers from Georgetown with frequent and convenient service once the stations are reached. Based on 2014 data, the Foggy Bottom-GWU Metro Station sees 22,053 boardings on the average weekday, while Rosslyn Station sees 15,460 boardings (Georgetown BID 2015).

3.4.2 METROBUS

WMATA provides the core of the transit service in the study area and the 0.25-mile buffer area examined for transit with its Metrobus services. A network of routes classified as "major" serve the study area along M Street NW and Wisconsin Avenue NW, and one route classified as "local" serves the northwest corner of the buffer area near Georgetown University. The major routes include 38B, 33, 31, 30S and 30N, which provide vital links to Metro stations for this area with no Metrorail service, as well as direct service to downtown and suburbs in Maryland and Virginia (WMATA 2015). The sole local route within the transit study area is Route G2. The Metrobus routes within the study area and the 0.25-mile buffer area are shown in figure 3-9.

Several of the major Metrobus routes are combined through the study area. Routes 30S and 30N operate together in Georgetown, as do Routes 31 and 33. This pairing of routes allows for tighter headways between Friendship Heights at the northern end of these routes, through Georgetown to near their southern ends, where they split to serve separate destinations. Routes 30S and 30N both originate at the Friendship Heights Metro Station in Bethesda, pass through Georgetown on Wisconsin Avenue NW and M Street NW, follow Pennsylvania Avenue NW, then split and end separately at the Southern Avenue Metro Station in Anacostia and the Naylor Avenue Metro Station. Routes 31 and 33 also both originate at the Friendship Heights Metro Station, follow Wisconsin Avenue NW and M Street NW through the study area, continue on Pennsylvania Avenue NW, then split and end at Potomac Park near the Foggy Bottom-GWU Metro Station in downtown and the Archives Metro Station in downtown. Route 38B operates from the Ballston Metro Station in Arlington, passes through the study area on M Street NW after crossing the Key Bridge, and ends at the Farragut West Metro Station in downtown. Along the major Metrobus routes, stops are made on Wisconsin Avenue NW at Dumbarton Street NW; Wisconsin Avenue NW and M Street NW; along M Street NW at 31st Street NW, Thomas Jefferson Street NW, and 30th Street NW; and on Pennsylvania Avenue NW at 28th Street NW. In addition, the 38B route alone serves M Street NW at 34th Street NW, 33rd Street NW, and Potomac Street NW. The local bus route through the 0.25-mile buffer area is the G2, which operates between Georgetown University on P and O Streets NW and Howard University. Stops are made where O Street NW intersects 37th Street NW and on Prospect Street NW at 36th Street NW.

Due to the multiple trip generators and the many active hours in Georgetown, hours of operation are long and headways are tight for all routes in the study area. Stops along Wisconsin Avenue NW and M Street NW east of their intersection have the most frequent service. The service hours and headways of the WMATA bus routes within the primary study area and the 0.25-mile buffer area are presented in table 3-2.



1 **FIGURE 3-9. METROBUS AND DC CIRCULATOR ROUTES WITHIN THE QUARTER-MILE BUFFER AREA**

TABLE 3-2. METROBUS SERVICE HOURS AND HEADWAYS

WMATA Metrobus Major Routes			
Route Name	**Route Endpoints**	**Headway**	**Service Hours for Study Area**
30S	Operates from Friendship Heights Metro Station in Bethesda to Southern Avenue Metro Station in Anacostia	All Day: 30 minutes (routes are combined in Georgetown)	Monday–Friday: 4:40 AM–2:10 AM Saturday: 4:50 AM–2:30 AM Sunday: 4:50 AM–2:20 AM
30N	Operates from Friendship Heights Metro Station in Bethesda to Naylor Avenue Metro Station in Anacostia		
31	Operates from Friendship Heights Metro Station in Bethesda to Potomac Park near the Foggy Bottom-GWU Metro Station in downtown	Peak: 5–10 minutes Off-peak: 10–20 minutes (routes are combined in Georgetown)	Monday - Friday: 5:30 AM–12:00 AM Saturday: 6:00 AM–12:50 AM Sunday: 7:00 AM–9:00 PM
33	Operates from Friendship Heights Metro Station in Bethesda to the Archives Metro Station in downtown		
38B	Operates from the Ballston Metro Station in Arlington to the Farragut West Metro Station in downtown	Peak: 12–15 minutes Off-peak: 20–30 minutes	Monday–Friday: 5:30 AM–1:30 AM Saturday: 6:00 AM–1:30 AM Sunday: 6:00 AM–12:20 AM
WMATA Metrobus Local Routes			
G2	Operates from Howard University to P Street at Georgetown University	Peak: 12–20 minutes Off-peak: 20–30 minutes	Monday–Friday: 5:35 AM–12:55am Saturday 6:30am–12:55am Sunday 6:56am–12:20am

Source: WMATA n.d.

WMATA ridership data from 2014 for bus routes serving Georgetown was used to show the number of daily weekday boardings at Georgetown stops. Overall, about 3,200 people board Metrobuses in Georgetown on an average day. Of those, 881 use Route 38B, 643 use Route 33, 623 use Route 31, 290 use Route 30S, and 280 use Route 30N. The local bus, Route G2, is used by 217 people on a typical weekday. Outbound boardings (on busses heading away from downtown) are favored on Routes 38B, 33, and 31, indicating that these routes are used mostly by people traveling to Georgetown from areas north or southeast of Georgetown, while 30S and 30N are balanced between inbound and outbound boardings (Georgetown BID 2015).

None of the Metrobus stops in the primary study area and the 0.25-mile buffer area have shelters, benches, or curb ramps for ADA accessible access. Two bus stops have timetable or map information on the bus stop sign post (M Street NW at Potomac, south side; M Street NW at 34th, south side), one stop has newspaper stands (Wisconsin Avenue NW at M, east side), and two bus stops have trash cans (M Street NW at 31st, south side; M Street NW at 33rd, north side).

3.4.3 DC CIRCULATOR

The DC Circulator Bus system launched its first routes through the study area in 2005. The DC Circulator makes up a significant portion of the transit service in the study area and operates the only bus service on

K Street NW along the Georgetown Waterfront. Located near the west end of the Circulator's route structure, Georgetown is served by two routes: the Dupont Circle – Georgetown – Rosslyn Route and the Georgetown – Union Station Route.

The Georgetown – Union Station Route provides service from the study area to Wisconsin Avenue NW/35th Street NW or Union Station from 7:00 AM to 9:00 PM, where connections can be made to the intercity trains of Amtrak, the regional/commuter rail systems of Maryland Area Regional Commuter (MARC) rail and Virginia Railway Express (VRE), and the Metrorail transit system. During late night hours service (Sunday to Thursday from 9:00 PM to midnight and Friday and Saturday from 9:00 PM to 2:00 AM), busses terminate at McPherson Square Metro Station, eliminating the connection to rail services at Union Station. The Dupont Circle – Rosslyn Route provides service from the study area to Dupont Circle or Rosslyn from 7:00 AM to 9:00 PM, where connections can be made to Metrorail. All DC Circulator bus routes operate on a 10-minute headway for the length of the service day, with no additional service during peak hours (DDOT 2015a).

Within the 0.25-mile buffer around the primary study area, the Dupont Circle – Rosslyn Route operates both directions along the length of M Street NW, except near the east end of the buffer where it operates westbound on M Street NW and eastbound on Pennsylvania Avenue NW. The Georgetown – Union Station Route operates westbound/northbound on K Street NW and Wisconsin Avenue NW and eastbound on M Street NW east of the intersection with Wisconsin Avenue NW. The Dupont Circle – Rosslyn Route makes eastbound stops along M Street NW at 34th Street NW, Potomac Street NW, Wisconsin Avenue NW, Thomas Jefferson Street NW, and one stop on Pennsylvania Avenue NW at 28th Street NW. Westbound stops are made on M Street NW at 28th Street NW, 30th Street NW, 31st Street NW, Wisconsin Avenue NW, and 33rd Street NW. The Georgetown – Union Station Route makes westbound stops on K Street NW at 30th Street NW and Wisconsin Avenue NW, eastbound stops along M Street NW at Wisconsin Avenue NW and Thomas Jefferson Avenue NW (DDOT 2015a). The two DC Circulator routes are shown on figure 3-9. Of the two routes, ridership on the Georgetown to Union Station Route is higher, with an average daily ridership of 5,587 passengers, while the Dupont Circle to Rosslyn Route has an average daily ridership of 2,197 passengers (DDOT n.d.a).

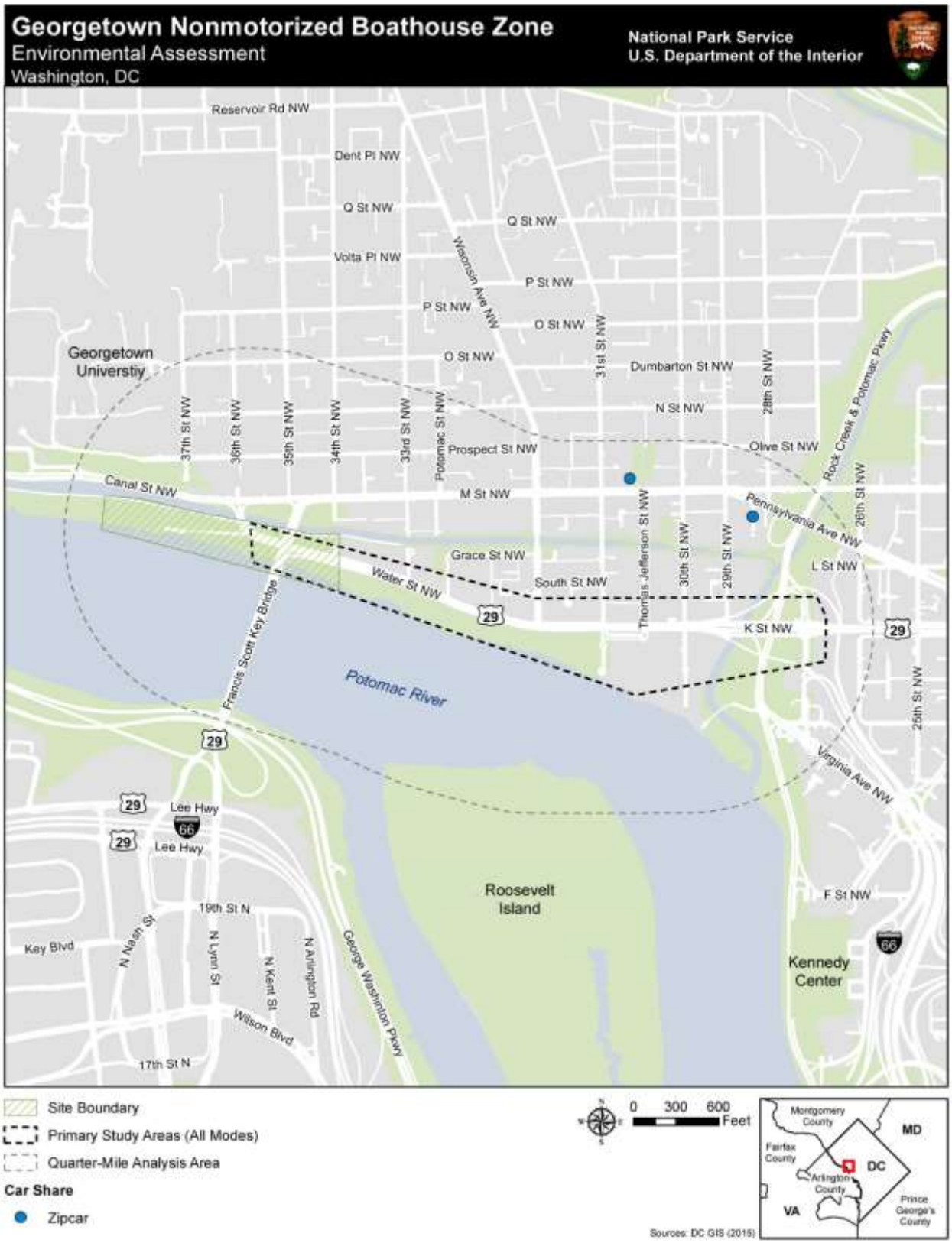
Only one Circulator bus stop in the primary study area or 0.25-mile buffer area includes a map of routes (M Street NW at 28th, north side) and no Circulator bus stops include shelters, benches, or curb ramps. Those Circulator stops that were co-located with the Metrobus stops previously noted share the same features. A summary of DC Circulator route information is presented in table 3-3.

TABLE 3-3. DC CIRCULATOR ROUTE INFORMATION

DC Circulator			
Route Name	**Route Endpoints**	**Headway**	**Service Hours for Study Area**
Georgetown to Union Station	Operates from Wisconsin Ave/35th Street NW in Georgetown to Massachusetts Ave/1st Street NE at Union Station (Metrorail Station, Amtrak, MARC, VRE)	10 minutes	Every day: 7:00 AM–9:00 PM
Georgetown to Union Station Additional Night Service	Operates from Wisconsin Ave/35th Street NW (Whitehaven) in Georgetown to K Street and 14th Street NW (McPherson Square Metro Station); Does not operate all the way to Union Station	10 minutes	Sunday–Thursday: 9:00 PM–Midnight Friday and Saturday: 9:00 PM–2:00 AM
Dupont Circle to Georgetown and Rosslyn	Operates from Dupont Circle (Dupont Circle Metro Station) to Rosslyn (Rosslyn Metro Station)	10 minutes	Sunday–Thursday: 7:00 AM–Midnight Friday and Saturday: 7:00 AM–2:00 AM

3.4.4 CARSHARE

Zipcar is the only carshare provider in the 0.25 mile buffer around the study area. Locations are at the Colonial Parking Garage at 3053 M Street NW (four cars) and the Four Seasons Hotel at 2800 Pennsylvania Avenue NW (one car) (Zipcar n.d.; Enterprise CarShare n.d.). These carshare locations within the study area are shown on figure 3-10. One additional carshare station is on the edge of the 0.25 mile study area and therefore is not shown on the below map; this carshare station is located at 3237 N Street NW and has one vehicle.



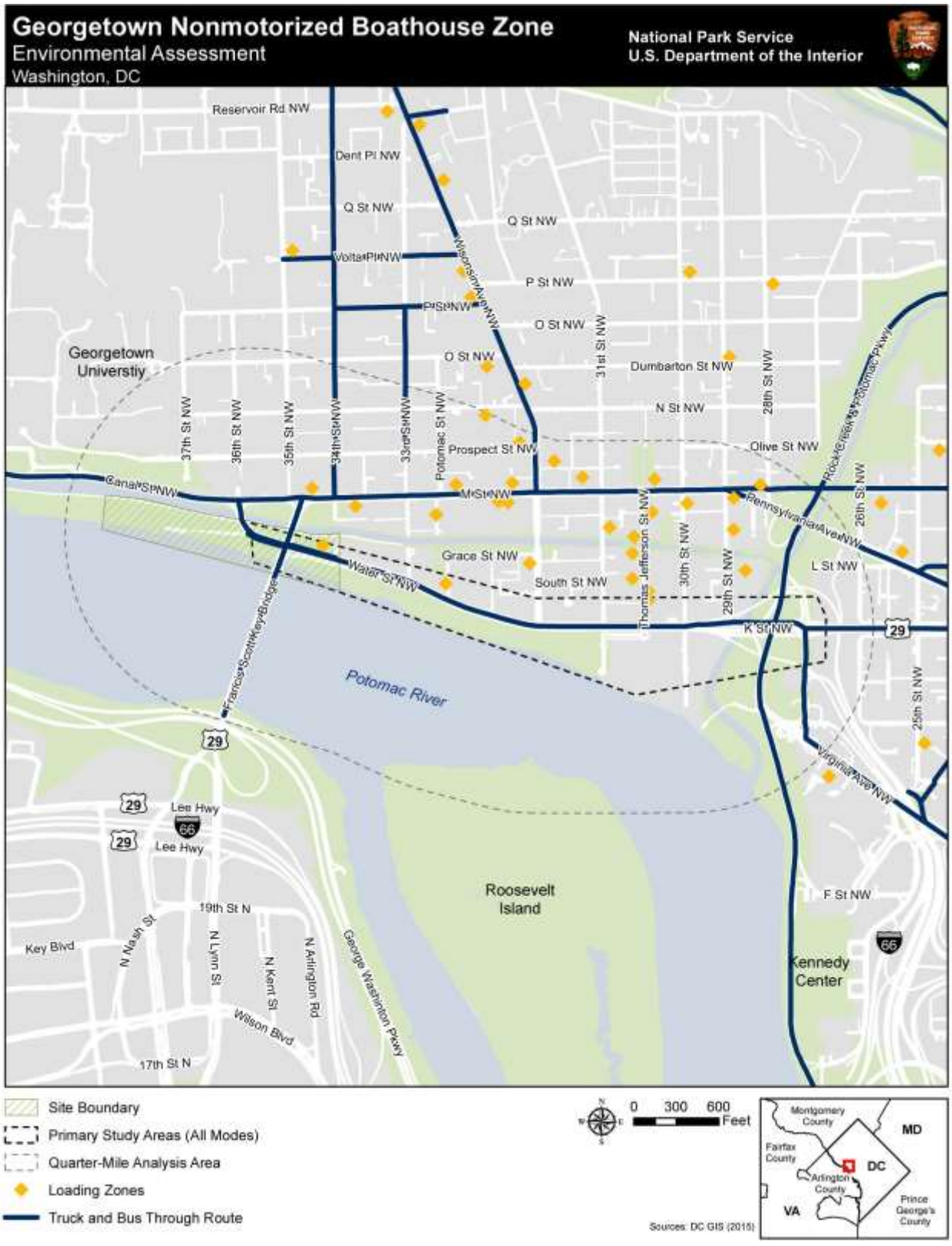
1 **FIGURE 3-10. CARSHARE LOCATIONS WITHIN THE QUARTER-MILE BUFFER AREA**

3.5 Trucks and Buses

Trucks and buses currently serve the project area in a similar manner to automobiles. While restricted from continuing past the Alexandria Aqueduct, vehicles pull-up as needed to buildings, parking on the pavement or on the side of the road, and return from the direction they came via a three or more point turn. The lack of definition of the road edges works in favor of trucks that probably use as much available space as possible for servicing the project area. Buses commonly service the project area on weekday mornings and afternoons during warmer weather months to bring high school and university rowers to the project area from schools in the area. There are currently approximately six reserved bus parking spaces on the south side of Water Street NW at the Key Bridge overpass that are likely used by these school buses and other buses servicing the Georgetown Waterfront area.

Outside of the project area, DDOT has designated truck and bus through routes to travel while in the District; these routes are shown in figure 3-11. Note that the section of roadway on figure 3-11 along Water/K Streets NW is actually designating the elevated Whitehurst Freeway as a truck and bus through route. However, the section of Water Street NW between 34th Street NW and what would be 36th Street NW if it were to intersect Water Street NW is shown as a truck and bus through route as well. Based on other data from DDOT, there are no bus or truck restrictions in the primary study area (DDOT 2014g). However, there are bus and truck restrictions on 34th Street NW between M Street NW and Wisconsin Avenue NW and on 33rd Street NW between N and P Streets NW. There are also truck restrictions on 33rd Street NW between Prospect and N Streets NW, on P Street NW between Wisconsin Avenue NW and 34th Street NW, on Volta Place NW between Wisconsin Avenue NW and 35th Street NW, and on New Hampshire Avenue NW between I Street NW and Pennsylvania Avenue NW.

DDOT has also identified commercial loading zones that are intended for businesses that do not have access to other off-street loading options. Loading zones are not for the exclusive use and benefit of singular businesses and there are now fees to use these zones (DDOT n.d.b). The loading zones within the primary study area and the 0.25-mile surrounding area are shown on figure 3-11. The two closest loading zones to the project are a 44-foot-long loading zone at 3401 Water Street NW on the north side of the street and a 172-foot-long loading zone at 1000 Potomac Street NW on the east side of the street.



1 **FIGURE 3-11. LOADING ZONES AND TRUCK AND BUS THROUGH ROUTES**

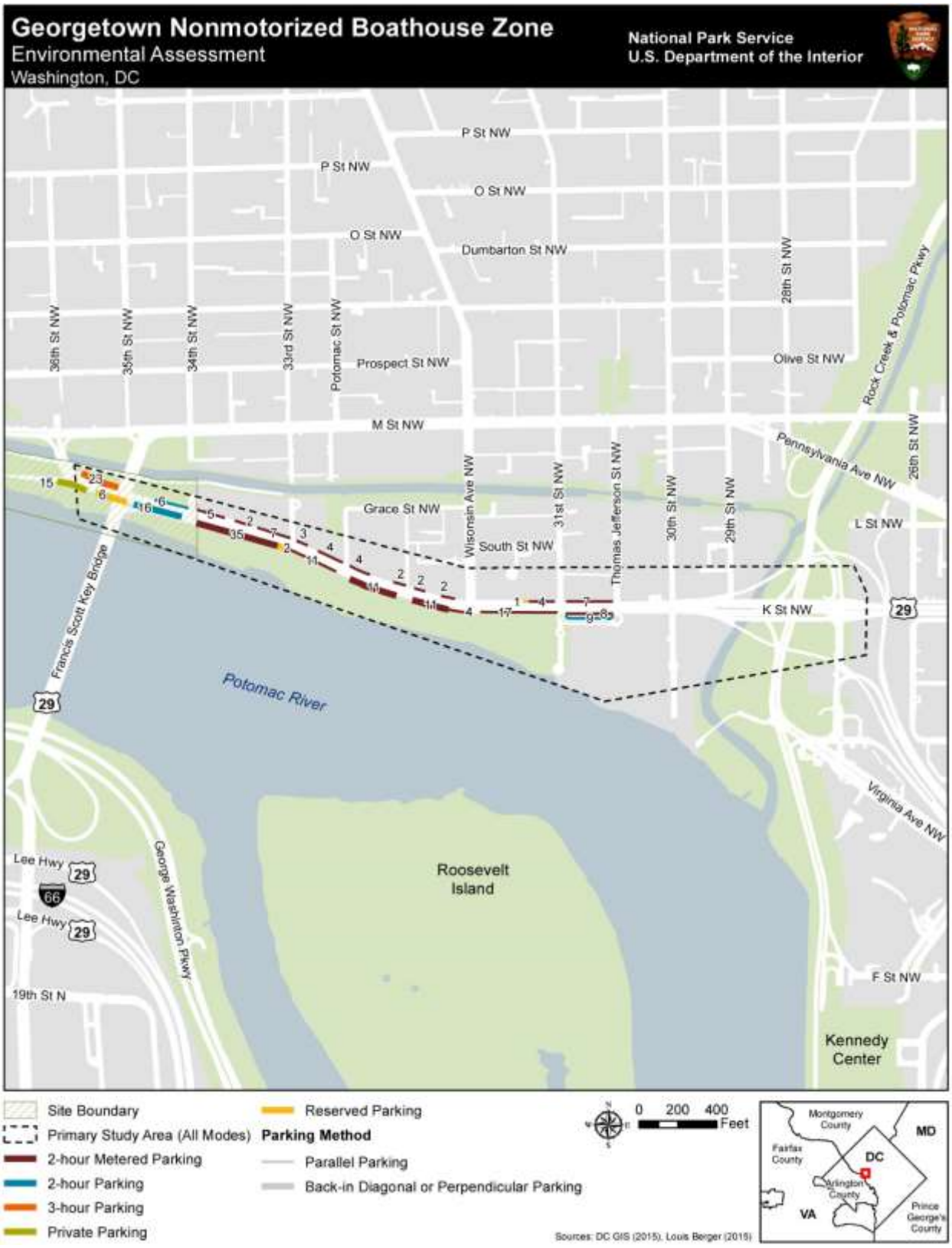
3.6 Parking

Existing public parking within the primary study area includes on-street metered and/or time-limited parking and public parking garages, while parking in the 0.25-mile area beyond the study area also includes some public parking lots. This section includes an inventory of on-street parking in the project area and primary study area, including the number of spaces and the type of parking restrictions. A general description of parking within 0.25-mile of the primary study area is also included, with a focus on garage parking. Public garages and parking lots were identified by online information or information provided by the Georgetown BID. The on-street parking inventory was performed in November 2015.

3.6.1 On-Street Parking

Within the project area, there are currently 55 public on-street parking spaces. Of these spaces, 22 are restricted to 2-hours and 23 are restricted to 3-hours. All of these public on-street parking spaces are back-in parking spaces with the exception of six parallel spaces on the north side of Water Street NW. Within the project area, there are also 6 reserved parking spaces for buses on the south side of Water Street NW under the Key Bridge overpass and 15 private parking spaces also on the south side of Water Street NW. Six of the private parking spaces are reserved for the owners or renters of the townhouses and nine of the private spaces are reserved for Potomac Boat Club users.

On-street parking in the primary study area consists of 217 parking spaces along Water/K Streets NW between 27th Street NW and the end of Water Street NW, 9 of which are located on a driveway loop adjacent to the road (these numbers include those parking spaces within the project area). Of these spaces, 193 are open to the general public, while 9 are reserved for select types of vehicles and 15 spaces are for private residences or businesses only. Of the 193 public spaces, 139 spaces are metered spaces and 54 are non-metered. Time limits on the public parking spaces are either 2 or 3 hours, with all of the 139 metered spaces having 2-hour time limits. Of the non-metered spaces, 31 spaces have 2-hour time limits and the other 23 spaces have 3-hour limits. Most of the non-metered spaces, including all of the non-metered 3-hour parking spaces, are located within the project area boundary west of 34th Street NW. The location, type, and amount of on-street parking in the primary study area is shown in figure 3-12.

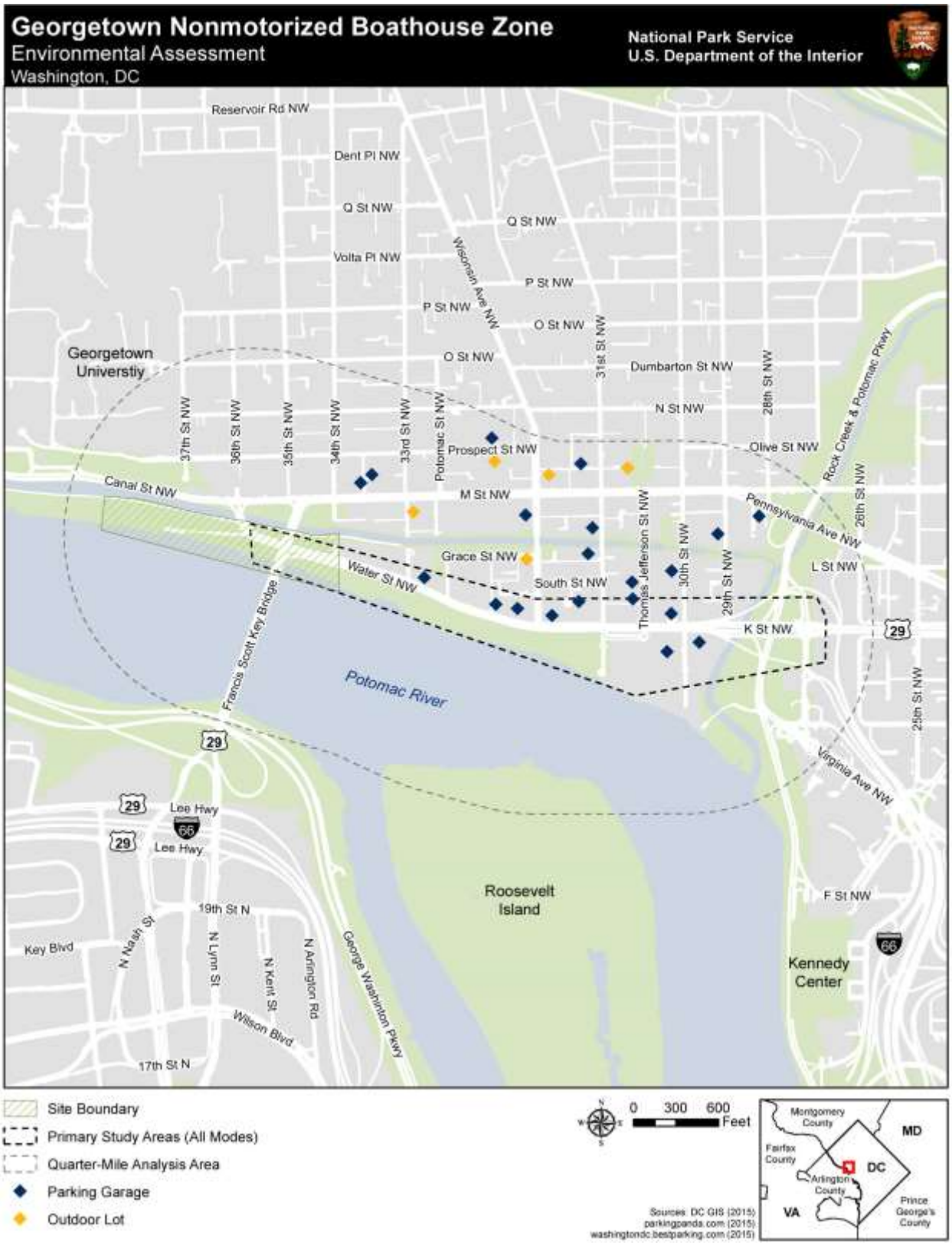


1 **FIGURE 3-12. ON-STREET PARKING WITHIN THE PRIMARY STUDY AREA**

On-street parking throughout the larger 0.25-mile buffer area is regulated by the use of on-street parking regulations, such as the residential parking permit program, and parking meters (HNTB 2008). As noted in the Georgetown Transportation Study, parking is an important issue in the Georgetown area. Residential streets north of M Street NW typically restrict non-resident permit holders to park for a period of 1 to 3 hours for free, while metered on-street parking is predominantly located in commercial areas of Georgetown such as along M Street NW, K Street NW, cross streets in between these two parallel roads, and areas surrounding Georgetown University.

3.6.2 PUBLIC PARKING GARAGES AND OUTDOOR LOTS

A large number of public parking garages and outdoor lots are located within a short walk of the project area, but neither type of parking facility is located within the project area. The public parking garages and outdoor lots in the area are concentrated around the Georgetown Waterfront, along M Street NW, and between Wisconsin Avenue NW and 30th Street NW. Within 0.25 mile of the primary study area there are a total of 25 public parking facilities that were identified, consisting of 5 outdoor surface lots and 20 parking garages, as shown in figure 3-13. Of those parking garages, eight are located within the primary study area, either on K Street NW or immediately adjacent to it, and four of those are at or west of Wisconsin Avenue NW, placing them within 2,000 feet of the project area (Georgetown BID n.d., BestParking 2015; Parking Panda 2015). The list of parking facilities within 0.25 mile of primary study area is provided in table 3-4.



1 **FIGURE 3-13. PUBLIC PARKING GARAGES AND OUTDOOR LOTS**

TABLE 3-4. PUBLIC PARKING GARAGES AND OUTDOOR LOTS WITHIN 0.25-MILE OF PRIMARY STUDY AREA

Owner	Location	Hours	Type
Central Parking	3100 South Street NW	24 hours	Garage
Colonial Parking	1000 Potomac Street NW	Monday-Friday 7AM-8PM	Garage
Colonial Parking	1025 Thomas Jefferson Street NW	Monday-Thursday 6AM-1AM, Friday 6AM-3AM, Saturday 10AM-3PM, Sunday 10AM-1AM	Garage
Colonial Parking	1055 Thomas Jefferson Street NW	Sunday-Thursday 6AM-1AM, Friday and Saturday 6AM-3AM	Garage
Colonial Parking	1050 31st Street NW	Monday-Sunday 7AM-12AM	Garage
Colonial Parking	3101 K Street NW	24 hours	Garage
Colonial Parking	901 30th Street NW	Mon-Thurs 6AM-12AM, Fri 6AM-2AM, Sat 12PM-2AM, Sun 12PM-12AM	Garage
Colonial Parking	1054 31st Street NW	Mon-Thurs 6:30AM-1AM, Fri 6:30AM-3AM, Sat 8:30AM-3AM, Sun 11AM-12:30AM	Garage
Colonial Parking	1050 Thomas Jefferson Street NW	Mon-Thurs 7AM-12AM, Fri 7AM-3AM, Sat 9AM-3AM, Sun 10AM-12AM	Garage
Colonial Parking	1101 30th Street NW	M-F 7AM-7PM	Garage
Colonial Parking	1010 Wisconsin Avenue NW	Mon-Thurs 6:30AM-1AM, Fri 6:30AM-3AM, Sat 8:30AM-3AM, Sun 11AM-12AM	Garage
Colonial Parking	3000 K Street NW	24 hours	Garage
Colonial Parking	1080 Wisconsin Avenue NW	24 hours	Garage
Colonial Parking	1000 Thomas Jefferson Street NW	M-F 7AM-7PM	Garage
Constitution Parking	3217 K Street NW	Mon-Thurs 6:30AM-1AM, Fri 6:30AM-3AM, Sat 8:30AM-3AM, Sun 11AM-12AM	Garage
Four Seasons Hotel	2800 Pennsylvania Avenue NW	24 hours	Garage
Georgetown Court Parking	3251 Prospect Street NW	24 hours	Garage
Hamilton Court Garage	1228 31st Street NW	Mon-Thurs 8AM-7PM, Fri 8AM-12AM, Sat 11AM-2AM	Garage
PMI Parking	3333 M Street NW	Mon-Fri 6AM-7PM, Sat 8AM-7PM	Garage
PMI Parking	3307 M Street NW	Mon-Wed 7AM-10PM, Thurs 7AM-12AM, Fri 7AM-2AM, Sat 10AM-2AM, Sun 10AM-7PM	Garage
Colonial Parking	3053 M Street NW	Mon-Thurs 8AM-11:30PM, Fri 8AM-3AM, Sat 9AM-3AM, Sun 10AM-10PM	Outdoor Lot
Colonial Parking	1205 Wisconsin Avenue NW	Mon-Thurs 8AM-12AM, Fri 8AM-3AM, Sat 9AM-3AM, Sun 10AM-12AM	Outdoor Lot
Doggett's Parking	3220 Prospect Street NW	Mon-Thurs 8AM-12AM, Fri & Sat 8AM-2AM, Sun 10AM-12AM	Outdoor Lot
UNIPARK Parking	1099 33rd Street NW	Mon-Thurs 8:30AM-11PM, Fri 8:30AM-3AM, Sat 9AM-3AM, Sun 10AM-12AM	Outdoor Lot
UNIPARK Parking	1046 Wisconsin Avenue NW	Mon-Thurs 4PM-11PM, Fri 5PM-11PM, Sat 11AM-11PM, Sun 11AM-8PM	Outdoor Lot

1

3.7 Traffic

This section explains the concepts and definitions for analyzing the traffic operations, the process used to analyze the 13 study area intersections, and the results.

3.7.1 Study Area Peak Hour Traffic Operations

Rock Creek Parkway NW and access to the roadway changes dramatically during the peak periods. The operations are designed to carry the maximum amount of vehicles in the peak direction of flow. During the AM peak period (6:45 AM–9:30 AM), all lanes on Rock Creek Parkway are designated for southbound travel only north of Virginia Avenue NW. The eastern most lanes that normally carry northbound traffic exit onto Virginia Avenue NW using all lanes along Virginia Avenue and split between I Street NW to access I-66 or follow Virginia Avenue NW toward New Hampshire Avenue NW. The Virginia Avenue NW westbound lanes end at 27th Street NW and all traffic must turn onto 27th Street. 27th Street NW southbound right-turn lanes on I Street NW westbound are closed. In addition, the ramps between Rock Creek Parkway and the intersection of K and 27th Streets NW are closed to vehicular traffic. Vehicles exiting the TBC can only make right turns from the driveway onto Rock Creek Parkway southbound.

During the PM peak period (4:00 PM–6:15 PM), all lanes on Rock Creek Parkway NW are for northbound travel only through the study area. The eastern most lanes that normally carry northbound traffic carry traffic from Virginia Avenue NW westbound onto Rock Creek Parkway northbound. The ramps between Rock Creek Parkway and K/29th Streets NW are closed to vehicular traffic. Vehicles exiting the TBC can only make left turns from the driveway onto Rock Creek Parkway northbound.

On Saturdays and all other times, all roadways in the study area operate in their normal capacity allowing for travel in both directions along Rock Creek Parkway NW, Virginia Avenue NW, and the ramps between Rock Creek Parkway and K Street NW.

3.7.2 Study Area Travel Observations

Conditions in the study area were observed on Tuesday, October 20, 2015, during the PM peak period and on Wednesday, October 21, 2015 during the AM peak period.

During the AM peak period, K Street NW westbound experiences queuing delays west of 27th Street NW as a result of a lane drop on the approach to the 29th Street NW intersection were noted. Queues were observed along K Street NW westbound extending almost to the 27th Street intersection. Queuing also was observed along K Street NW in the westbound direction extending from 30th Street. The Whitehurst Freeway approach to the K and 27th Streets NW intersection was observed to queue back to the diverging off-ramp serving the Potomac Freeway or I-66. The K Street NW westbound approach to 27th Street NW was observed to queue back to the 26th Street pedestrian crossing.

The intersection of Virginia Avenue NW and Rock Creek Parkway experienced queues extending back to the K Street overpass. This queue was compounded by the Virginia Avenue at 27th Street NW traffic light, which contributed to the Rock Creek Parkway queuing issue.

Halfway between Virginia Avenue and K Street NW along 27th Street NW, traffic was observed queuing on the off-ramp from the Potomac River Freeway to 27th Street NW. Queues were observed extending into the tunnel under Virginia Avenue/New Hampshire Avenue NW.

In terms of the bicycle and pedestrian observations, a large number of bicycles were observed riding along K Street NW eastbound destined toward Foggy Bottom and points west from Georgetown. Pedestrians were observed mainly walking westbound along K Street NW along the south side toward Georgetown. Pedestrian traffic crossing K Street NW to the sidewalk sometimes blocked the right-turning vehicles from K Street eastbound/Whitehurst Freeway approach at 27th Street NW.

During the PM peak period it was noted that K Street NW eastbound experiences queuing delays from 27th Street NW extending as far as Thomas Jefferson Street NW. Queues were observed along K Street NW westbound from the 27th Street intersection and extending under Washington Circle. The traffic signal that allows Washington Circle traffic to enter K Street NW westbound creates small gaps in the queue, but only temporarily. The Whitehurst Freeway approach to the K and 27th Streets intersection was observed to queue back to the diverging off-ramp serving the Potomac Freeway or I-66.

The intersection of Virginia Avenue NW and Rock Creek Parkway experienced queues extending halfway to the John F. Kennedy Center for the Performing Arts. Access to Rock Creek Parkway was also delayed from the traffic light at 27th Street NW, extending to New Hampshire Avenue.

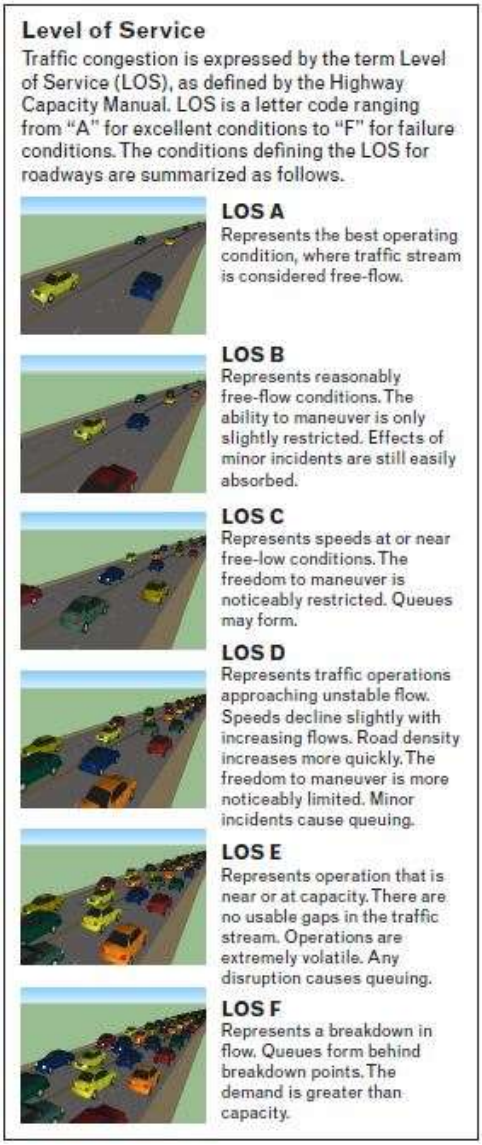
As was the case during the AM, traffic was observed queuing on the off-ramp from the Potomac River Freeway or I-66 to 27th Street NW. Queues were observed extending into the tunnel under Virginia Avenue/New Hampshire Avenue NW. In addition, there was a high volume of pedestrians heading eastbound along K Street NW crossing 27th Street and blocking the right-turning vehicles from K Street eastbound/Whitehurst Freeway approach.

3.7.3 ANALYSIS TOOLS

The study analyzed the study area intersections using Synchro™ Traffic Signal Coordination Software Version 8.0 (Build 806, Revision 77) and SimTraffic™ Version 8.0 (Build 806, Revision 77). 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 in the following sections to determine the LOS, or driver perception of an intersection's operation. The intersection capacity analysis results are presented in Section 3.7.5. The intersection queuing analysis uses the Synchro™ tool to determine different levels of queuing, or the length that vehicles may back up at an intersection. The intersection queuing analysis process is described more in Section 3.7.6, and the study area results of the queuing analysis are presented in the same section.

3.7.4 INTERSECTION OPERATIONS ANALYSIS METHOD

LOS is the primary measure of traffic operations for both signalized and unsignalized intersections. It is a standard 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. LOS provides a scale that is intended to match motorists' perception of how a transportation facility operates, and to provide a scale to compare different facilities. Detailed LOS descriptions are presented in figure 3-14.



Source: TRB (2000)

FIGURE 3-14. LEVEL OF SERVICE DIAGRAM

3.7.4.1 Signalized Intersection Level of Service

The LOS for signalized intersections as agreed in the DDOT scoping form is based on the Highway Capacity Manual (HCM) 2000 method and requires the same inputs to determine an accurate LOS (TRB 2000). The HCM 2010 method was not used because the principles behind the HCM 2010 procedures were unable to calculate an operation result based on the unique lane geometry for some of the study area intersections. 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 (v/c) 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 3-5 shows the average control delay and corresponding LOS for signalized intersections. Using the Synchro method, LOS E and LOS F constitute failing operations.

TABLE 3-5. 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 conditions intersections analyzed consisted of 7 signalized intersections and 6 unsignalized intersection.

3.7.4.2 Unsignalized Intersection Levels of Service

The LOS for unsignalized intersections (STOP-Controlled intersections) is based on HCM 2010 method and requires several inputs, including:

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

The average vehicle control delay, in seconds per vehicle, is calculated using these parameters with the HCM 2010 procedures (TRB 2010). 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 and for 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 also are 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 that drivers are both consistent and homogeneous and assumes consistency for their 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 3-6 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 2010 Method, LOS E and LOS F constitute failing operations.

TABLE 3-6. UNSIGNALIZED INTERSECTION CONTROL DELAY AND LOS THRESHOLDS – HCM 2010 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 (2010)

3.7.5 INTERSECTION OPERATIONS ANALYSIS

The results of the existing conditions operations analysis for both signalized and unsignalized intersections are discussed in this section. The average LOS for the various approaches to the intersection and the overall intersection LOS grades are depicted in figures 3-15 and 3-16 for weekday AM and PM peak hours, respectively, and figure 3-17 for the Saturday peak hour at the end of this section. Table 3-7 shows the results of the LOS capacity analysis and the intersection vehicle delay for the existing conditions during all peak hours (weekday AM and PM peak hours and Saturday peak hour).

3.7.5.1 Signalized Intersection Operations Analysis

Based on the signalized intersection analysis, more than half of the study intersections operate at acceptable conditions during the peak hours analyzed (weekday AM and PM peak hours, Saturday peak hour). However, the following three signalized intersections operate at overall unacceptable conditions under the existing conditions for the time periods noted:

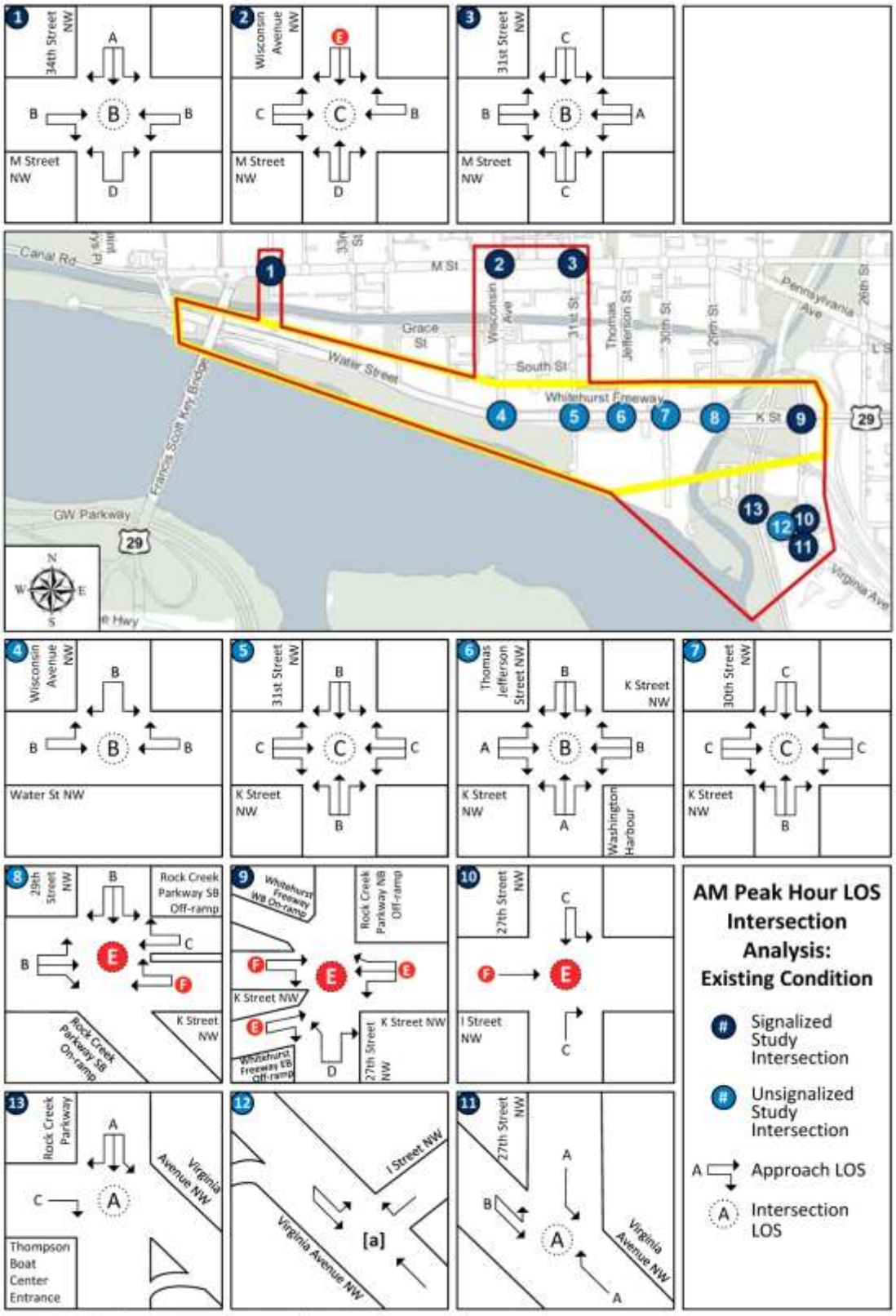
- K Street NW/Whitehurst Freeway NW eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during the weekday AM and PM peak hours
- I Street NW and 27th Street NW (Intersection #10) during the weekday AM peak hour
- Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the Saturday peak hour

The following individual signalized intersection approaches operate under unacceptable conditions during the noted peak hour:

- Southbound at the intersection of M Street NW and Wisconsin Avenue NW (Intersection #2) during the weekday AM peak hour
- Southbound at the intersection of M Street NW and 31st Street NW (Intersection #3) during the Saturday peak hour
- Eastbound (K Street NW) at the intersection of K Street NW/Whitehurst Freeway eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during all peak hours (weekday AM and PM peak hours and Saturday peak hour), eastbound (Whitehurst Freeway eastbound off-ramp) at the same intersection during the weekday AM and PM peak hours, and westbound at the same intersection during the weekday AM peak hour
- Eastbound at the intersection of I Street NW and 27th Street NW (Intersection #10) during the AM peak hour
- Eastbound, westbound, and southbound at the intersection of Thompson Boat Center (TBC)/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the Saturday peak hour

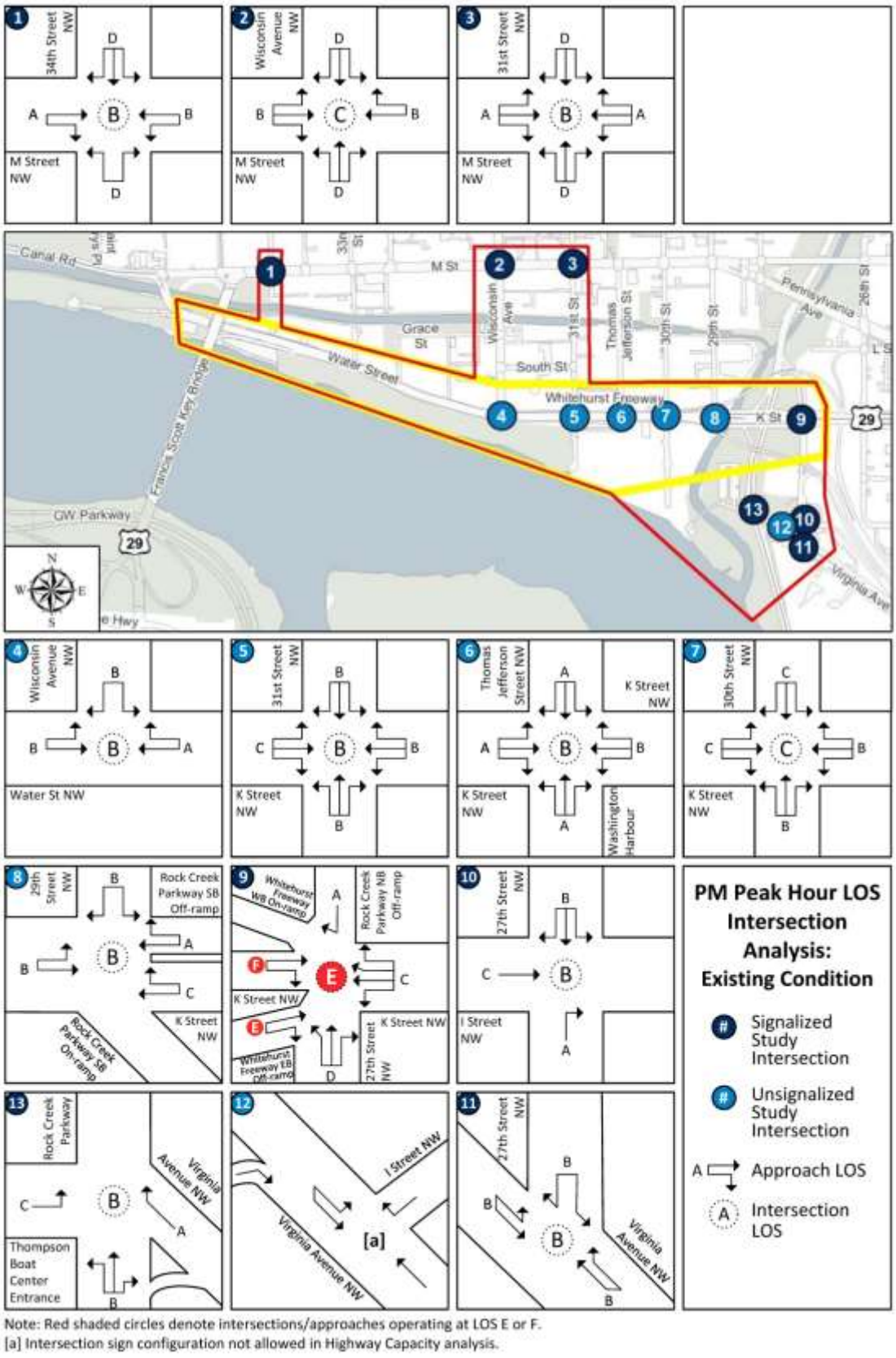
3.7.5.2 Unsignalized Intersection Operations Analysis

Based on the unsignalized intersection analysis, the intersection of K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) would operate at overall unacceptable conditions during the weekday AM peak hour. Additionally, the westbound approach of the same intersection would operate at unacceptable conditions during the weekday AM peak hour and Saturday peak hour. The remaining unsignalized intersections would operate at overall acceptable levels of service under existing conditions.



Note: Red shaded circles denote intersections/approaches operating at LOS E or F.
[a] Intersection sign configuration not allowed in Highway Capacity analysis.

FIGURE 3-15. EXISTING CONDITION INTERSECTION LEVEL OF SERVICE FOR WEEKDAY AM PEAK HOUR



Note: Red shaded circles denote intersections/approaches operating at LOS E or F.
[a] Intersection sign configuration not allowed in Highway Capacity analysis.

1 **FIGURE 3-16. EXISTING CONDITION INTERSECTION LEVEL OF SERVICE FOR WEEKDAY PM PEAK HOUR**

Note: Red shaded circles denote intersections/approaches operating at LOS E or F.
[a] Intersection sign configuration not allowed in Highway Capacity analysis.

FIGURE 3-17. EXISTING CONDITION INTERSECTION LEVEL OF SERVICE FOR SATURDAY PEAK HOUR

TABLE 3-7. EXISTING CONDITION ALL PEAK HOUR OPERATIONS ANALYSIS

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
1	**M Street NW & 34th Street NW (Signalized)**							
	EB (M St NW)	TR	11.2	B	6.4	A	6.8	A
	EB Overall (M St NW)		**11.2**	**B**	**6.4**	**A**	**6.8**	**A**
	WB (M St NW)	LT	15.6	B	16.2	B	10.5	B
	WB Overall (M St NW)		**15.6**	**B**	**16.2**	**B**	**10.5**	**B**
	NB (34th St NW)	LTR	47.0	D	43.2	D	0.1	A
	NB Overall (34th St NW)		**47.0**	**D**	**43.2**	**D**	**0.1**	**A**
	SB (34th St NW)	LT	47.7	D	42.5	D	45.5	D
	SB (34th St NW)	R	4.8	A	35.6	D	33.1	C
	SB Overall (34th St NW)		**5.6**	**A**	**35.7**	**D**	**33.9**	**C**
	Overall		**11.0**	**B**	**18.1**	**B**	**14.0**	**B**
2	**M Street NW & Wisconsin Avenue NW (Signalized)**							
	EB (M St NW)	LTR	24.5	C	14.0	B	19.2	B
	EB Overall (M St NW)		**24.5**	**C**	**14.0**	**B**	**19.2**	**B**
	WB (M St NW)	T	22.5	C	23.2	C	34.0	C
	WB (M St NW)	R	2.4	A	8.4	A	5.8	A
	WB Overall (M St NW)		**16.9**	**B**	**19.3**	**B**	**27.9**	**C**
	NB (Wisconsin Ave NW)	L	51.3	D	56.2	E	51.6	D
	NB (Wisconsin Ave NW)	LTR	49.3	D	52.7	D	50.1	D
	NB Overall (Wisconsin Ave NW)		**50.0**	**D**	**53.8**	**D**	**50.6**	**D**
	SB (Wisconsin Ave NW)	L	64.4	E	70.3	E	48.4	D
	SB (Wisconsin Ave NW)	LTR	53.7	D	30.6	C	36.3	D
	SB Overall (Virginia Ave NW)		**57.3**	**E**	**44.2**	**D**	**40.4**	**D**
	Overall		**32.9**	**C**	**29.2**	**C**	**30.5**	**C**
3	**M Street NW & 31st Street NW (Signalized)**							
	EB (M St NW)	LTR	11.4	B	-	-	-	-
	EB (M St NW)	TR	-	-	6.6	A	-	-
	EB (M St NW)	LT	-	-	-	-	6.4	A
	EB (M St NW)	R	-	-	-	-	39.4	D
	EB Overall (M St NW)		**11.4**	**B**	**6.6**	**A**	**10.0**	**A**
	WB (M St NW)	LTR	9.6	A	8.5	A	6.3	A
	WB Overall (M St NW)		**9.6**	**A**	**8.5**	**A**	**6.3**	**A**
	NB (31st St NW)	LTR	28.5	C	42.4	D	53.0	D
	NB Overall (31st St NW)		**28.5**	**C**	**42.4**	**D**	**53.0**	**D**
	SB (31st St NW)	LTR	32.8	C	35.2	D	59.1	E
	SB Overall (31st St NW)		**32.8**	**C**	**35.2**	**D**	**59.1**	**E**
	Overall		**12.6**	**B**	**13.2**	**B**	**14.3**	**B**

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TABLE 3-7. EXISTING CONDITION ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**							
	EB (Water St NW)	LT	10.2	B	14.4	B	12.5	B
	EB Overall (Water St NW)		**10.2**	**B**	**14.4**	**B**	**12.5**	**B**
	WB (K St NW)	T	10.8	B	9.7	A	10.8	B
	WB (K St NW)	R	9.7	A	9.4	A	9.3	A
	WB Overall (K St)		**10.2**	**B**	**9.5**	**A**	**10.1**	**B**
	SB (Wisconsin Ave NW)	L	16.6	C	12.3	B	12.9	B
	SB (Wisconsin Ave NW)	R	8.8	A	8.8	A	9.3	A
	SB Overall (Wisconsin Ave NW)		**14.3**	**B**	**11.3**	**B**	**11.5**	**B**
	Overall		**12.4**	**B**	**11.9**	**B**	**11.3**	**B**
5	**K Street NW & 31st Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.5	A	10.1	B	9.8	A
	EB (K St NW)	T	17.0	C	16.6	C	16.2	C
	EB (K St NW)	R	8.2	A	8.3	A	8.5	A
	EB Overall (K St NW)		**16.5**	**C**	**15.2**	**C**	**15.3**	**C**
	WB (K St NW)	L	9.2	A	10.0	A	10.1	B
	WB (K St NW)	TR	21.9	C	15.1	C	17.4	C
	WB Overall (K St NW)		**21.8**	**C**	**14.5**	**B**	**16.5**	**C**
	NB (31st St NW)	LTR	11.6	B	10.1	B	10.1	B
	NB Overall (31st St NW)		**11.6**	**B**	**10.1**	**B**	**10.1**	**B**
	SB (31st St NW)	LT	12.0	B	12.3	B	12.3	B
	SB (31st St NW)	R	9.4	A	9.5	A	9.8	A
	SB Overall (31st St NW)		**11.4**	**B**	**11.5**	**B**	**11.4**	**B**
	Overall		**18.4**	**C**	**14.2**	**B**	**15.0**	**B**
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.1	A	9.4	A	9.7	A
	EB (K St NW)	T	10.2	B	10.1	B	12.3	B
	EB (K St NW)	TR	7.2	A	9.0	A	10.0	A
	EB Overall (K St NW)		**8.7**	**A**	**9.7**	**A**	**11.3**	**B**
	WB (K St NW)	L	8.5	A	8.8	A	9.7	A
	WB (K St NW)	T	16.8	A	11.8	A	17.8	A
	WB (K St NW)	R	8.5	A	8.7	A	9.0	A
	WB Overall (K St NW)		**14.0**	**B**	**10.5**	**B**	**14.6**	**B**
	NB (Washington Harebour)	LTR	9.9	A	10.0	A	11.5	B
	NB Overall (Washington Harebour)		**9.9**	**A**	**10.0**	**A**	**11.5**	**B**
	SB (Thomas Jefferson St NW)	LTR	10.1	B	9.9	A	10.4	B
	SB Overall (Thomas Jefferson St NW)		**10.1**	**B**	**9.9**	**A**	**10.4**	**B**
	Overall		**11.9**	**B**	**10.2**	**B**	**13.1**	**B**

TABLE 3-7. EXISTING CONDITION ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
7	**K Street NW & 30th Street NW (AWSC) [a]**							
	EB (K St NW)	T	17.8	C	24.1	C	23.1	C
	EB (K St NW)	TR	13.3	B	13.9	B	13.7	B
	EB Overall (K St NW)		**16.2**	**C**	**20.6**	**C**	**19.8**	**C**
	WB (K St NW)	L	11.3	B	11.6	B	11.4	B
	WB (K St NW)	T	26.5	D	14.1	B	17.4	C
	WB (K St NW)	T	14.1	B	10.7	B	11.8	B
	WB Overall (K St NW)		**19.7**	**C**	**12.3**	**B**	**14.3**	**B**
	NB (30th St NW)	LTR	13.2	B	12.8	B	12.9	B
	NB Overall (30th St NW)		**13.2**	**B**	**12.8**	**B**	**12.9**	**B**
	SB (30th St NW)	LT	17.8	C	18.3	C	15.2	C
	SB (30th St NW)	R	11.7	B	11.9	B	11.9	B
	SB Overall (30th St NW)		**15.8**	**C**	**15.9**	**C**	**13.8**	**B**
	Overall		**18.0**	**C**	**16.6**	**C**	**16.2**	**C**
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**							
	EB (K St NW)	L	11.0	B	10.3	B	10.6	B
	EB (K St NW)	T	13.9	B	17.5	C	17.1	C
	EB (K St NW)	TR	9.6	A	10.3	B	10.3	B
	EB Overall (K St NW)		**11.7**	**B**	**13.6**	**B**	**13.6**	**B**
	WB (K St NW)	LTR	65.7	F	15.6	C	65.7	F
	WB Overall (K St NW)		**65.7**	**F**	**15.6**	**C**	**65.7**	**F**
	WB (Rock Creek Pkwy SB Off-ramp)	TR	17.1	C	9.6	A	12.2	B
	WB Overall (Rock Creek Pkwy SB Off-ram		**17.1**	**C**	**9.6**	**A**	**12.2**	**B**
	SB (29th St NW)	LTR	11.4	B	12.4	B	11.3	B
	SB Overall (29th Street NW)		**11.4**	**B**	**12.4**	**B**	**11.3**	**B**
	Overall		**35.8**	**E**	**13.7**	**B**	**33.1**	**D**

TABLE 3-7. EXISTING CONDITION ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
9	**K St NW/Whitehurst Fwy EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized**							
	EB (K St NW)	TR	185.8	F	287.2	F	182.1	F
	EB Overall (K St NW)		**185.8**	**F**	**287.2**	**F**	**182.1**	**F**
	EB (Whitehurst Fwy EB Off-ramp)	TR	66.7	E	58.7	E	24.3	C
	EB Overall (Whitehurst Fwy EB Off-ramp)		**66.7**	**E**	**58.7**	**E**	**24.3**	**C**
	WB (K St NW)	L	243.8	F	56.9	E	52.8	D
	WB (K St NW)	T	6.1	A	2.3	A	3.4	A
	WB (K St NW)	R	6.7	A	3.9	A	4.2	A
	WB Overall (K St NW)		**59.9**	**E**	**22.4**	**C**	**18.2**	**B**
	NB (27th St NW)	L	51.0	D	53.5	D	46.2	D
	NB (27th St NW)	R	1.1	A	-	-	-	-
	NB (27th St NW)	TR	-	-	24.3	C	0.5	A
	NB Overall (27th St NW)		**42.2**	**D**	**44.9**	**D**	**33.0**	**C**
	SB (Rock Creek Pkwy NB Off-ramp)	R	-	-	0.1	A	0.1	A
	SB Overall (Rock Creek Pkwy NB Off-ram		-	-	**0.1**	**A**	**0.1**	**A**
	Overall		**66.9**	**E**	**73.3**	**E**	**44.3**	**D**
10	**I Street NW & 27th Street NW (Signalized)**							
	EB (I St NW)	T	115.7	F	24.0	C	25.3	C
	EB Overall (I St NW)		**115.7**	**F**	**24.0**	**C**	**25.3**	**C**
	NB (27th St NW)	R	21.2	C	1.2	A	1.6	A
	NB Overall (27th St NW)		**21.2**	**C**	**1.2**	**A**	**1.6**	**A**
	SB (27th St NW)	L	20.3	C	19.5	B	10.4	B
	SB (27th St NW)	T	30.5	C	-	-	-	-
	SB (27th St NW)	TR	-	-	10.8	B	11.9	B
	SB (27th St NW)	R	-	-	6.2	A	7.3	A
	SB Overall (27th St NW)		**27.2**	**C**	**13.6**	**B**	**10.2**	**B**
	Overall		**76.9**	**E**	**12.8**	**B**	**12.3**	**B**
11	**Virginia Avenue NW & 27th Street NW (Signalized)**							
	EB (Virginia Ave NW)	LT	13.1	B	12.2	B	7.5	A
	EB Overall (Virginia Ave NW)		**13.1**	**B**	**12.2**	**B**	**7.5**	**A**
	WB (Virginia Ave NW)	T	-	-	16.3	B	7.9	A
	WB (Virginia Ave NW)	R	0.2	A	7.4	A	3.2	A
	WB Overall (Virginia Ave NW)		**0.2**	**A**	**15.3**	**B**	**6.8**	**A**
	SB (27th St NW)	L	4.7	A	-	-	23.8	C
	SB (27th St NW)	LR	-	-	18.0	B	-	-
	SB Overall (27th St NW)		**4.7**	**A**	**18.0**	**B**	**23.8**	**C**
	Overall		**9.2**	**A**	**15.2**	**B**	**10.3**	**B**

TABLE 3-7. EXISTING CONDITION ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized) [b]**							
	EB (Virginia Avenue NW)	L	-	-	-	-	-	-
	EB (Virginia Avenue NW)	T	-	-	-	-	-	-
	EB Overall (F St NW)		-	-	-	-	-	-
	Overall		-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**							
	EB (Thompson Boat Center)	R	22.0	C	-	-	-	-
	EB (Thompson Boat Center)	L	-	-	22.8	C	-	-
	EB (Thompson Boat Center)	LTR	-	-	-	-	57.1	E
	EB Overall (Thompson Boat Center)		**22.0**	**C**	**22.8**	**C**	**57.1**	**E**
	WB (Virginia Ave NW)	TR	-	-	-	-	219.7	F
	WB (Virginia Ave NW)	R	-	-	1.1	A	120.4	F
	WB Overall (Virginia Ave NW)		-	-	**1.1**	**A**	**169.8**	**F**
	NB (Rock Creek Pkwy)	LT	-	-	19.9	B	-	-
	NB (Rock Creek Pkwy)	R	-	-	6.4	A	31.9	C
	NB (Rock Creek Pkwy)	T	-	-	-	-	18.7	B
	NB Overall (Rock Creek Pkwy)		-	-	**18.9**	**B**	**30.2**	**C**
	SB (Rock Creek Pkwy)	L	1.6	A	-	-	-	-
	SB (Rock Creek Pkwy)	T	17.5	B	-	-	-	-
	SB (Rock Creek Pkwy)	LT	-	-	-	-	67.1	E
	SB (Rock Creek Pkwy)	R	1.3	A	-	-	0.0	A
	SB Overall (Rock Creek Pkwy)		**9.6**	**A**	-	-	**66.1**	**E**
	Overall		**9.6**	**A**	**11.0**	**B**	**76.5**	**E**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

3.7.6 INTERSECTION QUEUING ANALYSIS

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% of the analysis period. The 95th percentile queue length is the worst-case scenario, calculated as the queue that has a 5% 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 both the 50th and 95th percentile queue lengths for the seven signalized intersections, and only the 95th percentile queue lengths for the six unsignalized intersections (50th percentile not reported in Synchro for unsignalized intersections).

The results of the existing conditions queuing analysis for both signalized and unsignalized intersections are discussed in this section and are presented in table 3-8. This table presents specific details on the percentile queue length values calculated for the study area intersections. Note that the percentile values are expressed in feet and a car occupies about 25 linear feet of roadway, including the space between cars.

3.7.6.1 Signalized Intersection Queuing Analysis

Based on the Synchro™ queuing analysis, queue lengths exceeding the roadway storage capacity would occur at the following intersection approaches under existing conditions:

- Southbound at M Street and Wisconsin Avenue NW (Intersection #2) during the weekday AM and PM peak hours
- Eastbound at M and 31st Streets NW (Intersection #3) during the Saturday peak hour
- Eastbound and westbound at K Street NW/Whitehurst Freeway NW eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during the weekday AM and PM peak hours and Saturday peak hour
- Eastbound at I and 27th Streets NW (Intersection #10) during the weekday AM peak hour and southbound at the same intersection during the weekday PM peak hour
- Northbound at Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the weekday PM peak hour; and westbound, northbound, and southbound at the same intersection during the Saturday peak hour

The remaining intersections in the study area would have acceptable queue lengths or would experience low levels of queuing.

3.7.6.2 Unsignalized Intersection Queuing Analysis

Based on the analysis, queue lengths exceeding the roadway storage capacity would occur at the following unsignalized intersection approach under existing conditions:

- Westbound at K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) during the weekday AM and Saturday peak hours

The remaining unsignalized intersections in the study area would have acceptable queue lengths.

TABLE 3-8. EXISTING CONDITION ALL PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)
1	**M Street NW & 34th Street NW (Signalized)**										
	EB (M St NW)	TR	181	429	517	181	133	166	181	160	196
	WB (M St NW)	LT	437	76	98	437	181	217	437	78	98
	NB (34th St NW)	LTR	66	1	10	66	18	46	66	0	0
	SB (34th St NW)	LT	214	7	24	214	7	23	214	21	52
	SB (34th St NW)	R	214	16	56	214	261	343	214	160	223
2	**M Street NW & Wisconsin Avenue NW (Signalized)**										
	EB (M St NW)	LTR	577	254	303	577	90	115	86	132	168
	WB (M St NW)	T	382	125	170	382	155	204	302	176	232
	WB (M St NW)	R	382	22	35	382	28	83	302	16	53
	NB (Wisconsin Ave NW	L	175	47	94	175	101	173	175	83	149
	NB (Wisconsin Ave NW	LTR	867	48	80	867	102	148	867	84	127
	SB (Wisconsin Ave NW	L	226	194	#331	226	148	#269	226	115	191
	SB (Wisconsin Ave NW	LTR	226	183	#251	226	69	124	226	86	136
3	**M Street NW & 31st Street NW (Signalized)**										
	EB (M St NW)	LTR	382	129	140	-	-	-	-	-	-
	EB (M St NW)	TR	-	-	-	382	79	85	-	-	-
	EB (M St NW)	LT	-	-	-	-	-	-	302	87	105
	EB (M St NW)	R	-	-	-	-	-	-	50	16	m#141
	WB (M St NW)	LTR	198	70	87	198	83	106	198	101	130
	NB (31st St NW)	LTR	878	31	65	878	112	186	878	65	123
	SB (31st St NW)	LTR	216	69	118	216	61	114	216	92	162
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**										
	EB (Water St NW)	LT	942	-	13	942	-	75	942	-	48
	WB (K St NW)	T	434	-	25	434	-	18	434	-	28
	WB (K St NW)	R	300	-	23	300	-	25	300	-	20
	SB (Wisconsin Ave NW	L	897	-	88	897	-	33	897	-	40
	SB (Wisconsin Ave NW	R	25	-	18	25	-	10	25	-	18
5	**K Street NW & 31st Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	3	100	-	8	100	-	3
	EB (K St NW)	T	387	-	93	387	-	90	387	-	80
	EB (K St NW)	R	25	-	3	25	-	3	25	-	3
	WB (K St NW)	L	100	-	0	100	-	8	100	-	8
	WB (K St NW)	TR	205	-	150	205	-	75	205	-	98
	NB (31st St NW)	LTR	71	-	0	71	-	3	71	-	3
	SB (31st St NW)	LT	878	-	18	878	-	23	878	-	23
	SB (31st St NW)	R	25	-	3	25	-	8	25	-	10

TABLE 3-8. EXISTING CONDITION ALL PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**										
	EB (K St NW)	L	75	-	8	75	-	8	75	-	8
	EB (K St NW)	T	261	-	30	261	-	25	261	-	48
	EB (K St NW)	TR	25	-	18	25	-	13	25	-	20
	WB (K St NW)	L	100	-	3	100	-	5	100	-	13
	WB (K St NW)	T	274	-	123	274	-	53	274	-	118
	WB (K St NW)	R	274	-	25	274	-	23	274	-	23
	NB (Washington H)	LTR	249	-	8	249	-	13	249	-	25
	SB (Thomas J St NW)	LT	139	-	3	139	-	5	139	-	3
7	**K Street NW & 30th Street NW (AWSC) [a]**										
	EB (K St NW)	T	218	-	68	218	-	128	218	-	120
	EB (K St NW)	TR	218	-	28	218	-	40	218	-	38
	WB (K St NW)	L	100	-	10	100	-	5	100	-	10
	WB (K St NW)	T	212	-	150	212	-	35	212	-	73
	WB (K St NW)	T	212	-	83	212	-	25	212	-	48
	NB (30th St NW)	LTR	526	-	5	526	-	18	526	-	18
	SB (30th St NW)	LT	425	-	58	425	-	65	425	-	33
	SB (30th St NW)	R	25	-	18	25	-	23	25	-	18
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	5	100	-	13	100	-	5
	EB (K St NW)	T	268	-	53	292	-	100	292	-	93
	EB (K St NW)	TR	268	-	33	292	-	55	292	-	53
	WB (K St NW)	LTR	220	-	348	244	-	68	244	-	348
	WB (RC Pkwy SB Off-ra	TR	484	-	70	402	-	5	464	-	18
	SB (29th St NW)	LTR	453	-	10	513	-	5	513	-	15
9	**K St. NW/Whitehurst Fwy NW EB Off-ramp & 27th Street NW/Rock Creek Parkway NB Off-ramp (Signalized)**										
	EB (K St NW)	TR	236	~78	#152	236	~265	#374	236	~161	#255
	EB (W Fwy EB Off-ramp	TR	657	~634	#786	657	130	#242	657	117	180
	WB (K St NW)	L	185	~188	#336	185	402	#626	185	200	#340
	WB (K St NW)	T	707	37	60	707	12	22	707	17	31
	WB (K St NW)	R	370	67	90	370	91	118	370	62	85
	NB (27th St NW)	L	170	163	220	170	40	70	170	62	98
	NB (27th St NW)	R	272	0	1	-	-	-	-	-	-
	NB (27th St NW)	TR	-	-	-	272	6	43	272	0	0
	SB (Rock Creek Pkwy N	R	-	-	-	144	0	0	144	0	0

TABLE 3-8. EXISTING CONDITION ALL PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)
10	**I Street NW & 27th Street NW (Signalized)**										
	EB (I St NW)	T	48	~938	#1190	48	6	20	48	162	243
	NB (27th St NW)	R	55	42	89	55	0	0	55	0	0
	SB (27th St NW)	L	100	79	147	100	185	#401	100	36	143
	SB (27th St NW)	T	228	139	187	-	-	-	-	-	-
	SB (27th St NW)	TR	-	-	-	228	63	119	228	45	93
	SB (27th St NW)	R	-	-	-	228	0	83	228	0	79
11	**Virginia Avenue NW & 27th Street NW (Signalized)**										
	EB (Virginia Ave NW)	LT	105	114	135	105	27	41	105	27	34
	WB (Virginia Ave NW)	T	-	-	-	348	189	240	348	46	58
	WB (Virginia Ave NW)	R	348	0	0	50	20	48	50	0	21
	SB (27th St NW)	L	55	10	13	-	-	-	-	-	-
	SB (27th St NW)	LR	-	-	-	55	39	46	55	36	41
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized)** [b]										
	EB (Virginia Avenue NW	L	-	-	-	-	-	-	-	-	-
	EB (Virginia Avenue NW	T	-	-	-	-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**										
	EB (Thompson Boat Ctr)	R	113	0	4	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	L	-	-	-	86	9	27	-	-	-
	EB (Thompson Boat Ctr)	LTR	-	-	-	-	-	-	88	16	44
	WB (Virginia Ave NW)	TR	-	-	-	-	-	-	133	~422	#628
	WB (Virginia Ave NW)	R	-	-	-	157	0	0	133	~326	#442
	NB (Rock Creek Pkwy)	LT	-	-	-	559	348	#519	-	-	-
	NB (Rock Creek Pkwy)	R	-	-	-	559	26	49	557	394	495
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-	200	~326	#442
	SB (Rock Creek Pkwy)	L	257	0	22	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	T	257	322	441	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	263	~368	#568
	SB (Rock Creek Pkwy)	R	100	0	6	-	-	-	100	0	0

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

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

3.7.7 CRASH ANALYSIS

Accident ratings are used in transportation analyses to help determine where additional attention or examination of safety should be undertaken. Accident ratings are evaluated based on recorded accident information collected by a jurisdiction, in this case three years of data from DDOT (2012–2014), and calculated using the accident information and the daily volume of vehicles that travel through the intersection. Accident and injury ratings are calculated based on the number of accidents or injuries 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 accidents or injuries 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. Based on common assumptions that peak hour traffic volumes account for 8%–12% of daily traffic depending on the surrounding land use pattern, as noted in a recent Washington, DC, transportation study, the *Maryland Avenue SW Transportation Study*, it was assumed the peak hour accounted for 9% of the daily volumes (DDOT 2013b). The 9% factor was used because the traffic study area has a large number of traffic generators and therefore congestion is not limited solely to AM and PM peak hours, but is spread more evenly throughout the day than office-focused downtown areas such as the L'Enfant Plaza area studied in the *Maryland Avenue SW Transportation Study* that used a 11% factor.

Accident ratings for the intersections in the study area are presented in table 3-9 using crash data reports received from DDOT (DDOT 2012-2014). The intersections that have the highest accident rating are M Street NW at Wisconsin Avenue NW and M Street NW at 31st Street NW with accident rates of 5.63 and 4.72 accidents per MEV, respectively. The M and 31st Streets NW intersection was the only study area intersection with an injury rate greater than 1.00; the intersection had an injury rate of 1.04 injuries per MEV. Five additional study area intersections have accident ratings greater than 1.0 MEV (shown in gray in table 3-9). DDOT did not have crash or accident data for Intersection #11 (Virginia Avenue NW/Rock Creek Parkway southbound off-ramp).

TABLE 3-9. INTERSECTION ACCIDENT SUMMARY

Inter-section Number	Intersection Name (Cross Streets)	Accident Rate (accidents/ MEV*)	Injury Rate (injuries/ MEV*)
1	M Street NW & 34th Street NW	1.24	0.20
2	M Street NW & Wisconsin Avenue NW	5.63	0.95
3	M Street NW & 31st Street NW	4.72	1.04
4	Water Street NW/K Street & Wisconsin Avenue NW	2.58	0.21
5	K Street NW & 31st Street NW	1.81	0.70
6	K Street NW & Washington Harbour/Thomas Jefferson Street NW	0.85	0.00
7	K Street NW & 30th Street NW	2.05	0.75
8	K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW	1.51	0.39
9	K St NW/Whitehurst Freeway EB Off-ramp & 27th St NW/Rock Creek Parkway NB Off-ramp	0.86	0.32
10	I Street NW & 27th Street NW	0.97	0.40
11	Virginia Avenue NW & 27th Street NW	NA	NA
12	Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp	0.27	0.00
13	Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway	0.07	0.00

Source: DDOT crash/accident data from 2012-2014, received January 2016.
Notes:
*MEV = Million entering vehicles
NA = Crash data not available
Intersection depicted in gray may warrant further examination as they have an accident/injury rate over 1.0.

3.7.7.1 Detailed Crash Analysis

Intersections that have an accident rating of greater than 1.0 typically warrant further examination to determine if one or more particular causes can be gleaned from the detailed intersection accident data, and if mitigation is advisable, what mitigation measures would help to improve the safety of the intersection. Of the intersections for which sufficient data are available for analysis (minimum three years of data), seven of the intersections have an accident ratings of greater than 1.0, as shown in gray in table 3-9.

These high accident rating intersections are shown in more detail in table 3-10, which helps to examine whether there is a high percentage of a particular type of accident. Determining the true reasons for a high accident rating cannot solely be determined with accident data because each situation has unique circumstances that are not reflected in the accident/crash study reports. However, general trends can be determined or certain causes can be eliminated by examining the available accident-specific information. Accident data that may provide clues about accident trends have been highlighted in gray.

TABLE 3-10. DETAILED INTERSECTION CRASH ANALYSIS

Intersection Name (Number and Cross Streets)	Accident Rate per MEV*	Right Angle	Left Turn	Right Turn	Rear End	Side Swiped	Head On	Parked	Fixed Object	Ran Off Road	Pedestrian Involved	Backing	Non-Collision	Under/Over Ride	Unspecified	Total
1. M St NW & 34th St NW	**1.24**	5	2	2	12	12	2	5	0	0	1	2	0	0	0	**43**
2. M St NW & Wisconsin Ave NW	**5.63**	7	10	10	25	79	1	1	2	0	12	9	0	0	10	**166**
3. M Street NW & 31st Street NW	**4.72**	7	5	5	14	40	0	11	0	0	4	7	0	0	7	**100**
4. Water St NW/K St & Wisconsin Ave NW	**2.58**	2	0	2	5	5	1	3	0	0	2	2	1	0	2	**25**
5. K St NW & 31st St NW	**1.81**	1	2	0	6	6	0	1	0	0	1	1	0	0	0	**18**
7. K St NW & 30th St NW	**2.05**	1	0	0	2	7	1	3	2	0	1	4	0	0	9	**30**
8. K St NW/Rock Creek Pkwy SB Off-ramp & 29th St NW	**1.51**	0	2	0	5	6	0	0	2	0	0	4	0	1	3	**23**

Sources: DDOT crash data from 2012–2014

Notes:

*MEV = Million entering vehicles

Crash data that may provide clues about accident trends have been highlighted in gray.

4.0 NO-ACTION ALTERNATIVE BY MODE

This section describes the no-action alternative, or the baseline condition if the zone and associated planned development were not implemented. This condition is the basis for examining impacts on the transportation network for the action alternatives. Analysis of the no-action alternative assumes background development and growth through the year 2020, the full implementation year of the zone.

Under the no-action alternative, no changes are proposed within the project area itself. Therefore, this chapter only describes changes that are planned or reasonably foreseeable outside of the project area but within the study area or study area buffers noted in the existing conditions chapter.

4.1 Pedestrians

Only one project is expected to be completed by 2020 within the primary study area—a residential redevelopment at the intersection of Water and 34th Streets NW (see Section 4.6.2 for more details). This project may include replacing existing sidewalk torn-up or damaged during construction or improvements to the sidewalks to adhere to ADA requirements or DDOT streetscape guidelines.

Per DDOT's 2015–2020 Transportation Improvement Program, the District-wide Bicycle and Pedestrian Management Program includes sign and lighting upgrades to benefit pedestrians (MWCOG 2015). Some of these improvements may be located within the study area, but details and locations of future improvements are not yet known. Improvements associated with implementation of the planned Premium Transportation Service on K Street NW, would have minimal to no impacts on sidewalks in the area where this project overlaps the study area, between 27th Street NW and Wisconsin Avenue NW. It may even be likely that sidewalks and curb ramps would be upgraded with other construction associated with this project.

Under the no-action alternative, it is not anticipated that the Water Street residential project, other area projects as noted in Section 4.6.2, or other area pedestrian growth through 2020 would result in a substantial change to the volume of pedestrian activity or substantial changes to existing pedestrian infrastructure near the project area. Because the no-action alternative does not include additional development within the project area, no increase in pedestrians from the project area are anticipated other than normal annual growth.

4.2 Bicycles

DDOT plans to construct a number of bicycle facilities throughout the District, including new cycle tracks, bicycle lanes, trails, and contra-flow bicycle lanes. According to the moveDC plan, 230,000 additional annual bicycle trips are expected within the District by 2040, and these planned improvements would help to accommodate them (DDOT 2014a). Table 4-1 contains the planned bicycle facilities within the primary study area and within a 1-mile radius of the primary study area as presented in the moveDC: Bicycle Element (DDOT 2014f). Note that although the District has proposed many new bicycle lanes, trails, and cycle tracks, this list includes tiers 1–4 of proposed facilities. All facilities may not be implemented, and all facilities listed in table 4-1 would not be implemented by the no-action alternative date of 2020. Of the improvements noted in the table, DDOT is currently (2015/2016) studying the possibility of a cycle track along Pennsylvania Avenue NW between 17th and 22nd Streets NW (DDOT 2015b).

TABLE 4-1. NO-ACTION ALTERNATIVE PROPOSED BICYCLE FACILITIES

Roadway	From/To	Type	Tier
Massachusetts Avenue NW	Maryland line to R Street NW	Trail	1
Pennsylvania Avenue NW	17th Street NW to 29th Street NW / M Street NW	Cycle Track	1
33rd Street NW / Wisconsin Avenue NW (GAPS)	Georgetown Canal to R Street NW	Bicycle Lane	1
G Street NW	Virginia Avenue NW to Rock Creek and Potomac Parkway NW	Bicycle Lane	2
L Street NW	22nd Street NW / New Hampshire Avenue NW to 25th Street NW / Pennsylvania Avenue NW	Cycle Track	2
N Street NW	17th Street NW to Connecticut Avenue NW	Bicycle Lane	2
Roosevelt Island Bridge	30th Street NW to Roosevelt Island	Trail	2
Virginia Avenue NW	Constitution Avenue NW to Rock Creek and Potomac Parkway NW	Cycle Track	2
21st Street NW	Constitution Avenue NW to S Street NW	Cycle Track	3
22nd Street NW	Virginia Avenue NW to Q Street NW / Massachusetts Avenue NW	Bicycle Lane	3
37th Street NW	Reservoir Road NW / Winfield Lane NW to Tunlaw Road NW	Bicycle Lane	3
F Street NW	17th Street NW to 23rd Street NW	Bicycle Lane	3
F Street NW	23rd Street NW to Rock Creek and Potomac Parkway NW	Bicycle Lane	3
Florida Avenue NW / Q Street NW	Connecticut Avenue NW to 22nd Street NW / Q Street NW	Cycle Track	3
G Street NW	17th Street NW to Virginia Avenue NW	Bicycle Lane	3
Massachusetts Avenue NW/NW	1st Street NW / Columbus Circle NE to Dupont Circle NW	Cycle Track	3
R Street NW / 28th Street NW	Q Street NW to 37th Street NW	Cycle Track	3
Reservoir Road NW	37th Street NW / Winfield Lane NW to Foxhall Road NW / Salem Lane NW	Cycle Track	3
Reservoir Road NW / MacArthur Boulevard NW	Foxhall Road NW / Salem Lane NW to Canal Road NW	Bicycle Lane	3
M Street NW	29th Street NW / Pennsylvania Avenue NW to 34th Street NW	Bicycle Lane	4
Trolley Trail	Arizona Avenue NW to MacArthur Boulevard NW	Trail	4
Whitehurst Freeway NW	30th Street NW / K Street NW to Key Bridge	Cycle Track	4

In addition to bicycle facilities, the 2015 District of Columbia Capital Bikeshare Development Plan recommends expanding four Bicycle Share stations located within 1-mile of the primary study area by adding more docks (DDOT 2015c). These include the following locations:

- 22nd and I Streets NW expanded by eight docks
- 18th Street NW and Pennsylvania Avenue NW expanded by eight docks
- 19th Street NW and Pennsylvania Avenue NW expanded by eight docks
- 18th and M Streets NW expanded by four docks

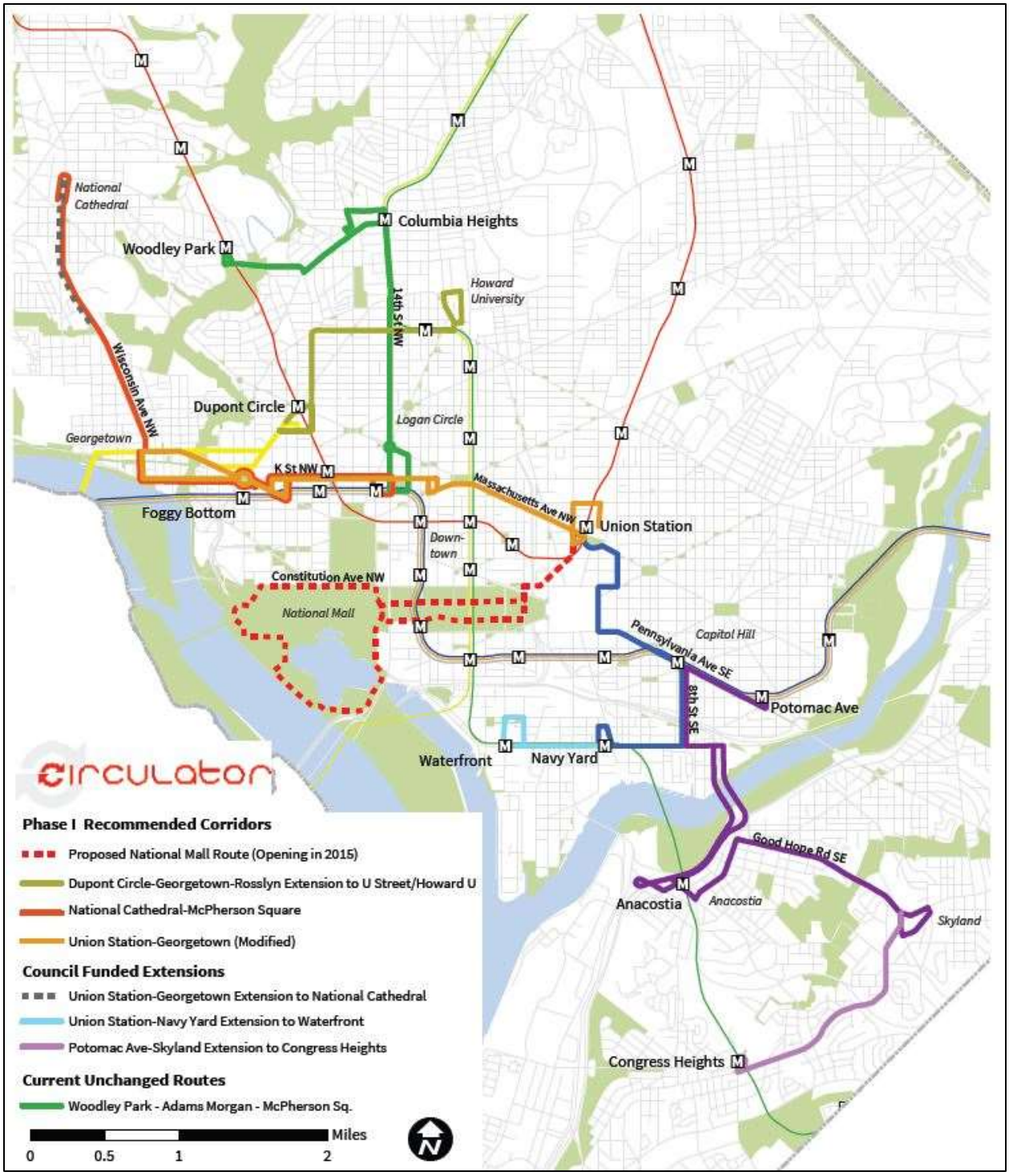
The District also recommends expanding the Capital Bikeshare station network over the next three years (DDOT 2015c). Within the primary study area, one new stations is planned along the Georgetown Waterfront Park just several blocks from the project area. Within the larger 1-mile area surrounding the primary study area, there are approximately eight or nine proposed new station locations.

The no-action alternative does not include additional development within the project area, therefore no increase in bicycles from the project area are anticipated other than normal annual growth. With the increase of Capital Bikeshare station docks and stations within 1 mile of the primary study area and the possibility for additional bicycle infrastructure improvements as planned by DDOT, there would be some improvements to the bicycle network within the bicycle study area under the no-action alternative. Annual background growth in bicyclists through 2020 would be expected both in the project area and the study area, especially with the introduction of a Capital Bikeshare station at or near the Georgetown Waterfront Park.

4.3 Transit

If the Union Station to Georgetown Premium Transit (K Street Transit) is implemented along K Street NW within the primary study area by 2020, the service would offer new transit options for non-vehicular study area trips. This transit line would extend over a 3-mile transit corridor between the area of Union Station and Georgetown, extending the current transit corridor on H Street NE between the intersection of Benning Road and Oklahoma Avenue NE and Union Station. The recommended alternative would travel east along K Street NW toward Georgetown, continue underneath the elevated Whitehurst Freeway, and end at the intersection of K Street NW and Wisconsin Avenue NW in Georgetown. This alternative specifies streetcar operation along K Street NW between Wisconsin Avenue NW to 26th Street NW, including tail tracks to allow the streetcar to change direction (DDOT 2013a). However, given the funding allocated in the most recent budget for the DC Streetcar or K Street Transit line, "it appears that the funding needs for a line to Georgetown 'will extend beyond' the proposed capital improvement plan, DDOT said" (Laris 2015).

According to the 2014 *DC Circulator Transit Development Plan Update* report, the DC Circulator system is proposed to have several routes within the primary study area and surrounding 0.25-mile area (DDOT 2014h). The *DC Circulator Transit Development Plan (TDP) Update* recommends implementation of the Georgetown-Union Station Extension to the National Cathedral and the Dupont-Georgetown-Rosslyn Extension to U Street/Howard University. Both of these changes are recommended for implementation in Phase I of improvements, or fiscal year 2015–2017 (near-term). Depending on the procurement of additional vehicles, the DC Circulator TDP also recommends a new National Cathedral-McPherson Square Metro route that would overlap with a shortened Georgetown-Union Station route. If the necessary vehicles cannot be procured, this new National Cathedral-McPherson Square Metro route would be implemented in Phase II, or fiscal year 2018–2020 (mid-term). These proposed route changes that would operate through the primary study area and 0.25-mile surrounding area are shown with the other Phase I DC Circulator TDP recommended corridors in figure 4-1.



1 **FIGURE 4-1. DC CIRCULATOR PHASE I RECOMMENDED CORRIDOR IMPROVEMENTS**

In addition to the route adjustments, the system evaluation of the DC Circulator system in the TDP identified several opportunities to improve the existing DC Circulator routes (DDOT 2014h). Improvements were identified based on performance data and/or input from stakeholders and the community. These improvements include deploying additional vehicles to meet service commitment, priority treatments along routes to improve reliability (transit signal priority, bus only lanes, queue jumping, re-timing of intersections, etc.), evaluating modifications to routes and stop consolidation, evaluating changes to schedule and span, and considering options to adapt to underutilization. It is likely DDOT would work to implement these improvements as needed along the current routes. For example, an analysis of boardings and alightings shows that service on the Georgetown-Union Station route would benefit from beginning earlier based on demand and ending at midnight.

It is also assumed that there would be continual local bus changes through WMATA's Better Bus Program, a program that covers service and route changes to improve the bus operations for all passengers (WMATA 2016). An example of this type of improvement that could be expected is the recent 30-line changes that became effective in August 2014. Under these changes, improvements included major changes to Route 32 and 36, and the introduction of three new routes (30N, 30S, and 33) (WMATA 2014b). These changes directly impacted routes that served the transit study area.

The no-action alternative does not include additional development (only redevelopment) within the project area; therefore, no or very minimal increase in transit trips from the project area are anticipated in addition to normal annual growth. By 2020, there would be local bus route improvements and background increases in local bus ridership in the transit study area as a result of increased development within the Georgetown area. If the K Street Transit line is implemented, additional transit options in the form of an east-west streetcar line across most of the city will be available. Some riders of this new transit service would be new and other riders would switch from other modes of transportation such as local bus routes. Any increase in future transit riders from the no-action alternative would be spread across multiple bus lines and the K Street Transit line if implemented; therefore, any increase in ridership, although expected to be minimal, would cause marginal impacts. Any impacts that do materialize for buses are likely to be addressed as service providers make regular service and route adjustments to lines to accommodate both changing ridership patterns, traffic conditions, and funding availability (e.g., the DC Circulator TDP adjustments and WMATA's Better Bus Program). Because the K Street Transit line, if implemented, would be new, it would operate to serve current and near future ridership. As a result, capacity issues would not be expected.

4.4 Trucks and Buses

There are no known changes to truck and bus circulation or loading in the project area, the primary study area, or the larger 0.25-mile area surrounding the primary study area. Therefore, the no-action alternative conditions for trucks and buses is the same as the existing conditions. With no future development proposed within the project area and minimal new development that would increase truck traffic since most proposed development projects are redevelopments, there would be very little change in truck or bus volumes other than trucks associated with short durations of development construction.

4.5 Parking

No parking changes are expected within the primary study area under the no-action alternative with the exception of a reduction of street parking if the proposed K Street Transit preferred alternative is implemented. Under Preferred Alternative 1, the K Street Transit streetcar option would remove 75 parking spaces on K Street NW between Wisconsin Avenue NW and 29th Street NW (DDOT 2013a). The decrease in on-street parking would have an adverse impact on parking within the primary study area, but the increase in transit provided by the streetcar would allow previous drivers alternative ways to easily access the area. It should be noted, however, that the current status of the DC Streetcar projects is behind schedule and it is unlikely that the K Street Transit streetcar would be implemented within the primary study area by 2020.

4.6 Traffic

The no-action alternative includes various programmed transportation improvements in the study area, growth in existing traffic volumes through the same horizon year as the action alternatives or 2020, and trips generated by approved and unbuilt development projects. Volumes are then used as an input, along with delay, signal timing, and geometrics, to evaluate traffic operations and queuing at signalized and unsignalized intersections to determine the impacts of traffic growth.

The following section describes the process for analyzing traffic for the no-action alternative and the results of the analysis. Note that the procedures to forecast future traffic volumes throughout the study include rounding; therefore, values may not add up to the precise value indicated.

4.6.1 Background Growth

Background growth was added to the roadway network to account for vehicle trips traveling through the study area during the AM and PM peak hours. These trips are important to include because they account for vehicle volume growth as a result of land use changes outside of the study area. Following DDOT's guidelines and agreed through the DDOT scoping form, AADTs were used to develop background growth rates. The AADT volumes provide a historical reference. DDOT recommends five years of historical data to determine a historical average growth. The latest available DDOT historic average daily vehicle counts were compared from 2009–2013 to provide an average annual growth rate to apply to the study area roadways (DDOT 2009–2013).

The comparison separated roadways into freeways, principal arterials, minor arterials, collectors, and local roadways based on DDOT's assigned functional classification map. All roadways examined in the study area had negative average growth trends. Principal arterials and local roadways had the greatest negative growth exceeding 0.5% per year while minor arterials had a 1.1% increase, and local streets had a 0.0% growth. DDOT agreed for study purposes to apply a 1.1% growth for all minor arterials in the study area.

4.6.2 Planned Developments

Based on the DDOT scoping form (Attachment 1), six planned developments are included as part of the no-action alternative. All developments are located adjacent to or within the study area.

- **3220 Prospect Street NW** would include the addition of 10 parking spaces and would redevelop the existing surface parking lot with 27,600 square feet (SF) of retail space. This project also would include an on-street loading zone due to the project site constraints (Wells + Associates 2015). The site is located on Prospect Street NW between Wisconsin Avenue and Potomac Street NW.
- **2715 Pennsylvania Avenue NW** would include redevelopment of an existing gas station into 43,395 SF of luxury residential units. The site is located at the corner of Pennsylvania Avenue NW, M Street NW, and 28th Street NW. According to data supplied by DDOT, this project would generate net negative trips because the previous use generated more (Rodgers 2015a).
- **John F. Kennedy Center for the Performing Arts Expansion** would expand the existing building by providing an additional 60,000 SF of space for performing art purposes, including classrooms, rehearsal rooms, and event spaces. The additional space would provide a proper place for existing users to warm up and prepare for concerts or shows. According to John F. Kennedy Center for the Performing Arts Expansion Project Traffic Impact Study, this project would not generate additional trips because there would be no increase in employees to the site; therefore, this planned development was not included in the no-action alternative analysis (Stantec 2013).
- **Old Lantham Hotel** would involve redeveloping this former hotel into 150 apartment units and 12,000 SF of retail space. The site is located on M Street NW between Thomas Jefferson and 30th Streets NW. According to Transportation Study and Transportation Demand Management

Plan for 3000 M Street NW, this project would generate net negative trips because the previous use generated more (Nelson Nygaard 2014).

- **Water Street Residential Development** would include redeveloping a building at the intersection of Water and 34th Streets NW into a 38-unit condominium building (Rodgers 2015b).
- **Watergate Hotel Renovation** would increase the number of rooms from 251 to 348. The hotel would add a drinking place and specialty restaurant, but would continue to occupy 265,000 total SF (Cooper 2014). The hotel is located along Virginia Avenue between 25th and 27th Streets NW.

4.6.3 Background Roadway Improvements

DDOT has plans for four roadway or transit improvements in the secondary (vehicular) study area in the future (MWCOG 2015). These include the following:

- **Rehabilitation of I-66 Ramp to Whitehurst Freeway over Potomac Parkway and Rock Creek** would rehabilitate the existing bridge span over the ramp between the Potomac Freeway and Whitehurst Freeway. Based on the description, there would be no changes to the roadway network affecting the study area.
- **Union Station to Georgetown Premium Transit (K Street Transit)** would implement transit along K Street NW and would require modifications to the existing lane geometry to accommodate a light rail streetcar traveling with traffic. Based on the description, there would be no changes to the roadway network affecting the study area and the project would offer new transit options for non-vehicular study area trips. See more detail of the preferred alternative in Section 2.2.1.5.
- **Rehabilitation of Ramp from Whitehurst Freeway to Potomac Freeway** would rehabilitate the concrete structure that crosses 27$_{th}$ Street NW. Based on the description, there would be no changes to the roadway network affecting the study area.
- **Replacement of 31st Street NW Bridge over C&O Canal** would remove and replace the deck, repair the structural steel, and substructure repairs. The project also would include lighting, signage, drainage, and safety feature upgrades. Based on the description, there would be no changes to the roadway network affected the study area.

4.6.4 No-Action Alternative Trip Generation

The development of the trip generation relied on existing studies if available and the Institute of Transportation Engineers (ITE) 9th edition of the *Trip Generation Manual* (ITE 2012). Vehicle trips published by existing transportation studies were used when available. If no report existed or a report lacked clearly defined vehicle trips, the ITE *Trip Generation Manual* was used. In these cases, the National Household Travel Survey average vehicle occupancy was applied to the ITE trip rates to convert the trips from suburban vehicle trips to person trips. According to the latest survey published in 2009, the national average vehicle occupancy is 1.13 for work-related trips and 1.67 for other trips purposes (i.e., work-related business trips for hotels) (FHWA 2011). A total of 626 trips are forecasted during the AM peak hour and 720 trips during the PM peak hour, as shown in table 4-2.

4.6.5 No-Action Alternative Modal Split

The modal splits were developed by using the modal splits provided in existing transportation reports if available. Other sources were also referenced, including the WMATA 2005 Ridership Survey for the Watergate Hotel and a blend of the American Community Survey published by the Census Bureau and WMATA survey for residential developments (GSA 2013; U.S. Census Bureau 2010-2014; WMATA 2005). In the case of the 3220 Prospect Street development it was assumed that all trips would be vehicle

trips and the additional 10 parking spaces would turn over twice and hour. Table 4-2 contains the trip generation summary with modal splits for the planned development projects included in the no-action alternative.

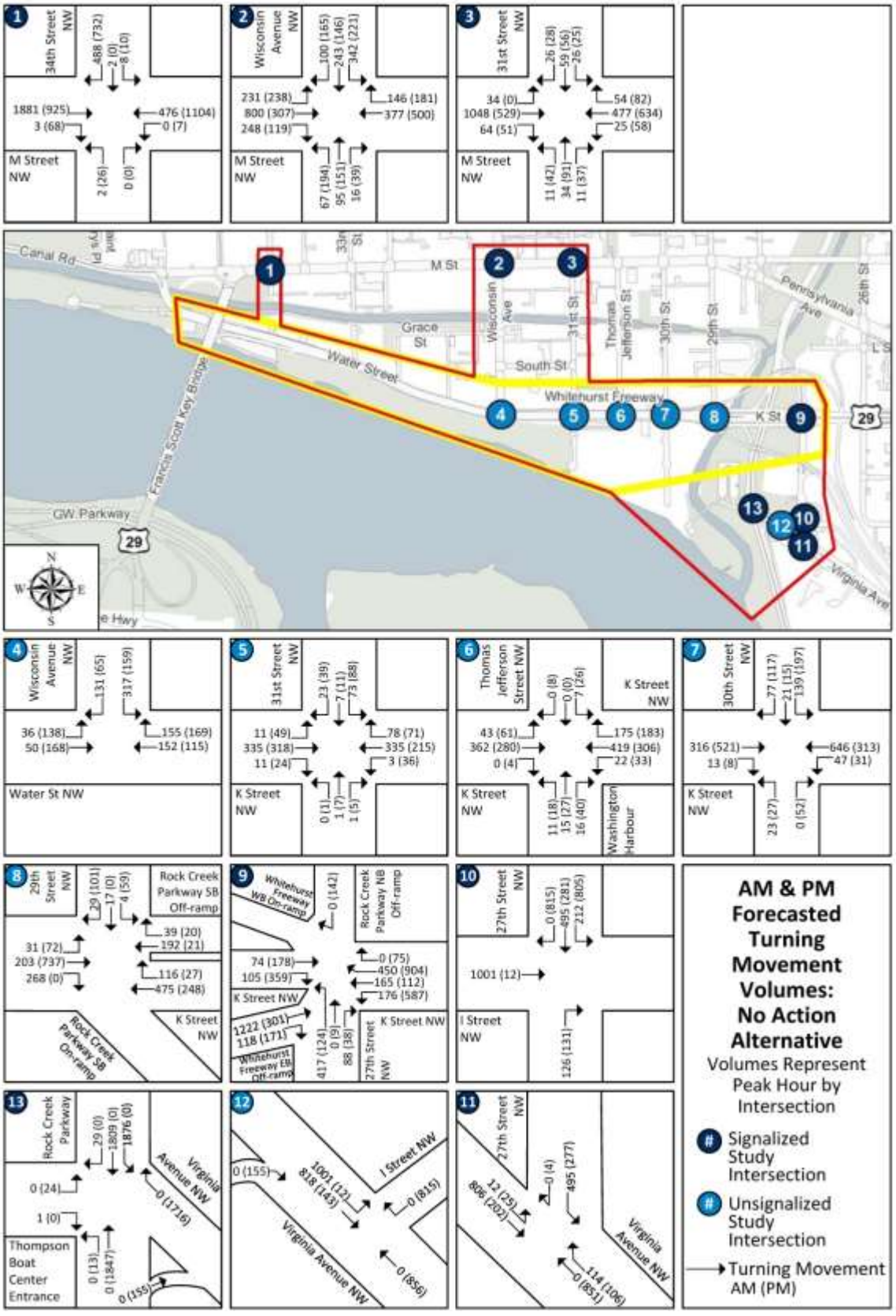
TABLE 4-2. SUMMARY OF NO-ACTION ALTERNATIVE TRIP GENERATION

Project	Units/Size/ Credits	AM PEAK HOUR TRIPS			PM PEAK HOUR TRIPS		
		IN	OUT	TOTAL	IN	OUT	TOTAL
3220 Prospect Street							
New parking spaces	10 new spaces	20	20	40	20	20	40
Alternative Travel Mode Reduction	0% Transit Credit	0	0	0	0	0	0
Net Vehicle Trips		20	20	40	20	20	40
2715 Pennsylvania Avenue							
Residential	43,395 SF	*No new trips anticipated*					
Kennedy Center							
New Rehersal Building	60,000 SF	*No new trips anticipated*					
Old Lantham Hotel							
Multipurpose space	9,100 SF	*No new trips anticipated*					
Water Street Development (ITE - 230 adjusted to person trips using 1.13 AVO)							
Residential	38 units	0	0	0	1	3	4
Alternative Travel Mode Reduction	59.9% Transit Credit	7	0	7	0	7	7
Total Vehicle Trips		7	0	7	1	10	11
Watergate Hotel Renovation (ITE - 310 adjusted to person trips using 1.67 AVO)							
Hotel	348 Rooms	182	127	309	178	171	349
Alternative Travel Mode Reduction	39% Transit Credit	-71	-50	-121	-69	-67	-136
Net Vehicle Trips		111	77	188	109	104	213

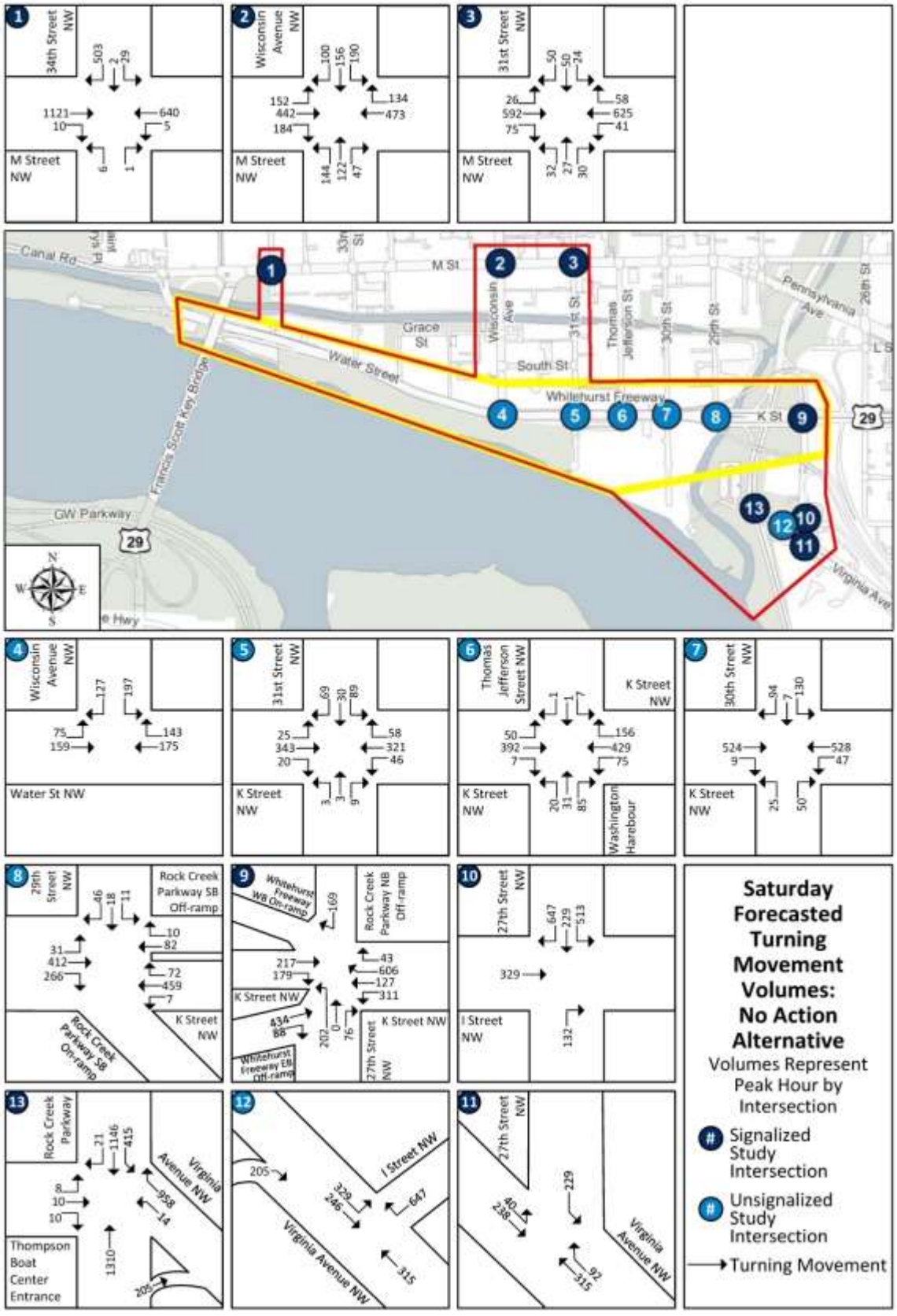
4.6.6 NO-ACTION ALTERNATIVE TRIP DISTRIBUTION

The trip distributions for each planned development followed the patterns provided in existing transportation reports or relied on Google Maps to develop the best route between the project area and study area bounds. In cases where planned developments were located outside of the study area, the routes crossing through the study area were included in the no-action alternative analysis. Attachment 3 contains the trips generated by each planned development distributed through the study area network.

Figure 4-2 shows the future no-action alternative AM and PM weekday peak hour turning movement volumes, and figure 4-3 shows the future no-action alternative Saturday peak hour turning movement volumes.



1 **FIGURE 4-2. NO-ACTION ALTERNATIVE AM AND PM PEAK HOUR TURNING MOVEMENT VOLUMES**



1 **FIGURE 4-3. NO-ACTION ALTERNATIVE SATURDAY PEAK HOUR TURNING MOVEMENT VOLUMES**

4.6.7 NO-ACTION ALTERNATIVE OPERATIONS ANALYSIS

The results of the no-action alternative operations analysis for both signalized and unsignalized intersections are discussed in this section. The average LOS for the various approaches to the intersection and the overall intersection LOS grades for the no-action alternative are depicted in figures 4-4 and 4-5 for weekday AM and PM peak hours, respectively, and figure 4-6 for the Saturday peak hour at the end of this section. Table 4-3 shows the results of the LOS capacity analysis and the intersection vehicle projected delay under the no-action alternative during all peak hours (weekday AM and PM peak hours and Saturday peak hour).

4.6.7.1 Signalized Intersection Operations Analysis

Based on the signalized intersection analysis, more than half of the study intersections operate at acceptable conditions during the peak hours analyzed (weekday AM and PM peak hours, Saturday peak hour). However, the following three signalized intersections operate at overall unacceptable conditions under the no-action alternative for the time periods noted:

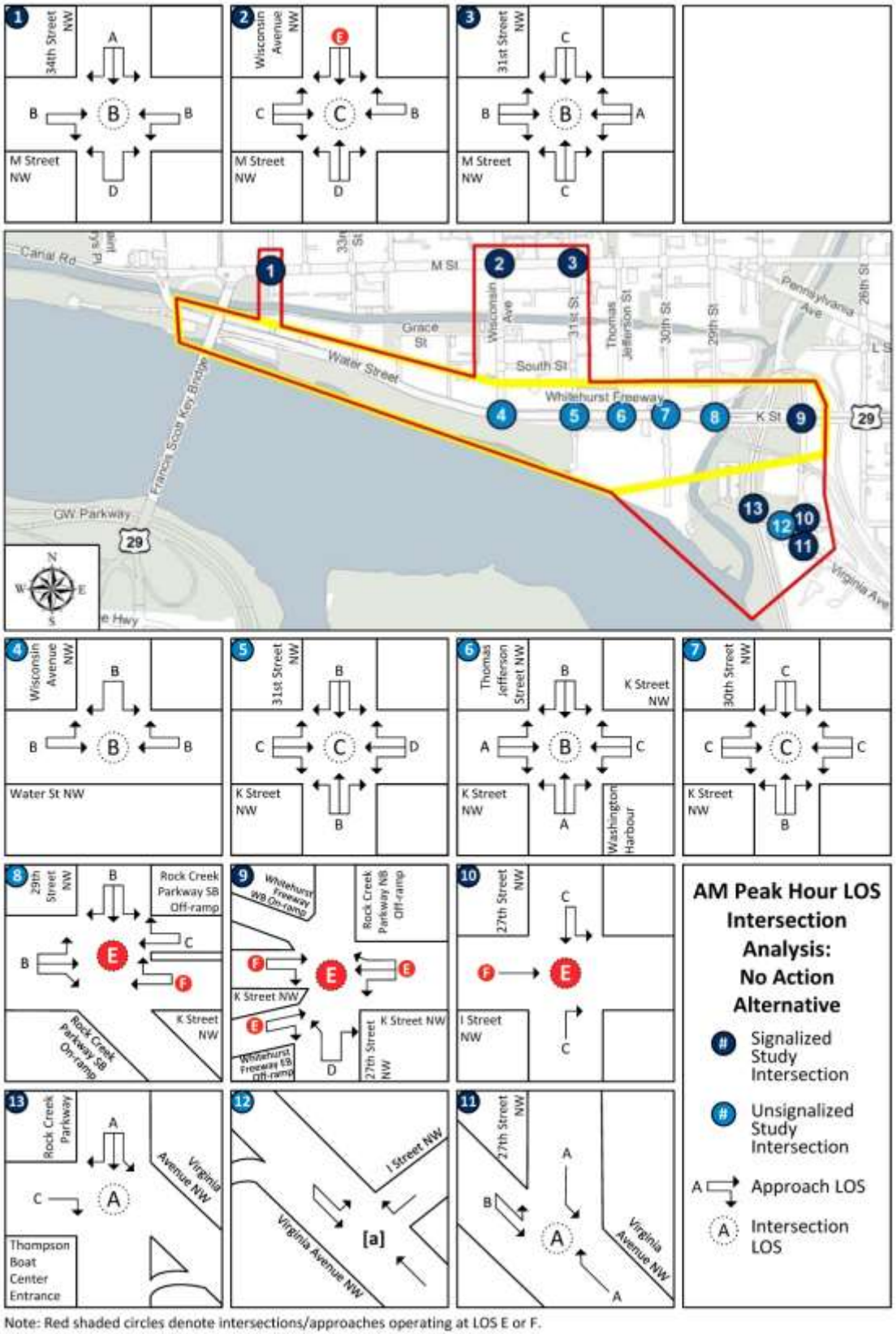
- K Street NW/Whitehurst Freeway NW eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during the weekday AM and PM peak hours and Saturday peak hour
- I Street NW and 27th Street NW (Intersection #10) during the weekday AM peak hour
- Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the Saturday peak hour

The following individual signalized intersection approaches operate under unacceptable conditions during the noted peak hour:

- Southbound at the intersection of M Street NW and Wisconsin Avenue NW (Intersection #2) during the weekday AM peak hour
- Southbound at the intersection of M Street NW and 31st Street NW (Intersection #3) during the Saturday peak hour
- Eastbound (K Street NW) at the intersection of K Street NW/Whitehurst Freeway eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during all peak hours (weekday AM and PM peak hours and Saturday peak hour), eastbound (Whitehurst Freeway eastbound off-ramp) at the same intersection during the weekday AM And PM peak hours, and westbound at the same intersection during the weekday AM peak hour
- Eastbound at the intersection of I Street NW and 27th Street NW (Intersection #10) during the AM peak hour
- Eastbound, westbound, and southbound at the intersection of Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the Saturday peak hour

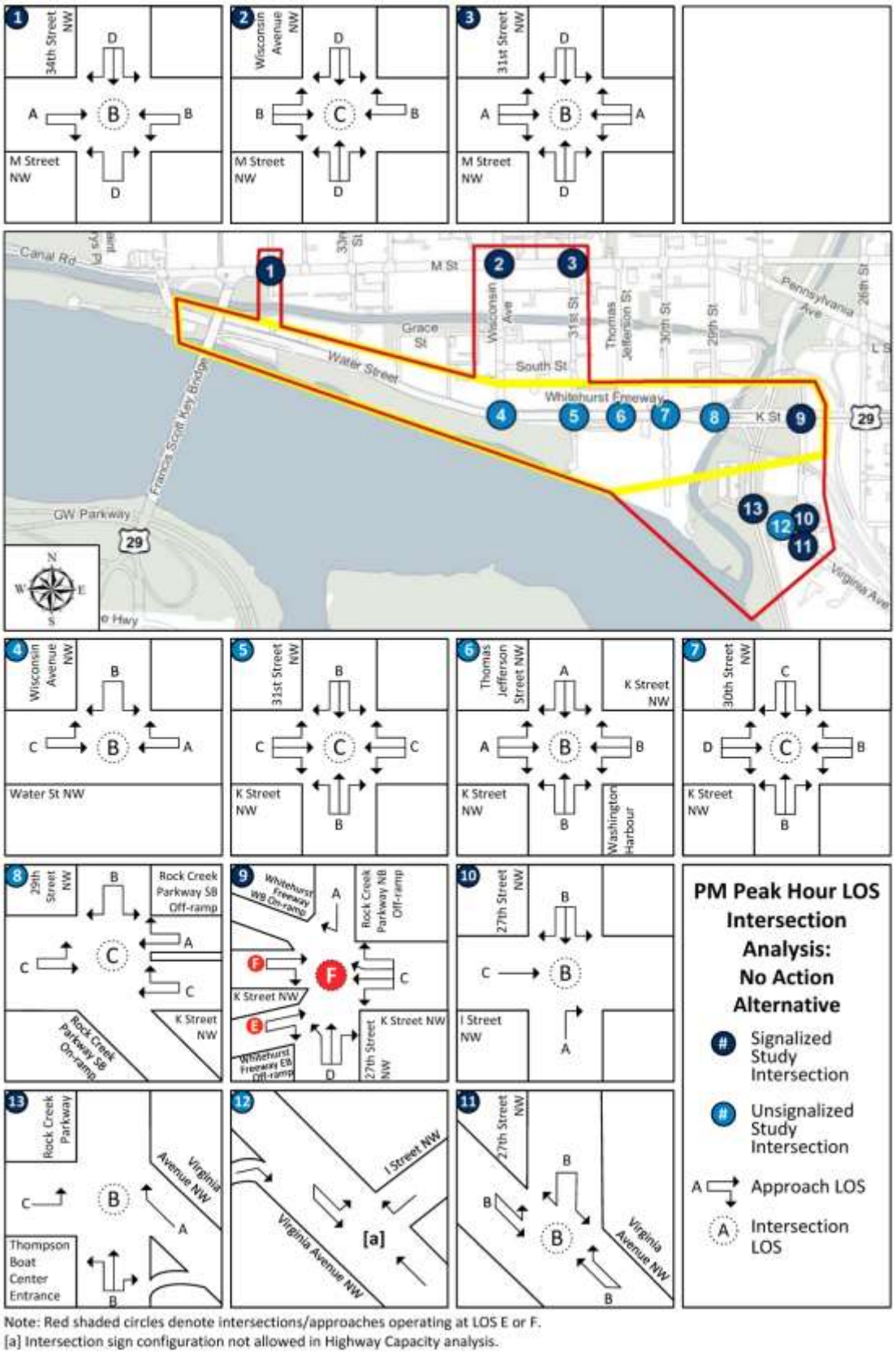
4.6.7.2 Unsignalized Intersection Operations Analysis

Based on the unsignalized intersection analysis, the intersection of K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) would operate at overall unacceptable conditions during the weekday AM peak hour. Additionally, the westbound approach of the same intersection would operate at unacceptable conditions during the weekday AM peak hour and Saturday peak hour. The remaining unsignalized intersections would operate at overall acceptable levels of service under the no-action alternative.

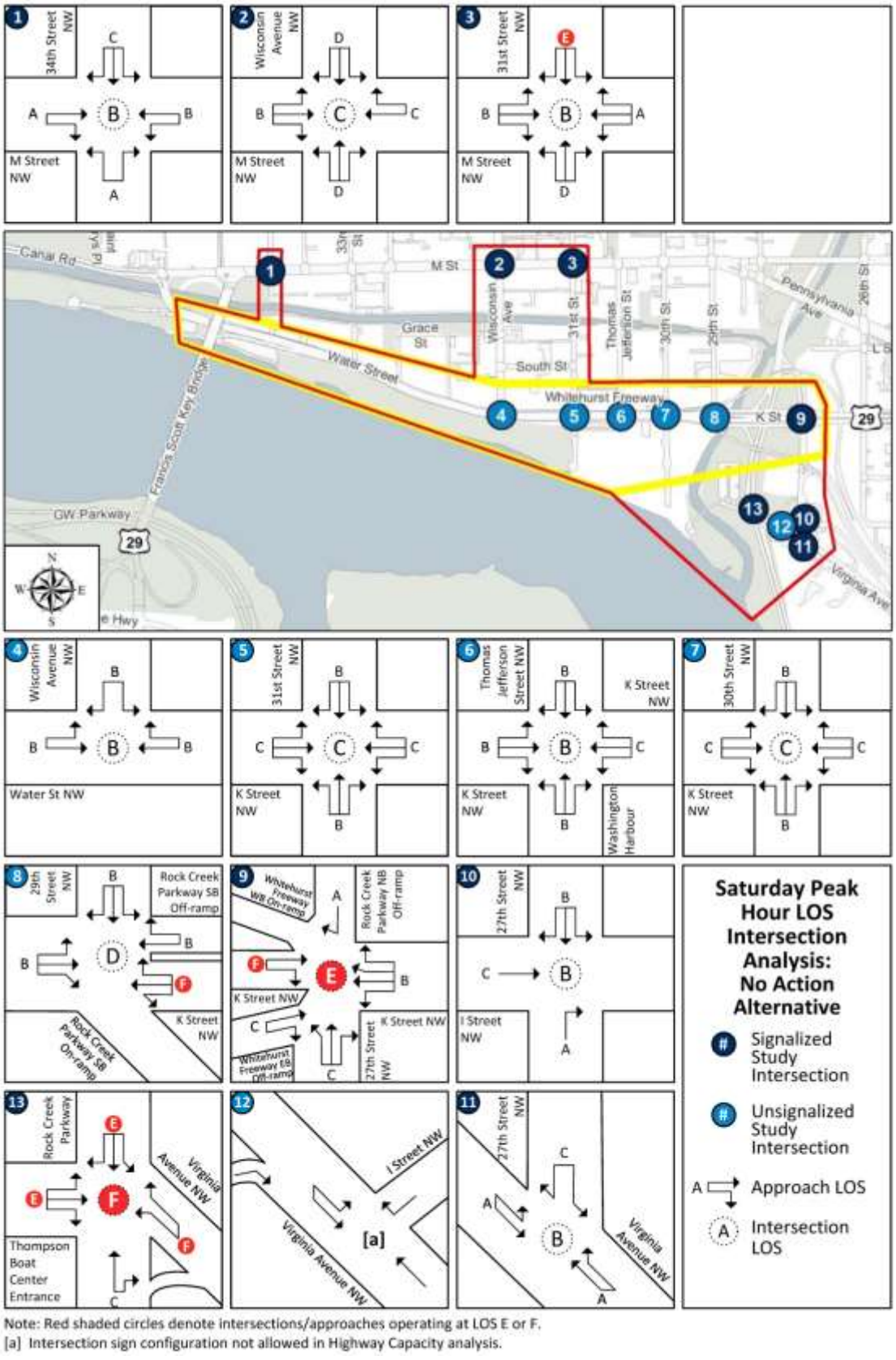


Note: Red shaded circles denote intersections/approaches operating at LOS E or F.
[a] Intersection sign configuration not allowed in Highway Capacity analysis.

1 **FIGURE 4-4. NO-ACTION ALTERNATIVE INTERSECTION LEVEL OF SERVICE FOR WEEKDAY AM PEAK HOUR**



1 **FIGURE 4-5. NO-ACTION ALTERNATIVE INTERSECTION LEVEL OF SERVICE FOR WEEKDAY PM PEAK HOUR**



Note: Red shaded circles denote intersections/approaches operating at LOS E or F.
[a] Intersection sign configuration not allowed in Highway Capacity analysis.

1 **FIGURE 4-6. NO-ACTION ALTERNATIVE INTERSECTION LEVEL OF SERVICE FOR SATURDAY PEAK HOUR**

TABLE 4-3. NO-ACTION ALTERNATIVE ALL PEAK HOUR OPERATIONS ANALYSIS

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
1	**M Street NW & 34th Street NW (Signalized)**							
	EB (M St NW)	TR	11.2	B	6.4	A	6.9	A
	EB Overall (M St NW)		**11.2**	**B**	**6.4**	**A**	**6.9**	**A**
	WB (M St NW)	LT	15.6	B	16.2	B	10.5	B
	WB Overall (M St NW)		**15.6**	**B**	**16.2**	**B**	**10.5**	**B**
	NB (34th St NW)	LTR	47.0	D	43.2	D	0.1	A
	NB Overall (34th St NW)		**47.0**	**D**	**43.2**	**D**	**0.1**	**A**
	SB (34th St NW)	LT	47.7	D	42.5	D	45.5	D
	SB (34th St NW)	R	4.8	A	36.0	D	33.5	C
	SB Overall (34th St NW)		**5.6**	**A**	**36.1**	**D**	**34.2**	**C**
	Overall		**11.0**	**B**	**18.2**	**B**	**14.2**	**B**
2	**M Street NW & Wisconsin Avenue NW (Signalized)**							
	EB (M St NW)	LTR	24.5	C	14.0	B	19.3	B
	EB Overall (M St NW)		**24.5**	**C**	**14.0**	**B**	**19.3**	**B**
	WB (M St NW)	T	22.5	C	23.1	C	34.1	C
	WB (M St NW)	R	2.4	A	8.7	A	5.9	A
	WB Overall (M St NW)		**16.9**	**B**	**19.3**	**B**	**27.9**	**C**
	NB (Wisconsin Ave NW)	L	51.7	D	57.1	E	52.1	D
	NB (Wisconsin Ave NW)	LTR	49.5	D	53.1	D	50.4	D
	NB Overall (Wisconsin Ave NW)		**50.2**	**D**	**54.4**	**D**	**51.0**	**D**
	SB (Wisconsin Ave NW)	L	67.0	E	73.7	E	49.4	D
	SB (Wisconsin Ave NW)	LTR	55.3	E	35.0	D	39.5	D
	SB Overall (Virginia Ave NW)		**59.2**	**E**	**48.2**	**D**	**42.8**	**D**
	Overall		**33.7**	**C**	**30.5**	**C**	**31.2**	**C**
3	**M Street NW & 31st Street NW (Signalized)**							
	EB (M St NW)	LTR	11.4	B	-	-	-	-
	EB (M St NW)	TR	-	-	6.7	A	-	-
	EB (M St NW)	LT	-	-	-	-	6.5	A
	EB (M St NW)	R	-	-	-	-	39.1	D
	EB Overall (M St NW)		**11.4**	**B**	**6.7**	**A**	**10.0**	**B**
	WB (M St NW)	LTR	9.6	A	8.5	A	6.3	A
	WB Overall (M St NW)		**9.6**	**A**	**8.5**	**A**	**6.3**	**A**
	NB (31st St NW)	LTR	29.1	C	42.3	D	53.4	D
	NB Overall (31st St NW)		**29.1**	**C**	**42.3**	**D**	**53.4**	**D**
	SB (31st St NW)	LTR	32.9	C	35.5	D	59.9	E
	SB Overall (31st St NW)		**32.9**	**C**	**35.5**	**D**	**59.9**	**E**
	Overall		**12.6**	**B**	**13.2**	**B**	**14.5**	**B**

1

TABLE 4-3. NO-ACTION ALTERNATIVE ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**							
	EB (Water St NW)	LT	10.5	B	15.2	C	13.1	B
	EB Overall (Water St NW)		**10.5**	**B**	**15.2**	**C**	**13.1**	**B**
	WB (K St NW)	T	11.1	B	10.0	A	11.4	B
	WB (K St NW)	R	9.9	A	9.6	A	9.5	A
	WB Overall (K St)		**10.5**	**B**	**9.8**	**A**	**10.5**	**B**
	SB (Wisconsin Ave NW)	L	17.5	C	12.9	B	13.7	B
	SB (Wisconsin Ave NW)	R	9.0	A	8.9	A	9.6	A
	SB Overall (Wisconsin Ave NW)		**15.0**	**B**	**11.7**	**B**	**12.1**	**B**
	Overall		**12.9**	**B**	**12.4**	**B**	**11.8**	**B**
5	**K Street NW & 31st Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.6	A	10.2	B	10.0	A
	EB (K St NW)	T	20.0	C	19.4	C	19.2	C
	EB (K St NW)	R	8.3	A	8.5	A	8.6	A
	EB Overall (K St NW)		**19.3**	**C**	**17.6**	**C**	**18.1**	**C**
	WB (K St NW)	L	9.3	A	10.2	B	10.3	B
	WB (K St NW)	TR	25.8	D	16.9	C	20.7	C
	WB Overall (K St NW)		**25.7**	**D**	**16.2**	**C**	**19.6**	**C**
	NB (31st St NW)	LTR	11.8	B	10.3	B	10.4	B
	NB Overall (31st St NW)		**11.8**	**B**	**10.3**	**B**	**10.4**	**B**
	SB (31st St NW)	LT	12.4	B	12.7	B	12.8	B
	SB (31st St NW)	R	9.6	A	9.7	A	10.1	B
	SB Overall (31st St NW)		**11.8**	**B**	**11.9**	**B**	**11.8**	**B**
	Overall		**21.4**	**C**	**16.1**	**C**	**17.4**	**C**
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.1	A	9.4	A	9.8	A
	EB (K St NW)	T	10.6	B	10.5	B	13.4	B
	EB (K St NW)	TR	7.4	A	9.2	A	10.4	B
	EB Overall (K St NW)		**9.0**	**A**	**9.9**	**A**	**12.1**	**B**
	WB (K St NW)	L	8.6	A	8.9	A	9.8	A
	WB (K St NW)	T	18.7	A	12.6	A	21.2	A
	WB (K St NW)	R	8.6	A	8.8	A	9.1	A
	WB Overall (K St NW)		**15.5**	**C**	**11.0**	**B**	**17.0**	**C**
	NB (Washington Harbour)	LTR	10.0	A	10.1	B	11.8	B
	NB Overall (Washington Harbour)		**10.0**	**A**	**10.1**	**B**	**11.8**	**B**
	SB (Thomas Jefferson St NW)	LTR	10.2	B	10.0	A	10.6	B
	SB Overall (Thomas Jefferson St NW)		**10.2**	**B**	**10.0**	**A**	**10.6**	**B**
	Overall		**12.8**	**B**	**10.5**	**B**	**14.6**	**B**

TABLE 4-3. NO-ACTION ALTERNATIVE ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
7	**K Street NW & 30th Street NW (AWSC) [a]**							
	EB (K St NW)	T	20.5	C	30.7	D	30.1	D
	EB (K St NW)	TR	14.1	B	15.0	B	15.0	B
	EB Overall (K St NW)		**18.2**	**C**	**25.3**	**D**	**24.9**	**C**
	WB (K St NW)	L	11.5	B	11.9	B	11.8	B
	WB (K St NW)	T	32.4	D	15.3	C	20.1	C
	WB (K St NW)	T	16.1	C	11.4	B	13.1	B
	WB Overall (K St NW)		**23.4**	**C**	**13.2**	**B**	**16.2**	**C**
	NB (30th St NW)	LTR	13.7	B	13.4	B	13.5	B
	NB Overall (30th St NW)		**13.7**	**B**	**13.4**	**B**	**13.5**	**B**
	SB (30th St NW)	LT	19.2	C	20.3	C	16.4	C
	SB (30th St NW)	R	12.2	B	12.4	B	12.5	B
	SB Overall (30th St NW)		**16.9**	**C**	**17.5**	**C**	**14.8**	**B**
	Overall		**20.7**	**C**	**19.3**	**C**	**19.1**	**C**
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**							
	EB (K St NW)	L	11.0	B	10.5	B	10.6	B
	EB (K St NW)	T	14.5	B	20.9	C	18.4	C
	EB (K St NW)	TR	9.9	A	11.4	B	10.7	B
	EB Overall (K St NW)		**12.1**	**B**	**15.6**	**C**	**14.4**	**B**
	WB (K St NW)	LTR	66.1	F	17.8	C	66.2	F
	WB Overall (K St NW)		**66.1**	**F**	**17.8**	**C**	**66.2**	**F**
	WB (Rock Creek Pkwy SB Off-ramp)	TR	17.2	C	10.0	A	12.3	B
	WB Overall (Rock Creek Pkwy SB Off-ramp)		**17.2**	**C**	**10.0**	**A**	**12.3**	**B**
	SB (29th St NW)	LTR	11.6	B	12.9	B	11.5	B
	SB Overall (29th Street NW)		**11.6**	**B**	**12.9**	**B**	**11.5**	**B**
	Overall		**36.2**	**E**	**15.6**	**C**	**33.9**	**D**
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**							
	EB (K St NW)	TR	295.1	F	334.5	F	247.2	F
	EB Overall (K St NW)		**295.1**	**F**	**334.5**	**F**	**247.2**	**F**
	EB (Whitehurst Fwy EB Off-ramp)	TR	66.7	E	58.7	E	24.3	C
	EB Overall (Whitehurst Fwy EB Off-ramp)		**66.7**	**E**	**58.7**	**E**	**24.3**	**C**
	WB (K St NW)	L	243.8	F	56.9	E	52.8	D
	WB (K St NW)	T	6.1	A	2.4	A	3.4	A
	WB (K St NW)	R	6.7	A	3.9	A	4.2	A
	WB Overall (K St NW)		**59.3**	**E**	**22.3**	**C**	**18.0**	**B**
	NB (27th St NW)	L	51.0	D	54.7	D	47.1	D
	NB (27th St NW)	R	1.1	A	-	-	-	-
	NB (27th St NW)	TR	-	-	24.3	C	0.5	A
	NB Overall (27th St NW)		**42.3**	**D**	**46.4**	**D**	**34.3**	**C**
	SB (Rock Creek Pkwy NB Off-ramp)	R	-	-	0.1	A	0.1	A
	SB Overall (Rock Creek Pkwy NB Off-ramp)		**-**	**-**	**0.1**	**A**	**0.1**	**A**
	Overall		**74.8**	**E**	**84.2**	**F**	**57.0**	**E**

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TABLE 4-3. NO-ACTION ALTERNATIVE ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
10	**I Street NW & 27th Street NW (Signalized)**							
	EB (I St NW)	T	115.7	F	24.0	C	25.3	C
	EB Overall (I St NW)		**115.7**	**F**	**24.0**	**C**	**25.3**	**C**
	NB (27th St NW)	R	21.1	C	1.2	A	1.6	A
	NB Overall (27th St NW)		**21.1**	**C**	**1.2**	**A**	**1.6**	**A**
	SB (27th St NW)	L	20.7	C	24.4	C	15.3	B
	SB (27th St NW)	T	31.5	C	-	-	-	-
	SB (27th St NW)	TR	-	-	15.9	B	15.8	B
	SB (27th St NW)	R	-	-	6.2	A	7.3	A
	SB Overall (27th St NW)		**28.3**	**C**	**17.4**	**B**	**13.6**	**B**
	Overall		**75.5**	**E**	**16.4**	**B**	**14.9**	**B**
11	**Virginia Avenue NW & 27th Street NW (Signalized)**							
	EB (Virginia Ave NW)	LT	13.3	B	12.3	B	7.6	A
	EB Overall (Virginia Ave NW)		**13.3**	**B**	**12.3**	**B**	**7.6**	**A**
	WB (Virginia Ave NW)	T	-	-	16.7	B	7.9	A
	WB (Virginia Ave NW)	R	0.2	A	7.6	A	3.2	A
	WB Overall (Virginia Ave NW)		**0.2**	**A**	**15.7**	**B**	**6.9**	**A**
	SB (27th St NW)	L	4.9	A	-	-	23.3	C
	SB (27th St NW)	LR	-	-	15.2	B	-	-
	SB Overall (27th St NW)		**4.9**	**A**	**15.2**	**B**	**23.3**	**C**
	Overall		**9.3**	**A**	**15.1**	**B**	**11.2**	**B**
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized)** [b]							
	EB (Virginia Avenue NW)	L	-	-	-	-	-	-
	EB (Virginia Avenue NW)	T	-	-	-	-	-	-
	EB Overall (F St NW)		-	-	-	-	-	-
	Overall		-	-	-	-	-	-

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TABLE 4-3. NO-ACTION ALTERNATIVE ALL PEAK HOUR OPERATIONS ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour		PM Peak Hour		Saturday Peak Hour	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**							
	EB (Thompson Boat Center)	R	22.0	C	-	-	-	-
	EB (Thompson Boat Center)	L	-	-	22.8	C	-	-
	EB (Thompson Boat Center)	LTR	-	-	-	-	57.1	E
	EB Overall (Thompson Boat Center)		**22.0**	**C**	**22.8**	**C**	**57.1**	**E**
	WB (Virginia Ave NW)	TR	-	-	-	-	251.8	F
	WB (Virginia Ave NW)	R	-	-	1.2	A	144.8	F
	WB Overall (Virginia Ave NW)		-	-	**1.2**	**A**	**198.0**	**F**
	NB (Rock Creek Pkwy)	LT	-	-	20.1	C	-	-
	NB (Rock Creek Pkwy)	R	-	-	6.4	A	32.2	C
	NB (Rock Creek Pkwy)	T	-	-	-	-	19.0	B
	NB Overall (Rock Creek Pkwy)		-	-	**19.0**	**B**	**30.4**	**C**
	SB (Rock Creek Pkwy)	L	1.8	A	-	-	-	-
	SB (Rock Creek Pkwy)	T	17.6	B	-	-	-	-
	SB (Rock Creek Pkwy)	LT	-	-	-	-	75.1	E
	SB (Rock Creek Pkwy)	R	1.3	A	-	-	0.0	A
	SB Overall (Rock Creek Pkwy)		**9.5**	**A**	-	-	**74.1**	**E**
	Overall		**9.5**	**A**	**10.9**	**B**	**87.2**	**F**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

4.6.8 NO-ACTION ALTERNATIVE QUEUING ANALYSIS

The results of the no-action alternative queuing analysis for both signalized and unsignalized intersections are discussed in this section and are presented in table 4-4. This table presents specific details on the 50th and 95th percentile queue length values calculated for the study area intersections (unsignalized intersections only have 95th percentile queue lengths included as explained in Section 3.7.6). Note that the percentile values are expressed in feet and a car occupies about 25 linear feet of roadway, including the space between cars.

4.6.8.1 Signalized Intersection Queuing Analysis

Based on the Synchro™ queuing analysis, queue lengths exceeding the roadway storage capacity would occur at the same signalized intersections as the existing condition (except where noted as a new failure) as follows:

- Southbound at M Street and Wisconsin Avenue NW (Intersection #2) during the weekday AM and PM peak hours
- Eastbound and southbound at M and 31st Streets NW (Intersection #3) during the Saturday peak hour (new southbound failure under the no-action alternative)
- Eastbound and westbound at K Street NW/Whitehurst Freeway NW eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during the weekday AM and PM peak hours and Saturday peak hour
- Eastbound at I and 27th Streets NW (Intersection #10) during the weekday AM peak hour and southbound at the same intersection during the weekday PM peak hour
- Northbound at Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the weekday PM peak hour; and westbound, northbound, and southbound at the same intersection during the Saturday peak hour

The remaining signalized intersections in the study area would have acceptable queue lengths or would experience low levels of queuing.

4.6.8.2 Unsignalized Intersection Queuing Analysis

Based on the analysis, queue lengths exceeding the roadway storage capacity would occur at the same unsignalized intersections as the existing condition (except where noted as a new failure) as follows:

- Westbound at K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) during the weekday AM and Saturday peak hours

The remaining unsignalized intersections in the study area would have acceptable queue lengths or would experience low levels of queuing.

TABLE 4-4. NO-ACTION ALTERNATIVE ALL PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)
1	**M Street NW & 34th Street NW (Signalized)**										
	EB (M St NW)	TR	181	429	518	181	134	168	181	162	198
	WB (M St NW)	LT	437	76	98	437	182	217	437	78	98
	NB (34th St NW)	LTR	66	1	10	66	18	46	66	0	0
	SB (34th St NW)	LT	214	7	24	214	7	23	214	21	52
	SB (34th St NW)	R	214	16	56	214	266	350	214	164	227
2	**M Street NW & Wisconsin Avenue NW (Signalized)**										
	EB (M St NW)	LTR	577	254	304	577	90	116	86	132	168
	WB (M St NW)	T	382	125	170	382	155	204	302	176	232
	WB (M St NW)	R	382	22	35	382	30	86	302	16	54
	NB (Wisconsin Ave NW	L	175	49	98	175	105	179	175	87	152
	NB (Wisconsin Ave NW	LTR	867	50	82	867	106	153	867	88	132
	SB (Wisconsin Ave NW	L	226	202	#349	226	154	#285	226	123	202
	SB (Wisconsin Ave NW	LTR	226	191	#273	226	82	140	226	100	152
3	**M Street NW & 31st Street NW (Signalized)**										
	EB (M St NW)	LTR	382	129	140	-	-	-	-	-	-
	EB (M St NW)	TR	-	-	-	382	81	89	-	-	-
	EB (M St NW)	LT	-	-	-	-	-	-	302	90	109
	EB (M St NW)	R	-	-	-	-	-	-	50	17	m#139
	WB (M St NW)	LTR	198	70	87	198	84	106	198	102	131
	NB (31st St NW)	LTR	878	32	67	878	112	186	878	66	124
	SB (31st St NW)	LTR	216	70	120	216	63	118	216	97	#170
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**										
	EB (Water St NW)	LT	942	-	15	942	-	83	942	-	53
	WB (K St NW)	T	434	-	28	434	-	20	434	-	35
	WB (K St NW)	R	300	-	25	300	-	28	300	-	23
	SB (Wisconsin Ave NW	L	897	-	95	897	-	38	897	-	48
	SB (Wisconsin Ave NW	R	25	-	18	25	-	10	25	-	20
5	**K Street NW & 31st Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	3	100	-	10	100	-	5
	EB (K St NW)	T	387	-	120	387	-	115	387	-	105
	EB (K St NW)	R	25	-	3	25	-	3	25	-	3
	WB (K St NW)	L	100	-	0	100	-	8	100	-	8
	WB (K St NW)	TR	205	-	178	205	-	90	205	-	125
	NB (31st St NW)	LTR	71	-	0	71	-	3	71	-	3
	SB (31st St NW)	LT	878	-	18	878	-	23	878	-	25
	SB (31st St NW)	R	25	-	5	25	-	8	25	-	10

TABLE 4-4. NO-ACTION ALTERNATIVE ALL PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**										
	EB (K St NW)	L	75	-	8	75	-	10	75	-	8
	EB (K St NW)	T	261	-	35	261	-	30	261	-	58
	EB (K St NW)	TR	25	-	20	25	-	13	25	-	23
	WB (K St NW)	L	100	-	3	100	-	5	100	-	13
	WB (K St NW)	T	274	-	140	274	-	63	274	-	148
	WB (K St NW)	R	274	-	25	274	-	23	274	-	23
	NB (Washington H)	LTR	249	-	8	249	-	13	249	-	28
	SB (Thomas J St NW)	LT	139	-	3	139	-	5	139	-	3
7	**K Street NW & 30th Street NW (AWSC) [a]**										
	EB (K St NW)	T	218	-	88	218	-	168	218	-	163
	EB (K St NW)	TR	218	-	33	218	-	48	218	-	48
	WB (K St NW)	L	100	-	10	100	-	8	100	-	10
	WB (K St NW)	T	212	-	185	212	-	43	212	-	90
	WB (K St NW)	T	212	-	100	212	-	30	212	-	58
	NB (30th St NW)	LTR	526	-	8	526	-	18	526	-	18
	SB (30th St NW)	LT	425	-	63	425	-	75	425	-	40
	SB (30th St NW)	R	25	-	18	25	-	25	25	-	20
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	5	100	-	13	100	-	5
	EB (K St NW)	T	268	-	60	292	-	130	292	-	108
	EB (K St NW)	TR	268	-	38	292	-	68	292	-	58
	WB (K St NW)	LTR	220	-	345	244	-	85	244	-	345
	WB (RC Pkwy SB Off-ra	TR	484	-	70	402	-	8	464	-	20
	SB (29th St NW)	LTR	453	-	10	513	-	8	513	-	15
9	**K St. NW/Whitehurst Fwy NW EB Off-ramp & 27th Street NW/Rock Creek Parkway NB Off-ramp (Signalized)**										
	EB (K St NW)	TR	236	~106	#184	236	~295	#406	236	~192	#291
	EB (W Fwy EB Off-ramp	TR	657	~634	#786	657	130	#242	657	117	180
	WB (K St NW)	L	185	~188	#336	185	402	#626	185	200	#340
	WB (K St NW)	T	707	40	63	707	13	23	707	19	33
	WB (K St NW)	R	370	67	90	370	91	118	370	62	85
	NB (27th St NW)	L	170	164	220	170	44	76	170	67	105
	NB (27th St NW)	R	272	0	1	-	-	-	-	-	-
	NB (27th St NW)	TR	-	-	-	272	6	43	272	0	0
	SB (Rock Creek Pkwy N	R	-	-	-	144	0	0	144	0	0

TABLE 4-4. NO-ACTION ALTERNATIVE ALL PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)	Link Distance/ Storage Bay	Queue Length 50th (ft)	Queue Length 95th (ft)
10	**I Street NW & 27th Street NW (Signalized)**										
	EB (I St NW)	T	48	~938	#1190	48	6	20	48	162	243
	NB (27th St NW)	R	55	42	89	55	0	0	55	0	0
	SB (27th St NW)	L	100	82	151	100	237	#512	100	72	200
	SB (27th St NW)	T	228	162	215	-	-	-	-	-	-
	SB (27th St NW)	TR	-	-	-	228	109	171	228	69	128
	SB (27th St NW)	R	-	-	-	228	0	83	228	0	79
11	**Virginia Avenue NW & 27th Street NW (Signalized)**										
	EB (Virginia Ave NW)	LT	105	123	145	105	29	43	105	29	37
	WB (Virginia Ave NW)	T	-	-	-	348	204	257	348	49	62
	WB (Virginia Ave NW)	R	348	0	0	50	21	49	50	0	21
	SB (27th St NW)	L	55	11	14	-	-	-	-	-	-
	SB (27th St NW)	LR	-	-	-	55	40	45	55	49	52
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized)** [b]										
	EB (Virginia Avenue NW	L	-	-	-	-	-	-	-	-	-
	EB (Virginia Avenue NW	T	-	-	-	-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**										
	EB (Thompson Boat Ct	R	113	0	4	-	-	-	-	-	-
	EB (Thompson Boat Ct	L	-	-	-	86	9	27	-	-	-
	EB (Thompson Boat Ct	LTR	-	-	-	-	-	-	88	16	44
	WB (Virginia Ave NW)	TR	-	-	-	-	-	-	133	~460	#668
	WB (Virginia Ave NW)	R	-	-	-	157	0	0	133	~275	#483
	NB (Rock Creek Pkwy)	LT	-	-	-	559	351	#571	-	-	-
	NB (Rock Creek Pkwy)	R	-	-	-	559	27	51	557	397	498
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-	200	~275	#483
	SB (Rock Creek Pkwy)	L	257	0	22	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	T	257	322	440	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	263	~399	#606
	SB (Rock Creek Pkwy)	R	100	0	6	-	-	-	100	0	0

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

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

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5.0 ACTION ALTERNATIVES BY MODE

See note in Chapter 1 (Introduction) about the development of alternatives for the TIA and EA. In the EA, only one blended action alternative was carried forward.

5.1 Description of Alternatives

Three alternatives were considered—the no-action alternative and two action alternatives that address the need for nonmotorized boating facilities within the zone along the Potomac River in Georgetown. The three alternatives include the following:

- No-action alternative (analyzed in Chapter 4)
- Alternative 1: Intense Development (analyzed in Chapter 5)
- Alternative 2: Minimal Development (not analyzed)

5.1.1 ELEMENTS COMMON TO BOTH ACTION ALTERNATIVES

The action alternatives differ primarily in how the project area is treated within the C&O Canal NHP, and therefore consider the same configurations east of the Alexandria Aqueduct outside the C&O Canal NHP. The first option for this area assumes that the privately owned townhouses would remain in private ownership and includes a smaller boathouse and plaza on site D, while the second option considers how the space might be configured should the townhouses become available for inclusion in the project at some point in the future and proposes a larger boathouse on that site with the public plaza shifted to the west where the townhouses are currently.

Both options include construction of a large 60 x 230 foot boathouse east of Key Bridge on site E, the same treatments and configurations for Water Street NW and links between the CCT, the street, and Georgetown Waterfront Park. As noted in table 5-1 below, all boathouses would have a maximum height of 45 feet from the level of the curb. Both options also include drop-off and temporary storage areas for car-top users to leave their boats while they find parking.

The focus in both options is also on the configuration of public spaces in relationship to the proposed new facilities and the street. Access for the townhouses, Potomac Boat Club, and WCC would be maintained, although access for others would be limited through the inclusion of a cul-de-sac with a mountable curb, improved wayfinding, and use of different pavement surfaces through the transition between the aqueduct and the cul-de-sac. Note that the Water Street design as described and depicted in this section is conceptual and can be refined in the future to optimize various elements.

TABLE 5-1. SUMMARY OF ACTION ALTERNATIVES

Feature	Alternative 1	Alternative 2
Site A Facilities	▪ ~2,700 SF storage structure on piles with flow-through walls and removable apron ▪ Sloped shoreline launch (beach entry) ▪ Picnic tables, grills	▪ Asphalt path ▪ Picnic tables, grills
Site B Facilities	▪ Rehabilitation of the WCC ▪ Removal of fenced yard, outdoor storage ▪ Public pedestrian and service access across WCC apron to site A	Same as alternative 1

Feature	Alternative 1	Alternative 2
Site C Facilities	Short Range (pending completion of DC Water plans) ▪ 500 SF rental kiosk on piles with public restroom ▪ Seasonal outdoor boat storage ▪ Access to boat storage beneath Alexandria Aqueduct ▪ Public plaza/deck with trailhead orientation and interpretive exhibits ▪ Public access dock with accessible kayak/canoe launch ▪ Picnic tables and grills ▪ Restricted access driveway for service and emergency vehicles Long Range (2025): ▪ ~10,000 SF boathouse ▪ Ground level uninhabited storage ▪ Two levels above base flood elevation ▪ Maximum height: 45 feet from the level of the curb opposite the middle of the front of the building to the highest point of the roof or parapet ▪ Public access dock and apron adjacent to aqueduct (walk-in) ▪ Trailhead orientation and interpretive exhibits	Same as alternative 1 short range
Alexandria Aqueduct	▪ Boat storage below arch	Same as alternative 1
Site D Facilities	▪ ~3,600 SF boathouse ▪ Ground level uninhabited storage ▪ Two levels above base flood elevation ▪ Maximum height: 45 feet from the level of the curb opposite the middle of the front of the building to the highest point of the roof or parapet ▪ Public access dock and apron	Same as alternative 1
Site E Facilities	▪ ~13,800 SF boathouse ▪ Ground level uninhabited storage ▪ Two levels above base flood elevation ▪ Maximum height: 45 feet from the level of the curb opposite the middle of the front of the building to the highest point of the roof or parapet ▪ Apron with vehicular access from Water Street NW at 34th Street NW	Same as alternative 1

Feature	Alternative 1	Alternative 2
	▪ Public plaza/apron with dock access at west end of boathouse	
Vehicular Access C&O Canal NHP	▪ Authorized vehicles only beyond aqueduct via NPS driveway (10 feet) ▪ Gate at Alexandria Aqueduct	Same as alternative 1
Vehicular Access Water Street	Street section: ▪ 2 travel lanes ▪ 36 metered parallel parking spaces ▪ 60-foot-diameter cul-de-sac ▪ Designated loading zones at 34th Street NW and at plaza/apron east of aqueduct ▪ Traffic calming pavement design similar to Georgetown Waterfront Park materials to minimize conflicts between uses within congested loading zones	Same as alternative 1
Multiuse Trail	▪ The CCT transitions to 10 feet with 2 foot wide shoulders east of Alexandria Aqueduct and continues on south side of Water Street between Whitehurst Freeway columns, connecting to Georgetown Waterfront Park ▪ Shared bike lanes in Water Street NW with transition between trail and cul-de-sac	Same as alternative 1

5.1.2 ALTERNATIVE 1: INTENSE DEVELOPMENT

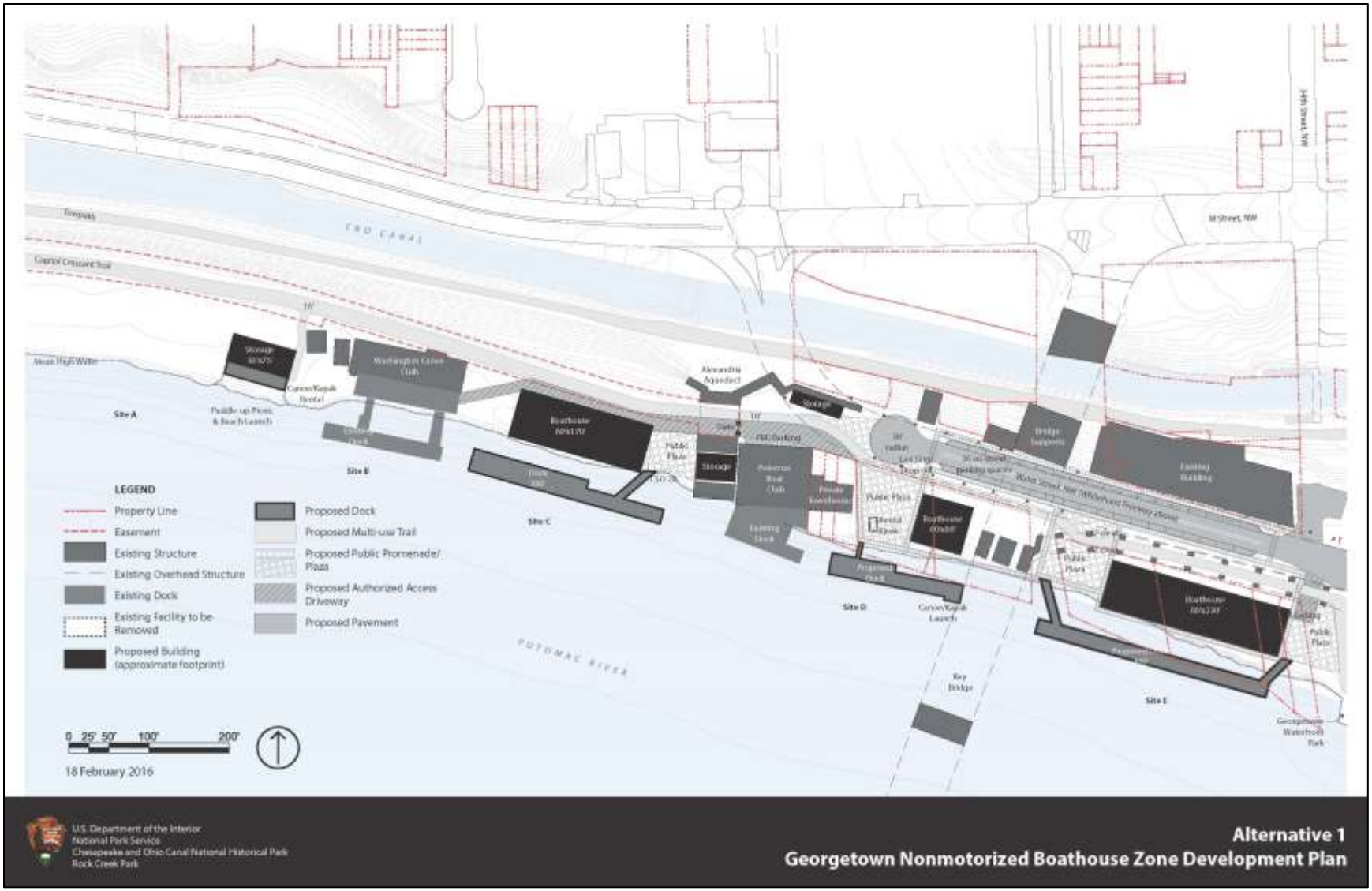
Alternative 1 assumes more intense development west of the Alexandria Aqueduct in the C&O Canal NHP (see table 5-1). Site C would include a public plaza and 60 x 170 foot boathouse with a 300-foot dock. Site A, west of the WCC, would include boat storage and concession areas and a paddle-up beach launch. WCC would remain and would be renovated once studies are complete and funds become available (figure 5-1).

5.1.3 ALTERNATIVE 2: MINIMAL DEVELOPMENT (PREFERRED ALTERNATIVE)

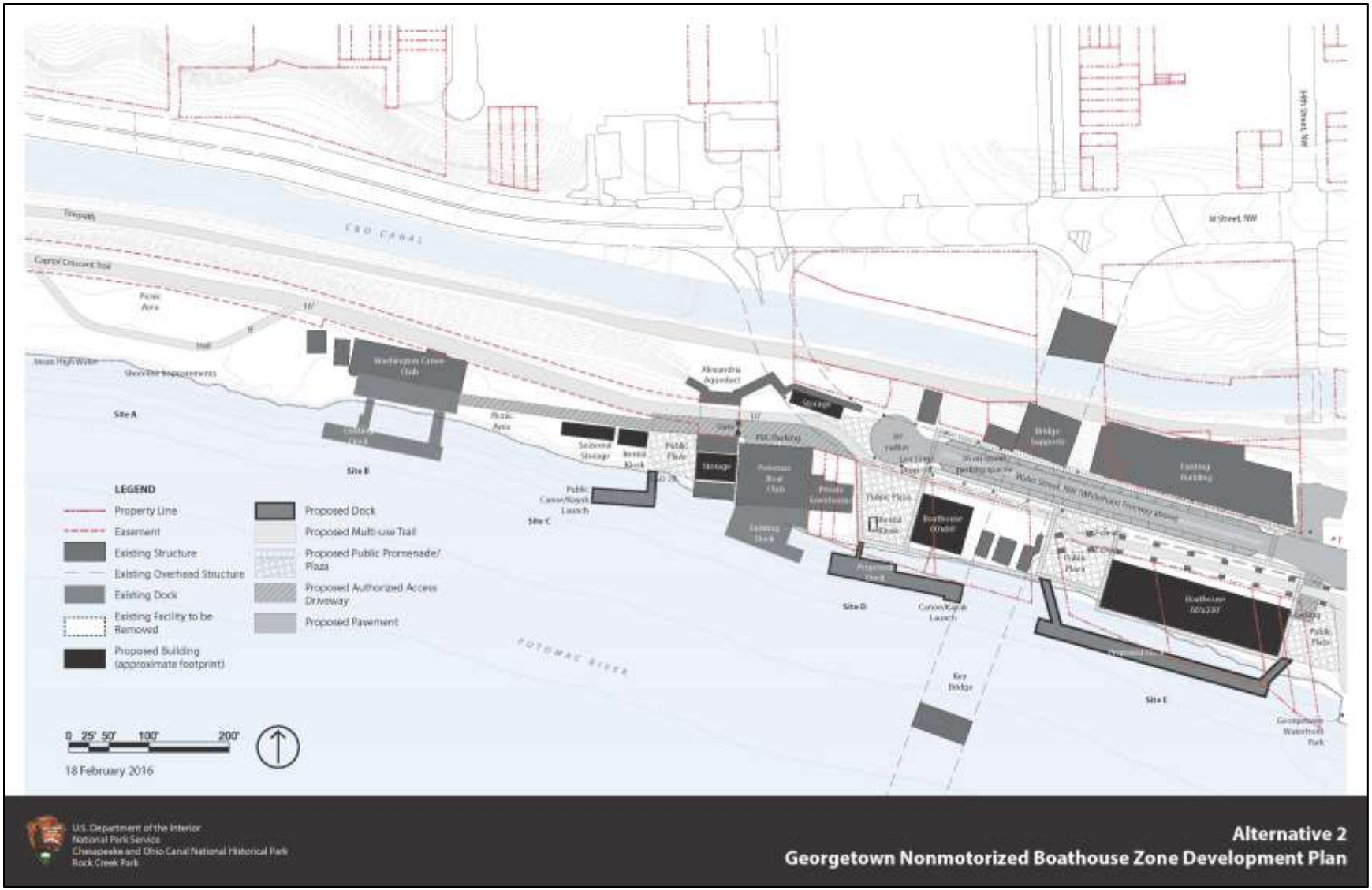
Alternative 2 includes the same development as alternative 1 at sites B, D, and E. Alternative 2 also would include a public plaza adjacent to the aqueduct on site C and room for a concession with a kiosk and seasonal storage, as well as a dock with a kayak launching feature. Site A would include shoreline improvements, a picnic area, and a trail through the site (figure 5-2).

5.1.4 OPTION FOR SITE D FOR BOTH ALTERNATIVES

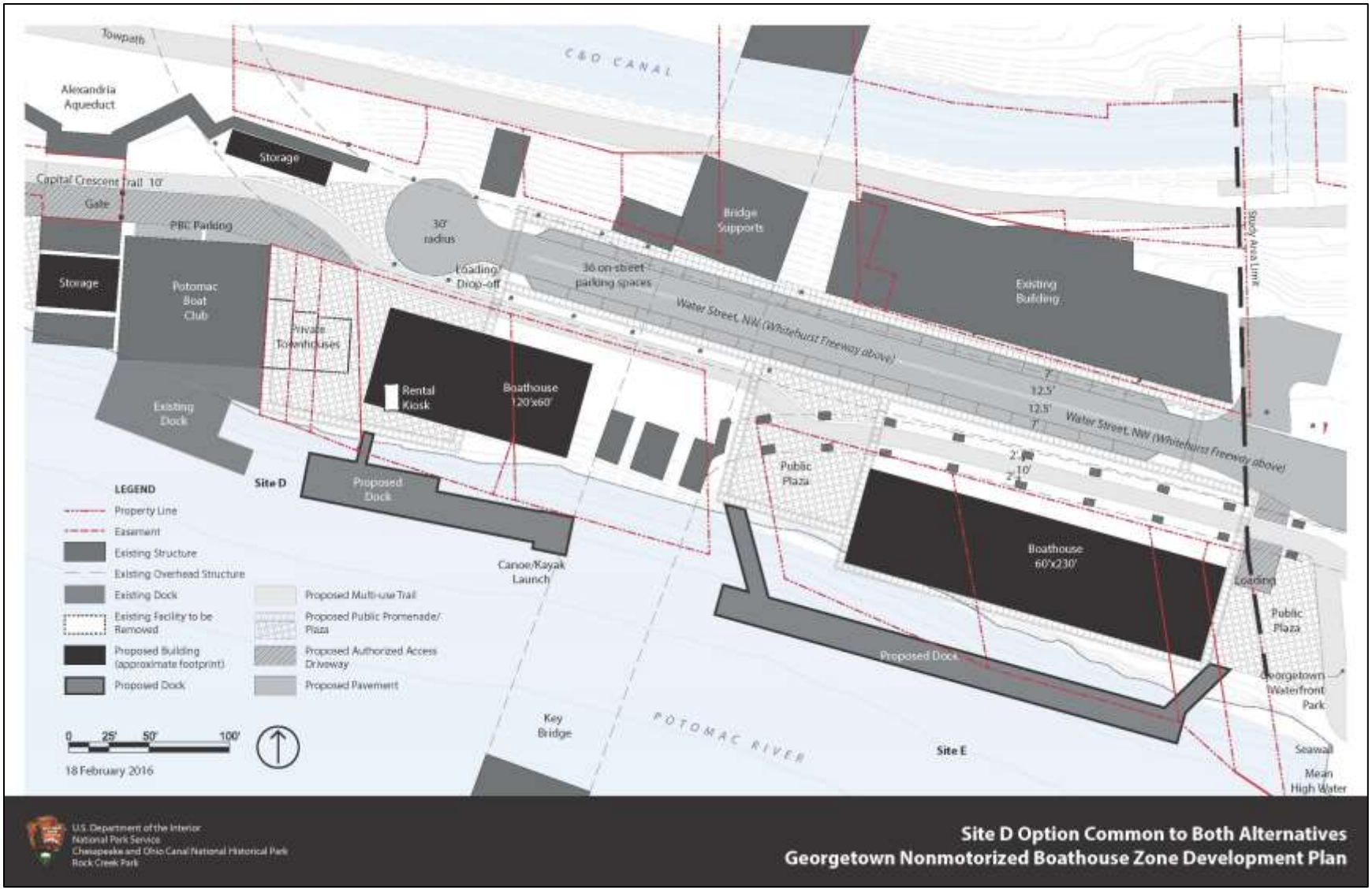
Two different options are being considered for the development at site D. The first option, which is already included in both alternatives, assumes that the privately owned townhouses would remain in private ownership and includes a smaller boathouse and plaza on site D. The second option, henceforth referred to as just "the option," considers how the space might be configured should the townhouses become available for inclusion in the project at some point in the future and proposes a larger boathouse on that site with the public plaza shifted to the west where the townhouses are currently (figure 5-3).



1 **FIGURE 5-1. ALTERNATIVE 1**



1 **FIGURE 5-2. ALTERNATIVE 2**



1 **FIGURE 5-3. OPTION FOR SITE D FOR BOTH ALTERNATIVES**

2

5.2 Alternative 1: Intense Development Scenario (Worst-Case Alternative)

This TIA only examines the worst-case alternative, or alternative 1, with an option for the public plaza, as agreed in the DDOT scoping form agreement (Attachment 1).

5.2.1 PEDESTRIANS

Alternative 1 includes a new separated multiuse trail along the south side of Water Street NW connecting the CCT to the Georgetown Waterfront Park Trail. This CCT extension would transition from 16 feet wide west of the Alexandria Aqueduct to 10 feet east of the aqueduct and continue on the south side of Water Street between the Whitehurst Freeway columns, connecting to Georgetown Waterfront Park. Alternative 1 also includes the addition of multiple public plazas between the site C boathouse and the Alexandria Aqueduct, between the Potomac Boat Club and the site D boathouse, and on both sides of the site E boathouse. These plazas would allow improved pedestrian access to existing docks and additional access to the water via future docks, as well as improve the overall environment for users.

Alternative 1 also includes the extension of the sidewalks on either side of Water Street NW from just east of the Key Bridge overpass to the new cul-de-sac and the upgrade of the authorized access driveway areas to pedestrian priority areas. These additions would significantly reclaim space for pedestrians and support the additional users that would be generated from the proposed development. Trailhead orientation and interpretive exhibits also would be added near the site C facilities to improve the pedestrian experience. Public pedestrian access to site A would be provided across the WCC apron area and additional pedestrian amenities would be provided in the form of picnic tables and grills, public restrooms, a rental kiosk, and seasonal outdoor boat storage.

Alternative 1 would likely draw additional pedestrians to and through the area with the additional capacity of the boathouses, additional recreational features, and the formalized connection between the Georgetown Waterfront Park and the CCT. Users of both area trails and visitors of the boathouses in the study area would now have a dedicated multiuse path, clearly demarcated from vehicles, that improves safety of all users.

In summary, alternative 1 would improve the pedestrian environment within the project area. Any increase in pedestrians would be accommodated with the new multiuse trail extension, additional sidewalks, pedestrian priority areas that also act as authorized vehicular access driveways, and plazas. Pedestrian improvements are not proposed outside of the project area for alternative 1; therefore, pedestrian conditions within the larger pedestrian study area as presented in the no-action alternative analysis outside the project area would not change under alternative 1. Any increase in pedestrians from the project to areas outside of the project area may cause increased congestion at times as a result of sidewalks that have obstructions (Whitehurst Freeway support columns) or may not be the DDOT recommended width of 6 or 10 feet, but the adjacent Georgetown Waterfront Park Trail would allow pedestrians alternate options for travel during those times.

5.2.2 BICYCLES

Bicycle accommodations within the project area would improve with the introduction of the multiuse trail extension between the CCT and Georgetown Waterfront Park under alternative 1. Because cyclists currently share the road with vehicles between these two points, the designated trail for cyclists and pedestrians would improve safety by separating these users from vehicular traffic. However, cyclists would have to share the trail with pedestrians, which at times may mean congestion and slight delays, both of which are typical for urban mixed-use trails. Cyclists would have the option of traveling on Water Street NW in vehicular lanes once they reached the cul-de-sac, offering potential decreases in speed or walking their bicycles if the multiuse trail is crowded.

Alternative 1 likely would draw additional cyclists to and through the area with the additional capacity of the boathouses, additional recreational features, and the formalized connection between the Georgetown

Waterfront Park and the CCT. Alternative 1 also would likely include the provision of bicycle racks to support existing and future users; however, the location of these racks is yet to be determined.

In summary, alternative 1 would improve the bicycle environment within the project area and improve overall safety for cyclists even with an increase in bicyclists. While additional cyclists and pedestrians within the project area may cause congestion at times, cyclists would have the option to share Water Street NW with vehicles as an alternate path. Bicycle improvements are not proposed outside of the project area for alternative 1; therefore, bicycle conditions within the larger bicycle study area would be the same as those presented in the no-action alternative analysis. Any increase in cyclists from alternative 1 to areas outside of the project area may cause increased congestion on trails at times, but the time periods of congestion would be minimal. Additionally, the network of streets within the Georgetown area with relatively low vehicle volumes and travel speeds would offer cyclists alternate options for travel. New facilities proposed by DDOT would provide additional travel options and capacity as they are implemented.

5.2.3 TRANSIT

Alternative 1 would have no physical impacts on transit within the project area or primary study area. There may be a slight increase in transit users as a result of the increased amenities and programming within the project area, but the increase in users cannot be quantified at this time and should not have any adverse impact on transit. The proposed action would increase traffic within the area, so minimal delays may accrue to transit. However, it is assumed bus routes, scheduling, and stop locations would be planned and updated as conditions require as new bus routes are introduced (DC Circulator) and as bus routes are adjusted periodically by the operators (e.g., WMATA's Better Bus Program).

If the Union Station to Georgetown Premium Transit (K Street Transit) is implemented along K Street NW as a streetcar, it is assumed that DDOT would undertake a detailed evaluation of the interaction between the streetcar operation and K Street NW. This study assumed the funding for that operation would occur beyond the horizon year or 2020. In addition, a proposed terminus station along K Street NW between Wisconsin Avenue NW and 31st Street NW also would need to be examined in detail to determine any impacts that could occur for vehicles and pedestrians traveling through this corridor and along a short piece of Water Street proposed as a turnaround location for the streetcar vehicles.

5.2.4 TRUCKS AND BUSES

This section discusses project area access for trucks and emergency vehicles, project area access for buses and off-site parking, loading within the project area, and the ability of rowing shell trailers to travel between the nearest interstate and access to the project area.

5.2.4.1 Project Area Access – Trucks and Emergency Vehicles

Similar to existing conditions, truck access would primarily be limited to smaller delivery and service vehicles given the constraints of the project area. Although there is a 60-foot diameter cul-de-sac, it is assumed trucks would use the two designated loading areas at the 34th Street plaza to the east of the boathouse on site E and the plaza/apron east of the aqueduct (north of Potomac Boat Club, adjacent to the cul-de-sac). If the project area loading areas were occupied or if delivery trucks preferred, trucks could also use the DDOT designated loading zones nearby as described in Section 3.5, such as the loading zone at 3401 Water Street NW.

Properties to the west of the aqueduct would be accessible only to authorized vehicles via a gate underneath the Alexandria Aqueduct. The authorized access driveway west of the aqueduct is limited to a width of approximately 10 feet and extends along the southern side of the CCT until the boathouse at site C, where it then veers southwest towards the dock of the WCC. Given the limited width of the access driveway, vehicles would need to drive in and back out so that they do not interfere with the CCT.

While fire trucks would likely be too long to turn around in the cul-de-sac, the project area would still be accessible to them; their departure from the project area would require mounting the curbs of the cul-de-sac with a multi-point turn or reversing direction down Water Street. Ambulances would likely be able to turn around in the cul-de-sac, and similar to the fire trucks could also use the restricted access area east of the aqueduct to access buildings at the west end of the project area. The ability of emergency vehicles to access points west of the Alexandria Aqueduct would require further project area design and study in coordination with the DC Fire and Emergency Management Services Department.

5.2.4.2 Project Area Access – Buses

Buses would not be able to turn around in the 60-foot diameter cul-de-sac, and would therefore be limited to using the same loading areas as trucks if they were allowed to do so and if there was sufficient room for them to use these facilities. It is likely, however, that only small buses could operate within the designed loading zones in the project area. Therefore, the only other way for buses to access the project area under alternative 1 would be via multi-point turns in the cul-de-sac or driving in and reversing direction down Water Street NW, as generally described in the "Rowing Shell Trailer Access" section below (Section 5.2.4.3), which would cause conflicts with other area users. Alternatively, buses could off-load students farther from the project area near the intersection of Wisconsin Avenue NW and K Street NW at the driveway pull-off south of Water Street between 31st Street NW and Thomas Jefferson Street. With permission from DDOT, other non-intrusive bus drop-off areas could be explored as well such as loading zones near the project area or local bus stops, provided school buses did not conflict with other buses. It should be noted that given the constraints of the project area and the uncertainty for how buses would access the area, the alternative 1 traffic analysis modeled these school buses serving the project area by operating on K Street NW east of Wisconsin Avenue only, not on Water Street NW. It was assumed that school buses servicing the project area would drop off students along K Street NW near the intersection of Wisconsin Avenue and then proceed to available bus parking outside of the study area, then return to pick up students at the same general location on K Street NW. For those school buses with students servicing TBC, the traffic analysis assumed buses would travel on Wisconsin Avenue to K Street NW (or vice versa), where they would drive south on 30th Street NW, drop off students, and turn around at the circle at the end of 30th Street NW or make a multi-point turn at one of the garage entrance areas; these buses would also park off-site during the school rowing practice.

Under alternative 1, bus parking spaces that are currently located in the project area on the south side of Water Street NW would be removed. During the scoping process for the project, DDOT representatives noted that they would work on alternative locations in the area for the on-street bus parking spaces that would be removed. Until other future bus parking spaces are designated near the project area, it is assumed that buses servicing the project area would park at the next nearest permitted area for bus parking. According to goDCgo, a website powered by DDOT, the nearest bus parking areas are along 15th Street NW between Pennsylvania Avenue and Constitution Avenue, along Independence Avenue SW westbound between 15th and 17th Streets, along Maine Avenue SW along the Southwest Waterfront, or on Ohio Drive SW in East Potomac Park, or other bus parking spaces designated within the city as well (DDOT n.d.c).

5.2.4.3 Project Area Loading

Designated loading zones have been designed at the 34th Street plaza to the east of the boathouse on site E and at the plaza/apron east of the aqueduct (north of Potomac Boat Club and west of the cul-de-sac). To minimize conflicts between uses within the congested loading zone areas, traffic calming pavement design would be used, similar to the Georgetown Waterfront Park materials, to suggest to users where different activities are acceptable and remind all vehicular users to proceed with caution.

Accessing these two loading areas would require trucks or other vehicles to mount the cul-de-sac curb or mount the curb at the intersection of Water and 34th Streets NW if a curb cut was not provided. Trucks exiting the loading area just east of the aqueduct (not at 34th Street) would likely be required to do

multi-point turns or drive in and back out of Water Street from at least as far as 34th or 33rd Streets NW. While multi-point turns would be possible because the curbs of the cul-de-sac would be mountable, the columns supporting the elevated Whitehurst Freeway, Potomac Boat Club vehicles, optional storage structures, and other vehicles in the cul-de-sac would present constraints that multi-point turn vehicles would need to maneuver around. Trucks exiting the loading area on site E at 34th Street, on the other hand, would simply need to wait for a break in traffic and do a single back out before proceeding east on Water Street.

Trash collection for properties west of the aqueduct would need to be determined during final site design given the general restriction of non-authorized vehicles beyond the aqueduct. Trash collection for properties east of the aqueduct would best be provided by the smallest trash truck vehicles available. Since it is preferred that trash trucks not operate past the cul-de-sac, staging and coordination of trash collection would need to be coordinated through future design processes and would likely include the use of a shared dumpster near the cul-de-sac. Depending on the length of the trash trucks, they may need to make multi-point turns to turn around at the end of Water Street NW. In the case that trash trucks may need to operate outside of the cul-de-sac and Water Street area, it would also be important to schedule trash collection during off-peak times to avoid interfering with boat drop-off/pick-up, bicyclists, and pedestrians sharing the same right of way.

5.2.4.4 Rowing Shell Trailer Access

For universities and high schools to take full advantage of the boathouse facilities planned for alternative 1, larger rowing shells would need to be delivered to the project area for regattas or for storage at the boathouses for regular use. The largest rowing shells are eight-person boats, which are approximately 60 feet long. While the strategy to transport these boats to the project area with the least disturbance to traffic, pedestrians, and bicyclists is to have trailers unload the shells at TBC and have individuals row the shells down to the project area via the Potomac River, it was requested this transportation report explore ways to allow these boats to be delivered via trailer.

Eight-person rowing shells are typically transported on specially designed trailers that are pulled by a van or large pick-up truck (or dually). Access needs for the trailers includes both access at the project area and traveling along city streets from the nearest truck-permitted regional highway or I-395. Note that a Ford-150 with an average trailer that can accommodate these shells would extend approximately 72 feet from the front of the truck to the end overhang point of the boats. Also note that when future plans for the boathouse development are completed and it is determined that the boathouse will handle these boats, another traffic study should be conducted to verify these turning movement findings.

5.2.4.4.1 Trailer Access at the Project Area

Trailers with rowing shells would be able to access the project area in two ways—both of which would cause disruptions to pedestrians, cyclists, and/or other vehicles. Therefore, both methods of accessing the project area would require flagmen to be stationed on either side of the rowing shell trailer to notify pedestrians, cyclists, and other vehicles that there may be temporary obstacles within their path. This practice would ensure safety of all users of the CCT and area roadways and sidewalks. Both of these options assumes limited access by other users during the time the trailers are situated in the active lanes along Water Street NW.

The first option for the trailers to access the project area is to pull straight in, park and unload the boats, and then reverse or back out to at least 34th Street NW where the truck and trailer could make a multi-point turn and turn around. If the truck and trailer were to pull straight in, they could pull up onto the authorized vehicle only area and over portions of the CCT trail or remain in the cul-de-sac and extend past the cul-de-sac into Water Street NW.

The second option for the trailers would be to pull in, park and unload the shells, unhook the trailer once unloaded, use at least six or more people to manually turn the trailer (trailers are typically made of

aluminum and are therefore not very heavy), have the driver of the truck make a multi-point turn, re-hook the trailer to the truck facing away from the project area, and then drive eastward to the trailer's next destination. Again, this option would likely require at least the truck and/or a portion of the trailer to pull onto the authorized vehicle only area.

5.2.4.4.2 Trailer Access to the Project Area

Given the tight constraints of streets within the Georgetown area, it is assumed the preferred access route to the project area for trailers carrying rowing shells is to use K Street NW to access the closest interstate option. Unfortunately, the Theodore Roosevelt Memorial Bridge to I-66 does not allow trucks. Therefore, the next best available route for trailers with rowing shells to access the project area is to use I-395 over the 14th Street Bridge, take 14th Street NW northbound, turn left onto K Street NW, and proceed on K Street NW westbound under Washington Circle to the project area. The return route would take Water/K Streets NW eastward, take a right turn onto 14th Street NW southbound, and then proceed straight southbound onto the 14th Street Bridge to I-395. Turns on interstate segments should not pose an issue for a trailer carrying rowing shells because of the wide turning radiuses employed for these roads. Similarly, outside of the project area and the turn between K and 14th Streets NW, there would be no turns required along the suggested sections of K/Water Streets or 14th Street NW.

The intersection of K and 14th Streets NW is wide; therefore, trucks pulling trailers with rowing shells should be able to make the turn within the available street right-of-way. However, trucks with trailers making the right turn from K Street NW eastbound to 14th Street NW southbound may not be able to make the turn from the service lanes, according to standard turning procedures on K Street NW. If this movement from service lanes is not possible, trucks with trailers would need to make the right turn from the main travel lanes on K Street NW; this movement may require coordination with other vehicles and DDOT should advise on the preferred method for making such a move.

In order to make the turn between K and 14th Streets NW, trucks would need to make wide turns and the truck or portions of the trailer or overhanging shells may cross into other lanes of traffic at times. Therefore it is recommended that trucks: (a) schedule to make this turn at off-peak traffic time periods when traffic volumes are low, (b) include signs to indicate the vehicle makes wide turns and that following vehicles are advised to keep some distance between the trailer and themselves; and (c) be equipped with visible turning blinkers to clearly communicate anticipated turns. If needed, trucks should employ the additional assistance of police to ensure turning movements are safe for all vehicles in the intersection. A more detailed turning movement study should be undertaken in the final design phase of the project, and more detailed routing also can be discussed between the developer of the boathouses and DDOT at that time.

5.2.4.5 Truck and Bus Summary under Alternative 1

Buses within the project area and the secondary study area would no longer have the six on-street parking spaces at the end of Water Street NW, and there would also be reduced area to turn around at the end of Water Street NW. Within the project area, alternative 1 could result in additional constraints or procedures for access for trucks (e.g., constraints: Whitehurst Freeway columns, procedures: need to station flagmen to stop or alert CCT users of crossing vehicles), although accommodations have been made to accommodate these vehicles to the greatest extent possible.

5.2.5 PARKING

The standardization of the roadway and parking as proposed with alternative 1 would reduce public and reserved use parking. The private parking spaces connected to the townhouses also would be removed with the option scenario where the townhouses are removed to make a larger boathouse at site D. Alternative 1 would provide between 26 and 36 metered parallel on-street parking spaces. These spaces would replace the 22 2-hour parking spaces (16 back-in and 6 parallel), about 6 reserved parking spaces for tour bus parking, and approximately 23 3-hour back-in parking spaces. The nine private parking

spaces for the Potomac Boat Club would be retained; however, vehicles parked in these spaces would need to coordinate with NPS to allow authorized vehicles to access properties west of the aqueduct as the Potomac Boat Club parked vehicles would inhibit direct access through the gate. Therefore, excluding private parking spaces, there would be a net reduction of between nine and nineteen public parking spaces and approximately six spaces for tour buses.

No designated off-street parking would be provided under alternative 1, with the exception of the approximate nine spaces behind the Potomac Boat Club that already exist. The parking required for the boathouses may be provided on-street or in local garages. Because car-top boat launching is a big demand, kayak storage lockers within the project area would allow future users to temporarily store their large equipment while they park elsewhere, thereby allowing parking demand to be met off-site.

Development of alternative 1 would draw additional users to the site and increase overall demand for both on-street and garage parking. Although there would be a reduction in on-street parking and the nearest parking garage is open during the week but not open on weekends, other parking garages a few blocks farther are open on both weekdays and weekends. Therefore, given sufficient capacity in these area garages, parking demand can likely be accommodated. Parking for future users would likely be more expensive than before, given the introduction of metered on-street parking where there was none before in the project area and a need for more vehicles to park in garages where prices can be higher. Parking may also be slightly farther from the project area than under the no-action alternative given the need to use more garage parking.

5.2.6 TRAFFIC

The future projected traffic analysis is based on the high density alternative (i.e., worst-case scenario), or alternative 1 with option. This traffic section first describes the roadway conditions within the project area. The remaining sections cover traffic analysis within the pre-determined secondary study area. The process the study followed to project future traffic volumes is described: first the trip generation is covered, followed by the modal split and trip distribution to develop the future forecasted traffic volumes. The section concludes with the results of the traffic analysis.

5.2.6.1 Proposed Alternative 1 Roadway Design

The proposed design for Water Street NW from 34th Street NW to the end of the street on the west includes 2 travel lanes (12.5 feet in width each), 36 total metered parallel parking spaces (7 feet wide), and a 60-foot diameter cul-de-sac. This design would formalize the parking and street section on the western end of Water Street NW. As noted in the truck section (Section 5.2.4), the curbs on the cul-de-sac would be mountable to allow authorized vehicles to access the Potomac Boat Club, private residences, and properties west of the aqueduct. There would be a gate across the authorized access driveway under the Alexandria Aqueduct south of the CCT to ensure only authorized vehicles could access beyond the aqueduct via the 10-foot-wide NPS driveway that extends to site B. The addition of these improvements would help to ensure unauthorized vehicles no longer access areas that are not intended for public vehicular use. Note that vehicles should not cross the CCT without proper notification to trail users in both directions and other necessary safety precautions. In the case that any vehicle would need to cross the CCT or mixed-use trail through the project area, DDOT procedures for temporary construction closure should be followed.

5.2.6.2 Trip Generation

Custom trip generations were calculated for the different proposed boathouse users. These include athletes from the area high schools (Washington, DC, Maryland, and Virginia) and universities (Georgetown and George Washington Universities), public use (users with their own boats and privately stored at a future boathouse), and recreational public rentals. There was a separate analysis covering the AM peak hour and PM weekday peak hour representing the early morning and late afternoon rowing

demand, as well as a Saturday peak hour analysis representing the private use and recreational rental demand.

The worse-case nonmotorized boathouse scenario for trip generation would be composed of 34,500 SF of boathouse development. Table 5-2 lists the high density scenario components (alternative 1 with option). Section 5.1 describes the scenario in detail. The primary assumption is that the available space would be divided evenly between athletic use, rental use, and private (storage and bring your own boat) or one-third of the total square footage divided among the three user groups.

TABLE 5-2. ACTION ALTERNATIVE 1 WITH OPTION: HIGH DENSITY SCENARIO DEVELOPMENT COMPONENTS

Site Letter	Description
A	2,700 SF
B	Existing WCC
C	10,200 SF
D	7,800 SF (Replaces the existing Key Bridge Boathouse)
E	13,800 SF
Total	34,500 SF

Rental User Group. The primary source for the trip generation is a customer turnover summary table provided by Key Bridge Boathouse, an existing boat rental facility located on Water Street NW in Georgetown. The customer use summary contains the percentage of customer turnover by hour and grouped by weekday and weekends/holidays between April 1, 2015 and July 31, 2015. Based on the data, the AM peak hour maximum percentage of turnover was 5% (representing those arriving at the tail end of the AM rush), the PM peak hour maximum percentage was 12% (representing those arriving at the tail end of the PM rush), and the Saturday peak hour maximum percentage was 13%. Table 5-3 contains the customer turnover summary.

TABLE 5-3. KEY BRIDGE BOATHOUSE CUSTOMER TURNOVER APRIL THROUGH JULY 2015

Time of Day	All Days	Weekdays	Weekends/Holidays
8:00 AM–8:59 AM	1%	0%	1%
9:00 AM–9:59 AM	3%	1%	3%
10:00 AM–10:59 AM	6%	**5%**	6%
11:00 AM–11:59 AM	9%	9%	9%
12:00 PM–12:59 PM	11%	10%	11%
1:00 PM–1:59 PM	12%	11%	12%
2:00 PM–2:59 PM	12%	11%	13%
3:00 PM–3:59 PM	13%	12%	**13%**
4:00 PM–4:59 PM	11%	10%	12%
5:00 PM–5:59 PM	9%	11%	9%
6:00 PM–6:59 PM	8%	**12%**	6%
7:00 PM–7:59 PM	5%	8%	3%
8:00 PM–8:59 PM	0%	1%	0%
Number of Days Counted:	98	67	31

Based on the average total number of weekday and weekend customers equating to 391 and 1,842, respectively, and the total area of the Key Bridge Boathouse parcel (no building within project area) listed as 9,391 SF in the DC parcel GIS layer, the AM, PM, and Saturday peak trip generation rates were calculated as follows:

- AM Trip Rate: (391 [customers] * 5% [peak customer turnover]) / 9,391 SF = 0.00208/SF
- PM Trip Rate: (391 [customers] * 12% [peak customer turnover]) / 9,391 SF = 0.005/SF
- Saturday Trip Rate: (1,842 [customers] * 13% [peak customer turnover]) / 9,391 SF = 0.0255/SF

The total trips were calculated by multiplying the trip rates by the proposed future rental user square feet or 11,500 SF (one-third of 34,500). This resulted in 24 AM peak hour, 57 PM peak hour, and 293 Saturday peak hour trips. To be conservative, these trips were considered the total inbound trips and the same number of trips were applied for outbound trips. Therefore, there would be a total of 48 AM peak hour, 114 PM peak hour, and 586 Saturday peak hour trips; all would have a 50/50 entering and exiting split. Tables 5-6 and 5-7 contains a summary of all three user group's trip generation.

Athlete User Group. TBC, a multi-purpose boathouse facility serving athletic and private use located at the western end of Georgetown near Rock Creek Parkway, currently houses the majority of athletes. Approximately 1,210 athletes use TBC on a daily basis during the week, 930 high school athletes and 280 university athletes. A total of 12 high schools use the 17,410 SF facility resulting in an average of 78 athletes per high school. Only two universities use TBC resulting in an average of 140 athletes per university. A representative from TBC indicated that 45% of athletic users use the facility during the morning and 55% use the facility during the afternoon. Therefore, the AM peak hour and PM peak hour trip generation rates were calculated as follows:

- AM Trip Rate: (1,210 [athletes] * 45% [AM percent of users]) / 17,410 SF = 0.031275/SF
- PM Trip Rate: (1,210 [athletes] * 55% [PM percent of users]) / 17,410 SF = 0.038225/SF

The total trips were calculated by multiplying the trip rates by the proposed future athletic user square feet or 11,500 SF (one-third of 34,500). Since the average number of athletes per high school is 78 athletes, the initial trips were adjusted to equate to the next highest number divisible by 78 (to reflect the need to have the whole school program participate). This calculation resulted in 388 AM peak hour and 465 PM peak hour trips, respectively. To be conservative, it was assumed that all AM trips were departing (athletes arrive early in the morning to practice) and PM trips were arriving (athletes arrive around 4:00 PM each day). Tables 5-6 and 5-7 contains a summary of all three user group's trip generation.

Private User Group (Store Boat at Boathouse). The ITE *Trip Generation Manual* land used code 420 (marina) was used to calculate trips because this land use most closely aligned with a person who owned a boat and stored it at a boat storage facility (ITE 2012). The ITE 420 unit of measure is berths; therefore, the number of racks capable of storing a kayak were used. The 2,700 SF site A is planned for storing 64 kayaks resulting in 42 SF per boat. This measure equates to 273 racks based on 42 SF per boat divided into the future private user space or 11,500 total SF (one-third of the total 34,500 SF). The ITE value was adjusted to person trips by multiplying the average vehicle occupancy from the National Household Travel Survey or 2.20 (FHWA 2011). Table 5-4 provides a summary of the ITE-based vehicle trips and person trips.

TABLE 5-4. PRIVATE USERS STORE AT BOATHOUSE: ITE FORECASTED TRIPS

Source	Independent Variable	Trip Type	Time Period	IN	OUT	Total Trips
ITE Land Use Code 420	273 Racks (berths)	**ITE Vehicle Trips**	AM Peak Hour	29	17	46
			PM Peak Hour	29	28	57
			Saturday Peak	33	41	74
		Person trips (2.20 AVO)*	AM Peak Hour	64	37	101
			PM Peak Hour	64	62	126
			Saturday Peak	73	90	163

*Average Vehicle Occupancy (AVO) obtained from the 2009 National Household Travel Survey

Private User Group (Bring Own Boat). This user category relied on two sources, an estimated number of temporary storage lockers that would be placed near the public launch area at the end of Water Street and an estimated number of on-street parking spaces between 34th Street NW and the Alexandria Aqueduct. Based on some research there are a variety of storage locker facilities used around the country, but one in particular seemed plausible based on real estate required for maximum capacity (28 lockers). Figure 5-4 shows an example of this type of boat storage locker facility.

FIGURE 5-4. BOAT STORAGE LOCKER FACILITY EXAMPLE

Is was assumed that each locker would be used twice per hour or 56 vehicle trips to allow users 30 minutes to drive to a parking garage or on-street parking spot, stop for supplies, and return to the locker. In addition, it is estimated that there would be 40 on-street parking spaces planned along Water Street NW between 34th Street NW and the roadway terminus. It should be noted that there is a planned development located along Water Street NW that would remove some of the estimated spaces. Since the concept plan was not available at the time this report was prepared, this report continues to assume 40 spaces. Since the rental and private users would be vying for those spaces, it was assumed that a maximum of 50% of those spaces would be taken by the private users bringing their own boat. This would result in 76 trips (storage locker trips plus parking space trips). There would be a differing amount of demand depending on the time of day; therefore, ITE 420 (marina) trip rates were used to calculate

demand. Based on the ITE 420 rates, Saturday would have the highest demand; therefore, the AM peak hour and PM peak hour demand were calculated by comparing the weekday rates to the Saturday rate. The following time-based rates were calculated:

- AM Trip Rate: 0.17 (AM ITE trip rate) / 0.27 (Saturday ITE trip rate) = 63% of Saturday trip rate
- PM Trip Rate: 0.21 (PM ITE trip rate) / 0.27 (Saturday ITE trip rate) = 78% of Saturday trip rate

Once the percentages were calculated, the values were used to calculate the vehicle generated trips covering the three time periods using the ITE 420 land use entering and exiting splits. It was assumed that all trips would be vehicle trips. Table 5-5 shows the forecasted trip generation for private users bringing their own boats.

TABLE 5-5. PRIVATE USERS BRINGING OWN BOATS FORECASTED VEHICLE TRIPS

Time Period	Half of On-Street Parking spaces	Temporary Locker Storage Units	Locker use by Hour	Vehicle Trips	Weekday Trip Rate Adjustment	Adjusted Vehicles using ITE 420 Trip Rates	IN	OUT
AM Peak Hour	20	28	2.0	76	63%	48	31	17
PM Peak Hour	20	28	2.0	76	78%	59	30	29
Saturday Peak	20	28	2.0	76	100%	76	33	43

All user groups were combined to develop a total forecasted trip generation. Based on the assumptions, it is estimated that 585 and 764 total AM and PM peak hour person trips, respectively, would be generated by the proposed high density scenario. On a typical Saturday, there would be an estimated 825 person trips generated during the afternoon peak hour. Table 5-6 contains a weekday peak hour summary of all user group's trip generation results. Table 5-7 contains a Saturday peak hour summary of all trip generation results by user group.

TABLE 5-6. WEEKDAY AM AND PM PEAK HOUR TRIP GENERATION BY USER GROUP

User	Independent Variable	Time Period	IN	OUT	TOTAL
Rental	Square footage of facility (11,500 SF)	**AM Peak**	24	24	48
		PM Peak	57	57	114
Athlete	Number of athletes	**AM Peak**	0	388	388
		PM Peak	465	0	465
Private User (Store at Boathouse)	Number of boat storage racks (ITE 420)	**AM Peak**	64	37	101
		PM Peak	64	62	126
Private User (Bring own Boat)	Parking spaces and temporary storage lockers	**AM Peak**	31	17	48
		PM Peak	30	29	59
TOTAL		**AM Peak**	119	466	585
		PM Peak	616	148	764

TABLE 5-7. SATURDAY PEAK HOUR TRIP GENERATION BY USER GROUP

Source	Independent Variable	IN	OUT	TOTAL
Rental	Square footage of facility (11,500 SF)	293	293	586
Athlete	Number of athletes	N/A	N/A	N/A
Private User (Store at Boathouse)	Number of boat storage racks (ITE 420)	73	90	163
Private User (Bring own Boat)	Parking spaces and temporary storage lockers	33	43	76
TOTAL		399	426	825

TBC Changes. In addition to new person trips from the construction of new boat houses, the existing use at TBC would change to reflect some of the current users moving to either of the proposed Georgetown or Arlington facilities. To be conservative, it is assumed that both universities would move from TBC because they produce pedestrian and bicycle trips only (this is the opposite of the conditions modeled for the new Georgetown boathouses, but it helps to determine if any impacts would occur if both universities were to relocate) and would be replaced by high schools creating more vehicle trips than currently exist at TBC. Based on the average number of university athletes, 140 athletes would be removed from TBC during the AM and PM peak hours, respectively, and 155 high school athletes would be added during each peak hour (next highest number divisible by 78). These trip values would equate to two high schools filling the two university slots. The total net change in person trips would be 15 during the AM peak hour and 15 during the PM peak hour. These values do not take into consideration that all of the university trips are non-vehicle trips. Therefore, the total new person trips would be based on the 155 new high school trips split into their appropriate mode (See Section 5.2.6.2). Table 5-8 summarizes the change in TBC person trips.

TABLE 5-8. TBC CHANGE IN PERSON TRIPS

User	Independent Variable	Time Period	IN	OUT	TOTAL
Athlete—University	Number of athletes	**AM Peak**	0	(140)	(140)
		PM Peak	(140)	0	(140)
Athlete—High School	Number of athletes	**AM Peak**	0	155	155
		PM Peak	155	0	155
Total Net Difference		**AM Peak**	0	15	15
		PM Peak	15	0	15

There would also be additional trips at TBC from increasing their rental use on weekends. This would create new person trips based on one-third of their square footage (5,803 SF) being allocated to the rental user group. A total of 148 person trips would be created based on the rental use group Saturday peak trip rate shown below:

- Saturday Trip Rate: (1,842 [customers] * 13% [peak customer turnover]) / 9,391 SF = 0.0255/SF
- Saturday Person Trips: 5,803 SF * 0.0255 = 148 person trips

5.2.6.3 Modal Split

Key Bridge Boathouse conducted modal split surveys on a weekday and weekend day as customers arrived at the facility. These surveys served to provide the modal split for the rental user group. Because there was a difference between the weekday and weekend modal split, the two time periods were assigned

different modal splits. As a comparison, the WMATA *2005 Development-Related Ridership Survey* provided a modal split for an entertainment destination (closest land use to proposed facilities) located approximately half mile from the nearest Metrorail station (the Rosslyn Metro Station is approximately 0.75 mile from the Georgetown Waterfront) (WMATA 2005). Other sources of modal split data, such as the census, were not relevant to recreational activities.

A representative from TBC indicated that 75% of athletic user trips were by school bus, 20% were by vehicle (mostly upperclassmen with driver licenses), and the remaining were by bicycle. TBC reached out to 18 of their private members to inquire about modal split and over 89% indicate that they drove to TBC to access their boat. The remaining 10% was split between walking and bicycling. Table 5-9 summarizes the modal split research.

TABLE 5-9. MODAL SPLIT SUMMARY FOR ALL USER GROUPS

Mode Share	Boat Rentals		Athletes	Private Use: Store at Boathouse	Private User: Bring own Boat
	Weekday	Saturday	Weekday	All Times	All Times
Vehicle	2.7%	2.1%	20%	90%	100%
Carpool	79.2%	62.9%	0%	0%	0%
Taxi	0.0%	7.3%	0%	0%	0%
Bicycle	2.7%	6.0%	5%	5%	0%
Walk	9.9%	10.7%	0%	5%	0%
Metro	2.2%	3.9%	0%	0%	0%
Bus	3.3%	7.1%	75%	0%	0%
TOTAL	100%	100%	100%	100%	100%

After applying the modal split results to the person trip generation, the number of vehicle trips were calculated by user group. A total of 245 vehicles during the AM peak hour and 317 vehicles during the PM peak hour would be generated. Table 5-10 contains the weekday forecasted vehicle trips produced by user group. On a typical Saturday, a total of 376 vehicles during the afternoon peak hour would be generated. Table 5-11 contains the Saturday forecasted vehicle trips produced by user group.

TABLE 5-10. WEEKDAY VEHICLE TRIPS BY USER GROUP

User	Independent Variable	Time Period	IN	OUT	TOTAL
Rental	Square footage of facility (11,500 SF)	**AM Peak**	8	8	16
		PM Peak	19	19	38
Athlete	Number of athletes	**AM Peak**	0	89	89
		PM Peak	106	0	106
Private User (Store at Boathouse)	Number of boat storage racks (ITE 420)	**AM Peak**	59	33	92
		PM Peak	58	56	114
Private User (Bring own Boat)	Parking spaces and temporary storage lockers	**AM Peak**	31	17	48
		PM Peak	30	29	59
TOTAL		**AM Peak**	98	147	245
		PM Peak	213	104	317

TABLE 5-11. SATURDAY VEHICLE TRIPS BY USER GROUP

Source	Independent Variable	IN	OUT	TOTAL
Rental	Square footage of facility (11,500 SF)	77	77	154
Athlete	Number of athletes	N/A	N/A	N/A
Private User (Store at Boathouse)	Number of boat storage racks (ITE 420)	64	82	146
Private User (Bring own Boat)	Parking spaces and temporary storage lockers	33	43	76
TOTAL		174	202	376

TBC vehicle trips added for the two new high schools, which would be vehicular trips as opposed to walking and biking trips for the universities, would follow the same modal split as the other boat house zones following the athlete and rental modal splits. A total of 35 vehicle trips (vehicles plus buses) would be generated during the AM and PM peak hours and 78 vehicles during a typical Saturday afternoon peak hour. The 35 vehicle trips is based on 155 new high school person trips. To be conservative, additional rentals on the weekend were added for future rental growth. Table 5-12 contains the forecasted TBC vehicle trips produced for the athlete and rental user groups.

TABLE 5-12. TBC VEHICLE TRIPS FOR ATHLETE AND RENTAL USER GROUPS

User	Independent Variable	Time Period	IN	OUT	TOTAL
Athlete—High School	Number of athletes	**AM Peak**	0	35	35
		PM Peak	35	0	35
Rental	Square footage of facility (5,803 SF)	**Saturday**	39	39	78

5.2.6.4 Trip Distribution

Trip distribution represents the origin-destination pattern by percentage for trips generated by each user group to/from points beyond the study area boundary. For example, 6% destined to Wisconsin Avenue NW or 19% destined to eastern Washington, DC, via K Street NW. This process sums to 100%. The trip assignment reflects the estimated number of trips between the Water Street NW corridor or TBC and the study area boundary by selecting which route within the study to assign the trip.

The trip distribution was developed differently for each user group. For the rental use group, an 18,000 plus log file was obtained from Key Bridge Boathouse that contains all the zip codes for each group renting a boat at the facility. Each log represented an individual or group of individuals boating together. Zip codes covering a similar area as the MWCOG travel demand model were selected to develop distribution zones based on geographic relation to the primary roadway network access from the Water/K Street corridor and MWCOG travel demand model boundary (approximately an 80-mile range). The total number of rental groups were summed by the distribution zone to create a list of the total number of rental groups by distribution zone. Because some of the roadways within the study area road network reverse direction depending on the time of day, AM, PM, and Saturday distribution patterns were developed separately. It was also assumed that one-third of the western Virginia and northwest Maryland destined traffic would use the Key Bridge and two-thirds would use the Roosevelt Bridge one-third of the traffic would still opt to take the Key Bridge route due to its shorter length with increased delays rather than looping clockwise around the Potomac to reach the Roosevelt Bridge. Because there was no available data describing the origins of the private user group, it was assumed the private user group would have the same distribution as the rental user group. Tables 5-13, 5-14, and 5-15 provide a rental/private use

group trip distribution summary for the AM, PM, and Saturday peak hours, respectfully. Figures 5-5, 5-6, and 5-7 show the rental/private user group AM, PM, and Saturday trip distributions, respectfully.

TABLE 5-13. RENTAL/PRIVATE USER GROUP AM PEAK HOUR TRIP DISTRIBUTION

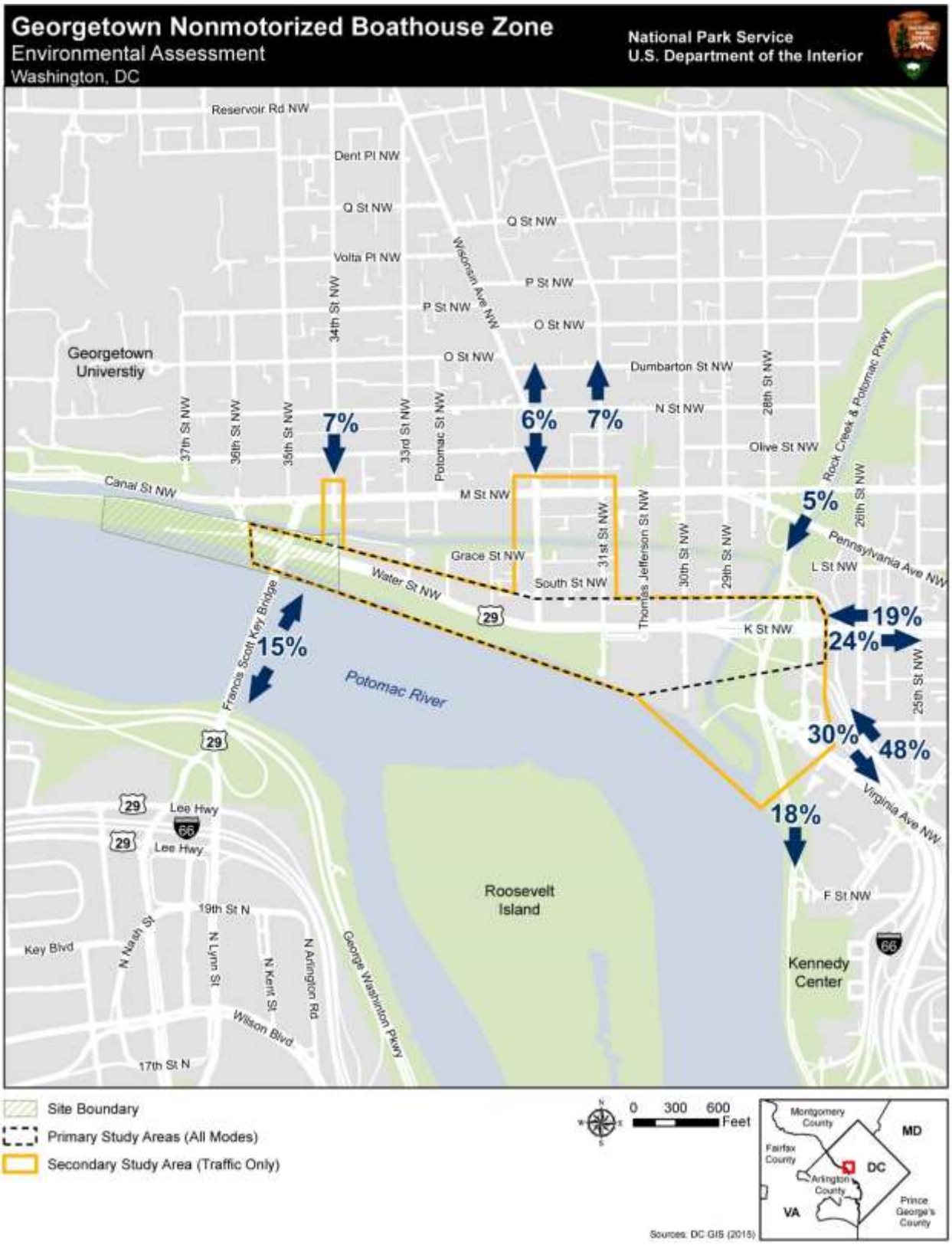
	Inbound		Outbound	
Destination	**Route**	**Percent**	**Route**	**Percent**
DC Points East	K Street WB	19%	K Street EB	19%
North DC	RCP from north	5%	K Street EB	5%
Bethesda	Wisconsin Avenue SB	6%	Wisconsin Avenue NB	6%
Georgetown	31st and 34th Street NW	7%	31st and 34th Street NW	7%
SE DC and SE MD	I-66 EB to 27th Street NW	3%	RCP to the south	3%
NW Maryland	I-66 EB to 27th Street NW	9%	27th Street NW to I-66 WB	9%
NW Maryland	Key Bridge to M Street NW to Wisconsin Avenue NW	4%	Wisconsin Avenue NW to M Street NW to Key Bridge	4%
Western VA	I-66 EB to 27th Street NW	21%	27th Street NW to I-66 WB	21%
Western VA	Key Bridge to M Street NW to Wisconsin Avenue NW	11%	Wisconsin Avenue NW to M Street NW to Key Bridge	11%
Southwest VA	I-66 EB to 27th Street NW	15%	RCP to the south	15%
		100%		100%

TABLE 5-14. RENTAL/PRIVATE USER GROUP PM PEAK HOUR TRIP DISTRIBUTION

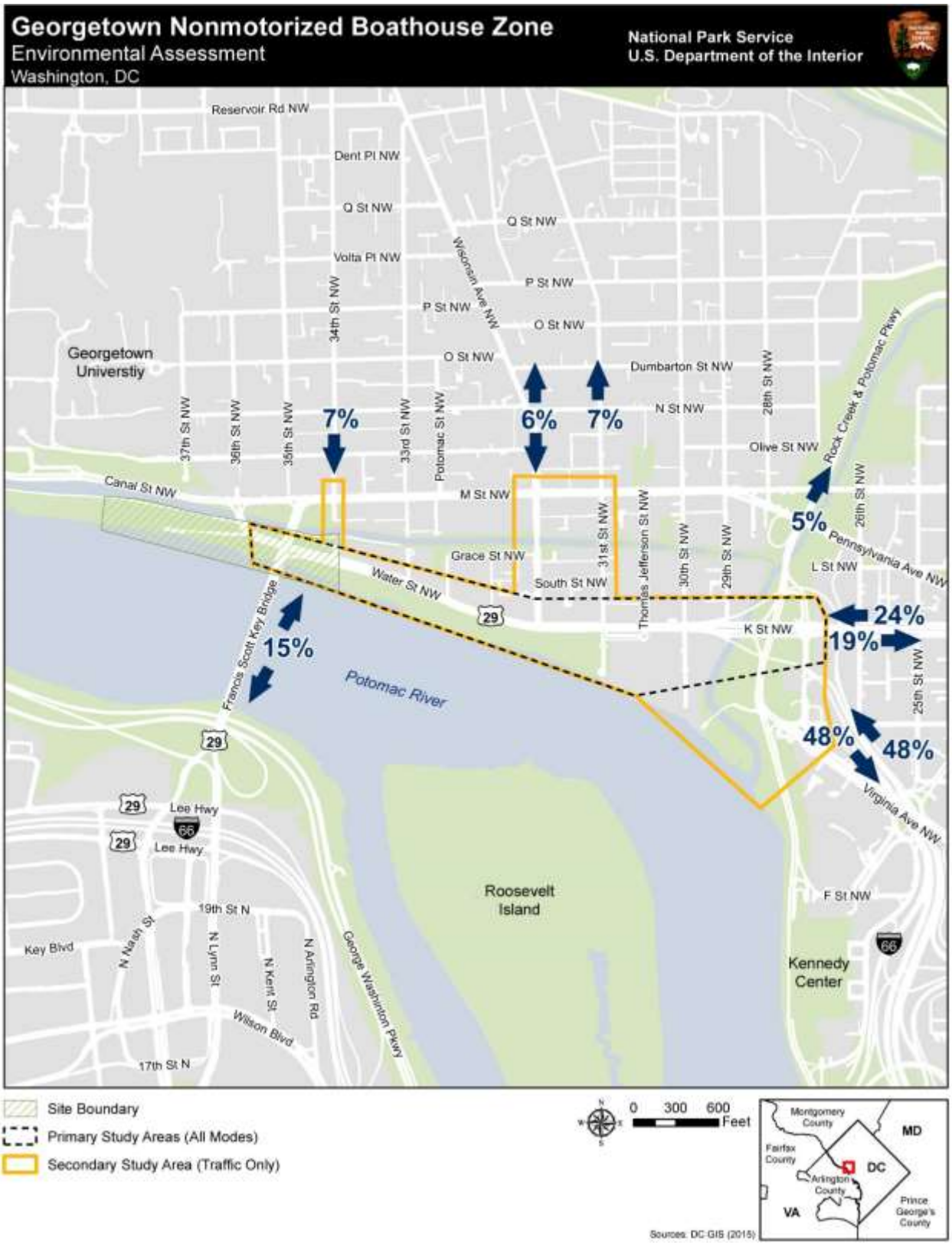
	Inbound		Outbound	
Destination	**Route**	**Percent**	**Route**	**Percent**
DC Points East	K Street WB	19%	K Street EB	19%
North DC	K Street WB	5%	27th Street to VA to RCP NB	5%
Bethesda	Wisconsin Avenue SB	6%	Wisconsin Avenue NB	6%
Georgetown	31st and 34th Street NW	7%	31st and 34th Street NW	7%
SE DC and SE MD	I-66 EB to 27th Street NW	3%	27th Street NW to I-66 WB	3%
NW Maryland	I-66 EB to 27th Street NW	9%	27th Street NW to I-66 WB	9%
NW Maryland	Key Bridge to M Street NW to Wisconsin Avenue NW	4%	Wisconsin Avenue NW to M Street NW to Key Bridge	4%
Western VA	I-66 EB to 27th Street NW	21%	27th Street NW to I-66 WB	21%
Western VA	Key Bridge to M Street NW to Wisconsin Avenue NW	11%	Wisconsin Avenue NW to M Street NW to Key Bridge	11%
Southwest VA	I-66 EB to 27th Street NW	15%	27th Street NW to I-66 WB	15%
		100%		100%

TABLE 5-15. RENTAL/PRIVATE USER GROUP SATURDAY PEAK HOUR TRIP DISTRIBUTION

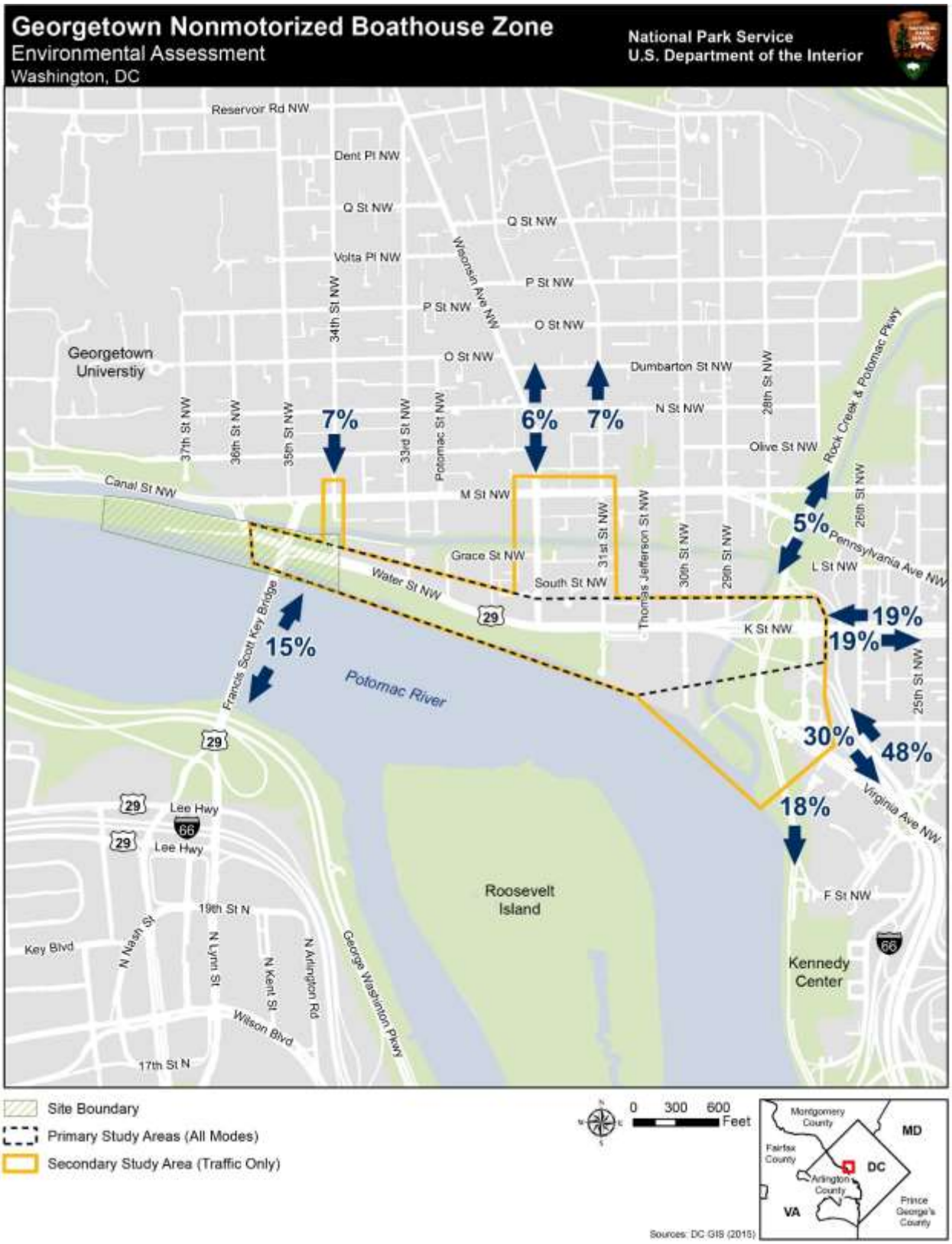
	Inbound		Outbound	
Destination	**Route**	**Percent**	**Route**	**Percent**
DC Points East	K Street WB	19%	K Street EB	19%
North DC	RCP from north	5%	27th Street to VA to RCP NB	5%
Bethesda	Wisconsin Avenue SB	6%	Wisconsin Avenue NB	6%
Georgetown	31st and 34th Street NW	7%	31st and 34th Street NW	7%
SE DC and SE MD	I-66 EB to 27th Street NW	3%	RCP to the south	3%
NW Maryland	I-66 EB to 27th Street NW	9%	27th Street NW to I-66 WB	9%
NW Maryland	Key Bridge to M Street NW to Wisconsin Avenue NW	4%	Wisconsin Avenue NW to M Street NW to Key Bridge	4%
Western VA	I-66 EB to 27th Street NW	21%	27th Street NW to I-66 WB	21%
Western VA	Key Bridge to M Street NW to Wisconsin Avenue NW	11%	Wisconsin Avenue NW to M Street NW to Key Bridge	11%
Southwest VA	I-66 EB to 27th Street NW	15%	RCP to the south	15%
		100%		100%



1 **FIGURE 5-5. RENTAL/PRIVATE USER GROUP AM TRIP DISTRIBUTION**



1 **FIGURE 5-6. RENTAL/PRIVATE USER GROUP PM TRIP DISTRIBUTION**

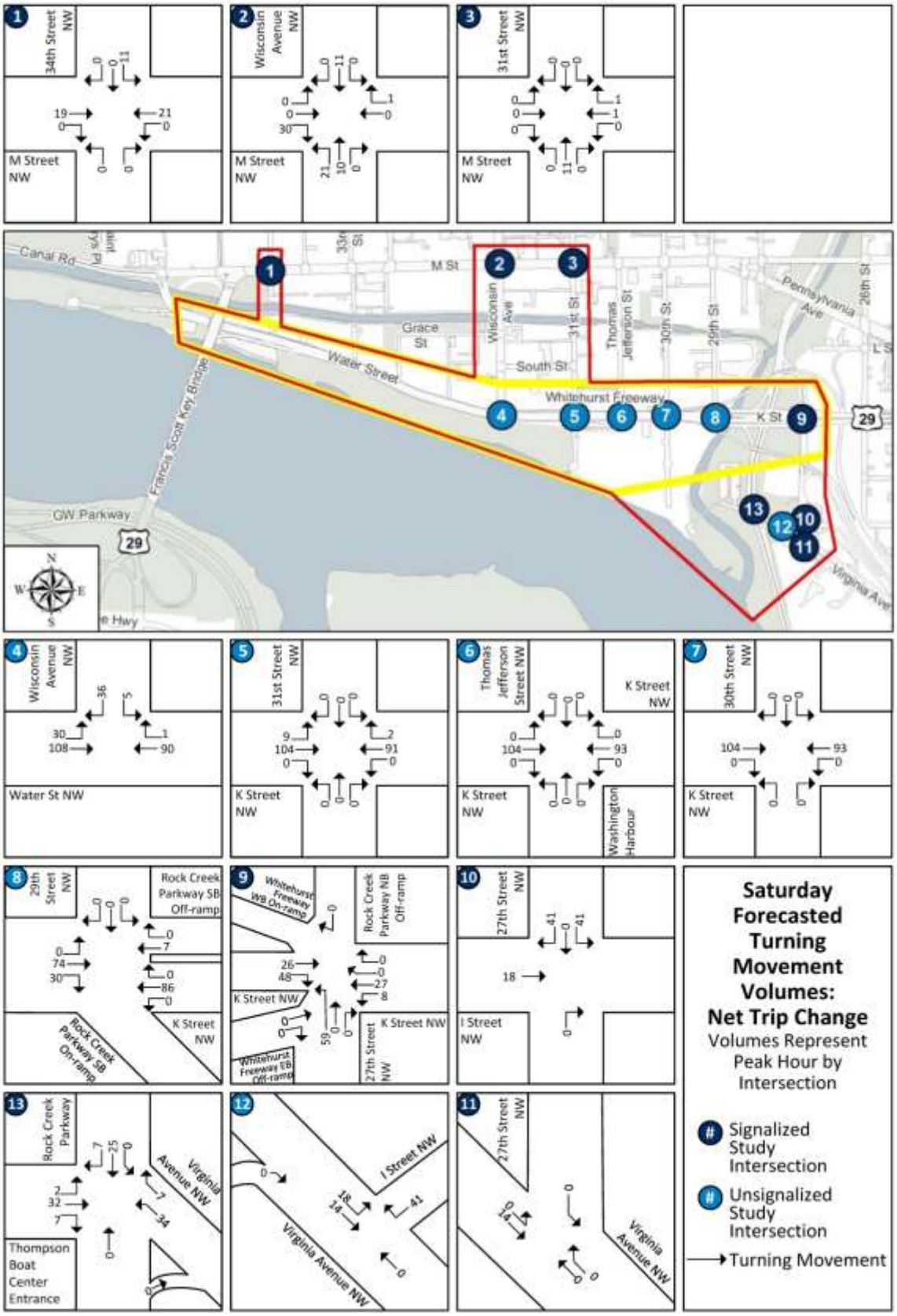


1 **FIGURE 5-7. RENTAL/PRIVATE USER GROUP SATURDAY TRIP DISTRIBUTION**

Based on mapping the existing athletic user groups located in Washington, DC, and Maryland that currently use TBC or a boat house along Water Street NW, all of the schools are located along or near Wisconsin Avenue NW. Therefore, all athletic vehicle trips were assigned to Wisconsin Avenue.

Figures 5-8 and 5-9 show all action alternative (alternative 1) vehicle trips for all user groups (rental/private and athletic users) for weekday AM and PM peak hours and Saturday peak hours, respectively. Figures 5-10 and 5-11 then show the full action alternative (alternative 1) turning movement volumes for weekday AM and PM peak hours and Saturday peak hours, respectively; these figures combine no-action alternative turning movement volumes presented in Section 4.6.6 with the action alternative vehicle trips presented in figures 5-8 and 5-9.

1 **FIGURE 5-8. ACTION ALTERNATIVE AM AND PM PEAK HOUR VEHICLE TRIPS**



1 **FIGURE 5-9. ACTION ALTERNATIVE SATURDAY PEAK HOUR VEHICLE TRIPS**

1 **FIGURE 5-10. ACTION ALTERNATIVE AM AND PM PEAK HOUR TURNING MOVEMENT VOLUMES**

1 **FIGURE 5-11. ACTION ALTERNATIVE SATURDAY PEAK HOUR TURNING MOVEMENT VOLUMES**

5.2.6.5 Alternative 1 Operations Analysis

The results of the action alternative (alternative 1) operations analysis for both signalized and unsignalized intersections are discussed in this section. Previous capacity analysis results in this report note any locations where an overall intersection or intersection approach would degrade to LOS E or worse. The capacity analysis results for the action alternative also notes any overall intersections or intersection approaches continuing to operate under LOS E or F, and when compared to the no-action alternative, any increase in vehicle delay by more than 5 seconds. These instances are be noted because DDOT requested that any instance of these conditions caused by the proposed action be mitigated, in addition to any degradations to LOS E or worse (see the DDOT scoping form [Attachment 1]).

The average LOS for the various approaches to the intersection and the overall intersection LOS grades for action alternative are depicted in figures 5-12 and 5-13 for weekday AM and PM peak hours, respectively, and figure 5-14 for the Saturday peak hour. Tables 5-16, 5-17, and 5-18 show the results of the LOS capacity analysis and the intersection vehicle projected delay under the action alternative compared to the no-action alternative results for the weekday AM, weekday PM, and Saturday peak hours, respectively. Note that the last two columns of these tables check for an increase in vehicle delay of more than 5 seconds between the no-action alternative and the action alternative; mitigation is only warranted for those cells that fail the 5 second vehicle delay test if the intersection or intersection approach operates under LOS E or F under both alternatives.

5.2.6.5.1 Signalized Intersection Operations Analysis

Based on the signalized intersection analysis, more than half of the study intersections operate at acceptable conditions during the peak hours analyzed (weekday AM and PM peak hours, Saturday peak hour). However, the following three signalized intersections would continue to operate at overall unacceptable conditions or conditions that require mitigation under the action alternative for the time periods noted:

- K Street NW/Whitehurst Freeway NW eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during the weekday AM and PM peak hours and the Saturday peak hour (change in LOS for weekday AM and Saturday peak hours from LOS E to LOS F and increase by over 5 seconds; overall intersection vehicle delay increase by over 5 seconds during the weekday PM peak hour – continues to operate at LOS F)
- I Street NW and 27th Street NW (Intersection #10) during the weekday AM peak hour
- Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the Saturday peak hour (overall intersection vehicle delay increase by over 5 seconds during Saturday peak hour – continues to operate at LOS F)

The following individual signalized intersection approaches operate under unacceptable conditions during the noted peak hour:

- Southbound at the intersection of M Street NW and Wisconsin Avenue NW (Intersection #2) during the weekday AM peak hour; northbound and southbound at the same intersection during the weekday PM peak hour (new failing – change from LOS D to LOS E and F, respectively)
- Southbound at the intersection of M Street NW and 31st Street NW (Intersection #3) during the Saturday peak hour
- Eastbound (K Street NW) at the intersection of K Street NW/Whitehurst Freeway eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during all peak hours (weekday AM and PM peak hours and Saturday peak hour) (vehicle delay increase by over 5 seconds in AM, PM, and Saturday peak hours); eastbound (Whitehurst Freeway eastbound off-ramp) at the same intersection during the weekday AM and PM peak hours; and westbound at the same intersection during the weekday AM peak hour

- Eastbound at the intersection of I Street NW and 27th Street NW (Intersection #10) during the AM peak hour
- Eastbound, westbound, and southbound at the intersection of Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the Saturday peak hour (eastbound and southbound – change in LOS for Saturday peak hour from LOS E to LOS F and increase by over 5 seconds; westbound – vehicle delay increase by over 5 seconds during Saturday peak hour – continues to operate at LOS F)

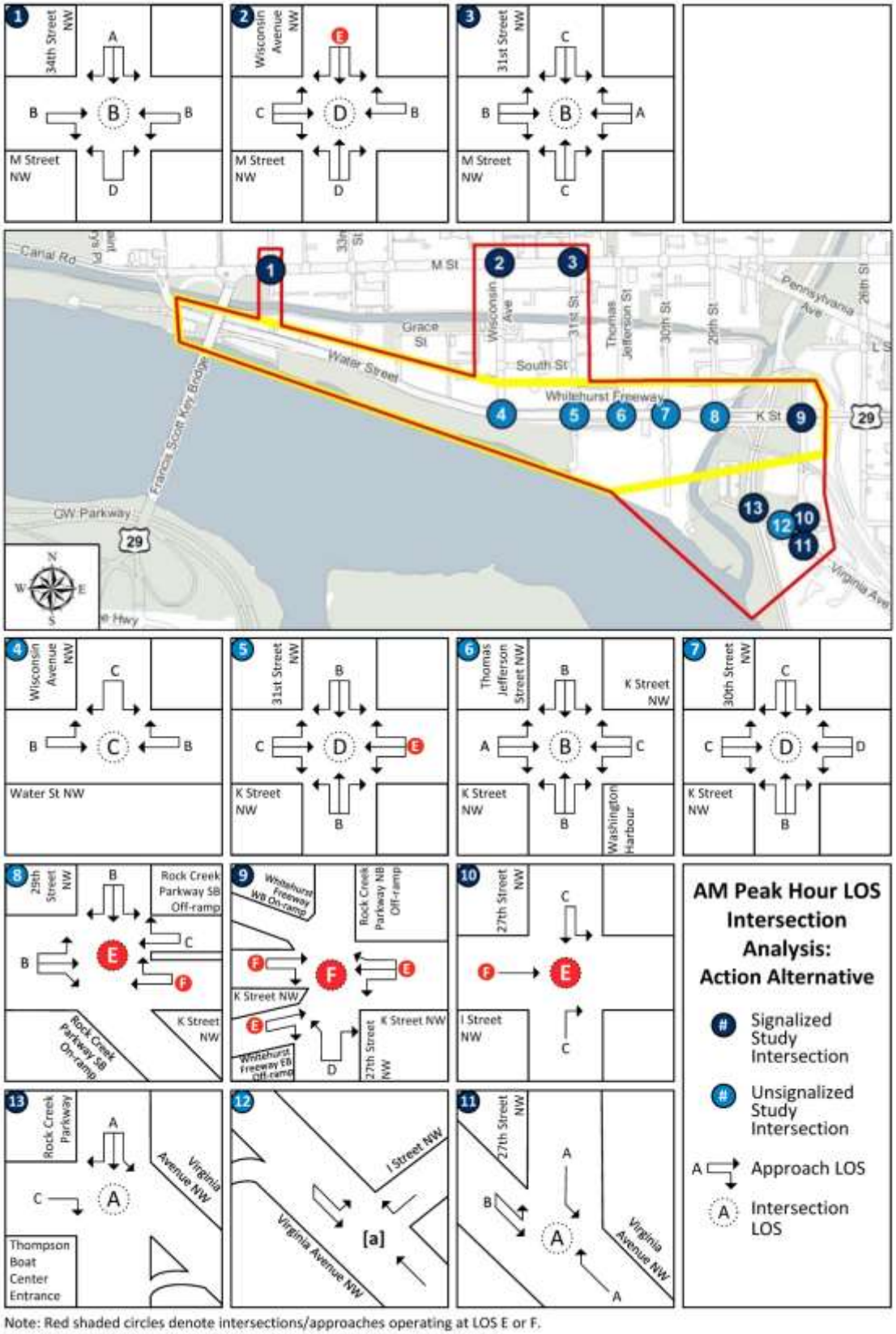
5.2.6.5.2 Unsignalized Intersection Operations Analysis

Based on the unsignalized intersection analysis, the intersection of K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) would continue to operate at unacceptable conditions during the weekday AM peak hour and would operate at unacceptable conditions during the Saturday peak hour (new failing – change from LOS D to LOS E).

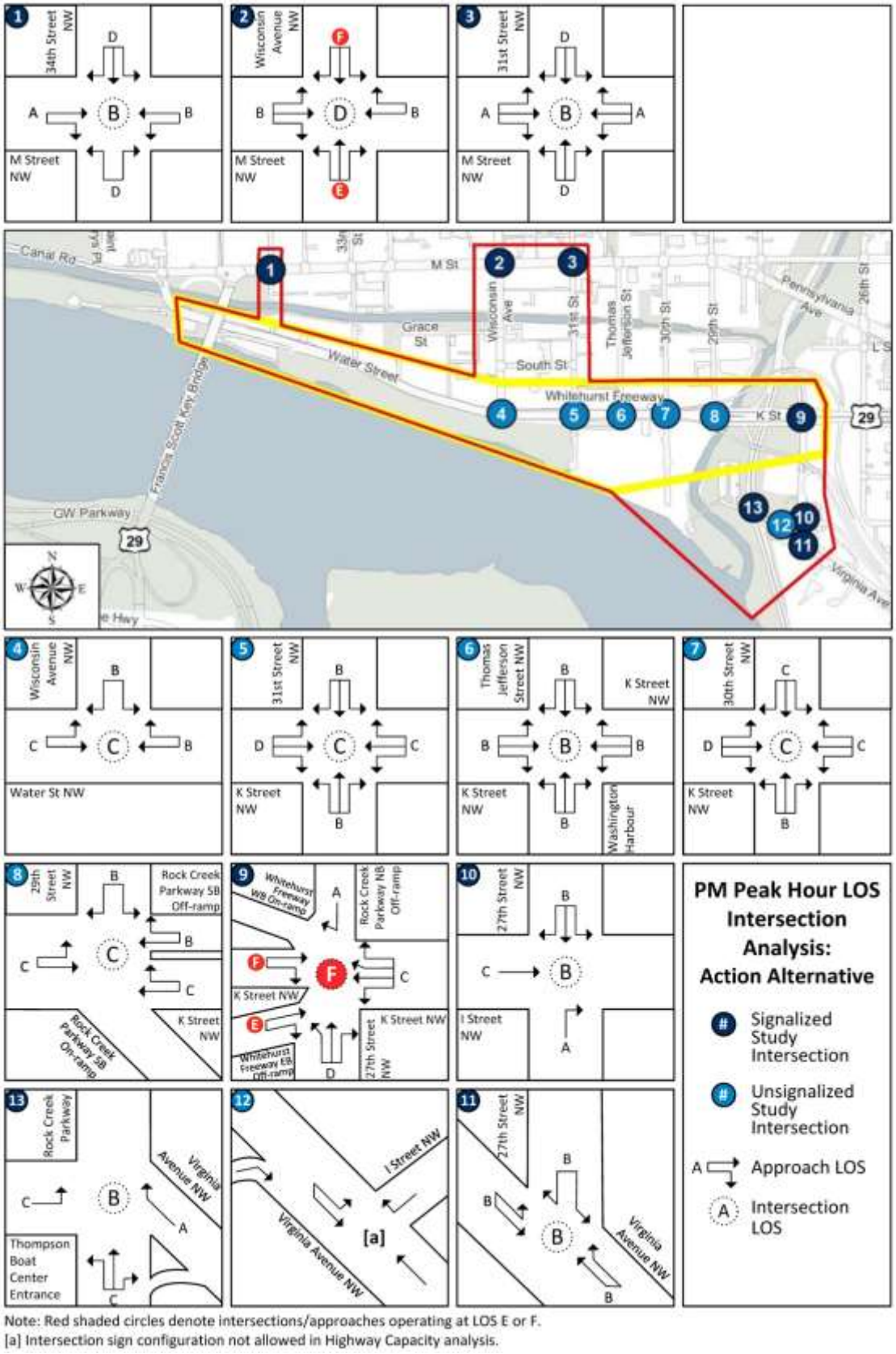
Additionally, the following unsignalized intersection approaches would operate under unacceptable conditions during the noted peak hour:

- Westbound at the intersection of K Street NW and 31st Street NW (Intersection #5) during the AM and Saturday peak hours (new failing – change from LOS D to LOS E for AM and change from LOS C to E for Saturday); eastbound at the same intersection during the Saturday peak hour (new failing – change from LOS C to LOS E)
- Eastbound at the intersection of K Street NW and 30th Street NW (Intersection #7) during the Saturday peak hour (new failing – change from LOS C to LOS E)
- Westbound at the intersection of K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) during the AM and Saturday peak hours

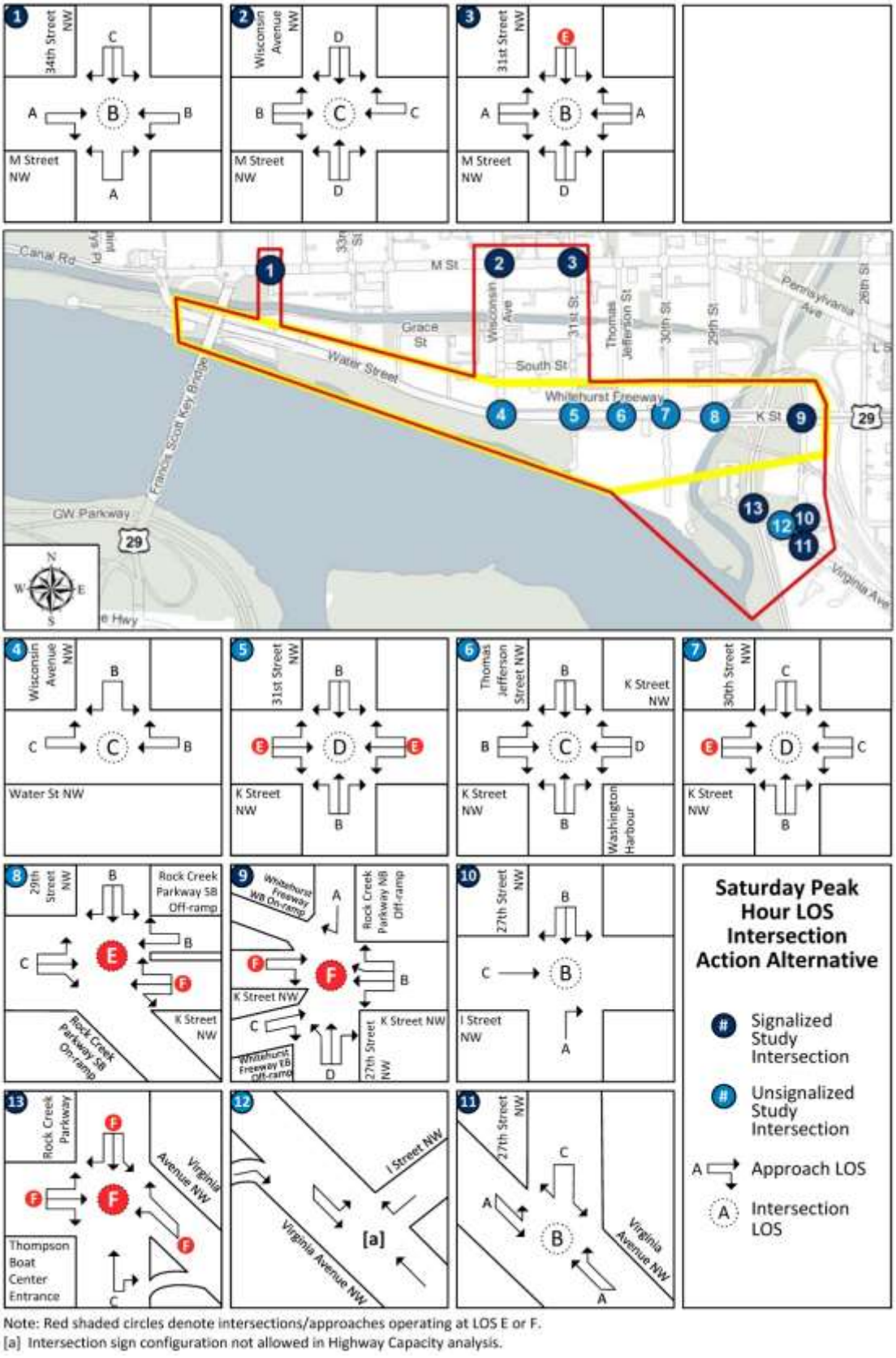
In summary, one signalized intersection would operate with two additional approach failings and two new unsignalized intersections would operate with approach failings.



1 **FIGURE 5-12. ACTION ALTERNATIVE INTERSECTION LEVEL OF SERVICE FOR WEEKDAY AM PEAK HOUR**



1 **FIGURE 5-13. ACTION ALTERNATIVE INTERSECTION LEVEL OF SERVICE FOR WEEKDAY PM PEAK HOUR**



Note: Red shaded circles denote intersections/approaches operating at LOS E or F.
[a] Intersection sign configuration not allowed in Highway Capacity analysis.

1 **FIGURE 5-14. ACTION ALTERNATIVE INTERSECTION LEVEL OF SERVICE FOR SATURDAY PEAK HOUR**

TABLE 5-16. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES AM PEAK HOUR CAPACITY ANALYSIS

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
1	**M Street NW & 34th Street NW (Signalized)**							
	EB (M St NW)	TR	11.2	B	11.3	B		
	EB Overall (M St NW)		**11.2**	**B**	**11.3**	**B**	**0.1**	**Pass**
	WB (M St NW)	LT	15.6	B	15.7	B		
	WB Overall (M St NW)		**15.6**	**B**	**15.7**	**B**	**0.1**	**Pass**
	NB (34th St NW)	LTR	47.0	D	47.0	D		
	NB Overall (34th St NW)		**47.0**	**D**	**47.0**	**D**	**0.0**	**Pass**
	SB (34th St NW)	LT	47.7	D	48.3	D		
	SB (34th St NW)	R	4.8	A	5.0	A		
	SB Overall (34th St NW)		**5.6**	**A**	**6.2**	**A**	**0.6**	**Pass**
	Overall		**11.0**	**B**	**11.2**	**B**	**0.2**	**Pass**
2	**M Street NW & Wisconsin Avenue NW (Signalized)**							
	EB (M St NW)	LTR	24.5	C	24.8	C		
	EB Overall (M St NW)		**24.5**	**C**	**24.8**	**C**	**0.3**	**Pass**
	WB (M St NW)	T	22.5	C	22.5	C		
	WB (M St NW)	R	2.4	A	2.4	A		
	WB Overall (M St NW)		**16.9**	**B**	**16.9**	**B**	**0.0**	**Pass**
	NB (Wisconsin Ave NW)	L	51.7	D	52.5	D		
	NB (Wisconsin Ave NW)	LTR	49.5	D	53.6	D		
	NB Overall (Wisconsin Ave NW)		**50.2**	**D**	**53.4**	**D**	**3.2**	**Pass**
	SB (Wisconsin Ave NW)	L	67.0	E	68.0	E		
	SB (Wisconsin Ave NW)	LTR	55.3	E	57.1	E		
	SB Overall (Virginia Ave NW)		**59.2**	**E**	**60.7**	**E**	**1.5**	**Pass**
	Overall		**33.7**	**C**	**35.1**	**D**	**1.4**	**Pass**
3	**M Street NW & 31st Street NW (Signalized)**							
	EB (M St NW)	LTR	11.4	B	11.3	B		
	EB (M St NW)	TR	-	-	-	-		
	EB (M St NW)	LT	-	-	-	-		
	EB (M St NW)	R	-	-	-	-		
	EB Overall (M St NW)		**11.4**	**B**	**11.3**	**B**	**-0.1**	**Pass**
	WB (M St NW)	LTR	9.6	A	9.6	A		
	WB Overall (M St NW)		**9.6**	**A**	**9.6**	**A**	**0.0**	**Pass**
	NB (31st St NW)	LTR	29.1	C	29.3	C		
	NB Overall (31st St NW)		**29.1**	**C**	**29.3**	**C**	**0.2**	**Pass**
	SB (31st St NW)	LTR	32.9	C	32.9	C		
	SB Overall (31st St NW)		**32.9**	**C**	**32.9**	**C**	**0.0**	**Pass**
	Overall		**12.6**	**B**	**12.7**	**B**	**0.1**	**Pass**

TABLE 5-16. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES AM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**							
	EB (Water St NW)	LT	10.5	B	13.6	B		
	EB Overall (Water St NW)		**10.5**	**B**	**13.6**	**B**	**3.1**	**Pass**
	WB (K St NW)	T	11.1	B	12.9	B		
	WB (K St NW)	R	9.9	A	10.7	B		
	WB Overall (K St)		**10.5**	**B**	**11.9**	**B**	**1.4**	**Pass**
	SB (Wisconsin Ave NW)	L	17.5	C	21.7	C		
	SB (Wisconsin Ave NW)	R	9.0	A	10.0	A		
	SB Overall (Wisconsin Ave NW)		**15.0**	**B**	**18.1**	**C**	**3.1**	**Pass**
	Overall		**12.9**	**B**	**15.1**	**C**	**2.2**	**Pass**
5	**K Street NW & 31st Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.6	A	9.8	A		
	EB (K St NW)	T	20.0	C	25.4	D		
	EB (K St NW)	R	8.3	A	8.5	A		
	EB Overall (K St NW)		**19.3**	**C**	**24.4**	**C**	**5.1**	**Pass**
	WB (K St NW)	L	9.3	A	9.5	A		
	WB (K St NW)	TR	25.8	D	36.9	E		
	WB Overall (K St NW)		**25.7**	**D**	**36.7**	**E**	**11.0**	**Fail**
	NB (31st St NW)	LTR	11.8	B	12.2	B		
	NB Overall (31st St NW)		**11.8**	**B**	**12.2**	**B**	**0.4**	**Pass**
	SB (31st St NW)	LT	12.4	B	12.9	B		
	SB (31st St NW)	R	9.6	A	10.0	A		
	SB Overall (31st St NW)		**11.8**	**B**	**12.3**	**B**	**0.5**	**Pass**
	Overall		**21.4**	**C**	**29.0**	**D**	**7.6**	**Pass**
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.1	A	9.2	A		
	EB (K St NW)	T	10.6	B	11.1	B		
	EB (K St NW)	TR	7.4	A	7.6	A		
	EB Overall (K St NW)		**9.0**	**A**	**9.3**	**A**	**0.3**	**Pass**
	WB (K St NW)	L	8.6	A	8.6	A		
	WB (K St NW)	T	18.7	A	23.2	A		
	WB (K St NW)	R	8.6	A	8.7	A		
	WB Overall (K St NW)		**15.5**	**C**	**18.9**	**C**	**3.4**	**Pass**
	NB (Washington Harbour)	LTR	10.0	A	10.2	B		
	NB Overall (Washington Harbour)		**10.0**	**A**	**10.2**	**B**	**0.2**	**Pass**
	SB (Thomas Jefferson St NW)	LTR	10.2	B	10.4	B		
	SB Overall (Thomas Jefferson St NW)		**10.2**	**B**	**10.4**	**B**	**0.2**	**Pass**
	Overall		**12.8**	**B**	**14.8**	**B**	**2.0**	**Pass**

TABLE 5-16. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES AM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
7	**K Street NW & 30th Street NW (AWSC) [a]**							
	EB (K St NW)	T	20.5	C	24.4	C		
	EB (K St NW)	TR	14.1	B	15.8	C		
	EB Overall (K St NW)		**18.2**	**C**	**21.2**	**C**	**3.0**	**Pass**
	WB (K St NW)	L	11.5	B	12.1	B		
	WB (K St NW)	T	32.4	D	44.0	E		
	WB (K St NW)	T	16.1	C	19.6	C		
	WB Overall (K St NW)		**23.4**	**C**	**30.4**	**D**	**7.0**	**Pass**
	NB (30th St NW)	LTR	13.7	B	14.5	B		
	NB Overall (30th St NW)		**13.7**	**B**	**14.5**	**B**	**0.8**	**Pass**
	SB (30th St NW)	LT	19.2	C	20.8	C		
	SB (30th St NW)	R	12.2	B	12.9	B		
	SB Overall (30th St NW)		**16.9**	**C**	**18.2**	**C**	**1.3**	**Pass**
	Overall		**20.7**	**C**	**25.4**	**D**	**4.7**	**Pass**
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**							
	EB (K St NW)	L	11.0	B	11.0	B		
	EB (K St NW)	T	14.5	B	15.3	C		
	EB (K St NW)	TR	9.9	A	10.2	B		
	EB Overall (K St NW)		**12.1**	**B**	**12.6**	**B**	**0.5**	**Pass**
	WB (K St NW)	LTR	66.1	F	66.6	F		
	WB Overall (K St NW)		**66.1**	**F**	**66.6**	**F**	**0.5**	**Pass**
	WB (Rock Creek Pkwy SB Off-ramp)	TR	17.2	C	17.6	C		
	WB Overall (Rock Creek Pkwy SB Off-ramp)		**17.2**	**C**	**17.6**	**C**	**0.4**	**Pass**
	SB (29th St NW)	LTR	11.6	B	11.7	B		
	SB Overall (29th Street NW)		**11.6**	**B**	**11.7**	**B**	**0.1**	**Pass**
	Overall		**36.2**	**E**	**36.9**	**E**	**0.7**	**Pass**

TABLE 5-16. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES AM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**							
	EB (K St NW)	TR	295.1	F	354.8	F		
	EB Overall (K St NW)		**295.1**	**F**	**354.8**	**F**	**59.7**	**Fail**
	EB (Whitehurst Fwy EB Off-ramp)	TR	66.7	E	66.7	E		
	EB Overall (Whitehurst Fwy EB Off-ramp)		**66.7**	**E**	**66.7**	**E**	**0.0**	**Pass**
	WB (K St NW)	L	243.8	F	243.8	F		
	WB (K St NW)	T	6.1	A	6.2	A		
	WB (K St NW)	R	6.7	A	6.7	A		
	WB Overall (K St NW)		**59.3**	**E**	**58.3**	**E**	**-1.0**	**Pass**
	NB (27th St NW)	L	51.0	D	52.4	D		
	NB (27th St NW)	R	1.1	A	1.1	A		
	NB (27th St NW)	TR	-	-	-	-		
	NB Overall (27th St NW)		**42.3**	**D**	**43.9**	**D**	**1.6**	**Pass**
	SB (Rock Creek Pkwy NB Off-ramp)	R	-	-	-	-		
	SB Overall (Rock Creek Pkwy NB Off-ramp)		-	-	-	-		
	Overall		**74.8**	**E**	**81.0**	**F**	**6.2**	**Fail**
10	**I Street NW & 27th Street NW (Signalized)**							
	EB (I St NW)	T	115.7	F	115.7	F		
	EB Overall (I St NW)		**115.7**	**F**	**115.7**	**F**	**0.0**	**Pass**
	NB (27th St NW)	R	21.1	C	21.1	C		
	NB Overall (27th St NW)		**21.1**	**C**	**21.1**	**C**	**0.0**	**Pass**
	SB (27th St NW)	L	20.7	C	21.4	C		
	SB (27th St NW)	T	31.5	C	31.5	C		
	SB (27th St NW)	TR	-	-	-	-		
	SB (27th St NW)	R	-	-	-	-		
	SB Overall (27th St NW)		**28.3**	**C**	**28.4**	**C**	**0.1**	**Pass**
	Overall		**75.5**	**E**	**75.3**	**E**	**-0.2**	**Pass**
11	**Virginia Avenue NW & 27th Street NW (Signalized)**							
	EB (Virginia Ave NW)	LT	13.3	B	13.3	B		
	EB Overall (Virginia Ave NW)		**13.3**	**B**	**13.3**	**B**	**0.0**	**Pass**
	WB (Virginia Ave NW)	T	-	-	-	-		
	WB (Virginia Ave NW)	R	0.2	A	0.2	A		
	WB Overall (Virginia Ave NW)		**0.2**	**A**	**0.2**	**A**	**0.0**	**Pass**
	SB (27th St NW)	L	4.9	A	4.9	A		
	SB (27th St NW)	LR	-	-	-	-		
	SB Overall (27th St NW)		**4.9**	**A**	**4.9**	**A**	**0.0**	**Pass**
	Overall		**9.3**	**A**	**9.3**	**A**	**0.0**	**Pass**

TABLE 5-16. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES AM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized) [b]**							
	EB (Virginia Avenue NW)	L	-	-	-	-		
	EB (Virginia Avenue NW)	T	-	-	-	-		
	EB Overall (F St NW)		-	-	-	-	-	-
	Overall		-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**							
	EB (Thompson Boat Center)	R	22.0	C	23.1	C		
	EB (Thompson Boat Center)	L	-	-	-	-		
	EB (Thompson Boat Center)	LTR	-	-	-	-		
	EB Overall (Thompson Boat Center)		**22.0**	**C**	**23.1**	**C**	**1.1**	**Pass**
	WB (Virginia Ave NW)	TR	-	-	-	-		
	WB (Virginia Ave NW)	R	-	-	-	-		
	WB Overall (Virginia Ave NW)		-	-	-	-		
	NB (Rock Creek Pkwy)	LT	-	-	-	-		
	NB (Rock Creek Pkwy)	R	-	-	-	-		
	NB (Rock Creek Pkwy)	T	-	-	-	-		
	NB Overall (Rock Creek Pkwy)		-	-	-	-		
	SB (Rock Creek Pkwy)	L	1.8	A	1.8	A		
	SB (Rock Creek Pkwy)	T	17.6	B	17.7	B		
	SB (Rock Creek Pkwy)	LT	-	-	-	-		
	SB (Rock Creek Pkwy)	R	1.3	A	1.3	A		
	SB Overall (Rock Creek Pkwy)		**9.5**	**A**	**9.6**	**A**	**0.1**	**Pass**
	Overall		**9.5**	**A**	**9.7**	**A**	**0.2**	**Pass**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

TABLE 5-17. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES PM PEAK HOUR CAPACITY ANALYSIS

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
1	**M Street NW & 34th Street NW (Signalized)**							
	EB (M St NW)	TR	6.4	A	6.4	A		
	EB Overall (M St NW)		**6.4**	**A**	**6.4**	**A**	**0.0**	**Pass**
	WB (M St NW)	LT	16.2	B	16.3	B		
	WB Overall (M St NW)		**16.2**	**B**	**16.3**	**B**	**0.1**	**Pass**
	NB (34th St NW)	LTR	43.2	D	43.2	D		
	NB Overall (34th St NW)		**43.2**	**D**	**43.2**	**D**	**0.0**	**Pass**
	SB (34th St NW)	LT	42.5	D	43.6	D		
	SB (34th St NW)	R	36.0	D	36.1	D		
	SB Overall (34th St NW)		**36.1**	**D**	**36.3**	**D**	**0.2**	**Pass**
	Overall		**18.2**	**B**	**18.3**	**B**	**0.1**	**Pass**
2	**M Street NW & Wisconsin Avenue NW (Signalized)**							
	EB (M St NW)	LTR	14.0	B	13.9	B		
	EB Overall (M St NW)		**14.0**	**B**	**13.9**	**B**	**-0.1**	**Pass**
	WB (M St NW)	T	23.1	C	23.1	C		
	WB (M St NW)	R	8.7	A	8.7	A		
	WB Overall (M St NW)		**19.3**	**B**	**19.3**	**B**	**0.0**	**Pass**
	NB (Wisconsin Ave NW)	L	57.1	E	57.8	E		
	NB (Wisconsin Ave NW)	LTR	53.1	D	53.6	D		
	NB Overall (Wisconsin Ave NW)		**54.4**	**D**	**55.0**	**E**	**0.6**	**Fail**
	SB (Wisconsin Ave NW)	L	73.7	E	85.1	F		
	SB (Wisconsin Ave NW)	LTR	35.0	D	82.5	F		
	SB Overall (Virginia Ave NW)		**48.2**	**D**	**83.3**	**F**	**35.1**	**Fail**
	Overall		**30.5**	**C**	**40.9**	**D**	**10.4**	**Pass**
3	**M Street NW & 31st Street NW (Signalized)**							
	EB (M St NW)	LTR	-	-	-	-		
	EB (M St NW)	TR	6.7	A	6.6	A		
	EB (M St NW)	LT	-	-	-	-		
	EB (M St NW)	R	-	-	-	-		
	EB Overall (M St NW)		**6.7**	**A**	**6.6**	**A**	**-0.1**	**Pass**
	WB (M St NW)	LTR	8.5	A	8.5	A		
	WB Overall (M St NW)		**8.5**	**A**	**8.5**	**A**	**0.0**	**Pass**
	NB (31st St NW)	LTR	42.3	D	42.6	D		
	NB Overall (31st St NW)		**42.3**	**D**	**42.6**	**D**	**0.3**	**Pass**
	SB (31st St NW)	LTR	35.5	D	35.5	D		
	SB Overall (31st St NW)		**35.5**	**D**	**35.5**	**D**	**0.0**	**Pass**
	Overall		**13.2**	**B**	**13.2**	**B**	**0.0**	**Pass**

TABLE 5-17. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES PM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**							
	EB (Water St NW)	LT	15.2	C	22.7	C		
	EB Overall (Water St NW)		**15.2**	**C**	**22.7**	**C**	**7.5**	**Pass**
	WB (K St NW)	T	10.0	A	12.1	B		
	WB (K St NW)	R	9.6	A	10.9	B		
	WB Overall (K St)		**9.8**	**A**	**11.5**	**B**	**1.7**	**Pass**
	SB (Wisconsin Ave NW)	L	12.9	B	14.6	B		
	SB (Wisconsin Ave NW)	R	8.9	A	11.6	B		
	SB Overall (Wisconsin Ave NW)		**11.7**	**B**	**13.1**	**B**	**1.4**	**Pass**
	Overall		**12.4**	**B**	**16.0**	**C**	**3.6**	**Pass**
5	**K Street NW & 31st Street NW (AWSC) [a]**							
	EB (K St NW)	L	10.2	B	10.6	B		
	EB (K St NW)	T	19.4	C	29.6	D		
	EB (K St NW)	R	8.5	A	8.7	A		
	EB Overall (K St NW)		**17.6**	**C**	**26.3**	**D**	**8.7**	**Pass**
	WB (K St NW)	L	10.2	B	10.5	B		
	WB (K St NW)	TR	16.9	C	22.6	C		
	WB Overall (K St NW)		**16.2**	**C**	**21.4**	**C**	**5.2**	**Pass**
	NB (31st St NW)	LTR	10.3	B	10.9	B		
	NB Overall (31st St NW)		**10.3**	**B**	**10.9**	**B**	**0.6**	**Pass**
	SB (31st St NW)	LT	12.7	B	13.6	B		
	SB (31st St NW)	R	9.7	A	10.3	B		
	SB Overall (31st St NW)		**11.9**	**B**	**12.7**	**B**	**0.8**	**Pass**
	Overall		**16.1**	**C**	**22.3**	**C**	**6.2**	**Pass**
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.4	A	9.5	A		
	EB (K St NW)	T	10.5	B	11.6	B		
	EB (K St NW)	TR	9.2	A	9.6	A		
	EB Overall (K St NW)		**9.9**	**A**	**10.7**	**B**	**0.8**	**Pass**
	WB (K St NW)	L	8.9	A	9.0	A		
	WB (K St NW)	T	12.6	A	14.4	A		
	WB (K St NW)	R	8.8	A	9.0	A		
	WB Overall (K St NW)		**11.0**	**B**	**12.3**	**B**	**1.3**	**Pass**
	NB (Washington Harbour)	LTR	10.1	B	10.5	B		
	NB Overall (Washington Harbour)		**10.1**	**B**	**10.5**	**B**	**0.4**	**Pass**
	SB (Thomas Jefferson St NW)	LTR	10.0	A	10.3	B		
	SB Overall (Thomas Jefferson St NW)		**10.0**	**A**	**10.3**	**B**	**0.3**	**Pass**
	Overall		**10.5**	**B**	**11.5**	**B**	**1.0**	**Pass**

TABLE 5-17. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES PM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
7	**K Street NW & 30th Street NW (AWSC) [a]**							
	EB (K St NW)	T	30.7	D	44.3	E		
	EB (K St NW)	TR	15.0	B	17.8	C		
	EB Overall (K St NW)		**25.3**	**D**	**34.7**	**D**	**9.4**	Pass
	WB (K St NW)	L	11.9	B	12.4	B		
	WB (K St NW)	T	15.3	C	17.7	C		
	WB (K St NW)	T	11.4	B	12.9	B		
	WB Overall (K St NW)		**13.2**	**B**	**15.1**	**C**	**1.9**	Pass
	NB (30th St NW)	LTR	13.4	B	15.0	B		
	NB Overall (30th St NW)		**13.4**	**B**	**15.0**	**B**	**1.6**	Pass
	SB (30th St NW)	LT	20.3	C	22.7	C		
	SB (30th St NW)	R	12.4	B	13.4	B		
	SB Overall (30th St NW)		**17.5**	**C**	**19.4**	**C**	**1.9**	Pass
	Overall		**19.3**	**C**	**24.3**	**C**	**5.0**	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**							
	EB (K St NW)	L	10.5	B	10.9	B		
	EB (K St NW)	T	20.9	C	26.7	D		
	EB (K St NW)	TR	11.4	B	13.1	B		
	EB Overall (K St NW)		**15.6**	**C**	**19.2**	**C**	**3.6**	Pass
	WB (K St NW)	TR	17.8	C	22.6	C		
	WB Overall (K St NW)		**17.8**	**C**	**22.6**	**C**	**4.8**	Pass
	WB (Rock Creek Pkwy SB Off-ramp)	TR	10.0	A	10.4	B		
	WB Overall (Rock Creek Pkwy SB Off-ramp)		**10.0**	**A**	**10.4**	**B**	**0.4**	Pass
	SB (29th St NW)	LTR	12.9	B	13.6	B		
	SB Overall (29th Street NW)		**12.9**	**B**	**13.6**	**B**	**0.7**	Pass
	Overall		**15.6**	**C**	**19.1**	**C**	**3.5**	Pass

TABLE 5-17. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES PM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**							
	EB (K St NW)	TR	334.5	F	402.5	F		
	EB Overall (K St NW)		**334.5**	**F**	**402.5**	**F**	**68.0**	**Fail**
	EB (Whitehurst Fwy EB Off-ramp)	TR	58.7	E	58.7	E		
	EB Overall (Whitehurst Fwy EB Off-ramp)		**58.7**	**E**	**58.7**	**E**	**0.0**	**Pass**
	WB (K St NW)	L	56.9	E	58.5	E		
	WB (K St NW)	T	2.4	A	2.4	A		
	WB (K St NW)	R	3.9	A	3.9	A		
	WB Overall (K St NW)		**22.3**	**C**	**22.8**	**C**	**0.5**	**Pass**
	NB (27th St NW)	L	54.7	D	58.4	E		
	NB (27th St NW)	R	-	-	-	-		
	NB (27th St NW)	TR	24.3	C	24.3	C		
	NB Overall (27th St NW)		**46.4**	**D**	**50.4**	**D**	**4.0**	**Pass**
	SB (Rock Creek Pkwy NB Off-ramp)	R	0.1	A	0.1	A		
	SB Overall (Rock Creek Pkwy NB Off-ramp)		**0.1**	**A**	**0.1**	**A**	**0.0**	**Pass**
	Overall		**84.2**	**F**	**102.1**	**F**	**17.9**	**Fail**
10	**I Street NW & 27th Street NW (Signalized)**							
	EB (I St NW)	T	24.0	C	24.0	C		
	EB Overall (I St NW)		**24.0**	**C**	**24.0**	**C**	**0.0**	**Pass**
	NB (27th St NW)	R	1.2	A	1.2	A		
	NB Overall (27th St NW)		**1.2**	**A**	**1.2**	**A**	**0.0**	**Pass**
	SB (27th St NW)	L	24.4	C	27.0	C		
	SB (27th St NW)	T	-	-	-	-		
	SB (27th St NW)	TR	15.9	B	16.3	B		
	SB (27th St NW)	R	6.2	A	6.2	A		
	SB Overall (27th St NW)		**17.4**	**B**	**18.8**	**B**	**1.4**	**Pass**
	Overall		**16.4**	**B**	**17.7**	**B**	**1.3**	**Pass**
11	**Virginia Avenue NW & 27th Street NW (Signalized)**							
	EB (Virginia Ave NW)	LT	12.3	B	12.3	B		
	EB Overall (Virginia Ave NW)		**12.3**	**B**	**12.3**	**B**	**0.0**	**Pass**
	WB (Virginia Ave NW)	T	16.7	B	16.7	B		
	WB (Virginia Ave NW)	R	7.6	A	7.6	A		
	WB Overall (Virginia Ave NW)		**15.7**	**B**	**15.7**	**B**	**0.0**	**Pass**
	SB (27th St NW)	L	-	-	-	-		
	SB (27th St NW)	LR	15.2	B	15.1	B		
	SB Overall (27th St NW)		**15.2**	**B**	**15.1**	**B**	**-0.1**	**Pass**
	Overall		**15.1**	**B**	**15.1**	**B**	**0.0**	**Pass**

TABLE 5-17. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES PM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized) [b]**							
	EB (Virginia Avenue NW)	L	-	-	-	-		
	EB (Virginia Avenue NW)	T	-	-	-	-		
	EB Overall (F St NW)		-	-	-	-		
	Overall		-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**							
	EB (Thompson Boat Center)	R	-	-	-	-		
	EB (Thompson Boat Center)	L	22.8	C	22.8	C		
	EB (Thompson Boat Center)	LTR	-	-	-	-		
	EB Overall (Thompson Boat Center)		**22.8**	**C**	**22.8**	**C**	**0.0**	**Pass**
	WB (Virginia Ave NW)	TR	-	-	-	-		
	WB (Virginia Ave NW)	R	1.2	A	1.3	A		
	WB Overall (Virginia Ave NW)		**1.2**	**A**	**1.3**	**A**	**0.1**	**Pass**
	NB (Rock Creek Pkwy)	LT	20.1	C	21.6	C		
	NB (Rock Creek Pkwy)	R	6.4	A	6.4	A		
	NB (Rock Creek Pkwy)	T	-	-	-	-		
	NB Overall (Rock Creek Pkwy)		**19.0**	**B**	**20.4**	**C**	**1.4**	**Pass**
	SB (Rock Creek Pkwy)	L	-	-	-	-		
	SB (Rock Creek Pkwy)	T	-	-	-	-		
	SB (Rock Creek Pkwy)	LT	-	-	-	-		
	SB (Rock Creek Pkwy)	R	-	-	-	-		
	SB Overall (Rock Creek Pkwy)		-	-	-	-	-	-
	Overall		**10.9**	**B**	**11.7**	**B**	**0.8**	**Pass**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

TABLE 5-18. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES SATURDAY PEAK HOUR CAPACITY ANALYSIS

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
1	**M Street NW & 34th Street NW (Signalized)**							
	EB (M St NW)	TR	6.9	A	6.9	A		
	EB Overall (M St NW)		**6.9**	**A**	**6.9**	**A**	**0.0**	**Pass**
	WB (M St NW)	LT	10.5	B	10.6	B		
	WB Overall (M St NW)		**10.5**	**B**	**10.6**	**B**	**0.1**	**Pass**
	NB (34th St NW)	LTR	0.1	A	0.1	A		
	NB Overall (34th St NW)		**0.1**	**A**	**0.1**	**A**	**0.0**	**Pass**
	SB (34th St NW)	LT	45.5	D	47.7	D		
	SB (34th St NW)	R	33.5	C	33.7	C		
	SB Overall (34th St NW)		**34.2**	**C**	**34.8**	**C**	**0.6**	**Pass**
	Overall		**14.2**	**B**	**14.4**	**B**	**0.2**	**Pass**
2	**M Street NW & Wisconsin Avenue NW (Signalized)**							
	EB (M St NW)	LTR	19.3	B	19.7	B		
	EB Overall (M St NW)		**19.3**	**B**	**19.7**	**B**	**0.4**	**Pass**
	WB (M St NW)	T	34.1	C	34.0	C		
	WB (M St NW)	R	5.9	A	5.9	A		
	WB Overall (M St NW)		**27.9**	**C**	**27.8**	**C**	**-0.1**	**Pass**
	NB (Wisconsin Ave NW)	L	52.1	D	53.7	D		
	NB (Wisconsin Ave NW)	LTR	50.4	D	51.4	D		
	NB Overall (Wisconsin Ave NW)		**51.0**	**D**	**52.2**	**D**	**1.2**	**Pass**
	SB (Wisconsin Ave NW)	L	49.4	D	49.8	D		
	SB (Wisconsin Ave NW)	LTR	39.5	D	40.6	D		
	SB Overall (Virginia Ave NW)		**42.8**	**D**	**43.7**	**D**	**0.9**	**Pass**
	Overall		**31.2**	**C**	**31.9**	**C**	**0.7**	**Pass**
3	**M Street NW & 31st Street NW (Signalized)**							
	EB (M St NW)	LTR	-	-	-	-		
	EB (M St NW)	TR	-	-	-	-		
	EB (M St NW)	LT	6.5	A	6.6	A		
	EB (M St NW)	R	39.1	D	38.1	D		
	EB Overall (M St NW)		**10.0**	**B**	**10.0**	**A**	**0.0**	**Pass**
	WB (M St NW)	LTR	6.3	A	6.3	A		
	WB Overall (M St NW)		**6.3**	**A**	**6.3**	**A**	**0.0**	**Pass**
	NB (31st St NW)	LTR	53.4	D	54.8	D		
	NB Overall (31st St NW)		**53.4**	**D**	**54.8**	**D**	**1.4**	**Pass**
	SB (31st St NW)	LTR	59.9	E	59.9	E		
	SB Overall (31st St NW)		**59.9**	**E**	**59.9**	**E**	**0.0**	**Pass**
	Overall		**14.5**	**B**	**14.8**	**B**	**0.3**	**Pass**

TABLE 5-18. COMPARISON NO-ACTION AND ACTION ALTERNATIVES SATURDAY PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC) [a]**							
	EB (Water St NW)	LT	13.1	B	23.0	C		
	EB Overall (Water St NW)		**13.1**	**B**	**23.0**	**C**	**9.9**	**Pass**
	WB (K St NW)	T	11.4	B	15.9	C		
	WB (K St NW)	R	9.5	A	10.4	B		
	WB Overall (K St)		**10.5**	**B**	**14.0**	**B**	**3.5**	**Pass**
	SB (Wisconsin Ave NW)	L	13.7	B	16.0	C		
	SB (Wisconsin Ave NW)	R	9.6	A	11.5	B		
	SB Overall (Wisconsin Ave NW)		**12.1**	**B**	**14.0**	**B**	**1.9**	**Pass**
	Overall		**11.8**	**B**	**16.9**	**C**	**5.1**	**Pass**
5	**K Street NW & 31st Street NW (AWSC) [a]**							
	EB (K St NW)	L	10.0	A	10.7	B		
	EB (K St NW)	T	19.2	C	40.0	E		
	EB (K St NW)	R	8.6	A	9.1	A		
	EB Overall (K St NW)		**18.1**	**C**	**36.8**	**E**	**18.7**	**Fail**
	WB (K St NW)	L	10.3	B	10.9	B		
	WB (K St NW)	TR	20.7	C	44.5	E		
	WB Overall (K St NW)		**19.6**	**C**	**41.5**	**E**	**21.9**	**Fail**
	NB (31st St NW)	LTR	10.4	B	11.4	B		
	NB Overall (31st St NW)		**10.4**	**B**	**11.4**	**B**	**1.0**	**Pass**
	SB (31st St NW)	LT	12.8	B	14.4	B		
	SB (31st St NW)	R	10.1	B	11.2	B		
	SB Overall (31st St NW)		**11.8**	**B**	**13.2**	**B**	**1.4**	**Pass**
	Overall		**17.4**	**C**	**34.8**	**D**	**17.4**	**Pass**
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**							
	EB (K St NW)	L	9.8	A	10.0	A		
	EB (K St NW)	T	13.4	B	17.2	C		
	EB (K St NW)	TR	10.4	B	11.4	B		
	EB Overall (K St NW)		**12.1**	**B**	**14.7**	**B**	**2.6**	**Pass**
	WB (K St NW)	L	9.8	A	10.1	B		
	WB (K St NW)	T	21.2	A	39.6	A		
	WB (K St NW)	R	9.1	A	9.5	A		
	WB Overall (K St NW)		**17.0**	**C**	**30.4**	**D**	**13.4**	**Pass**
	NB (Washington Harbour)	LTR	11.8	B	12.6	B		
	NB Overall (Washington Harbour)		**11.8**	**B**	**12.6**	**B**	**0.8**	**Pass**
	SB (Thomas Jefferson St NW)	LTR	10.6	B	11.2	B		
	SB Overall (Thomas Jefferson St NW)		**10.6**	**B**	**11.2**	**B**	**0.6**	**Pass**
	Overall		**14.6**	**B**	**22.6**	**C**	**8.0**	**Pass**

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TABLE 5-18. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES SATURDAY PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
7	**K Street NW & 30th Street NW (AWSC) [a]**							
	EB (K St NW)	T	30.1	D	59.9	F		
	EB (K St NW)	TR	15.0	B	18.1	C		
	EB Overall (K St NW)		**24.9**	**C**	**45.6**	**E**	**20.7**	**Fail**
	WB (K St NW)	L	11.8	B	12.3	B		
	WB (K St NW)	T	20.1	C	28.7	D		
	WB (K St NW)	T	13.1	B	16.7	C		
	WB Overall (K St NW)		**16.2**	**C**	**22.0**	**C**	**5.8**	**Pass**
	NB (30th St NW)	LTR	13.5	B	14.8	B		
	NB Overall (30th St NW)		**13.5**	**B**	**14.8**	**B**	**1.3**	**Pass**
	SB (30th St NW)	LT	16.4	C	18.2	C		
	SB (30th St NW)	R	12.5	B	13.6	B		
	SB Overall (30th St NW)		**14.8**	**B**	**16.3**	**C**	**1.5**	**Pass**
	Overall		**19.1**	**C**	**30.2**	**D**	**11.1**	**Pass**
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**							
	EB (K St NW)	L	10.6	B	10.6	B		
	EB (K St NW)	T	18.4	C	23.2	C		
	EB (K St NW)	TR	10.7	B	12.0	B		
	EB Overall (K St NW)		**14.4**	**B**	**17.3**	**C**	**2.9**	**Pass**
	WB (K St NW)	TR	66.2	F	67.4	F		
	WB Overall (K St NW)		**66.2**	**F**	**67.4**	**F**	**1.2**	**Pass**
	WB (Rock Creek Pkwy SB Off-ramp)	LTR	12.3	B	12.7	B		
	WB Overall (Rock Creek Pkwy SB Off-ramp)		**12.3**	**B**	**12.7**	**B**	**0.4**	**Pass**
	SB (29th St NW)	LTR	11.5	B	11.8	B		
	SB Overall (29th Street NW)		**11.5**	**B**	**11.8**	**B**	**0.3**	**Pass**
	Overall		**33.9**	**D**	**36.3**	**E**	**2.4**	**Fail**

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TABLE 5-18. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES SATURDAY PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
9	K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)							
	EB (K St NW)	TR	247.2	F	380.0	F		
	EB Overall (K St NW)		**247.2**	**F**	**380.0**	**F**	**132.8**	**Fail**
	EB (Whitehurst Fwy EB Off-ramp)	TR	24.3	C	24.3	C		
	EB Overall (Whitehurst Fwy EB Off-ramp)		**24.3**	**C**	**24.3**	**C**	**0.0**	**Pass**
	WB (K St NW)	L	52.8	D	54.7	D		
	WB (K St NW)	T	3.4	A	3.5	A		
	WB (K St NW)	R	4.2	A	4.2	A		
	WB Overall (K St NW)		**18.0**	**B**	**18.5**	**B**	**0.5**	**Pass**
	NB (27th St NW)	L	47.1	D	52.3	D		
	NB (27th St NW)	R	-	-	-	-		
	NB (27th St NW)	TR	0.5	A	0.5	A		
	NB Overall (27th St NW)		**34.3**	**C**	**40.6**	**D**	**6.3**	**Pass**
	SB (Rock Creek Pkwy NB Off-ramp)	R	0.1	A	0.1	A		
	SB Overall (Rock Creek Pkwy NB Off-ramp)		**0.1**	**A**	**0.1**	**A**	**0.0**	**Pass**
	Overall		**57.0**	**E**	**86.1**	**F**	**29.1**	**Fail**
10	I Street NW & 27th Street NW (Signalized)							
	EB (I St NW)	T	25.3	C	25.9	C		
	EB Overall (I St NW)		**25.3**	**C**	**25.9**	**C**	**0.6**	**Pass**
	NB (27th St NW)	R	1.6	A	1.7	A		
	NB Overall (27th St NW)		**1.6**	**A**	**1.7**	**A**	**0.1**	**Pass**
	SB (27th St NW)	L	15.3	B	17.5	B		
	SB (27th St NW)	T	-	-	-	-		
	SB (27th St NW)	TR	15.8	B	15.5	B		
	SB (27th St NW)	R	7.3	A	7.4	A		
	SB Overall (27th St NW)		**13.6**	**B**	**14.3**	**B**	**0.7**	**Pass**
	Overall		**14.9**	**B**	**15.5**	**B**	**0.6**	**Pass**
11	Virginia Avenue NW & 27th Street NW (Signalized)							
	EB (Virginia Ave NW)	LT	7.6	A	7.6	A		
	EB Overall (Virginia Ave NW)		**7.6**	**A**	**7.6**	**A**	**0.0**	**Pass**
	WB (Virginia Ave NW)	T	7.9	A	7.9	A		
	WB (Virginia Ave NW)	R	3.2	A	3.2	A		
	WB Overall (Virginia Ave NW)		**6.9**	**A**	**6.9**	**A**	**0.0**	**Pass**
	SB (27th St NW)	L	23.3	C	23.8	C		
	SB (27th St NW)	LR	-	-	-	-		
	SB Overall (27th St NW)		**23.3**	**C**	**23.8**	**C**	**0.5**	**Pass**
	Overall		**11.2**	**B**	**11.3**	**B**	**0.1**	**Pass**

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TABLE 5-18. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVES SATURDAY PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Action - No Action	Check > 5 secs?
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized) [b]**							
	EB (Virginia Avenue NW)	L	-	-	-	-		
	EB (Virginia Avenue NW)	T	-	-	-	-		
	EB Overall (F St NW)		-	-	-	-		
	Overall		-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**							
	EB (Thompson Boat Center)	R	-	-	-	-		
	EB (Thompson Boat Center)	L	-	-	-	-		
	EB (Thompson Boat Center)	LTR	57.1	E	111.3	F		
	EB Overall (Thompson Boat Center)		**57.1**	**E**	**111.3**	**F**	**54.2**	**Fail**
	WB (Virginia Ave NW)	TR	251.8	F	278.1	F		
	WB (Virginia Ave NW)	R	144.8	F	158.0	F		
	WB Overall (Virginia Ave NW)		**198.0**	**F**	**218.6**	**F**	**20.6**	**Fail**
	NB (Rock Creek Pkwy)	LT	-	-	-	-		
	NB (Rock Creek Pkwy)	R	32.2	C	32.2	C		
	NB (Rock Creek Pkwy)	T	19.0	B	19.0	B		
	NB Overall (Rock Creek Pkwy)		**30.4**	**C**	**30.4**	**C**	**0.0**	**Pass**
	SB (Rock Creek Pkwy)	L	-	-	-	-		
	SB (Rock Creek Pkwy)	T	-	-	-	-		
	SB (Rock Creek Pkwy)	LT	75.1	E	82.4	F		
	SB (Rock Creek Pkwy)	R	0.0	A	0.0	A		
	SB Overall (Rock Creek Pkwy)		**74.1**	**E**	**81.0**	**F**	**6.9**	**Fail**
	Overall		**87.2**	**F**	**96.3**	**F**	**9.1**	**Fail**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

5.2.6.6 Alternative 1 Queuing Analysis

The results of the action alternative (alternative 1) queuing analysis for both signalized and unsignalized intersections are discussed in this section. DDOT requested that any increase in an already failing 95th percentile queue length of greater than 150 feet in the action alternative when compared to the no-action alternative be mitigated (see the DDOT scoping form [Attachment 1]); however, no-action alternative failing queue lengths exceeded this threshold.

The comparison of the no-action alternative and action alternative queuing analysis results are presented in tables 5-19, 5-20, and 5-21 for the weekday AM, weekday PM, and Saturday peak hours, respectively. This table presents specific details on the 50th and 95th percentile queue length values calculated for the study area intersections (unsignalized intersections only have 95th percentile queue lengths included as explained in Section 3.7.6). Note that the percentile values are expressed in feet and a car occupies about 25 linear feet of roadway, including the space between cars. Also note that the last two columns of the tables check for an increase in queue length of greater than 150 feet between the no-action alternative and the action alternative; mitigation is only required for those cells that fail if both conditions had a failing queue length or if the queue length fails as a result of the action alternative.

5.2.6.6.1 Signalized Intersection Queuing Analysis

Based on the Synchro™ queuing analysis, queue lengths exceeding the roadway storage capacity would occur at the same signalized intersections as the no-action alternative (except where noted as a new failure) as follows:

- Southbound at M Street and Wisconsin Avenue NW (Intersection #2) during the weekday AM and PM peak hours
- Eastbound and southbound at M and 31st Streets NW (Intersection #3) during the Saturday peak hour
- Eastbound and westbound at K Street NW/Whitehurst Freeway NW eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during the weekday AM and PM peak hours and Saturday peak hour
- Eastbound at I and 27th Streets NW (Intersection #10) during the weekday AM peak hour and southbound at the same intersection during the weekday AM and PM peak hours
- Northbound at Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13) during the weekday PM peak hour, and all directions at the same intersection during the Saturday peak hour **(new eastbound Saturday failure under the action alternative)**

The remaining signalized intersections in the study area would have acceptable queue lengths or would experience low levels of queuing. In summary, there would be one new failing signalized approach with unacceptable queue lengths under the action alternative compared to the no-action alternative.

5.2.6.6.2 Unsignalized Intersection Queuing Analysis

Based on the analysis, queue lengths exceeding the roadway storage capacity would occur at the same unsignalized intersections as the no-action alternative (except where noted as a new failure) as follows:

- Southbound at Water Street NW/K Street and Wisconsin Avenue NW (Intersection #4) during the weekday PM and Saturday peak hours (new weekday PM and Saturday failures under the action alternative)
- Westbound at K and 31st Streets NW (Intersection #5) during the weekday AM and Saturday peak hours (new weekday AM and Saturday failures under the action alternative)

- Eastbound and westbound at K Street NW and Washington Harbor/Thomas Jefferson Street NW (Intersection #6) during the Saturday peak hour (both new Saturday failures under the action alternative)
- Westbound at K and 30th Streets NW (Intersection #7) during the weekday AM peak hour (new weekday AM failure under the action alternative), eastbound and southbound at the same intersection during the weekday PM peak hour (both new weekday PM failures under the action alternative), and eastbound at the same intersection during the Saturday peak hour (new Saturday failure under the action alternative)
- Westbound at K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8) during the weekday AM and Saturday peak hours

The remaining unsignalized intersections in the study area would have acceptable queue lengths or would experience low levels of queuing. In summary, there would be six new failing unsignalized approaches with unacceptable queue lengths for at least one peak time period under the action alternative compared to the no-action alternative.

TABLE 5-19. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE AM PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
1	**M Street NW & 34th Street NW (Signalized)**								
	EB (M St NW)	TR	181	429	518	434	524	6	Pass
	WB (M St NW)	LT	437	76	98	77	99	1	Pass
	NB (34th St NW)	LTR	66	1	10	1	10	0	Pass
	SB (34th St NW)	LT	214	7	24	11	33	9	Pass
	SB (34th St NW)	R	214	16	56	18	58	2	Pass
2	**M Street NW & Wisconsin Avenue NW (Signalized)**								
	EB (M St NW)	LTR	577	254	304	257	308	4	Pass
	WB (M St NW)	T	382	125	170	125	170	0	Pass
	WB (M St NW)	R	382	22	35	22	35	0	Pass
	NB (Wisconsin Ave NW)	L	175	49	98	53	106	8	Pass
	NB (Wisconsin Ave NW)	LTR	867	50	82	87	131	49	Pass
	SB (Wisconsin Ave NW)	L	226	202	#349	205	#354	5	Pass
	SB (Wisconsin Ave NW)	LTR	226	191	#273	198	#286	13	Pass
3	**M Street NW & 31st Street NW (Signalized)**								
	EB (M St NW)	LTR	382	129	140	130	141	1	Pass
	EB (M St NW)	TR	-	-	-	-	-	-	-
	EB (M St NW)	LT	-	-	-	-	-	-	-
	EB (M St NW)	R	-	-	-	-	-	-	-
	WB (M St NW)	LTR	198	70	87	70	87	0	Pass
	NB (31st St NW)	LTR	878	32	67	34	70	3	Pass
	SB (31st St NW)	LTR	216	70	120	70	120	0	Pass
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC)** [a]								
	EB (Water St NW)	LT	942	-	15	-	45	30	Pass
	WB (K St NW)	T	434	-	28	-	43	15	Pass
	WB (K St NW)	R	300	-	25	-	28	3	Pass
	SB (Wisconsin Ave NW)	L	897	-	95	-	120	25	Pass
	SB (Wisconsin Ave NW)	R	25	-	18	-	23	5	Pass
5	**K Street NW & 31st Street NW (AWSC)** [a]								
	EB (K St NW)	L	100	-	3	-	3	0	Pass
	EB (K St NW)	T	387	-	120	-	160	40	Pass
	EB (K St NW)	R	25	-	3	-	3	0	Pass
	WB (K St NW)	L	100	-	0	-	0	0	Pass
	WB (K St NW)	TR	205	-	178	-	248	70	Pass
	NB (31st St NW)	LTR	71	-	0	-	0	0	Pass
	SB (31st St NW)	LT	878	-	18	-	20	2	Pass
	SB (31st St NW)	R	25	-	5	-	5	0	Pass

TABLE 5-19. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE AM PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**								
	EB (K St NW)	L	75	-	8	-	8	0	Pass
	EB (K St NW)	T	261	-	35	-	40	5	Pass
	EB (K St NW)	TR	25	-	20	-	23	3	Pass
	WB (K St NW)	L	100	-	3	-	3	0	Pass
	WB (K St NW)	T	274	-	140	-	185	45	Pass
	WB (K St NW)	R	274	-	25	-	25	0	Pass
	NB (Washington H)	LTR	249	-	8	-	8	0	Pass
	SB (Thomas J St NW)	LT	139	-	3	-	3	0	Pass
7	**K Street NW & 30th Street NW (AWSC) [a]**								
	EB (K St NW)	T	218	-	88	-	108	20	Pass
	EB (K St NW)	TR	218	-	33	-	43	10	Pass
	WB (K St NW)	L	100	-	10	-	13	3	Pass
	WB (K St NW)	T	212	-	185	-	235	50	Pass
	WB (K St NW)	T	212	-	100	-	128	28	Pass
	NB (30th St NW)	LTR	526	-	8	-	13	5	Pass
	SB (30th St NW)	LT	425	-	63	-	68	5	Pass
	SB (30th St NW)	R	25	-	18	-	20	3	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**								
	EB (K St NW)	L	100	-	5	-	5	0	Pass
	EB (K St NW)	T	268	-	60	-	68	8	Pass
	EB (K St NW)	TR	268	-	38	-	40	3	Pass
	WB (K St NW)	LTR	220	-	345	-	343	-3	Pass
	WB (RC Pkwy SB Off-ramp)	TR	484	-	70	-	73	3	Pass
	SB (29th St NW)	LTR	453	-	10	-	10	0	Pass
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**								
	EB (K St NW)	TR	236	~106	#184	~129	#213	29	Pass
	EB (W Fwy EB Off-ramp)	TR	657	~634	#786	~634	#786	0	Pass
	WB (K St NW)	L	185	~188	#336	~188	#336	0	Pass
	WB (K St NW)	T	707	40	63	43	68	5	Pass
	WB (K St NW)	R	370	67	90	67	90	0	Pass
	NB (27th St NW)	L	170	164	220	175	234	14	Pass
	NB (27th St NW)	R	272	0	1	0	1	0	Pass
	NB (27th St NW)	TR	-	-	-	-	-	-	-
	SB (RC Pkwy NB Off-ramp)	R	-	-	-	-	-	-	-

TABLE 5-19. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE AM PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
10	**I Street NW & 27th Street NW (Signalized)**								
	EB (I St NW)	T	48	~938	#1190	~938	#1190	0	Pass
	NB (27th St NW)	R	55	42	89	42	89	0	Pass
	SB (27th St NW)	L	100	82	151	89	160	9	Pass
	SB (27th St NW)	T	228	162	215	162	215	0	Pass
	SB (27th St NW)	TR	-	-	-	-	-	-	-
	SB (27th St NW)	R	-	-	-	-	-	-	-
11	**Virginia Avenue NW & 27th Street NW (Signalized)**								
	EB (Virginia Ave NW)	LT	105	123	145	123	145	0	Pass
	WB (Virginia Ave NW)	T	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	R	348	0	0	0	0	0	Pass
	SB (27th St NW)	L	55	11	14	11	14	0	Pass
	SB (27th St NW)	LR	-	-	-	-	-	-	-
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized)** [b]								-
	EB (Virginia Avenue NW)	L	-	-	-	-	-	-	-
	EB (Virginia Avenue NW)	T	-	-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**								
	EB (Thompson Boat Ctr)	R	113	0	4	12	33	29	Pass
	EB (Thompson Boat Ctr)	L	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	LTR	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	TR	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	R	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	R	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	L	257	0	22	0	22	0	Pass
	SB (Rock Creek Pkwy)	T	257	322	440	324	444	4	Pass
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	R	100	0	6	0	6	0	Pass

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

Red cells denote lane groups whose queuing length exceeds capacity.

TABLE 5-20. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE PM PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
1	**M Street NW & 34th Street NW (Signalized)**								
	EB (M St NW)	TR	181	134	168	136	170	2	Pass
	WB (M St NW)	LT	437	182	217	183	219	2	Pass
	NB (34th St NW)	LTR	66	18	46	18	46	0	Pass
	SB (34th St NW)	LT	214	7	23	12	34	11	Pass
	SB (34th St NW)	R	214	266	350	267	350	0	Pass
2	**M Street NW & Wisconsin Avenue NW (Signalized)**								
	EB (M St NW)	LTR	577	90	116	91	118	2	Pass
	WB (M St NW)	T	382	155	204	155	204	0	Pass
	WB (M St NW)	R	382	30	86	30	86	0	Pass
	NB (Wisconsin Ave NW)	L	175	105	179	108	184	5	Pass
	NB (Wisconsin Ave NW)	LTR	867	106	153	109	158	5	Pass
	SB (Wisconsin Ave NW)	L	226	154	#285	174	#327	42	Pass
	SB (Wisconsin Ave NW)	LTR	226	82	140	170	#290	150	Pass
3	**M Street NW & 31st Street NW (Signalized)**								
	EB (M St NW)	LTR	-	-	-	-	-	-	-
	EB (M St NW)	TR	382	81	89	75	m86	-3	Pass
	EB (M St NW)	LT	-	-	-	-	-	-	-
	EB (M St NW)	R	-	-	-	-	-	-	-
	WB (M St NW)	LTR	198	84	106	84	106	0	Pass
	NB (31st St NW)	LTR	878	112	186	115	191	5	Pass
	SB (31st St NW)	LTR	216	63	118	63	118	0	Pass
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC)** [a]								
	EB (Water St NW)	LT	942	-	83	-	143	60	Pass
	WB (K St NW)	T	434	-	20	-	35	15	Pass
	WB (K St NW)	R	300	-	28	-	33	5	Pass
	SB (Wisconsin Ave NW)	L	897	-	38	-	48	10	Pass
	SB (Wisconsin Ave NW)	R	25	-	10	-	35	25	Pass
5	**K Street NW & 31st Street NW (AWSC)** [a]								
	EB (K St NW)	L	100	-	10	-	10	0	Pass
	EB (K St NW)	T	387	-	115	-	190	75	Pass
	EB (K St NW)	R	25	-	3	-	3	0	Pass
	WB (K St NW)	L	100	-	8	-	8	0	Pass
	WB (K St NW)	TR	205	-	90	-	135	45	Pass
	NB (31st St NW)	LTR	71	-	3	-	3	0	Pass
	SB (31st St NW)	LT	878	-	23	-	25	2	Pass
	SB (31st St NW)	R	25	-	8	-	8	0	Pass

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TABLE 5-20. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE PM PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**								
	EB (K St NW)	L	75	-	10	-	10	0	Pass
	EB (K St NW)	T	261	-	30	-	43	13	Pass
	EB (K St NW)	TR	25	-	13	-	18	5	Pass
	WB (K St NW)	L	100	-	5	-	5	0	Pass
	WB (K St NW)	T	274	-	63	-	83	20	Pass
	WB (K St NW)	R	274	-	23	-	25	2	Pass
	NB (Washington H)	LTR	249	-	13	-	15	2	Pass
	SB (Thomas J St NW)	LT	139	-	5	-	5	0	Pass
7	**K Street NW & 30th Street NW (AWSC) [a]**								
	EB (K St NW)	T	218	-	168	-	228	60	Pass
	EB (K St NW)	TR	218	-	48	-	68	20	Pass
	WB (K St NW)	L	100	-	8	-	8	0	Pass
	WB (K St NW)	T	212	-	43	-	55	13	Pass
	WB (K St NW)	T	212	-	30	-	40	10	Pass
	NB (30th St NW)	LTR	526	-	18	-	28	10	Pass
	SB (30th St NW)	LT	425	-	75	-	85	10	Pass
	SB (30th St NW)	R	25	-	25	-	28	3	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**								
	EB (K St NW)	L	100	-	13	-	13	0	Pass
	EB (K St NW)	T	292	-	130	-	170	40	Pass
	EB (K St NW)	TR	292	-	68	-	85	18	Pass
	WB (K St NW)	LR	244	-	85	-	123	38	Pass
	WB (RC Pkwy SB Off-ramp)	TR	402	-	8	-	8	0	Pass
	SB (29th St NW)	LTR	513	-	8	-	8	0	Pass
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**								
	EB (K St NW)	TR	236	~295	#406	~342	#458	52	Pass
	EB (W Fwy EB Off-ramp)	TR	657	130	#242	130	#242	0	Pass
	WB (K St NW)	L	185	402	#626	409	#634	8	Pass
	WB (K St NW)	T	707	13	23	15	26	3	Pass
	WB (K St NW)	R	370	91	118	91	118	0	Pass
	NB (27th St NW)	L	170	44	76	56	91	15	Pass
	NB (27th St NW)	R	-	-	-	-	-	-	-
	NB (27th St NW)	TR	272	6	43	6	43	0	Pass
	SB (RC Pkwy NB Off-ramp)	R	144	0	0	0	0	0	Pass

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TABLE 5-20. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE PM PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
10	**I Street NW & 27th Street NW (Signalized)**								
	EB (I St NW)	T	48	6	20	6	20	0	Pass
	NB (27th St NW)	R	55	0	0	0	0	0	Pass
	SB (27th St NW)	L	100	237	#512	260	#548	36	Pass
	SB (27th St NW)	T	-	-	-	-	-	-	-
	SB (27th St NW)	TR	228	109	171	113	176	5	Pass
	SB (27th St NW)	R	228	0	83	0	83	0	Pass
11	**Virginia Avenue NW & 27th Street NW (Signalized)**								
	EB (Virginia Ave NW)	LT	105	29	43	29	43	0	Pass
	WB (Virginia Ave NW)	T	348	204	257	204	257	0	Pass
	WB (Virginia Ave NW)	R	50	21	49	21	49	0	Pass
	SB (27th St NW)	L	-	-	-	-	-	-	-
	SB (27th St NW)	LR	55	40	45	40	46	1	Pass
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized) [b]**								-
	EB (Virginia Avenue NW)	L	-	-	-	-	-	-	-
	EB (Virginia Avenue NW)	T	-	-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**								
	EB (Thompson Boat Ctr)	R	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	L	86	9	27	9	27	0	Pass
	EB (Thompson Boat Ctr)	LTR	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	TR	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	R	157	0	0	0	0	0	Pass
	NB (Rock Creek Pkwy)	LT	559	351	#571	364	#587	16	Pass
	NB (Rock Creek Pkwy)	R	559	27	51	27	51	0	Pass
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	L	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	R	-	-	-	-	-	-	-

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

Red cells denote lane groups whose queuing length exceeds capacity.

TABLE 5-21. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE SATURDAY PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
1	**M Street NW & 34th Street NW (Signalized)**								
	EB (M St NW)	TR	181	162	198	165	203	5	Pass
	WB (M St NW)	LT	437	78	98	80	101	3	Pass
	NB (34th St NW)	LTR	66	0	0	0	0	0	Pass
	SB (34th St NW)	LT	214	21	52	29	66	14	Pass
	SB (34th St NW)	R	214	164	227	165	228	1	Pass
2	**M Street NW & Wisconsin Avenue NW (Signalized)**								
	EB (M St NW)	LTR	86	132	168	138	176	8	Pass
	WB (M St NW)	T	302	176	232	176	232	0	Pass
	WB (M St NW)	R	302	16	54	16	55	1	Pass
	NB (Wisconsin Ave NW)	L	175	87	152	97	168	16	Pass
	NB (Wisconsin Ave NW)	LTR	867	88	132	97	143	11	Pass
	SB (Wisconsin Ave NW)	L	226	123	202	126	207	5	Pass
	SB (Wisconsin Ave NW)	LTR	226	100	152	105	158	6	Pass
3	**M Street NW & 31st Street NW (Signalized)**								
	EB (M St NW)	LTR	-	-	-	-	-	-	-
	EB (M St NW)	TR	-	-	-	-	-	-	-
	EB (M St NW)	LT	302	90	109	91	110	1	Pass
	EB (M St NW)	R	50	17	m#139	17	m#130	-9	Pass
	WB (M St NW)	LTR	198	102	131	102	132	1	Pass
	NB (31st St NW)	LTR	878	66	124	75	138	14	Pass
	SB (31st St NW)	LTR	216	97	#170	97	#170	0	Pass
4	**Water Street NW/K Street & Wisconsin Avenue NW (AWSC)** [a]								
	EB (Water St NW)	LT	942	-	53	-	143	90	Pass
	WB (K St NW)	T	434	-	35	-	75	40	Pass
	WB (K St NW)	R	300	-	23	-	25	2	Pass
	SB (Wisconsin Ave NW)	L	897	-	48	-	58	10	Pass
	SB (Wisconsin Ave NW)	R	25	-	20	-	33	13	Pass
5	**K Street NW & 31st Street NW (AWSC)** [a]								
	EB (K St NW)	L	100	-	5	-	5	0	Pass
	EB (K St NW)	T	387	-	105	-	238	133	Pass
	EB (K St NW)	R	25	-	3	-	3	0	Pass
	WB (K St NW)	L	100	-	8	-	8	0	Pass
	WB (K St NW)	TR	205	-	125	-	265	140	Pass
	NB (31st St NW)	LTR	71	-	3	-	3	0	Pass
	SB (31st St NW)	LT	878	-	25	-	28	3	Pass
	SB (31st St NW)	R	25	-	10	-	13	3	Pass

TABLE 5-21. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE SATURDAY PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
6	**K Street NW & Washington Harbour/Thomas Jefferson Street NW (AWSC) [a]**								
	EB (K St NW)	L	75	-	8	-	8	0	Pass
	EB (K St NW)	T	261	-	58	-	95	37	Pass
	EB (K St NW)	TR	25	-	23	-	33	10	Pass
	WB (K St NW)	L	100	-	13	-	13	0	Pass
	WB (K St NW)	T	274	-	148	-	275	127	Pass
	WB (K St NW)	R	274	-	23	-	23	0	Pass
	NB (Washington H)	LTR	249	-	28	-	30	2	Pass
	SB (Thomas J St NW)	LT	139	-	3	-	3	0	Pass
7	**K Street NW & 30th Street NW (AWSC) [a]**								
	EB (K St NW)	T	218	-	163	-	290	127	Pass
	EB (K St NW)	TR	218	-	48	-	68	20	Pass
	WB (K St NW)	L	100	-	10	-	10	0	Pass
	WB (K St NW)	T	212	-	90	-	143	53	Pass
	WB (K St NW)	T	212	-	58	-	85	27	Pass
	NB (30th St NW)	LTR	526	-	18	-	20	2	Pass
	SB (30th St NW)	LT	425	-	40	-	45	5	Pass
	SB (30th St NW)	R	25	-	20	-	23	3	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**								
	EB (K St NW)	L	100	-	5	-	5	0	Pass
	EB (K St NW)	T	292	-	108	-	150	42	Pass
	EB (K St NW)	TR	292	-	58	-	78	20	Pass
	WB (K St NW)	LTR	244	-	345	-	340	-5	Pass
	WB (RC Pkwy SB Off-ramp)	TR	464	-	20	-	20	0	Pass
	SB (29th St NW)	LTR	513	-	15	-	15	0	Pass
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**								
	EB (K St NW)	TR	236	~192	#291	~250	#355	64	Pass
	EB (W Fwy EB Off-ramp)	TR	657	117	180	117	180	0	Pass
	WB (K St NW)	L	185	200	#340	206	#352	12	Pass
	WB (K St NW)	T	707	19	33	23	39	6	Pass
	WB (K St NW)	R	370	62	85	62	85	0	Pass
	NB (27th St NW)	L	170	67	105	89	132	27	Pass
	NB (27th St NW)	R	-	-	-	-	-	-	-
	NB (27th St NW)	TR	272	0	0	0	0	0	Pass
	SB (RC Pkwy NB Off-ramp)	R	144	0	0	0	0	0	Pass

1

TABLE 5-21. COMPARISON OF NO-ACTION AND ACTION ALTERNATIVE SATURDAY PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Action - No Action	Check > 150 feet?
10	**I Street NW & 27th Street NW (Signalized)**								
	EB (I St NW)	T	48	162	243	173	259	16	Pass
	NB (27th St NW)	R	55	0	0	0	0	0	Pass
	SB (27th St NW)	L	100	72	200	91	231	31	Pass
	SB (27th St NW)	T	-	-	-	-	-	-	-
	SB (27th St NW)	TR	228	69	128	69	129	1	Pass
	SB (27th St NW)	R	228	0	79	0	81	2	Pass
11	**Virginia Avenue NW & 27th Street NW (Signalized)**								
	EB (Virginia Ave NW)	LT	105	29	37	31	38	1	Pass
	WB (Virginia Ave NW)	T	348	49	62	49	62	0	Pass
	WB (Virginia Ave NW)	R	50	0	21	0	21	0	Pass
	SB (27th St NW)	L	-	-	-	-	-	-	-
	SB (27th St NW)	LR	55	49	52	50	53	1	Pass
12	**Virginia Avenue NW/ Rock Creek Parkway SB Off-ramp (Unsignalized) [b]**								-
	EB (Virginia Avenue NW)	L	-	-	-	-	-	-	-
	EB (Virginia Avenue NW)	T	-	-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**								
	EB (Thompson Boat Ctr)	R	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	L	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	LTR	88	16	44	45	#130	86	Pass
	WB (Virginia Ave NW)	TR	133	~460	#668	~495	#708	40	Pass
	WB (Virginia Ave NW)	R	133	~275	#483	~295	#503	20	Pass
	NB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	R	557	397	498	397	498	0	Pass
	NB (Rock Creek Pkwy)	T	200	~275	#483	~295	#503	20	Pass
	SB (Rock Creek Pkwy)	L	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	LT	263	~399	#606	~423	#639	33	Pass
	SB (Rock Creek Pkwy)	R	100	0	0	0	0	0	Pass

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

Red cells denote lane groups whose queuing length exceeds capacity.

5.2.6.7 Traffic Summary for Alternative 1

Alternative 1 would provide definition of vehicular space where it is currently lacking at the end of Water Street NW in the project area. However, there would be increased traffic in the project area due to increased vehicle demand and trips and increased congestion caused by large vehicles operating in a small space. Within the secondary study area, additional operational failures created by the additional vehicular trips generated by the alternative would increase delay and queuing at several intersections.

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6.0 PROPOSED MITIGATIONS AND RECOMMENDATIONS BY MODE

To reduce impacts on the transportation system caused as a result of the action alternative, or alternative 1 with option, mitigation measures are proposed in this section for each mode of transportation analyzed if they are warranted. Because the development program and design of the zone will continue to evolve until a final development is proposed, recommendations are also suggested to further improve the design and operations during future site planning. Water Street improvements themselves would be completed by DDOT to provide enhanced bicycle and pedestrian facilities. Because NPS supports the Water Street improvement concept, Water Street improvements would be made by DDOT in close coordination with NPS and both parties would work to expedite the process and address right-of-way issues. The future developers of the individual facilities are likely to be a university or a non-profit.

In summary, traffic or vehicular mitigation is proposed at three intersections; other traffic recommendations are suggested at two intersections; and minor other improvements are recommended for pedestrians, bicycles, transit, trucks and buses, and parking.

6.1 Pedestrians

The action alternative would create additional development and amenities in the project area that would result in an increase in pedestrian traffic both within the project area and likely within the primary transportation study area because many project area users would need to walk at least some distance from their primary mode of transportation to the project area. The increase in pedestrians could cause increased congestion along the CCT and mixed-use trail within the project area at times. To accommodate pedestrians, a large portion of undeveloped areas outside of the cul-de-sac and Water Street NW would be prioritized for pedestrians as indicated by materials and signage. These pedestrian areas would include sidewalk improvements along Water Street and pedestrian plazas.

Therefore, accommodations have been made within the project area for pedestrians to the extent that existing constraints allow (e.g., Whitehurst Freeway columns cannot be moved), and no internal project area mitigations or recommendations for pedestrians are proposed. Outside of the project area, it is recommended that the future developer of the proposed action work with DDOT to study locations noted in the existing conditions analysis that do not meet ADA or DDOT, particularly those that lead to the nearest transit facilities. No external project area mitigations are proposed.

6.2 Bicycles

The implementation of the mixed-use trail connection between the CCT at the end of Water Street NW and the Georgetown Waterfront Trails and new development and amenities would draw additional cyclists to the project area and the larger bicycle study area. Because there is only limited space available for the mixed-use trail between the Whitehurst Freeway columns, the buildings, and the Water Street roadway, additional congestion on the mixed-use path from both pedestrians and bicyclists would be likely at times.

Although no bicycle mitigations are proposed within or outside of the project area, the following actions are recommended within the project area to ease bicycle congestion and reduce conflicts between bicyclists and pedestrians:

- Installation of signing or trail markings by the developer of the proposed action to guide use of the trail; for example, signing could remind cyclists to yield to pedestrians.
- Self-enforcement of posted signs and trail markings.
- Monitoring of the number and types of users that would travel through the project area by the developer in coordination with NPS and local volunteers, particularly from the point at which the

CCT narrows to 10 feet wide on the west to the edge of the project area on the east, to determine if additional guidance to users should be provided. For example, if there is heightened congestion and possibly unsafe conditions as a result of the volume of cyclists and pedestrians in the project area, it may be advisable to recommend that cyclists walk their bicycle for a portion of the mixed-use trail. These restrictions, implemented by NPS in coordination with the site developer, could be limited to certain hours to reduce the impact on bicyclists.

- Installation of bicycle parking facilities in the project area by the developer. If possible, covered bicycle parking is preferred.
- Designing the materials and transitions in the area west of the cul-de-sac to allow cyclists to easily transition to sharing the Water Street NW roadway with vehicles as an alternate route to reduce congestion on the mixed-use trail along Water/K Streets NW.

Outside of the project area, the following additional actions are recommended:

- Installation of bicycle route signs by NPS or DDOT to highlight the mixed-use trail along Water/K Streets NW and indicate how and where it connects to other local bicycle facilities, as recommended in the Georgetown Transportation Study (HNTB 2008).
- Within the primary transportation study area and the 1-mile surrounding area, the future developer of the proposed action should work with DDOT and with the appropriate entities to coordinate refinement of the K Street/Water Street concept plan and recommendations between the EA design and the design developed by DDOT and the Georgetown BID, implement the improvements noted in the Georgetown Transportation Study, identify and fund improvements to alleviate the gaps and barriers noted in the Existing Conditions bicycle section (Section 3.3.2), and continue work on the moveDC bicycle recommendations.

6.3 Transit

NPS employees are already encouraged to use transit when feasible, therefore no internal or external project area mitigations for transit are proposed. It is recommended that the developer(s) of the sites encourage visitors, facility users, and employees to take transit or non-automotive modes of transportation whenever possible.

6.4 Trucks and Buses

Implementation of the action alternative would affect access to the project area for trucks and reduced access for buses. Therefore, the following recommendations are suggested within the project area to alleviate adverse impacts from the changes created under the action alternative:

- Given the limited area to turn around, it is recommended the developers, in coordination with DDOT, post notices as far back on Water/K Streets NW as necessary to advise large trucks and buses not to proceed farther west because there is no area to safely turn around. The notices should note maximum size vehicle that can operate within the cul-de-sac.
- The developers of the sites should develop plans or guidelines for accommodating deliveries, trash trucks, and large vehicles and clearly communicate this information to all potential operators of such vehicles. This step includes developing protocols for how authorized vehicles access the area beyond the aqueduct and developing protocols for how vehicles may temporarily block access on the mixed-use trail (i.e., with flaggers and notice to trail users in both directions). The developers of the sites should also install signing to indicate locations within the project area that trucks may access outside of the Water Street NW roadway and cul-de-sac. Note restrictions

and requirements for accessing such areas if there are any (e.g., authorized access areas only, procedures for blocking portions of the mixed-use trail).

The following additional actions are recommended to further improve truck and bus operations near the project area or as a result of indirect effects of the proposed action:

- Determine the optimal location to load/unload high school and university students accessing the project area by school bus for weekday practices if the above recommendations in Section 5.2.4 are not adequate. This recommendation would be performed by the developer of the site in coordination with DDOT.
- Request DDOT study off-site bus parking locations to replace removed spaces on Water Street NW within the project area in coordination with other truck parking studies throughout the city.

6.5 Parking

Although not a parking mitigation, it is worthwhile to note that the project area temporary kayak storage facilities and cul-de-sac drop-off loop provide a creative solution for managing users bringing kayaks to the project area given the very limited parking. It is recommended that NPS and future facility operators within the study area clearly communicate the advantages and intended use patterns of the temporary storage facilities via posted signs, website information, and information provided at the docks and facility venues. It is also recommended that both NPS and future facility operators oversee the use of the short-term kayak storage lockers to ensure there is sufficient turnover for new users throughout operating hours.

Because of the decrease in parking within the project area, it is recommended that NPS and future operators of facilities developed in the project area coordinate with area parking garages to ensure there is sufficient off-street parking available nearby on weekends and other times as needed to meet user demand for the proposed facilities. These open and available parking facilities should be clearly communicated to the public in multiple ways to prevent users from circling the area to find parking. It is also recommended that NPS work with DDOT to enforce on-street parking restrictions and authorized vehicles only in designated areas, as well as monitor and redirect vehicles overextending reasonable use of the cul-de-sac. No specific parking mitigations are proposed.

6.6 Traffic

Based on agreements with DDOT in the scoping form (attachment 1 of appendix B), the study evaluated traffic improvements for intersections within the study area where the action alternative resulted in a failing intersection operation or failing queue to adhere to the scoping form requirements. These requirements included intersections that had level of service (LOS) degradation to LOS E or worse, an increase in vehicle delay greater than 5.0 seconds at an intersection operating with a failing LOS (LOS E or F), or failing queues with an increase in queue length of greater than 150 feet when compared to the no-action alternative required improvements. Ideas were identified by examining a range of options ranging from lane geometry adjustments (number of right-turning, through, and left-turning lanes), turning movement restrictions, turning lane extensions or additions, or adding a signal if warranted. Adjustments to the traffic signal timings (changing the amount of seconds when a green light is displayed for each movement) were also considered as a recommendation if the improvement addressed congestion at intersections.

Evaluated improvements were developed through an iterative process of testing the different improvement strategies, starting with the least intrusive strategies. If implemented, the roadway improvements would address the traffic operations at most failing study area intersections to a passing LOS, or if the intersection or intersection approach is already failing, the recommended improvements would result in equal to or better operations than under the no-action alternative. The recommended improvements also would result in no vehicle queues beyond the available storage capacity at most

intersections, or if beyond the available storage capacity, would be no greater than 150 feet longer than the queues measured under the no-action alternative.

To address failures in the action alternative, improvements were evaluated to determine the best possible solution, which includes balancing traffic improvements with other environmental concerns. Evaluated traffic improvements primarily focus on allowing intersections within the larger secondary transportation study area to operate acceptably. The ideal set of improvement yields the analysis results presented in sections 6.6.1, 6.6.2, and 6.6.3.

This section provides an overview of the signal warrant analysis conducted to determine if several unsignalized intersections should be mitigated with the introduction of a traffic signal (6.6.1), traffic operations and queuing analysis results of the evaluated improvements for those intersections, which did not meet the DDOT scoping form requirements (6.6.2 and 6.6.3), and proposed mitigations and recommendations for those intersections that required improvements to meet DDOT scoping form requirements (6.6.4 and 6.6.5).

All planned mitigations and recommendations would follow the American Association of State Highway Transportation Officials and DDOT requirements to ensure all vehicle, bicycle, and pedestrian movements are designed to the latest safety requirements.

6.6.1 Signal Warrant Analysis Procedure and Results

To determine if some of the unsignalized intersections might warrant the installation of a traffic signal, a signal warrant analysis was performed. A signal warrant analysis is a quantitative assessment based on traffic volumes and established standards to determine whether or not installing a traffic signal at a specific intersection is justified, or warranted. The signal warrant analysis was conducted following the guidelines from the *2009 Manual on Uniform Traffic Control Devices* (FHWA 2012). Only the peak hour warrant analysis was conducted as data for other warrant analyses was not available.

The peak hour warrant analysis following the *Manual on Uniform Traffic Control Devices* requires two categorical tests. If either of the tests passes, then the intersection meets the warrant. The first category (Warrant 3A) includes three tests: (1) a test of the delay under STOP-sign control; (2) a test of the minor street vehicle volume; and (3) a test of the total intersection volume. The intersection delay test determines if the intersection is under a STOP-control, the delay for the minor-street would exceed four vehicle-hours (number of vehicles in queue times approach vehicle delay) for one lane or five vehicle-hours for two-lanes. The minor street vehicle volume approach test determines whether or not the vehicle volume exceeds 100 vehicles for one lane or 150 vehicles per hour for two lanes. The test of the total intersection volume examines if the total volume entering the intersection exceeds 650 vehicles for a three-lane approach or 800 vehicles for a four-lane approach. The second categorical test (Warrant 3B) includes one test based on a plotted chart published in the *Manual on Uniform Traffic Control Devices* (figure 4C-3). The chart plots the highest minor street approach volume against the total major street approach volumes. If the plotted point falls higher than the appropriate curve (based on number of lanes for the major and minor approaches), the warrant is met.

Intersections #5, #7, and #8 along K Street NW are AWSC unsignalized intersections that have failing K Street approaches (LOS E or worse). These unsignalized intersections on K Street NW require improvements to meet acceptable operations thresholds. The following options were explored to improve operations:

- Change the intersection from AWSC to TWSC to allow K Street NW to no longer fail.
- If minor approaches are failing, perform signal warrant analysis to see if a signal is justified.
- If a signal is not warranted, recommend the intersection become TWSC (unless there are conditions that would cause safety issues if a TWSC intersection was implemented).
- If a signal is warranted, recommend a traffic signal be implemented at the intersection.

Based on the peak hour warrant analysis, two of the three unsignalized intersections would meet the warrant. Tables 6-1, 6-2, and 6-3 contain the peak hour warrant analysis results for the three unsignalized intersections examined. Figure 6-1 shows the *Manual on Uniform Traffic Control Devices* plotted graph with the three intersection points.

TABLE 6-1. INTERSECTION #5 – PEAK HOUR WARRANT ANALYSIS

#	Warrant	Results	Warrant Minimum Limit	Category Check	Overall Check
5	**K Street NW & 31st Street NW**				
	Warrant 3A1 – Total Stopping Time	21.9 hours	5 hours	Meets	
	Warrant 3A2 – Minor Street Volume	188 vehicles	150 vehicles	Meets	
	Warrant 3A3 – Total Entering Volume	1,208 vehicles	800 vehicles	Meets	
	Warrant 3B – Plotted Point Falls Above Curve	See Figure 6-2		Fails	Meets

TABLE 6-2. INTERSECTION #7 – PEAK HOUR WARRANT ANALYSIS

#	Warrant	Results	Warrant Minimum Limit	Category Check	Overall Check
7	**K Street NW & 30th Street NW**				
	Warrant 3A1 – Total Stopping Time	5.9 hours	5 hours	Meets	
	Warrant 3A2 – Minor Street Volume	231 vehicles	150 vehicles	Meets	
	Warrant 3A3 – Total Entering Volume	1,611 vehicles	800 vehicles	Meets	
	Warrant 3B – Plotted Point Falls Above Curve	See Figure 6-2		Fails	Meets

TABLE 6-3. INTERSECTION #8 – PEAK HOUR WARRANT ANALYSIS

#	Warrant	Results	Warrant Minimum Limit	Category Check	Overall Check
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW**				
	Warrant 3A1 – Total Stopping Time	5.4 hours	4 hours	Meets	
	Warrant 3A2 – Minor Street Volume	75 vehicles	100 vehicles	Fails	
	Warrant 3A3 – Total Entering Volume	1,611 vehicles	800 vehicles	Meets	
	Warrant 3B – Plotted Point Falls Above Curve	See Figure 6-2		Fails	Fails

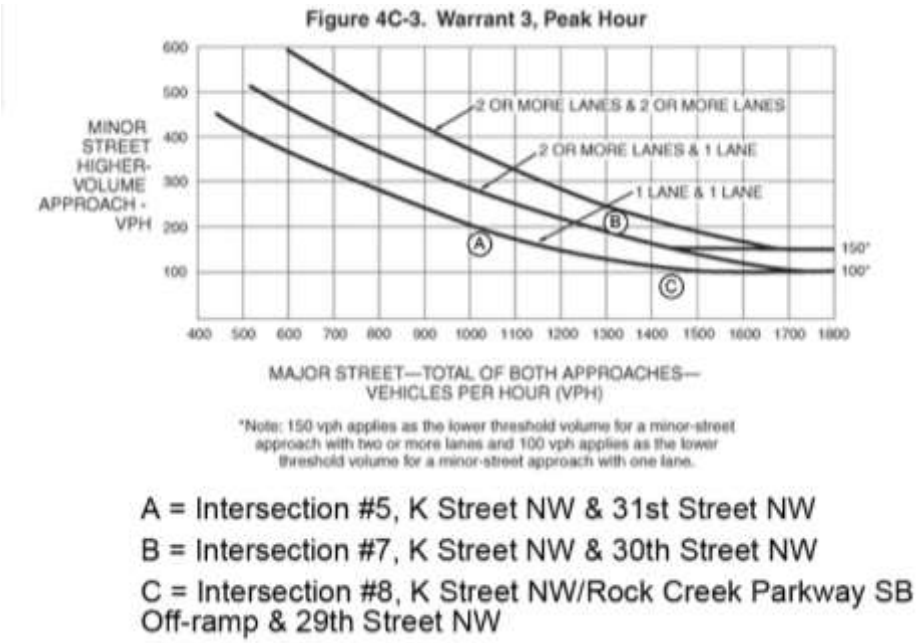


FIGURE 6-1. MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES WARRANT 3B – PEAK HOUR WARRANT (ALL INTERSECTIONS)

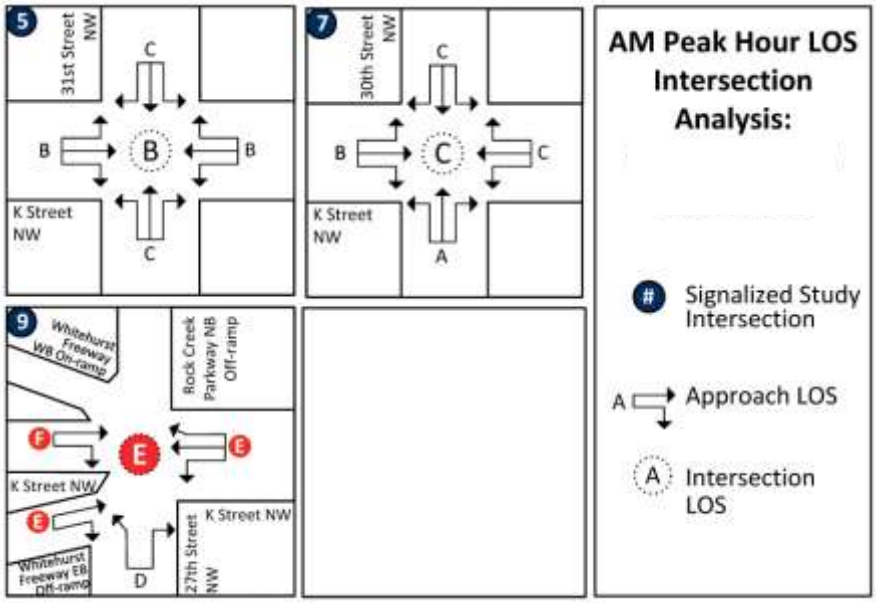
6.6.2 EVALUATED IMPROVEMENT (MITIGATION) CONDITION OPERATIONS ANALYSIS

Operation and queueing analysis was conducted for Intersections #2, #5, #7, #8, #9, and #13 to address the DDOT scoping form requirements described at the beginning of Section 6.6. These included Intersections #5, #7, and #9 during the AM peak hour, Intersections #2, #5, #7, and #9 during the PM peak hour, and Intersections #5, #7, #8, #9, and #13 during the Saturday peak hour. The improvements evaluated were as follows:

- Installation of a traffic signal at Intersections #5, #7, and #8
- Retiming of the traffic signal at Intersections #2 and #9
- Upgrade of the lane geometry for the westbound approach plus retime the traffic signal at Intersection #13

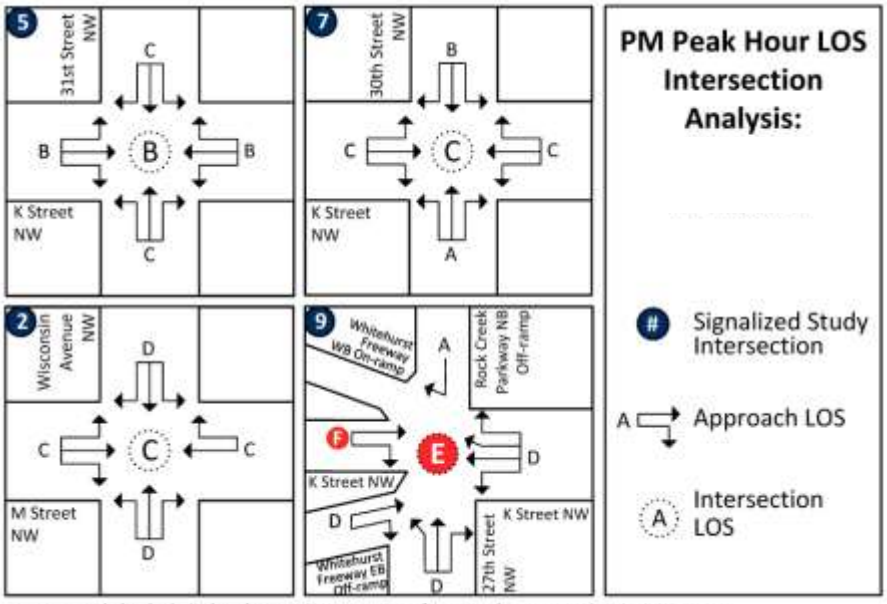
Based on the analysis, 1) the addition of new traffic signals at Intersections #5 and #7, 2) retiming at intersections #2 and #9, and 3) change in the westbound approach lane geometry and retiming of the traffic signal at Intersection #13 would improve the intersection operation and address the DDOT scoping form requirements. Intersections #5 and #7 also passed signal warrant analysis to justify the need for the traffic signals at these locations. The addition of a traffic signal at Intersections # 9 would not address the failing operations and this intersection also did not pass the signal warrant analysis.

The average LOS for the various approaches to the intersections and the overall intersection LOS grades for the evaluated improvements are depicted in figures 6-2, 6-3, and 6-4 for the weekday AM, weekday PM, and Saturday peak hours, respectively. Tables 6-4, 6-5, and 6-6 show a comparison between the no-action alternative, action alternative, and evaluated improvement (mitigation) condition operations results for the weekday AM, weekday PM, and Saturday peak hours, respectively.



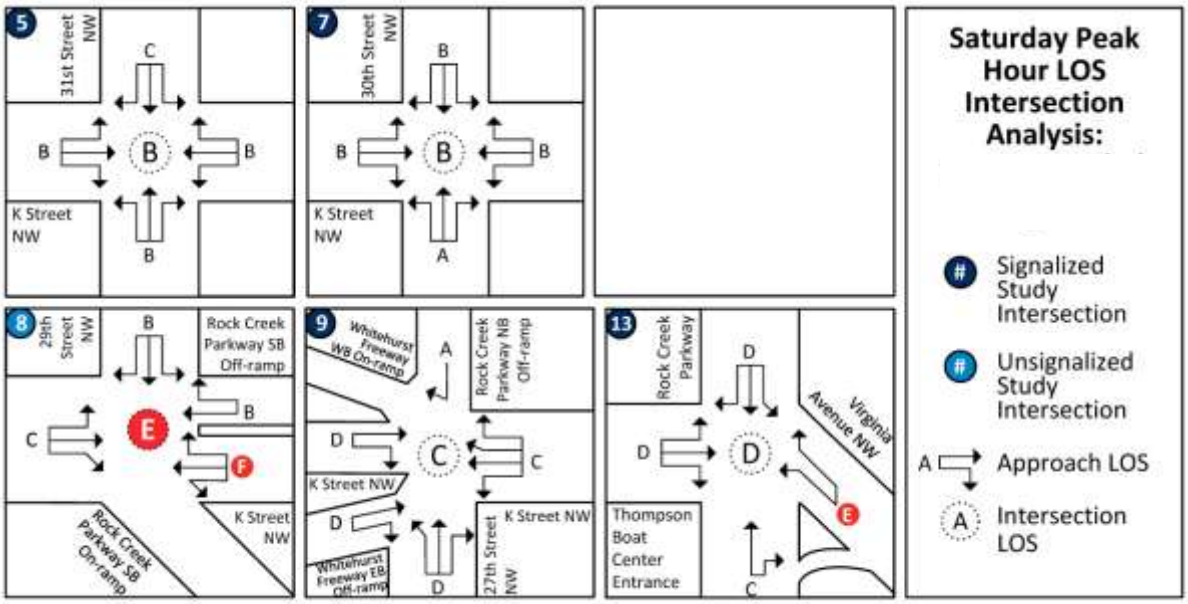
Note: Red shaded circles denote intersections/approaches operating at LOS E or F.

FIGURE 6-2. EVALUATED IMPROVEMENT (MITIGATION) CONDITION AM PEAK HOUR LEVEL OF SERVICE



Note: Red shaded circles denote intersections/approaches operating at LOS E or F.

FIGURE 6-3. EVALUATED IMPROVEMENT (MITIGATION) CONDITION PM PEAK HOUR LEVEL OF SERVICE



Note: Red shaded circles denote intersections/approaches operating at LOS E or F.

FIGURE 6-4. EVALUATED IMPROVEMENT (MITIGATION) CONDITION SATURDAY PEAK HOUR LEVEL OF SERVICE

TABLE 6-4. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) AM PEAK HOUR CAPACITY ANALYSIS

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
2	**M Street NW & Wisconsin Avenue NW (Signalized)**									
	EB (M St NW)	LTR	24.5	C	24.8	C	24.8	C		
	EB Overall (M St NW)		**24.5**	**C**	**24.8**	**C**	**24.8**	**C**	**0.3**	**Pass**
	WB (M St NW)	T	22.5	C	22.5	C	22.5	C		
	WB (M St NW)	R	2.4	A	2.4	A	2.4	A		
	WB Overall (M St NW)		**16.9**	**B**	**16.9**	**B**	**16.9**	**B**	**0.0**	**Pass**
	NB (Wisconsin Ave NW)	L	51.7	D	52.5	D	52.5	D		
	NB (Wisconsin Ave NW)	LTR	49.5	D	53.6	D	53.6	D		
	NB Overall (Wisconsin Ave NW)		**50.2**	**D**	**53.4**	**D**	**53.4**	**D**	**3.2**	**Pass**
	SB (Wisconsin Ave NW)	L	67.0	E	68.0	E	68.0	E		
	SB (Wisconsin Ave NW)	LTR	55.3	E	57.1	E	57.1	E		
	SB Overall (Virginia Ave NW)		**59.2**	**E**	**60.7**	**E**	**60.7**	**E**	**1.5**	**Pass**
	Overall		**33.7**	**C**	**35.1**	**D**	**35.1**	**D**	**1.4**	**Pass**
5	**K Street NW & 31st Street NW (AWSC) [a]**									
	EB (K St NW)	L	9.6	A	9.8	A	8.4	A		
	EB (K St NW)	T	20.0	C	25.4	D	11.2	B		
	EB (K St NW)	R	8.3	A	8.5	A	0.3	A		
	EB Overall (K St NW)		**19.3**	**C**	**24.4**	**C**	**10.8**	**B**	**-8.5**	**Pass**
	WB (K St NW)	L	9.3	A	9.5	A	8.0	A		
	WB (K St NW)	TR	25.8	D	36.9	E	12.3	B		
	WB Overall (K St NW)		**25.7**	**D**	**36.7**	**E**	**12.3**	**B**	**-13.4**	**Pass**
	NB (31st St NW)	LTR	11.8	B	12.2	B	26.0	C		
	NB Overall (31st St NW)		**11.8**	**B**	**12.2**	**B**	**26.0**	**C**	**14.2**	**Pass**
	SB (31st St NW)	LT	12.4	B	12.9	B	35.3	D		
	SB (31st St NW)	R	9.6	A	10.0	A	7.7	A		
	SB Overall (31st St NW)		**11.8**	**B**	**12.3**	**B**	**29.2**	**C**	**17.4**	**Pass**
	Overall		**21.4**	**C**	**29.0**	**D**	**13.5**	**B**	**-7.9**	**Pass**
7	**K Street NW & 30th Street NW (AWSC) [a]**									
	EB (K St NW)	T	20.5	C	24.4	C	-	-		
	EB (K St NW)	TR	14.1	B	15.8	C	18.2	B		
	EB Overall (K St NW)		**18.2**	**C**	**21.2**	**C**	**18.2**	**B**	**0.0**	**Pass**
	WB (K St NW)	L	11.5	B	12.1	B	19.3	B		
	WB (K St NW)	T	32.4	D	44.0	E	21.7	C		
	WB (K St NW)	T	16.1	C	19.6	C	-	-		
	WB Overall (K St NW)		**23.4**	**C**	**30.4**	**D**	**21.5**	**C**	**-1.9**	**Pass**
	NB (30th St NW)	LTR	13.7	B	14.5	B	9.5	A		
	NB Overall (30th St NW)		**13.7**	**B**	**14.5**	**B**	**9.5**	**A**	**-4.2**	**Pass**
	SB (30th St NW)	LT	19.2	C	20.8	C	25.6	C		
	SB (30th St NW)	R	12.2	B	12.9	B	10.4	B		
	SB Overall (30th St NW)		**16.9**	**C**	**18.2**	**C**	**20.7**	**C**	**3.8**	**Pass**
	Overall		**20.7**	**C**	**25.4**	**D**	**20.1**	**C**	**-0.6**	**Pass**

TABLE 6-4. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) AM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**									
	EB (K St NW)	L	11.0	B	11.0	B	11.0	B		
	EB (K St NW)	T	14.5	B	15.3	C	15.3	C		
	EB (K St NW)	TR	9.9	A	10.2	B	10.2	B		
	EB Overall (K St NW)		**12.1**	**B**	**12.6**	**B**	**12.6**	**B**	**0.5**	**Pass**
	WB (K St NW)	LTR	66.1	F	66.6	F	66.6	F		
	WB Overall (K St NW)		**66.1**	**F**	**66.6**	**F**	**66.6**	**F**	**0.5**	**Pass**
	WB (RC Pkwy SB Off-ramp)	TR	17.2	C	17.6	C	17.6	C		
	WB Overall (RC Pkwy SB Off-ramp)		**17.2**	**C**	**17.6**	**C**	**17.6**	**C**	**0.4**	**Pass**
	SB (29th St NW)	LTR	11.6	B	11.7	B	11.7	B		
	SB Overall (29th Street NW)		**11.6**	**B**	**11.7**	**B**	**11.7**	**B**	**0.1**	**Pass**
	Overall		**36.2**	**E**	**36.9**	**E**	**36.9**	**E**	**0.7**	**Pass**
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**									
	EB (K St NW)	TR	295.1	F	354.8	F	215.1	F		
	EB Overall (K St NW)		**295.1**	**F**	**354.8**	**F**	**215.1**	**F**	**-80.0**	**Pass**
	EB (Whitehurst Fwy EB Off-ramp)	TR	66.7	E	66.7	E	59.0	E		
	EB Overall (Whitehurst Fwy EB Off-ramp)		**66.7**	**E**	**66.7**	**E**	**59.0**	**E**	**-7.7**	**Pass**
	WB (K St NW)	L	243.8	F	243.8	F	243.8	F		
	WB (K St NW)	T	6.1	A	6.2	A	5.1	A		
	WB (K St NW)	R	6.7	A	6.7	A	5.5	A		
	WB Overall (K St NW)		**59.3**	**E**	**58.3**	**E**	**57.4**	**E**	**-1.9**	**Pass**
	NB (27th St NW)	L	51.0	D	52.4	D	63.1	E		
	NB (27th St NW)	R	1.1	A	1.1	A	1.9	A		
	NB (27th St NW)	TR	-	-	-	-	-	-		
	NB Overall (27th St NW)		**42.3**	**D**	**43.9**	**D**	**52.9**	**D**	**10.6**	**Pass**
	SB (RC Pkwy NB Off-ramp)	R	-	-	-	-	-	-		
	SB Overall (RC Pkwy NB Off-ramp)		-	-	-	-	-	-		
	Overall		**74.8**	**E**	**81.0**	**F**	**68.7**	**E**	**-6.1**	**Pass**

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TABLE 6-4. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) AM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**									
	EB (Thompson Boat Center)	R	22.0	C	23.1	C	23.1	C		
	EB (Thompson Boat Center)	L	-	-	-	-	-	-		
	EB (Thompson Boat Center)	LTR	-	-	-	-	-	-		
	EB Overall (Thompson Boat Center)		**22.0**	**C**	**23.1**	**C**	**23.1**	**C**	**1.1**	**Pass**
	WB (Virginia Ave NW)	TR/T (Mit)	-	-	-	-	-	-		
	WB (Virginia Ave NW)	R	-	-	-	-	-	-		
	WB Overall (Virginia Ave NW)		-	-	-	-	-	-		
	NB (Rock Creek Pkwy)	LT	-	-	-	-	-	-		
	NB (Rock Creek Pkwy)	R	-	-	-	-	-	-		
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-		
	NB Overall (Rock Creek Pkwy)		-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	L	1.8	A	1.8	A	1.8	A		
	SB (Rock Creek Pkwy)	T	17.6	B	17.7	B	17.7	B		
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	R	1.3	A	1.3	A	1.3	A		
	SB Overall (Rock Creek Pkwy)		**9.5**	**A**	**9.6**	**A**	**9.6**	**A**	**0.1**	**Pass**
	Overall		**9.5**	**A**	**9.7**	**A**	**9.7**	**A**	**0.2**	**Pass**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

Intersections #5 and #7 are signalized for the Mitigation Condition.

TABLE 6-5. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) PM PEAK HOUR CAPACITY ANALYSIS

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
2	**M Street NW & Wisconsin Avenue NW (Signalized)**									
	EB (M St NW)	LTR	14.0	B	13.9	B	25.7	C		
	EB Overall (M St NW)		**14.0**	**B**	**13.9**	**B**	**25.7**	**C**	**11.7**	**Pass**
	WB (M St NW)	T	23.1	C	23.1	C	28.0	C		
	WB (M St NW)	R	8.7	A	8.7	A	12.0	B		
	WB Overall (M St NW)		**19.3**	**B**	**19.3**	**B**	**23.7**	**C**	**4.4**	**Pass**
	NB (Wisconsin Ave NW)	L	57.1	E	57.8	E	51.5	D		
	NB (Wisconsin Ave NW)	LTR	53.1	D	53.6	D	48.6	D		
	NB Overall (Wisconsin Ave NW)		**54.4**	**D**	**55.0**	**E**	**49.6**	**D**	**-4.8**	**Pass**
	SB (Wisconsin Ave NW)	L	73.7	E	85.1	F	44.6	D		
	SB (Wisconsin Ave NW)	LTR	35.0	D	82.5	F	37.0	D		
	SB Overall (Virginia Ave NW)		**48.2**	**D**	**83.3**	**F**	**39.4**	**D**	**-8.8**	**Pass**
	Overall		**30.5**	**C**	**40.9**	**D**	**32.8**	**C**	**2.3**	**Pass**
5	**K Street NW & 31st Street NW (AWSC) [a]**									
	EB (K St NW)	L	10.2	B	10.6	B	12.5	B		
	EB (K St NW)	T	19.4	C	29.6	D	15.0	B		
	EB (K St NW)	R	8.5	A	8.7	A	3.1	A		
	EB Overall (K St NW)		**17.6**	**C**	**26.3**	**D**	**14.1**	**B**	**-3.5**	**Pass**
	WB (K St NW)	L	10.2	B	10.5	B	11.9	B		
	WB (K St NW)	TR	16.9	C	22.6	C	15.1	B		
	WB Overall (K St NW)		**16.2**	**C**	**21.4**	**C**	**14.8**	**B**	**-1.4**	**Pass**
	NB (31st St NW)	LTR	10.3	B	10.9	B	20.2	C		
	NB Overall (31st St NW)		**10.3**	**B**	**10.9**	**B**	**20.2**	**C**	**9.9**	**Pass**
	SB (31st St NW)	LT	12.7	B	13.6	B	31.9	C		
	SB (31st St NW)	R	9.7	A	10.3	B	12.9	B		
	SB Overall (31st St NW)		**11.9**	**B**	**12.7**	**B**	**26.5**	**C**	**14.6**	**Pass**
	Overall		**16.1**	**C**	**22.3**	**C**	**16.2**	**B**	**0.1**	**Pass**
7	**K Street NW & 30th Street NW (AWSC) [a]**									
	EB (K St NW)	T	30.7	D	44.3	E	-	-		
	EB (K St NW)	TR	15.0	B	17.8	C	29.2	C		
	EB Overall (K St NW)		**25.3**	**D**	**34.7**	**D**	**29.2**	**C**	**3.9**	**Pass**
	WB (K St NW)	L	11.9	B	12.4	B	27.7	C		
	WB (K St NW)	T	15.3	C	17.7	C	26.1	C		
	WB (K St NW)	T	11.4	B	12.9	B	-	-		
	WB Overall (K St NW)		**13.2**	**B**	**15.1**	**C**	**26.2**	**C**	**13.0**	**Pass**
	NB (30th St NW)	LTR	13.4	B	15.0	B	9.8	A		
	NB Overall (30th St NW)		**13.4**	**B**	**15.0**	**B**	**9.8**	**A**	**-3.6**	**Pass**
	SB (30th St NW)	LT	20.3	C	22.7	C	19.5	B		
	SB (30th St NW)	R	12.4	B	13.4	B	6.5	A		
	SB Overall (30th St NW)		**17.5**	**C**	**19.4**	**C**	**14.9**	**B**	**-2.6**	**Pass**
	Overall		**19.3**	**C**	**24.3**	**C**	**23.7**	**C**	**4.4**	**Pass**

TABLE 6-5. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) PM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**									
	EB (K St NW)	L	10.5	B	10.9	B	10.9	B		
	EB (K St NW)	T	20.9	C	26.7	D	26.7	D		
	EB (K St NW)	TR	11.4	B	13.1	B	13.1	B		
	EB Overall (K St NW)		**15.6**	**C**	**19.2**	**C**	**19.2**	**C**	**3.6**	**Pass**
	WB (K St NW)	TR	17.8	C	22.6	C	22.6	C		
	WB Overall (K St NW)		**17.8**	**C**	**22.6**	**C**	**22.6**	**C**	**4.8**	**Pass**
	WB (RC Pkwy SB Off-ramp)	TR	10.0	A	10.4	B	10.4	B		
	WB Overall (RC Pkwy SB Off-ramp)		**10.0**	**A**	**10.4**	**B**	**10.4**	**B**	**0.4**	**Pass**
	SB (29th St NW)	LTR	12.9	B	13.6	B	13.6	B		
	SB Overall (29th Street NW)		**12.9**	**B**	**13.6**	**B**	**13.6**	**B**	**0.7**	**Pass**
	Overall		**15.6**	**C**	**19.1**	**C**	**19.1**	**C**	**3.5**	**Pass**
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**									
	EB (K St NW)	TR	334.5	F	402.5	F	165.7	F		
	EB Overall (K St NW)		**334.5**	**F**	**402.5**	**F**	**165.7**	**F**	**-168.8**	**Pass**
	EB (Whitehurst Fwy EB Off-ramp)	TR	58.7	E	58.7	E	54.6	D		
	EB Overall (Whitehurst Fwy EB Off-ramp)		**58.7**	**E**	**58.7**	**E**	**54.6**	**D**	**-4.1**	**Pass**
	WB (K St NW)	L	56.9	E	58.5	E	148.5	F		
	WB (K St NW)	T	2.4	A	2.4	A	2.3	A		
	WB (K St NW)	R	3.9	A	3.9	A	3.7	A		
	WB Overall (K St NW)		**22.3**	**C**	**22.8**	**C**	**54.2**	**D**	**31.9**	**Pass**
	NB (27th St NW)	L	54.7	D	58.4	E	60.9	E		
	NB (27th St NW)	R	-	-	-	-	-	-		
	NB (27th St NW)	TR	24.3	C	24.3	C	25.0	C		
	NB Overall (27th St NW)		**46.4**	**D**	**50.4**	**D**	**52.5**	**D**	**6.1**	**Pass**
	SB (RC Pkwy NB Off-ramp)	R	0.1	A	0.1	A	0.1	A		
	SB Overall (RC Pkwy NB Off-ramp)		**0.1**	**A**	**0.1**	**A**	**0.1**	**A**	**0.0**	**Pass**
	Overall		**84.2**	**F**	**102.1**	**F**	**73.1**	**E**	**-11.1**	**Pass**

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TABLE 6-5. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) PM PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alternative		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**									
	EB (Thompson Boat Center)	R	-	-	-	-	-	-		
	EB (Thompson Boat Center)	L	22.8	C	22.8	C	22.8	C		
	EB (Thompson Boat Center)	LTR	-	-	-	-	-	-		
	EB Overall (Thompson Boat Center)		**22.8**	**C**	**22.8**	**C**	**22.8**	**C**	**0.0**	**Pass**
	WB (Virginia Ave NW)	TR/ T (Mit)	-	-	-	-	-	-		
	WB (Virginia Ave NW)	R	1.2	A	1.3	A	1.3	A		
	WB Overall (Virginia Ave NW)		**1.2**	**A**	**1.3**	**A**	**1.3**	**A**	**0.1**	**Pass**
	NB (Rock Creek Pkwy)	LT	20.1	C	21.6	C	21.6	C		
	NB (Rock Creek Pkwy)	R	6.4	A	6.4	A	6.4	A		
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-		
	NB Overall (Rock Creek Pkwy)		**19.0**	**B**	**20.4**	**C**	**20.4**	**C**	**1.4**	**Pass**
	SB (Rock Creek Pkwy)	L	-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	T	-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	R	-	-	-	-	-	-		
	SB Overall (Rock Creek Pkwy)		-	-	-	-	-	-	-	-
	Overall		**10.9**	**B**	**11.7**	**B**	**11.7**	**B**	**0.8**	**Pass**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

Intersections #5 and #7 are signalized for the Mitigation Condition.

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TABLE 6-6. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) SATURDAY PEAK HOUR CAPACITY ANALYSIS

#	Intersection and Approach	Lane Group	No Action Alterantive		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
2	**M Street NW & Wisconsin Avenue NW (Signalized)**									
	EB (M St NW)	LTR	19.3	B	19.7	B	19.7	B		
	EB Overall (M St NW)		**19.3**	**B**	**19.7**	**B**	**19.7**	**B**	**0.4**	**Pass**
	WB (M St NW)	T	34.1	C	34.0	C	34.0	C		
	WB (M St NW)	R	5.9	A	5.9	A	5.9	A		
	WB Overall (M St NW)		**27.9**	**C**	**27.8**	**C**	**27.8**	**C**	**-0.1**	**Pass**
	NB (Wisconsin Ave NW)	L	52.1	D	53.7	D	53.7	D		
	NB (Wisconsin Ave NW)	LTR	50.4	D	51.4	D	51.4	D		
	NB Overall (Wisconsin Ave NW)		**51.0**	**D**	**52.2**	**D**	**52.2**	**D**	**1.2**	**Pass**
	SB (Wisconsin Ave NW)	L	49.4	D	49.8	D	49.8	D		
	SB (Wisconsin Ave NW)	LTR	39.5	D	40.6	D	40.6	D		
	SB Overall (Virginia Ave NW)		**42.8**	**D**	**43.7**	**D**	**43.7**	**D**	**0.9**	**Pass**
	Overall		**31.2**	**C**	**31.9**	**C**	**31.9**	**C**	**0.7**	**Pass**
5	**K Street NW & 31st Street NW (AWSC) [a]**									
	EB (K St NW)	L	10.0	A	10.7	B	11.9	B		
	EB (K St NW)	T	19.2	C	40.0	E	15.0	B		
	EB (K St NW)	R	8.6	A	9.1	A	1.8	A		
	EB Overall (K St NW)		**18.1**	**C**	**36.8**	**E**	**14.3**	**B**	**-3.8**	**Pass**
	WB (K St NW)	L	10.3	B	10.9	B	12.0	B		
	WB (K St NW)	TR	20.7	C	44.5	E	16.1	B		
	WB Overall (K St NW)		**19.6**	**C**	**41.5**	**E**	**15.7**	**B**	**-3.9**	**Pass**
	NB (31st St NW)	LTR	10.4	B	11.4	B	17.6	B		
	NB Overall (31st St NW)		**10.4**	**B**	**11.4**	**B**	**17.6**	**B**	**7.2**	**Pass**
	SB (31st St NW)	LT	12.8	B	14.4	B	31.4	C		
	SB (31st St NW)	R	10.1	B	11.2	B	21.3	C		
	SB Overall (31st St NW)		**11.8**	**B**	**13.2**	**B**	**27.7**	**C**	**15.9**	**Pass**
	Overall		**17.4**	**C**	**34.8**	**D**	**17.0**	**B**	**-0.4**	**Pass**
7	**K Street NW & 30th Street NW (AWSC) [a]**									
	EB (K St NW)	T	30.1	D	59.9	F	-	-		
	EB (K St NW)	TR	15.0	B	18.1	C	20.0	B		
	EB Overall (K St NW)		**24.9**	**C**	**45.6**	**E**	**20.0**	**B**	**-4.9**	**Pass**
	WB (K St NW)	L	11.8	B	12.3	B	19.5	B		
	WB (K St NW)	T	20.1	C	28.7	D	19.9	B		
	WB (K St NW)	T	13.1	B	16.7	C	-	-		
	WB Overall (K St NW)		**16.2**	**C**	**22.0**	**C**	**19.8**	**B**	**3.6**	**Pass**
	NB (30th St NW)	LTR	13.5	B	14.8	B	9.2	A		
	NB Overall (30th St NW)		**13.5**	**B**	**14.8**	**B**	**9.2**	**A**	**-4.3**	**Pass**
	SB (30th St NW)	LT	16.4	C	18.2	C	24.3	C		
	SB (30th St NW)	R	12.5	B	13.6	B	7.9	A		
	SB Overall (30th St NW)		**14.8**	**B**	**16.3**	**C**	**17.6**	**B**	**2.8**	**Pass**
	Overall		**19.1**	**C**	**30.2**	**D**	**19.1**	**B**	**0.0**	**Pass**

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TABLE 6-6. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) SATURDAY PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alterantive		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**									
	EB (K St NW)	L	10.6	B	10.6	B	10.6	B		
	EB (K St NW)	T	18.4	C	23.2	C	23.2	C		
	EB (K St NW)	TR	10.7	B	12.0	B	12.0	B		
	EB Overall (K St NW)		**14.4**	**B**	**17.3**	**C**	**17.3**	**C**	**2.9**	**Pass**
	WB (K St NW)	LTR	66.2	F	67.4	F	67.4	F		
	WB Overall (K St NW)		**66.2**	**F**	**67.4**	**F**	**67.4**	**F**	**1.2**	**Pass**
	WB (RC Pkwy SB Off-ramp)	TR	12.3	B	12.7	B	12.7	B		
	WB Overall (RC Pkwy SB Off-ramp)		**12.3**	**B**	**12.7**	**B**	**12.7**	**B**	**0.4**	**Pass**
	SB (29th St NW)	LTR	11.5	B	11.8	B	11.8	B		
	SB Overall (29th Street NW)		**11.5**	**B**	**11.8**	**B**	**11.8**	**B**	**0.3**	**Pass**
	Overall		**33.9**	**D**	**36.3**	**E**	**36.3**	**E**	**2.4**	**Fail**
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**									
	EB (K St NW)	TR	247.2	F	380.0	F	44.9	D		
	EB Overall (K St NW)		**247.2**	**F**	**380.0**	**F**	**44.9**	**D**	**-202.3**	**Pass**
	EB (Whitehurst Fwy EB Off-ramp)	TR	24.3	C	24.3	C	47.8	D		
	EB Overall (Whitehurst Fwy EB Off-ramp)		**24.3**	**C**	**24.3**	**C**	**47.8**	**D**	**23.5**	**Pass**
	WB (K St NW)	L	52.8	D	54.7	D	77.2	E		
	WB (K St NW)	T	3.4	A	3.5	A	3.5	A		
	WB (K St NW)	R	4.2	A	4.2	A	4.2	A		
	WB Overall (K St NW)		**18.0**	**B**	**18.5**	**B**	**24.8**	**C**	**6.8**	**Pass**
	NB (27th St NW)	L	47.1	D	52.3	D	52.3	D		
	NB (27th St NW)	R	-	-	-	-	-	-		
	NB (27th St NW)	TR	0.5	A	0.5	A	0.6	A		
	NB Overall (27th St NW)		**34.3**	**C**	**40.6**	**D**	**40.7**	**D**	**6.4**	**Pass**
	SB (RC Pkwy NB Off-ramp)	R	0.1	A	0.1	A	0.1	A		
	SB Overall (RC Pkwy NB Off-ramp)		**0.1**	**A**	**0.1**	**A**	**0.1**	**A**	**0.0**	**Pass**
	Overall		**57.0**	**E**	**86.1**	**F**	**33.4**	**C**	**-23.6**	**Pass**

1

TABLE 6-6. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) SATURDAY PEAK HOUR CAPACITY ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	No Action Alterantive		Action Alternative		Mitigation		Delay Check (sec/vehicle)	
			Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Delay (sec/ veh)	LOS	Mitigation - No Action	Check > 5 secs?
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**									
	EB (Thompson Boat Center)	R	-	-	-	-	-	-		
	EB (Thompson Boat Center)	L	-	-	-	-	-	-		
	EB (Thompson Boat Center)	LTR	57.1	E	111.3	F	36.6	D		
	EB Overall (Thompson Boat Center)		**57.1**	**E**	**111.3**	**F**	**36.6**	**D**	**-20.5**	**Pass**
	WB (Virginia Ave NW)	TR/ T (Mit)	251.8	F	278.1	F	33.9	C		
	WB (Virginia Ave NW)	R	144.8	F	158.0	F	57.2	E		
	WB Overall (Virginia Ave NW)		**198.0**	**F**	**218.6**	**F**	**56.1**	**E**	**-141.9**	**Pass**
	NB (Rock Creek Pkwy)	LT	-	-	-	-	-	-		
	NB (Rock Creek Pkwy)	R	32.2	C	32.2	C	24.9	C		
	NB (Rock Creek Pkwy)	T	19.0	B	19.0	B	15.6	B		
	NB Overall (Rock Creek Pkwy)		**30.4**	**C**	**30.4**	**C**	**23.6**	**C**	**-6.8**	**Pass**
	SB (Rock Creek Pkwy)	L	-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	T	-	-	-	-	-	-		
	SB (Rock Creek Pkwy)	LT	75.1	E	82.4	F	50.6	D	-24.5	Pass
	SB (Rock Creek Pkwy)	R	0.0	A	0.0	A	1.3	A		
	SB Overall (Rock Creek Pkwy)		**74.1**	**E**	**81.0**	**F**	**49.7**	**D**		
	Overall		**87.2**	**F**	**96.3**	**F**	**41.6**	**D**	**-45.6**	**Pass**

Notes:

LOS = Level of Service

Delay is Measured in Seconds Per Vehicle

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

LTR = left/thru/right lanes

AWSC = All Way Stop Controlled intersection

[a] Highway Capacity Software 2010 results

[b] Highway Capacity Software does not support this intersection configuration

Red shaded areas denote intersections with LOS E or F

Intersections #5 and #7 are signalized for the Mitigation Condition.

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6.6.3 EVALUATED IMPROVEMENT (MITIGATION) CONDITION QUEUING ANALYSIS

The same intersections covering the same time periods evaluated in the operations analysis (Section 6.6.2) were evaluated for queue analysis. Based on the analysis, all improvements evaluated resulting in passing queueing analysis following the DDOT scoping form criteria. Tables 6-7, 6-8, and 6-9 show a comparison between the no-action alternative, action alternative, and evaluated improvement (mitigation) condition queuing results for the weekday AM, weekday PM, and Saturday peak hours, respectively. Only the intersections that failed the DDOT scoping form criteria (Intersections #2, #5, #7, #8, #9, and #13) are included in these tables.

TABLE 6-7. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) AM PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		Mitigation		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Mitigation - No Action	Check > 150 feet?
2	**M Street NW & Wisconsin Avenue NW (Signalized)**										
	EB (M St NW)	LTR	577	254	304	257	308	257	308	4	Pass
	WB (M St NW)	T	382	125	170	125	170	125	170	0	Pass
	WB (M St NW)	R	382	22	35	22	35	22	35	0	Pass
	NB (Wisconsin Ave NW)	L	175	49	98	53	106	53	106	8	Pass
	NB (Wisconsin Ave NW)	LTR	867	50	82	87	131	87	131	49	Pass
	SB (Wisconsin Ave NW)	L	226	202	#349	205	#354	205	#354	5	Pass
	SB (Wisconsin Ave NW)	LTR	226	191	#273	198	#286	198	#286	13	Pass
5	**K Street NW & 31st Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	3	-	3	4	13	10	Pass
	EB (K St NW)	T	387	-	120	-	160	134	187	67	Pass
	EB (K St NW)	R	25	-	3	-	3	0	1	-2	Pass
	WB (K St NW)	L	100	-	0	-	0	1	4	4	Pass
	WB (K St NW)	TR	205	-	178	-	248	173	242	64	Pass
	NB (31st St NW)	LTR	71	-	0	-	0	1	6	6	Pass
	SB (31st St NW)	LT	878	-	18	-	20	51	95	77	Pass
	SB (31st St NW)	R	25	-	5	-	5	0	16	11	Pass
7	**K Street NW & 30th Street NW (AWSC) [a]**										
	EB (K St NW)	T	218	-	88	-	108	97	117	30	Pass
	EB (K St NW)	TR	218	-	33	-	43	-	-	-	-
	WB (K St NW)	L	100	-	10	-	13	26	49	39	Pass
	WB (K St NW)	T	212	-	185	-	235	211	232	47	Pass
	WB (K St NW)	T	212	-	100	-	128	-	-	-	-
	NB (30th St NW)	LTR	526	-	8	-	13	6	25	18	Pass
	SB (30th St NW)	LT	425	-	63	-	68	96	139	77	Pass
	SB (30th St NW)	R	25	-	18	-	20	17	42	25	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	5	-	5	-	5	0	Pass
	EB (K St NW)	T	268	-	60	-	68	-	68	8	Pass
	EB (K St NW)	TR	268	-	38	-	40	-	40	3	Pass
	WB (K St NW)	LTR	220	-	345	-	343	-	343	-3	Pass
	WB (RC Pkwy SB Off-ramp)	TR	484	-	70	-	73	-	73	3	Pass
	SB (29th St NW)	LTR	453	-	10	-	10	-	10	0	Pass

TABLE 6-7. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) AM PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		Mitigation		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Mitigation - No Action	Check > 150 feet?
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**										
	EB (K St NW)	TR	236	~106	#184	~129	#213	~114	#198	14	Pass
	EB (W Fwy EB Off-ramp)	TR	657	~634	#786	~634	#786	~620	#772	-14	Pass
	WB (K St NW)	L	185	~188	#336	~188	#336	~188	#336	0	Pass
	WB (K St NW)	T	707	40	63	43	68	38	60	-3	Pass
	WB (K St NW)	R	370	67	90	67	90	59	80	-10	Pass
	NB (27th St NW)	L	170	164	220	175	234	181	#261	41	Pass
	NB (27th St NW)	R	272	0	1	0	1	0	4	3	Pass
	NB (27th St NW)	TR	-	-	-	-	-	-	-	-	-
	SB (RC Pkwy NB Off-ramp)	R	-	-	-	-	-	-	-	-	-
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**										
	EB (Thompson Boat Ctr)	R	113	0	4	12	33	12	33	29	Pass
	EB (Thompson Boat Ctr)	L	-	-	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	LTR	-	-	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	TR/ T (Mit)	-	-	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	R	-	-	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	R	-	-	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	L	257	0	22	0	22	0	22	0	Pass
	SB (Rock Creek Pkwy)	T	257	322	440	324	444	324	444	4	Pass
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	R	100	0	6	0	6	0	6	0	Pass

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

Red cells denote lane groups whose queuing length exceeds capacity.

Intersections #5 and #7 are signalized for the Mitigation Condition.

TABLE 6-8. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) PM PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		Mitigation		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Mitigation - No Action	Check > 150 feet?
2	**M Street NW & Wisconsin Avenue NW (Signalized)**										
	EB (M St NW)	LTR	577	90	116	91	118	123	159	43	Pass
	WB (M St NW)	T	382	155	204	155	204	168	221	17	Pass
	WB (M St NW)	R	382	30	86	30	86	65	114	28	Pass
	NB (Wisconsin Ave NW)	L	175	105	179	108	184	105	178	-1	Pass
	NB (Wisconsin Ave NW)	LTR	867	106	153	109	158	106	153	0	Pass
	SB (Wisconsin Ave NW)	L	226	154	#285	174	#327	152	240	-45	Pass
	SB (Wisconsin Ave NW)	LTR	226	82	140	170	#290	145	206	66	Pass
5	**K Street NW & 31st Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	10	-	10	20	40	30	Pass
	EB (K St NW)	T	387	-	115	-	190	169	224	109	Pass
	EB (K St NW)	R	25	-	3	-	3	0	9	6	Pass
	WB (K St NW)	L	100	-	8	-	8	13	29	21	Pass
	WB (K St NW)	TR	205	-	90	-	135	143	201	111	Pass
	NB (31st St NW)	LTR	71	-	3	-	3	4	18	15	Pass
	SB (31st St NW)	LT	878	-	23	-	25	63	107	84	Pass
	SB (31st St NW)	R	25	-	8	-	8	4	30	22	Pass
7	**K Street NW & 30th Street NW (AWSC) [a]**										
	EB (K St NW)	T	218	-	168	-	228	182	238	71	Pass
	EB (K St NW)	TR	218	-	48	-	68	-	-	-	-
	WB (K St NW)	L	100	-	8	-	8	16	42	35	Pass
	WB (K St NW)	T	212	-	43	-	55	101	141	99	Pass
	WB (K St NW)	T	212	-	30	-	40	-	-	-	-
	NB (30th St NW)	LTR	526	-	18	-	28	24	54	37	Pass
	SB (30th St NW)	LT	425	-	75	-	85	95	161	86	Pass
	SB (30th St NW)	R	25	-	25	-	28	17	47	22	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	13	-	13	-	13	0	Pass
	EB (K St NW)	T	292	-	130	-	170	-	170	40	Pass
	EB (K St NW)	TR	292	-	68	-	85	-	85	18	Pass
	WB (K St NW)	LR	244	-	85	-	123	-	123	38	Pass
	WB (RC Pkwy SB Off-ramp)	TR	402	-	8	-	8	-	8	0	Pass
	SB (29th St NW)	LTR	513	-	8	-	8	-	8	0	Pass

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TABLE 6-8. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) PM PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		Mitigation		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Mitigation - No Action	Check > 150 feet?
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**										
	EB (K St NW)	TR	236	~295	#406	~342	#458	~285	#400	-6	Pass
	EB (W Fwy EB Off-ramp)	TR	657	130	#242	130	#242	129	#237	-5	Pass
	WB (K St NW)	L	185	402	#626	409	#634	~523	#740	114	Pass
	WB (K St NW)	T	707	13	23	15	26	15	25	2	Pass
	WB (K St NW)	R	370	91	118	91	118	88	115	-3	Pass
	NB (27th St NW)	L	170	44	76	56	91	56	91	15	Pass
	NB (27th St NW)	R	-	-	-	-	-	-	-	-	-
	NB (27th St NW)	TR	272	6	43	6	43	6	44	1	Pass
	SB (RC Pkwy NB Off-ramp)	R	144	0	0	0	0	0	0	0	Pass
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**										
	EB (Thompson Boat Ctr)	R	-	-	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	L	86	9	27	9	27	9	27	0	Pass
	EB (Thompson Boat Ctr)	LTR	-	-	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	TR/ T (Mit)	-	-	-	-	-	-	-	-	-
	WB (Virginia Ave NW)	R	157	0	0	0	0	0	0	0	Pass
	NB (Rock Creek Pkwy)	LT	559	351	#571	364	#587	364	#587	16	Pass
	NB (Rock Creek Pkwy)	R	559	27	51	27	51	27	51	0	Pass
	NB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	L	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	R	-	-	-	-	-	-	-	-	-

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

Red cells denote lane groups whose queuing length exceeds capacity.

Intersections #5 and #7 are signalized for the Mitigation Condition.

TABLE 6-9. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) SATURDAY PEAK HOUR QUEUING ANALYSIS

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		Mitigation		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Mitigation - No-build	Check > 150 feet?
2	**M Street NW & Wisconsin Avenue NW (Signalized)**										
	EB (M St NW)	LTR	86	132	168	138	176	138	176	8	Pass
	WB (M St NW)	T	302	176	232	176	232	176	232	0	Pass
	WB (M St NW)	R	302	16	54	16	55	16	55	1	Pass
	NB (Wisconsin Ave NW)	L	175	87	152	97	168	97	168	16	Pass
	NB (Wisconsin Ave NW)	LTR	867	88	132	97	143	97	143	11	Pass
	SB (Wisconsin Ave NW)	L	226	123	202	126	207	126	207	5	Pass
	SB (Wisconsin Ave NW)	LTR	226	100	152	105	158	105	158	6	Pass
5	**K Street NW & 31st Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	5	-	5	11	27	22	Pass
	EB (K St NW)	T	387	-	105	-	238	173	247	142	Pass
	EB (K St NW)	R	25	-	3	-	3	0	6	3	Pass
	WB (K St NW)	L	100	-	8	-	8	15	34	26	Pass
	WB (K St NW)	TR	205	-	125	-	265	188	274	149	Pass
	NB (31st St NW)	LTR	71	-	3	-	3	3	18	15	Pass
	SB (31st St NW)	LT	878	-	25	-	28	65	117	92	Pass
	SB (31st St NW)	R	25	-	10	-	13	8	56	46	Pass
7	**K Street NW & 30th Street NW (AWSC) [a]**										
	EB (K St NW)	T	218	-	163	-	290	157	204	41	Pass
	EB (K St NW)	TR	218	-	48	-	68	-	-	-	-
	WB (K St NW)	L	100	-	10	-	10	20	47	37	Pass
	WB (K St NW)	T	212	-	90	-	143	153	199	109	Pass
	WB (K St NW)	T	212	-	58	-	85	-	-	-	-
	NB (30th St NW)	LTR	526	-	18	-	20	11	41	23	Pass
	SB (30th St NW)	LT	425	-	40	-	45	67	119	79	Pass
	SB (30th St NW)	R	25	-	20	-	23	9	43	23	Pass
8	**K Street NW/Rock Creek Parkway SB Off-ramp & 29th Street NW (AWSC) [a]**										
	EB (K St NW)	L	100	-	5	-	5	-	5	0	Pass
	EB (K St NW)	T	292	-	108	-	150	-	150	42	Pass
	EB (K St NW)	TR	292	-	58	-	78	-	78	20	Pass
	WB (K St NW)	LTR	244	-	345	-	340	-	340	-5	Pass
	WB (RC Pkwy SB Off-ramp)	TR	464	-	20	-	20	-	20	0	Pass
	SB (29th St NW)	LTR	513	-	15	-	15	-	15	0	Pass

TABLE 6-9. COMPARISON OF NO-ACTION, ACTION, AND EVALUATED IMPROVEMENT (MITIGATION) SATURDAY PEAK HOUR QUEUING ANALYSIS (CONTINUED)

#	Intersection and Approach	Lane Group	Link Distance/ Storage Bay	No Action Alternative		Action Alternative		Mitigation		95th Percentile Check (feet)	
				Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Queue Length 50th (ft)	Queue Length 95th (ft)	Mitigation - No-build	Check > 150 feet?
9	**K St NW/Whitehurst Fwy NW EB Off-ramp & 27th St NW/Rock Creek Pkwy NB Off-ramp (Signalized)**										
	EB (K St NW)	TR	236	~192	#291	~250	#355	156	#225	-66	Pass
	EB (W Fwy EB Off-ramp)	TR	657	117	180	117	180	138	#247	67	Pass
	WB (K St NW)	L	185	200	#340	206	#352	215	#387	47	Pass
	WB (K St NW)	T	707	19	33	23	39	23	39	6	Pass
	WB (K St NW)	R	370	62	85	62	85	62	85	0	Pass
	NB (27th St NW)	L	170	67	105	89	132	89	132	27	Pass
	NB (27th St NW)	R	-	-	-	-	-	-	-	-	-
	NB (27th St NW)	TR	272	0	0	0	0	0	0	0	Pass
	SB (RC Pkwy NB Off-ramp)	R	144	0	0	0	0	0	0	0	Pass
13	**Thompson Boat Center/Virginia Avenue NW & Rock Creek Parkway (Signalized)**										
	EB (Thompson Boat Ctr)	R	-	-	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	L	-	-	-	-	-	-	-	-	-
	EB (Thompson Boat Ctr)	LTR	88	16	44	45	#130	37	76	32	Pass
	WB (Virginia Ave NW)	TR/ T (Mit)	133	~460	#668	~495	#708	25	58	-610	Pass
	WB (Virginia Ave NW)	R	133	~275	#483	~295	#503	325	#481	-2	Pass
	NB (Rock Creek Pkwy)	LT	-	-	-	-	-	-	-	-	-
	NB (Rock Creek Pkwy)	R	557	397	498	397	498	340	433	-65	Pass
	NB (Rock Creek Pkwy)	T	200	~275	#483	~295	#503	325	#481	-2	Pass
	SB (Rock Creek Pkwy)	L	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	T	-	-	-	-	-	-	-	-	-
	SB (Rock Creek Pkwy)	LT	263	~399	#606	~423	#639	~282	#470	-136	Pass
	SB (Rock Creek Pkwy)	R	100	0	0	0	0	0	6	6	Pass

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 may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

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

LTR = left / through / right lanes

Red cells denote lane groups whose queuing length exceeds capacity.

Intersections #5 and #7 are signalized for the Mitigation Condition.

6.6.4 TRAFFIC MITIGATION MEASURES

Mitigation measures to alleviate failing operations or queuing impacts related to the implementation of the action alternatives include the following:

- K Street NW and 31st Street NW (Intersection #5): A signal warrant analysis was performed for this unsignalized intersection. Because the intersection met the peak hour signal warrant, a traffic signal should be installed at this intersection by the developer(s) of the site facilities. If the site is developed in phases, all developers involved should contribute to the cost of this traffic signal to avoid all costs placed on the first developer to determine that the intersection would fail. Implementation of the traffic signal would need to be implemented concurrently with the phase of boathouse development that causes the intersection to fail.
- K Street NW and 30th Street NW (Intersection #7): A signal warrant analysis was performed for this unsignalized intersection. Because the intersection met the peak hour signal warrant, a traffic signal should be installed at this intersection by the developer(s) of the site facilities. If the site is developed in phases, all developers involved should contribute to the cost of this traffic signal to avoid all costs placed on the first developer to determine that the intersection would fail. Implementation of the traffic signal would need to be implemented concurrently with the phase of boathouse development that causes the intersection to fail.
- K Street NW/Rock Creek Parkway southbound off-ramp and 29th Street NW (Intersection #8): A signal warrant analysis was performed for this unsignalized intersection. Because the intersection did not meet the peak hour signal warrant, signalization is not proposed. Because the failing approaches on K Street NW westbound are mainly a result of high through traffic volume, the failing approach could theoretically be mitigated by converting the All-way STOP-Controlled (AWSC) intersection to a TWSC intersection (just stopping the minor approaches). However, introduction of a TWSC intersection would cause safety issues because of the limited sight lines on minor approaches from Whitehurst Freeway support columns and safety issues for pedestrians that would no longer have breaks from stopping traffic allowing them to safely cross K Street NW. Furthermore, the southbound approach on 29th Street NW would result in LOS F if the intersection were switched to TWSC. Therefore, given the intersection did not meet the signal warrant and there would be safety issues with implementing a TWSC intersection, no mitigations are recommended at this time for Intersection #8.
- Thompson Boat Center/Virginia Avenue NW and Rock Creek Parkway (Intersection #13): During the Saturday peak period, the following improvements are needed to mitigate impacts: (1) lane configuration changes to the westbound approach (i.e., add one right turn lane and change the existing left from a shared through/right to a through-only lane), and (2) signal phasing changes on the westbound approach. Note that the addition of a right turn lane for mitigation would improve intersection operations, but would affect parkland on the eastern side of Rock Creek Parkway. Since parkland would be impacted, Section 4(f) of the Department of Transportation Act of 1966 would need to be followed (FHWA n.d.); therefore, the westbound approach lane configuration in combination with the signal retiming is not proposed.

Figure 6-5 shows what the revised signalization at Intersections #5 and #7 would be once the proposed mitigations are implemented.

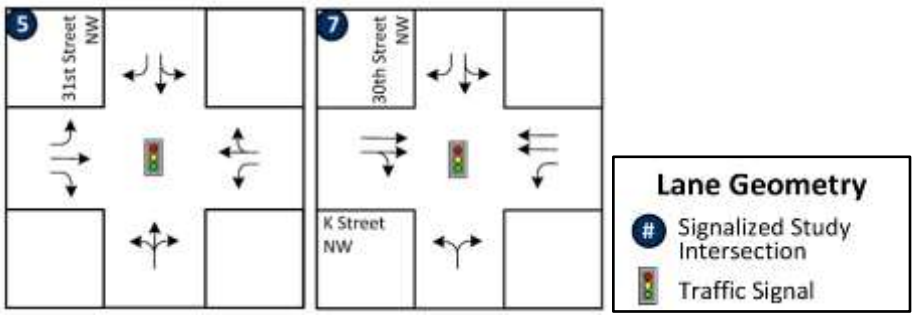

FIGURE 6-5. EVALUATED IMPROVEMENT (MITIGATION) CONDITION REVISED SIGNALIZATION

6.6.5 TRAFFIC RECOMMENDATIONS

To ensure traffic operations within the project area operate acceptably, the following improvements are recommended:

- Post signs as needed guiding vehicular use within the project area (e.g., no parking signs within the cul-de-sac, time limits to idling or unloading, no double parking).
- If needed, post signs along Water Street NW notifying users that the road does not provide an outlet.
- Work with DDOT to enforce parking and vehicle loading/unloading in the project area.

In addition to the above mitigations and recommendations, the traffic analysis revealed that signal optimization would alleviate the failing or adverse intersection operations at M Street NW and Wisconsin Avenue NW (Intersection #2) during the PM peak hour and at K Street NW/Whitehurst Freeway eastbound off-ramp and 27th Street NW/Rock Creek Parkway northbound off-ramp (Intersection #9) during all peak hours (weekday AM, weekday PM, and Saturday). The signal timings would be addressed through DDOT's ongoing signal optimization project in conjunction with the DC Streetcar project to address congestion at the noted intersections.

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7.0 CONCLUSION

The following summarizes the conclusions of the transportation evaluation:

Transportation conditions within the project area would improve or stay the same under the action alternative for non-vehicular modes of transportation. Clear benefits to pedestrians and bicyclists, particularly in the form of safety, would occur as a result of the introduction of a mixed-use trail connection between the CCT and the Georgetown Waterfront Trail, new sidewalks on either side of Water Street NW, additional pedestrian amenities, bicycle parking, standardization of parking and vehicular areas, and prioritization of areas outside of parking and roadways for pedestrians. While there would be additional congestion for pedestrians and cyclists as times, the amount of pedestrian-prioritized space and implementation of signing to control high volumes of users on the mixed-use trail should reduce overall conflicts to the greatest extent possible. While there may be a slight increase in transit users as a result of the action alternative, the impacts of the action alternative to transit users would not change from those of the no-action alternative.

Also within the project area, formalized on-street parking and a clear definition of roadway and parking areas would produce less confusion for all users, thereby increasing safety overall. While the action alternative would reduce available on-street public parking (reduction of between nine and nineteen spaces), sufficient garage parking should exist at most times within the area, although parking may be more expensive and further than under existing conditions.

While the implementation of a cul-de-sac to provide a designated area to reverse direction would improve vehicular operations, there would be increased traffic in the project area due to increased vehicle demand and trips and increased congestion caused by large vehicles operating in a small space. Therefore, conditions for vehicles within the study area may not improve. Additionally, the action alternative would limit operations for buses and large trucks within the project area. The definition of clear drive aisles, on-street vehicle parking, and a 30-foot radius cul-de-sac would result in overall reduced areas for large trucks and buses to reverse direction and would eliminate approximately six bus parking spaces. Only small trucks, no larger than approximately 20–25 feet long, would be able to operate within the cul-de-sac without hopping the curb. Where development constraints allow, two loading areas east of the Alexandria Aqueduct would be provided and an authorized vehicle-only path would be designed for access to parcels west of the aqueduct. While all other areas outside of the drive aisles, parking, and cul-de-sac would be prioritized for pedestrians, the curbs of the cul-de-sac would be mountable, and authorized vehicles would be able to access additional areas after yielding to pedestrians and following established procedures. Several recommendations are proposed to address the reduced truck and bus access within the project area.

Outside of the project area, there would be no physical changes to the pedestrian, parking, bicycling, or transit networks as a result of the action alternative. There would be additional users of all transportation modes as a result of the action alternative that would result in increased demand on parking and increased congestion on sidewalks, trails, and bike and transit facilities at certain times. However, the accommodations of these transportation networks outside of the project area should be sufficient to handle any additional minimal demands created under the action alternative.

Transport of trailers with rowing shells to the project area generated under the action alternative would create minimal impacts outside of the secondary transportation study area. Because trucks are not permitted on the Theodore Roosevelt Memorial Bridge to I-66, the proposed alternate route assumes travel along Water/K Streets NW eastward from the project area, traveling under Washington Circle, turning right at the intersection of K and 14th Streets NW, and then continuing straight southbound over the 14th Street Bridge to I-395. No conflicts are expected with the left turn from 14th to K Streets NW when trailers are brought to the project area other than the need to make a wide turn and the possible overhang of the trailer or rowing shells into adjacent lanes, movements which are common for large turning vehicles. Trailers making the right turn from K to 14th Streets NW likely would need to make the

turn from the through-traffic lanes instead of the service lanes to have enough room to make the turn. Because turns are normally made from K Street via the service lanes, this movement may require coordination with other vehicles and DDOT should advise on the preferred method for making such a move. Additional precautions for trailer turning movements at this intersection are recommended in Section 5.2.4.4.2 of this report.

From a traffic perspective, three study area intersections would fail overall for at least one peak hour (weekday AM, weekday PM, or Saturday) under the existing conditions, no-action alternative, and action alternative: Intersection #9 during the AM and PM peak hour, Intersection #10 during the AM peak hour, and Intersection #13 during the Saturday peak hour. However, based on DDOT's thresholds, two intersections would require improvement during the weekday AM peak hour (#5 and #9), two intersections would require improvement during the weekday PM peak hour (#2 and #9), and five intersections would require improvement during the Saturday peak hour (#5, #7, #8, #9, #13). Intersections #5 and #7 would be mitigated by installing a traffic signal. Intersection #13 would not be mitigated because the improvements would include an impact to parkland on the westbound approach. Intersections #2 and #9 would be improved with signal timing changes as part of DDOT's ongoing signal optimization project. Intersection #8 was unable to be mitigated because the intersection did not warrant a signal (signal warrant not met) and it would be unsafe to change the intersection from an AWSC to a TWSC intersection, which would be an alternate approach. Therefore, the recommended mitigations, combined with a recommendation for DDOT to continue with its signal optimization project, all but Intersection #8 and Intersection #13 addressed the DDOT scoping form requirements.

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