Downtown West Transportation Planning Study

Existing Conditions Report

September 27, 2016

WE ARE WASHINGTON DC

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Key Abbreviations

- AM: Morning Peak Hour
- APC: Automated Passenger Counter
- ATR: Automatic Traffic Recorder
- AVL: Automatic Vehicle Location
- BID: Business Improvement District
- DDOT: District Department of Transportation
- HCT: High Capacity Transit
- IADB: Inter-American Development Bank
- IFC: International Finance Corporation
- IMF: International Monetary Fund
- LOS: Level of Service
- MD: Midday Peak Hour
- MPD: Metropolitan Police Department
- NPS: National Park Services
- PCN: Priority Corridor Network
- PM: Evening Peak Hour
- ROW: Right of Way
- The Study: Downtown West Transportation Planning Study
- TMC: Vehicular Turning Movement Counts
- VA: The U.S. Department of Veterans Affairs
- WB: World Bank
- WMATA: Washington Metropolitan Area Transit Authority

Introduction

The Downtown West Transportation Planning Study (the Study) seeks to improve east-west travel along several prominent transportation routes in the District of Columbia, namely Pennsylvania Avenue NW, H Street NW, and I Street NW in the western portion of Downtown.

Pennsylvania Avenue NW is an iconic corridor that connects some of the District's most notable institutions and historic landmarks. However, west of the White House, the street is characterized by long pedestrian crossings, inconsistent streetscape materials, a wide roadway, and a lack of bicycle facilities. Currently, a cycle track runs along Pennsylvania Avenue NW from the Capitol to the 15th Street NW cycle track, which routes cyclists north through Lafayette Park. Cyclists wishing to continue west on Pennsylvania Avenue NW must cross 17th Street and ride with traffic.

The 30s Metrobus line also travels along Pennsylvania Avenue NW, joining up with several other high ridership routes through downtown on H and I Streets NW. Given the security-related closures of Pennsylvania Avenue NW and E Street NW in the vicinity of the White House, H Street and I Streets NW provide key east-west connections through the Downtown core. This couplet is particularly critical to the Metrobus network, as over 30 bus routes travel along these streets, comprising approximately 25 percent of all daily Metrobus trips. Bus travel is often very slow, with average speeds between three and eight miles per hour in the peak periods.

This Existing Conditions Report documents the existing demographic characteristics, land use, and transportation infrastructure of the study area, which define the function and character of Pennsylvania Avenue NW, H Street NW, and I Street NW. It uses readily available information which was field verified where possible. Data referenced throughout this report were current as of July 2016, unless otherwise noted.

The existing conditions analysis, in conjunction with public and stakeholder input, will form the foundation for the development of a series of alternatives to improve travel for bicycles, pedestrians, and buses within the study area.

STUDY GOAL, OBJECTIVES AND METRICS

Study Goal

The Study's goal is to improve east-west travel for pedestrians and cyclists on Pennsylvania Avenue NW and persons using public transit along H and I Streets NW. The Study seeks to achieve this goal by developing alternatives based on public and stakeholder input. The alternatives will be evaluated in terms of their benefits to pedestrians, cyclists, and transit users; possible impacts on other users of the corridors; and safety.

The Study's anticipated outcome will be a preferred set of improvements on H Street NW and Pennsylvania Avenue NW that build on previous studies in the area and achieve the objectives presented below.

Study Objectives

- Improve pedestrian and cyclist comfort, safety, and mobility on Pennsylvania Avenue NW.
- Improve the pedestrian realm and sustainability of Pennsylvania Avenue NW.
- Evaluate the feasibility and effectiveness of a contraflow bus lane on H Street NW between New York Avenue NW and Pennsylvania Avenue NW.
- Prioritize pedestrians, cyclists, and transit users while maintaining operations for other modes.
- Develop a feasible and implementable conceptual plan.

Study Metrics

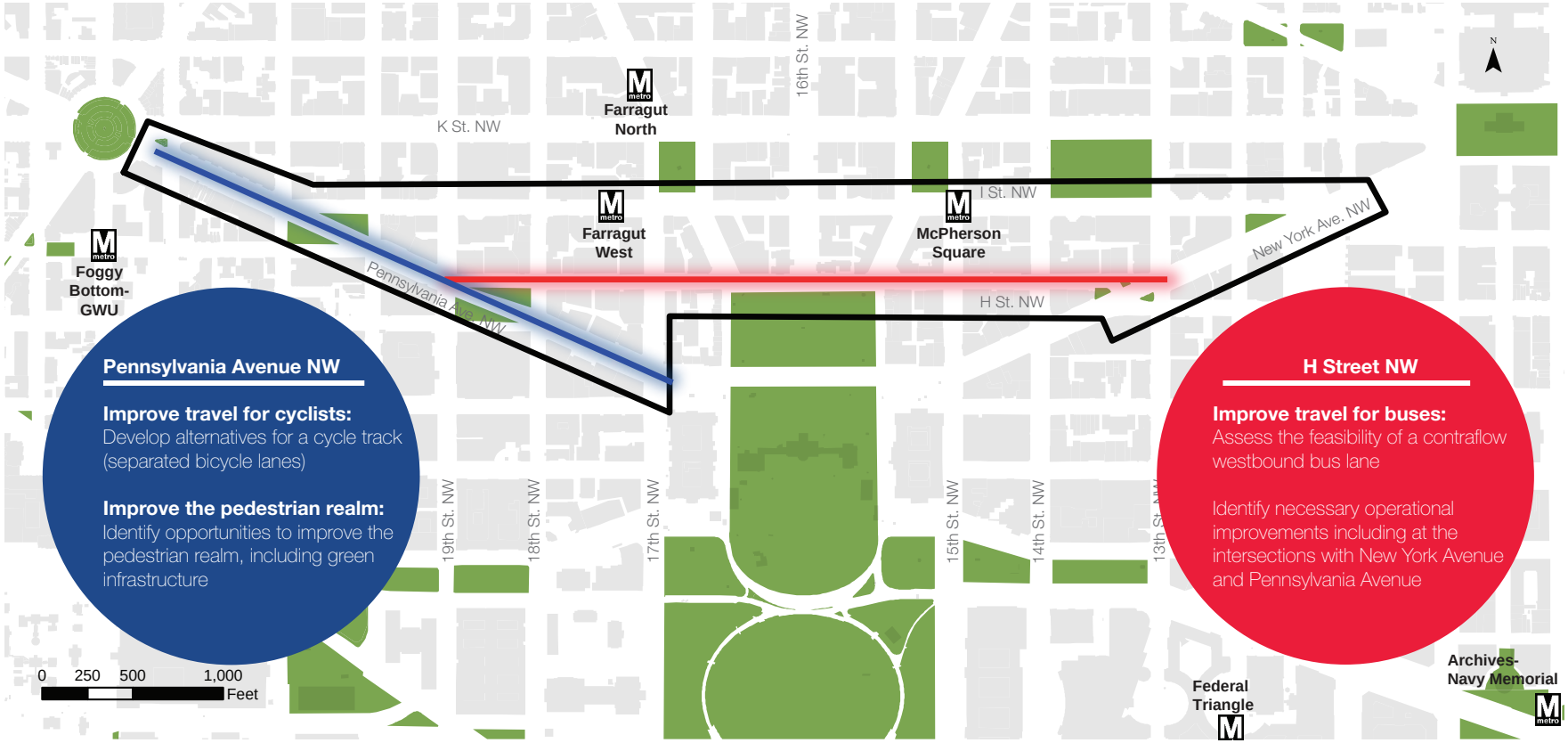
Based on these objectives, the following measures were developed to evaluate the effectiveness of the recommendations:

- Improve pedestrian and cyclist comfort, safety, and mobility on Pennsylvania Avenue NW
  - ► Pedestrian crossing distances
  - ► Pedestrian delay at intersections
  - ► Cyclist progression along the corridor (end-to-end and segment-by-segment travel time)
  - ► Connectivity to the surrounding bicycle facility and roadway network
  - ► Level of protection for cyclists
- Improve the pedestrian realm and sustainability of Pennsylvania Avenue NW
  - ► Pedestrian connectivity to Monroe and Murrow Parks
  - ► Uniformity of the streetscape design and opportunities for activation
  - ► Volume of stormwater retained using green infrastructure
- Evaluate the feasibility and effectiveness of the H Street NW contraflow bus lane
  - ► End-to-end and segment-by-segment transit travel time
  - ► Transit on-time performance
  - ► Ease of multimodal operations, including predictability for all modes
- Prioritize pedestrians, cyclists, and transit users while maintaining operations for other modes
  - ► Level of Service (LOS) at intersections
  - ► Queue lengths
  - ► End-to-end travel time
  - ► Person throughput
  - ► Driveway, alley, and loading conflicts
- Develop a feasible and implementable conceptual plan
  - ► Cost

STUDY AREA

Figure 1 illustrates the study area and the scope of improvements that will be evaluated and developed for each corridor. The Pennsylvania Avenue NW corridor is bound on the west by 22nd Street NW and on the east by 17th Street NW. As outlined in the Study objectives, the focus for Pennsylvania Avenue NW will be improvements for cyclists, including a cycle track, and enhancements to the pedestrian realm. For H and I Streets NW, the study area runs from their intersections with Pennsylvania Avenue NW on the west to their intersections with New York Avenue NW on the east. On H Street NW, the Study will evaluate the feasibility of a contraflow bus lane, which could shift a share of bus routes from I Street NW to H Street NW. The portion of New York Avenue NW between Pennsylvania Avenue NW and I Street NW is included in the study area to ensure the intersections with the street operate effectively. However, no changes are being proposed to the street outside of intersection alterations that may be needed at the intersections with H and I Streets NW. Together, the portions of Pennsylvania Avenue NW, H Street NW, and I Street NW within the study area encompass 30 intersections and approximately 2.4 miles of roadway.

Figure 1 - Study Area



Existing Planning Framework

The Downtown West Transportation Planning Study builds off of an array of previous planning efforts. These studies have helped to develop a vision for the future while also outlining key policy priorities and strategies to meet these objectives. Of the several studies and reports that pave the way for this project, three are of particular relevance to this Study:

- *moveDC: The District of Columbia's Multimodal Long-Range Transportation Plan* (District Department of Transportation, 2014)
- *H/I Streets Bus Improvements: Final Technical Report* (Washington Metropolitan Area Transit Authority, 2013)
- *Pennsylvania Avenue: West of the White House* (Golden Triangle Business Improvement District, 2015)

MoveDC: THE DISTRICT OF COLUMBIA'S MULTIMODAL LONG-RANGE TRANSPORTATION PLAN (DISTRICT DEPARTMENT OF TRANSPORTATION, 2014)

Vision and Goals

moveDC is the District's Multimodal Long-Range Transportation Plan. The vision of *moveDC* is:

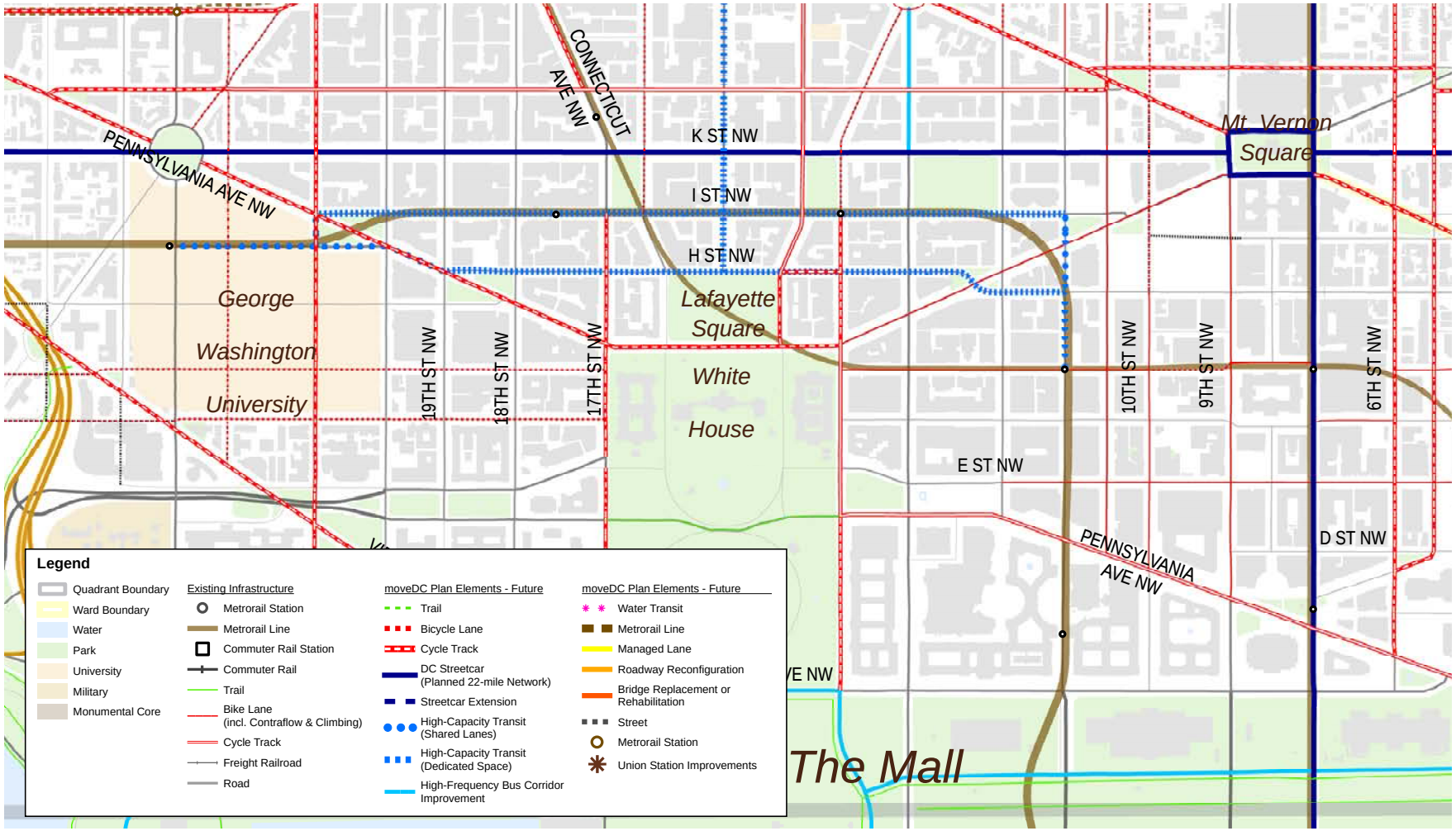
> *The District of Columbia will have a world-class transportation system serving the people who live, work, and visit the city. The transportation system will make the city more livable, sustainable, prosperous, and attractive. It will offer everyone in the District exceptional travel choices.*

This vision statement is supported by several goals to ensure the plan is carried out successfully. The Downtown West Transportation Planning Study supports the following goals:

- Sustainability and Health: Achieve 75% of all commute trips in the District by non-auto modes
- Citywide Accessibility and Mobility: Maximize system reliability and capacity for moving people and goods
- Neighborhood Accessibility and Connectivity: Support neighborhood vitality and economic development
- Safety and Security: Achieve zero fatalities and serious injuries on the District transportation network
- Public Space: Reinforce Washington, D.C.'s historic landscapes and quality of neighborhood public space

moveDC recommends capital improvements and modal priorities to accommodate the District's growing population and workforce. *moveDC* proposes developing 47 miles of high capacity transit (HCT) across the District, including on H and I Streets NW within the study area. HCT is defined as a high frequency, fixed-route transit service that can operate in exclusive right-of-way (dedicated lanes) or mixed traffic. H and I Streets NW are highlighted as a Tier 1 priority for capital investment. *moveDC* also identifies Pennsylvania Avenue NW within the study area as a Tier 1 bicycle-priority corridor for a future cycle track, or a bicycle lane that is physically separated from vehicle traffic. In conducting the Downtown West Transportation Planning Study, DDOT aims to improve sustainability, neighborhood connectivity, and safety in the study area, as well as mobility across the District.

Figure 2 - moveDC Planned Transportation Network



H/I STREET BUS IMPROVEMENTS: FINAL TECHNICAL REPORT (WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY, 2013)

WMATA, in partnership with DDOT, conducted the *H/I Street Bus Improvements: Final Technical Report* in 2013. The project purpose was to:

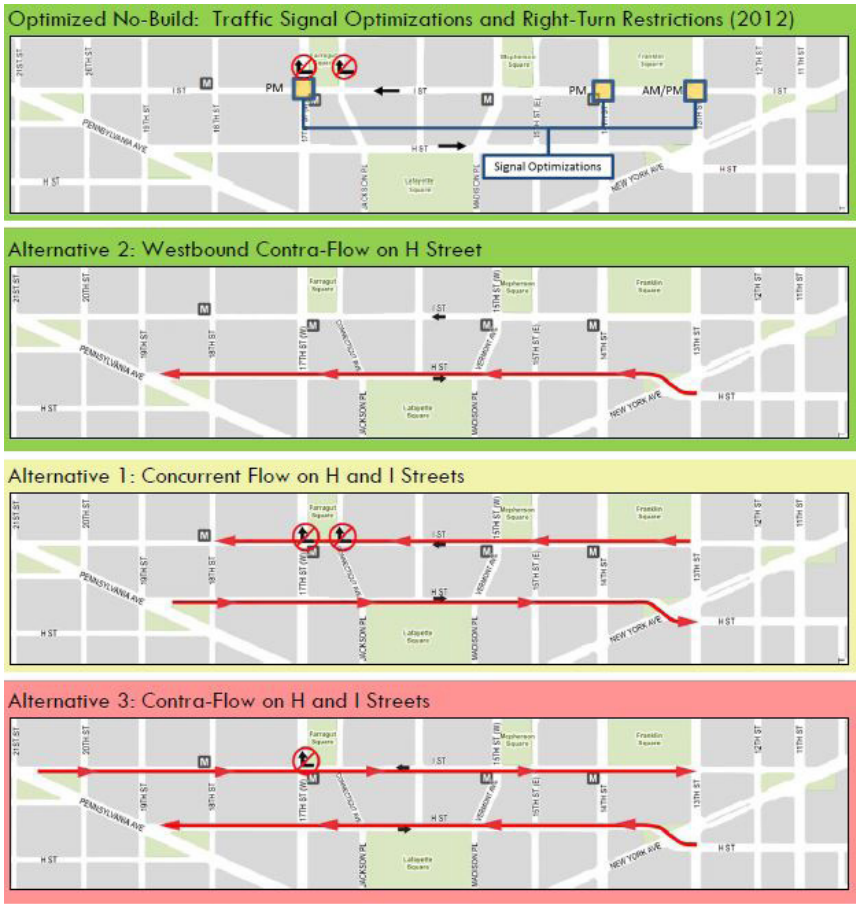
> *Examine bus improvement alternatives along the H and I Street corridors and provide comprehensive assessments of potential costs and benefits for all corridor users.*

Four alternatives were evaluated in terms of their benefits to transit riders, impacts on other modes, operational concerns, and cost. Ultimately, a westbound contraflow bus lane along H Street NW, Alternative 2, was identified as the preferred option.

All four alternatives perform well in achieving the project purpose. However, a contraflow bus lane on H Street NW, Alternative 2, demonstrated the best operational performance based on traffic simulation and benefit-cost analysis. The project is a medium cost solution while still attaining nearly all the possible benefits, and the benefits of the project are not contingent on enforcement. Furthermore, the selected alternative allows flexibility in allocating bus routes along H and I Streets NW while providing the best results in terms of traffic impacts, vehicle travel times, and intersection performance.

Alternative 2, the contraflow bus lane on H Street NW, is being carried forward and further analyzed in this Study. If the analysis determines that the contraflow lane performs well in existing and future traffic conditions and supports the Study's goal and objectives, it will be conceptually designed and recommended for implementation.

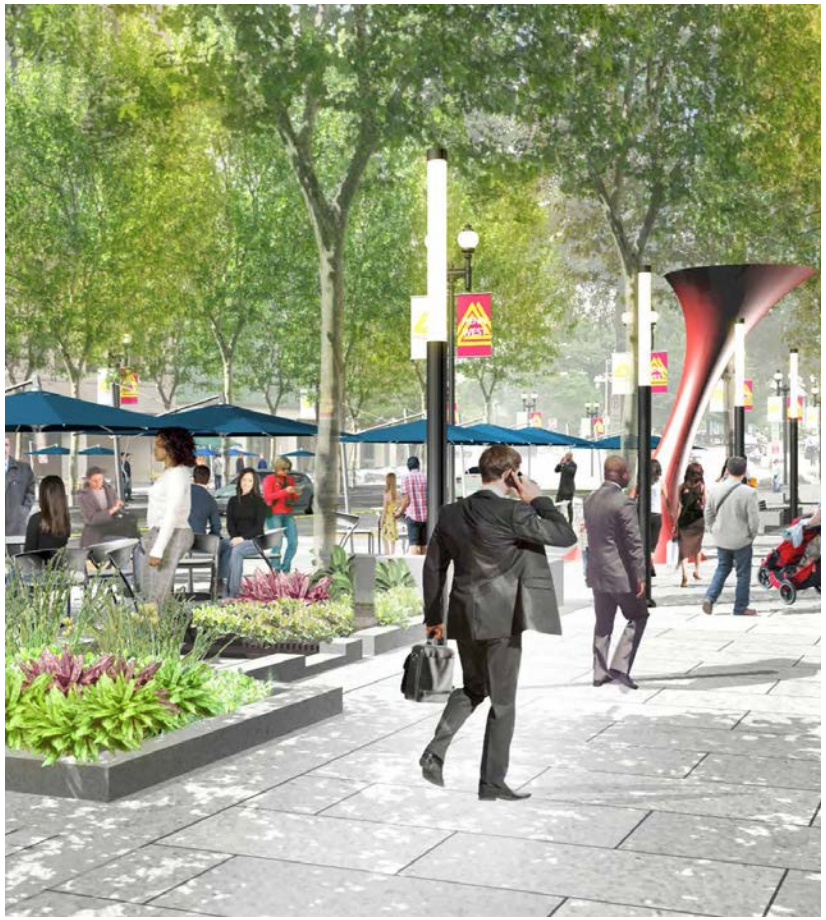
Figure 3 - H/I Street Bus Improvements Technical Report: Bus Improvement Options Considered



PENNSYLVANIA AVENUE WEST OF THE WHITE HOUSE (GOLDEN TRIANGLE BUSINESS IMPROVEMENT DISTRICT, 2015)

In Spring 2014, the Golden Triangle Business Improvement District (BID) initiated a design competition for the portion of Pennsylvania Avenue NW west of the White House. The winner of the competition developed their design recommendations into a vision for the corridor, and the resulting work is compiled in *Pennsylvania Avenue West of the White House*. The project seeks to achieve several goals, including promoting sustainability along the corridor, creating destinations and improving the pedestrian realm, activating the parks, and balancing the transportation modes. After conducting an existing conditions analysis of the streetscape and urban design characteristics, the report proposes a concept that aims to transform the currently underutilized corridor into a unique destination combining business, retail and cultural activities.

Figure 4 - Pennsylvania Avenue West of White House Design Concept



Existing Community

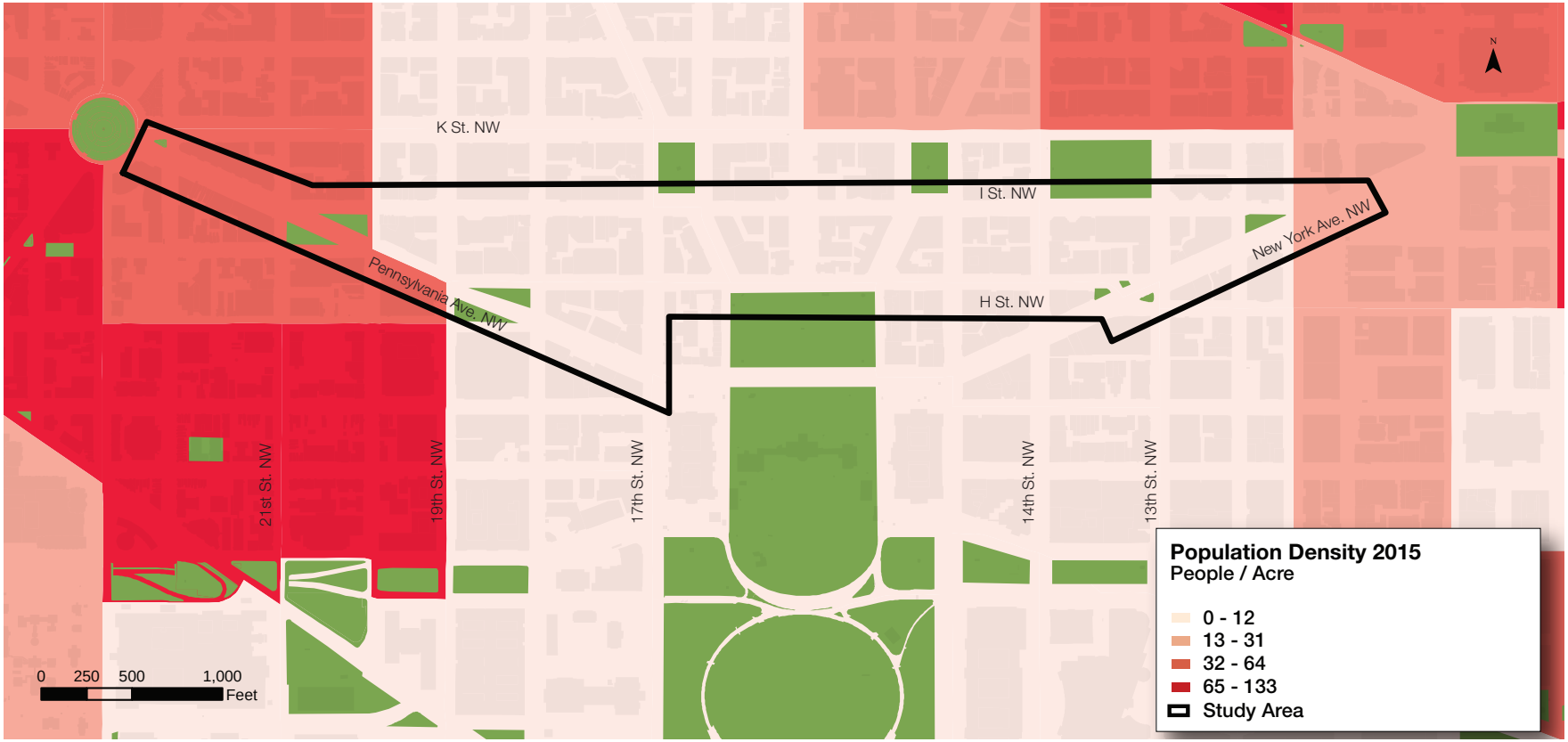
This section summarizes land use, community facilities, demographics, and commuter trends in the study area, as these aspects influence the transportation operations and demand. For contextual purposes, many of the demographic trends provided include District-wide statistics as well.

POPULATION AND DEMOGRAPHICS

Population

In 2014, the population of the study area was 12,350, representing approximately two percent of the District's total population. According to the US Census, since 2000, the resident population in the study area has increased by 56 percent, compared with an eleven percent growth rate District-wide.

Figure 5 - Population Density (2015)



This rapid population growth is anticipated to continue. By 2040, *moveDC* predicts a net increase of 15 to 20 people per acre along the portion of Pennsylvania Avenue NW between 19th Street NW and Washington Circle, particularly around the campus of George Washington University.

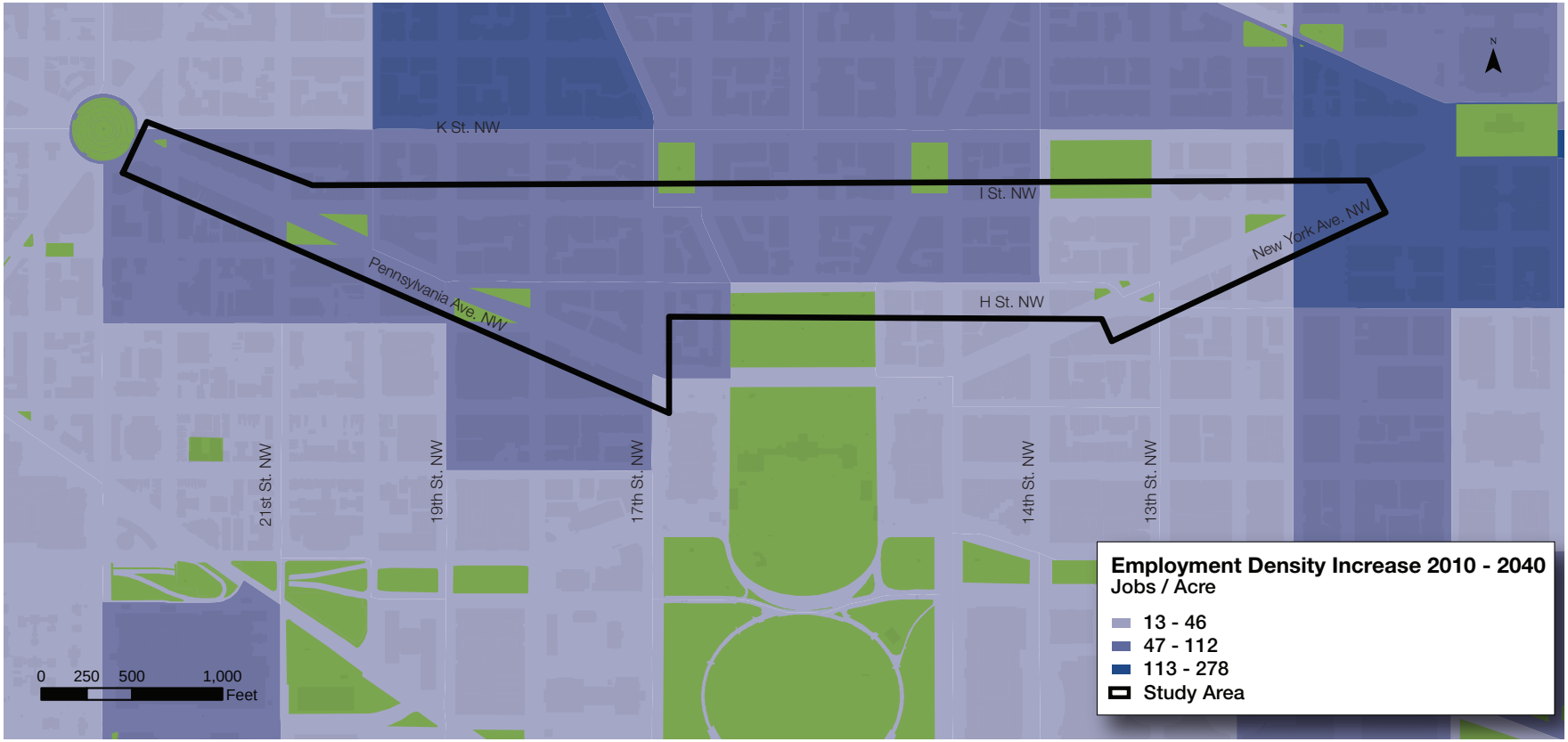
Figure 6 - Population Density Increase (2010-2040)

Employment

In 2014, the number of the employed residents in the area was approximately 6,100, representing nearly two percent of the District's employment. These jobs are drawn largely from financial, legal and governmental professions. The employment rate of residents in the study area was 94.4 percent, higher than the District-wide employment rate of 89.5 percent. While new residents living in the area will have an effect on the transportation infrastructure, so too will job growth in the study area. *moveDC* predicts substantial increases in employment density across the entire study area. By 2040, *moveDC* expects a net increase of approximately 50 to 100 employees per acre, with new job growth occurring particularly along the H and I Street NW corridors and along Pennsylvania Avenue NW between 17th Street NW and Washington Circle.

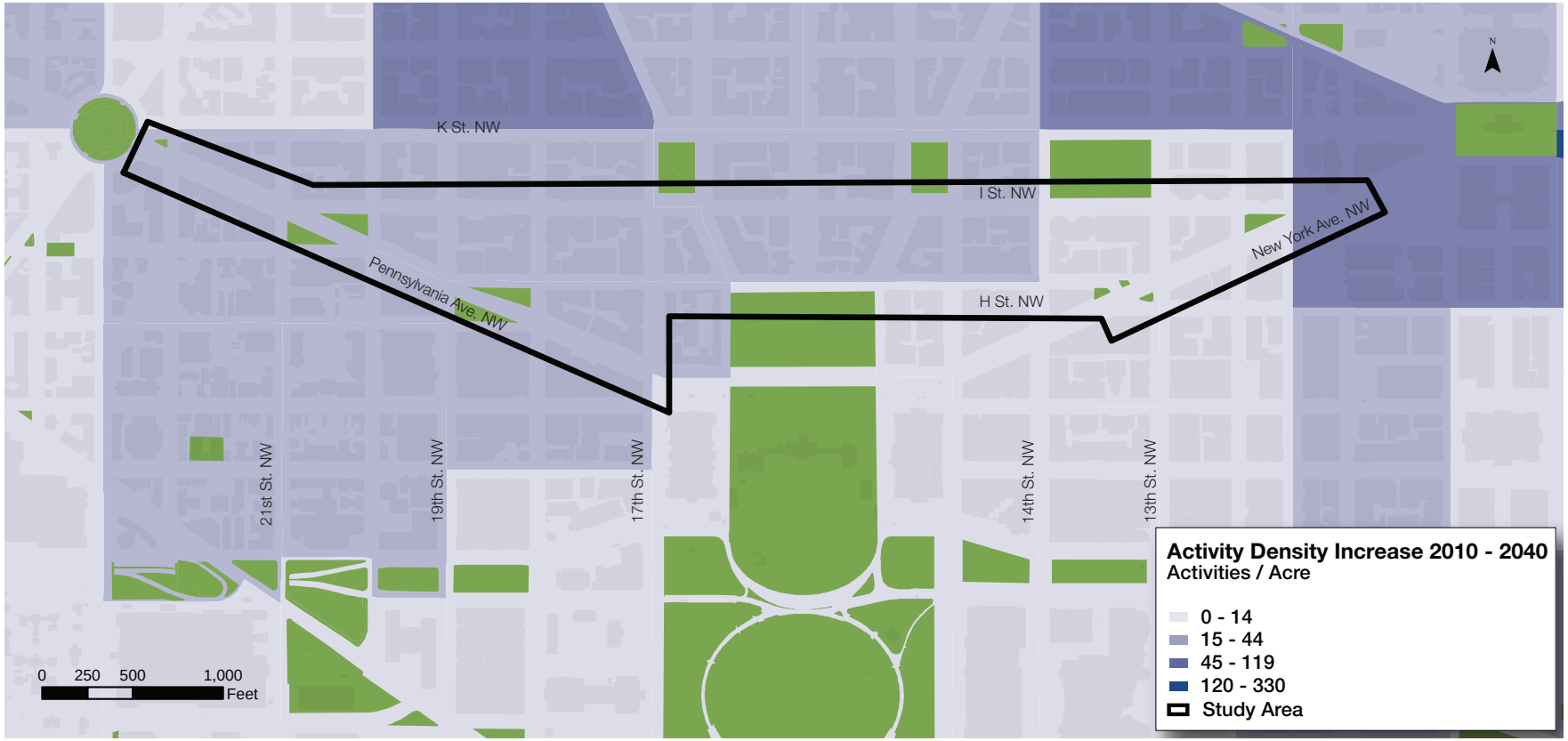
This increase in jobs will create new demands on transportation infrastructure as people commute to the study area for the workday.

Figure 7 - Employment Density Increase (2010-2040)



For this reason, *moveDC* utilizes an Activity Density indicator, which combines population and employment forecasts. As a result, the entirety of the study area is predicted to have greater than 250 jobs and people per acre, the highest rate of activity density projected in the *moveDC* plan. Activity Density is expected to increase between 2010 and 2040 across most of the study area. The highest rates of change in the study area are expected to occur toward the eastern end of the study area, which overlaps with City Center, where there is projected to be an increase of between 120 and 330 people and jobs per acre. The majority of the study area is expected to increase by between 15 and 44 people and jobs per acre.

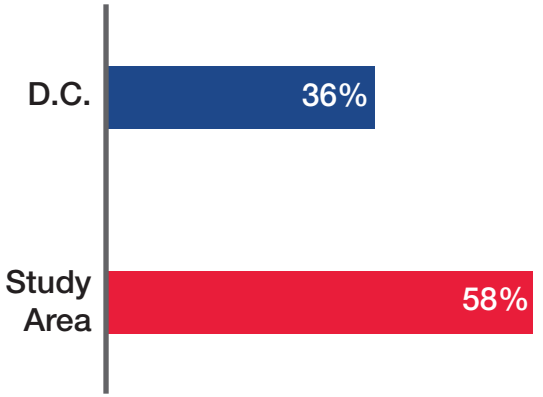
Figure 8 - Activity Density Increase (2010-2040)



Vehicle Ownership Rates

District-wide, approximately 36 percent of households did not own a vehicle in 2014. Households in the study area had an even lower rate of vehicle ownership, with 58 percent of households not owning a vehicle. Lower rates of vehicle ownership translate into higher demands for transit and other non-auto modes.

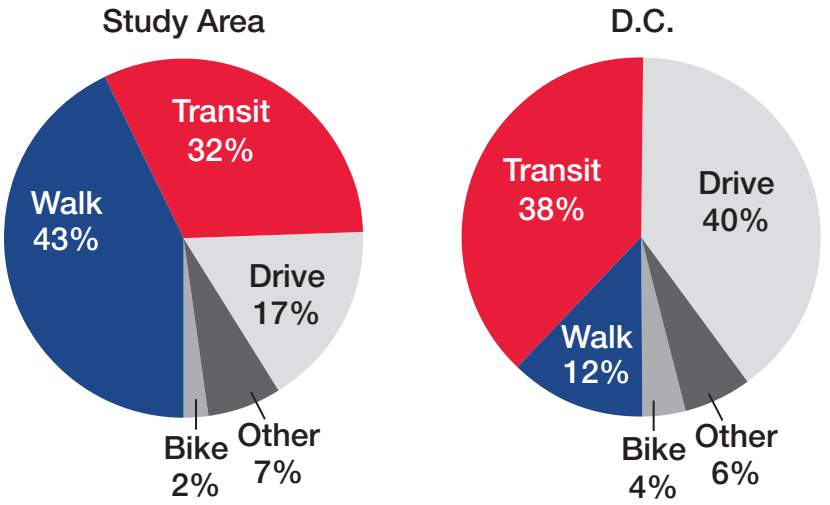
Figure 9 - Households with No Vehicle in the Study Area and the District



Commute Mode Share

In 2014, 32 percent of study area residents took public transit to work. 2 percent rode bicycles and 43 percent of residents walked to their place of work. Only 17 percent of study area residents commuted to work using a car. Compared to the District overall, study area residents were more than three times more likely to walk to work. Reflecting the higher percentage of residents without a car, study area residents are more than 50 percent less likely to commute by car. These differences, particularly the large number of residents who walk to work, are likely attributable to the close proximity of the study area to the downtown core.

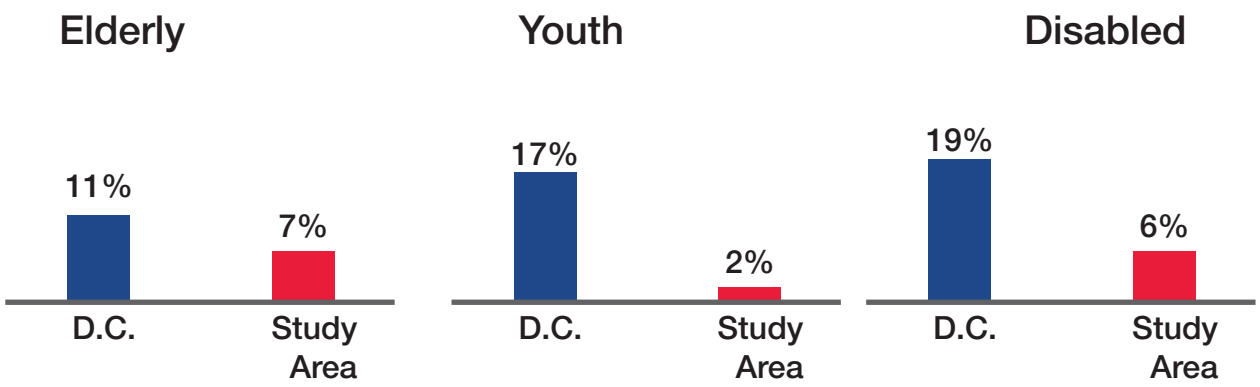
Figure 10 - Mode Share: Commute to Work from Study Area and the District



Vulnerable Populations

Certain demographic groups are more likely to rely on non-auto modes to meet their mobility needs due to age and ability. In 2014, the share of vulnerable residents in the study area was lower than in the District overall. Young people, under the age of 18, made up two percent of the study area population. By contrast, those under the age of 18 make up 17 percent of the total population of the District. Seven percent of study area residents were age 65 or above, but District-wide, this same age group made up 11 percent of the population. Lastly, six percent of households in the study area included at least one individual with a disability. District-wide, 19 percent of households have at least one individual with a disability.

Figure 11 - Vulnerable Population Cohort Comparisons

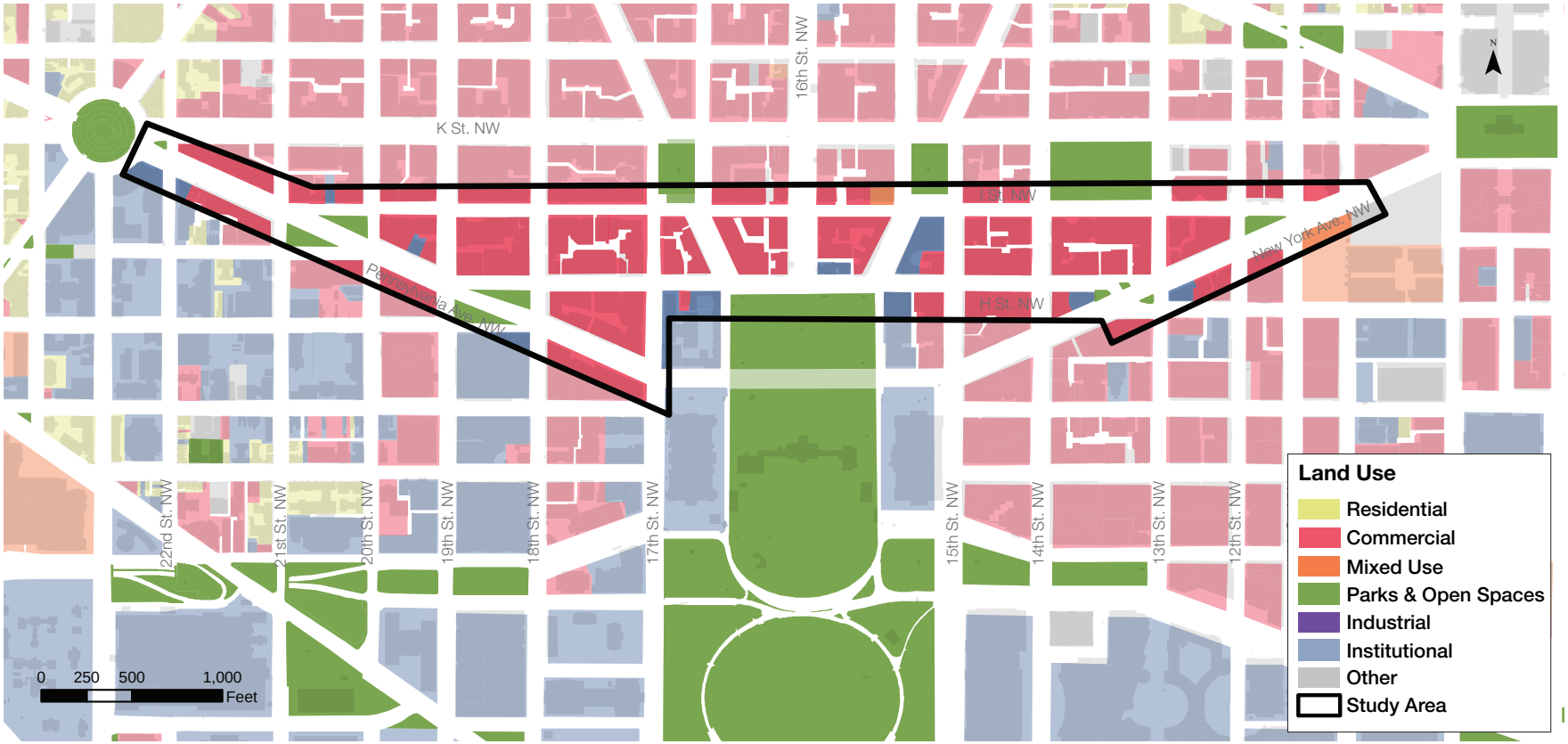


Land Use

The land use in the study area is primarily dominated by commercial and institutional uses. There is little residential land use in the study area, making the area primarily a trip attractor. Foggy Bottom is the closest residential area, located to the west and northwest of the study area. George Washington University, while an institutional land use, houses several thousand students, contributing to the residential population in proximity to the study area.[1]

1 As of 2014, GWU has an undergraduate student population of more than 10,000 (more than 25,000 including graduate students) across all three of its campuses. The Foggy Bottom Campus is the University's main campus and contains 26 residence halls. Although the on-campus student population at the Foggy Bottom campus was not available, it is reported that 63 percent students live in college-owned, -operated or –affiliated housing (source: US News and World Report, accessed July 20, 2016).

Figure 12 - Study Area Land Use



Expected Development and Recent Construction

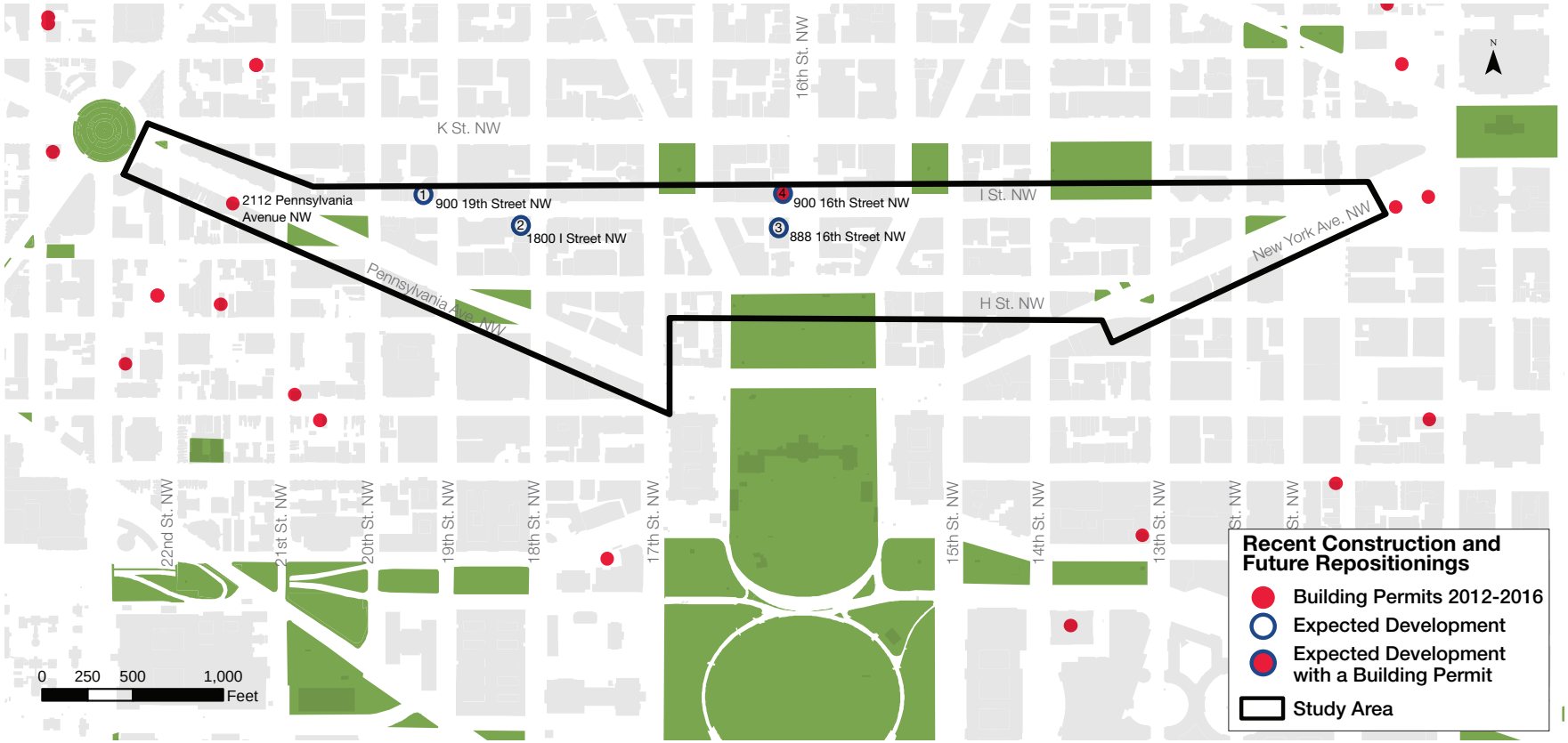
An investigation of Department of Buildings permits issued between 2012 and 2016 indicates that a significant amount of new development is occurring or has recently occurred in the area. This includes a large-scale office development at 2112 Pennsylvania Avenue NW that is sited in the western portion of the study area.

Figure 13 - Recent Construction and Future Repositionings (source: Department of Buildings Permits Issued from 2012 -2016 and Categorized as "New Construction" and Golden Triangle BID)

According to the Golden Triangle BID, in addition to this construction activity, several commercial office space redevelopments are anticipated, including four along I Street NW. These projects represent a substantial investment in the area that will generate additional multi-modal transportation demand.

2112 PENNSYLVANIA AVENUE NW

Currently under construction, 2112 Pennsylvania Avenue NW will be an 11-story, 240,000 square foot office building on George



Washington University's campus. The building will feature 10,000 square feet of ground floor retail and is scheduled to be completed in 2018.

900 19TH STREET NW

Originally built in 1979, 900 19th Street NW is being redeveloped into an eight-story, Class A boutique office building. At the corner of 19th Street NW and I Street NW, the 113,000 square foot building is located one block from the Farragut West Metro station and will feature primarily office space along with a new fitness center, rooftop terrace and an updated lobby design. The developer's website states that building will be complete in 2016, though Golden Triangle BID lists it as a 2017-2019 projected delivery.

900 16TH STREET NW

To be completed in 2016, 900 16th Street NW is a new office building at the corner of 16th Street NW and I Street NW. The building will contain more than 127,000 square feet of office space, ground-floor retail and underground parking.

888 16TH STREET NW

Listed on Golden Triangle BID's "Future Repositionings in the Golden Triangle" map, 888 16th Street NW is owned by CBRE and is slated for redevelopment between 2017 and 2019. No further information was available on this property.

1800 I STREET NW

Listed on Golden Triangle BID's "Future Repositionings in the Golden Triangle" map, 1800 I Street NW is owned by the State of Arizona and is slated for redevelopment between 2017 and 2019. No further information was available on this property.

Institutions

There are a number of embassies and other institutions within the study area, which are particularly concentrated along Pennsylvania Avenue NW (Figure 14, following page). These include George Washington University's main campus, which extends along the southern side of Pennsylvania Avenue NW from 20th Street NW to Washington Circle.

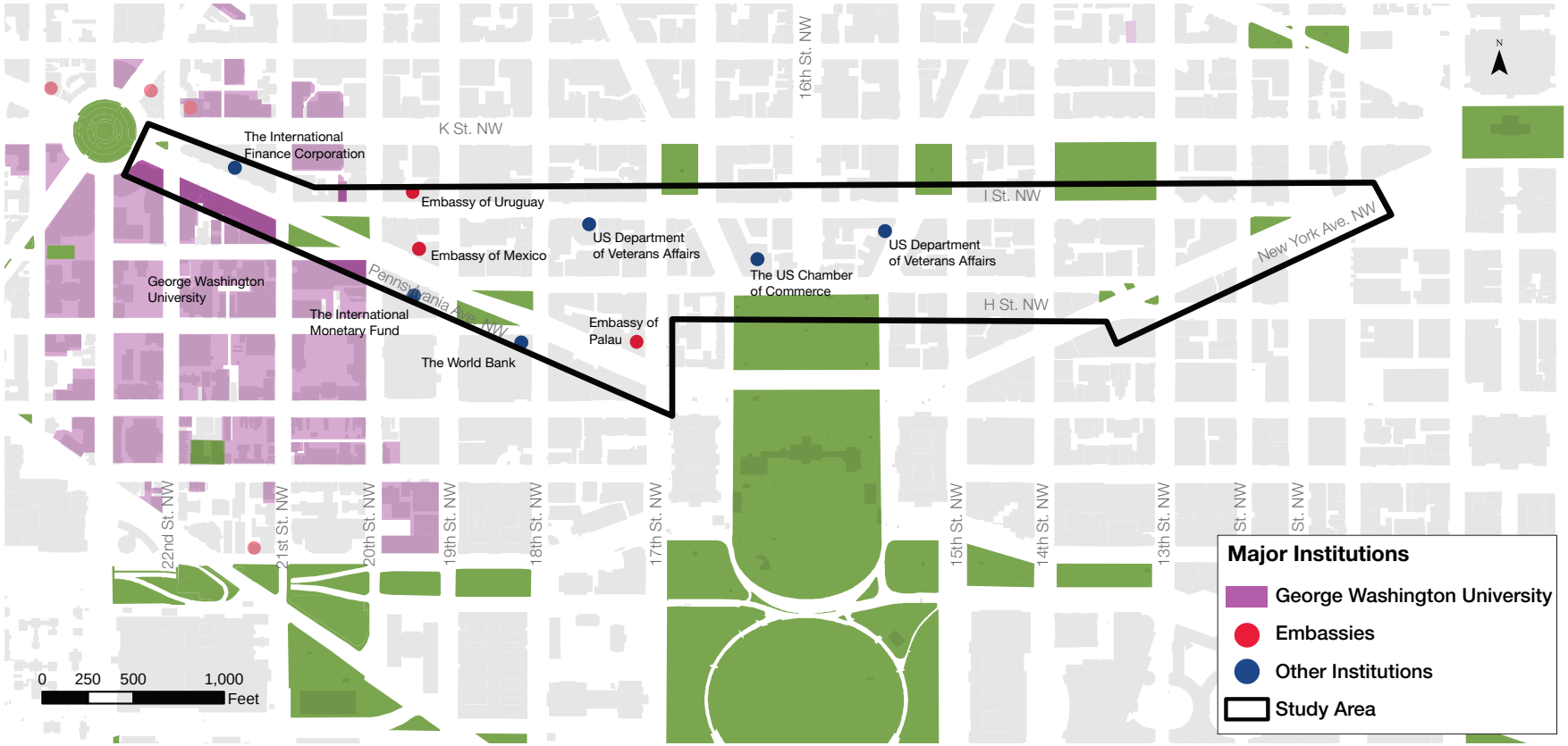
Other major institutions within the study area include:

- The World Bank, located at 1818 H Street NW.
- The International Monetary Fund (IMF), located at 1900 Pennsylvania Avenue NW.
- The International Finance Corporation (IFC), located at 2121 Pennsylvania Avenue NW.
- The U.S. Chamber of Commerce, located at 1615 H Street NW.
- The U.S. Department of Veterans Affairs, located at 1722 I Street NW and 810 Vermont Avenue NW.
- Inter-American Development Bank, located at 1300 New York Avenue NW.
- The Embassies of Palau, Mexico, and Uruguay.

These institutions all place particular demands on the transportation system. The embassies, for example, typically have dedicated curbside space adjacent to their building. There is also security-related infrastructure associated with several institutions on Pennsylvania Avenue NW, such as the security bollards outside the World Bank, IMF, and IFC.

The White House, Eisenhower Executive Office Building, and U.S. Department of the Treasury are located just outside the study area on Pennsylvania Avenue NW between 17th and 15th Streets NW, which is closed to vehicle traffic.

Figure 14 - Major Institutions in the Study Area

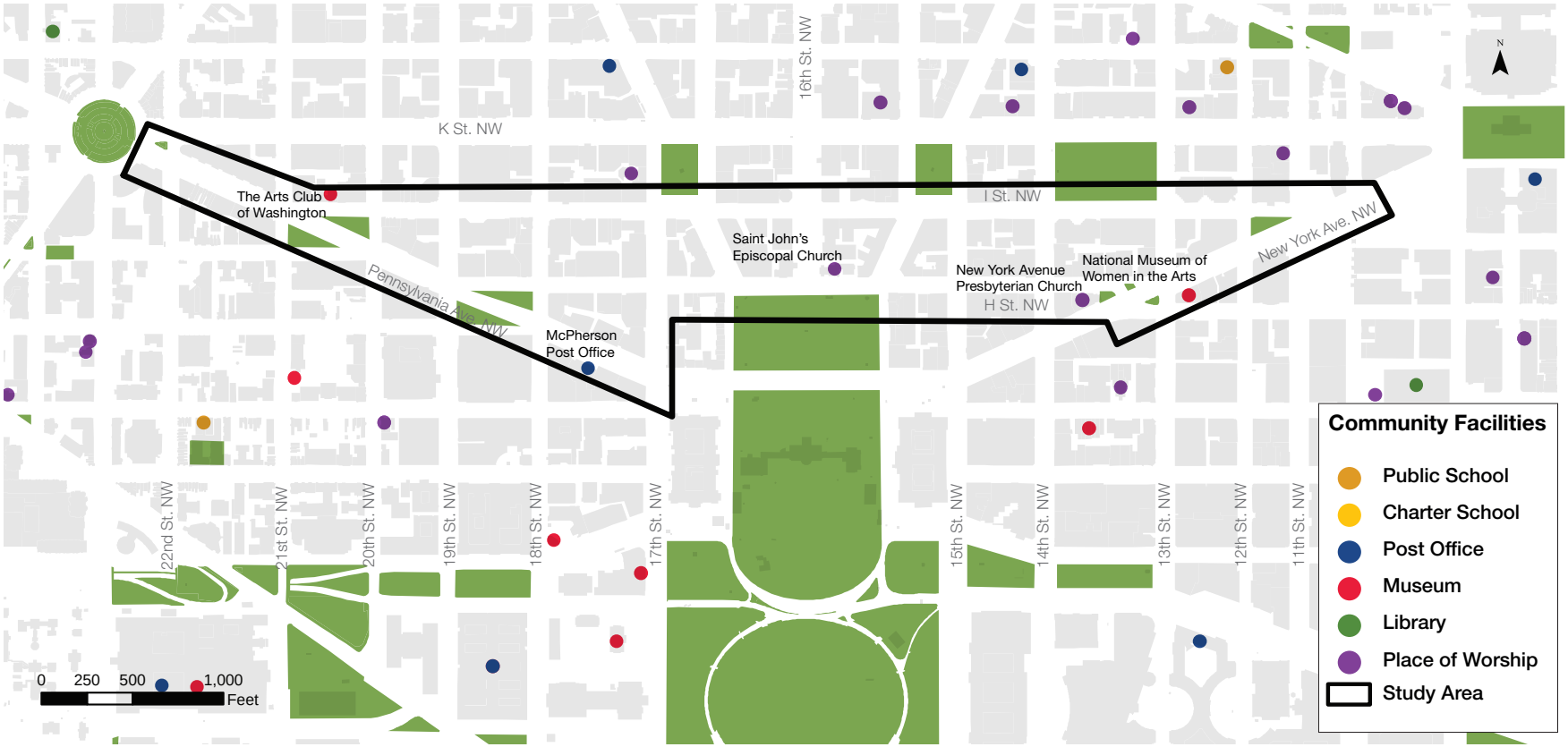


Community Facilities

There are several community facilities within the study area, which impact the demand for transportation in the area, including curbside use and sidewalk capacity. For example, the two places of worship in the study area increase transportation demand on weekends and have associated parking and loading needs. The following community facilities in the study area were identified:

- Places of Worship
- Libraries
- Public Schools, charter schools
- Post offices
- Museums
- Parks

Figure 15 - Community Facilities in the Study Area

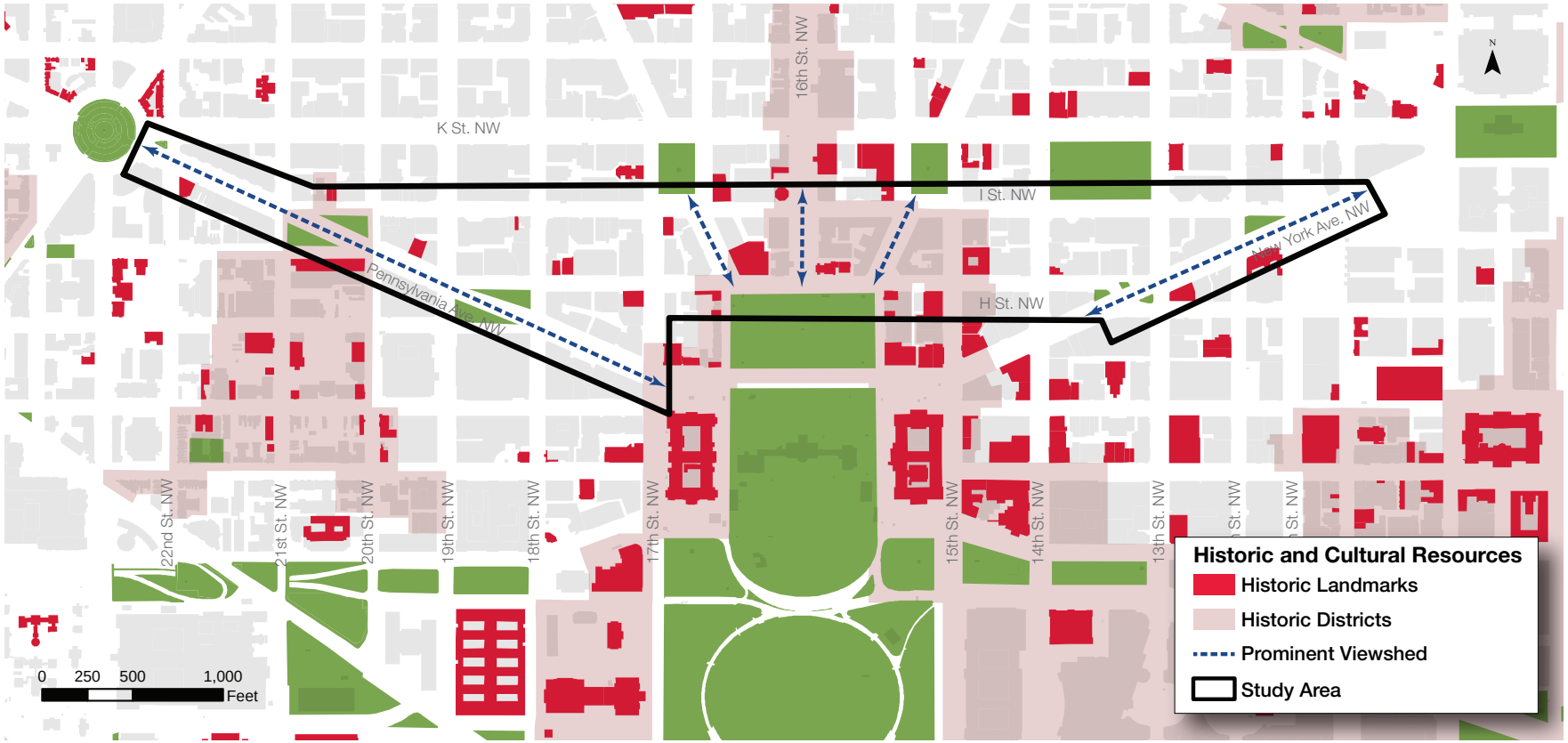


Historic and Cultural Resources

The study area overlaps with a number of historic districts and contains numerous landmarked buildings and structures, as illustrated in Figure 16.

The study area is also fully within the L'Enfant Plan area of the District (and the L'Enfant Plan itself is a historic resource), accented by several National Park Service reservations (namely, Monroe and Murrow Parks, which are the pairs of triangular parks along Pennsylvania Avenue NW, from west to east). In addition, there are several prominent viewsheds within the study area, namely along Pennsylvania Avenue NW, New York Avenue NW, Vermont Avenue NW, Connecticut Avenue NW, and 16th Street NW.

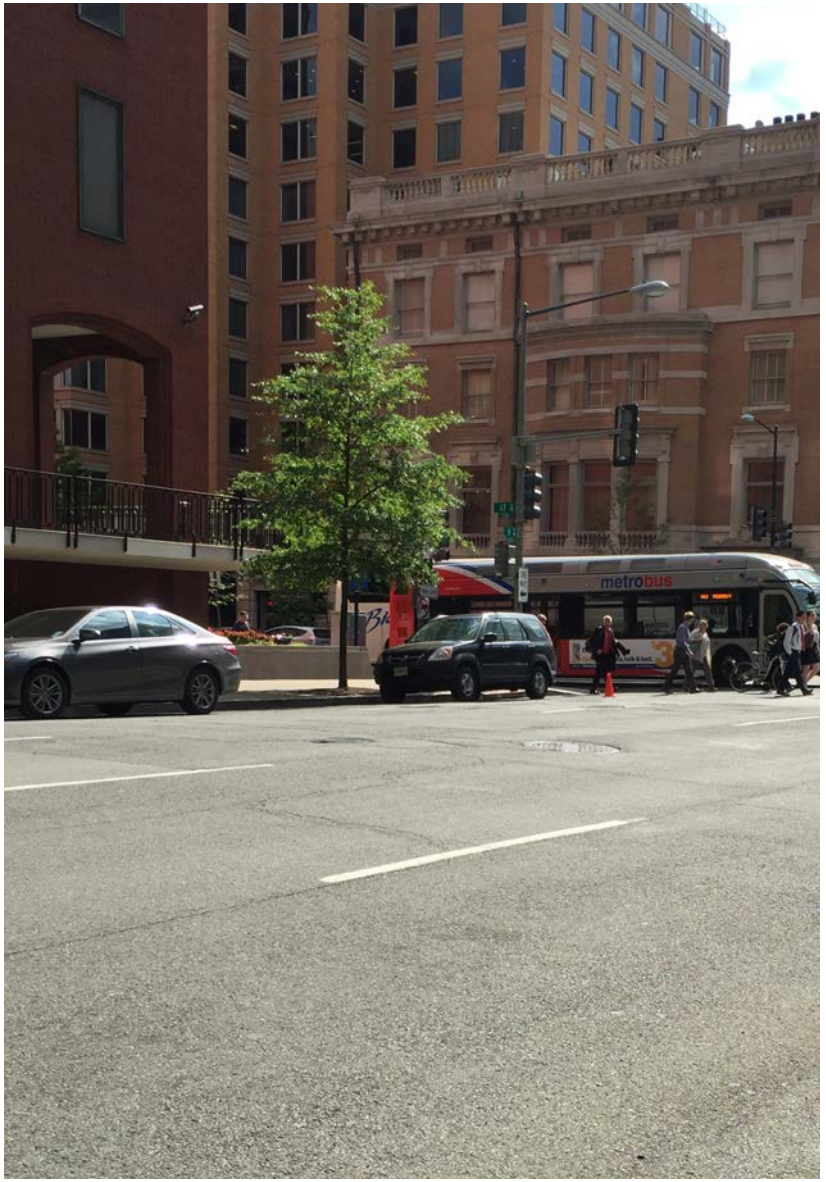
Figure 16 - Historic and Cultural Resources in the Study Area



Existing Transportation Characteristics and Infrastructure

This section provides a detailed description of transportation characteristics and infrastructure as indicated through the data collection and field inventory processes (outlined below). The summaries also rely on previously collected data, background research and the previous planning studies outlined earlier in this document.

The following sections, broken down by travel mode (vehicle, pedestrian, bicycle and transit), also help identify the issues and opportunities within the study area. As noted in the project description, the primary focus for Pennsylvania Avenue NW is pedestrian and bicycle improvements, while H and I Streets NW are centered around improving bus transit. As such, the pedestrian and bicycle data and infrastructure sections primarily focus on Pennsylvania Avenue NW. The transit section focuses primarily on H Street NW, with a secondary focus on I Street NW and Pennsylvania Avenue NW. The vehicle section will focus on the entire study area. A key findings section follows this section and highlights the most important takeaways from each section and how they relate to each other.



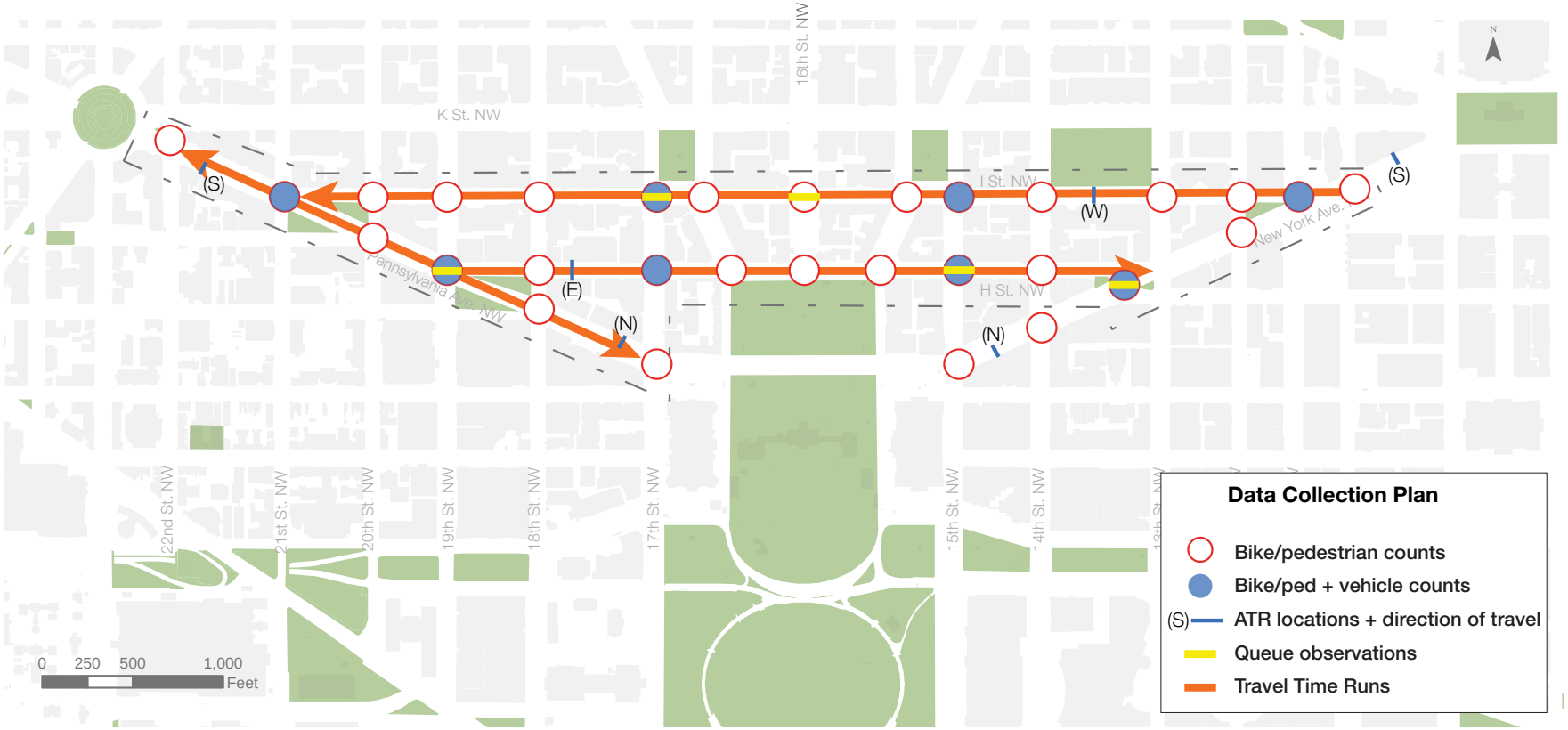
DATA COLLECTION SUMMARY

In January 2013, as part of the ongoing District-wide signal optimization project, DDOT collected turning movement counts in the study area. This data, and the resulting Synchro traffic analysis, formulate the foundation of the existing conditions vehicle network for this Study.

In May 2016, the project team conducted supplemental data collection to obtain updated traffic volumes at key locations throughout the study area:

- Data were collected during three peak periods: the morning peak period 6:30-9:30 AM (AM peak period), the midday peak period 11:00 AM -2:00 PM (MD peak period), and the evening peak period 4:00-7:00 PM (PM peak period).
- Data are further defined by the peak hour, the busiest hour of each peak period. The peak hours in this study parallel the peak hours identified in DDOT's 2013 Signal Optimization Project, allowing for comparisons between the two studies. The peak hours within each peak period are the morning peak hour 8:00-9:00 AM (AM peak hour), the midday peak hour 11:45 AM -12:45 PM (MD peak hour), and the evening peak hour 5:00-6:00 PM (PM peak hour).

Figure 17 - Data Collection Plan



- Automatic Traffic Recorder Data (ATR): ATR counts were collected at six key locations within the project study area. Those data were collected from May 16th to May 24th for eight consecutive days.
- Vehicular Turning Movement Counts (TMC): vehicular TMC were collected at eight locations using cameras during typical weekday AM, MD and PM peak periods. Those data were collected on May 19th and May 24th, 2016.[2]
- Bicycle and Pedestrian Counts: Bicycle TMC and pedestrian counts at crosswalks were conducted at all 30 study intersections using cameras during typical weekday AM, MD, and PM peak periods. Those data were collected on May 19th and May 24th, 2016.
- Queue Length: Vehicular queue length was observed at five locations during the same period turning movements counts were collected.
- Travel Times: Vehicular travel time runs were conducted concurrently with the turning movement counts along H Street NW, I Street NW and Pennsylvania Avenue NW.
- Garage Counts: Counts were taken at eight parking garage entrances along the north side of H Street NW, as the contraflow bus lane would operate in the northernmost lane of H Street NW. The counts include vehicles entering and exiting the garages, as well as bicycles and pedestrians crossing the garage entrances. Understanding the turning movements into and out of garages will enable more accurate modeling of the proposed contraflow lane, its ability to function effectively, and its impact on other modes.

These data will be analyzed and discussed in the Vehicle, Pedestrian and Bicycle Analysis sections below. Additionally, the D.C. Office of Planning, in collaboration with DDOT, is leading an in-depth analysis of pedestrian activity along Pennsylvania Avenue NW. That work will inform the development of alternatives and recommendations for this Study.

In addition, the following data was provided by WMATA to support the transit analysis:

- WMATA Bus Routes and Stops (effective June 2016).
- Raw and validated Automatic Vehicle Location (AVL) data (May 2016).
- Validated Automated Passenger Counter (APC) data (March 2016-June 2016).
- Headway sheets with blocking (vehicle ID numbers).

Lastly, in order to fully understand the existing infrastructure throughout the study area, a streetscape inventory was conducted during May-June 2016. This information is synthesized in the Roadway Configuration and Pedestrian Infrastructure sections.

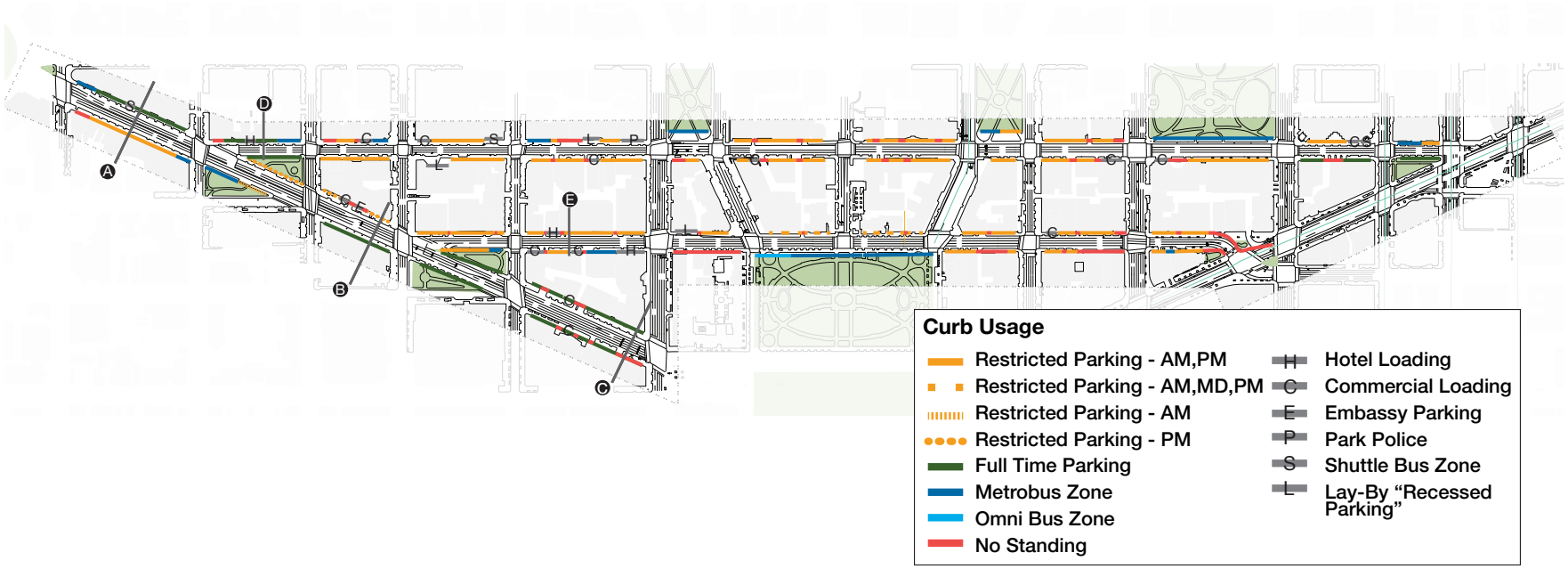
2 The vehicle volume data is also supported by DDOT's 2013 Signal Optimization Project, which contains turning movement counts at each intersection within the study area. The eight turning movement counts conducted in May 2016 were conducted to ensure similar travel patterns still exist in 2016, and to enable a vehicle volume balancing exercise, ensuring the existing conditions models reflect actual conditions, to the extent possible. Subsequently, the turning movement counts discussed below refer to the balanced volumes that are being used in the modeling exercises as opposed to the raw data volumes that were collected.

ROADWAY CONFIGURATION

Within the study area, there are two primary study corridors:

- H Street NW and I Street NW are a one-way couplet, serving eastbound traffic on H Street NW and westbound traffic on I Street NW. Both H Street NW and I Street NW are crosstown arterials with roadway width of approximately 50 feet and 40 feet, respectively. Sidewalks of approximately 20 feet are provided on either side of each street.
- Pennsylvania Avenue NW is a wide, bi-directional urban arterial with an 80 foot roadway width and sidewalk widths varying between 12 and nearly 30 feet.

Figure 18 - Roadway Configuration and Curb Usage



TRAVEL LANES AND PARKING REGULATIONS

On H Street NW and I Street NW, the provision of on-street parking, loading, and bus stops dictates the number of travel lanes available throughout the day. Most commonly, AM and PM peak period parking restrictions maintain the curbside lanes as travel lanes, while during the MD peak period, on-street parking or other curbside uses reduces the number of travel lanes by one or two lanes. In general, H Street NW is slightly wider than I Street NW, with five travel lanes between 18th Street NW and 14th Street NW during the AM and PM peak periods compared to four travel lanes on I Street NW.

In contrast to H Street NW and I Street NW, Pennsylvania Avenue NW's 80' roadway width enables full-time on-street parking while maintaining three travel lanes in each direction. In general, Pennsylvania Avenue NW has three travel lanes in both directions at all times, except for several locations where double left or right turn lanes are provided, resulting in fewer travel lanes in the opposing direction, as shown in Figures 20-22. The curbside lane is 18 feet wide, enough space for curbside parking and a travel lane. This lane configuration enables flexibility to serve curbside demands of adjacent buildings and provides additional capacity at intersections, where space for turning vehicles replaces parking. However, the shared lane can also reduce the effective capacity of the travel function of the lane, as parking movements, loading and unloading and large vehicles can impede the travel portion of the lane.

Figure 19 - Loudoun County Transit bus turning from I Street NW onto Pennsylvania Avenue NW

Figure 20 - Roadway Configuration and Curb Usage Pennsylvania Avenue NW Detail 1

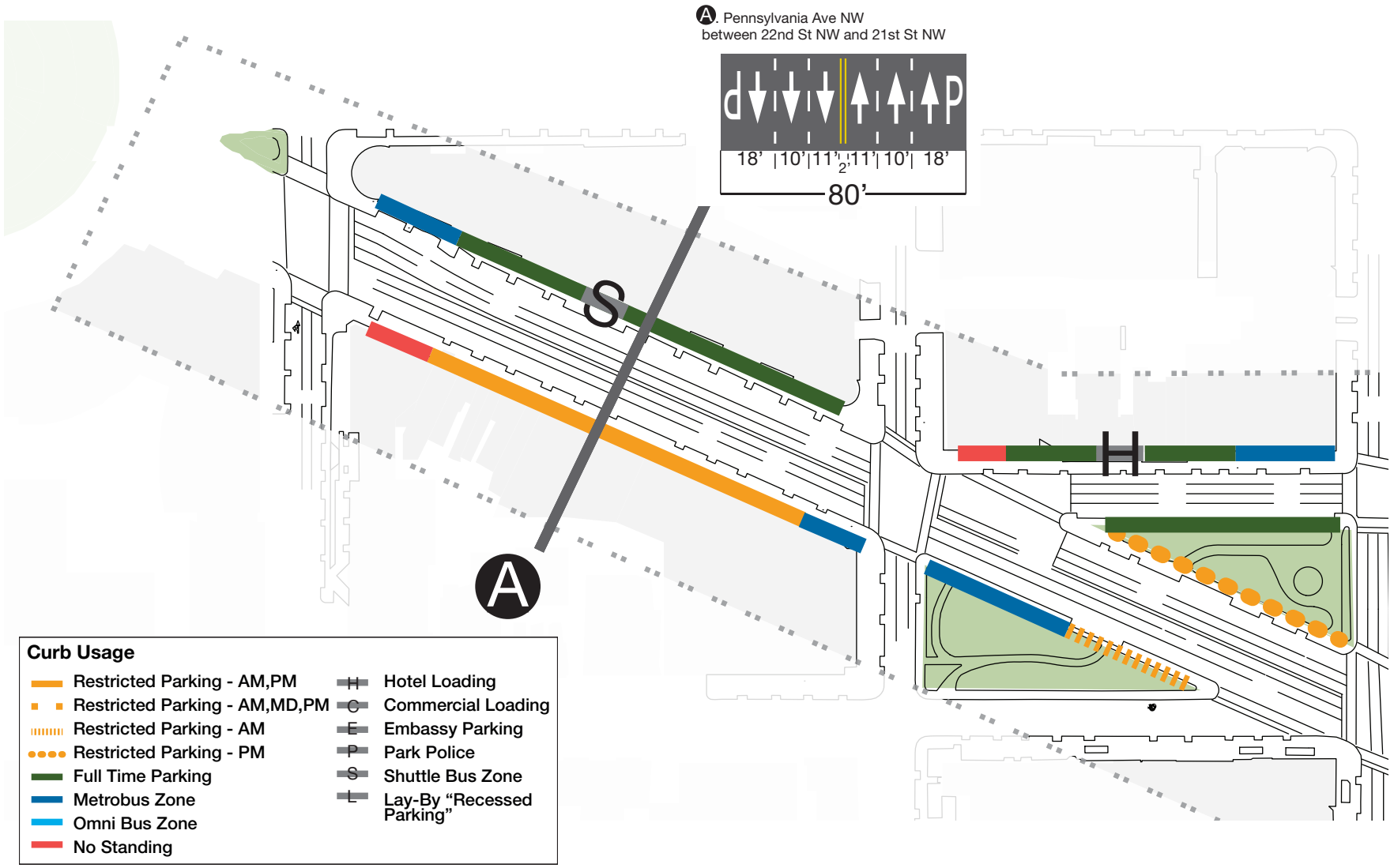


Figure 21 - Roadway Configuration and Curb Usage Pennsylvania Avenue NW Detail 2

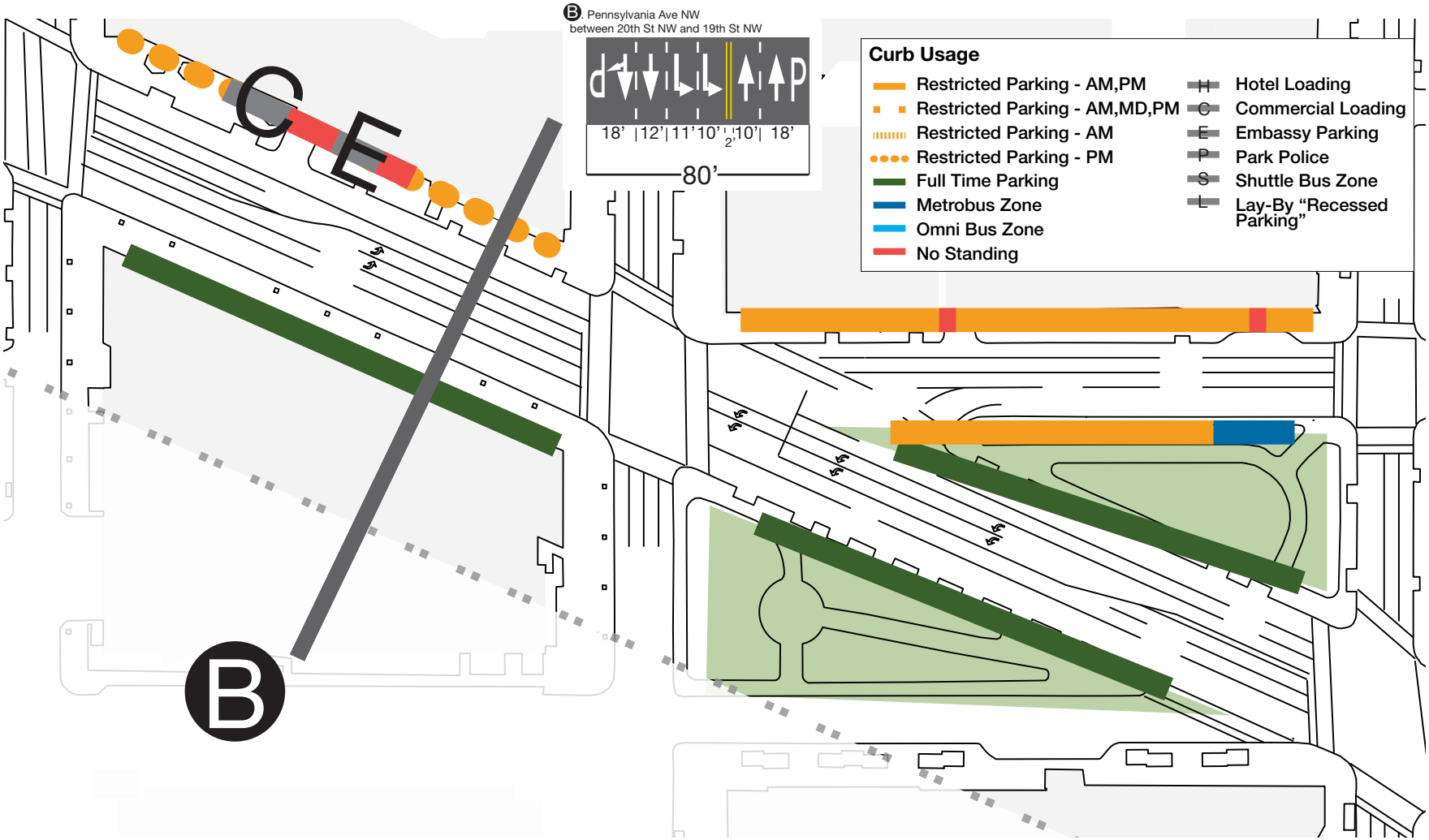


Figure 22 - Roadway Configuration and Curb Usage Pennsylvania Avenue NW Detail 3

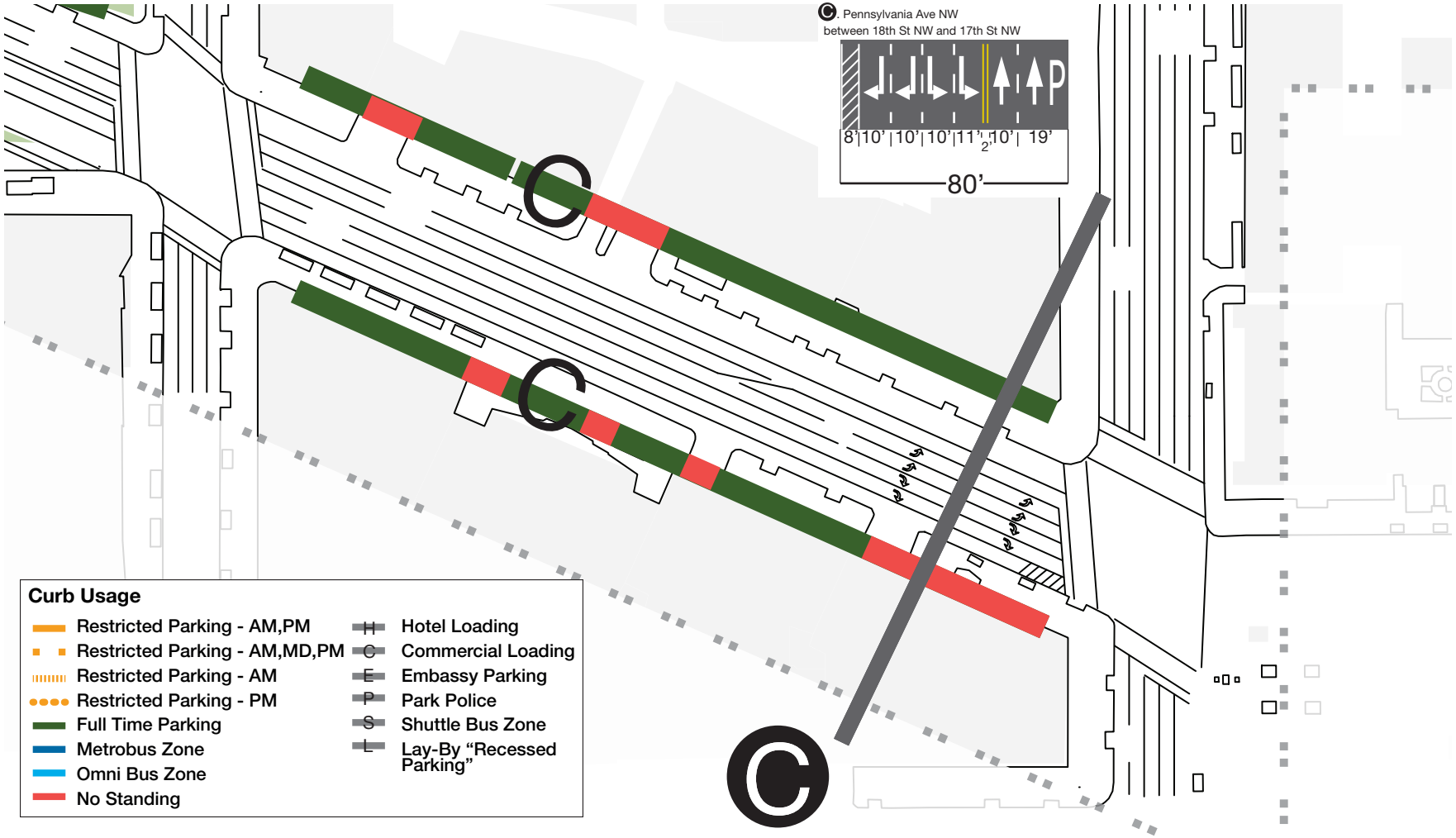


Figure 23 - Roadway Configuration and Curb Usage H and I Streets NW Detail 1

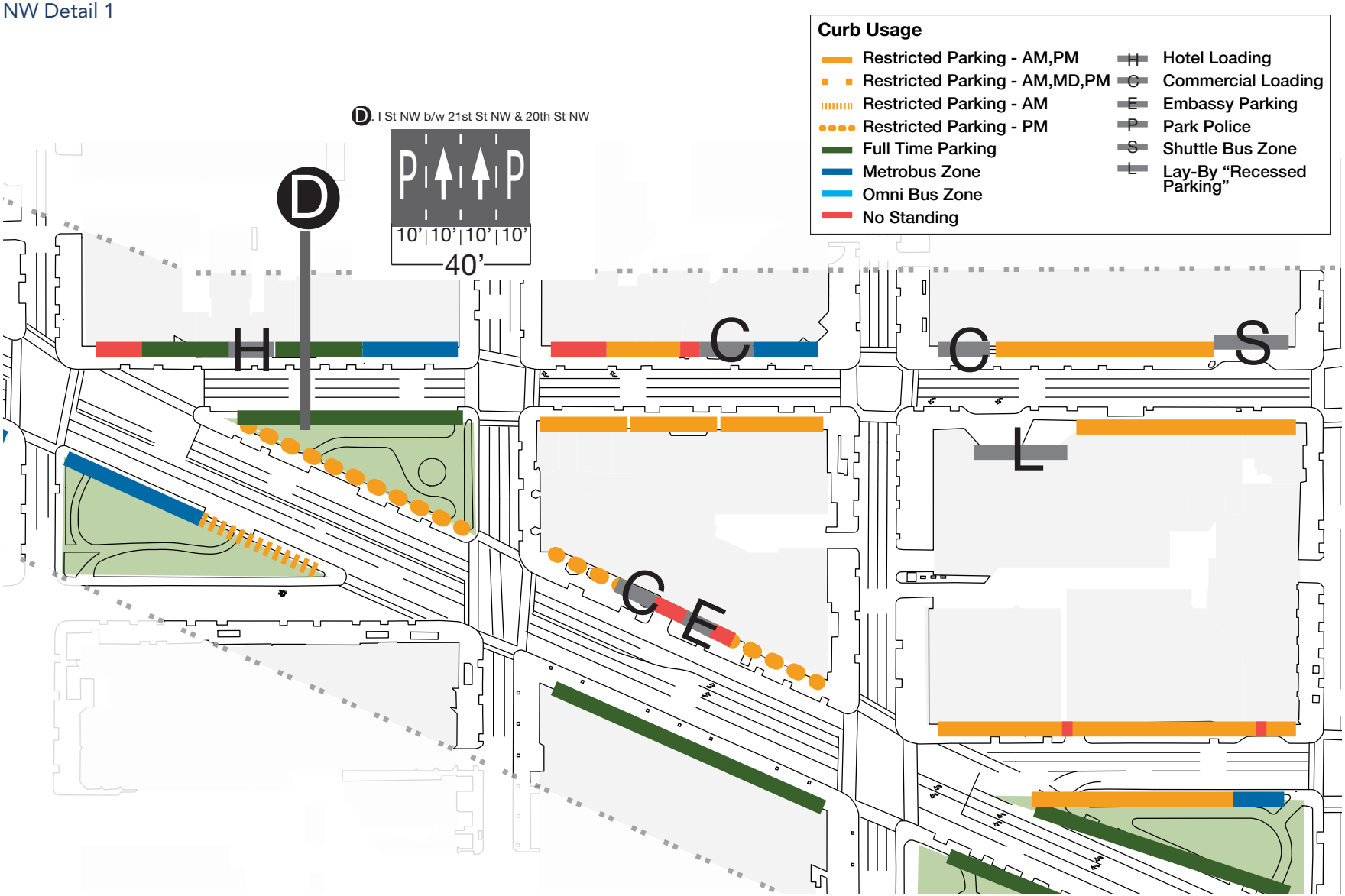


Figure 24 - Roadway Configuration and Curb Usage H and I Streets NW Detail 2

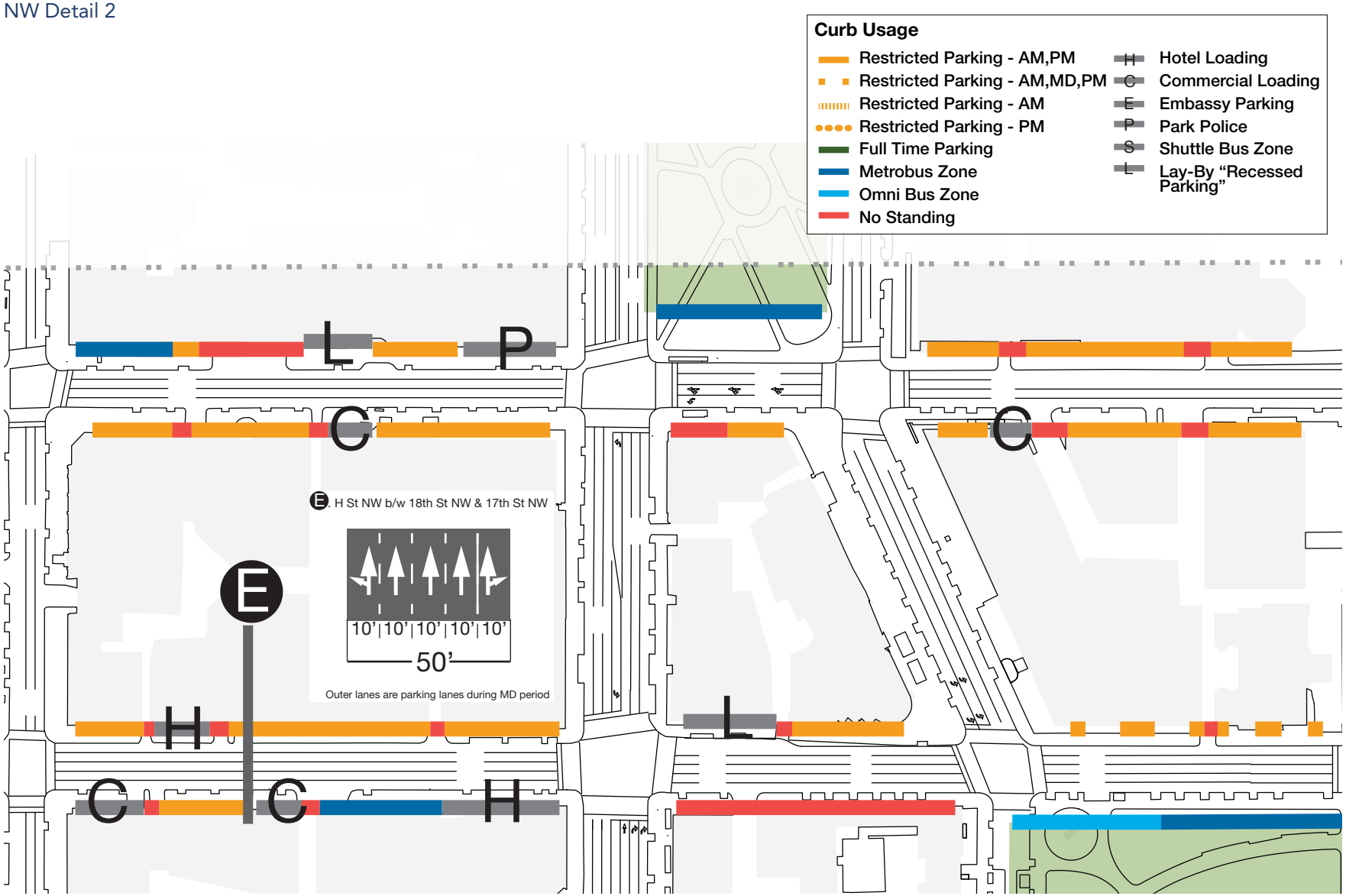


Figure 25 - Roadway Configuration and Curb Usage H and I Streets NW Detail 3

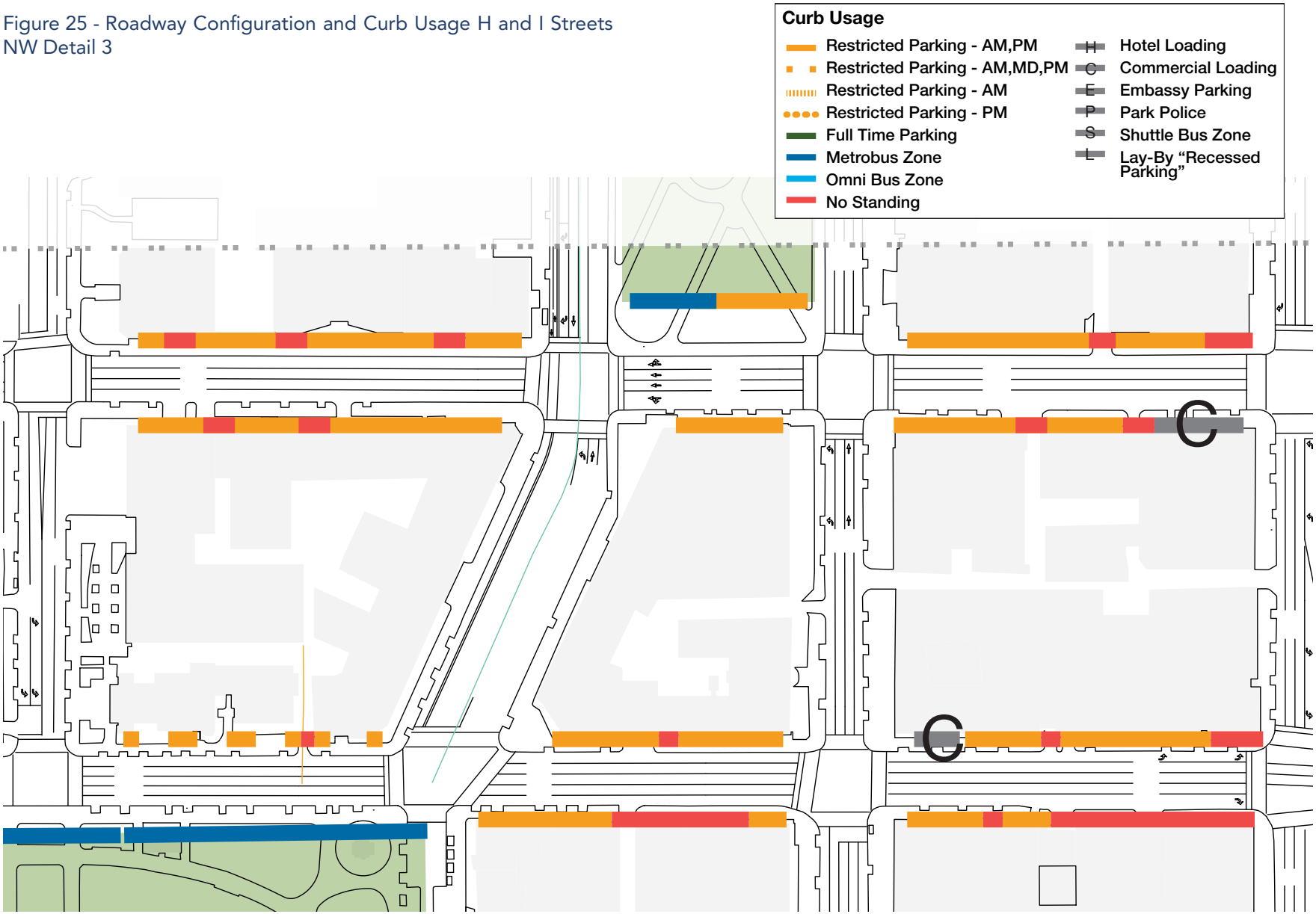
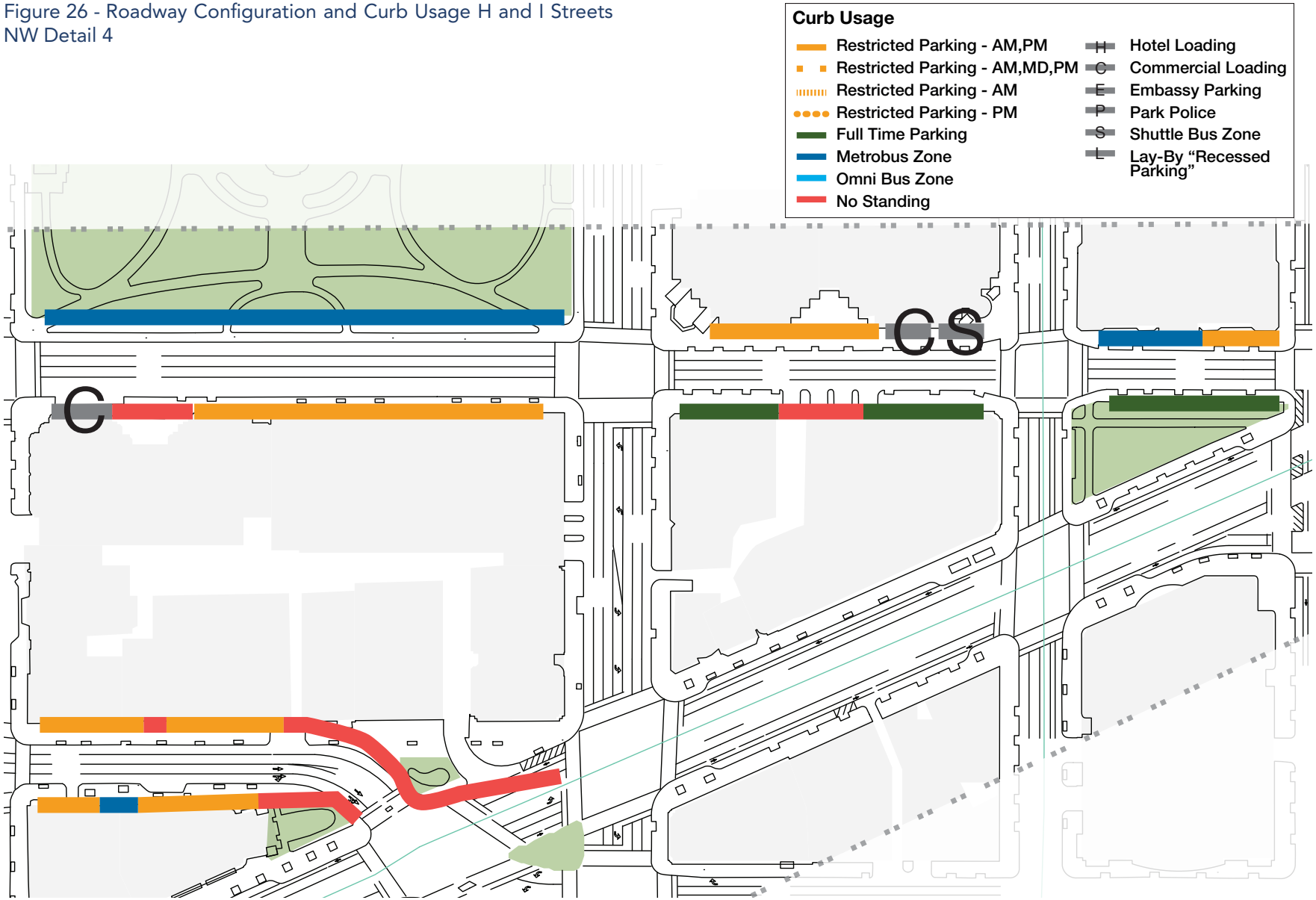


Figure 26 - Roadway Configuration and Curb Usage H and I Streets NW Detail 4



VEHICLE ANALYSIS

Vehicle Data

The main study corridors are Pennsylvania Avenue NW, H Street NW and I Street NW, along with New York Avenue NW, which serves as the eastern boundary of the H and I Street NW corridors. According to DDOT's 2014 Traffic Volume Map, each corridor carries the following daily traffic volumes:

- Pennsylvania Avenue NW – 19,400 vehicles per day, both directions.
- H Street NW – 15,000 vehicles per day, eastbound direction.
- I Street NW – 15,000 vehicles per day, westbound direction.
- New York Avenue NW – 10,600 vehicles per day, both directions.[3]

VOLUME DISTRIBUTION

Traffic volumes were analyzed and summarized for the AM, MD and PM peak hours. These peak hours were determined by DDOT's ongoing signal optimization project. Vehicle traffic conditions along Pennsylvania Avenue NW and H Street NW are summarized in the following figures and discussed below.

Key Findings - Pennsylvania Avenue NW:

- Pennsylvania Avenue NW does not carry a substantial volume of east-west traffic given the number of travel lanes provided, likely due to the road closure to vehicles adjacent to the White House.
- As shown, peak hour volumes are consistently higher in the eastbound direction along Pennsylvania Avenue NW compared to the westbound direction.
- Between 40 and 60 percent of eastbound traffic turns left onto H Street NW in each peak hour and volumes subsequently drop-off between 19th Street NW and 17th Street NW.
- Volumes on Pennsylvania Avenue NW at 17th Street NW are 77 percent, 43 percent, and 21 percent lower than they are at 21st Street NW in the AM, MD, and PM peak hours, respectively.
- Westbound volumes along Pennsylvania Avenue NW are also lowest between 17th Street NW and 18th Street NW. Heavy right-turn volumes from I Street NW contribute to higher through volumes from 21st Street NW to 22nd Street NW.
- Vehicles turning onto Pennsylvania Avenue NW from I Street NW represent between 70 and 80 percent of the volume approaching 22nd Street NW.
- Consistent with the ATR volumes displayed above, both eastbound and westbound volumes indicate lower daily traffic volumes than were reported in 2014.

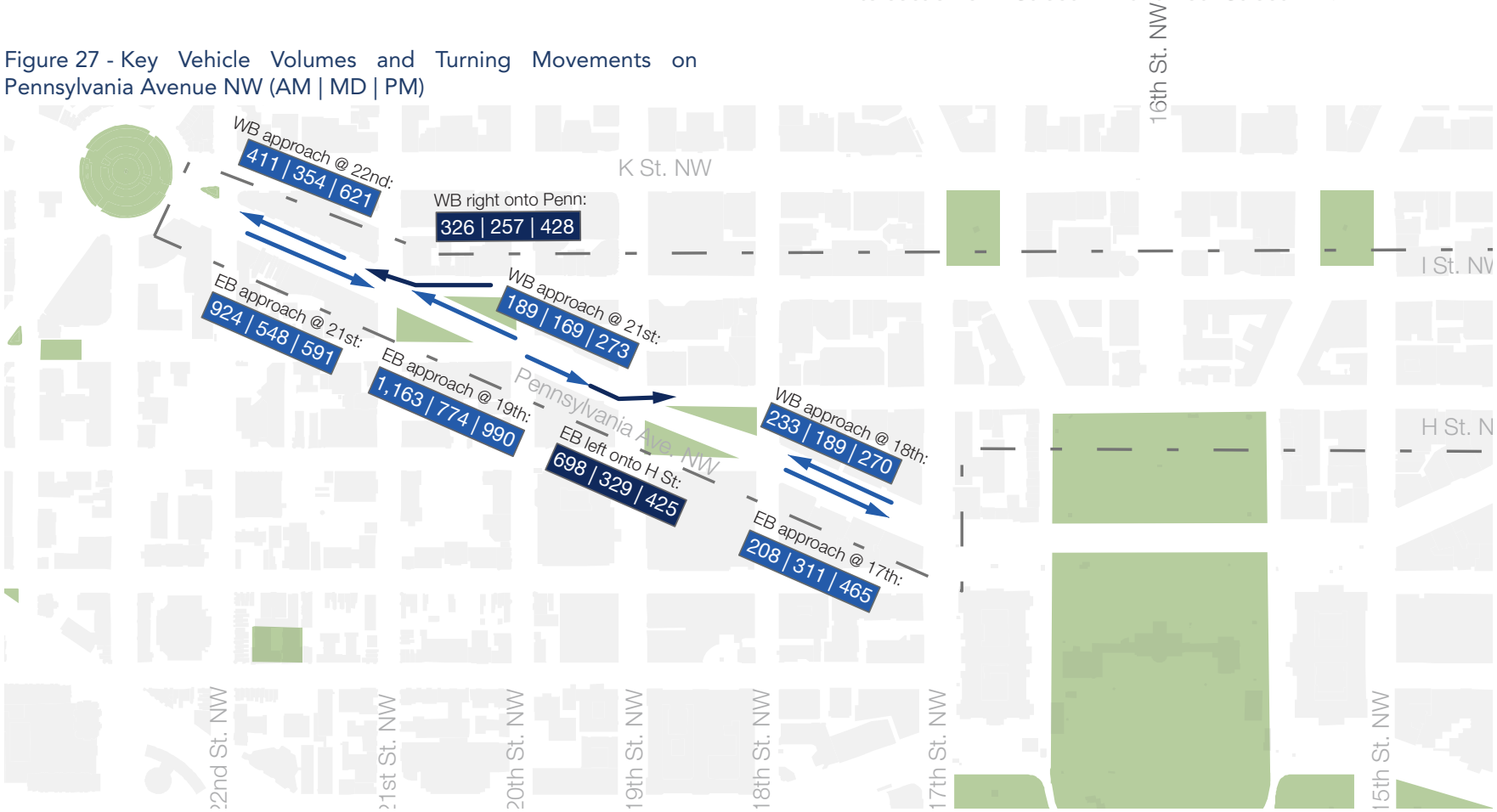
3 2014 DDOT Traffic Volume Map - http://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/Inset2014.pdf. Accessed, 7/2016

- Based on a preliminary traffic modeling exercise, Pennsylvania Avenue NW uses approximately 40 percent of its capacity during the AM, MD, and PM peak hours, on average, with certain blocks using below 20 percent of available capacity.
- The low vehicle volumes during the peak hours support the observations and assumptions that, in general, Pennsylvania Avenue NW has excess roadway capacity.

Key Findings - H Street NW and I Street NW

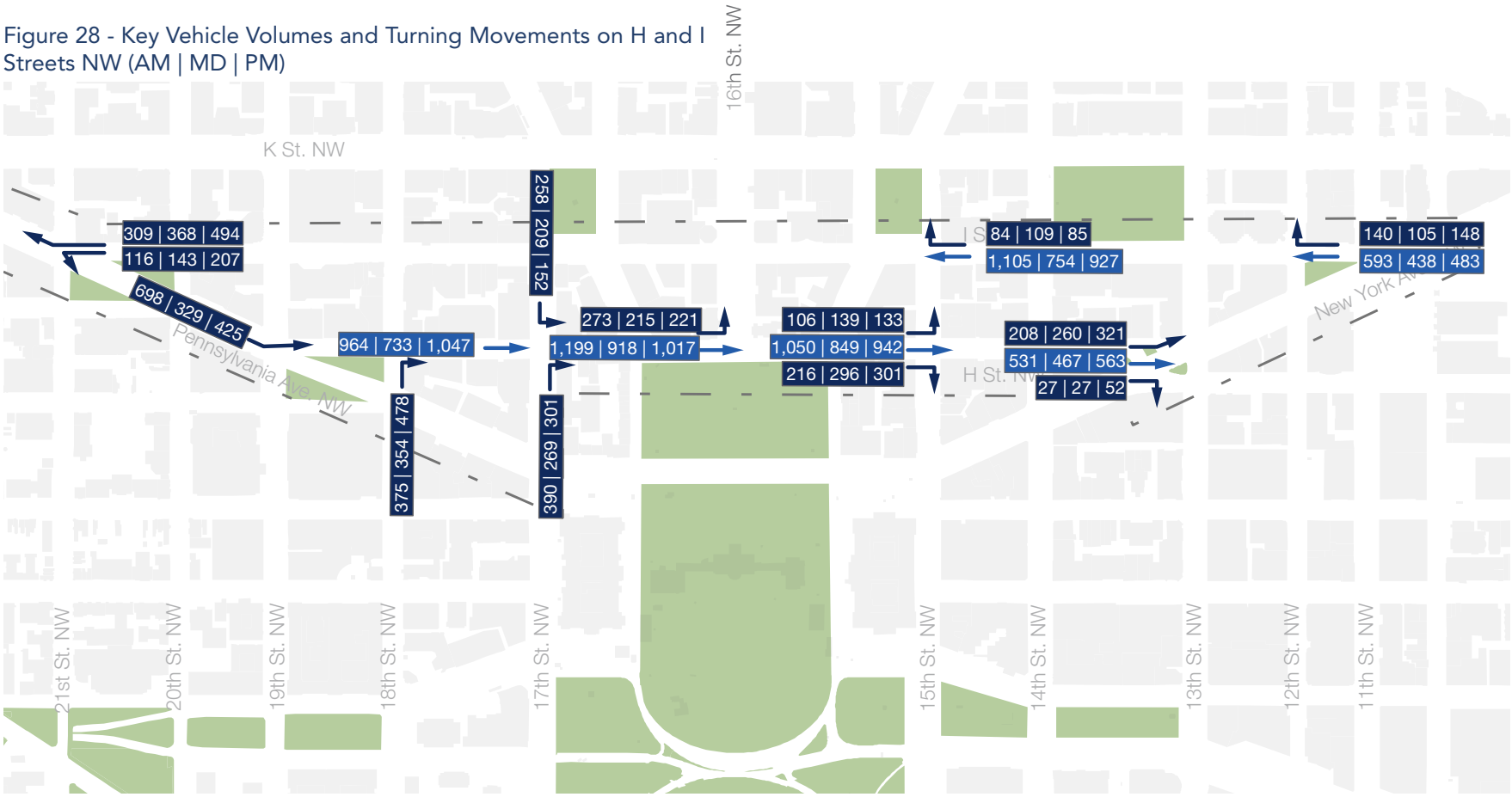
- H Street NW and I Street NW form a one way couplet that provides east-west access through Downtown.
- Vehicle volumes on H Street NW are heavily driven by turns from Pennsylvania Avenue NW, with left-turns onto H Street NW generating 75 to 85 percent of volumes approaching the intersection of H Street NW and 18th Street NW.

Figure 27 - Key Vehicle Volumes and Turning Movements on Pennsylvania Avenue NW (AM | MD | PM)



- Heavy turn volumes from 18th Street NW (right-turn) and 17th Street NW (left-turn and right-turn) contribute to volumes on H Street NW as well.
- However, high turn volumes from H Street NW onto 16th Street NW and 15th Street NW tend to keep volumes consistent along most of the corridor.
- Between 15th Street NW and New York Avenue NW, turning volumes from H Street NW are higher, reflecting a 32 to 45 percent drop in volumes approaching New York Avenue NW.
- Similar conditions occur on I Street NW, with heavy turning volumes from 14th Street NW (left-turn), 15th Street NW (left-turn) and 17th Street NW (right-turn) onto I Street NW and heavy turn volumes onto 17th Street NW, 19th Street NW, and Pennsylvania Avenue NW from I Street NW.

Figure 28 - Key Vehicle Volumes and Turning Movements on H and I Streets NW (AM | MD | PM)

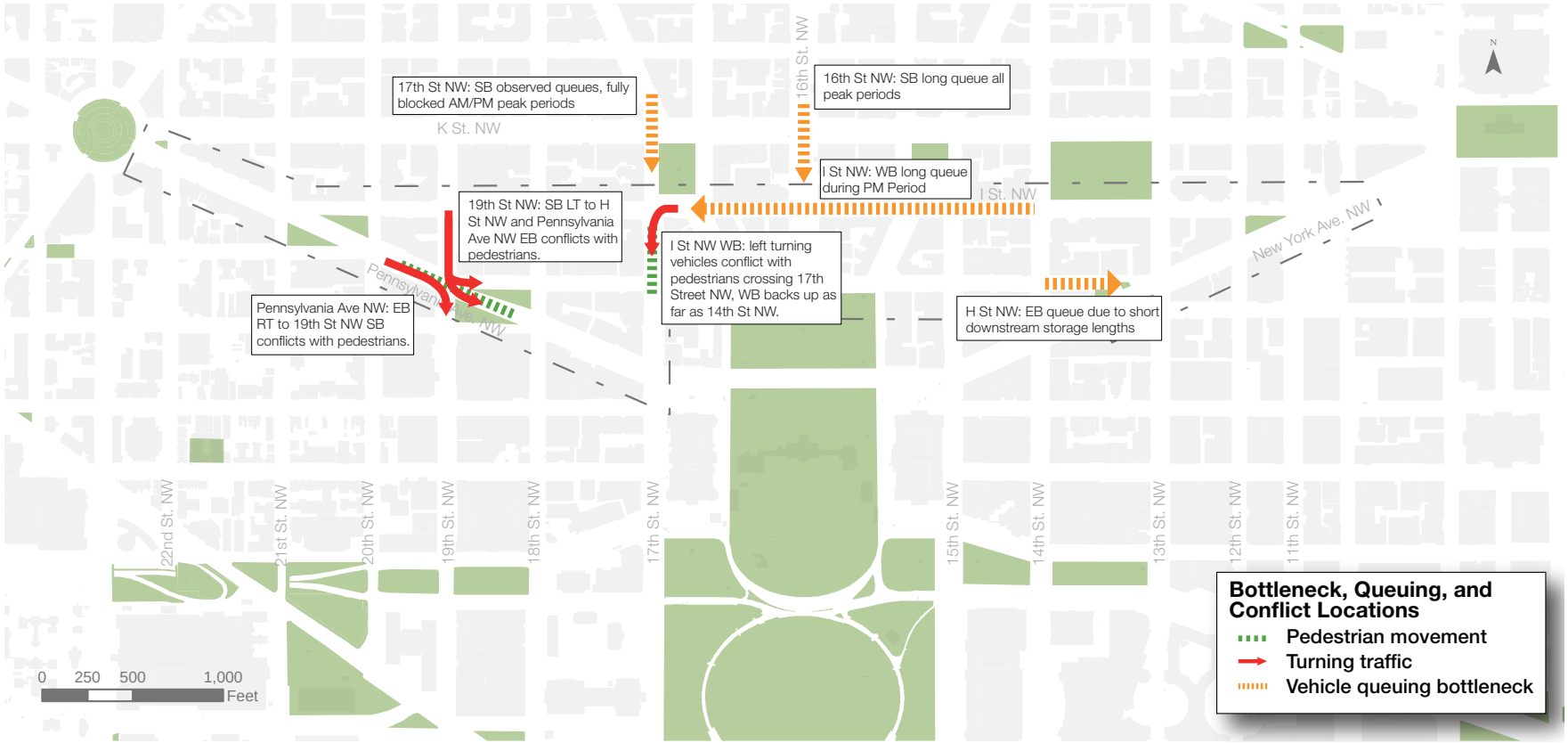


OBSERVED QUEUING

Insufficient capacity and the conflicts between turning vehicles and crossing pedestrians can contribute to lengthy traffic delays. Long queues that spill back multiple blocks were observed on I Street NW. Congestion on H Street NW and I Street NW often blocks traffic turning from side streets, causing congestion on those streets as well. During the field inventory and data collection process, queues and bottlenecks were observed at the following locations:

- Pennsylvania Avenue NW and H Street NW/19th Street NW: Queues were observed on Pennsylvania Avenue NW eastbound and 19th Street NW southbound due conflicts between turning vehicles and crossing pedestrians. Pedestrian volumes are high in all directions at this location.
- I Street NW and 17th Street NW: I Street NW westbound and 17th Street NW southbound approaches are congested most of the time during peak periods. The queues on I Street NW westbound are caused by conflicts between left turning vehicles

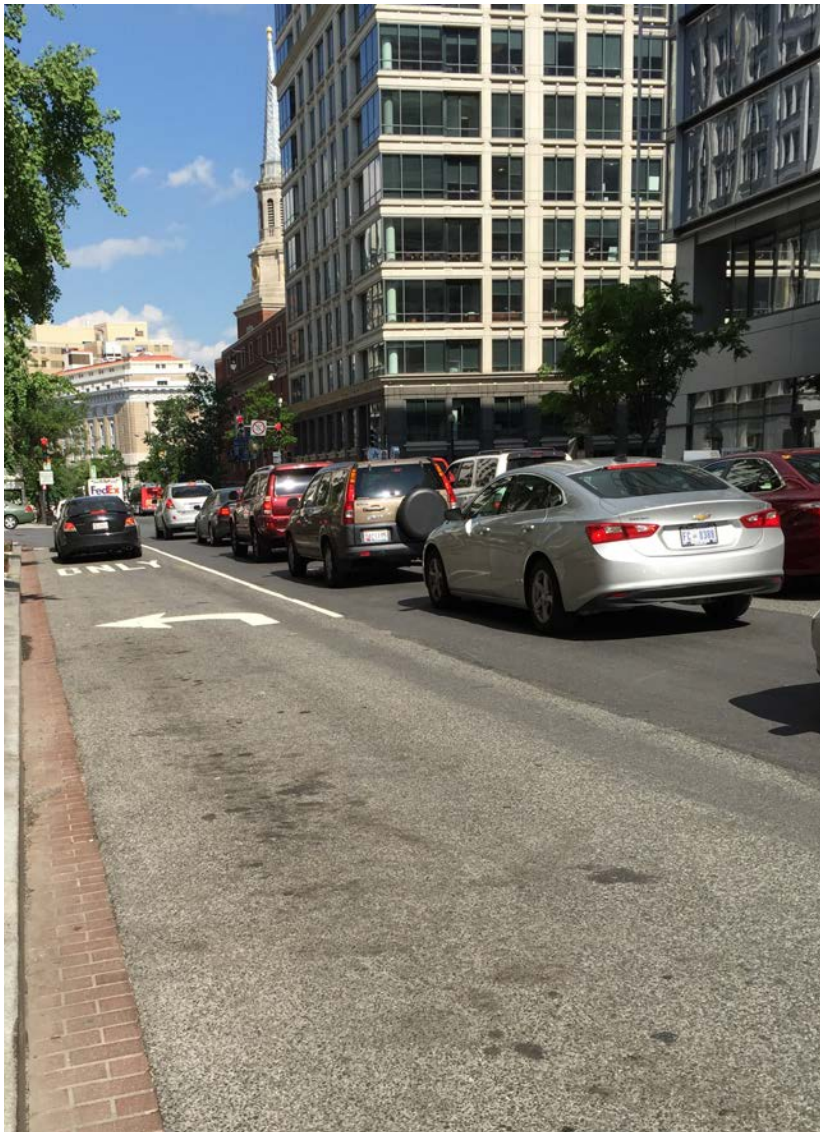
Figure 29 - Bottleneck, Queuing and Conflict Locations



and pedestrians crossing 17th Street NW. The queues on I Street NW westbound spill back as far as 14th Street NW. Safety is a concern at this location as numerous close encounters between pedestrians and motorists were observed.

- I Street NW and 16th Street NW: Long queues were observed on the 16th Street NW southbound approach for all three peak periods. Long queues were observed on I Street NW westbound during the PM peak period.
- H Street NW and 15th Street NW: Delays are caused by queues spilling back from downstream intersections on H Street NW. The spill-back also blocks turning traffic from 15th Street NW and causes intersection delays.
- New York Avenue NW and H Street NW/13th Street NW: Queues on H Street NW often do not clear after each signal cycle due to insufficient downstream storage in both AM and PM peak periods. The queue spill-back on H Street NW also affects westbound traffic on New York Avenue NW.

Figure 30 - Vehicles Queuing Along H Street NW at 14th Street NW



TRAFFIC OPERATIONS

A Synchro traffic model and a multimodal Vissim traffic model were developed to establish the existing conditions of the study area. The models include outputs for the AM, MD and PM peak hours.

The inputs for these models include the geometric roadway configuration, traffic volumes of various travel modes, traffic signal timings as well as bus schedule and bus dwell times information (Vissim only). These models will continue to be used throughout the Study to evaluate the impacts of proposed alternatives on each travel mode.

The Synchro outputs, summarized and discussed below, provide an indication of how vehicle traffic moves in the existing condition and are input into the Vissim model to calibrate the model to the actual vehicle and transit travel behaviors. The Vissim model will provide more insight in the variations in person delay between the existing conditions, future conditions and future conditions with and without applying the design alternatives. The Vissim model includes H Street NW and I Street NW to evaluate the contraflow bus lane on H Street NW. The Synchro model covers the entire study area.

Level of Service and Vehicle Delay

This section provides a summary of level of service and vehicle delay at each intersection. The Highway Capacity Manual defines one of the main outputs of the Synchro model, level of service (LOS), as a measure of average total vehicle delay of all movements through a particular intersection. Table 1 displays the criteria for LOS at signalized intersections based on the Highway Capacity Manual (2010).

Table 2 (following page) presents the intersection LOS and vehicle delay for the AM, MD, and PM peak hours.

Table 1 - LOS Criteria and Description

LOS	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

It is acceptable, particularly in urban areas, for roadways to operate at LOS D, which equates to approximately 85% capacity. Nearly all intersections function effectively, with only one intersection experiencing LOS lower than D. However, the following intersections operate at LOS D and are locations that may require special consideration in the design process:

- H Street NW & New York Avenue NW (PM)
- I Street NW & Pennsylvania Avenue NW (MD)
- I Street NW & Vermont Avenue NW (AM)
- New York Avenue NW & 10th Street NW (PM)
- New York Avenue NW & 15th Street NW (PM)
- Pennsylvania Avenue NW & 19th Street NW (MD)

Table 2 - AM, MD, and PM Peak Hour Existing Conditions Model Results

	LOS			Delay (Sec)		
Intersection	AM	MD	PM	AM	MD	PM
Pennsylvania Avenue NW & 22nd Street NW	C	B	C	20.3	16.0	20.6
Pennsylvania Avenue NW & 21st Street NW	C	B	C	26.0	15.4	20.4
I Street NW & Pennsylvania Avenue NW	C	**D**	**F**	20.4	47.3	108.5
I Street NW & 20th Street NW	C	B	B	33.9	19.8	11.1
I Street NW & 19th Street NW	B	B	B	10.7	13.8	19.8
I Street NW & 18th Street NW	B	B	C	16.7	17.0	28.2
I Street NW & 17th Street NW	B	C	C	19.5	30.6	30.3
I Street NW & Connecticut Avenue NW	B	B	C	12.1	16.7	22.9
I Street NW & 16th Street NW	A	B	A	8.6	15.8	9.3
I Street NW & Vermont Avenue NW	**D**	C	B	36.0	23.4	17.5
I Street NW & 15th Street NW	B	B	B	18.0	19.3	17.9
I Street NW & 14th Street NW	C	C	C	31.7	21.0	25.9
I Street NW & 13th Street NW	C	C	C	27.6	21.7	25.0
I Street NW & 12th Street NW	B	A	B	18.2	8.8	13.8
I Street NW & 11th Street NW	B	B	C	19.4	14.2	20.9
I Street NW & 11th Street NW	A	A	A	7.1	8.4	5.4
Pennsylvania Avenue NW & 20th Street NW	B	B	C	18.8	15.5	25.8
Pennsylvania Avenue NW & 19th Street NW	C	**D**	C	25.7	36.7	28.6
H Street NW & 18th Street NW	A	A	A	6.1	5.5	8.5
H Street NW & 17th Street NW	C	C	C	23.8	22.3	25.0
H Street NW & 16th Street NW	B	B	B	11.4	17.8	11.6
H Street NW & Vermont Avenue NW	B	C	B	10.9	20.9	18.4
H Street NW & 15th Street NW	A	B	B	7.7	14.3	10.1
H Street NW & 14th Street NW	A	A	A	8.6	8.6	7.9
H Street NW & 13th Street NW	B	B	B	12.9	15.7	16.6
H Street NW & New York Avenue NW	C	C	**D**	20.2	26.7	42.3

Intersection	LOS			Delay (Sec)		
	AM	MD	PM	AM	MD	PM
Pennsylvania Avenue NW & 18th Street NW	B	B	B	19.3	18.1	19.1
Pennsylvania Avenue NW & 17th Street NW	B	C	B	13.4	22.8	17.5
New York Avenue NW & 15th Street NW	B	B	**D**	19.6	19.5	48.1
New York Avenue NW & 14th Street NW	B	B	B	16.7	15.0	14.9
New York Avenue NW & 13th Street NW	A	A	A	8.4	7.3	6.5
New York Avenue NW & 12th Street NW	C	C	C	26.1	22.5	24.9
New York Avenue NW & 11th Street NW	B	B	B	14.8	14.6	13.6
New York Avenue NW & 10th Street NW	C	B	**D**	24.8	18.8	48.9

The intersection of I Street NW and Pennsylvania Avenue NW performs at LOS F during the PM peak hour. This is due heavy right-turn volumes onto Pennsylvania Avenue NW. In addition, right-turns are not permitted during the red phase, resulting in diminished LOS for all westbound movements from I Street NW onto Pennsylvania Avenue NW.

While overall intersections perform well, Individual approaches at some intersections perform below LOS D. The full table of approach LOS, delay and queue length is included in Appendix 1.

The design alternatives proposed as part of the Study will strive to address intersections and approaches with diminished LOS, acknowledging that vehicle LOS must be balanced with the level and quality of service for transit, bicycle and pedestrian users.

PEDESTRIAN ANALYSIS

Pedestrian Infrastructure

The existing pedestrian infrastructure along Pennsylvania Avenue NW is driven by the Pierre L'Enfant plan from 1791. The diagonal avenue preserves viewsheds of the White House, incorporates National Parks Service parks and overlaps with several historically significant structures and areas. Despite these features, the corridor lacks a clear identity and consistent streetscape language. In addition, Pennsylvania Avenue NW's diagonal nature bisects the north-south, east-west street grid and creates long and difficult pedestrian crossings. The following site plan (Figure 31) and section diagrams (Figures 32-35) provide an overview of the existing conditions that are furthered examined in this section.

Figure 31 - Site Plan of Pennsylvania Avenue NW

Figure 32 - Section A - Pennsylvania Avenue NW between 22nd Street NW and 21st Street NW

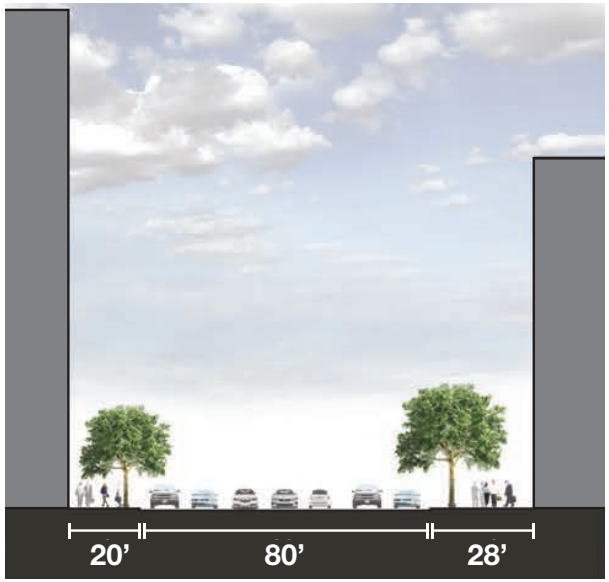


Figure 33 - Section B - Pennsylvania Avenue NW between 21st Street NW and 20th Street NW

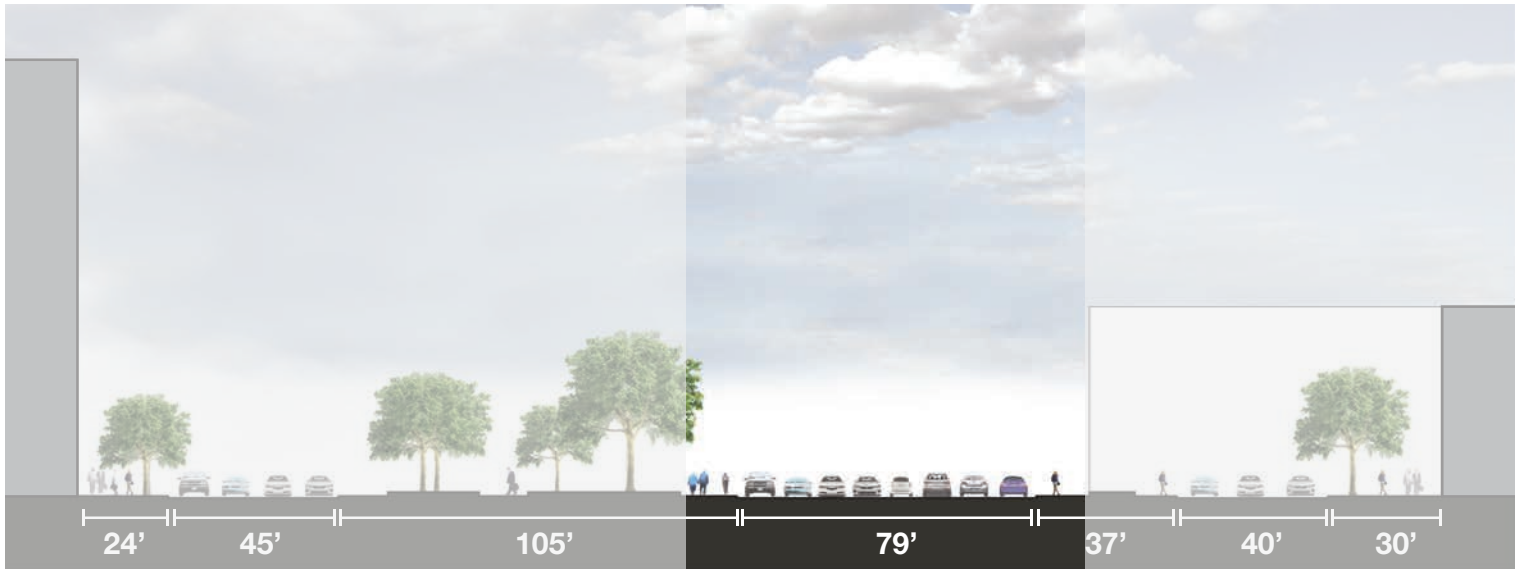


Figure 34 - Section C - Pennsylvania Avenue NW between 20th Street NW and 19th Street NW

Figure 36 - Section E - Pennsylvania Avenue NW between 18th Street NW and 17th Street NW

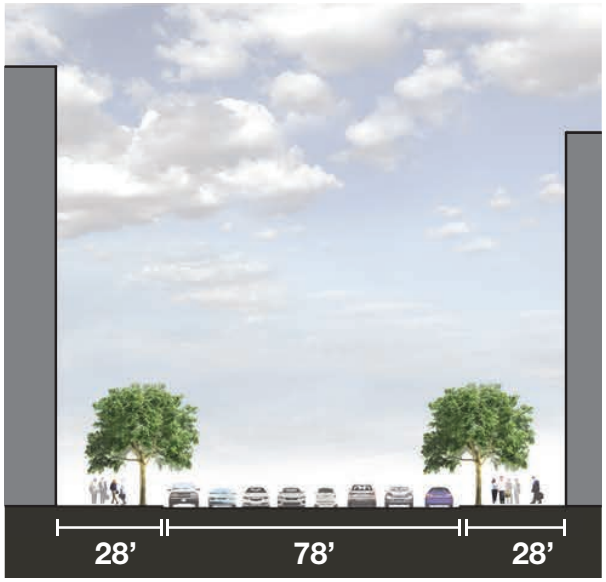
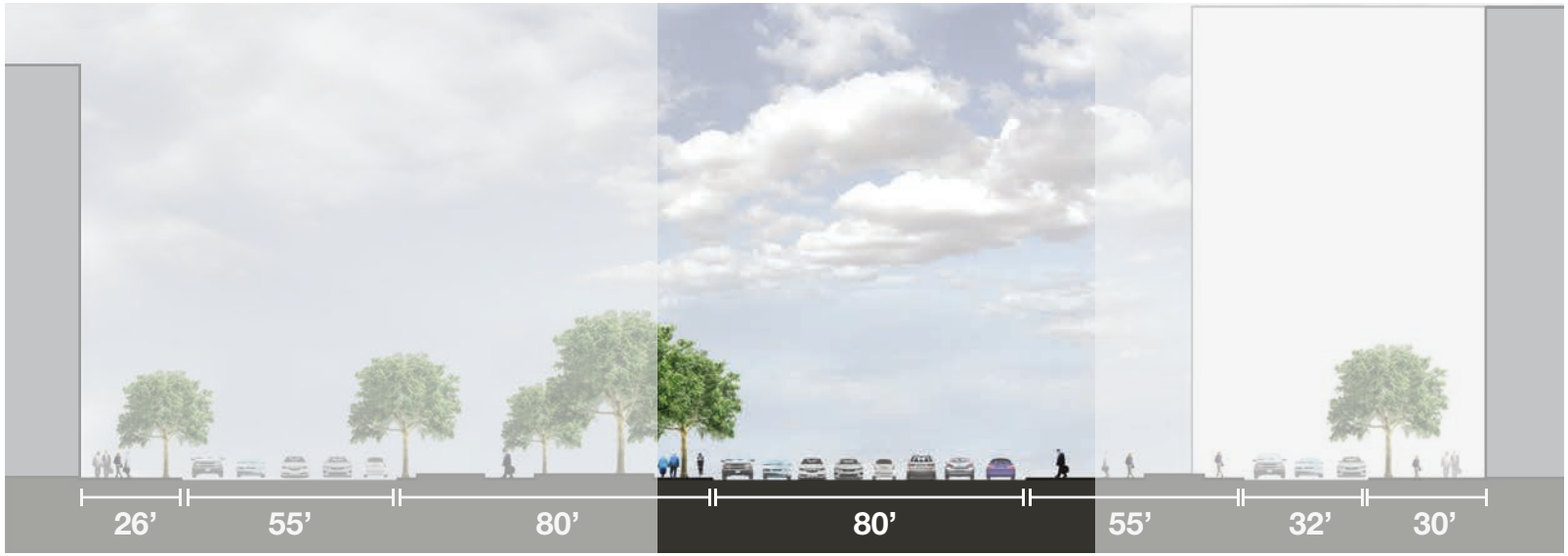


Figure 35 - Section D - Pennsylvania Avenue NW between 19th Street NW and 18th Street NW



SIDEWALKS

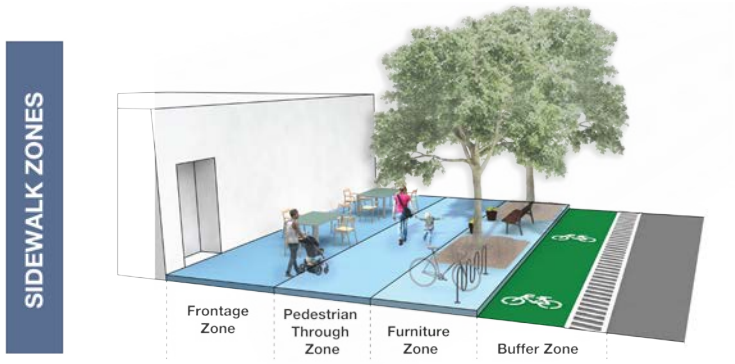
Pennsylvania Avenue NW's monumental design results in wide sidewalks that range in size from 12 feet to nearly 30 feet on some blocks. There are no gaps in sidewalk connectivity along the corridor and the width provides space for commuting on foot, sidewalk furniture and pedestrian amenities, and non-commuting activities including socializing, eating and relaxing.

Sidewalk Zones

Most urban streets contain at least three sidewalk zones. The zones help to define the pedestrian experience as well as set a foundation for activity programming. Along the Pennsylvania Avenue NW, the sidewalk zones include: frontage zone, pedestrian through zone, and street furniture/curb zone. If space exists, an additional zone, the enhancement/buffer zone, which can be defined as the space between the sidewalk and the travel lane, can be added, often by removing space from the roadway.

Currently, sidewalk zones along the corridor are ambiguous, with limited definition between zones. Aside from some stretches between 22nd Street NW and 21st Street NW, which maintain distinctions between each of the basic three zones, most sidewalk stretches do not delineate the pedestrian through zone from the street furniture/curb zone.

Figure 37 - Typical Urban Sidewalk Zones



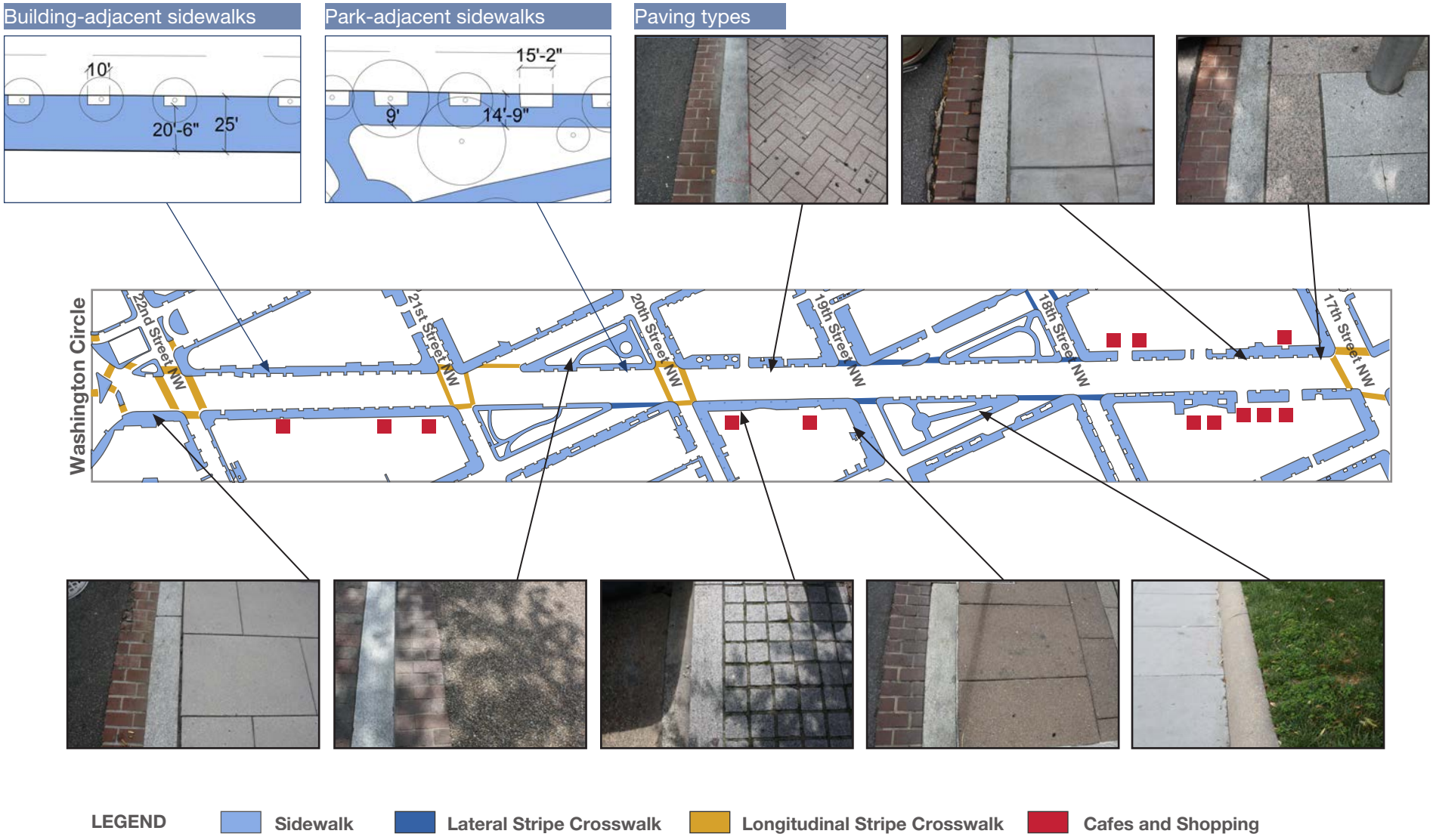
Sidewalk Typologies

The corridor's sidewalks include two main typologies: the building-adjacent sidewalk and the park-adjacent sidewalk. The majority of the sidewalks along Pennsylvania Avenue NW fit into the first category. These are sidewalks that span the space between parked vehicles and the build-to-line or façade of an adjoining building. Along the corridor, building-liner sidewalks range from approximately 23 feet to more than 26 feet. Park-liner sidewalks consist of sidewalks lining Monroe and Murrow Parks. At their narrowest, the park-liner sidewalks are 12 feet wide. At their widest, these sidewalks reach 15 feet in width.

Sidewalk Paving

The corridor's sidewalks lack consistent paving materials and styles. As Pennsylvania Avenue NW's buildings have changed ownership and use, each new building has utilized contrasting paving designs that support the building's unique architecture. This approach results in a disjointed pedestrian experience and detracts from the corridor's collective identity.

Figure 38 - Sidewalk Conditions Along Pennsylvania Avenue NW

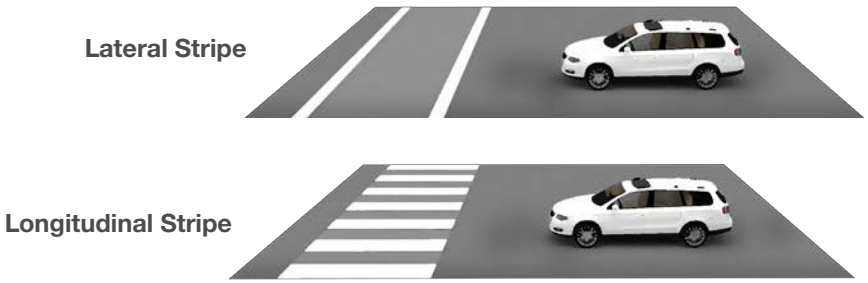


Crosswalk Typologies

The corridor's crosswalks occur in three typologies: long-span crosswalks, short-span crosswalks and long-span slip lane crosswalks. Long-span crosswalks consist of those crossing Pennsylvania Avenue NW's 80 foot wide roadway. Short-span crosswalks consist of those crossing Pennsylvania Avenue NW's narrower cross streets. Long-span slip lane crosswalks may include a pedestrian refuge island. The only existing example along the corridor is located at Murrow Park's northwest corner and spans H Street NW. There are no mid-block crosswalks along the corridor.

There are two variations of crosswalk markings along Pennsylvania Avenue NW. The primary marking type is the longitudinal strip marking style and the secondary type is the lateral stripe marking style. With the exception of crosswalks surrounding Murrow Park, Pennsylvania Avenue NW's crosswalks are longitudinal stripe crosswalks.

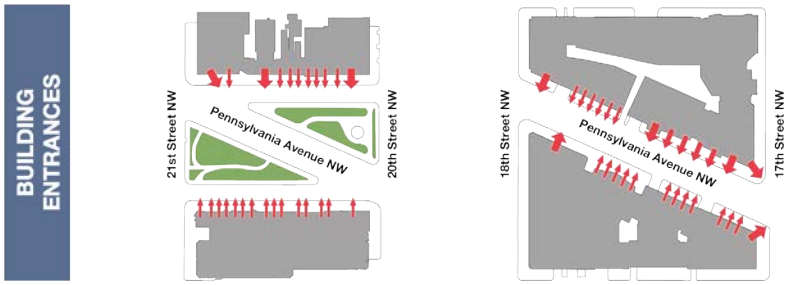
Figure 39 - Crosswalk Typologies Along Pennsylvania Avenue NW



Building Frontage

Along Pennsylvania Avenue NW in the study area, blocks with well-defined sidewalks tend to also serve more buildings than block with poorly-defined sidewalks and have the highest concentrations of building entry points. As referenced in the diagram below, the blocks between 22nd Street NW and 21st Street NW and 19th Street NW and 18th Street NW have the highest building entrance concentrations. These blocks also have the most clearly defined sidewalk zones.

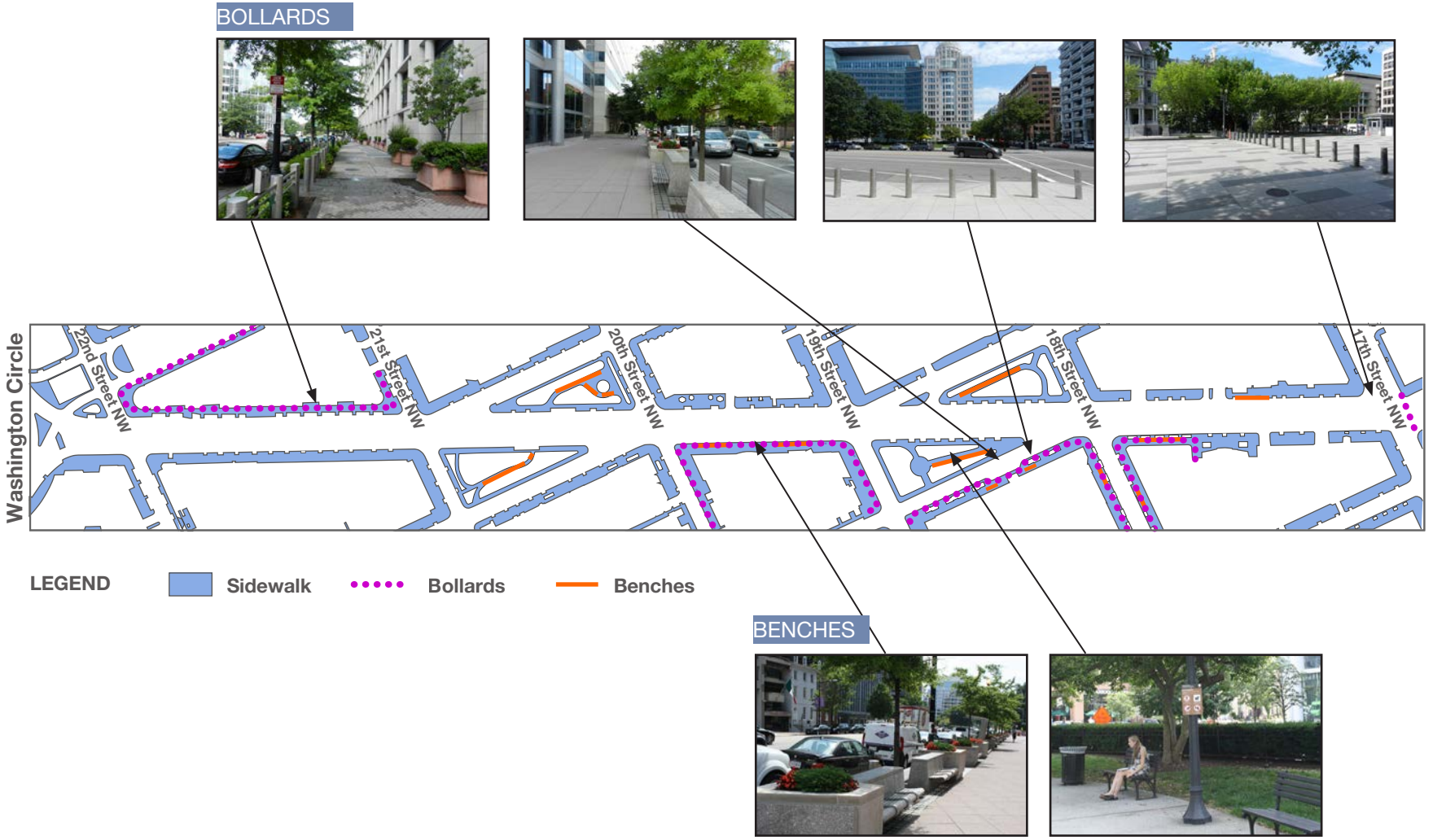
Figure 40 - Building Entrances



Security and Sidewalk Amenities

Pennsylvania Avenue NW is home to a variety of institutional uses including the IMF, World Bank, and embassies. These buildings require certain security measures that influence the urban design and sidewalk character along the corridor. In some cases, this may result in bollards located within the Furniture Zone in order to keep vehicles away from the building. These bollards may also provide seating and landscaping. In addition, Monroe and Murrow Parks feature benches, pedestrian scale lighting, and trash receptacles in the Frontage Zone, adjacent to the parks.

Figure 41 - Security Features and Pedestrian Amenities



Green Space

The corridor has two main sources of green space within its boundaries: Monroe Park and Murrow Park. These two urban parks are under the National Park Service's jurisdiction. However, both parks are bisected by Pennsylvania Avenue NW, resulting in long and complicated connections between the parks for pedestrians. As a complement to the parks, the corridor has a multitude of tree boxes that help to soften its hardscape.

PARKS

Monroe Park and Murrow Park are two rectangular parks that are each bisected diagonally by Pennsylvania Avenue NW. This bisection results in four independent triangular green spaces. In relationship to the five-block study area, these parks are evenly spaced, located between 21st Street NW and 20th Street NW, and 19th Street NW and 18th Street NW.

TREE BOXES

Although inconsistent in design, there are a number of tree boxes along the corridor. There is a variety of both understory landscaping and above-ground landscaping. Understory landscaping is planting that occurs within a sidewalk planting strip or street tree basin. Many of these tree boxes are planted with extensive seasonal plantings and designed and managed privately by the property managers of adjoining buildings. For institutional tenants such as the International Monetary Fund, The World Bank or International Finance Corporation, understory landscaping along the corridor are designed with security in mind. Examples of such tree boxes include the integration of bollards, railings and benches.

The *Sustainable DC* Plan also pledges to cover the District with 40 percent tree canopy by the year 2032. Currently, the corridor's tree canopy covers 15 percent of the total area, leaving opportunity for improvement to help support the 40 percent goal. In many locations, especially along sidewalks surrounding Monroe and Murrow Parks, some existing trees are not spaced at the minimal distances. In other cases, street trees have perished or do not exist at all.

Nine tree species currently exist along Pennsylvania Avenue NW. Among the nine, the top four species that make up the majority of the tree canopy are all in the Oak genus. 55 percent of the total tree canopy consists of the Willow Oak. Following the Willow Oak in descending rank are the Red Oak, Swamp White Oak and Shingle Oak.

ABOVE-GROUND LANDSCAPING

Above ground landscaping is the most common type of landscaping along the corridor. Similar to that of understory landscaping, many above-ground landscaping tree boxes are also being utilized as security barriers. The above-ground tree boxes appear to be privately maintained by adjoining buildings' property managers as well. Most of these tree boxes are located adjacent to the building façade within the frontage sidewalk zone. A few tree boxes are incorporated into seating arrangements. These tree boxes include a variety of native and exotic plants. In most cases, these tree boxes lack piped irrigation and require high levels of maintenance.

GREEN INFRASTRUCTURE

According to the District of Columbia's *Sustainable DC* Plan, the District pledges to use 75 percent of the landscape to capture and filter stormwater by the year 2032. While many of the existing understory landscaping is well maintained and aesthetically pleasing, there are no visible locations of using planting for green infrastructure.

Figure 42 - Existing Tree Canopy and Tree Types

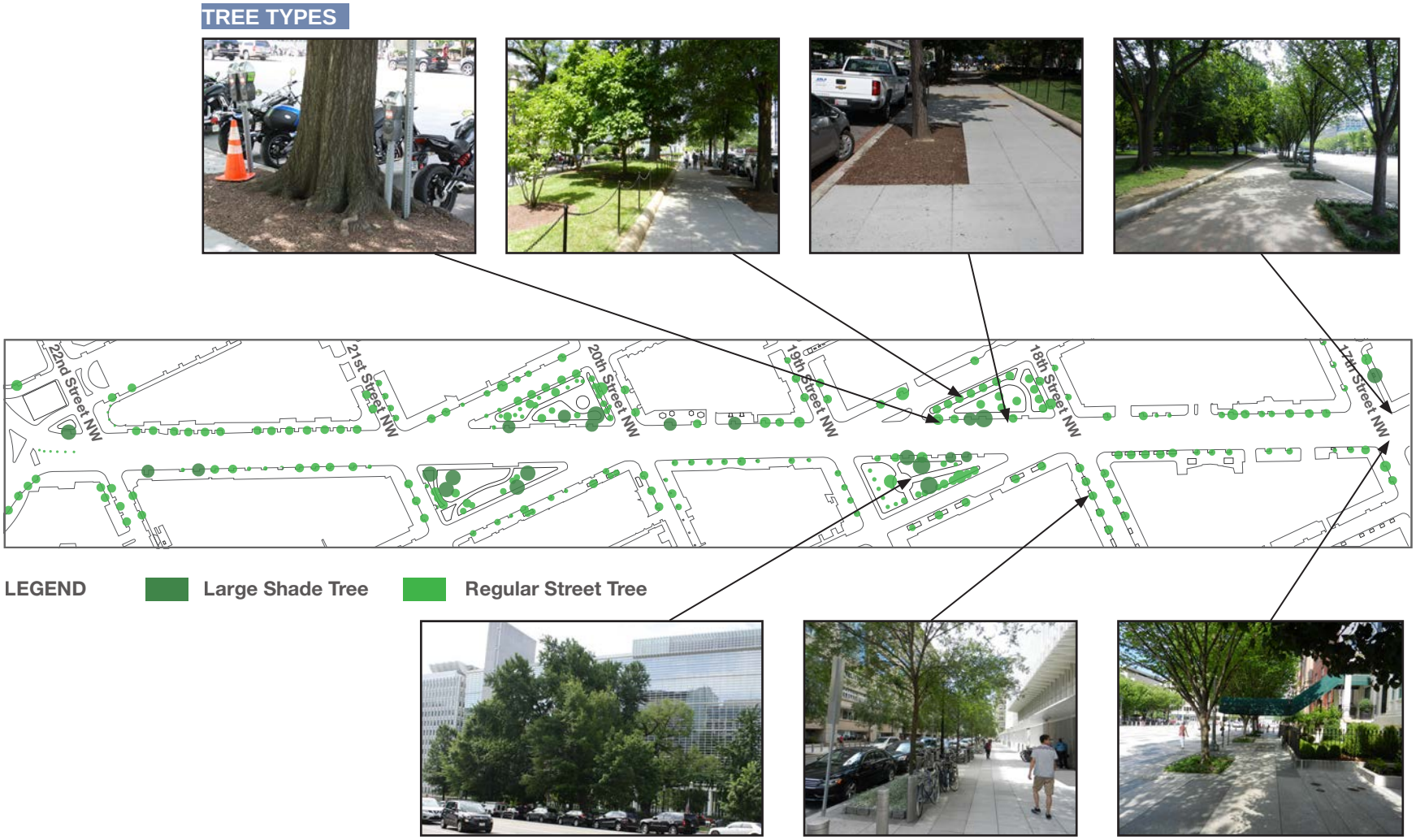
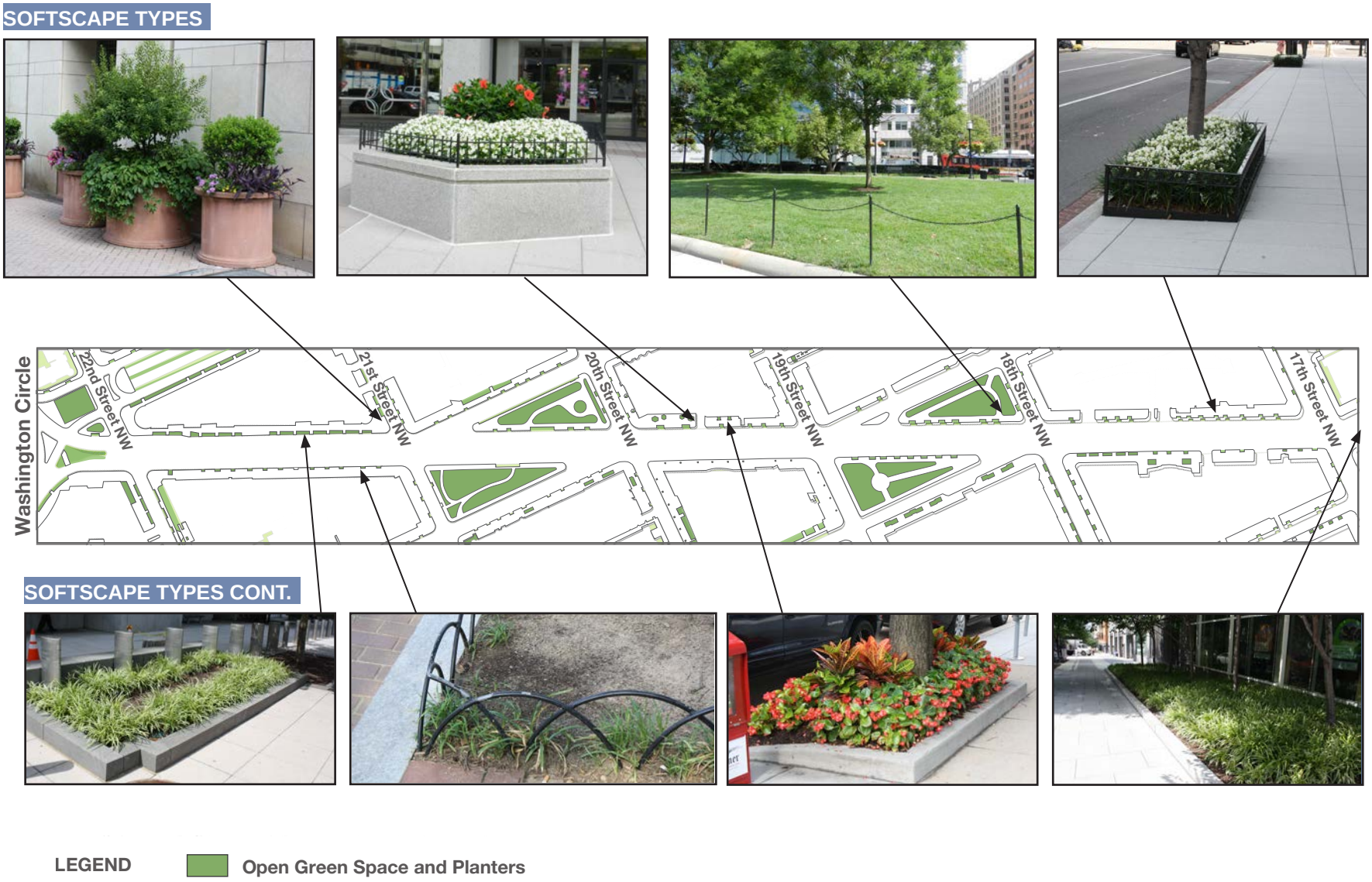


Figure 43 - Existing Softscape Types



Pedestrian Data

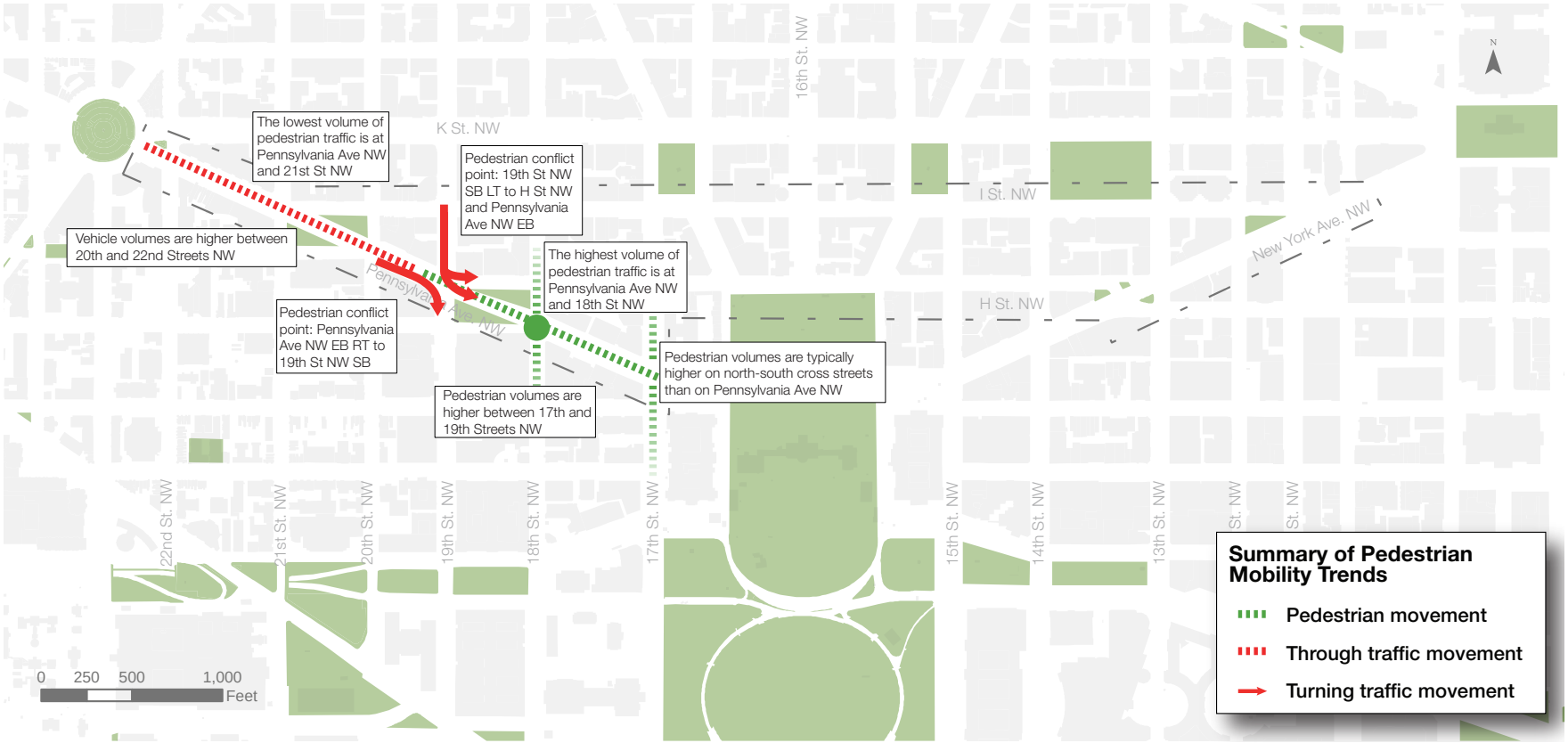
VOLUMES

The following analysis of pedestrian travel describes pedestrian volumes at intersections along the Pennsylvania Avenue NW corridor, between 17th Street NW and 22nd Street NW during the AM, MD, and PM peak periods. Pedestrian counts were conducted throughout the study area and the data are summarized in the figures below, however the analysis targets Pennsylvania Avenue NW and the streets with which it intersects.

Pedestrian travel throughout the study area is summarized as follows:

- Of the three daily peak travel periods, pedestrian volumes along the Pennsylvania Avenue NW corridor are highest during the MD peak period and lowest during the AM peak period.
- Metro stations appear to be a driver of pedestrian traffic, with higher pedestrian volumes at intersections nearby and adjacent to station entrances.

Figure 44 - Summary of Pedestrian Mobility Trends



- Volumes tend to be higher on the north-south streets (crossing Pennsylvania Avenue NW) than on Pennsylvania Avenue NW.
- Contrarily to vehicle volumes, pedestrian volumes are generally higher within eastern half of corridor (17th–19th Streets NW) than in the western half (20th–22nd Streets NW).
- On average, the intersection of 18th Street NW and Pennsylvania Avenue NW experiences the highest overall volume of pedestrian traffic over the course of the day, perhaps due to its connection to Farragut North and Farragut West Metro stations.
- The intersection of 21st Street NW and Pennsylvania Avenue NW experiences the lowest overall volume of pedestrian traffic throughout the day. This intersection is adjacent to Monroe Park and a large, empty, office building (2100 Pennsylvania Avenue NW) that is slated for redevelopment.

Figure 45 - AM Peak Hour Pedestrian Activity

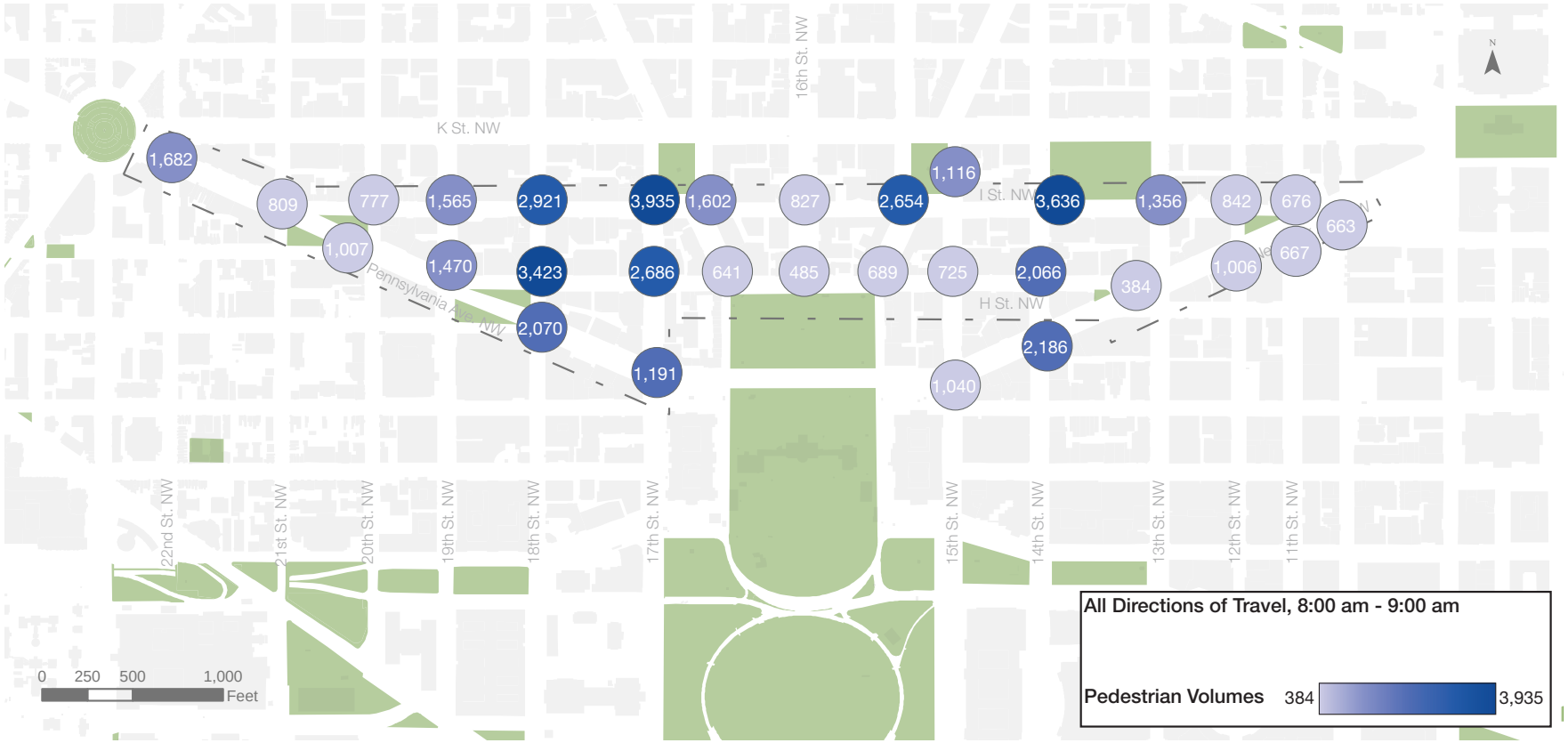


Figure 46 - MD Peak Hour Pedestrian Activity

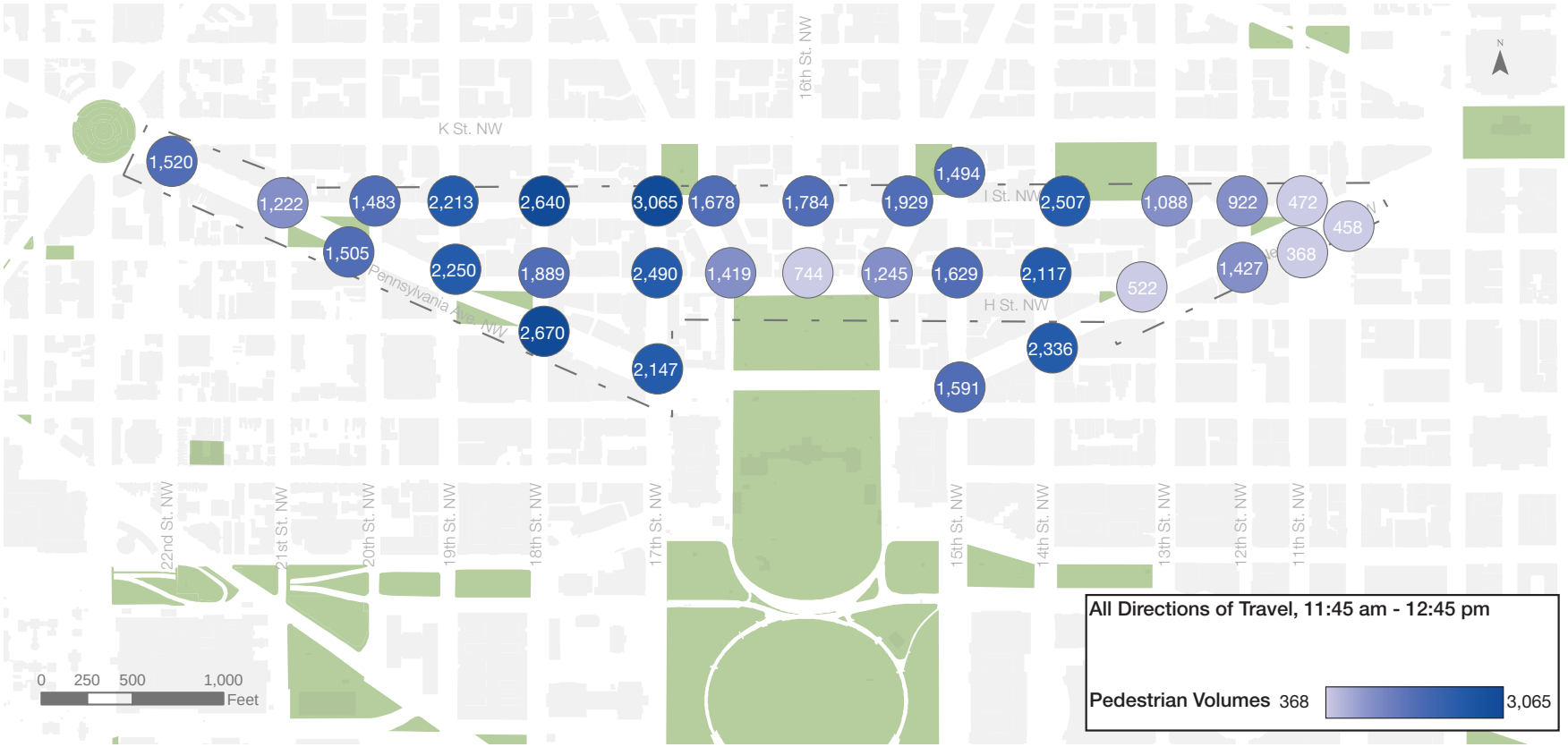
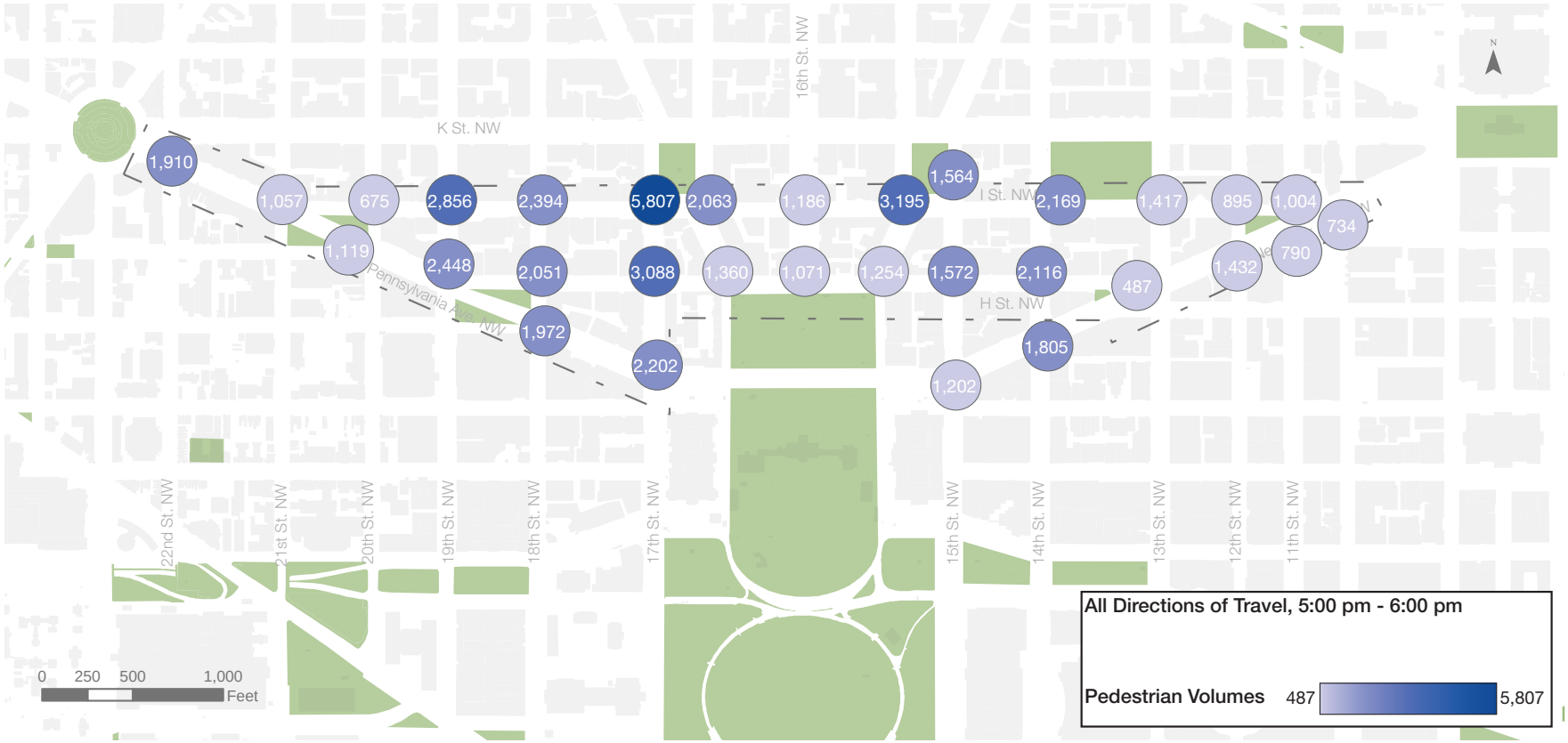


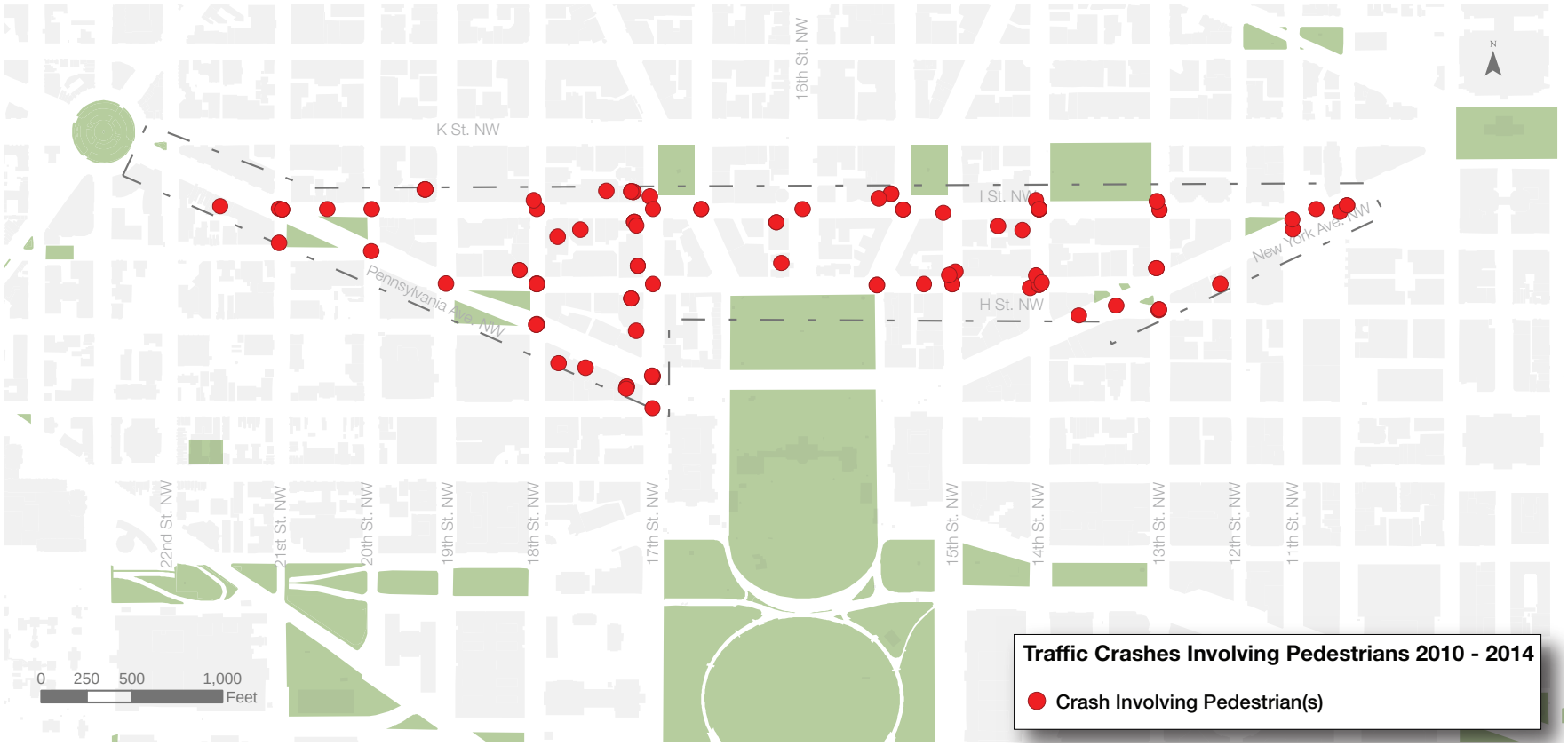
Figure 47 - PM Peak Hour Pedestrian Activity



SAFETY

- Between 2010 and 2014, Vehicular Crash Data reported by the Metropolitan Police Department (MPD) identifies 106 crashes between vehicles and pedestrians in the study area, involving a total of 112 pedestrians. There were no fatalities in the study area during this time period.
- Relative to other main corridors within the study area (I Street NW, H Street NW, and New York Avenue NW), the Pennsylvania Avenue NW corridor has fewer crashes involving pedestrians, with only eight crashes involving 10 pedestrians occurring on the corridor. Despite the relatively lower number of crashes, the long, unprotected crossings on Pennsylvania Avenue NW and low visibility, high-speed turning movements for vehicles exposes pedestrians to a high crash risk.
- Three intersections, 17th Street NW (3 crashes), 18th Street NW (2 crashes) and 21st Street NW (2 crashes) contained seven of the eight crashes involving pedestrians along Pennsylvania Avenue NW.

Figure 48 - Traffic Crashes Involving Pedestrians, 2010-2014



BICYCLE ANALYSIS

Bicycle Infrastructure

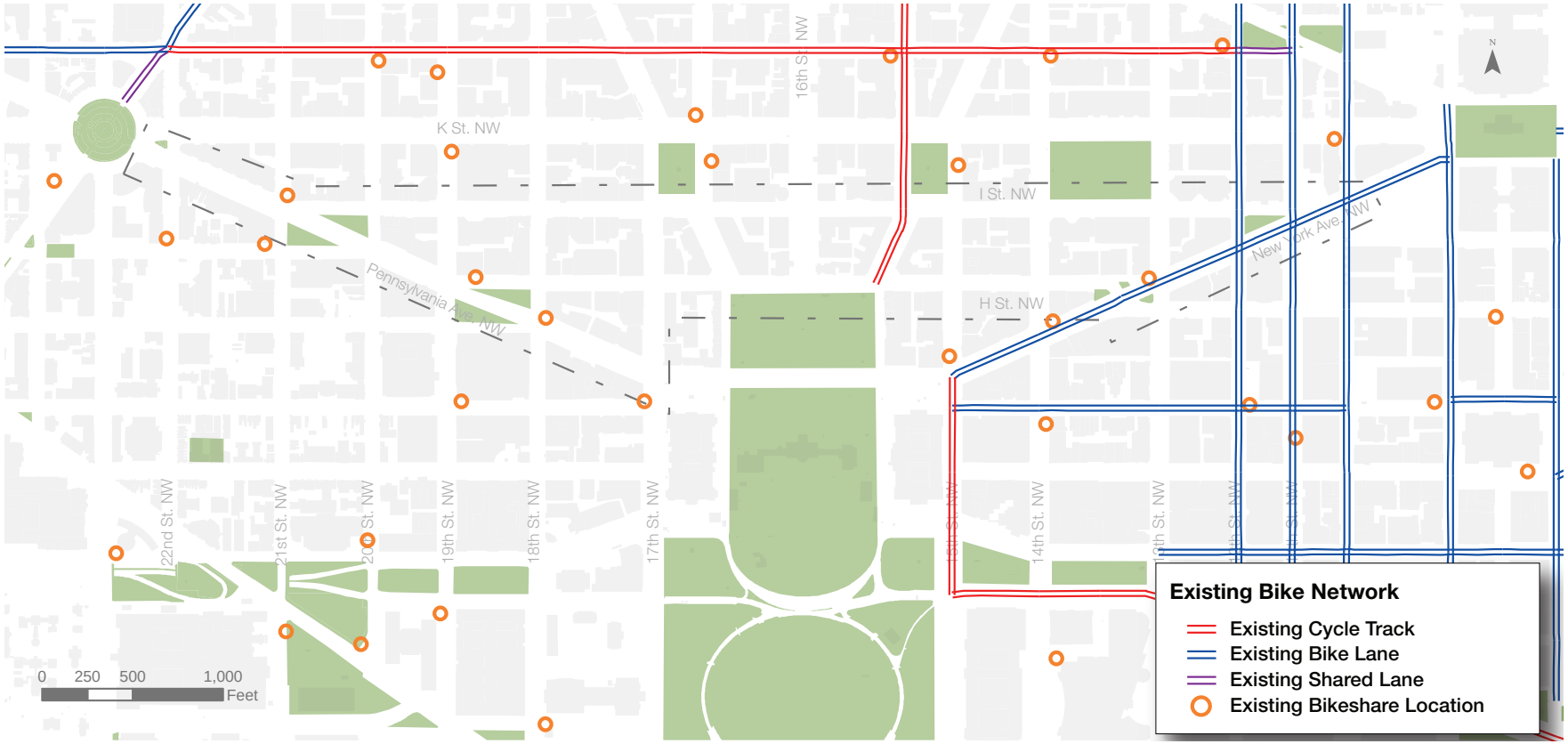
Within the study area, Pennsylvania Avenue NW does not have any existing dedicated bicycle infrastructure. However, existing bicycle amenities exist, in addition to surrounding bicycle network facilities and proposed network enhancements.

EXISTING BICYCLE INFRASTRUCTURE

To the southeast, between the Capitol and the White House, Pennsylvania Avenue NW features a center-running bidirectional cycle track. The corridor is well-travelled by cyclists spurred by the completion of the cycle track in 2010. Existing dedicated bicycle facilities in the study area include:

- 15th Street NW/Vermont Avenue NW – two-way northbound and southbound cycle track (terminating at H Street NW).

Figure 49 - Existing Bike Network



- 15th Street NW – two-way northbound and southbound cycle track (between New York Avenue NW and Pennsylvania Avenue NW.
- New York Avenue NW – northeast- and southwest-bound parking-adjacent bicycle lanes (terminating at 15th Street NW).
- 12th Street NW – northbound bicycle lane.
- 11th Street NW – northbound and southbound parking-adjacent bicycle lanes.
- 10th Street NW – southbound parking-adjacent bicycle lane.

EXISTING CAPITAL BIKESHARE STATIONS

Capital Bikeshare provides bicycle share service throughout the study area. All of the stations along Pennsylvania Avenue NW in the study area are heavily used, experiencing more than 1,000 trips per month during the summer 2015 season. Key Capital Bikeshare stations along the corridor include:

- 21st Street NW and Pennsylvania Avenue NW (18 docks).
- 21st Street NW and I Street NW (35 docks).
- 19th Street NW and Pennsylvania Avenue NW (15 docks).
- 18th Street NW and Pennsylvania Avenue NW (27 docks).
- 17th Street NW and G Street NW (30 docks).

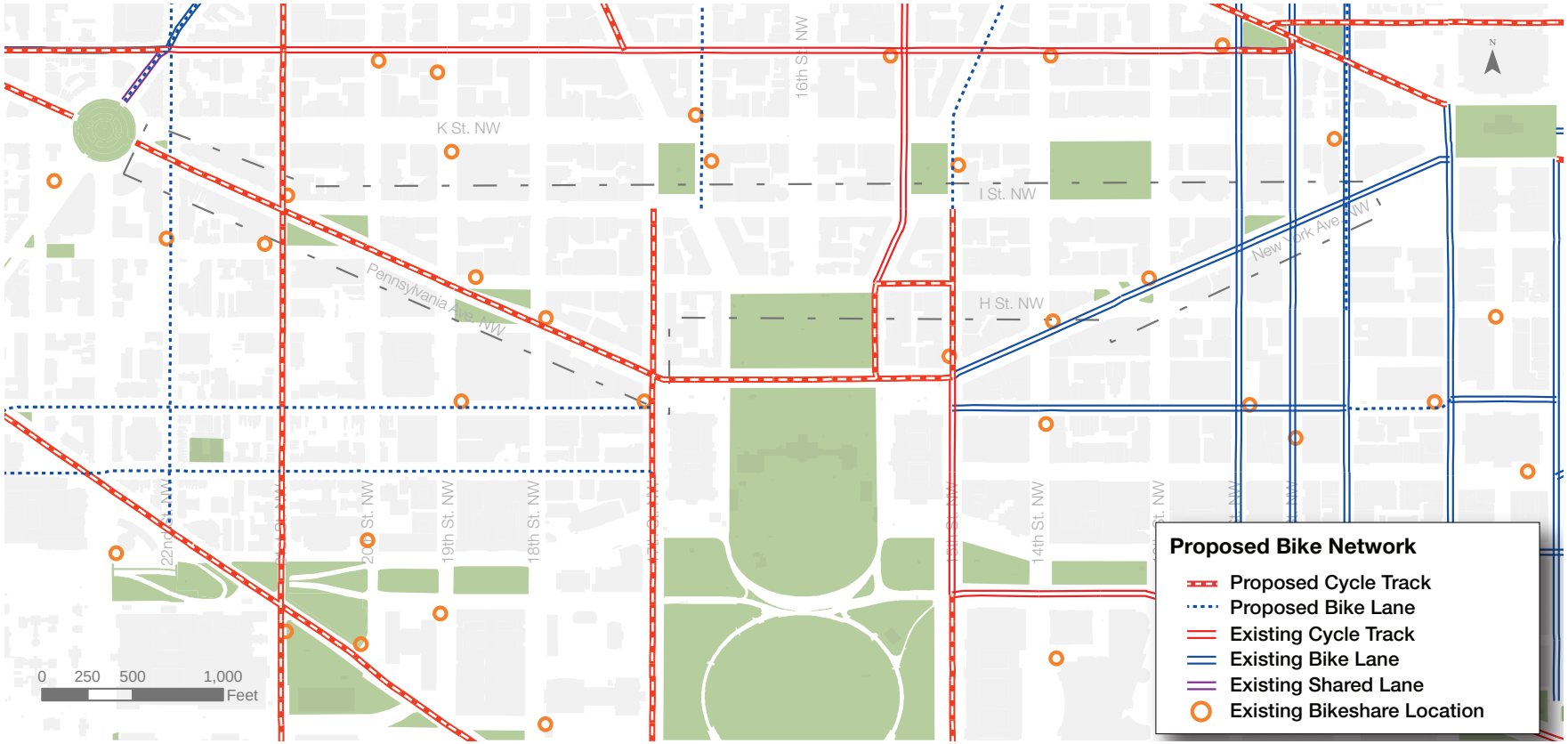
PROPOSED BICYCLE NETWORK EXPANSION (MOVEDC)

moveDC proposes significant expansions to the bicycle network within and surrounding the study area. The expansions include a cycle track along Pennsylvania Avenue NW, which will be developed as part of the Downtown West Transportation Planning Study. In addition, the following dedicated bicycle facilities are proposed:

- 22nd Street NW – northbound bicycle lane.
- 21st Street NW – southbound cycle track.
- 17th Street NW – northbound and southbound cycle track (terminating in the north at I Street NW).
- 17th Street NW – northbound and southbound bicycle lane (extending north from I Street NW).
- Vermont Street NW - extension south from H Street NW through Lafayette Square.
- 15th Street NW – northbound and southbound cycle track between I Street NW and the pedestrianized portion of Pennsylvania Avenue NW.
- 15th Street NW – northbound and southbound bicycle lane (extending north from I Street NW).

The proposed facilities that interact with the study area will serve primarily northbound and southbound bicycle desire lines. As such, the development of the Pennsylvania Avenue NW corridor within the study area will provide a critical east-west function and improve overall bicycle network functionality and mobility.

Figure 50 - Proposed Bike Network



Bicycle Data

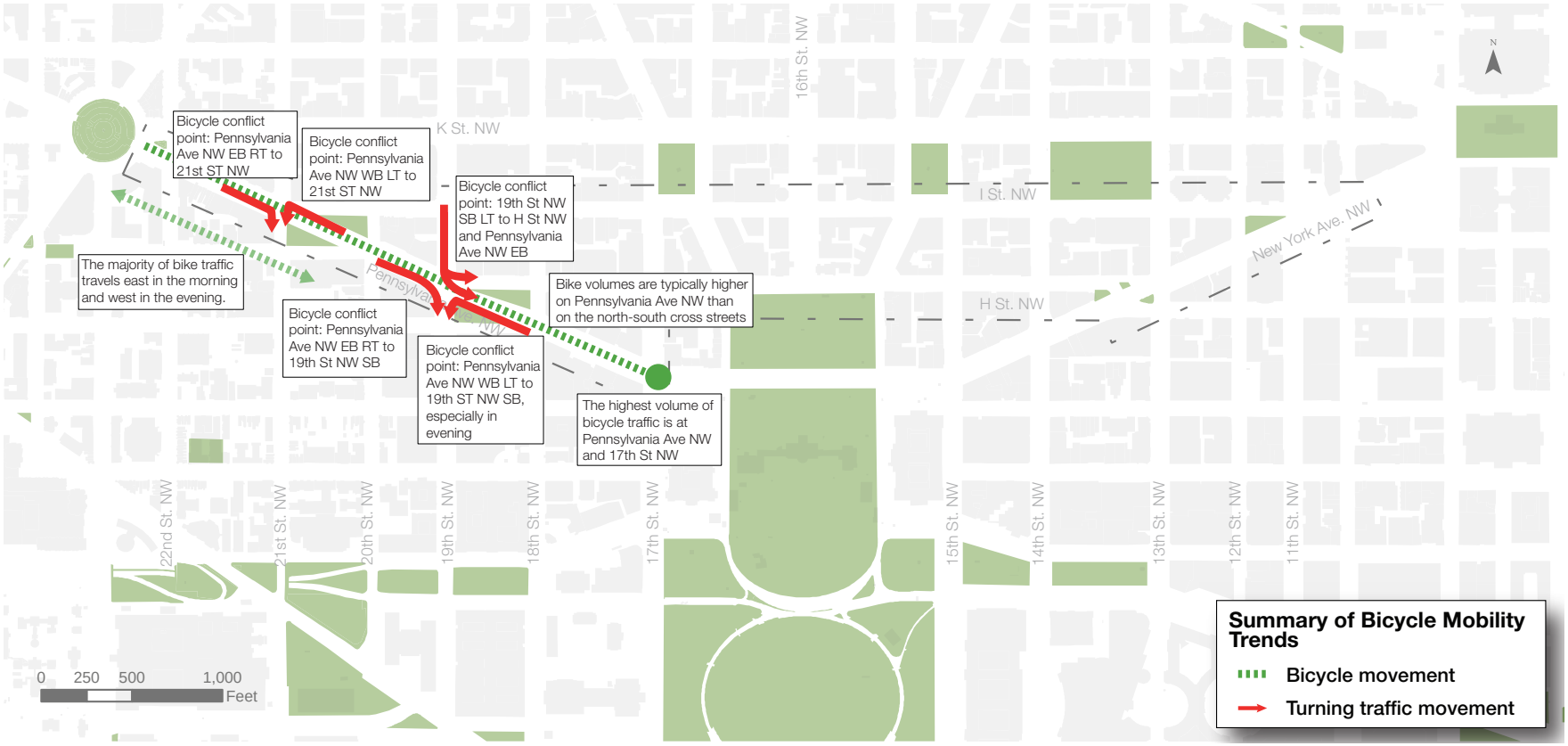
VOLUMES

The following analysis of cyclist travel describes cyclist volumes at intersections along the Pennsylvania Avenue NW corridor, between 17th Street NW and 22nd Street NW during the AM, MD and PM peak periods.

Cyclist travel throughout the study area is summarized as follows:

- Cyclist volumes tend to be significantly higher along Pennsylvania Avenue NW than on the cross streets during all three peak periods, in contrast to pedestrian travel.
- On average, the PM peak period marks the busiest period for cyclist traffic, while the MD peak period experiences the lowest cyclist volumes (approximately one-quarter that of the AM or PM peak periods).

Figure 51 - Summary of Bicycle Mobility Trends



- AM peak hour travel is heavier in the eastbound direction and PM peak hour travel is heavier in the westbound direction along Pennsylvania Avenue NW.
- 17th Street NW and Pennsylvania Avenue NW experience the highest peak hour volumes along the Pennsylvania Avenue NW corridor, likely due to its proximity to higher activity zones, a large Capital Bikeshare station, and the pedestrianized portion of Pennsylvania Avenue NW.
- 15th Street NW experiences higher volumes than Pennsylvania Avenue NW during peak hours due to the existing cycle track.
- MD volumes are consistently low throughout the study area.

Figure 52 - AM Peak Hour Bike Activity

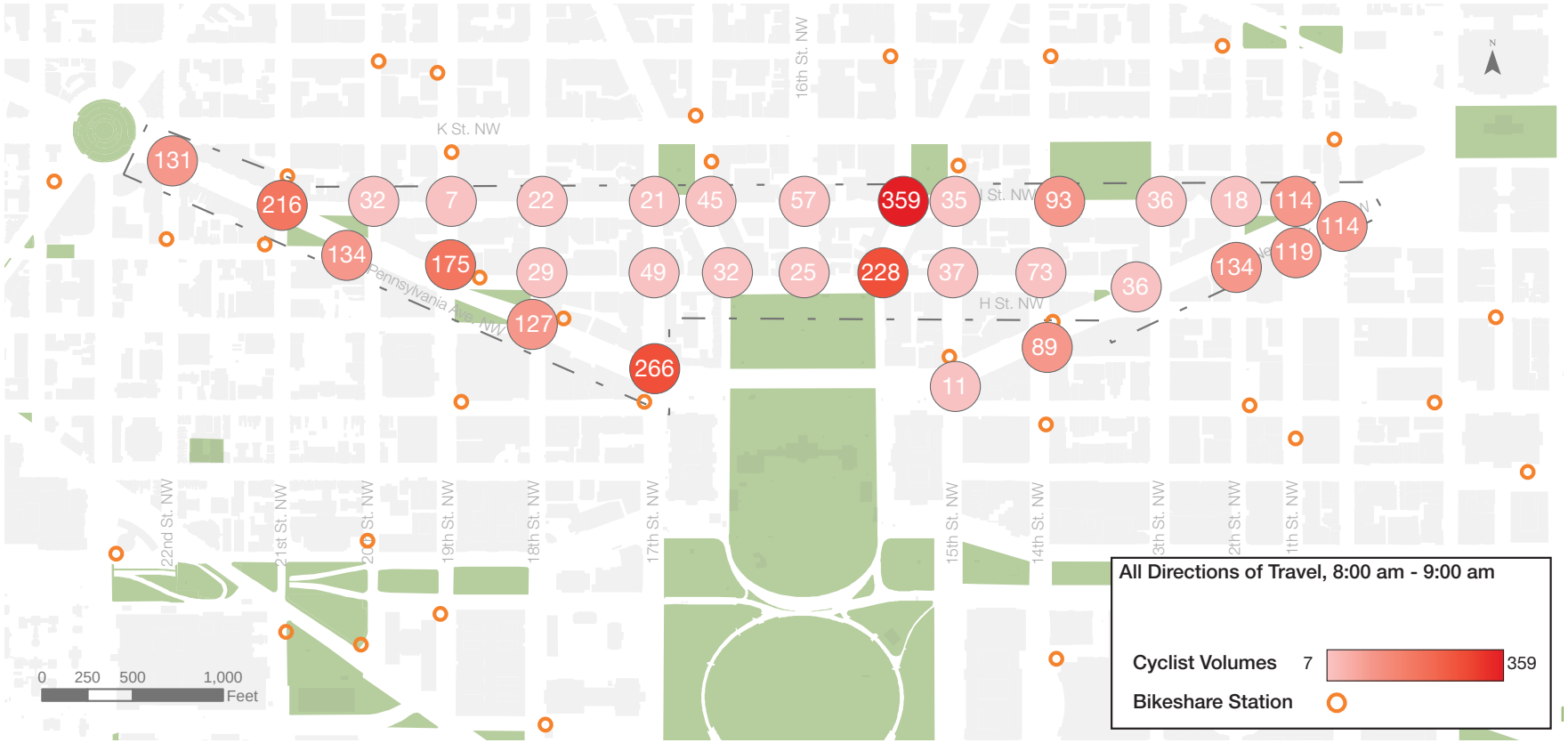


Figure 53 - MD Peak Hour Bike Activity

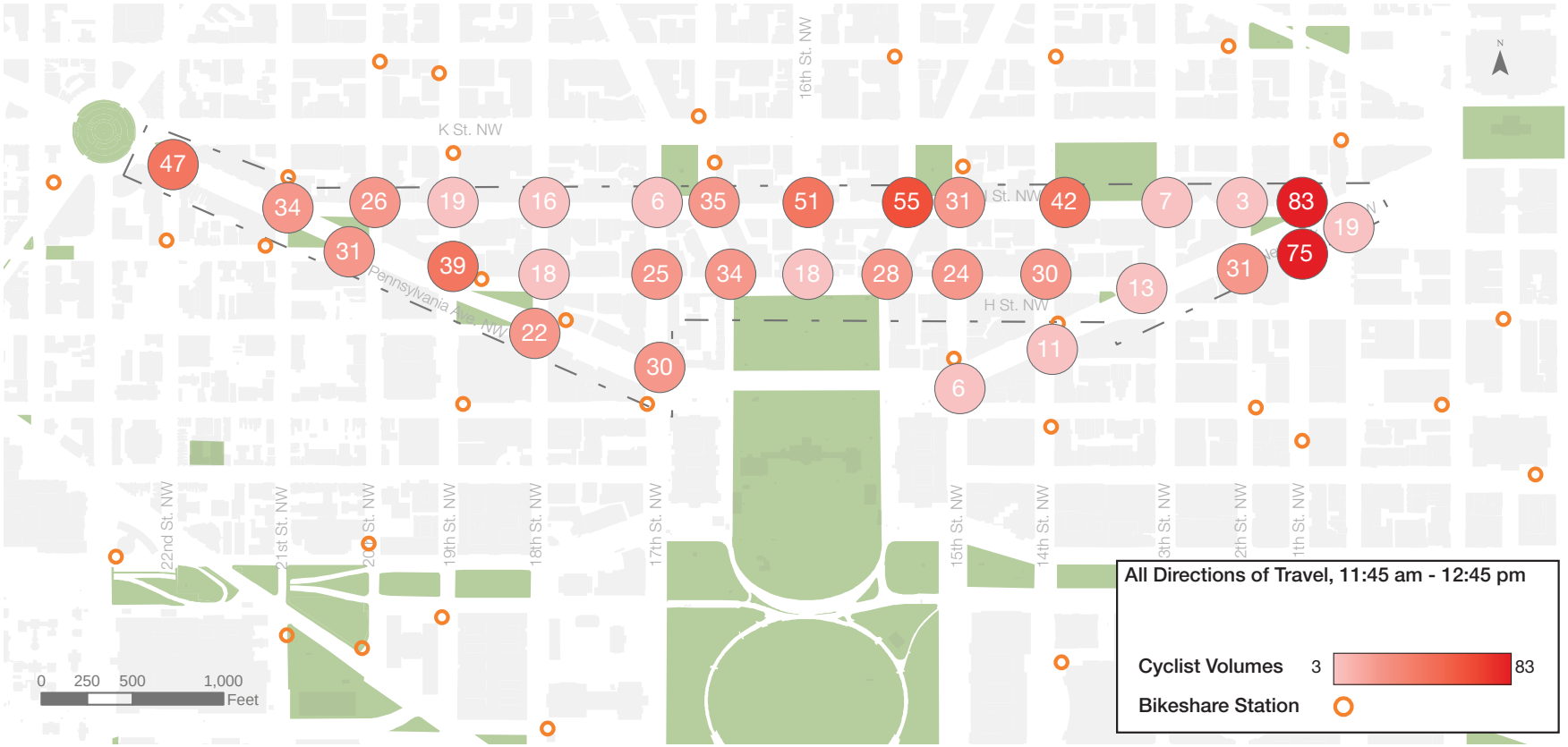
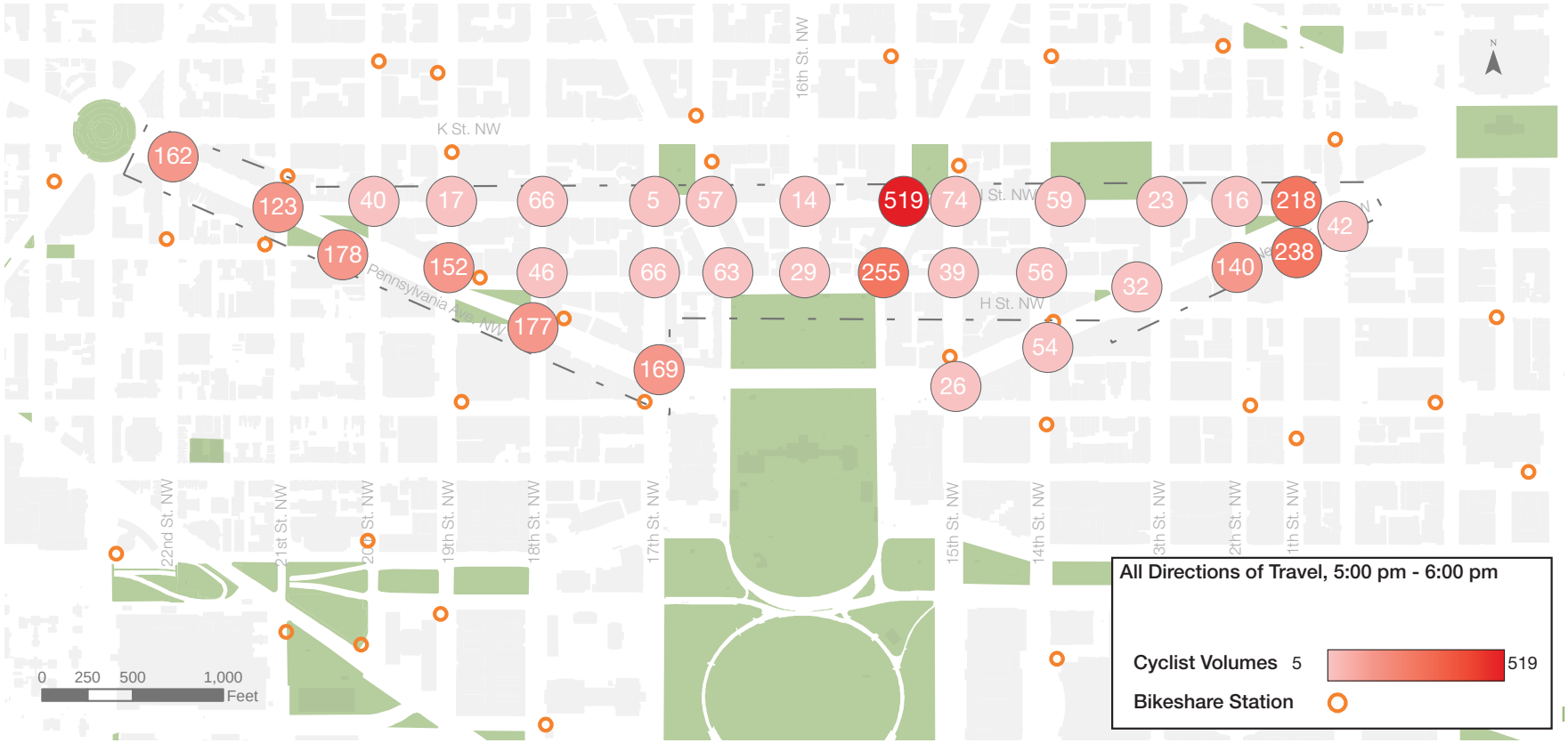


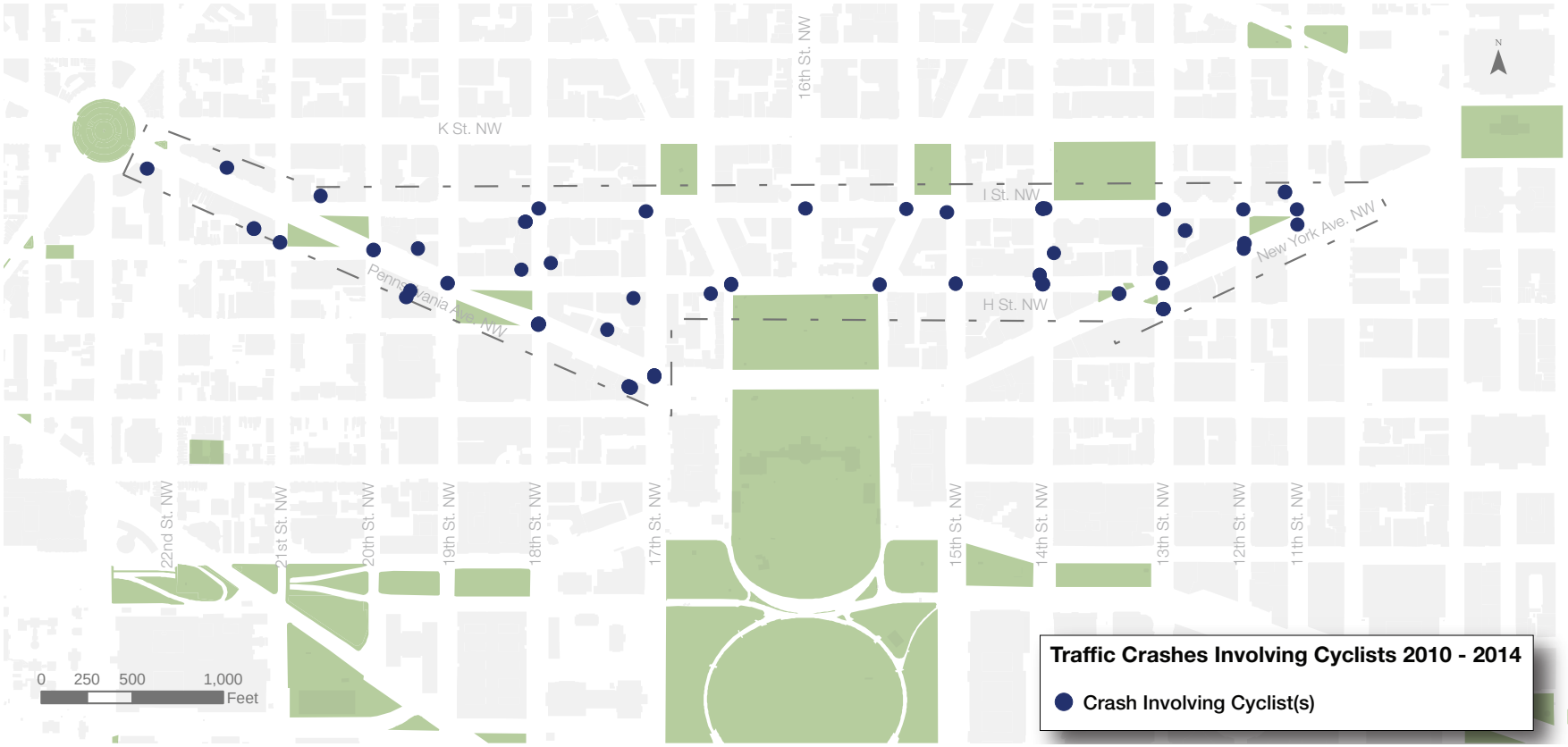
Figure 54 - PM Peak Hour Bike Activity



SAFETY

- There were 63 crashes involving bicycles in the study area between 2010 and 2014, 14 of which occurred along Pennsylvania Avenue NW.
- While the majority of crashes in the study area did not occur on Pennsylvania Avenue NW, large volumes of bicyclists share Pennsylvania Avenue NW with vehicles, many of which make high-speed turning movements onto cross streets. These conditions contribute to a high crash risk for bicyclists.

Figure 55 - Traffic Crashes Involving Cyclists, 2010-2014

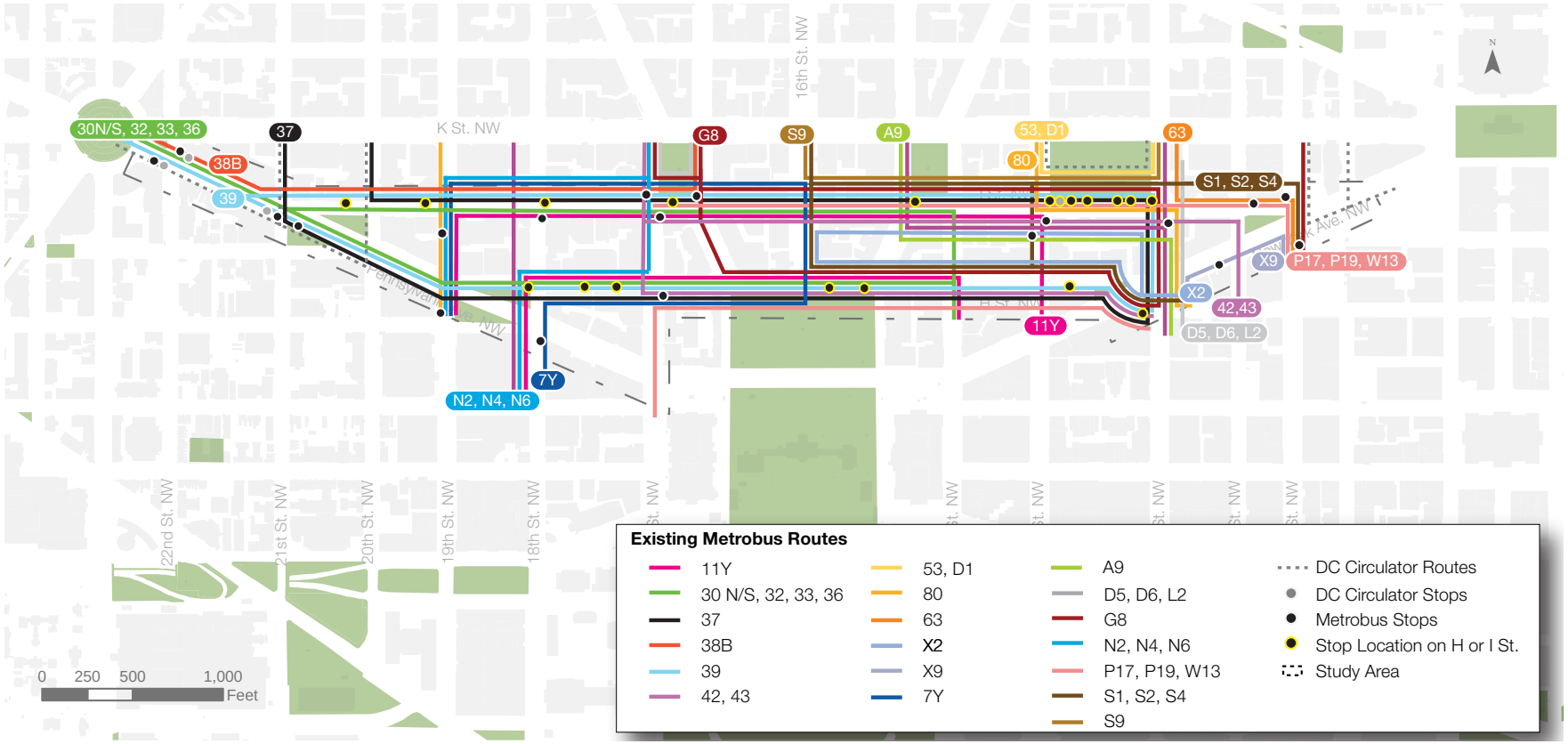


TRANSIT ANALYSIS

The transit data and infrastructure presented below spans the entire study area. However, the forthcoming transit travel time analysis, conducted using microsimulation modelling software, which will be included in a subsequent release of this memo, will focus primarily on the H and I Street NW corridors. Establishing the existing conditions of these areas will support the analysis of a contraflow bus lane on H Street NW and provide context for how this network change may influence bus service and vehicle travel throughout the study area.

The H and I Street NW corridors serve more than 30 WMATA bus routes, in addition to DDOT's DC Circulator routes, Loudoun County and Potomac and Rappahannock Transportation Commission (PRTC) commuter bus routes, and serving heavy volumes of crosstown vehicular traffic.

Figure 56 - Existing Metrobus Routes



Existing Transit Service

EXISTING BUS SERVICE

The Washington Metropolitan Area Transit Authority (WMATA) runs local bus service (Metrobus) in and around the District. A range of bus routes converge in and around the study area, including 34 WMATA bus routes that use the study area corridors. With the exception of the five major bus routes discussed below, most routes only use the study area for a few blocks and several do not make stops within the study area.

Two DC Circulator routes pass through the study area, providing direct connectivity west into Georgetown and Arlington County, north to Columbia Heights and Woodley Square, and east across the District into Southeast. Additionally, several suburban commuter bus routes run through or adjacent to the study area, providing service to suburban towns in Maryland and Virginia. This section describes the extensive bus activity that takes place in the study area.

Metrobus – Key Routes

30N/S – FRIENDSHIP HEIGHTS TO SOUTHEAST

- The 30N/S provides service from Friendship Heights, Maryland, traverses the study area along H Street NW, I Street NW and Pennsylvania Avenue NW, and continues through the District before crossing the Anacostia River and the Maryland boarder once again, ending at the Naylor Road Metro station.
- The 30N/S runs the longest span of service, with buses running nearly 24 hours a day (approximately 4:00 AM through approximately 2:30 AM).
- With average headways of approximately sixty minutes, each route (30N and 30S) runs once per hour.
- Within the study area, though, the 30N and the 30S run parallel to one another, accounting for twice hourly service on this line.

32 – PENNSYLVANIA AVENUE LINE

- The 32 provides service between Foggy Bottom/George Washington University and Southern Avenue Metro station in Hillcrest Heights, Maryland. The 32 follows the same route as the 30N/S through the study area and across the Anacostia River before diverging and heading south to the Southern Avenue Metro station.
- The 32 features the shortest peak-hour headways of the study area's bus service, making six eastbound trips per hour on weekday mornings.
- Service runs seven days a week from about 4:45 AM –12:30 AM.
- The 32 makes about six westbound trips per hour during the AM peak period but runs twice hourly during other peak periods.

33 - WISCONSIN AVENUE LINE

- Similar to the 30N/S, the 33 starts/ends at the Friendship Heights Metro station in Maryland. After following the same route through the study area, the 33 diverges at 9th Street NW in Federal Triangle and returns to Friendship Heights Metro station via I Street NW and Pennsylvania Avenue NW.
- Weekday service runs from about 5:00 AM –10:30 PM.
- Saturday service begins around 6:00 AM and concludes just before 11:00 PM, while Sunday service runs from about 6:45 AM –10:15 PM.
- During peak hours in the peak direction (westbound in the evening and eastbound in the morning), the 33 runs 4 times per hour. It runs twice per hour during other peak periods.

36 – PENNSYLVANIA AVENUE LINE

- The 36 provides service between Foggy Bottom/George Washington University and Naylor Road Metro station. Once the 36 reaches Washington Circle, it follows the same route through the study area as the 30N/S, 32, and 33 and follows the same route as the 30N/S to Naylor Road Metro station.
- Weekday service runs seven days a week from about 5:15 AM –12:00 AM.
- During peak hours in peak direction (westbound in the morning and eastbound in the evening), the 33 runs three times per hour. It runs twice per hour during other peak periods.

OTHER METROBUS ROUTES IN THE STUDY AREA

Aside from the key routes discussed above, 29 other Metrobus routes travel through the study area and use Pennsylvania Avenue NW, H Street NW, I Street NW, and/or New York Avenue NW. These routes, including the five key routes, are presented in the table below, displaying their origin and peak hour volumes within the study area, by direction of travel:

Figure 57 - Metrobus Route 33 in Rush Hour Traffic on H Street NW

Table 3 - Metrobus Routes in Study Area

Route	Origin	Direction	Peak Hour Volumes (Buses per hour)			Direction	Peak Hour Volumes (Buses per Hour)		
			AM	MD	PM		AM	MD	PM
7Y	Arlington	East (North)	7	0	0	West (South)	0	0	5
11Y	Mount Vernon	West (North)	5	0	0	East (South)	0	0	3
30N	Southeast/Friendship Heights	West	1	1	1	East	1	1	1
30S	Southeast/Friendship Heights	West	1	1	1	East	1	1	1
32	Foggy Bottom/Southern Avenue	West	6	2	2	East	2	2	2
33	Friendship Heights	West (North)	2	2	4	East (South)	4	2	2
36	Foggy Bottom/Naylor Road	West	3	2	2	East	2	2	3
37	Friendship Heights	West (North)	4	0	0	East (South)	0	0	3
38B	Arlington	East	5	3	4	West	5	3	4
39	Foggy Bottom/Naylor Road	West	3	0	0	East	4	0	0
42	Mount Pleasant	West (North)	5	5	7	East (South)	6	5	5
43	Mount Pleasant	West (North)	0	0	7	East (South)	0	0	0
53	Takoma	South	5	3	3	North	3	3	4
63	Takoma	West (North)	5	0	6	East (South)	8	0	5
80	Foggy Bottom/Fort Totten	North	4	4	7	South	8	3	5
A9	Southeast	West (North)	4	0	0	East (South)	0	0	4
D1	Glover Park	East	6	0	0	West	0	0	2

Route	Origin	Direction	Peak Hour Volumes (Buses per Hour)			Direction	Peak Hour Volumes (Buses per Hour)		
			AM	MD	PM		AM	MD	PM
D5	Bethesda	East	3	0	0	West	0	0	2
D6	Palisades	West	7	2	6	East	3	2	9
G8	Avondale	West	10	2	5	East	3	2	5
L2	Chevy Chase	South	5	3	4	North	4	3	3
N2	Friendship Heights/Foggy Bottom	South	4	2	2	North	2	2	3
N4	Friendship Heights/Foggy Bottom	South	7	2	3	North	2	2	6
N6	Friendship Heights/Foggy Bottom	Operates weekend and off-peak only							
P17	PG County	West (north)	4	0	0	East (South)	0	0	4
P19	PG County	West (north)	3	0	0	East (South)	0	0	3
S1	Crestwood	South	10	0	0	North	0	0	4
S2	Silver Spring	South	18	4	7	North	4	4	11
S4	Silver Spring	South	4	4	5	North	3	4	6
S9	Silver Spring	South	7	0	6	North	6	0	8
W13	PG County	North	3	0	0	South	0	0	3
X2	Minnesota Ave	West	4	4	4	East	4	4	4
X9	Capitol Heights	West	4	0	4	East	3	0	4

DC Circulator

Operated by DDOT, the DC Circulator runs six limited-stop routes from Downtown to neighborhoods in three quadrants (no DC Circulator route travels to Southwest). DC Circulator buses run at ten-minute frequencies at a fare of $1. Two DC Circulator routes pass through the study area:

- Woodley Park-Adams Morgan-McPherson Square Metro Circulator
  - ► This route runs north-south on 14th Street between Franklin Square, Columbia Heights, and Woodley Park.
  - ► It briefly enters the study area on I Street NW between 13th Street NW and 14th Street NW.
  - ► It runs Sundays through Thursdays from 7am–midnight and Fridays and Saturdays from 7:00 AM -3:30 AM.
- Georgetown-Union Station Circulator
  - ► This route runs east-west along K Street and Massachusetts Avenue between Georgetown and Union Station.
  - ► It briefly enters the study area on Pennsylvania Avenue NW between 20th and 22nd Streets NW.
  - ► It runs Sundays through Thursdays from 7am–midnight and Fridays and Saturdays from 7:00 AM –2:00 AM.

Commuter Buses

A number of commuter buses provide service into Downtown D.C. from suburban towns in Maryland and Virginia. Operated by several different entities—including the Maryland Transit Administration (MTA), Loudoun County Transit, and Potomac and Rappahannock Transportation Commission (PRTC)—dozens of routes enter the study area, stopping at Metro stations and other key District destinations.

MTA ROUTES

MTA provides commuter bus service from various part of Maryland to Washington D.C. and Baltimore. Many of MTA's routes travel through the study area, however they do not use the study area corridors. MTA routes in the area primarily use 11th Street NW, 12th Street NW, 18th Street NW, 19th Street NW, and K Street NW, with some routes making stops on these numbered streets in the study area. The 800 routes (810, 820, 830, and 840) do use Pennsylvania Avenue NW between 19th Street NW and 21st Street NW, however, no stops are made on the corridor.

LOUDOUN COUNTY TRANSIT

Loudoun County Transit provides commuter bus service from Loudoun County, Virginia to the District. Like MTA, Loudoun County's routes travel through but do not stop within the study area and do not use the study area corridors. Loudoun County Transit routes use 14th Street NW, 18th Street NW, and K Street NW in the vicinity of the study area.

PRTC ROUTES

PRTC provides commuter service (OmniRide) from across the Potomac River in Virginia. There are four routes that use H Street NW and I Street NW within the study area:

Metro Stations

The study area includes two Metro stations, both providing service on the blue, orange, and silver lines:

- Farragut West, located at 17th Street NW/I Street NW.
- McPherson Square, located at 15th Street NW/I Street NW.

Several additional stations are located just outside the study area boundaries:

- Foggy Bottom-GWU, located at 23rd Street NW/I Street NW, providing service on the blue, orange, and silver lines.
- Farragut North, located at 17th Street NW/K Street NW, providing service on the red line.
- Metro Center, located at G Street NW/13th Street NW, providing service on the blue, orange, red, and silver lines.

Table 4 - PRTC Routes in Study Area

Route	Origin	Direction	Stop	Peak Hour Volumes		
				AM	MD	PM
DC-R	Dale City	Dale City to Downtown Washington	19th Street NW & H Street NW	4	1	--
DC-R	Dale City	Downtown Washington to Dale City	18th Street NW & Pennsylvania Avenue NW	--	2	6
GV-R	Gainesville	Gainesville to Downtown Washington	18th Street NW & Pennsylvania Avenue NW	2	--	--
GV-R	Gainesville	Downtown Washington to Gainesville	19th Street NW & H Street NW	--	--	3
LR-R	Lake Ridge	Lake Ridge to Downtown Washington	19th Street NW & H Street NW	3	1	--
LR-R	Lake Ridge	Downtown Washington to Lake Ridge	18th Street NW & Pennsylvania Avenue NW	--	1	7
MN-R	Manassas	Manassas to Downtown Washington	19th Street NW & H Street NW	2	--	--
MN-R	Manassas	Downtown Washington to Manassas	18th Street NW & Pennsylvania Avenue NW	--	1	2

Transit Data

WMATA RIDERSHIP

Based on data provided by WMATA, ridership on the routes that use the H Street NW and I Street NW corridors vary significantly. The 16th Street routes (S1, S2, S4, S9) experience the highest daily ridership, followed by the 30- routes (30 N/S, 32, 33, 36, 37, 39), and the Benning Road-H Street routes (X2, X9). The route with the highest overall ridership is the X2, serving more than 15,000 passengers per day.

Table 5 - WMATA Ridership in Study Area

Route	Passengers
S1, S2, S4, S9	21,706
30N, 30S, 32, 33, 36, 37, 39	19,023
X2, X9	17,998
52, 53, 54	17,441
60, 62, 63, 64	11,215
80	8,278
42, 43	8,064
D1, D4, D5, D6	7,788
L1, L2	5,677
G8	4,766
N2, N4, N6	4,278
38B	4,017
16Y	2,016
7Y	1,413
P17, P19	1,214
A9	961
3Y	604
11Y	544
W13	543

Of the key routes (30 N/S, 32, 33, 36) in the study area, route 32 serves the most passengers, with more than 4,800 daily passengers. The remaining routes all serve between 2,600 and 3,600 passengers per day.

METROBUS STOP USAGE

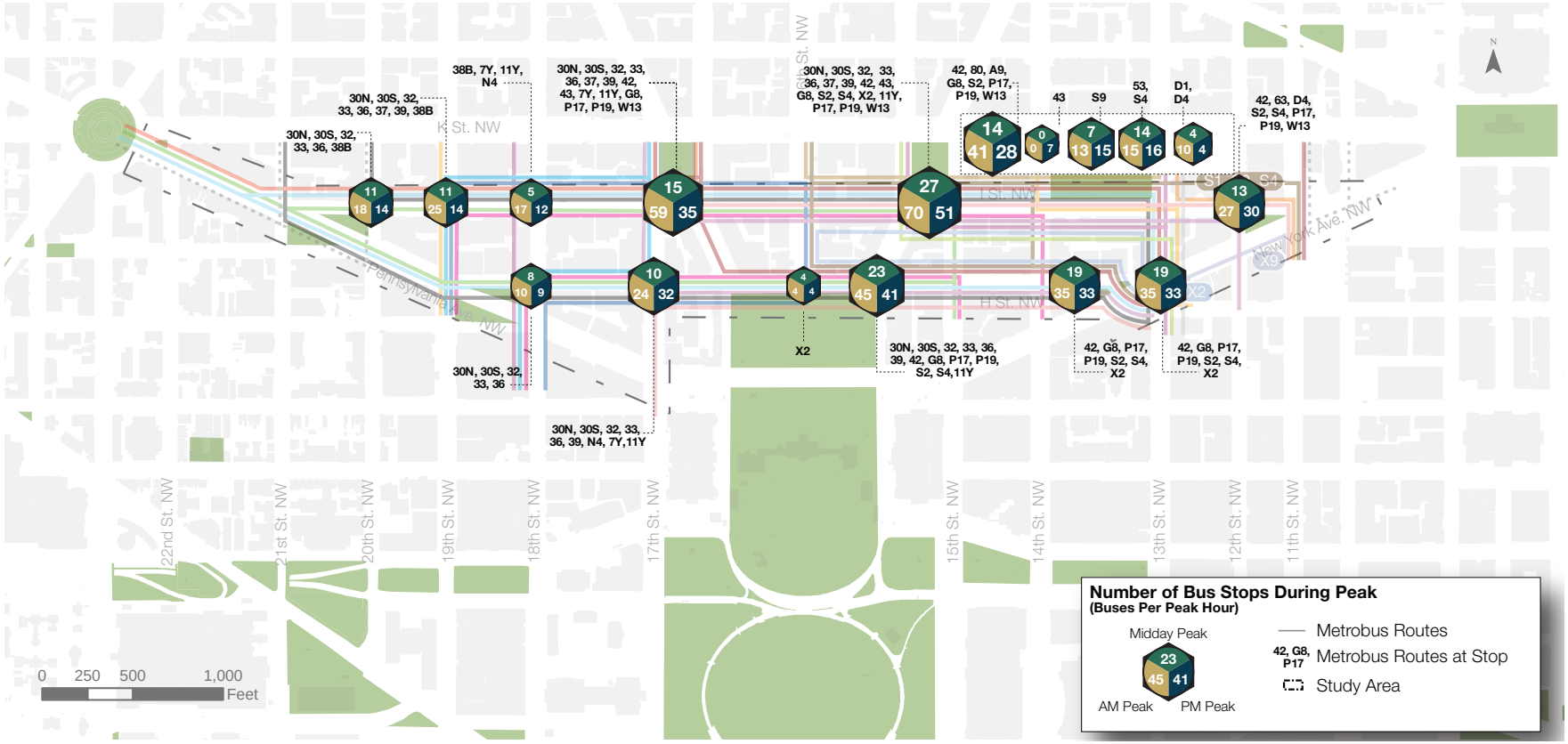
Stop usage is an important metric because it provides insight to how the proposed contraflow lane will be used. If routes shift from I Street NW to H Street NW, then certain bus stops, and subsequent stopping activities by buses, may be shifted as well.

Along H Street NW and I Street NW in the study area, there are stops at nearly every block, with each stop serving several routes. The stops at I Street NW and 15th Street NW, I Street NW and 17th Street NW and H Street NW and 15th Street NW serve the highest number of routes during the peak periods.

Bus stop usage in the study area reflects the imbalance between jobs and residents in the area, with AM peak period usage being dominated by bus alightings (people getting off of buses) and evening peak period usage dominated by bus boardings:

- During the AM peak period, the stop at the intersection of I Street NW and 17th Street NW experiences the highest average number of boardings and alightings of any bus stop in the study area.
- The stops at eastern and western edges of I Street NW in the study area experience the lowest volumes of passenger activity during the AM peak period.
- During the PM peak period, the stop at I Street NW and 17th Street NW sees the highest volume of boardings and alightings.
- The MD peak period results in wider variance between boardings and alightings. In some cases, such as at I Street NW and 13th Street NW and H Street NW and 16th Street NW, boardings and alightings are higher than during the AM and PM peak periods.

Figure 58 - Number of Bus Stops During Peak[4]



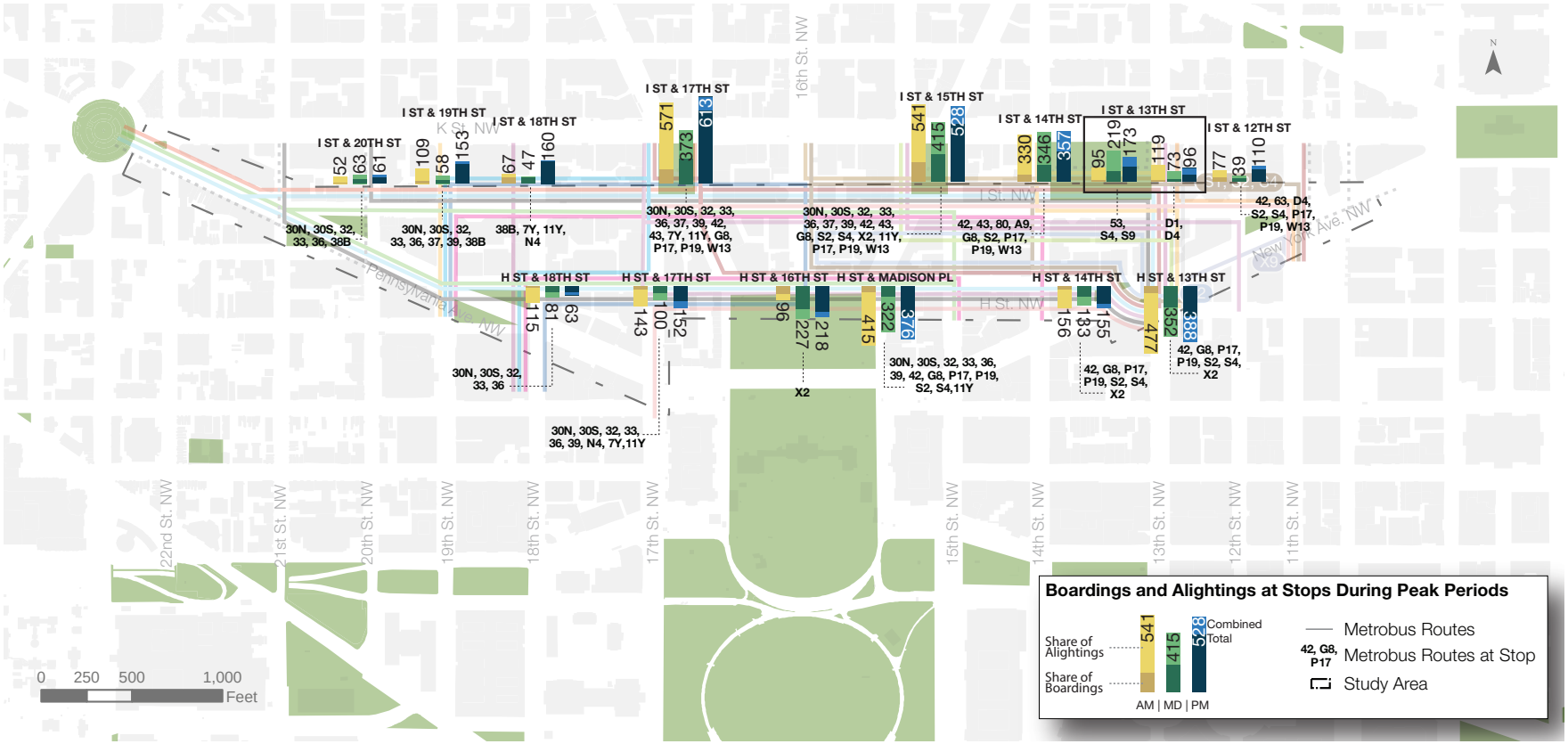
4 Boarding and Alighting data provided by WMATA is grouped by peak period and is reported based on these pre-determined peak periods. As the data could not be disaggregated from these periods, the time periods presented include, but do not align with, the peak hours of this study.

BOARDING AND ALIGHTING BY STOP

Boarding and alighting, or getting on and off of transit vehicles at bus stops demonstrate which stop locations are most heavily used, but also provide insight into delays that bus routes may experience.

The stops with high bus usage also experience the highest number of on- and off-boardings during the peak periods. These include I Street NW and 15th Street NW, I Street NW and 17th Street NW. Along H Street NW, H Street NW and 13th Street NW and H Street NW and Madison Place NW experience the highest throughput of passengers. The block of I Street NW between 13th Street NW and 14th Street NW also experiences high passenger volumes due to the block-long Metrobus Zone on the north curb.

Figure 58 - Boardings and Alightings at Stops During Peak Periods



TRAVEL SPEEDS BY ROUTE AND DWELL TIMES

As documented in the H/I Street Bus Improvements: Final Technical Report (2013), travel speeds along H Street NW and I Street NW for transit vehicles are low. The low speeds through the study area impact reliability, quality of service and ridership across the Metrobus system. Proposed transit improvements, including the contraflow bus lane along H Street NW seek to improve travel speeds through this heavily used corridor and improve service reliability for thousands of daily riders. The following data and figures summarize travel speeds and dwell times of the five key routes through the study area during the critical peak periods[5]:

- On average, the 36 reaches the highest speed of the study area's routes, running eastbound at about 10.1 mph during the AM peak period. (Average speeds factor in delays caused by boarding and alighting and deceleration and acceleration.)
- Examining the three peak hours each day (AM, MD, and PM), the 30N/S tends to run fastest heading eastbound in the AM peak period (about 7.5 mph on average), while it runs slowest heading eastbound during the MD peak period (around 5.4 mph on average). The route experiences its longest dwell time (24 seconds) in the MD peak hour at Pennsylvania Avenue NW and 22nd Street NW.
- The 32 tends to run fastest heading eastbound in the AM peak period (about 10.0 mph on average), while it runs slowest heading westbound during the MD peak period (around 5.9 mph on average). With generally low eastbound dwell times across the day, the highest dwell times (20-21 seconds) are experienced in the AM peak hour at I Street NW and 15th Street NW, I Street NW and 17th Street NW and Pennsylvania Avenue NW and 22nd Street NW.
- The 33 tends to run fastest heading eastbound in the evening (about 7.3 mph on average), while it runs slowest heading westbound during the evening (around 5.6 mph on average). Dwell times vary throughout the day, however Pennsylvania Avenue NW and 22nd Street NW in the westbound direction experiences the highest dwell times (17-19 seconds) across the three peak hours.
- Examining the three peak periods each day, the 36 tends to run fastest heading eastbound in the AM peak period (about 10.1 mph on average), while it runs slowest heading westbound during the AM peak period (around 5.9 mph on average). Similar to the 32, the 36 sees generally low dwell times across the stops in the eastbound direction. In the westbound direction, I Street NW and 15th Street NW, I Street NW and 17th Street NW and Pennsylvania Avenue NW and 22nd Street NW all experience dwell times over 10 seconds in each peak period.

The analyses discussed above suggest that certain high volume stops, such as I Street NW and 15th Street NW and I Street NW and 17th Street NW contribute to low travel speeds and impact service reliability through the study area. Travel speeds are consistently low across I Street NW, H Street NW, as well as Pennsylvania Avenue NW. However, the high tunning volumes from Pennsylvania Avenue NW onto H Street NW, and from I Street NW onto Pennsylvania Avenue NW suggest that crosstown traffic is having spillover impacts on travel speeds along Pennsylvania Avenue NW as well.

Figures 59-60 display combined average (AM, MD, and PM peak period) travel speeds and dwell times for the Metrobus 33 Line.

5 Travel speed and dwell time data based on raw Automatic Vehicle Location data. It is noted that AVL data recording can result in reliability/accuracy issues and thus the results displayed are recommended for indicative purposes only.

Figure 59 - AM Travel Speed and Dwell Time Metrobus 33 Line

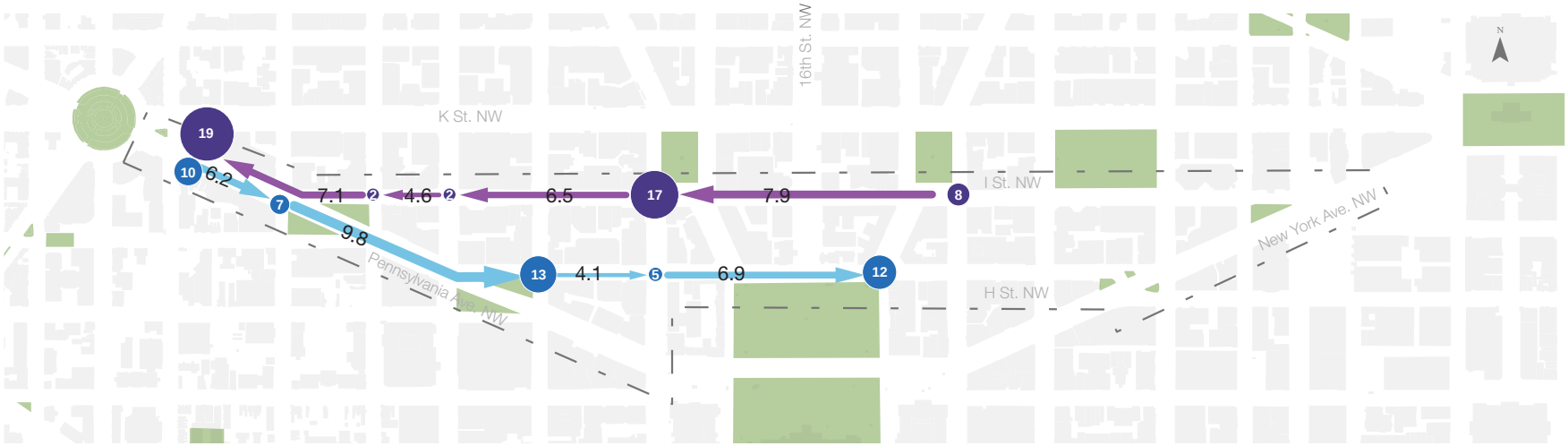
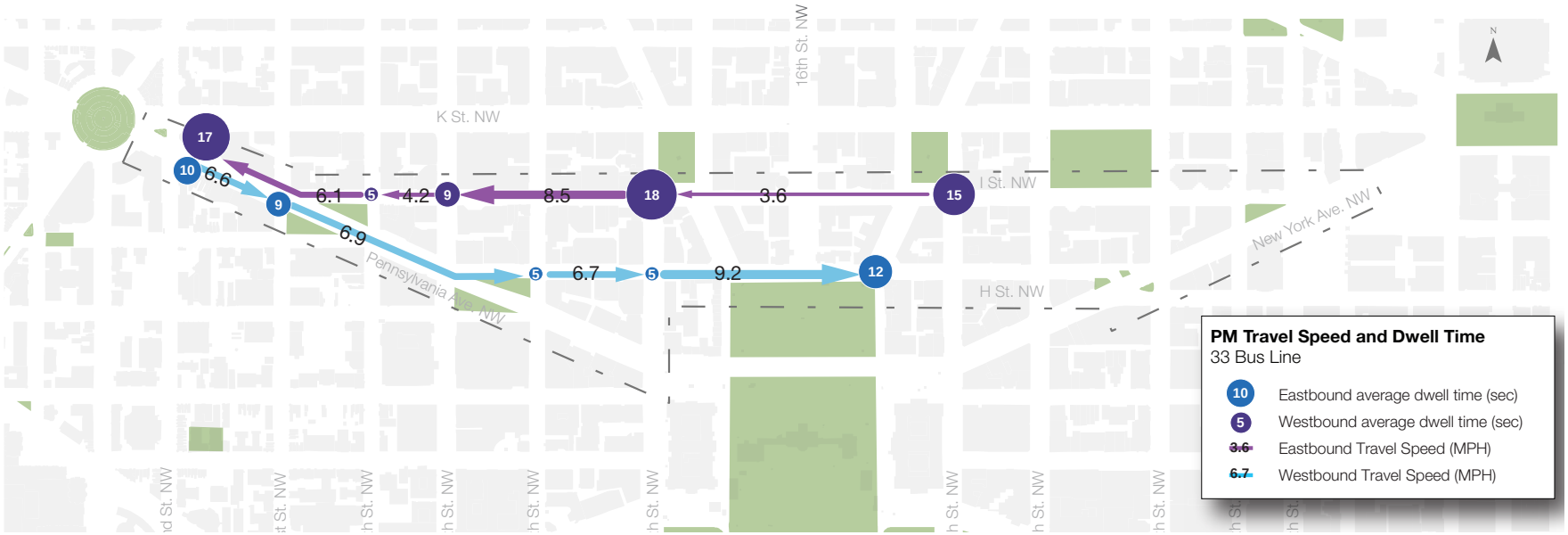


Figure 60 - PM Travel Speed and Dwell Time Metrobus 33 Line



Transit Infrastructure

PROPOSED TRANSIT NETWORK EXPANSIONS

In addition to the proposed contraflow bus lane along H Street NW, *moveDC* proposes dedicated high capacity transit facilities along I Street NW and 16th Street NW. Shared high capacity transit facilities are proposed along Pennsylvania Avenue NW, I Street NW (to the west of Pennsylvania Avenue NW) and 12th Street NW. The H Street NW corridor is a critical component of the Downtown West transit network, together with I Street NW it will provide efficient east-west travel and connect to proposed north-south routes.

H Street NW is also a component of WMATA's Priority Corridor Network (PCN), a strategy for improving bus service in the Washington D.C. region. As one of 24 corridors identified for rapid and efficient upgrades, continuous improvements have been made since 2009. WMATA also identifies dedicated transit lanes during peak periods as one of the future improvements to be made to the H Street NW corridor.

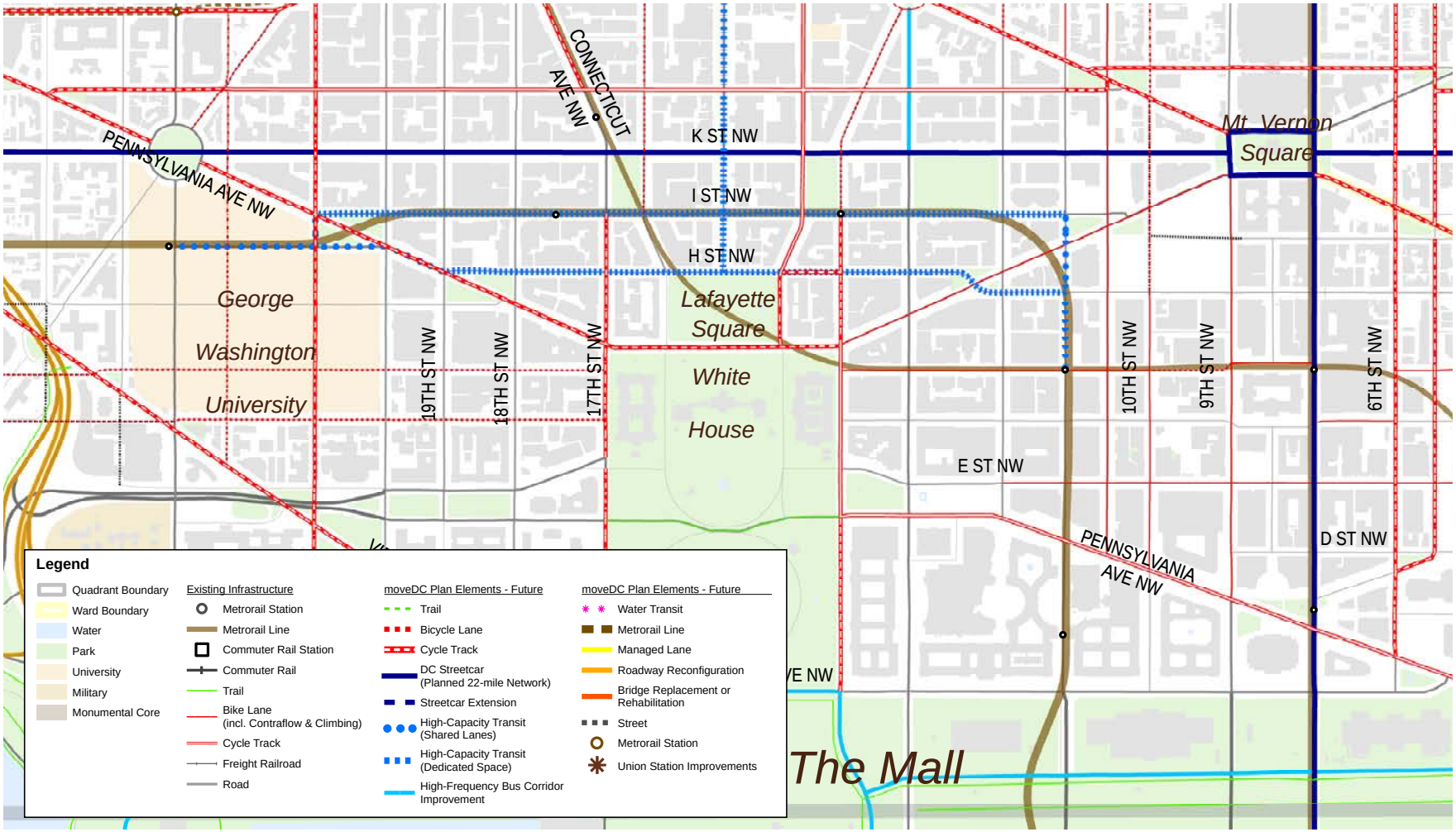
BUS LAYOVER ZONE

In considering the feasibility of a contraflow bus lane along H Street NW, the provision of curbside space for buses to stop and layover is an important factor. As many routes may be shifted from I Street NW to H Street NW with the contraflow bus lane, new space for bus zones will need to be identified to replace space currently provided on I Street NW. Curbside space for buses to layover helps to promote schedule reliability and driver safety and comfort. However, a contraflow bus lane on H Street is anticipated to be only one lane wide, leaving no space for westbound buses to layover. Thus appropriate space outside of the H Street NW corridor may need to be identified.

Within the study area, two large Metrobus zones currently provide layover functions: the southern side of Franklin Park on I Street NW between 13th Street NW and 14th Street NW and the northern side of Lafayette Square on H Street NW between Madison Place NW and Jackson Place NW. As shown in Figure 18: Roadway Configuration above, both of these curbs are dedicated Metrobus zones. Visually, these lanes are distinguished by the coverage of a block-long concrete bus pad in the curb lane, as well as no-parking signage indicating bus-only regulations. Particularly during weekday peak hours, these bus zones are heavily used by buses laying over and serving stops. The Franklin Square Metrobus zone provides approximately 500 linear feet of space and boarding and alighting is concentrated towards 14th Street NW. The Lafayette Square Metrobus zone is more heavily used throughout the day for boarding and alighting, with most of this activity occuring near the corner of Madison Place NW. This zone provides approximately 600 linear feet of space, with 300 feet on either side of the 16th Street NW intersection.

Figure 61 - X2 Route at Lafayette Square Metrobus Zone

Figure 62 - Proposed Transit Network (*moveDC*)



Key Findings

The following key findings synthesize the individual analysis of each transportation mode into a holistic, multimodal description of the study area's existing conditions and opportunities for improvement. Along with feedback from the public input process, these key findings will directly inform the design alternatives for the study area:

MULTIMODAL OVERVIEW OF STUDY AREA WITH KEY INFO ON EACH MODE

- The study area has a wealth of transportation options. These options include nearby Metro stations, wide sidewalks for pedestrians, more than 30 Metrobus routes with several stops throughout the study area, many Capital Bikeshare stations, and adequate capacity and parking for private vehicles.
- Each of these transportation options are all well-utilized. There are large volumes of pedestrians, bicyclists, transit riders, and vehicles. Transit service is concentrated along H and I Streets NW. Pedestrian and bicycle volumes are present throughout the study area. Pedestrian volumes tend to be higher near Metro stations and key employment areas. Bicycle volumes are consistently higher on Pennsylvania Avenue NW than on H and I Streets NW. Vehicle volumes are highest along H and I Streets NW.
- The convergence of well-used transportation modes can lead to conflicts and complexity in navigating the area, resulting in congestion and inefficient use of the transportation network. Though pedestrian and cyclist crash rates are relatively low, the diagonal path of Pennsylvania Avenue NW presents challenging conditions, low visibility and increased risk factors to people using these modes.
- There is an opportunity to improve the overall network by improving traffic predictability at intersections, dedicating ROW space to buses and cyclists and realigning transit operations. This can make travel more reliable and increase safety and comfort for all users on these critical shared corridors.
- There is substantial support for improvements to these corridors, as evidenced through strategic planning, policy, and corridor studies, as well as advocacy for transportation improvements.

Vehicles

- Vehicle volumes are inconsistent along Pennsylvania Avenue NW, with high-volume movements representing desires to efficiently move east-west across the District.
- This desire is best represented by the high-volume turning movements at the intersections of Pennsylvania Avenue NW with H Street NW and I Street NW.
- High turning volumes from numbered streets onto H Street NW and I Street NW also demonstrate the importance of the one-way couplet for crosstown travel.

Pedestrians

- Pedestrian volumes are high throughout the study area, reflecting the high transit accessibility, wide sidewalks along Pennsylvania Avenue NW, the high level of employment opportunities in the study area, the pedestrian plaza north of the White House, and the historic and touristic land uses surrounding the study area. Higher volumes were observed toward the eastern end of Pennsylvania Avenue NW, which reflects the greater mix of uses, and proximity to cultural and touristic facilities.
- The Pennsylvania Avenue NW corridor lacks a consistent urban design aesthetic, due, in part, to the institutional uses (IMF, WB, IFC and embassies)

that dot the corridor.

- Monroe and Murrow Parks are a pedestrian amenity, but they are bisected by Pennsylvania Avenue NW, creating long street crossings and reducing the accessibility of the parks.
- The wide ROW of Pennsylvania Avenue NW provides an opportunity for safety and aesthetic improvements that can benefit users of all types of modes, making it easier to walk or bike in the study area and reducing the likelihood of crashes.

Cyclists

- Bicyclists are present throughout the study area, however, volumes tend to be higher along Pennsylvania Avenue NW, indicating a preference among cyclists for wider ROW, lower vehicle volumes and more direct connections to the surrounding bicycle network, than offered by H and I Streets NW.
- Planned expansions and improvements to the cyclist network, including Pennsylvania Avenue NW can significantly improve cyclist safety, comfort and accessibility in the area.
- Low vehicle volumes along Pennsylvania Avenue NW support a redistribution of space toward cyclists, which can help calm traffic speeds, provide protection for cyclists and provide a more direct route through the District. However, operational and geometric obstacles must be addressed at intersections to ensure safe travel.

Transit

- Transit service to, from and through the corridor is plentiful, providing exceptional mobility alternatives to private vehicles.
- The convergence of more than 30 Metrobus routes, DC Circulator routes, and several commuter routes, results in congestion impacts and high demands for curbside space in the study area.
- H and I Streets NW suffer from vehicle congestion and impact transit service reliability and speed, particularly during peak hours, when demands for fast and reliable transit service are highest.
- Ongoing and planned improvements along H Street NW and I Street NW reflect the need to improve transit travel conditions on these key corridors as an integral component of supporting and complementing the Metrorail network and reducing private vehicle travel into the District.

Summary and Next Steps

The Downtown West Transportation Planning Study reflects the need for improved circulation for all modes throughout the study area and the wider downtown D.C. area. The need for the proposed changes have been documented in previous planning studies, including *moveDC*. The existing and projected community demographics and buildings reflect the need for reliable and safe multi-modal transportation options. Additionally, the existing conditions of the transportation infrastructure and characteristics indicate that reimaging Pennsylvania Avenue NW to reflect current needs and uses of the corridor, and that providing a contraflow bus lane along H Street NW would improve transportation conditions in the study area and help the District realize its transportation planning goals.

As the Study continues, the existing conditions of the vehicular and transit networks will be further analyzed. The analysis will inform the development of transportation planning models to reflect actual travel conditions. The subsequent models that are developed will be appended to this memo. As alternative concept designs for the pedestrian, bicycle and transit components of the Study are developed, they will be tested and evaluated by adapting the existing conditions transportation models. This process will be shared with and informed by public input throughout the process.

Appendices

Appendix 1 contains the full table of LOS, delay and queuing for each intersection analyzed. Please note the following annotations and abbreviations:

- m - Volume for the 95th percentile queue is metered by upstream signal.
- # - 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
- ~ - Volume exceeds capacity, queue may be longer than estimated.
- Approach abbreviating convention:
  - Uses the direction (Northbound, Southbound, Eastbound, Westbound, Southeast, etc.) followed by the approach (Right, Through, Left)
  - Examples: Northbound Left is displayed as NBL, Southeast Right is displayed as SER

Appendix 1

Intersection		AM					
H Street NW & 13th Street NW	Lane Group	EBT	WBT	WBR	NBT	SBL	SBT
	Total Delay	10.6	12.9	1.9	28.1	8.8	7.5
	LOS	B	B	A	C	A	A
	Approach Delay	10.6		9.5	28.1		7.7
	Approach LOS	B		A	C		A
	Queue Length 50th (ft)	55	29	0	78	9	84
	Queue Length 95th (ft)	73	48	14	108	24	96
	Intersection Signal Delay				12.9		
	Intersection LOS				B		
H Street NW & 14th Street NW	Lane Group	EBL	EBT	EBR	NBT	SBL	SBT
	Total Delay	11.7	9.4	16	10.3	5.6	2.7
	LOS	B	A	B	B	A	A
	Approach Delay		11.1		10.3		2.8
	Approach LOS		B		B		A
	Queue Length 50th (ft)	20	40	22	79	3	26
	Queue Length 95th (ft)	32	48	32	91	m4	24
	Intersection Signal Delay				8.6		
	Intersection LOS				A		

MD						PM					
EBT	WBT	WBR	NBT	SBL	SBT	EBT	WBT	WBR	NBT	SBL	SBT
7.8	12.9	0.7	28.8	14.1	12.4	6.2	12.6	2	34.8	16.5	5.6
A	B	A	C	B	B	A	B	A	C	B	A
7.8		8.8	28.8		12.6	6.2		9.4	34.8		6.9
A		A	C		B	A		A	C		A
29	18	0	150	19	137	36	30	0	182	10	40
42	34	3	208	67	160	46	48	14	229	20	49
			15.7						16.6		
			B						B		

EBL	EBT	EBR	NBT	SBL	SBT	EBL	EBT	EBR	NBT	SBL	SBT
13.1	11.1	15.2	8.1	5.9	3.9	11.2	9.8	2.6	9.3	22.1	3.8
B	B	B	A	A	A	B	A	A	A	C	A
	12.3		8.1		4		8.6		9.3		5.3
	B		A		A		A		A		A
19	36	23	39	6	28	20	39	0	86	12	42
m42	73	63	49	m10	35	31	47	2	90	m17	m44
			8.6						7.9		
			A						A		

Intersection		AM	
H Street NW & 15th Street NW	Lane Group	EBT	NBT
	Total Delay	3.3	14.2
	LOS	A	B
	Approach Delay	3.3	14.2
	Approach LOS	A	B
	Queue Length 50th (ft)	25	186
	Queue Length 95th (ft)	28	236
	Intersection Signal Delay	7.7	
	Intersection LOS	A	

H Street NW & 16th Street NW	Lane Group	EBT	SBL
	Total Delay	8.7	29.5
	LOS	A	C
	Approach Delay	8.7	29.5
	Approach LOS	A	C
	Queue Length 50th (ft)	49	78
	Queue Length 95th (ft)	52	117
	Intersection Signal Delay	11.4	
	Intersection LOS	B	

MD			PM	
EBT	NBT	NBR	EBT	NBT
11	19.2	24.1	5.1	20.8
B	B	C	A	C
11	20.1		5.1	20.8
B	C		A	C
322	85	36	51	130
374	168	127	60	169
	14.3			10.1
	B			B

EBL	EBT	SBL	EBT	SBL
33.8	8.1	41.1	6.5	36.7
C	A	D	A	D
	13	41.1	6.5	36.7
	B	D	A	D
128	41	172	34	82
#270	47	m#262	38	129
	17.8			11.6
	B			B

Intersection		AM				
H Street NW & 17th Street NW	Lane Group	EBT	NBT	NBR	SBL	SBT
	Total Delay	22.4	25.6	40.5	37.9	7.3
	LOS	C	C	D	D	A
	Approach Delay	22.4		30.2		15.9
	Approach LOS	C		C		B
	Queue Length 50th (ft)	105	153	75	130	66
	Queue Length 95th (ft)	134	187	#251	m#231	m67
	Intersection Signal Delay			23.8		
	Intersection LOS			C		

H Street NW & 18th Street NW	Lane Group	EBT	NBT
	Total Delay	8.1	4.9
	LOS	A	A
	Approach Delay	8.1	4.9
	Approach LOS	A	A
	Queue Length 50th (ft)	14	31
	Queue Length 95th (ft)	20	41
	Intersection Signal Delay		6.1
	Intersection LOS		A

MD					PM				
EBT	NBT	NBR	SBL	SBT	EBT	NBT	NBR	SBL	SBT
28.7	23.6	38.9	13.4	7.9	36	21.3	51.6	12	9.4
C	C	D	B	A	D	C	D	B	A
28.7		29.6		9.3	36		34.3		9.8
C		C		A	D		C		A
168	139	106	45	73	194	85	80	43	115
188	193	#149	m61	m84	217	136	#202	m44	107
		22.3					25		
		C					C		

EBT	NBT	EBT	NBT
8.4	4.1	9	8.1
A	A	A	A
8.4	4.1	9	8.1
A	A	A	A
16	19	14	195
m24	31	m20	254
5.5		8.5	
A		A	

Intersection		AM				
H Street NW & Connecticut Avenue NW	Lane Group	EBT	NBR	SBL		
	Total Delay	13.8	36.5	0.2		
	LOS	B	D	A		
	Approach Delay	13.8	36.5	0.2		
	Approach LOS	B	D	A		
	Queue Length 50th (ft)	103	1	0		
	Queue Length 95th (ft)	m119	8	0		
	Intersection Signal Delay	12.2				
	Intersection LOS	B				
H Street NW & New York Avenue NW	Lane Group	SEL	SET	NWL	NET	SWT
	Total Delay	17.4	21.3	29.3	12.3	28
	LOS	B	C	C	B	C
	Approach Delay	20.2		29.3	12.3	28
	Approach LOS	C		C	B	C
	Queue Length 50th (ft)	28	77	34	45	66
	Queue Length 95th (ft)	47	112	55	65	93
	Intersection Signal Delay	20.2				
	Intersection LOS	C				

MD					PM				
EBT	NBT	SBT			EBT	NBT	SBL		
18	32.7	35.9			13.7	36	37.1		
B	C	D			B	D	D		
18	32.7	35.9			13.7	36	37.1		
B	C	D			B	D	D		
81	2	71			96	1	78		
96	10	m136			m109	5	147		
	20.6					16.2			
	C					B			

SEL	SET	NWL	NET	SWT	SEL	SET	NWL	NET	SWT
27.9	34.2	27.3	12.4	26.3	45.7	54.6	35.1	19.3	33.5
C	C	C	B	C	D	D	D	B	C
	32.1	27.3	12.4	26.3		51.4	35.1	19.3	33.5
	C	C	B	C		D	D	B	C
52	103	41	28	51	138	262	48	32	74
67	116	47	63	75	162	314	76	93	105
		26.7					42.3		
		C					D		

Intersection		AM		
H Street NW & Vermont Avenue NW	Lane Group	EBT	SBL	
	Total Delay	9.4	27.9	
	LOS	A	C	
	Approach Delay	9.4	27.9	
	Approach LOS	A	C	
	Queue Length 50th (ft)	51	67	
	Queue Length 95th (ft)	57	m91	
	Intersection Signal Delay	10.9		
	Intersection LOS	B		
(I Street NW) & 11th Street NW	Lane Group	NBT	SBT	SER
	Total Delay	16.1	0.1	0.1
	LOS	B	A	A
	Approach Delay	16.1	0.1	0.1
	Approach LOS	B	A	A
	Queue Length 50th (ft)	75	0	0
	Queue Length 95th (ft)	131	0	0
	Intersection Signal Delay	7.1		
	Intersection LOS	A		

MD			PM		
EBL	EBT	SBL	EBT	SBL	
10	11.4	71.9	11.5	54.2	
B	B	E	B	D	
	11.3	71.9	11.5	54.2	
	B	E	B	D	
13	59	162	60	161	
m22	69	#285	68	251	
	20.9			18.4	
	C			B	

NBT	SBT	SER	NBT	SBT	SER
15.4	0	0.1	12.3	0.1	0.6
B	A	A	B	A	A
15.4		0.1	12.3	0.1	0.6
B		A	B	A	A
86	0	0	107	0	0
148	0	m0	184	0	0
	8.4			5.4	
	A			A	

Intersection		AM			
I Street NW & 11th Street NW	Lane Group	WBT	NBT	SBT	SBR
	Total Delay	27.2	3.1	24.2	6.6
	LOS	C	A	C	A
	Approach Delay	27.2	3.1		21
	Approach LOS	C	A		C
	Queue Length 50th (ft)	192	7	137	3
	Queue Length 95th (ft)	250	19	180	41
	Intersection Signal Delay			19.4	
	Intersection LOS			B	

I Street NW & 12th Street NW	Lane Group	WBT	NBT		
	Total Delay	22.9	14.8		
	LOS	C	B		
	Approach Delay	22.9	14.8		
	Approach LOS	C	B		
	Queue Length 50th (ft)	133	60		
	Queue Length 95th (ft)	172	71		
	Intersection Signal Delay		18.2		
	Intersection LOS		B		

MD				PM			
WBT	NBT	SBT	SBR	WBT	NBT	SBT	SBR
19	1.3	22.7	2.6	37.9	5.7	22.7	3.5
B	A	C	A	D	A	C	A
19	1.3		19.2	37.9	5.7		20.6
B	A		B	D	A		C
86	3	99	0	172	17	199	0
111	4	141	12	237	31	264	23
		14.2				20.9	
		B				C	

WBT	WBR	NBT	WBT	NBT
11.8	2.4	8.1	24.9	8.2
B	A	A	C	A
	9.6	8.1	24.9	8.2
	A	A	C	A
50	0	30	116	50
67	0	53	155	63
	8.8			13.8
	A			B

Intersection		AM				
I Street NW & 13th Street NW	Lane Group	WBT	NBL	NBT	SBT	
	Total Delay	25.9	32.6	9.2	35.3	
	LOS	C	C	A	D	
	Approach Delay	25.9		14.9	35.3	
	Approach LOS	C		B	D	
	Queue Length 50th (ft)	170	45	40	275	
	Queue Length 95th (ft)	221	121	47	314	
	Intersection Signal Delay			27.6		
	Intersection LOS			C		
I Street NW & 14th Street NW	Lane Group	WBT	NBL	NBT	SBT	SBR
	Total Delay	28.2	75	3.8	47.3	48
	LOS	C	E	A	D	D
	Approach Delay	28.2		24		47.4
	Approach LOS	C		C		D
	Queue Length 50th (ft)	287	185	29	258	76
	Queue Length 95th (ft)	231	#328	34	#361	#162
	Intersection Signal Delay			31.7		
	Intersection LOS			C		

MD					PM				
WBT	NBL	NBT	SBT	SBR	WBT	NBL	NBT	SBT	
12.1	30.3	19	29.9	32.7	23.7	30.8	10.4	39.3	
B	C	B	C	C	C	C	B	D	
12.1		21.9	30.4		23.7		14	39.3	
B		C	C		C		B	D	
75	62	95	159	63	175	36	60	208	
94	114	141	216	105	215	#146	71	261	
		21.7					25		
		C					C		

WBT	NBL	NBT	SBT	SBR	WBT	NBL	NBT	SBT	SBR
26.2	23.3	6.5	26.9	21.4	40.4	34.7	3.4	32.9	31.8
C	C	A	C	C	D	C	A	C	C
26.2		10.6		26.3	40.4		10.4		32.7
C		B		C	D		B		C
123	32	36	192	37	209	92	33	236	74
167	98	47	256	77	#308	151	34	308	106
		21					25.9		
		C					C		

Intersection		AM		
I Street NW & 15th Street NW	Lane Group	WBT	NBL	NBT
	Total Delay	14.8	37.3	9.1
	LOS	B	D	A
	Approach Delay	14.8	22.5	
	Approach LOS	B	C	
	Queue Length 50th (ft)	98	163	117
	Queue Length 95th (ft)	122	217	135
	Intersection Signal Delay	18		
	Intersection LOS	B		

I Street NW & 16th Street NW	Lane Group	WBT	NBT	SBT
	Total Delay	6.6	0.6	21.9
	LOS	A	A	C
	Approach Delay	6.6	0.6	21.9
	Approach LOS	A	A	C
	Queue Length 50th (ft)	96	0	89
	Queue Length 95th (ft)	90	0	127
	Intersection Signal Delay	8.6		
	Intersection LOS	A		

MD			PM		
WBT	NBL	NBT	WBT	NBL	NBT
18	29.2	10.6	11.9	41.9	12.5
B	C	B	B	D	B
18	20.8		11.9	27.4	
B	C		B	C	
119	149	39	86	129	68
164	201	47	m88	185	86
	19.3			17.9	
	B			B	

WBT	NBT	SBT	SBR	WBT	NBT	SBT
14.6	1	29.3	34.9	3.8	9.1	27.3
B	A	C	C	A	A	C
14.6	1	31.3		3.8	9.1	27.3
B	A	C		A	A	C
365	0	95	55	27	18	98
437	m0	151	109	29	35	142
	15.8				9.3	
	B				A	

Intersection		AM			
I Street NW & 17th Street NW	Lane Group	WBT	NBL	NBT	SBT
	Total Delay	17.7	33.5	4.2	36.7
	LOS	B	C	A	D
	Approach Delay	17.7		10.1	36.7
	Approach LOS	B		B	D
	Queue Length 50th (ft)	339	60	35	175
	Queue Length 95th (ft)	374	88	41	222
	Intersection Signal Delay			19.5	
	Intersection LOS			B	

I Street NW & 18th Street NW	Lane Group	WBT	NBT
	Total Delay	28.1	7.6
	LOS	C	A
	Approach Delay	28.1	7.6
	Approach LOS	C	A
	Queue Length 50th (ft)	130	58
	Queue Length 95th (ft)	168	64
	Intersection Signal Delay		16.7
	Intersection LOS		B

MD						PM			
WBT	WBR	NBL	NBT	SBT	SBR	WBT	NBL	NBT	SBT
41.6	8.6	21.7	5	32.7	44.4	20.8	40.7	12.3	52.6
D	A	C	A	C	D	C	D	B	D
40.9		8.9		34.6		20.8		18	52.6
D		A		C		C		B	D
193	3	19	30	180	66	337	39	47	227
#421	m6	m54	40	221	117	405	37	58	#302
		30.6						30.3	
		C						C	

WBT	WBR	NBT	WBT	NBT
12.4	25.8	18.8	12.9	50.6
B	C	B	B	D
15.7		18.8	12.9	50.6
B		B	B	D
81	70	120	90	189
m94	m85	156	m125	232
17			28.2	
B			C	

Intersection		AM		
I Street NW & 19th Street NW	Lane Group	WBT	SBT	
	Total Delay	4.8	19.9	
	LOS	A	B	
	Approach Delay	4.8	19.9	
	Approach LOS	A	B	
	Queue Length 50th (ft)	27	64	
	Queue Length 95th (ft)	29	86	
	Intersection Signal Delay	10.7		
	Intersection LOS	B		

I Street NW & 20th Street NW	Lane Group	WBT	WBR	NBT
	Total Delay	42.6	122.4	8.8
	LOS	D	F	A
	Approach Delay	79.6		8.8
	Approach LOS	E		A
	Queue Length 50th (ft)	83	~211	44
	Queue Length 95th (ft)	116	#326	51
	Intersection Signal Delay	33.9		
	Intersection LOS	C		

MD			PM		
WBT	SBT		WBT	SBT	
12.7	15.7		13.1	25.4	
B	B		B	C	
12.7	15.7		13.1	25.4	
B	B		B	C	
31	55		57	178	
40	77		62	215	
	13.8			19.8	
	B			B	

WBT	WBR	NBT	WBT	WBR	NBT
7.6	67.8	9.3	11.9	25.8	6.2
A	E	A	B	C	A
	27.9	9.3		15.9	6.2
	C	A		B	A
23	121	81	41	78	10
33	#219	105	50	102	18
	19.8			11.1	
	B			B	

Intersection		AM			
I Street NW & Connecticut Avenue NW	Lane Group	WBT	SBT		
	Total Delay	9.2	22.3		
	LOS	A	C		
	Approach Delay	9.2	22.3		
	Approach LOS	A	C		
	Queue Length 50th (ft)	41	45		
	Queue Length 95th (ft)	68	58		
	Intersection Signal Delay	12.1			
	Intersection LOS	B			
Pennsylvania Avenue NW & 21st Street NW	Lane Group	EBT	EBR	WBT	SBT
	Total Delay	34.5	18.3	0.7	32.1
	LOS	C	B	A	C
	Approach Delay	32.3		0.7	32.1
	Approach LOS	C		A	C
	Queue Length 50th (ft)	233	42	0	103
	Queue Length 95th (ft)	268	89	m1	129
	Intersection Signal Delay	25.1			
	Intersection LOS	C			

MD				PM			
WBT	NBT	SBT		WBT	NBT	SBT	
12.1	25.3	31.4		22.4	25.3	22.9	
B	C	C		C	C	C	
12.1	25.3	31.4		22.4	25.3	22.9	
B	C	C		C	C	C	
65	56	101		200	77	74	
m77	105	196		238	117	112	
	16.7				22.9		
	B				C		

EBT	EBR	WBT	SBT	EBT	EBR	WBT	SBT
27.9	9.3	0.9	20.5	29.3	6.1	1.2	28.5
C	A	A	C	C	A	A	C
	23.6	0.9	20.5		24.7	1.2	28.5
	C	A	C		C	A	C
94	0	2	72	76	0	15	190
128	52	m0	82	93	14	m4	241
		14.8				18.4	
		B				B	

Intersection		AM				
I Street NW & Pennsylvania Avenue NW	Lane Group	EBT	WBT	SWL	SWR	
	Total Delay	0.1	11	97.6	92.1	
	LOS	A	B	F	F	
	Approach Delay	0.1	11	94.9		
	Approach LOS	A	B	F		
	Queue Length 50th (ft)	0	20	118	121	
	Queue Length 95th (ft)	0	24	#248	#252	
	Intersection Signal Delay	20.4				
	Intersection LOS	C				
I Street NW & Vermont Avenue NW	Lane Group	WBT	NBL	NBT	SBT	SBR
	Total Delay	39.4	38.6	17.8	29.3	3.8
	LOS	D	D	B	C	A
	Approach Delay	39.4	21	14.1		
	Approach LOS	D	C	B		
	Queue Length 50th (ft)	98	14	38	25	0
	Queue Length 95th (ft)	335	m27	66	47	0
	Intersection Signal Delay	36				
	Intersection LOS	D				

MD				PM			
EBT	WBT	SWL	SWR	EBT	WBT	SWL	SWR
0.1	31.8	141.7	90	0.1	42.2	363.8	196.2
A	C	F	F	A	D	F	F
0.1	31.8	115.2		0.1	42.2	281	
A	C	F		A	D	F	
0	72	~176	~167	0	80	~301	~267
0	61	#321	#268	0	101	#475	#372
	47.3				108.5		
	D				F		

WBL	WBT	WBR	NBL	NBT	SBT	SBR	WBT	NBL	NBT	SBT	SBR
13.7	23.8	25.3	34.4	16.9	38.8	8.5	9.5	60.2	42.1	46.7	5
B	C	C	C	B	D	A	A	E	D	D	A
	23.1			22.2		25.6	9.5		44.5		34.9
	C			C		C	A		D		C
32	284	98	21	25	75	0	77	19	108	123	0
m60	371	m199	34	34	132	0	88	30	132	179	0
			23.4						17.5		
			C						B		

Intersection		AM					
New York Avenue NW & 10th Street NW	Lane Group	EBT	WBT	NBL	NBR	SBL	SBT
	Total Delay	19.7	23.9	31.4	1.6	30.8	32.2
	LOS	B	C	C	A	C	C
	Approach Delay	19.7	23.9		22.1		31.7
	Approach LOS	B	C		C		C
	Queue Length 50th (ft)	114	198	40	0	92	185
	Queue Length 95th (ft)	156	263	66	0	149	297
	Intersection Signal Delay				24.8		
	Intersection LOS				C		
New York Avenue NW & 11th Street NW	Lane Group	EBT	WBT	NBT	SBT		
	Total Delay	23	19.5	5.3	13.6		
	LOS	C	B	A	B		
	Approach Delay	23	19.5	5.3	13.6		
	Approach LOS	C	B	A	B		
	Queue Length 50th (ft)	115	50	11	23		
	Queue Length 95th (ft)	137	61	18	27		
	Intersection Signal Delay			14.8			
	Intersection LOS			B			

MD						PM					
EBT	WBT	NBL	NBR	SBL	SBT	EBT	WBT	NBL	NBR	SBL	SBT
8	15	38.6	2.9	36.5	31.5	88	49.3	13	2	22.7	14.8
A	B	D	A	D	C	F	D	B	A	C	B
8	15		26.2		33.6	88	49.3		9.1		18.6
A	B		C		C	F	D		A		B
51	93	46	0	116	138	242	189	30	0	159	131
65	130	70	5	193	201	#355	240	61	11	264	212
			18.8						48.9		
			B						D		

EBT	WBT	NBT	SBT	EBT	WBT	NBT	SBT
27.3	14.7	4.6	11.3	33.5	26.5	4.2	7.7
C	B	A	B	C	C	A	A
27.3	14.7	4.6	11.3	33.5	26.5	4.2	7.7
C	B	A	B	C	C	A	A
106	23	10	32	143	36	26	34
122	33	26	51	197	54	41	32
		14.6				13.6	
		B				B	

Intersection		AM					
New York Avenue NW & 12th Street NW	Lane Group	EBT	WBT	NBT			
	Total Delay	38.3	20.1	20.9			
	LOS	D	C	C			
	Approach Delay	38.3	20.1	20.9			
	Approach LOS	D	C	C			
	Queue Length 50th (ft)	195	52	194			
	Queue Length 95th (ft)	224	72	240			
	Intersection Signal Delay		26.1				
	Intersection LOS		C				

New York Avenue NW & 13th Street NW	Lane Group	EBL	EBT	WBT	NBT	SBL	SBT
	Total Delay	26.8	22	22	4.5	3.7	1.3
	LOS	C	C	C	A	A	A
	Approach Delay		23.1	22	4.5		1.6
	Approach LOS		C	C	A		A
	Queue Length 50th (ft)	37	65	45	19	4	5
	Queue Length 95th (ft)	88	93	80	27	m5	6
	Intersection Signal Delay				8.4		
	Intersection LOS				A		

MD			PM		
EBT	WBT	NBT	EBT	WBT	NBT
23	8.8	25.3	22	19.4	26.8
C	A	C	C	B	C
23	8.8	25.3	22	19.4	26.8
C	A	C	C	B	C
95	17	208	206	43	301
148	m27	283	263	67	365
	22.5			24.9	
	C			C	

EBL	EBT	WBT	NBT	NBR	SBL	SBT	EBL	EBT	WBT	NBT	SBL	SBT
23.2	21.3	7.6	2.1	1.5	2.9	2.2	21.4	12.3	14.6	2.9	9	2.5
C	C	A	A	A	A	A	C	B	B	A	A	A
	21.6	7.6		2.1		2.3		15	14.6	2.9		3.1
	C	A		A		A		B	B	A		A
21	57	3	11	0	4	12	35	43	27	15	6	16
42	80	m9	14	m0	m6	14	175	60	m38	21	m8	23
			7.3							6.5		
			A							A		

Intersection		AM			
New York Avenue NW & 14th Street NW	Lane Group	EBT	WBT	NBT	SBT
	Total Delay	24.5	42.4	16.8	6
	LOS	C	D	B	A
	Approach Delay	24.5	42.4	16.8	6
	Approach LOS	C	D	B	A
	Queue Length 50th (ft)	38	140	212	64
	Queue Length 95th (ft)	53	187	260	68
	Intersection Signal Delay			16.7	
	Intersection LOS			B	
New York Avenue NW & 15th Street NW	Lane Group	WBL	WBR	NBT	SBT
	Total Delay	79.7	34.5	13.5	3.6
	LOS	E	C	B	A
	Approach Delay		56.2	13.5	3.6
	Approach LOS		E	B	A
	Queue Length 50th (ft)	97	63	131	27
	Queue Length 95th (ft)	#154	112	164	36
	Intersection Signal Delay			19.6	
	Intersection LOS			B	

MD				PM			
EBT	WBT	NBT	SBT	EBT	WBT	NBT	SBT
27.6	44.2	12.5	4.2	18.3	40.6	14.4	3.7
C	D	B	A	B	D	B	A
27.6	44.2	12.5	4.2	18.3	40.6	14.4	3.7
C	D	B	A	B	D	B	A
50	120	106	44	23	137	182	46
88	162	137	53	28	155	204	48
		15				14.9	
		B				B	

WBL	WBR	NBT	NBR	SBT	WBL	WBR	NBT	SBT
80.4	14.8	13.1	3	17.5	188.5	31.7	14.9	0.3
F	B	B	A	B	F	C	B	A
	44.9		10.8	17.5		128	14.9	0.3
	D		B	B		F	B	A
66	13	102	0	124	~281	101	88	0
#168	65	138	27	123	#322	152	94	0
		19.5					48.1	
		B					D	

Intersection		AM				
Pennsylvania Avenue NW & 17th Street NW	Lane Group	EBL	EBR	NBT	SBT	SBR
	Total Delay	27.6	29.2	14.1	6.4	9
	LOS	C	C	B	A	A
	Approach Delay		28.7	14.1		7.2
	Approach LOS		C	B		A
	Queue Length 50th (ft)	20	51	199	35	31
	Queue Length 95th (ft)	m35	m80	243	71	67
	Intersection Signal Delay			13.4		
	Intersection LOS			B		
Pennsylvania Avenue NW & 18th Street NW	Lane Group	EBT	WBT	NBT		
	Total Delay	11.4	7.6	22.5		
	LOS	B	A	C		
	Approach Delay	11.4	7.6	22.5		
	Approach LOS	B	A	C		
	Queue Length 50th (ft)	16	31	250		
	Queue Length 95th (ft)	24	39	294		
	Intersection Signal Delay		19.3			
	Intersection LOS		B			

MD				PM				
EBL	EBR	NBT	SBT	EBL	EBR	NBT	SBT	SBR
33.8	34.2	16.4	23.9	25.5	25.4	19.3	13.4	12
C	C	B	C	C	C	B	B	B
	34	16.4	23.9		25.4	19.3		13.2
	C	B	C		C	B		B
30	64	98	215	39	65	116	231	30
56	104	130	274	65	102	152	291	55
		22.8				17.5		
		C				B		

EBT	WBT	NBT	EBT	WBT	NBT
11.1	34.7	16.4	11.2	34	18.3
B	C	B	B	C	B
11.1	34.7	16.4	11.2	34	18.3
B	C	B	B	C	B
26	50	134	29	74	145
m36	79	170	m42	106	175
	18.1			19.1	
	B			B	

Intersection		AM				
Pennsylvania Avenue NW & 19th Street NW	Lane Group	EBL	EBT	WBL	WBT	SBT
	Total Delay	26.3	11	39.9	18.1	37.8
	LOS	C	B	D	B	D
	Approach Delay		19.9		22	37.8
	Approach LOS		B		C	D
	Queue Length 50th (ft)	269	55	14	28	136
	Queue Length 95th (ft)	301	62	m26	67	167
	Intersection Signal Delay			25.7		
	Intersection LOS			C		
Pennsylvania Avenue NW & 20th Street NW	Lane Group	EBT	WBT	NBT		
	Total Delay	15.5	11.4	23.9		
	LOS	B	B	C		
	Approach Delay	15.5	11.4	23.9		
	Approach LOS	B	B	C		
	Queue Length 50th (ft)	282	22	208		
	Queue Length 95th (ft)	m337	28	255		
	Intersection Signal Delay		18.8			
	Intersection LOS		B			

MD					PM				
EBL	EBT	WBL	WBT	SBT	EBL	EBT	WBL	WBT	SBT
41.5	29.9	51.7	26.4	40.4	37.3	28.2	64.8	46.7	19.1
D	C	D	C	D	D	C	E	D	B
	34.9		33.8	40.4		32.2		57.7	19.1
	C		C	D		C		E	B
110	146	28	32	208	187	243	85	50	134
153	202	47	50	#282	231	286	89	81	154
		36.7					28.6		
		D					C		

EBT	WBT	NBL	NBT	EBT	WBT	NBT
8	4	25.2	29.6	29.8	5.6	26.9
A	A	C	C	C	A	C
8	4	29		29.8	5.6	26.9
A	A	C		C	A	C
121	9	34	141	211	17	179
m116	m10	67	174	m243	m21	204
	15.5				25.8	
	B				C	

Intersection		AM		
Pennsylvania Avenue NW & 22nd Street NW	Lane Group	EBT	WBT	NBT
	Total Delay	9	44.1	33.4
	LOS	A	D	C
	Approach Delay	9	44.1	33.4
	Approach LOS	A	D	C
	Queue Length 50th (ft)	102	97	73
	Queue Length 95th (ft)	126	133	104
	Intersection Signal Delay		22	
	Intersection LOS		C	

MD			PM		
EBT	WBT	NBT	EBT	WBT	NBT
8.6	13.3	30.4	9.3	27.6	30.2
A	B	C	A	C	C
8.6	13.3	30.4	9.3	27.6	30.2
A	B	C	A	C	C
46	52	75	60	165	67
63	82	114	78	214	95
	15.3			21.5	
	B			C	

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