COMPREHENSIVE TRANSPORTATION REVIEW

CENTRAL ARMATURE WORKS PUD

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Contents

Figures

Tables

EXECUTIVE SUMMARY

This report is a Comprehensive Transportation Review (CTR) for the Central Armature Works Planned Unit Development (PUD). This report reviews the transportation aspects of the project's Consolidated PUD application. The Zoning Commission Case Number is 16-09.

The purpose of this study is to review the design of the project and evaluate whether the project will generate a detrimental impact to the surrounding transportation network. This evaluation is based on a technical comparison of the existing conditions, and future with and without the development. This report concludes that **the project will not have a detrimental impact** to the surrounding transportation network assuming that all planned site design elements are implemented.

Proposed Project

The Central Armature Works site is currently occupied by the namesake two-story repair, supply, and construction company with an informal parking lot in the rear of the property abutting the Northeast Corridor railroad lines, which provides rail access for WMATA and Amtrak personnel. The site is bounded by M Street NE to the south, Florida Avenue NE to the north, 3rd Street NE to the east, and the Northeast Corridor rail lines to the west.

The applicant plans to develop the site into a mixed-use development including residential, retail, and hotel uses. The project will be three structures containing approximately 631 residential units, approximately 27,200 square feet of ground floor retail, and a hotel with approximately 196 rooms. Parking and loading will be accessed through a curb cut along M Street which will become the southbound approach of the existing intersection at Delaware Avenue and M Street NE.

The development will be served by a total of 356 off-street parking spaces in a below-grade parking garage, including 60 valet spaces for hotel use. The loading will be accommodated with three 30-foot loading berths and two 20-foot delivery spaces to adequately serve the demands set forth by the development program.

Pedestrian facilities along the perimeter of the site will be improved to include sidewalk and buffer widths that meet or exceed DDOT requirements. The incorporation of space for the future N Street tunnel to the NoMa Gallaudet U Metro Station will allow for greater pedestrian circulation across a major barrier in the NoMa area.

The development will supply a total of approximately 220 long-term bicycle parking spaces on the second level, exceeding the current zoning requirements.

Multi-Modal Impacts and Recommendations

Transit

The site is served by regional and local transit services such as Metrorail and Metrobus. The site is 400 feet from the NoMa-Gallaudet U Metrorail Station portal at 2nd Street and N Street, and many Metrobus stops are located within a block of the site along Florida Avenue.

Although the development will be generating new transit trips, existing facilities have sufficient capacity to handle the new trips.

Pedestrian

The site is surrounded by a well-connected pedestrian network. Most roadways within a quarter-mile radius provide sidewalks and acceptable crosswalks and curb ramps, particularly along the primary walking routes. There are some pedestrian barriers surrounding the site such as limited connectivity due to the rail tracks to the west.

As a result of the development, pedestrian facilities along the perimeter of the site will be improved, most notably by removing all existing curb cuts around the perimeter of the site and the development of a public plaza adjacent to N Street. The N Street Plaza will be the entrance to the future pedestrian tunnel connecting to the NoMa Gallaudet U Metro Station, allowing a more direct and conflict-free passageway to the other side of the railway tracks.

The development will improve sidewalks adjacent to the site such that they meet or exceed DDOT requirements and provide an improved pedestrian environment.

Bicycle

The site is very well served by existing and proposed bicycle infrastructure. The site is just blocks away from trails and bike lanes, such as the Metropolitan Branch Trail to the west and bike lanes along 4th Street and 6th Street to the east of the site. A future cycle track along M Street will provide additional connectivity.

On site, the development will provide 52 short-term bicycle parking along the perimeter of the site and 220 on-site secure long-term bicycle parking for residents and employees of the development.

Vehicular

The site is well-connected to regional roadways such as I-395 and US-50, principal and minor arterials such as Florida Avenue and 6th Street, and an existing network of collector and local roadways.

In order to determine if the proposed development will have a negative impact on this transportation network, this report projects future conditions with and without the development of the site and performs analyses of intersection delays. These delays are compared to the acceptable levels of delay set by DDOT standards to determine if the site will negatively impact the study area.

The analysis concluded that all intersections that are impacted due to PUD generated traffic have readily implementable mitigation measures, which range from simple signal timing adjustments to making changes in the roadway configuration that are concurrent with recommendations made in DDOT planning studies of the local area.

Summary and Recommendations

This report concludes that the PUD will not have a detrimental impact to the surrounding transportation network for the following reasons:

- The vehicular trips generated by the PUD will be around one new car every 14 seconds during the busiest traffic hour of the day. Impact of new PUD traffic will be negligible when spread across the nearby roadway network.
- The analysis conducted within this report showed that all intersections that are impacted due to PUD generated traffic have readily implementable mitigation measures, which range from simple signal timing adjustments to making changes in the roadway configuration that are concurrent with recommendations made in DDOT planning studies of the local area.
- Adequate on-site parking to accommodate all residents, employees, and guests of the PUD, with additional on-street parking spaces created with the elimination of curb cuts on 3rd Street.
- The improved pedestrian network in and around the site.
- The Applicant is working with WMATA to allow the construction of a future pedestrian tunnel from the development to the NoMa-Gallaudet U Metrorail Station, creating a buffer between pedestrians and vehicular conflicts.
- The site's close proximity to Metrorail, and proposed TDM plan.
- The inclusion of secure long-term bicycle parking spaces on-site that greatly exceed zoning requirements, as well as a bike service area.
- The Applicant is funding a new Capital Bikeshare station and one year of maintenance for the neighborhood.
- The Applicant is purchasing ten electric bikes and installing ten electric bike charging stations to be shared by residents and guests. Additionally, the Applicant is installing eight publically accessible electric bike charging stations.
- The Applicant is devoting six parking spaces for electric car charging stations.
- The Applicant is providing 20 shopping carts for tenants to run daily errands and grocery shopping.
- The PUD is designed to integrate with future cycle tracks along M Street, further encouraging residents, employees, and hotel guests to use the on-site enclosed bicycle facilities.

INTRODUCTION

PURPOSE OF STUDY

This report reviews the transportation elements of the project, supplementing material provided in the Site Plan Package that accompanied the Zoning Commission Application for the Central Armature Works development. The site, shown in Figure 1, is located in the NoMa neighborhood in northeast DC, just south of Union Market.

The purpose of this report is to:

1. Review the transportation elements of the development site plan and demonstrate that the site conforms to DDOT's general polices of promoting non-automobile modes of travel and sustainability.
2. Provide information to the District Department of Transportation (DDOT) and other agencies on how the development of the site will influence the local transportation network. This report accomplishes this by identifying the potential trips generated by the site on all major modes of travel and where these trips will be distributed on the network.
3. Determine if development of the site will lead to adverse impacts on the local transportation network. This report accomplishes this by projecting future conditions with and without development of the site and performing analyses of vehicular delays. These delays are compared to the acceptable levels of delay set by DDOT standards to determine if the site will negatively impact the study area. The report discusses what improvements to the transportation network are needed to mitigate adverse impacts.

CONTENTS OF STUDY

This report contains nine sections as follows:

- *Study Area Overview*
  This section reviews the area near and adjacent to the proposed project and includes an overview of the site location.
- *Project Design*
  This section reviews the transportation components of the project, including the site plan and access. This chapter also contains the proposed Transportation Demand Management (TDM) plan for the site.
- *Trip Generation*
  This section outlines the travel demand of the proposed project. It summarizes the proposed trip generation of the project.
- *Traffic Operations*
  This section provides a summary of the existing roadway facilities and an analysis of the existing and future roadway capacity in the study area. This section highlights the vehicular impacts of the project, including presenting mitigation measures for minimizing impacts.
- *Transit*
  This section summarizes the existing and future transit service adjacent to the site, reviews how the project's transit demand will be accommodated, outlines impacts, and presents recommendations as needed.
- *Pedestrian Facilities*
  This section summarizes existing and future pedestrian access to the site, reviews walking routes to and from the project site, outlines impacts, and presents recommendations as needed.
- *Bicycle Facilities*
  This section summarizes existing and future bicycle access to the site, reviews the quality of cycling routes to and from the project site, outlines impacts, and presents recommendations as needed.
- *Safety/Crash Analysis*
  This section reviews the potential safety impacts of the project. This includes a review of crash data at intersections in the study area and a qualitative discussion on how the development will influence safety.
- *Summary and Conclusions*
  This section presents a summary of the recommended mitigation measures by mode and presents overall report findings and conclusions.

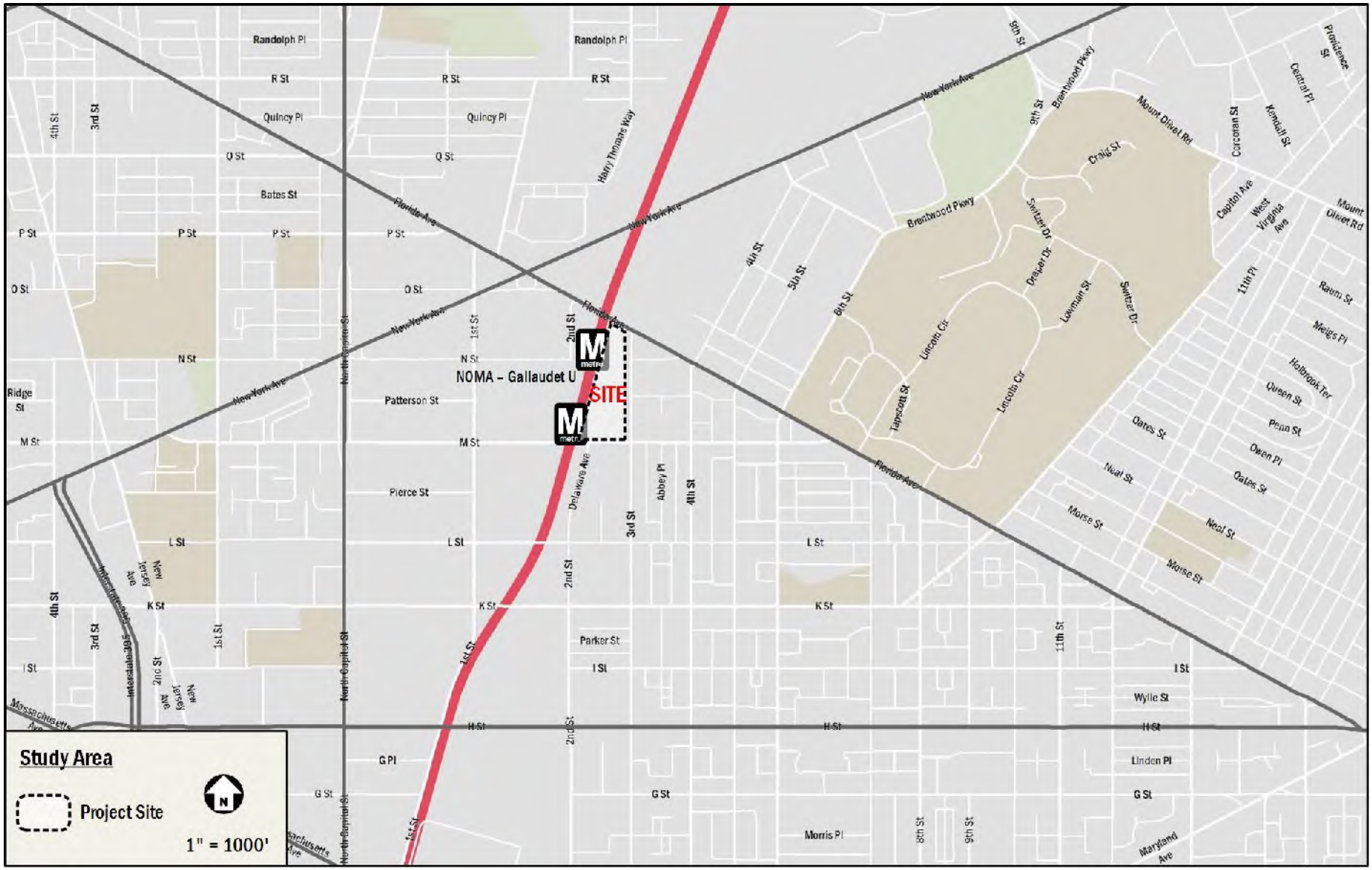

Figure 1: Site Location

STUDY AREA OVERVIEW

This section reviews the study area and includes an overview of the site location, including a summary of the major transportation characteristics of the area and of future regional projects.

The following conclusions are reached within this chapter:

- The site is surrounded by an extensive regional and local transportation system that will connect the residents, employees, and patrons of the proposed development
- The site is well-served by public transportation with access to Metrorail, and several local Metro bus lines.
- There is excellent existing bicycle infrastructure including the Metropolitan Branch Trail and several bike lanes in the vicinity of the site.
- Pedestrian conditions are generally good, particularly along anticipated major walking routes.

MAJOR TRANSPORTATION FEATURES

Overview of Regional Access

The Central Armature Works site has ample access to regional vehicular- and transit-based transportation options, as shown in Figure 3, that connect the site to destinations within the District, Virginia, and Maryland.

The site is accessible from Florida Avenue, which connects to several US highways such as US-50 (New York Avenue), US-29 (Georgia Avenue), and US-1 (Rhode Island Avenue), as well as Interstate 395. The highways and interstates create connectivity to the Capital Beltway (I-495) that surrounds Washington, DC and its inner suburbs. All of these roadways bring vehicular traffic within half-mile of the site, at which point arterials and local roads can be used to access the site directly.

The site is located extremely close to the NoMa-Gallaudet U Metrorail station. The proposed development has access to the Red line which provides connections to areas in the District and Maryland. The Red Line connects Prince George's County and Montgomery County, Maryland while providing access to the District core. Of particular importance, the Red Line provides a direct connection to Union Station, which is a hub for commuter rail—such as Amtrak, MARC, and VRE—in addition to all additional Metrorail lines allowing for access to much of the DC Metropolitan area.

Overall, the site has access to several regional roadways and transit options, making it convenient to travel between the site and destinations in the District, Virginia, and Maryland.

Overview of Local Access

There are several local transportation options near the site that serve vehicular, transit, walking, and cycling trips, as shown on Figure 4.

The site is served by a local vehicular network that includes several minor arterials such as M Street and 4th Street NE. In addition, there is an existing network of connector and local roadways that provide access to the site.

The Metrobus systems provide local transit service in the vicinity of the site, including connections to several neighborhoods within the District and additional Metrorail stations. As shown in Figure 4, there are three routes that service the site. In the vicinity of the site the majority of routes travel along Florida Avenue. These bus lines connect the site to many areas of the District.

There are existing bicycle facilities that connect the site to areas within the District, most notably the Metropolitan Branch Trail, 4th Street bike lanes, and the M Street Cycle Track as shown in Figure 25. A few blocks from the site the 6th Street bike lanes and 1st Street cycle track provide further connections to the rest of the District. A detailed review of the existing and proposed bicycle facilities is provided in a later section of this report.

In the vicinity of the site, most roadways provide sidewalks with crosswalks present at most intersections. Anticipated pedestrian routes, such as those to bus stops, Metrorail stations, retail zones, and community amenities, provide acceptable pedestrian facilities; however, there are some pedestrian barriers in the area that limit the overall connectivity to and from the site. A detailed review of existing and proposed pedestrian access and infrastructure is provided in a later section of this report.

Overall the Central Armature Works site is surrounded by an expansive local transportation network that allows for efficient

transportation options via transit, bicycle, walking, or vehicular modes.

Car-sharing

Three car-sharing companies provide service in the District: Zipcar, Enterprise Carshare, and Car2Go. All three services are private companies that provide registered users access to a variety of automobiles. Of these, Zipcar and Enterprise Carshare have designated spaces for their vehicles. There are four Carshare locations within a quarter-mile of the site, housing a total of twelve vehicles. Table 1 breaks down the carshare locations that are made available to the public.

Car-sharing is also provided by Car2Go, which provides point-to-point car sharing. Unlike Zipcar or Enterprise Carshare, which require two-way trips, Car2Go can be used for one-way rentals. Car2Go currently has a fleet of vehicles located throughout the District. Car2Go vehicles may park in any non-restricted metered curbside parking space or Residential Parking Permit (RPP) location in any zone throughout the defined "Home Area". Members do not have to pay the meters or pay stations. Car2Go does not have permanent designated spaces for their vehicles; however availability is tracked through their website, which provides an additional option for car-sharing patrons.

Walkscore

Walkscore.com is a website that provides scores and rankings for the walking, biking, and transit conditions within neighborhoods of the District. Based on this website the planned development is located in the H Street-NoMa neighborhood. The project location itself has a walk score of 94 (or "Walker's Paradise"), a transit score of 79 (or "Excellent Transit"), and a bike score of 93 (or "Biker's Paradise"). Figure 2 shows the neighborhood borders in relation to the site location and displays a heat map for walkability and bikeability.

The site is situated in an area with an excellent walk score due to the abundance of neighborhood serving retail locations, where most errands can be completed by walking. The site is situated in an area with good bike scores due to its proximity to bike facilities and flat topography. The high transit score was based on the proximity to the NoMa-Gallaudet U Metrorail station, car share, and multiple bus lines.

Overall, the H Street-NoMa neighborhood has a high walk, transit, and high bike scores. Additionally, other planned developments and roadway improvements will help increase the walk and bike scores in the H Street-NoMa neighborhood.

Future Regional Projects

There are a few District initiatives and background developments located in the vicinity of the site. These planned and proposed projects are summarized below.

Local Initiatives

MoveDC: Multimodal Long-Range Transportation Plan

MoveDC is a long-range plan that provides a vision for the future of DC's transportation system. As the District grows, so must the transportation system, specifically in a way that expands transportation choices while improving the reliability of all transportation modes.

The MoveDC report outlines recommendations by mode with the goal of having them complete by 2040. The plan hopes to achieve a transportation system for the District that includes:

- 70 miles of high-capacity transit (streetcar or bus)
- 200 miles of on-street bicycle facilities or trails
- Sidewalks on at least one side of every street
- New street connections

Table 1: Car-share within 0.25 miles of the Site

Carshare Location	Number of Vehicles
Zipcar	
NoMa/Gallaudet Metro (100 Florida Avenue NE)	2 vehicles
Constitution Square (130 M Street NE)	2 vehicles
The Loree Grand (250 K Street NE)	2 vehicles
Enterprise Carshare	
66 New York Avenue NE	6 vehicles
Total	**12 vehicles**

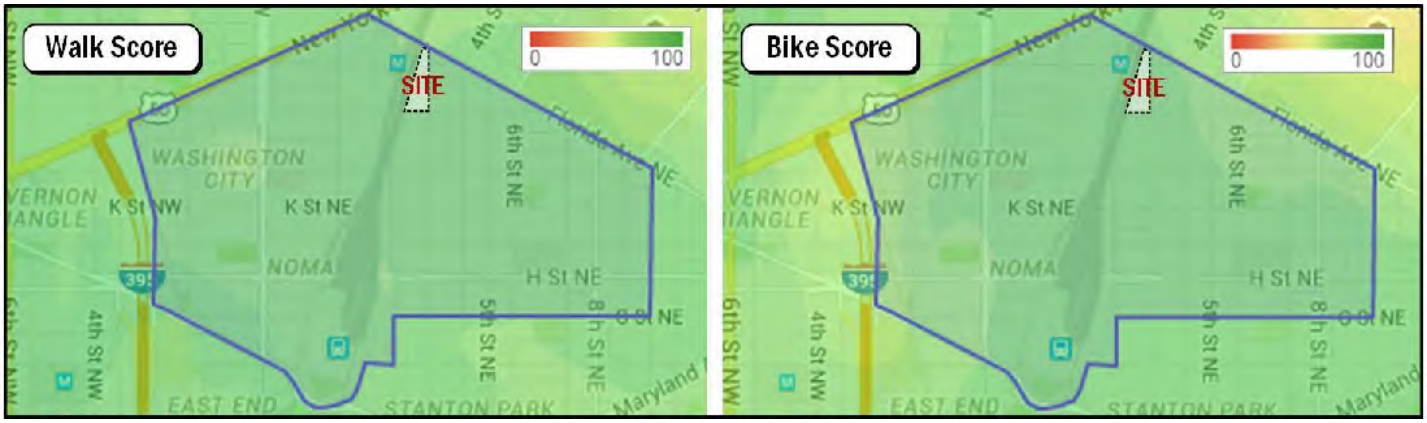

Figure 2: Summary of Walkscore and Bikescore

- Road management/pricing in key corridors and the Central Employment Area
- A new downtown Metrorail loop
- Expanded commuter rail
- Water taxis

In direct relation to the proposed development, the MoveDC plan outlines recommended pedestrian, bicycle, and transit improvements such as a new trail along New York Avenue, new cycle tracks along M Street and 4th Street, and a high-capacity surface transit route. These recommendations would create additional multi-modal capacity and connectivity to the proposed development and are discussed further down in the report.

M Street Cycle Track

As previously stated from the Move DC report, cycle tracks are planned along M Street and 4th Street, in the vicinity of the PUD site. The eight-foot wide track will be bi-directional, placed on the south side of M Street NE from the railroad tracks eastward to 3rd Street NE, at which time the tracks will shift to the north side of M Street NE until curving north onto the west side of 4th Street NE. The design of the PUD was coordinated with DDOT in order to accommodate the M Street cycle track.

SustainableDC: Sustainable DC Plan

SustainableDC is a planning effort initiated by the Department of Energy & Environment and the Office of Planning that provides the District with a framework of leading Washington DC to become the most sustainable city in the nation. The 2012 report proposes a 20-year timeframe to answer challenges in areas of: (1) Jobs & the economy; (2) Health & Wellness; (3) Equity & Diversity; (4) Climate & Environment; (5) Built Environment; (5) Energy; (6) Food; (7) Nature; (8) Transportation; (9) Waste; and (10) Water. With respect to transportation, the sustainability goals targeted in 20 years include:

- Improving connectivity and accessibility through efficient, integrated, and affordable transit systems
- Expanding provision of safe, secure infrastructure for cyclists and pedestrians
- Reducing traffic congestion to improve mobility
- Improving air quality along major transportation routes

A combination of increasing public transit and decreasing vehicular mode shares has been suggested to meet the transportation targets. The high walk and bike scores in the NoMa neighborhood are examples of the reduction in vehicle use and the need to expand safe and secure infrastructure for cyclists and pedestrians. The development will address these concerns in the form of long-term bicycle spaces that exceed zoning requirements and its proximity to the NoMa-Gallaudet U Metro Station and future pedestrian tunnel, reducing the burden of auto trips and traffic conflicts.

NoMa Neighborhood Access Study and Transportation Management Plan

Published in 2010, the purpose of this DDOT study was to provide a framework for handling expected growth and changing transportation needs in the neighborhood. By providing strategies for managing congestion and mitigating potential conflicts between multi-modal users, the Plan seeks to improve safety, comfort and efficiency of all transportation modes.

To accomplish this, the Plan identifies the following five goals:

- Connectivity: The NoMA neighborhood is fully connected via a multi-modal transportation system to surrounding neighborhoods, the City, and the region.
- Multi-modal accessibility: The transportation network functions for all modes.
- Sustainability: Bicycling, walking and transit represent significant proportions of all trips; green features and policies are incorporated.
- Safety and efficiency: The transportation network is safe and efficient for all users.
- Coordination: Transportation improvements are made in sync with land use changes to ensure continued mobility and accessibility; construction is coordinated so as not to diminish quality of life for residents and visitors.

The Plan identified the following recommendations in direct relation to the Central Armature Works development:

- *Short Term Recommendations (by 2015)*
  (1) Fill a gap in the sidewalk network on 3rd Street in between N Street and Florida Avenue; (2) Implement a lane reduction on Florida Avenue to provide space for a wider sidewalk under the CSX tracks; (3) Provide Leading Pedestrian Intervals (LPI) at ten intersection; (4) Prohibit right turns on red at six intersections; (5) Improve bike parking facilities throughout the area; and (6) Convert Pierce, Patterson, L, and M Streets to two-way between First Street NE and North Capitol Street.

- *Medium Term Recommendations (by 2020)*
  (1) Provide six new traffic signals throughout the area; (2) Realign selected intersections to create more compact intersections with right-angle crossings, slow turning motor vehicles and improve visibility; (3) Alter lane configurations to maximize the operation and flow of traffic at intersections throughout the study area; (4) Implement an extension to the existing DC Circulator system to better serve NoMa; and (5) Develop a connected network of bicycle facilities throughout the study area including shared use paths, cycle tracks, bicycle lanes, and shared lane markings.

- *Long Term Recommendations (by 2030)*
  (1) Implement grid extensions, alternative access routes, and one-way/ two-way traffic conversions to further improve access and circulation in NoMa; and (2) Designate First Street in between Massachusetts Avenue and G Street as a pedestrian priority zone along with other locations as developments are completed.

Florida Avenue Multimodal Transportation Study

Published in 2015, the purpose of the Florida Avenue Multimodal Transportation Study is to improve safety for all roadway users, particularly the most vulnerable (pedestrians and bicyclists), while ensuring safe access and maintaining mobility for all modes within and through the study area. The study area is bordered by Gallaudet University and Florida Avenue Market to the north, H Street and Greater Capitol Hill to the south, the "Virtual Circle" and NoMa District to the west, and the "Starburst Intersection" (the intersection of Florida Avenue with H Street/Benning Road/ Maryland Avenue/Bladensburg Road) to the east.

To accomplish this, the Florida Avenue Multimodal Study identifies the following nine needs that it addresses in the report:

- History of auto and non-auto related crashes;
- High automobile speeds;
- Lack of ADA compliant pedestrian facilities;
- Maintaining automobile access, particularly for corridor-wide trips and trucks;
- Meeting specialized needs of large deaf population due to the corridor's proximity to Gallaudet University;
- Lack of bicycle facilities within the study area;
- Need for safe access to transit;
- Florida Market access and mobility needs; and
- Resident requests for supporting multimodal access.

These identified project needs informed the specific data to collect, required analysis to perform, and appropriate stakeholders to include in the process. As a result of the supporting analysis and community feedback, three alternatives were developed for further study and evaluation. However, after detailed analysis was conducted on Alternatives 1-3 and through public and stakeholder input, a fourth alternative was developed as an additional possible option. At a minimum, all recommendations include sidewalk widening on the south side of Florida Avenue west of West Virginia Avenue, pedestrian scale lighting throughout the entire corridor, and low-impact development and trees.

In direct relation to the development, Florida Avenue will be converted to two eastbound and two westbound lanes with a center left-turn lane in certain sections. 6th Street north of Florida Avenue will be improved to include a two-way cycle-track on the east side, widened sidewalks, and curb extensions where possible. 6th Street south of Florida Avenue to K Street will be converted to one-way northbound, improved with widened sidewalks, and improved with a two-way cycle track on the east side.

NoMa Pedestrian Tunnel Feasibility Study

Published in 2015, the feasibility study conducted by WMATA and AECOM looks at possible options into building a pedestrian tunnel connecting the NoMa-Gallaudet U Metro Station to areas of NoMa east of the railroad tracks. The study determined that a tunnel can be constructed underneath the railroad tracks to provide a direct connection to the Metro Station. The three preferred alternatives will have eastern portals at or near the Central Armature Works site. As such, the developer has been cooperating with WMATA in designing the development in a way to incorporate and not preclude this future tunnel.

Planned Developments

There are many development projects in the vicinity of the Central Armature Works site. A review of development activity (included in the technical attachments) found 10 developments that are approved and located within the vehicular study ares of this CTR (defined later in this report), and an additional nine that are either outside the study area or not approved. Figure 5 shows the location of all 19 developments. The following describes the 10 approved developments within the study area:

Gateway Market and Residences (Z.C. Case No. 06-40A/B/C)

The second phase of the Union Market District development plan, Gateway Market at 340 Florida Avenue, will be a six-story, 188-unit apartment building (153,000 sq. ft.) with 30,000 sq. ft. of ground floor retail space. Gateway Market Center will also include affordable units (20% of the units) and 72 bike spaces. The Joint Venture between LCOR, EDENS and Sang Oh & Company Inc. will jointly develop the project with LCOR retaining ownership in the residential piece and EDENS & Sang Oh retaining ownership in the retail piece. This development is has an expected delivery date of 2017.

300 M Street NE (Z.C. Case No. 14-19)

The proposed mixed-use project will have 401 new apartments, 9,000 - 12,900 sq. ft. of retail space and 175 parking spaces in a two-level underground garage. The property is located in NoMa at 3rd and M Streets, NE, one block from the M Street entrance to the NoMa-Gallaudet Metro Station. The developer submitted plans to the Zoning Commission in October 2014. This development has an expected delivery date of 2018.

Uline Arena (BZA Case No. 18558)

The U-Line Arena project will include the adaptive re-use of the existing 110,000 sq. ft. masonry arena building and adjacent Ice House. The site is located between 3rd Street and Delaware Avenue, NE, and bounded to the north by M Street. Both structures were built in the 1930s. The U-Line Arena is most noted for hosting numerous sporting, entertainment, and political events in Washington D.C. The current redevelopment calls for 146,000 - 170,000 sq. ft. of office space and 68,000 sq. ft. of retail (potential for a large 40,000 sq. ft. user). This development has an expected delivery date of 2016.

301-331 N Street (Z.C. Case No. 15-28)

The 301-331 N Street project proposes to replace an existing retail building, parking lot, and self-storage building with a mixed-use development containing four structures with 367 dwelling units, 26,000 square feet of ground floor retail, 25,000 square feet of office, and a 175-room hotel. The new complex would utilize underground parking totaling 250 spaces. This development has an expected delivery date of 2019.

The Highline at Union Market (Z.C. Case No. 15-22)

The Highline at Union Market project will feature 313 dwelling units and 10,000 sf of retail. This development has an expected delivery date of 2018.

Ava NoMa

AVA NoMa is the second phase of Archstone 1st + M. AVA NoMa offers 435 apartments (studio, 1, 2, and 3-bedroom units) and 6,500 sf of retail. Additional state of the art amenities include a fitness center, movie screen, bike storage and repair room, chill lounge and Social Media Feature Wall. This site was previously owned by Archstone as part of the Archstone at 1st + M Project, but was purchased by AvalonBay. A building permit was issued in October 2013.This development is under construction with an expected delivery date of 2017.

88 M Street and Capitol Plaza

Skanska USA is creating mixed-use development consisting of three buildings. Building 1 (88 M Street) is planned to include 315,000 square feet of office space and 6,500 square feet of retail space. This development is expected to be complete in 2017.

Buildings 2 and 3 of the Skanska Development are separately part of the Capitol Plaza development. Building 2 (44 M Street) is proposed to include 315,000 square feet of office space and 6,500 square feet of retail space. Building 3 (22 M Street) is expected to include 285 residential units and 5,000 square feet of retail space. The buildings of this development (and 88 M Street) are expected to be complete in 2017.

Union Place (Phase II) (Z.C. Case No. 05-36)

The Union Place (Phase II) development calls for an additional 14-story, 525-unit building to compliment a 212-unit building delivered in 2010. Initially started by the Cohen Companies and now headed by Toll Brothers, Phase II of Union Place will also include over 10,000 square feet of retail space and a 3,400 square foot day care facility. This development is expected to be completed in the near term.

301 Florida Avenue NE (Z.C. Case No. 14-19)

The 301 Florida Avenue NE project will see a mixed-use retail and residential eight-story building with 56 units and 10,000 square feet of retail. This development is expected to be complete in 2018.

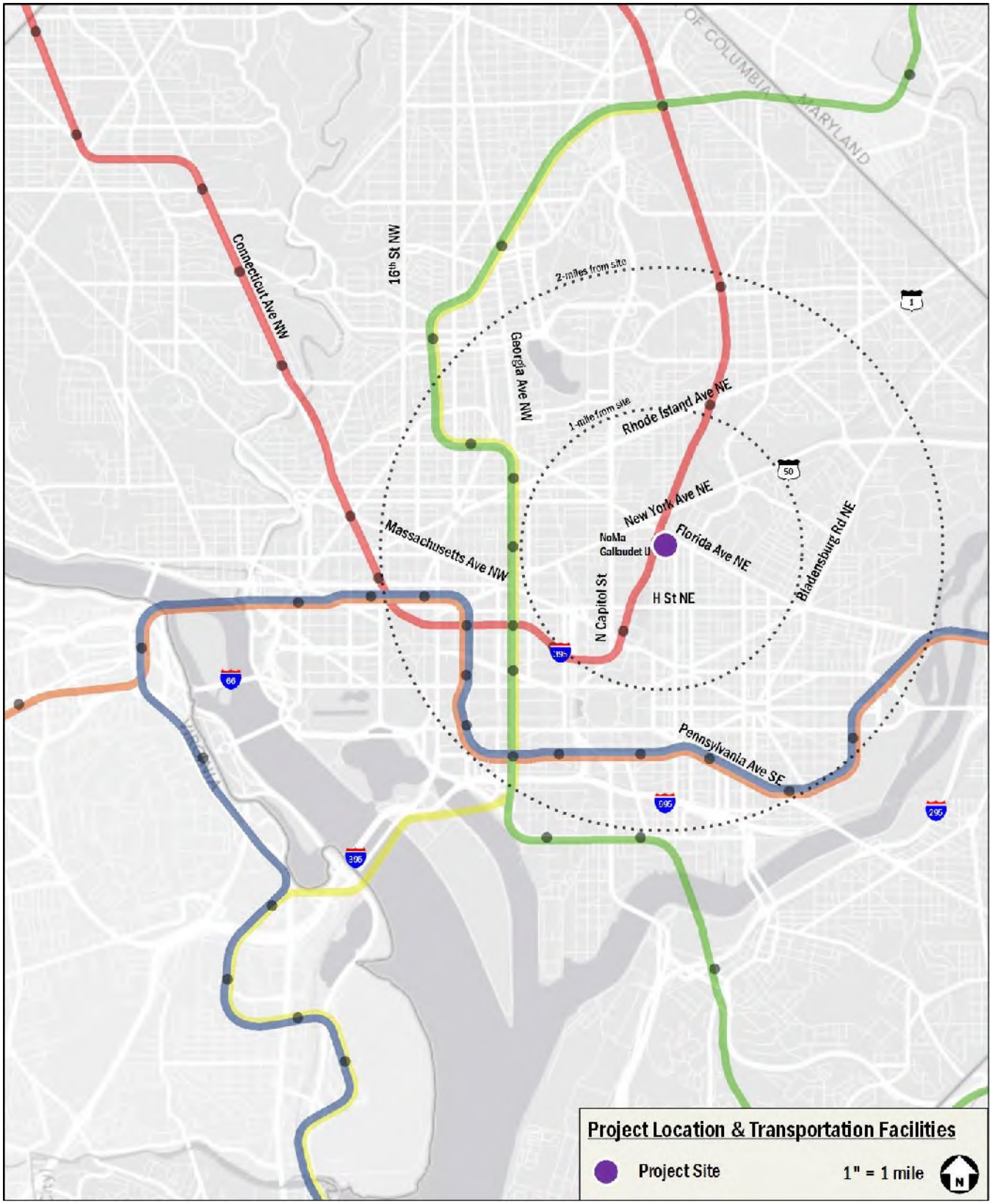

Figure 3: Major Regional Transportation Facilities

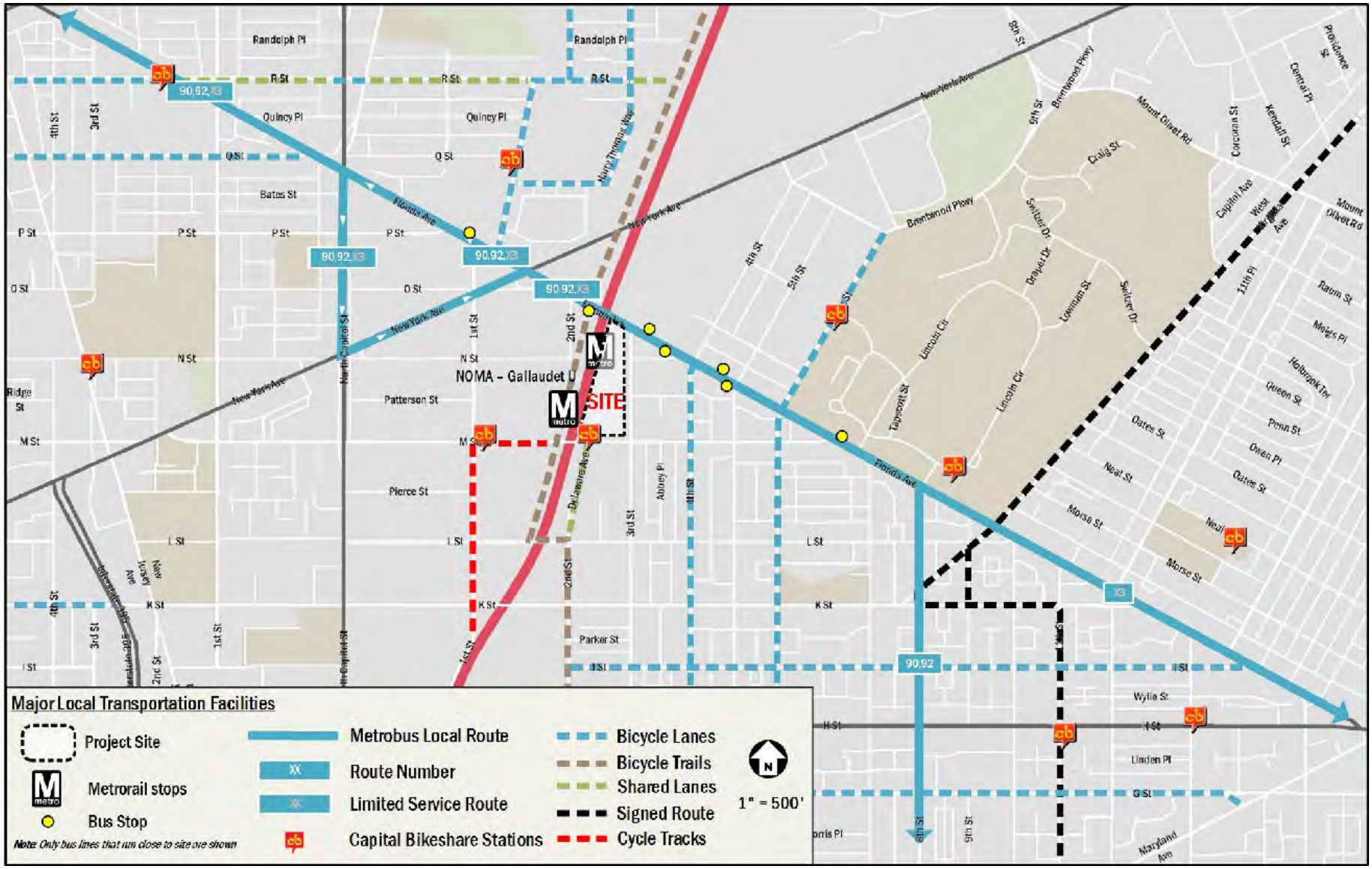

Figure 4: Major Local Transportation Facilities

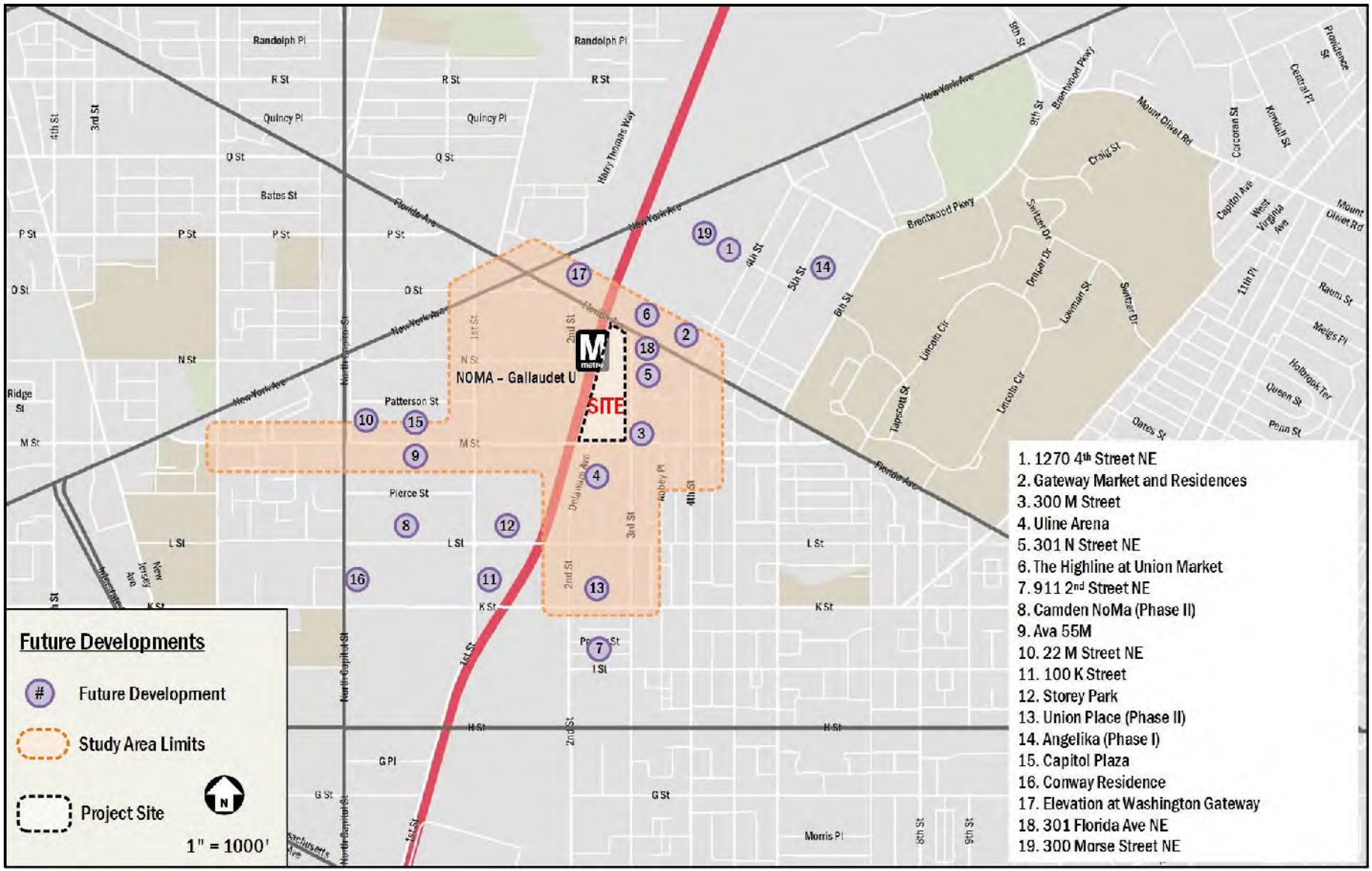

Figure 5: Planned Development Map

PROJECT DESIGN

This section reviews the transportation components of the Central Armature Works development, including the proposed site plan and access points. It includes descriptions of the site's vehicular access, loading, parking, bicycle, and pedestrian facilities, and Transportation Demand Management (TDM) plan. It supplements the information provided in the site's plan package that accompanied the Zoning Application, which includes several illustrations of site circulation and layout.

Project Description

There are currently four curb cuts that access the existing site: all along 3rd Street. The site is primarily at-grade with a fence separating the informal parking lot and WMATA property from the street. Along M Street, the property is kept at a level grade as M Street descends underneath the Amtrak/WMATA tracks. A fence borders the tracks along the western face of the property. Easements from DC Water and Amtrak are present on the property, with Amtrak utilizing a permanent east-west easement to access the rail bed and DC Water utilizing a below grade easement in the former N Street right of way. The PUD accommodates these easements.

The planned development will replace the existing building and informal rear parking lot with three mixed-use buildings that will be integrated and function as one project. The Central Armature Works development program will include approximately 631 residential dwelling units across two buildings, approximately 27,200 square feet of above- and ground-floor retail, and a hotel with approximately 196 rooms. The development will be served by a total of approximately 356 off-street parking spaces, including 60 hotel valet spaces, in a below-grade parking garage accessed from the SW corner of the property at M Street and Delaware Avenue. Figure 6 shows an overview of the development program and site plan elements.

ACCESS AND LOADING

Multi-Modal Access

Vehicular access to the site will be off M Street. The access will tie into the existing traffic signal at Delaware Avenue and M Street. The driveway provides access to the underground garage and the loading docks

Pedestrian access to the residential component of the development will occur predominately via the 3rd Street and Florida Avenue entrances. For the retail component, pedestrian access will be through interior passageways accessed from 3rd Street and the N Street Plaza. Pedestrian access for the hotel component will occur at the M Street entrance. Pedestrian access points are outlined on the site plan in Figure 6.

Bicycle access to the site will be primarily off the N Street plaza that will link cyclists to the proposed secure bicycle parking access. It is expected that the majority of cyclists will utilize the proposed M Street cycle track to access the site. A circulation plan showing primary bicycle and pedestrian routes is shown on Figure 7.

Loading Facilities

The PUD is required to provide two (2) 30-foot and two (2) 55-foot loading bays, as well as three (3) 20-foot service and delivery loading space. The Applicant is seeking relief for the requirements set forth by District zoning laws for loading and service space. The development is proposing to include three (3) 30-foot loading bays and two (2) 20-foot service and delivery spaces.

The residential and hotel components of the site, as well as each individual retail space have access to the loading area via a loading corridor. For the retail spaces on the northern end of the site the corridor passes through the N Street plaza via doors on either side of the plaza.

The proposed amount of loading facilities will be sufficient to accommodate all loading and service demand. In order to review the adequacy of the loading facilities, the amount of loading expected at the site is estimated based on the following assumptions:

- As a baseline, it is assumed that there will be three daily truck deliveries for the site as a whole (covering trash, a general shared delivery, and mail).
- Residential loading activity is estimated assuming an expected rental or condo turnover of 18 months, with two trucks per move – one move-in and one move-out.
- A general retail store is expected to generate an additional two (2) deliveries per day in addition to the shared deliveries.
- A hotel is expected to generate an additional (2) deliveries per day in addition to the shared deliveries.

Using these assumptions, it is expected that there will be three (3) shared deliveries per day, up to three (3) residential deliveries per day, 18 retail deliveries per day (assuming nine independent retail spaces), and two (2) hotel deliveries per day. This amounts to a maximum of 26 deliveries per day, which can be handled within the proposed loading facilities.

Truck routing to and from the site will be focused on M Street eastward to 3rd Street and 4th Street, which connects the site with Florida Avenue, a DDOT designated primary truck route. Turning maneuvers into and out of the site for each loading dock are included in the Technical Appendix.

PARKING

On-Site Parking

Based on current District zoning laws, the following outlines the parking requirements for all land uses of the development:

- *Residential*
  1 space per 4 dwelling units, amounting to a minimum requirement of 158 parking spaces

- *Retail*
  1 space per 750 square feet of retail space in excess of 3,000 square feet, amounting to a minimum requirement of 67 parking spaces (Note: this amount of parking is based on a previous version of the development plan which included approximately 53,000 square feet of retail space)

- *Hotel*
  1 space per 4 hotel rooms and 1 space per 300 square feet of its largest function room, amounting to a minimum requirement of 57 parking spaces

The PUD exceeds the zoning requirements for parking, providing 356 parking spaces will be supplied in a below-grade parking garage. 229 parking spaces being for residential use, 67 parking spaces for retail use, and 60 valet parking spaces for hotel use.

The proposed amount of parking also meets practical demands and can accommodate all parking generated by the PUD on site within the garage. The parking ratios of 0.36 spaces per residential unit, 1.27 spaces per 1,000 square feet of retail space, and 0.31 spaces per hotel room provide sufficient supply for a PUD developed in this location in the District with the multi-modal access and connectivity provided.

On-Street Parking

Although PUD generated parking will not need to use on-street parking, the PUD will generate an increase in on-street parking supply. The elimination of curb cuts on 3rd Street provides an extra 140 feet of curbed roadway, allowing for an additional 7 on-street parking spaces.

BICYCLE AND PEDESTRIAN FACILITIES

Bicycle Facilities

The project includes secure long-term bicycle parking. The plans identify approximately 220 secure long-term spaces in the proposed development. According to the *DC Zoning Regulations and Bicycle Commuter and Parking Expansion Act of 2007*, all residential developments must provide at least one secure bicycle parking space for each 3 residential units. In addition, the number of bicycle parking spaces for all other land uses amount to 5 percent of the automobile parking spaces required. Based on these regulations the development must provide 171 bicycle parking spaces. The development exceeds these requirements.

The project includes short-term public bicycle spaces at street level along the perimeter of the site on Florida Avenue, 3rd Street, and M Street. These short term spaces will include inverted U-racks placed in high-visibility areas. The Applicant will work with DDOT in selecting locations for the racks during the public space permitting process.

In addition to short and long-term bicycle parking spaces, the Applicant will install a Capital Bikeshare station along the perimeter of or near the development and maintain it for a period of one year, supply ten electric bikes and charging stations to be shared by residents and guests of the project, and supply eight publically accessible electric bike charging stations.

Having direct access to the N Street plaza to and from an enclosed bicycle storage room as well as the quantity and quality of the on-site bicycle amenities, makes cycling an extremely attractive mode of travel to and from the site.

Pedestrian Facilities

As a result of the development, pedestrian facilities along the perimeter of the site will be improved, for example by removing the four curb cuts on 3rd Street. The development will improve sidewalks adjacent to the site such that they meet or

exceed DDOT requirements and provide an improved pedestrian environment.

As a result of the other planned developments and roadway improvements in the area, it is expected that pedestrian infrastructure bordering developments will be improved to meet DDOT and ADA standards.

Transportation Demand Management (TDM)

TDM is the application of policies and strategies used to reduce travel demand or to redistribute demand to other times or spaces. TDM typically focuses on reducing the demand of single-occupancy, private vehicles during peak period travel times or on shifting single-occupancy vehicular demand to off-peak periods.

The Transportation Demand Management (TDM) plan for the Central Armature Works development is based on the DDOT expectations for TDM programs. The Applicant proposes the following TDM measures:

- The Applicant will exceed Zoning requirements for bicycle parking/storage facilities at the proposed development. This includes secure parking located on-site and short-term bicycle parking around the perimeter of the site that exceed zoning requirements, as well as a bike service area.
- The Applicant will unbundle the cost of residential parking from the cost of lease or purchase and charge a market rate for the area.
- The Applicant will identify a TDM Leader (for planning, construction, and operations). There will be one TDM leader who will coordinate with the managers of the retail, residential, and hotel components of the development. The contact information for the TDM leader will be shared with goDCgo and DDOT. The TDM leader will work with goDCgo to receive free TDM marketing materials and guidance, as well as to enforce TDM measures within the development.
- The Applicant will provide TDM materials to new residents in the Residential Welcome Package materials. At a minimum, this package will include a Get Around Guide from goDCgo and info about bikesharing and carsharing.
- The Applicant will install Transportation Information Center Displays (electronic screens) within the residential, hotel, and office lobbies, containing real-time information related to local transportation alternatives.
- The Applicant will fund the installation of a new Capital Bikeshare station and one year of maintenance for the neighborhood.
- The Applicant will purchase ten electric bikes and install ten electric bike charging stations to be shared by residents and guests. Additionally, the Applicant will install eight publically accessible electric bike charging stations.
- The Applicant will devote six parking spaces for electric car charging stations.
- The Applicant will provide 20 shopping carts for tenants to run daily errands and grocery shopping.

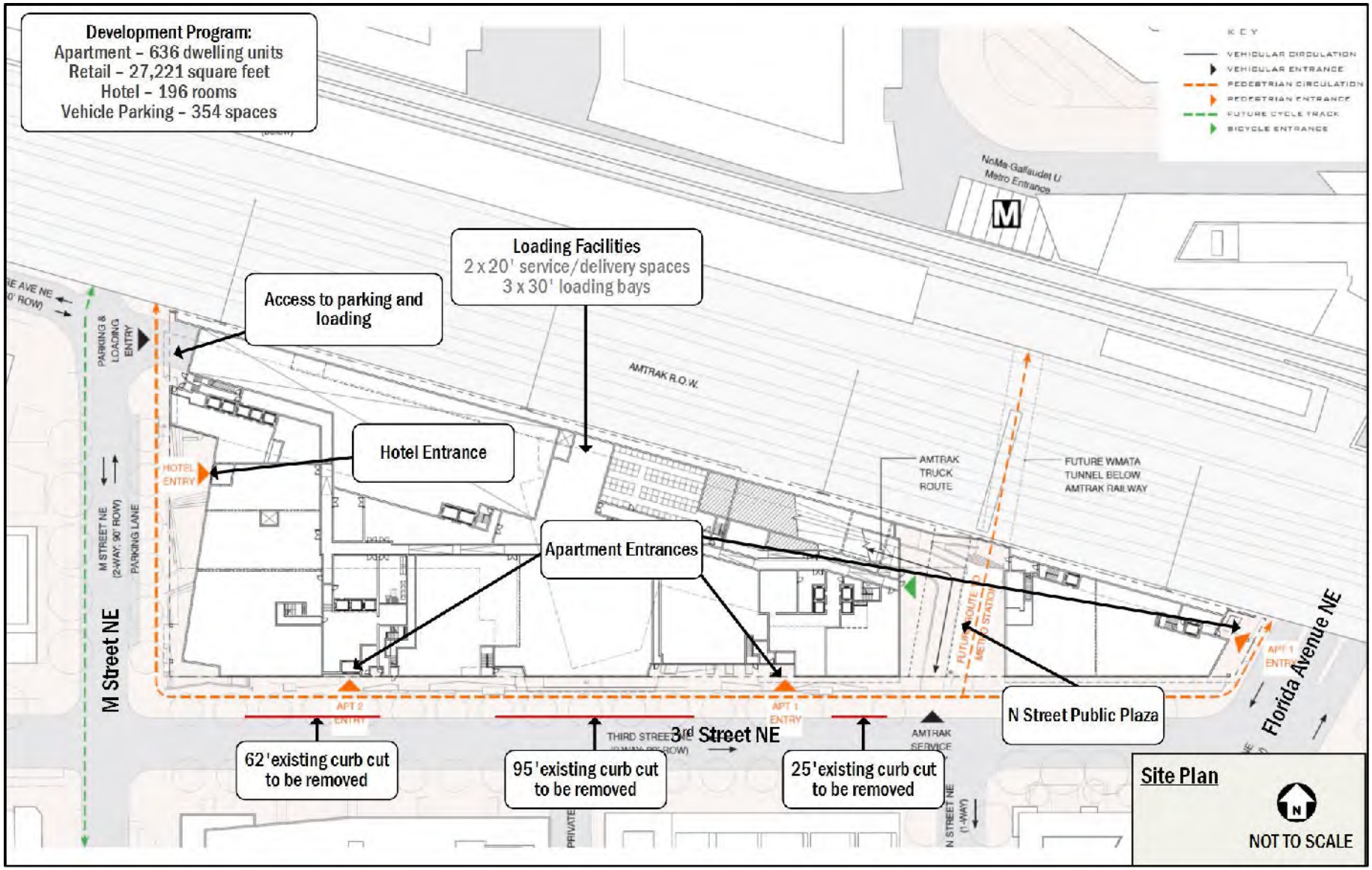

Figure 6: Site Plan

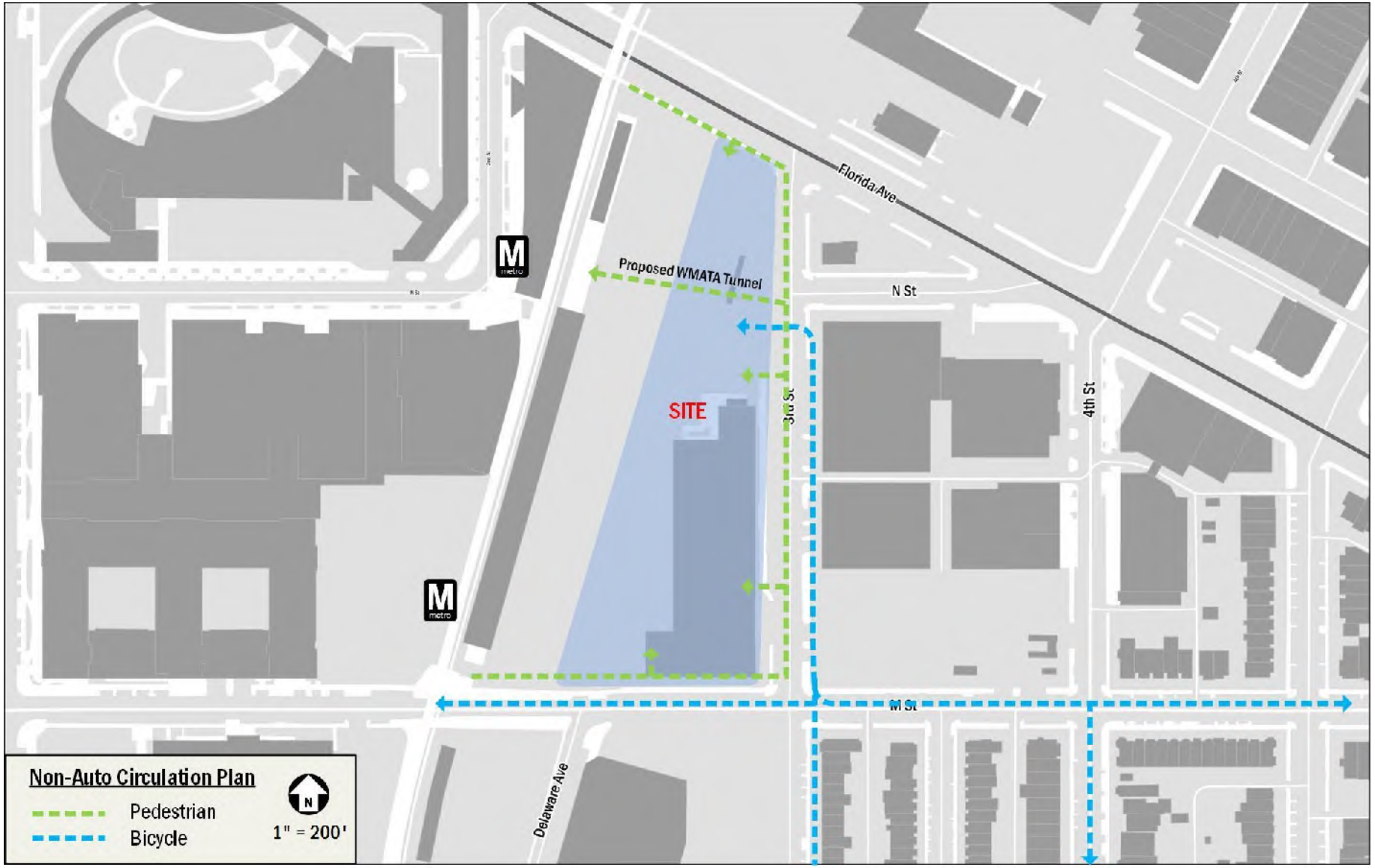

Figure 7: Circulation Plan

TRIP GENERATION

This section outlines the transportation demand of the proposed Central Armature Works project. It summarizes the projected trip generation of the site by mode, which forms the basis for the chapters that follow. These trip generation and mode split assumptions contained within this section were discussed with and agreed to with DDOT.

Traditionally, weekday peak hour trip generation is calculated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 9th Edition. This methodology was supplemented to account for the urban nature of the site (the *Trip Generation Manual* provides data for non-urban, low transit use sites) and to generate trips for multiple modes.

Residential trip generation was calculated based on ITE land use 220, Apartment, splitting trips into different modes using assumptions derived from census data for the residents that currently live near the site. The vehicular mode split was then adjusted to reflect the parking supply and other developments with similar proximity to Metrorail.

Retail trip generation was calculated based on ITE land use 820, Shopping Center. Mode splits for the retail portion of the site were based on information contained in WMATA's 2005 *Development-Related Ridership Survey* and mode splits used for retail uses of nearby developments that have recently been studied. It should be noted that the retail trip generation was determined based on a previous plan that proposed approximately 53,000 square feet of retail space. Therefore, because the updated plan proposed approximately 27,200 square feet of retail, this analysis represents a conservative analysis.

Hotel trip generation was calculated based on ITE land use 310, Hotel. Mode splits for the hotel portion of the site were based on information contained in WMATA's 2005 *Development-Related Ridership Survey* and mode splits used for hotel uses of nearby developments that have recently been studied.

Of note, the 40% auto mode split for hotels includes pass-by trips for hired vehicles. Of this mode split, 40% of these auto trips (16% of total hotel trips) are parking in the garage and the remaining 60% are from hired vehicles that make an inbound and outbound trip. These vehicular splits are consistent with data collected at various hotels in the District.

The mode split assumptions for all land uses within the development is summarized in Table 3. A summary of the multimodal trip generation for the development is provided in Table 2 for the morning and afternoon peak hours. Detailed calculations are included in the Technical Appendix.

Table 2: Summary of Mode Split Assumptions

Land Use	Mode			
	Auto	Transit	Bike	Walk
Residential	35%	40%	5%	20%
Retail	25%	40%	5%	30%
Hotel	40%	40%	5%	15%

Of note, the proposed development is planned to greatly exceed the amount of bicycle parking as required by Zoning by supplying a total of 220 long-term secure on-site bicycle spaces and short-term bicycle spaces around the perimeter of the site determined by public space permitting, as well as a bike service area and a shower/changing area for non-residential uses. As such, the trip generation used for this analysis is conservative in its assumptions and reflects the transportation habits of the existing residents as opposed to future residents who will have more access to multimodal amenities.

Table 3: Multi-Modal Trip Generation Summary

Mode	Land Use	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto	Apartments	22 veh/hr	89 veh/hr	111 veh/hr	83 veh/hr	44 veh/hr	127 veh/hr
	Retail	8 veh/hr	5 veh/hr	13 veh/hr	24 veh/hr	25 veh/hr	49 veh/hr
	Hotel	25 veh/hr	17 veh/hr	42 veh/hr	24 veh/hr	23 veh/hr	47 veh/hr
	Total	**55 veh/hr**	**111 veh/hr**	**166 veh/hr**	**131 veh/hr**	**92 veh/hr**	**223 veh/hr**
Transit	Apartments	28 ppl/hr	114 ppl/hr	142 ppl/hr	107 ppl/hr	58 ppl/hr	165 ppl/hr
	Retail	23 ppl/hr	13 ppl/hr	36 ppl/hr	67 ppl/hr	73 ppl/hr	140 ppl/hr
	Hotel	54 ppl/hr	38 ppl/hr	92 ppl/hr	53 ppl/hr	51 ppl/hr	104 ppl/hr
	Total	**105 ppl/hr**	**165 ppl/hr**	**270 ppl/hr**	**227 ppl/hr**	**182 ppl/hr**	**409 ppl/hr**
Bike	Apartments	4 ppl/hr	14 ppl/hr	18 ppl/hr	13 ppl/hr	8 ppl/hr	21 ppl/hr
	etail	3 ppl/hr	2 ppl/hr	5 ppl/hr	8 ppl/hr	9 ppl/hr	17 ppl/hr
	Hotel	7 ppl/hr	4 ppl/hr	11 ppl/hr	7 ppl/hr	6 ppl/hr	13 ppl/hr
	Total	**14 ppl/hr**	**20 ppl/hr**	**34 ppl/hr**	**28 ppl/hr**	**23 ppl/hr**	**51 ppl/hr**
Walk	Apartments	14 ppl/hr	57 ppl/hr	71 ppl/hr	54 ppl/hr	28 ppl/hr	82 ppl/hr
	Retail	17 ppl/hr	10 ppl/hr	27 ppl/hr	50 ppl/hr	55 ppl/hr	105 ppl/hr
	Hotel	20 ppl/hr	14 ppl/hr	34 ppl/hr	20 ppl/hr	19 ppl/hr	39 ppl/hr
	Total	**51 ppl/hr**	**81 ppl/hr**	**132 ppl/hr**	**124 ppl/hr**	**102 ppl/hr**	**226 ppl/hr**

TRAFFIC OPERATIONS

This section provides a summary of an analysis of the existing and future roadway capacity in the study area. Included is an analysis of potential vehicular impacts of the Central Armature Works project and a discussion of potential improvements.

The purpose of the capacity analysis is to:

- Determine the existing capacity of the study area roadways;
- Determine the overall impact of the proposed development on the study area roadways; and
- Discuss potential improvements and mitigation measures to accommodate the additional vehicular trips.

This analysis was accomplished by comparing traffic volumes and roadway capacity for existing, background, and future scenarios. The capacity analysis focuses on the morning and afternoon commuter peak hours, as determined by the existing traffic volumes in the study area.

The following conclusions are reached within this chapter:

- The existing study area intersections generally operate at an acceptable level of service during all analysis scenarios for both the morning and afternoon peak hours.
- Existing areas of concern for roadway capacity are primarily focused along the heavily trafficked commuter routes: North Capitol Street, New York Avenue, Florida Avenue and M Street.
- The addition of trips generated by background developments and inherent growth on the study area roadways causes a number of intersections to experience unacceptable levels of delay.
- The addition of trips generated by the PUD will slightly increase delays at already unacceptable intersections.
- Mitigations measures, in addition to a robust TDM plan, can be implemented in order to greatly improve operations at intersections with excessive delay.
- Overall, this report concludes that the project will not have a detrimental impact to the surrounding transportation network assuming all background improvements and development-related mitigations are implemented.

STUDY AREA, SCOPE, & METHODOLOGY

This section outlines the vehicular trips generated in the study area along the vehicular access routes and defines the analysis assumptions. The scope of the analysis contained within this report was discussed with and agreed to with DDOT. The general methodology of the analysis follows national and DDOT guidelines on the preparation of transportation impact evaluations of site development.

Capacity Analysis Scenarios

The vehicular analyses are performed to determine if the proposed development of the Central Armature Works development will lead to adverse impacts on traffic operations. (A review of impacts to each of the other modes is outlined later in this report.) This is accomplished by comparing future scenarios: (1) without the proposed development (referred to as the Background condition) and (2) with the development approved and constructed (referred to as the Future condition).

Specifically, the roadway capacity analysis examined the following scenarios:

1. 2016 Existing Conditions
2. 2019 Background Conditions without the development (2019 Background)
3. 2019 Future Conditions with the development (2019 Total Future)

Study Area

The study area of the analysis is a set of intersections where detailed capacity analyses are performed for the scenarios listed above. The set of intersections decided upon during the study scoping process with DDOT are those intersections most likely to have potential impacts or require changes to traffic operations to accommodate the proposed development. Although it is possible that impacts will occur outside of the study area, those impacts are not significant enough to be considered a detrimental impact nor worthy of mitigation measures.

Based on the projected future trip generation and the location of the site access points, the following intersections were chosen for analysis:

1. New York Avenue NE & 1st Street NE & O Street NE
2. Florida Avenue & 3rd Street NE
3. Florida Avenue & N Street NE

4. Florida Avenue & 4th Street
5. M Street & First Street NW
6. M Street & North Capitol Street
7. M Street & First Street NE
8. M Street & Delaware Avenue NE
9. M Street & 3rd Street NE
10. M Street & 4th Street NE
11. L Street & 2nd Street
12. L Street & 3rd Street NE
13. K Street & 2nd Street NE

Figure 8 shows a map of the study area intersections.

Geometry and Operations Assumptions

The following section reviews the roadway geometry and operations assumptions made and the methodologies used in the roadway capacity analyses.

Existing Geometry and Operations Assumptions

The geometry and operations assumed in the existing conditions scenario are those present when the main data collection occurred. Gorove/Slade made observations and confirmed the existing lane configurations and traffic controls at the intersections within the study area. Existing signal timings and offsets were obtained from DDOT and confirmed during field reconnaissance.

The lane configurations and traffic controls for the Existing conditions are shown on Figure 15.

Future Geometry and Operations Assumptions

Following national and DDOT methodologies, a background improvement must meet the following criteria to be incorporated into the analysis:

- Be funded; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, the proposed reconfiguration to Florida Avenue and 6th Street, based on the *Florida Avenue Multimodal Study* was included in the background and future scenarios. The two-way conversion of several roadways based on the *NoMa Neighborhood Access Study and Transportation Management Plan* was not included in the background and future scenarios, but instead analyzed separately for the directly impacted intersections of M Street at North Capitol Street and First Street NE. As discussed in the Mitigations section, a separate analysis table showcasing the difference in the vehicular capacity analyses as a result of the two-way conversions is included in the Technical Attacments.

Improvements associated with the *Florida Avenue Safety Study* along the study area intersections are described below:

- Florida Avenue and 3rd Street NE
  - Three eastbound lanes (shared left-thru lane, thru lane, and shared thru-right lane)
  - Two westbound lanes (thru lane and shared thru-right lane)
  - Westbound left turns restricted
- Florida Avenue and 4th Street NE
  - Five-lane cross-section (two lanes east- and westbound, with left-turn lanes)
  - Signal timing optimization (removal of EB-WB split phase and the addition of a WB left-turn phase)
- Florida Avenue and 5th Street NE
  - Four lane cross-section (two lanes east- and westbound)
  - Eastbound and westbound left turns restricted
- Florida Avenue and 6th Street NE
  - Northbound approach converted to one-way northbound
  - Five-lane cross-section (two lanes east- and westbound, with an eastbound left-turn lane)
  - Southbound thru lane eliminated from the southbound approach resulting in one right turn lane and one left turn lane.
  - Signal timing optimization

Of note, these future improvements are still under development as the *Florida Avenue Safety Study* has not yet been published. The cross-sections above represent Alternative 4 and were agreed to by Gorove/Slade and DDOT.

In the total future scenario, the site driveway for the development will connect into the existing T-intersection of Delaware Avenue & M Street NE. As the three-way intersection will now become a four-way intersection, adjustments were made in the phasing and timing of the traffic signal in order to optimize traffic flow along M Street NE. The signal timing plans for this intersection can be found in the Technical Appendix.

Lane configurations and traffic controls for the 2019 Background and Future scenarios are shown on Figure 16.

Traffic Volume Assumptions

The following section reviews the traffic volume assumptions and methodologies used in the roadway capacity analyses.

Existing Traffic Volumes

The existing traffic volumes are comprised of turning movement count data, which is a mix of new counts and data on record. Figure 8 includes the date at which turning movement data was collected for each study intersection. The results of the traffic counts are included in the Technical Attachments. The existing peak hour traffic volumes are shown on Figure 9. For all intersections the individual morning and afternoon peak hours were used.

2019 Background Traffic Volumes (without the project)

The traffic projections for the 2019 Background conditions consist of the existing volumes with two additions:

- Traffic generated by developments expected to be completed prior to the project (known as background developments);
- Traffic rerouted to/from roadways within the study area due to background-related roadway improvements; and
- Inherent growth on the roadway (representing regional traffic growth).

Following national and DDOT methodologies, a background development must meet the following criteria to be incorporated into the analysis:

- Be located in the study area, defined as having an origin or destination point within the cluster of study area intersections;
- Have entitlements; and
- Have a construction completion date prior or close to the proposed development.

Based on these criteria, and as discussed previously, 10 developments were included in the 2019 Background scenario. These developments are as follows:

1. Gateway Market
2. 300 M Street
3. Uline Arena
4. 301-331 N Street NE
5. Highline at Union Market
6. AVA NoMa
7. 22 M Street NE
8. Union Place (Phase II)
9. Capitol Plaza
10. 301 Florida Ave NE

Existing studies were available for all developments except the Capitol Plaza, 22 M Street, and AVA NoMa developments. Trip generation for these developments was calculated based on the Institute of Transportation Engineers' *Trip Generation Manual*, 9th Edition, with mode splits based on those used for similar developments in the NoMa neighborhood. Trip distribution assumptions for the background developments were based on those determined for the Central Armature Works development and altered where necessary based on anticipated travel patterns and proposed access locations. Mode split and trip generation assumptions for the background developments are shown Table 4.

In addition to traffic generated by background developments, the 2019 Background volumes are also impacted by rerouted trips associated with background-related roadway improvements. Trips were rerouted throughout the network as a result of several improvements as follows:

- At the intersection of Florida Avenue and 6th Street, existing southbound thru volumes, eastbound right-turn volumes, and westbound left-turn volumes were rerouted through the network as a result of the one-way northbound conversion of 6th Street south of Florida Avenue.
- Existing westbound left-turn volumes at Florida Avenue and 3rd Street, and existing eastbound and westbound left-turn volumes at Florida Avenue and 6th Street were rerouted through the network as a result of the Florida Avenue improvements.
- Existing volumes traveling along 4th Street, 5th Street, and 6th Street were rerouted through the network to account for the conversion of 4th Street and 5th Street to two-way operations.

While the background developments and rerouted trips represent local traffic changes, regional traffic growth is typically accounted for using percentage growth rates. The growth rates used in this analysis are derived using the Metropolitan Washington Council of Government's (MWCOG) currently adopted regional transportation model, comparing the difference between the year 2015 and 2020 model scenarios. The growth rates observed in this model served as a basis for analysis assumptions, and where negative growth was

observed, a conservative 0.25 percent annual growth rate was applied to the roadway. Along roadways where no MWCOG data was available, DDOT historical Annual Average Daily Traffic (AADT) data was used to calculate growth rates. Growth rates were applied at intersections based on the year of the traffic count. The applied growth rates are shown in Table 5.

The traffic volumes generated by background developments, background roadway improvements, and the inherent growth along the network were added to the existing traffic volumes in order to establish the 2019 Background traffic volumes. The traffic volumes for the 2019 Background conditions are shown on Figure 10.

2019 Total Future Traffic Volumes (with the project)

The 2019 Total Future traffic volumes consist of the 2019 Background volumes with the addition of the traffic volumes generated by the proposed development (site-generated trips). Thus, the 2019 Total Future traffic volumes include traffic generated by: the existing volumes, background developments, rerouted volumes, the inherent growth on the study area roadways, and the proposed project.

Trip distribution for the site-generated trips was determined based on: (1) CTPP TAZ data, (2) existing travel patterns in the study area, and (3) the allotted parking locations of various users of the development.

The residential trip distribution was significantly influenced by the CTPP TAZ flow data for drivers commuting from the site's TAZ, and adjusted based on traffic volumes and patterns. The origin of outbound and destination of inbound residential vehicular trips was the below-grade parking garage along the public alley to the south of the development.

The retail distribution was mostly based on locations and proximity of other retail centers, with some influence on the CTPP TAZ flow data for drivers commuting to the site's TAZ (representing retail employees that drive). Thus, the retail trip distribution is weighted more towards nearby residential areas and less on regional origins. The origin of outbound and destination of inbound retail vehicular trips was the below-grade parking garage along the public alley to the south of the site.

The hotel distribution was mostly based on the locations of if major routes used by visitors to the District, the locations of major airports in the area such as BWI, DCA, and IAD, major through routes such as I-95/I-495, and the locations of popular tourist attractions, mostly located to the southwest of the site. The hotel parking will be valet service, with 60 spaces allocated on the mezzanine level. Pick-up and drop-off for valet parking will take place along the south block face of M Street, directly in front of the hotel entrance.

Based on this review and the site access locations, the site-generated trips were distributed through the study area intersections. A summary of trip distribution assumptions and specific routing is provided on Figure 11 for outbound trips and on Figure 12 for inbound trips.

The traffic volumes for the 2019 Total Future conditions were calculated by adding the development-generated traffic volumes to the 2019 Background traffic volumes. Thus, the future condition with the proposed development scenario includes traffic generated by: existing volumes, background developments through the year 2019, rerouted volumes, inherent growth on the network, and the proposed development. The site-generated traffic volumes are shown on Figure 13 and the 2019 Total Future traffic volumes are shown on Figure 14.

Vehicular Analysis Results

Intersection Capacity Analysis

Intersection capacity analyses were performed for the three scenarios outlined previously at the intersections contained within the study area during the morning and afternoon peak hours. Synchro version 9.1 was used to analyze the study intersections based on the *Highway Capacity Manual* (HCM) 2000 methodology.

The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS D is typically used as the acceptable LOS threshold in the District; although LOS E or F is sometimes accepted in urbanized areas if vehicular improvements would be a detriment to safety or non-auto modes of transportation.

The LOS capacity analyses were based on: (1) the peak hour traffic volumes; (2) the lane use and traffic controls; and (3) the Highway Capacity Manual (HCM) methodologies (using the *Synchro* software). The average delay of each approach and

LOS is shown for the signalized intersections in addition to the overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

Table 6 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds) for the Existing, 2019 Background, and 2019 Future scenarios. The capacity analysis results are shown on Figure 17 for the morning peak hour, and Figure 18 for the afternoon peak hour.

Study intersections generally operate at acceptable conditions during the morning and afternoon peak hours for the Existing, 2019 Background, and 2019 Future scenarios. However, six intersections operate under unacceptable conditions during one or more peak hour:

- 3rd Street & Florida Avenue NE
- First Street & M Street NW
- North Capitol Street & M Street
- First Street & M Street NE
- 2nd Street & L Street NE
- 2nd Street & K Street NE

It should be noted that while the above intersections operated as unacceptable during future with development scenarios, most of these intersections operated as unacceptable during the background scenario as well.

Queuing Analysis

In addition to the capacity analyses presented above, a queuing analysis was performed at the study intersections. The queuing analysis was performed using Synchro software. The 50th percentile and 95th percentile queue lengths are shown for each lane group at the study area signalized intersections. The 50th percentile queue is the maximum back of queue on a median cycle. The 95th percentile queue is the maximum back of queue that is exceeded 5% of the time. For unsignalized intersections, only the 95th percentile queue is reported for each lane group (including free-flowing left turns and stop-controlled movements) based on the HCM calculations.

Table 7 shows the queuing results for the study area intersections. Several of the study intersections have a queue length that exceeds its storage length during at least one peak hour in all of the study scenarios. These intersections are as follows:

- New York Avenue & 1st Street & O Street NE
- 4th Street & Florida Avenue NE
- First Street & M Street NW
- North Capitol Street & M Street
- First Street & M Street NE
- Delaware Avenue & M Street NE
- 2nd Street & K Street NE

With the addition of the site-generated traffic, queues are slightly increased at all of the study intersections, but no major impacts are seen as a result of the development.

Mitigations

Generally speaking, the proposed development is considered to have an impact at an intersection within the study area if: (1) the capacity analyses show an LOS E or F at an intersection or along an approach where one does not exist in the existing or background conditions; (2) there is an increase in delay at any approach or the overall intersection operating under LOS E or F of greater than 5 seconds, when compared to the background conditions; or (3) there is an increase in queue length of 150 feet for any lane group. Following these guidelines there are impacts to six intersections as a result of the development. Mitigation measures were tested at these intersections with the results reported in Table 8. The following conclusions were made:

- *3rd Street & Florida Avenue NE*

  Under the 2019 Future conditions the overall delay for the northbound approach increases by more than the 5 second threshold over the 2019 Background conditions during the afternoon study period.

  This intersection can be improved by adjusting signal timings so that the northbound and southbound approaches receive more green time. Due to the heavy traffic along Florida Avenue, shifting more green time to the northbound and southbound movements will create capacity concerns along Florida Avenue, but will not deteriorate conditions to an unacceptable level.

- *First Street & M Street NW*

  Under the 2019 Future conditions delay at the overall intersection as well as the northbound and southbound approaches increase by more than the 5 second threshold

over the 2019 Background conditions during the morning and afternoon study periods.

For potential mitigations, an exclusive left turn lane for the southbound approach was added, in addition to signal timing changes to reduce the delay along northbound and southbound travel under mitigation thresholds. The adjustments to allow more green time to the northbound and southbound approaches will however degrade LOS and delay on the eastbound approach, but will not create capacity concerns along M Street. Figure 19 depicts the proposed lane configuration.

- *North Capitol Street & M Street NE*

  Under the 2019 Future conditions the eastbound approach delay for the intersection increases by more than the 5 second threshold over the 2019 Background conditions during both study periods.

  At the request of DDOT, an additional analysis was conducted to study the impacts of the two-way conversion on the operations of the study intersections that fall under the NoMa two-way conversion plan. As mentioned previously, this intersection will fall under the NoMa two-way conversion plan, which will result in a westbound approach where one does not exist today. The new signal timing plan for this intersection reduces the amount of green time that eastbound traffic receives, increasing delay to unacceptable levels.

  The results show that there is overall less delay at the study intersections under the existing one-way system than under the DDOT-proposed two-way conversion. The results of the one-way versus two-way conversion analysis are included in the Appendix.

  As previously mentioned, DDOT is studying operations at this intersection as part of the NoMa two-way conversion project. This report defers to the findings of the DDOT study, as it takes into account more stakeholder input and multimodal considerations.

  This report explored short-term operational mitigations that could be implemented prior to DDOT's full study. This includes adjusting signal timings such that the eastbound and westbound approaches receive protected left phases, and shifting more green time away from north- and southbound approaches. However, the inclusion of these operational improvements results in negative impacts to pedestrian crossings and require geometric changes along the eastbound approach. Therefore it was determined that these improvements should not be implemented as part of the PUD.

- *First Street & M Street NE*

  Under the 2019 Future conditions the overall delay for the eastbound and westbound approach increases by more than the 5 second threshold over the 2019 Background conditions during the morning study period, with the southbound approach increasing over the threshold during the afternoon study period.

  Similar to the intersection of North Capitol Street and M Street, this intersection was analyzed to study the impact of the NoMa two-way conversion plan, and this report defers to the findings of the DDOT study.

  This report explored short term operational mitigations that could be implemented prior to DDOT's full study. This includes adjusting signal timings such that the east- and westbound approaches receive more green time. The proximity of the M Street Cycle Track precludes geometric changes at the intersection.

- *2nd Street & L Street NE*

  Under the 2019 Future conditions the overall delay for the overall and westbound approach increases by more than the 5 second threshold over the 2019 Background conditions during the morning study period.

  As an unsignalized intersection, the incorporation of a traffic signal was studied as a potential mitigation measure; however, the intersection did not meet the peak hour volume thresholds outlined in the MUTCD. Although the intersection is restricted along the eastbound approach by the overhead railroad tracks and to the north and south by developments, the westbound approach of the intersection can be modified to allow a westbound left turning lane by restricting parking along the north side of L Street. This modification allows the intersection to operate at acceptable conditions; however, the elimination of parking as a mitigation measure should be discussed with DDOT in order to determine if it is appropriate at this location. Figure 20 depicts the proposed lane configuration and quantifies the impacts to parking.

- *2nd Street & K Street NE*

  Under the 2019 Future conditions the overall delay for the northbound approach increases by more than the 5 second threshold over the 2019 Background conditions during the morning and afternoon study period.

  Signal timing adjustments were made to allow more green time for the northbound and southbound approach. Shifting more green time to the northbound and southbound movements will add some delay along K Street, but will not deteriorate conditions to an unacceptable level.

In addition to the intersections that require mitigation as a result of the development, it should be noted that the intersection of Delaware Avenue and M Street was modified in the total future scenario to account for the construction of the CAW development and associated driveway as the southbound approach of the intersection. The adjusted signal timings at this intersection were developed such that all approaches operate an acceptable level of service, while maintaining a level of service A or B along M Street. With the implementation of the modified signal timing, no additional mitigation measures are necessary.

Table 4: Summary of Background Development Trip Generation

Background Development	AM Peak Hour			PM Peak Hour		
	In	*Out*	*Total*	*In*	*Out*	*Total*
Gateway Market	34 veh/hr	57 veh/hr	91 veh/hr	87 veh/hr	71 veh/hr	158 veh/hr
300 M Street	26 veh/hr	90 veh/hr	116 veh/hr	97 veh/hr	57 veh/hr	154 veh/hr
Uline Arena	135 veh/hr	26 veh/hr	161 veh/hr	70 veh/hr	156 veh/hr	226 veh/hr
301 N Street	55 veh/hr	78 veh/hr	133 veh/hr	95 veh/hr	75 veh/hr	170 veh/hr
Highline	20 ppl/hr	66 ppl/hr	86 ppl/hr	74 ppl/hr	44 ppl/hr	118 ppl/hr
Ava 55M	24 veh/hr	88 veh/hr	112 veh/hr	90 veh/hr	51 veh/hr	141 veh/hr
22 M Street	16 ppl/hr	58 ppl/hr	74 ppl/hr	61 ppl/hr	36 ppl/hr	97 ppl/hr
Union Place (Phase 2)	48 veh/hr	140 veh/hr	188 veh/hr	142 veh/hr	90 veh/hr	232 veh/hr
Capitol Plaza	426 ppl/hr	60 ppl/hr	486 ppl/hr	86 ppl/hr	370 ppl/hr	456 ppl/hr
301 Florida Avenue	4 veh/hr	14 veh/hr	18 veh/hr	10 veh/hr	9 veh/hr	19 veh/hr
Total 2019 Background Trips	**788 veh/hr**	**677 veh/hr**	**1465 veh/hr**	**812 veh/hr**	**959 veh/hr**	**1771 veh/hr**

Table 5: Applied Annual and Total Growth Rates

Road & Direction	Proposed Annual Growth Rate		Total Growth between 2015 and 2019		Total Growth between 2016 and 2019	
	AM Peak	AM Peak	AM Peak	PM Peak	AM Peak	PM Peak
New York Ave NE – NEB	1.25%	0.25%	5.09%	1.00%	3.80%	0.75%
New York Ave NE – SWB	0.25%	0.50%	1.00%	2.02%	0.75%	1.51%
Florida Ave NE – NWB	0.25%	1.00%	1.00%	4.06%	0.75%	3.03%
Florida Ave NE – SWB	1.50%	0.25%	6.14%	1.00%	4.57%	0.75%
First Street NE – NB	0.25%	0.50%	1.00%	2.02%	0.75%	1.51%
First Street NE – SB	2.00%	0.00%	8.24%	1.00%	6.12%	0.75%
3rd Street NE – NB*	1.00%	1.00%	4.06%	4.06%	3.03%	3.03%
3rd Street NE – SB*	1.00%	1.00%	4.06%	4.06%	3.03%	3.03%
4th Street NE – SB	1.50%	1.25%	6.14%	5.09%	4.57%	3.80%
K Street NE – EB	0.37%	0.31%	1.47%	1.24%	1.10%	0.93%
K Street NE – WB	0.47%	0.46%	1.90%	1.86%	1.42%	1.39%
M Street NE – EB*	1.00%	1.00%	4.06%	4.06%	3.03%	3.03%
M Street NE – WB*	1.00%	1.00%	4.06%	4.06%	3.03%	3.03%

* Conservative 1% growth rate applied.

Figure 8: Study Area

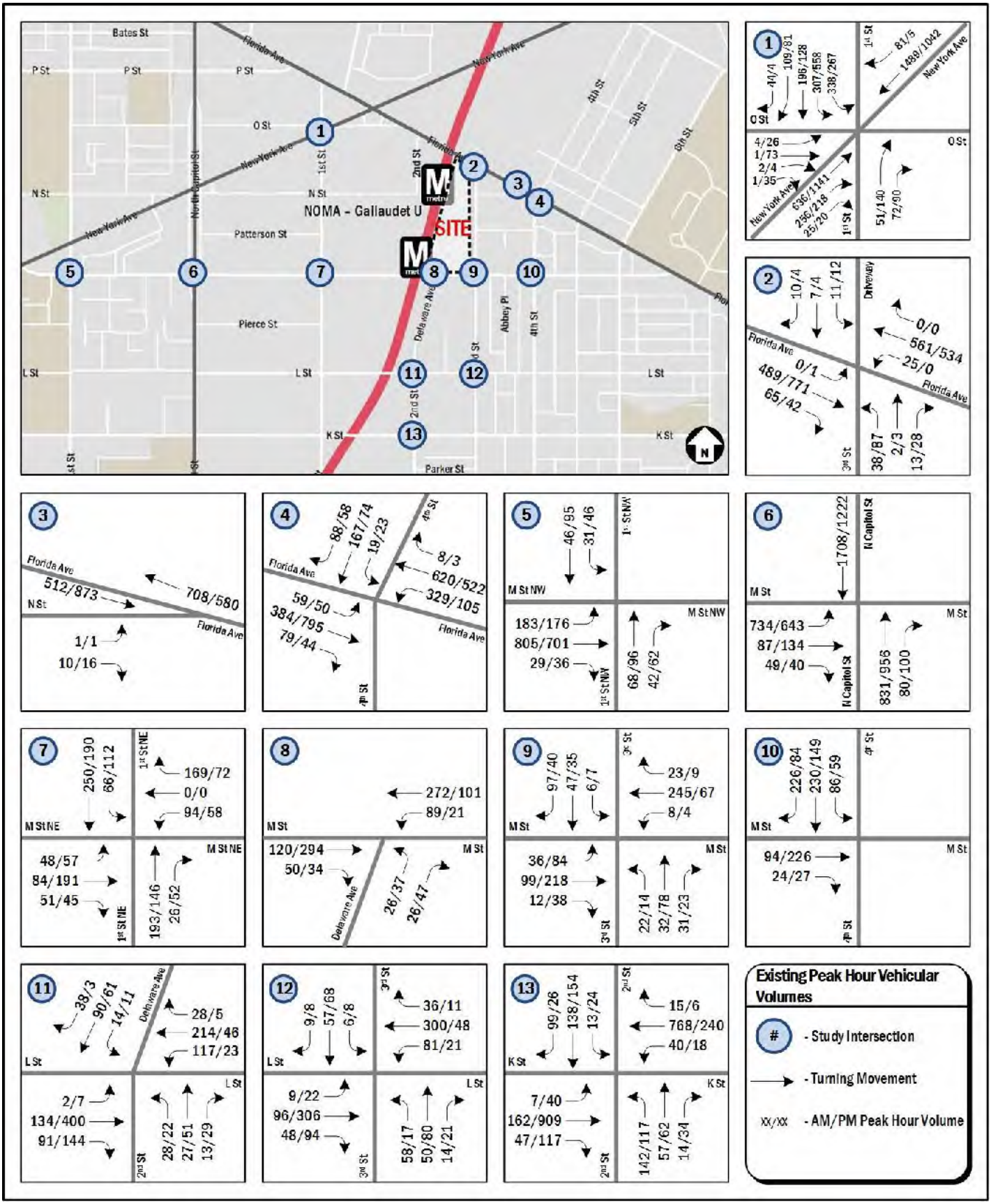

Figure 9: Existing Peak Hour Traffic Volumes

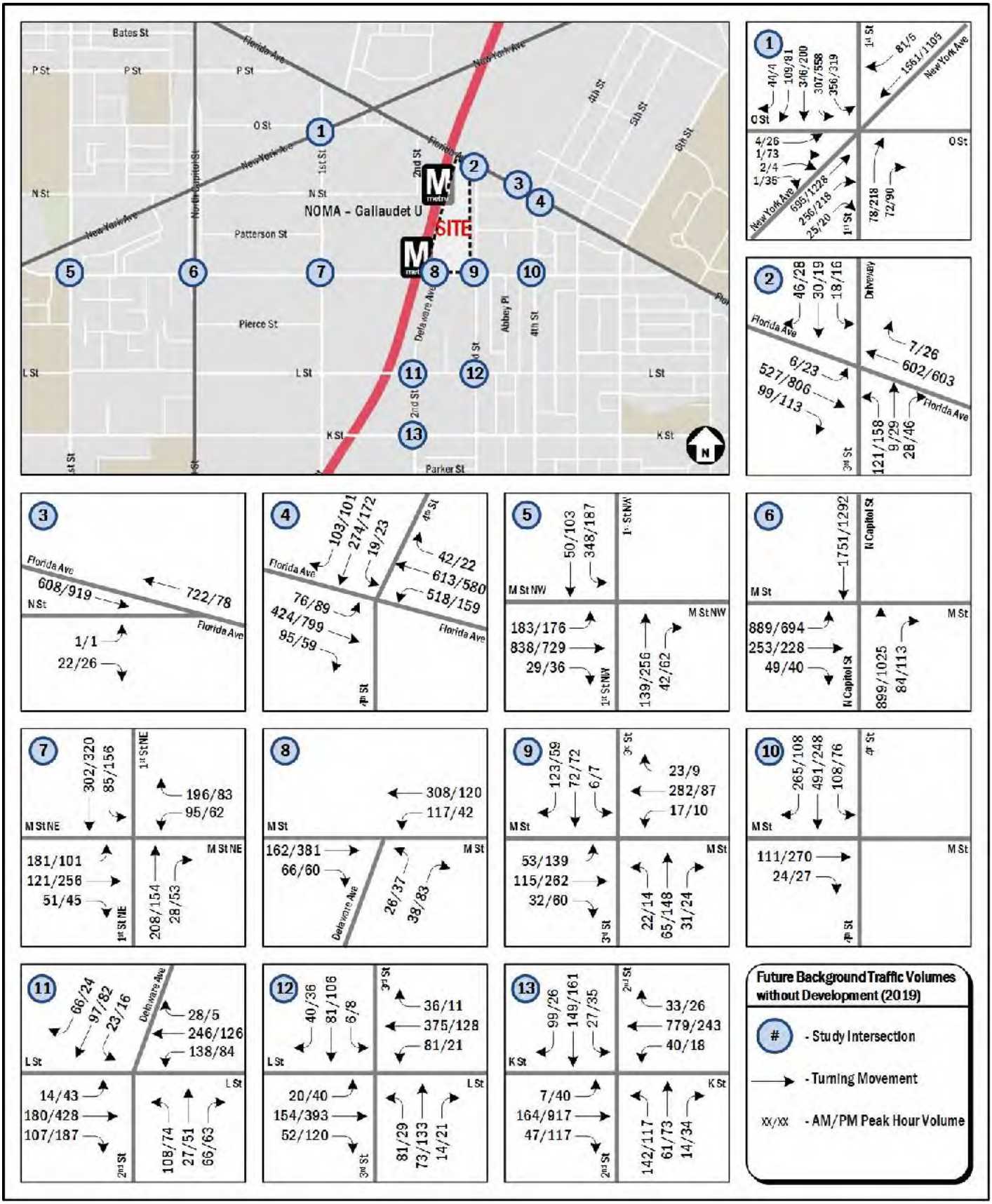

Figure 10: Background Peak Hour Volumes

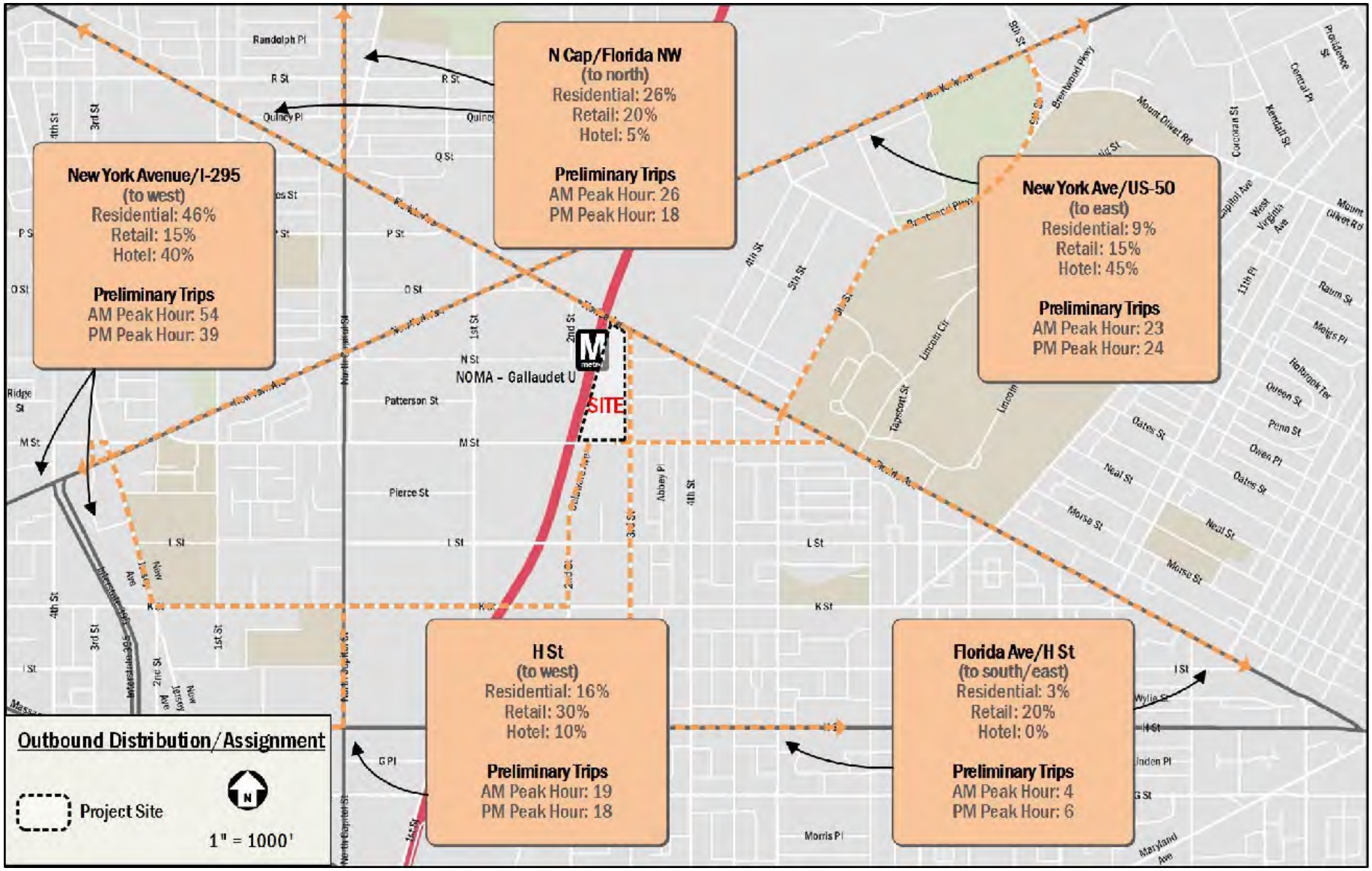

Figure 11: Outbound Trip Distribution and Routing

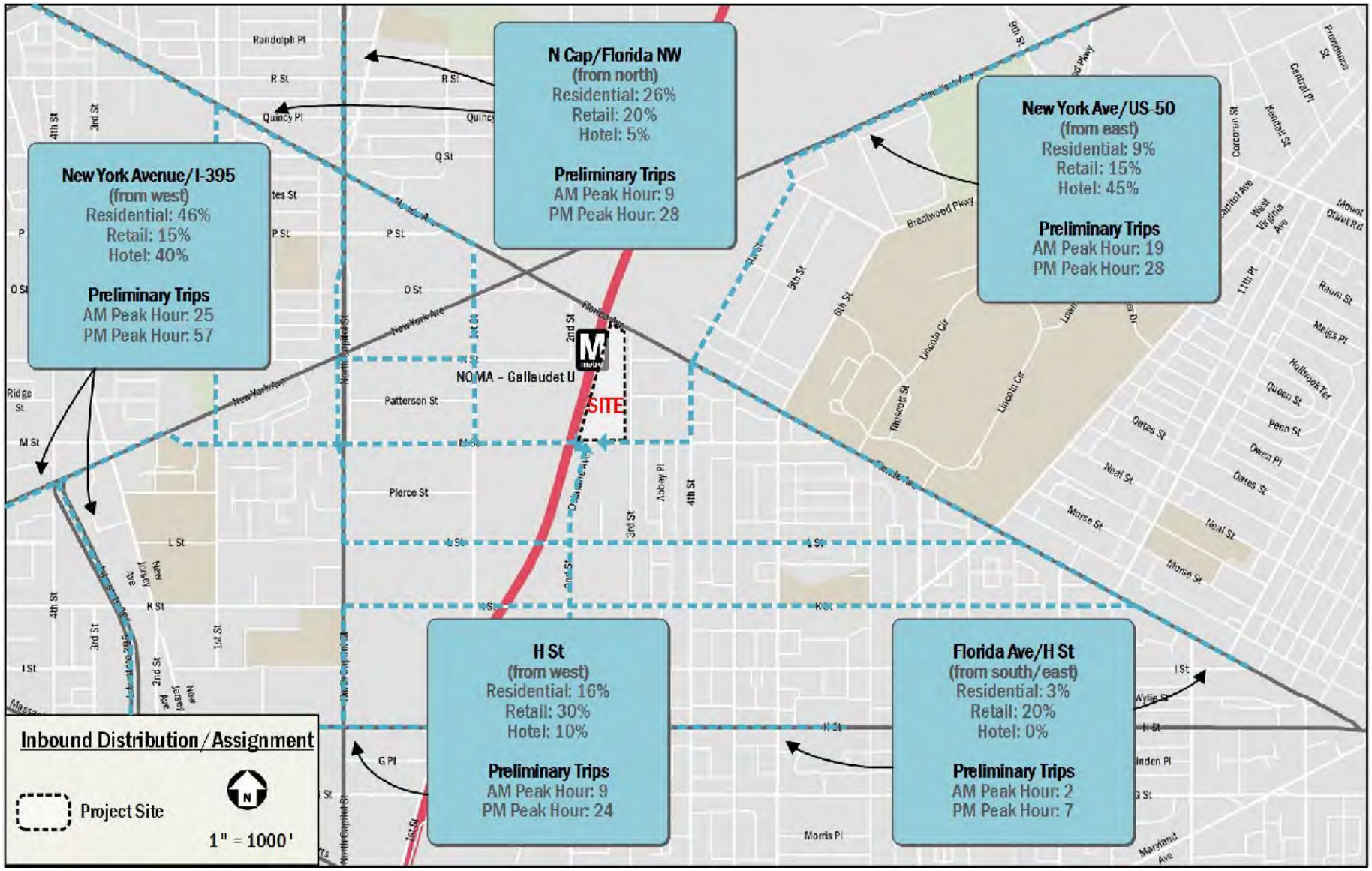

Figure 12: Inbound Trip Distribution and Routing

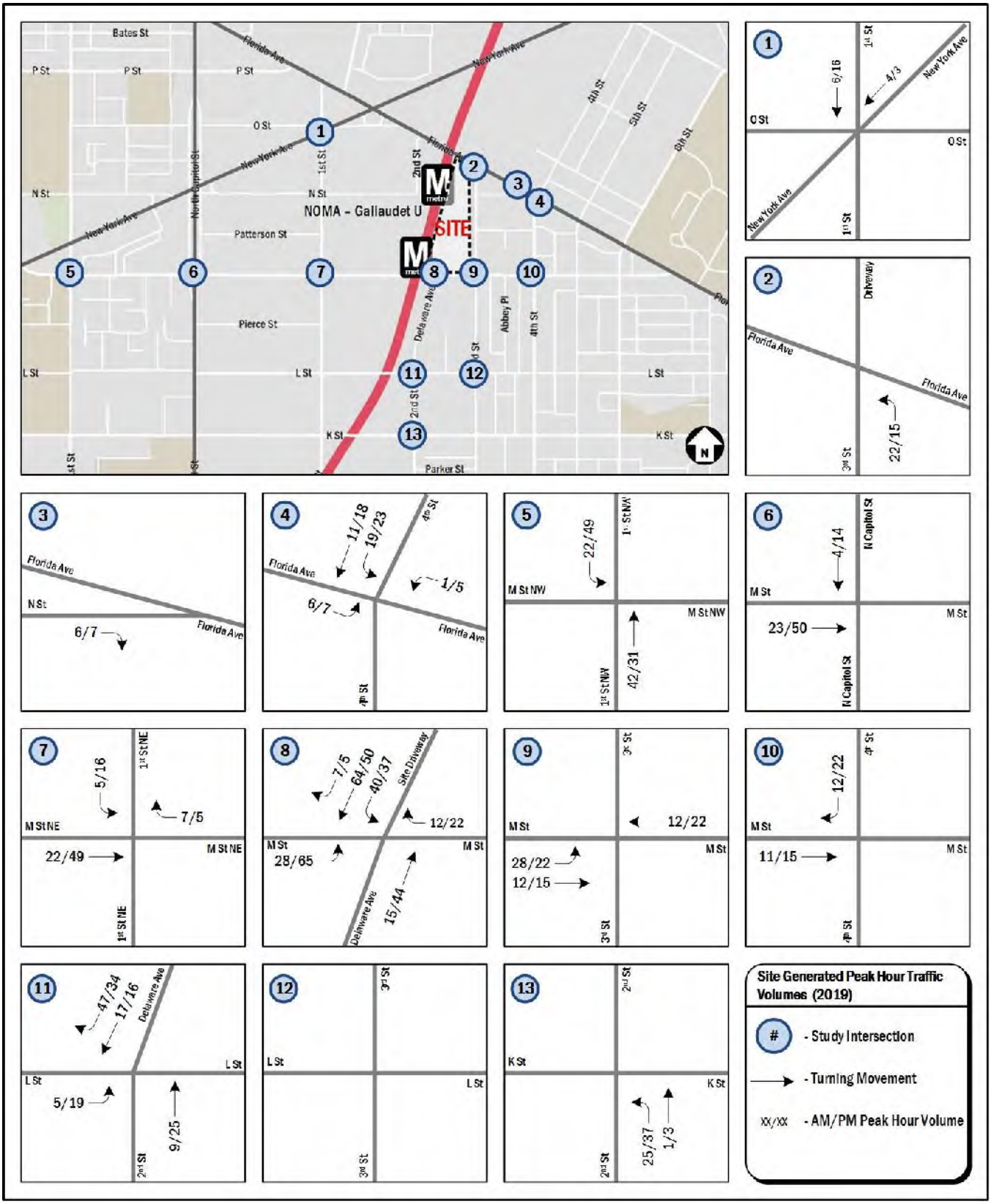

Figure 13: Site Generated Peak Hour Traffic Volumes

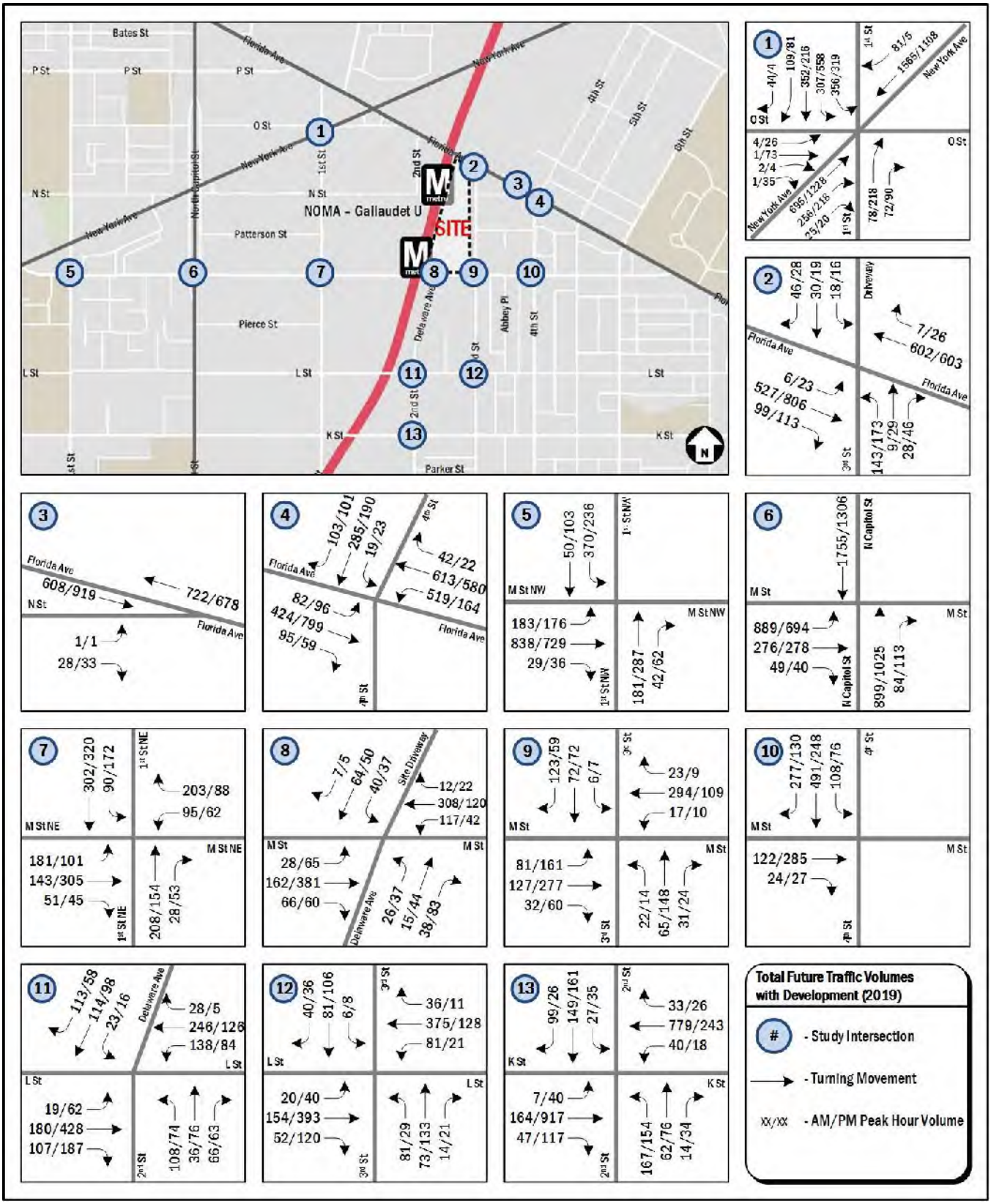

Figure 14: Future Peak Hour Traffic Volumes

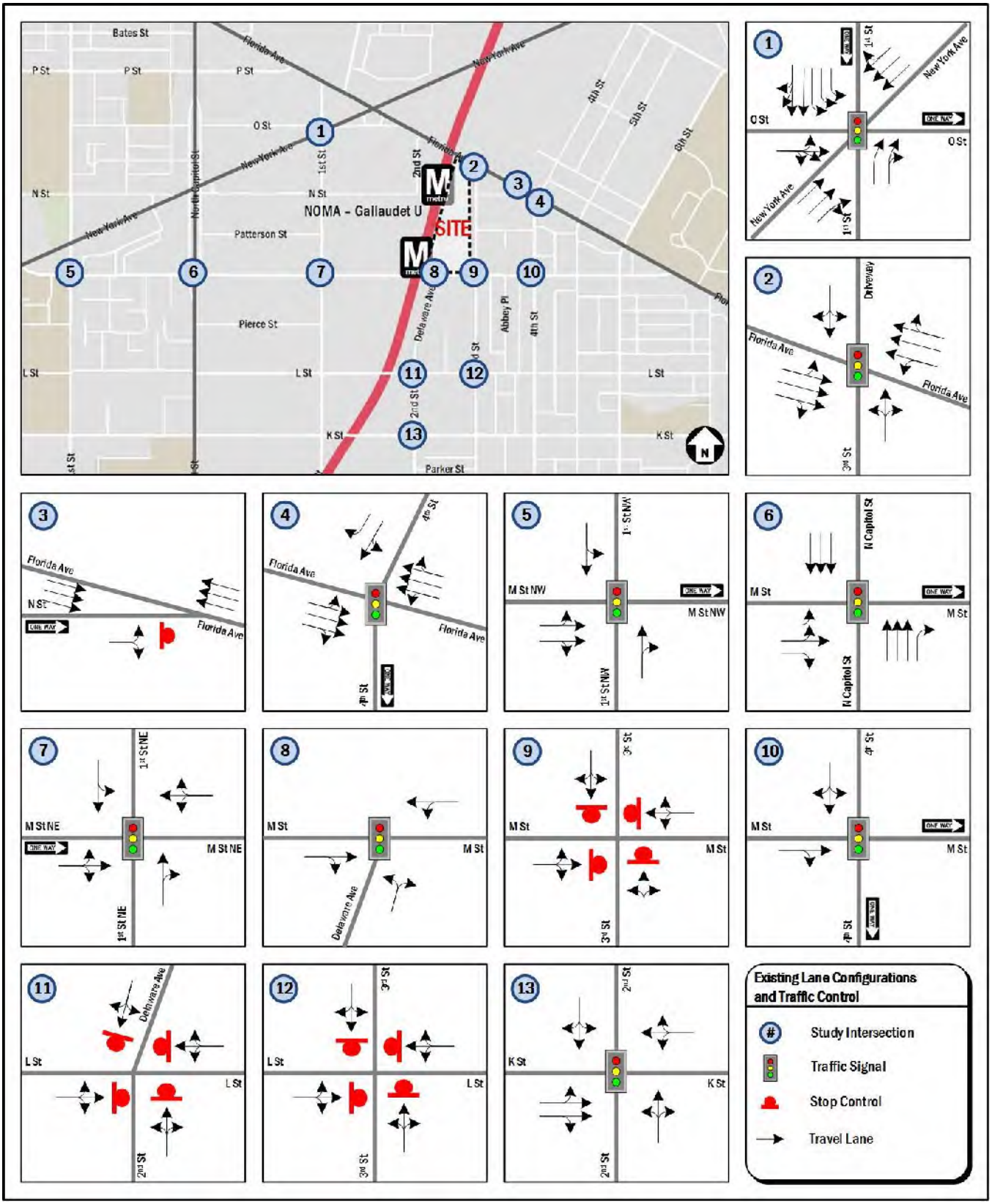

Figure 15: Current Lane Configuration and Traffic Controls

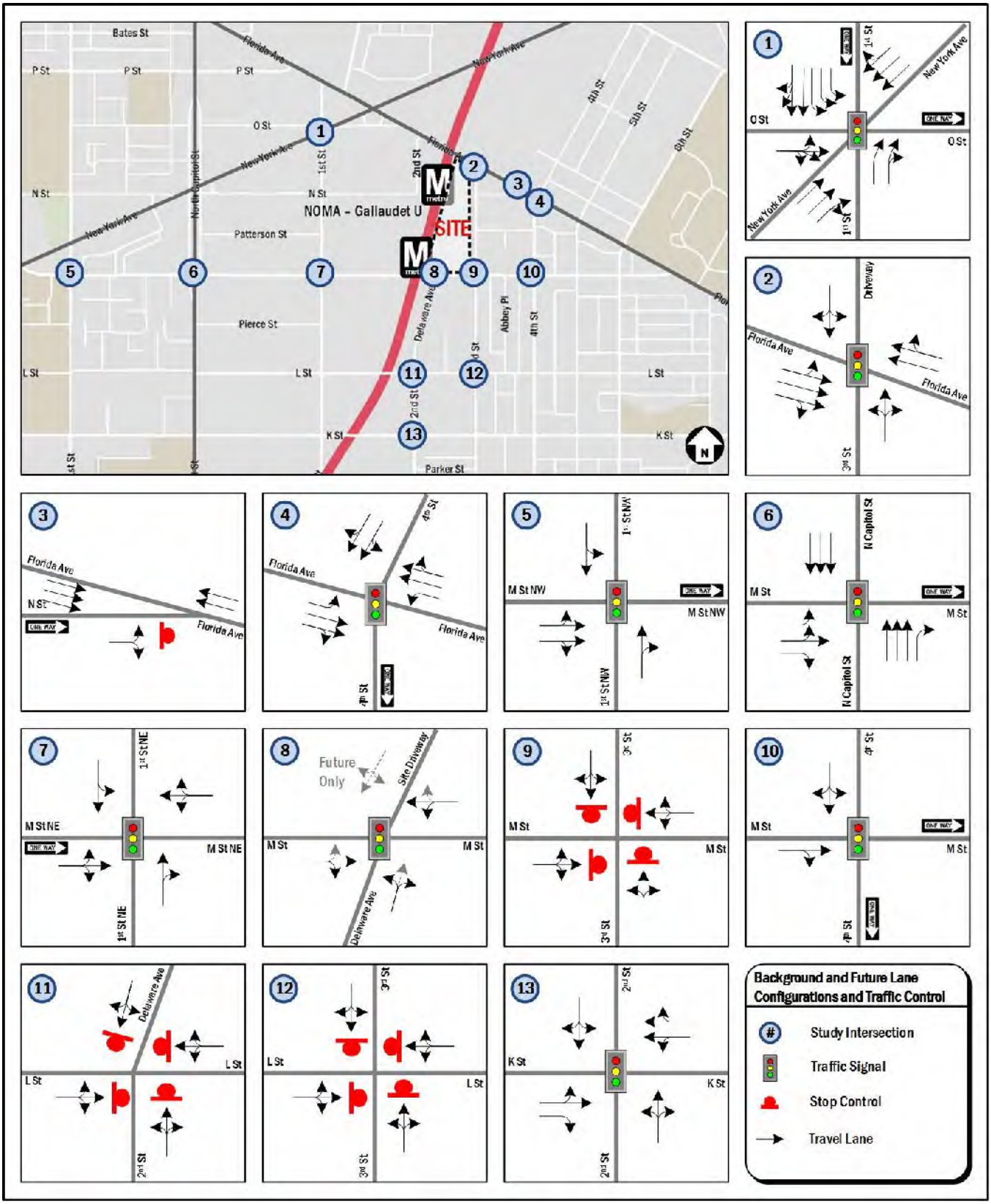

Figure 16: Future Lane Configuration and Traffic Controls

Table 6: LOS Results

Intersection		Approach	Existing Conditions (2016)				Future Background Conditions (2019)				Total Future Conditions (2019)			
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.	**New York Avenue & 1st Street & O Street NE**	**Overall**	**86.5**	**F**	**63.3**	**E**	**89.0**	**F**	**73.6**	**E**	**89.1**	**F**	**73.5**	**E**
		Eastbound	22.0	C	27.7	C	22.5	C	28.7	C	22.5	C	28.7	C
		Westbound	19.0	B	15.9	B	19.5	B	16.2	B	19.5	B	16.2	B
		Northbound to NY	71.4	E	103.8	F	82.8	F	252.5	F	82.8	F	252.5	F
		Northbound to O	61.7	E	60.1	E	61.7	E	60.1	E	61.7	E	60.1	E
		Southbound	250.4	F	78.4	E	240.6	F	86.5	F	240.5	F	86.2	F
		O Street Eastbound	72.1	E	616.4	F	72.1	E	616.4	F	72.1	E	616.4	F
2.	**3rd Street & Florida Avenue NE**	**Overall**	**7.4**	**A**	**15.1**	**B**	**13.5**	**B**	**22.2**	**C**	**14.9**	**B**	**24.3**	**C**
		Eastbound	6.7	A	7.3	A	7.0	A	7.8	A	7.0	A	7.8	A
		Westbound	4.4	A	20.3	C	7.2	A	23.8	C	7.2	A	23.8	C
		Northbound	32.8	C	38.5	D	47.1	D	67.2	E	54.2	D	79.3	E
		Southbound	31.3	C	31.2	C	33.7	C	32.3	C	33.7	C	32.3	C
3.	**Florida Avenue & N Street NE**	Eastbound	9.7	A	9.2	A	9.7	A	10.6	B	9.6	A	10.6	B
4.	**4th Street & Florida Avenue NE**	**Overall**	**32.4**	**C**	**29.1**	**C**	**28.2**	**C**	**35.4**	**D**	**28.5**	**C**	**35.4**	**D**
		Eastbound	45.8	D	24.1	C	15.8	B	31.1	C	15.9	B	31.1	C
		Westbound	25.3	C	36.7	D	30.9	C	43.5	D	31.1	C	43.5	D
		Southbound	30.5	C	27.8	C	39.0	D	29.2	C	39.5	D	29.7	C
5.	**First Street & M Street NW**	**Overall**	**19.9**	**B**	**23.6**	**C**	**93.6**	**F**	**109.4**	**F**	**132.3**	**F**	**167.9**	**F**
		Eastbound	13.7	B	13.6	B	13.9	B	13.8	B	13.9	B	13.8	B
		Northbound	58.1	E	63.5	E	67.1	E	140.7	F	76.6	E	179.2	F
		Southbound	41.9	D	45.6	D	305.7	F	387.1	F	443.4	F	584.8	F
6.	**North Capitol Street & M Street**	**Overall**	**24.0**	**C**	**22.9**	**C**	**46.9**	**D**	**31.6**	**C**	**50.0**	**D**	**36.4**	**D**
		Eastbound	44.3	D	53.2	D	112.4	F	80.7	F	120.9	F	95.0	F
		Northbound	13.9	B	11.4	B	14.2	B	11.6	B	14.2	B	11.6	B
		Southbound	18.8	B	12.9	B	19.2	B	13.2	B	19.2	B	13.3	B

Intersection		Approach	Existing Conditions (2016)				Future Background Conditions (2019)				Total Future Conditions (2019)			
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
7.	**First Street & M Street NE**	**Overall**	**59.1**	**E**	**21.6**	**C**	**134.2**	**F**	**36.5**	**D**	**150.9**	**F**	**43.5**	**D**
		Eastbound	33.9	C	22.9	C	269.1	F	31.8	C	288.8	F	36.0	D
		Westbound	165.0	F	15.3	B	209.3	F	18.4	B	245.0	F	24.9	C
		Northbound	10.9	B	19.2	B	11.1	B	19.4	B	11.1	B	19.4	B
		Southbound	12.8	B	25.0	C	14.4	B	55.0	D	14.7	B	68.2	E
8	**Delaware Avenue & M Street NE**	**Overall**	**7.1**	**C**	**9.2**	**A**	**8.1**	**A**	**10.0**	**A**	**14.2**	**B**	**17.7**	**B**
		Eastbound	2.4	B	2.9	A	4.6	A	4.0	A	4.0	A	12.6	B
		Westbound	3.9	A	2.8	A	4.5	A	3.8	A	13.1	B	7.7	A
		Northbound	42.5	D	43.1	D	42.7	D	40.4	D	29.5	C	36.8	D
		Southbound	--	--	--	--	--	--	--	--	31.3	C	33.8	C
9.	**3rd Street & M Street NE**	**Overall**	**10.1**	**B**	**10.5**	**B**	**12.3**	**B**	**16.3**	**C**	**13.2**	**B**	**19.5**	**C**
		Eastbound	9.7	A	11.8	B	11.6	B	21.2	C	12.9	B	26.9	D
		Westbound	11.0	B	8.8	A	14.0	B	10.5	B	15.0	B	11.2	B
		Northbound	9.1	A	9.3	A	10.5	B	12.2	B	10.8	B	12.8	B
		Southbound	9.5	A	8.8	A	11.5	B	11.0	B	12.0	B	11.5	B
10.	**4th Street & M Street NE**	**Overall**	**18.6**	**B**	**19.8**	**B**	**27.2**	**C**	**20.3**	**C**	**29.7**	**C**	**21.7**	**C**
		Eastbound	34.0	C	41.3	D	34.9	C	46.1	D	35.5	D	48.6	D
		Southbound	15.5	B	3.2	A	26.1	C	4.4	A	28.8	C	5.2	A
11.	**2nd Street & L Street NE**	**Overall**	**13.1**	**B**	**17.5**	**C**	**27.5**	**D**	**38.5**	**E**	**39.1**	**E**	**39.4**	**E**
		Eastbound	11.1	B	21.2	C	20.8	C	58.8	F	27.9	D	61.2	F
		Westbound	15.6	C	9.2	A	41.9	E	14.6	B	64.6	F	16.2	C
		Northbound	10.2	B	10.0	A	18.0	C	14.2	B	22.2	C	16.2	C
		Southbound	11.0	B	9.9	A	16.5	C	12.8	B	24.1	C	14.8	B
12.	**3rd Street & L Street NE**	**Overall**	**13.0**	**B**	**11.9**	**B**	**22.4**	**C**	**26.6**	**D**	**22.4**	**C**	**26.6**	**D**
		Eastbound	9.9	A	13.7	B	13.9	B	39.4	E	13.9	B	39.4	E
		Westbound	15.6	C	8.9	A	32.4	D	12.3	B	32.4	D	12.3	B

Intersection	Approach	Existing Conditions (2016)				Future Background Conditions (2019)				Total Future Conditions (2019)			
		AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
	Northbound	10.5	B	9.7	A	13.7	B	13.6	B	13.7	B	13.6	B
	Southbound	9.8	A	9.4	A	12.3	B	12.4	B	12.3	B	12.4	B
13. 2nd Street & K Street NE	**Overall**	**28.4**	**C**	**30.0**	**C**	**32.4**	**C**	**30.7**	**C**	**42.9**	**D**	**48.9**	**D**
	Eastbound	7.9	A	9.9	A	7.9	A	10.0	A	7.9	A	10.0	A
	Westbound	10.6	B	7.4	A	10.9	B	7.6	A	10.9	B	7.6	A
	Northbound	107.4	F	139.6	F	128.6	F	136.4	F	188.9	F	243.2	F
	Southbound	38.5	D	42.7	D	43.3	D	47.4	D	43.3	D	47.3	D

Table 7: Queuing Results

Intersection		Lane Group	Storage Length (ft)	Existing Conditions (2016)				Future Background Conditions (2019)				Total Future Conditions (2019)			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %
1.	New York Avenue & 1st Street & O Street NE	Eastbound Thru	870	219	253	368	417	237	272	402	454	237	272	402	454
		Westbound Thru	175	359	405	208	239	385	433	224	257	387	434	225	258
		Northbound R to NY	330	52	100	151	#283	82	#150	~305	#485	82	#150	~305	#485
		Northbound R to O	330	0	25	0	57	0	25	0	57	0	25	0	57
		Southbound L to NY	175	~472	#681	280	#438	~512	#723	~363	#568	~512	#723	~363	#568
		Southbound L to O	175	161	215	306	#413	161	215	306	#413	161	215	306	#413
		Southbound Thru	175	183	268	111	175	359	#525	182	267	367	#539	198	287
		Southbound Right	175	~128	#289	5	#141	~128	#289	5	#141	~128	#289	5	#141
		O St Eastbound	750	7	26	~223	#376	7	26	~223	#376	7	26	~223	#376
2.	3rd Street & Florida Avenue NE	Eastbound	345	42	56	72	91	47	63	84	106	47	63	84	106
		Westbound	380	53	50	93	135	125	155	186	m245	125	156	187	m246
		Northbound	690	24	56	69	121	103	168	164	#285	122	#214	179	#315
		Southbound	100	11	34	10	29	34	76	21	55	34	76	21	55
3.	Florida Avenue & N Street NE	Eastbound LR	240	--	1	--	2	--	2	--	3	--	3	--	4
		Northbound	--	--	0	--	0	--	0	--	0	--	0	--	0
		Southbound	375	--	0	--	0	--	0	--	0	--	0	--	0
4.	4th Street & Florida Avenue NE	Eastbound Left	380	--	--	--	--	27	m52	27	m53	30	m55	28	m57
		Eastbound TR	380	--	--	--	--	96	118	288	m367	96	118	288	m365
		Eastbound	380	131	167	188	234	--	--	--	--	--	--	--	--
		Westbound Left	130	--	--	--	--	~195	404	92	156	~196	#406	95	161
		Westbound TR	250	--	--	--	--	91	121	203	#276	91	121	203	#276
		Westbound	250	187	231	139	180	--	--	--	--	--	--	--	--
		Southbound Thru	200	114	171	56	95	127	168	66	98	133	175	77	110
		Southbound Right	200	0	34	0	24	--	--	--	--	--	--	--	--
5.	First Street & M Street NW	Eastbound	260	252	301	239	286	265	313	250	298	265	313	250	298

Intersection		Lane Group	Storage Length (ft)	Existing Conditions (2016)				Future Background Conditions (2019)				Total Future Conditions (2019)			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %
		Northbound	285	90	157	135	217	175	266	~366	#569	226	#353	~434	#644
		Southbound	120	62	109	120	186	~590	#807	~399	#600	~673	#894	~540	#750
6.	North Capitol Street & M Street	Eastbound Left	230	307	#484	288	#472	~546	#778	~388	#604	~562	#794	~423	#640
		Eastbound Thru	230	306	#481	291	#469	~551	#786	365	#595	~576	#810	~425	#645
		Eastbound Right	100	14	42	9	37	14	42	9	37	14	42	9	37
		Northbound Thru	335	122	150	120	146	135	165	131	159	135	165	131	159
		Northbound Right	100	4	29	4	27	7	32	7	31	7	32	7	31
		Southbound Thru	1375	316	368	184	215	329	383	200	232	330	384	202	235
7.	First Street & M Street NE	Eastbound	785	102	167	146	218	~365	#513	238	346	~395	#545	281	#416
		Westbound	730	~194	363	19	41	~226	#404	27	50	~223	#369	49	108
		Northbound	600	66	108	84	131	72	117	89	138	72	117	89	138
		Southbound	270	112	174	150	243	147	227	305	#524	151	233	~333	#556
8.	Delaware Avenue & M Street NE	Eastbound	730	5	36	42	77	37	m38	76	m104	24	m34	160	m217
		Westbound	200	69	102	19	34	89	131	26	49	164	242	46	75
		Northbound	640	18	53	26	68	18	56	26	74	23	64	77	146
		Southbound	100	--	--	--	--	--	--	--	--	60	111	51	98
9.	3rd Street & M Street NE	Eastbound	200	--	--	--	--	--	--	--	--	--	--	--	--
		Westbound	350	--	--	--	--	--	--	--	--	--	--	--	--
		Northbound	650	--	--	--	--	--	--	--	--	--	--	--	--
		Southbound	690	--	--	--	--	--	--	--	--	--	--	--	--
10.	4th Street & M Street NE	Eastbound	350	61	115	150	235	74	132	182	#296	81	142	194	#323
		Southbound	450	265	56	25	37	235	m237	45	m55	255	m266	45	m75
11.	2nd Street & L Street NE	Eastbound	200	--	--	--	--	--	--	--	--	--	--	--	--
		Westbound	350	--	--	--	--	--	--	--	--	--	--	--	--
		Northbound	350	--	--	--	--	--	--	--	--	--	--	--	--
		Southbound	625	--	--	--	--	--	--	--	--	--	--	--	--

Intersection	Lane Group	Storage Length (ft)	Existing Conditions (2016)				Future Background Conditions (2019)				Total Future Conditions (2019)			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %	50th %	95th %
12. 3rd Street & L Street NE	Eastbound	360	--	--	--	--	--	--	--	--	--	--	--	--
	Westbound	340	--	--	--	--	--	--	--	--	--	--	--	--
	Northbound	360	--	--	--	--	--	--	--	--	--	--	--	--
	Southbound	650	--	--	--	--	--	--	--	--	--	--	--	--
13. 2nd Street & K Street NE	Eastbound Thru	575	48	74	--	--	49	75	--	--	49	75	--	--
	Eastbound Right	575	0	12	--	--	0	12	--	--	0	12	--	--
	Eastbound	575	--	--	175	227	--	--	177	231	--	--	177	231
	Westbound	350	149	191	71	103	156	199	77	111	156	199	77	111
	Northbound	185	~162	#316	~176	#315	~175	#331	~186	#328	218	#380	~257	#406
	Southbound	360	147	220	135	203	172	253	151	225	172	252	151	224

Table 8: LOS Results, with Mitigations

Intersection		Approach	Total Future Conditions (2019)				Total Future Conditions (2019), with Mitigations				Mitigations Made
			AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	
2.	**3rd Street & Florida Avenue NE**	**Overall**	**14.9**	**B**	**24.3**	**C**	**14.9**	**B**	**24.2**	**C**	Signal timing adjustments in PM
		Eastbound	7.0	A	7.8	A	7.0	A	13.5	B	
		Westbound	7.2	A	23.8	C	7.2	A	34.4	C	
		Northbound	54.2	D	79.3	E	54.2	D	36.4	D	
		Southbound	33.7	C	32.3	C	33.7	C	23.7	C	
5.	**First Street & M Street NW**	**Overall**	**132.3**	**F**	**167.9**	**F**	**38.9**	**D**	**39.9**	**D**	Signal timing adjustments in AM, PM, inclusion of SBL lane
		Eastbound	13.9	B	13.8	B	34.4	C	30.4	C	
		Northbound	76.6	E	179.2	F	45.2	D	60.7	E	
		Southbound	443.4	F	584.8	F	46.4	D	45.5	D	
6.	**North Capitol Street & M Street**	**Overall**	**50.0**	**D**	**36.4**	**D**	**32.3**	**C**	**26.5**	**C**	Signal timing adjustments in AM, PM
		Eastbound	120.9	F	95.0	F	46.2	D	52.0	D	
		Northbound	14.2	B	11.6	B	20.5	C	14.9	B	
		Southbound	19.2	B	13.3	B	29.1	C	17.1	B	
7.	**First Street & M Street NE**	**Overall**	**150.9**	**F**	**43.5**	**D**	**52.8**	**D**	**41.3**	**D**	Signal timing adjustments in AM, PM
		Eastbound	288.8	F	36.0	D	52.5	D	44.3	D	
		Westbound	245.0	F	24.9	C	95.1	F	44.0	D	
		Northbound	11.1	B	19.4	B	22.9	C	17.2	B	
		Southbound	14.7	B	68.2	E	36.1	D	48.6	D	
11.	**2nd Street & L Street NE**	**Overall**	**39.1**	**E**	**39.4**	**E**	**20.9**	**C**	**38.7**	**E**	Added 85' pocket lane for WBT and WBR.
		Eastbound	27.9	D	61.2	F	24.0	C	61.5	F	
		Westbound	64.6	F	16.2	C	19.9	C	11.9	B	
		Northbound	22.2	C	16.2	C	19.1	C	15.9	C	
		Southbound	24.1	C	14.8	B	20.3	C	14.6	B	
13.	**2nd Street & K Street NE**	**Overall**	**42.9**	**D**	**48.9**	**D**	**22.5**	**C**	**23.7**	**C**	
		Eastbound	7.9	A	10.0	A	12.8	B	20.7	C	

Intersection	Approach	Total Future Conditions (2019)				Total Future Conditions (2019), with Mitigations				Mitigations Made
		AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*		
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	
	Westbound	10.9	B	7.6	A	17.6	B	15.4	B	Signal timing adjustments in AM, PM
	Northbound	188.9	F	243.2	F	42.5	D	42.1	D	
	Southbound	43.3	D	47.3	D	28.1	C	26.2	D	

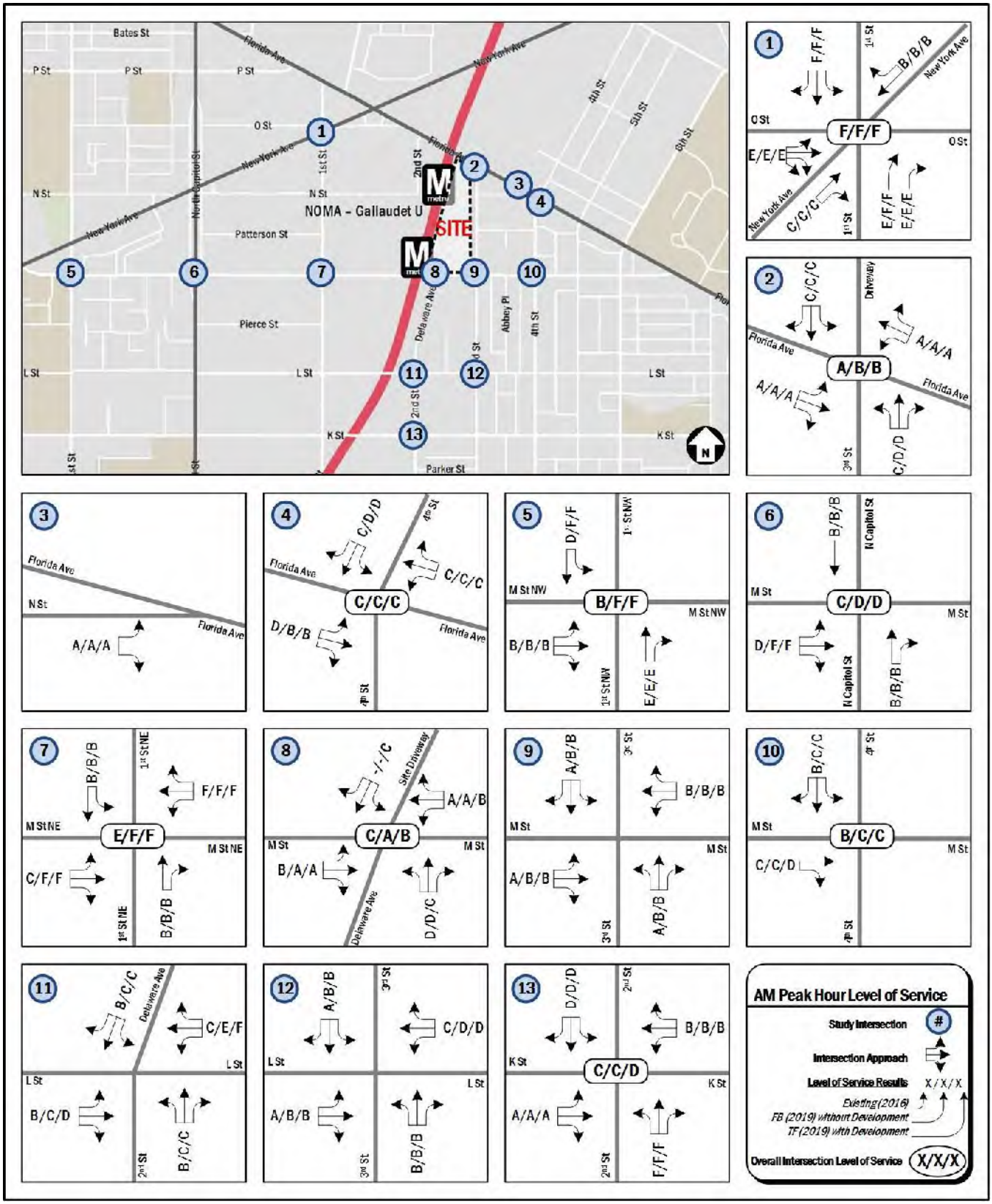

Figure 17: Morning Peak Hour Capacity Analysis Results

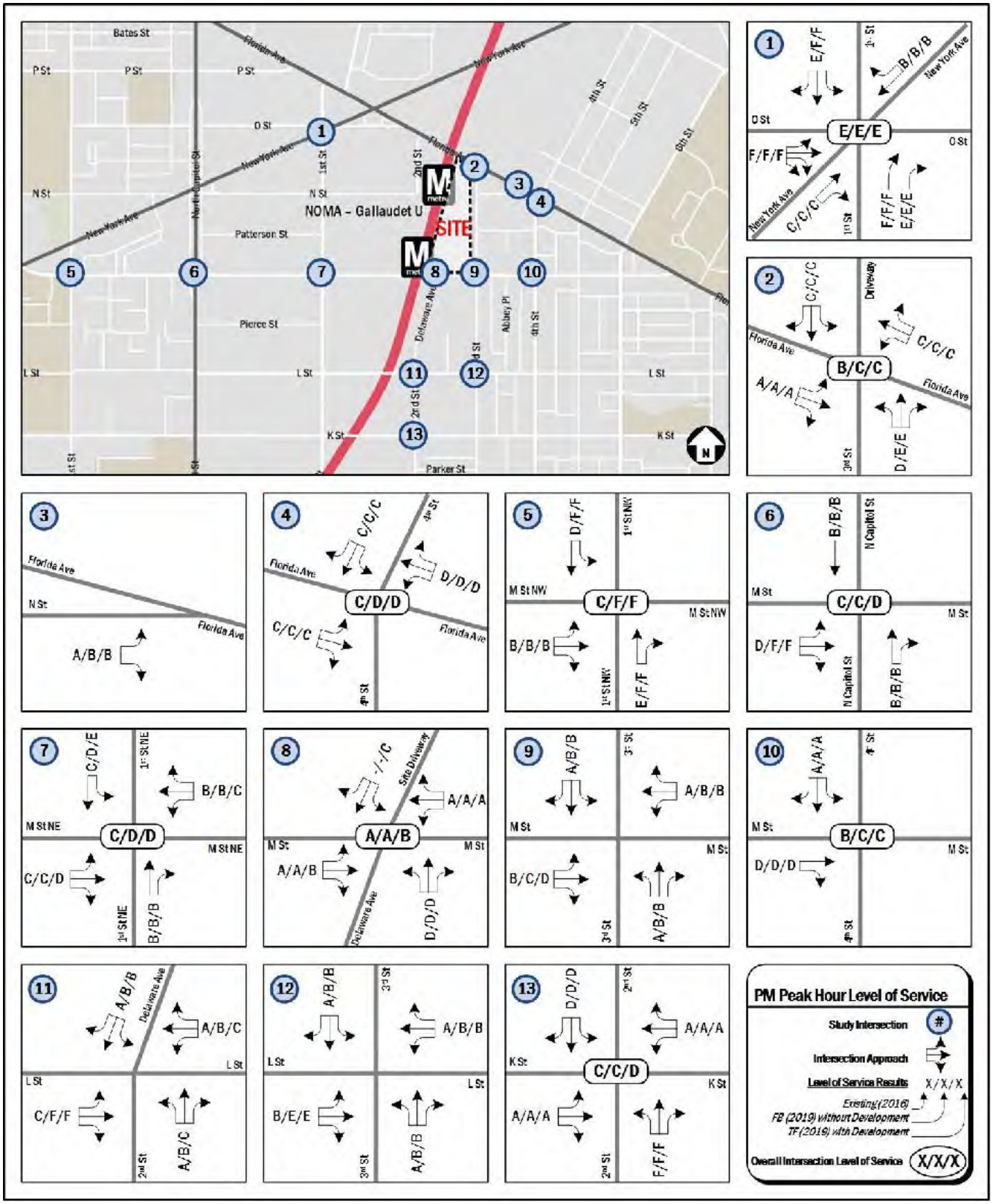

Figure 18: Afternoon Peak Hour Capacity Analysis Results

Figure 19: First Street & M Street NW Mitigations

Figure 20: L Street & 2nd Street NE Mitigations

TRANSIT

This section discusses the existing and proposed transit facilities in the vicinity of the site, accessibility to transit, and evaluates the overall transit impacts due to the Central Armature Works project.

The following conclusions are reached within this chapter:

- The development has excellent access to transit.
- The development site is served by the NoMa-Gallaudet U Metrorail station and by multiple Metrobus routes that travel along Florida Avenue in the vicinity of the project.
- The site is expected to generate a manageable amount of transit trips, and the existing service is capable of handling these new trips.

EXISTING TRANSIT SERVICE

The study area is well served by Metrobus and Metrorail. Combined, these transit services provide local, city wide, and regional transit connections and link the site with major cultural, residential, employment, and commercial destinations throughout the region. Figure 21 identifies the major transit routes, stations, and stops in the study area.

The NoMa-Gallaudet U Metrorail station is located less than 0.1 miles from the development site and is served by the Red Line, which provides direct connections to areas in the District and Maryland and provides a connection to all additional Metrorail lines. The Red Line connects Shady Grove with Glenmont while providing access to the District core in a "U" shape. Red Line trains run approximately every three to six minutes during the morning and afternoon peak hours. The Red Line runs about every 12 minutes during weekday non-peak hours, every 15-18 minutes on weekday evenings after 9:30 pm and 12 to 15 minutes on the weekends.

The site is also serviced by Metrobus with stops located along Florida Avenue in the vicinity of the site. These bus lines connect the site to many areas of the District, including several Metrorail stations which provide further connections to Virginia and Maryland. Table 9 shows a summary of the bus route information for the routes that serve the site, including service hours, headway, and distance to the nearest bus stop.

A detailed inventory of Metrobus stops within a quarter-mile walkshed of the site, detailing individual bus stop amenities and conditions is included in the Technical Appendix. A summary of this inventory is shown on Figure 21.

PROPOSED TRANSIT SERVICE

Due to growth of population, jobs, and retail in several neighborhoods in the District and the potential for growth in other neighborhoods, the District's infrastructure is challenged with the need for transportation investments to support the recent growth and to further strengthen neighborhoods. In order to meet these challenges and capitalize on future opportunities, DDOT has developed a plan to identify transit challenges and opportunities and to recommend investments. This is outlined in DC's *Transit Future System Plan* report published by DDOT in April 2010, which includes the reestablishment of streetcar service in the District.

In addition to the existing streetcar line that runs along H Street, one planned streetcar route is expected to travel near the site. The Woodley Park/Adams Morgan to Congress Heights line would run along Florida Avenue and connect the site to several commercial districts including Woodley Park, Adams Morgan, U Street NW, NoMa, H Street NE, Barracks Row, Anacostia Waterfront, and Historic Anacostia. The line also will have direct connections to all five Metrorail lines and serve Gallaudet University and the National Zoo. Additionally, Florida Avenue was identified as a corridor in need of a Metro Express by the *Transit Future System Plan* report.

Table 9: Metrobus Route Information

Route Number	Route Name	Service Hours	Headway	Walking Distance to Nearest Bus Stop
90,92	U Street-Garfield Line	Weekdays: 4:05AM – 2:04 AM Weekends: 4:05AM – 2:18 AM	7-15 min	0.1 miles, 2 minutes
X3	Benning Road Line	Weekdays: Westbound 6:00AM-8:39AM Eastbound 3:31PM-5:37PM	20-30 min	0.1 miles, 2 minutes

Additionally, WMATA and local transportation agencies in the District, Maryland, and Virginia have begun reviewing Metrobus lines and system wide facilities for service improvements since 2007. In direct relation to this development, routes 90, 92, 93, and X3 were studied.

WMATA and DDOT published the *90-92-93 Metrobus U Street-Garfield Line Study* in March 2011. At the time of the report (2011), the 90s line had one of highest ridership of any Metrobus line at almost 14,700 daily riders. The report cites the need for improved customer experience, updating services and operating plans, improved reliability and travel times, and reducing passenger crowding. As possible solutions the report proposes a new Metro Express limited-stop service, increased supervision and bus operator training, traffic operation enhancements, improved bus facilities, consolidation and relocation of bus stops, and improved safety and security. In March 2016, the 93 line was discontinued due to low ridership, and additional trips were reallocated to the 90 and 92 lines. As of this report the recommendations outlined in the WMATA report for the potential Metro Express 99 Line have not been enacted.

WMATA and DDOT published the *X1-X2-X3 Metrobus Benning Road/H Street Line Study* in January 2010. At the time of the report (2010) the "X" line had one of the highest ridership of any Metrobus line at almost 14,000 daily riders. Overcrowding, delays, and other reliability issues prompted WMATA and DDOT to explore potential improvements. The report lists service recommendations such as increased frequency, the addition of articulated buses, and the creation of the X9 Metro Express route. Additionally, improved scheduling, increased supervision, improved bus stop facilities, better customer information, improved safety measures, and prioritized signals are proposed as potential recommendations. Specifically related to the proposed development, the X3 was recommended to be eliminated by the WMATA report to help cover the cost of operating the proposed X9 Metro Express route. As of this report, the X3 has not been eliminated.

Site-Generated Transit Impacts

This section summarizes the impacts of the development on the overall transit operations in the vicinity of the site.

Transit Trip Generation

The proposed development is projected to generate 270 transit trips (105 inbound, 165 outbound) during the morning peak hour and 409 transit trips (227 inbound, 182 outbound) during the afternoon peak hour.

US Census data was used to determine the distribution of those taking Metrorail and those taking Metrobus. The site lies in TAZ 20282 which shows that approximately 71 percent of transit riders used Metrorail and the remainder use Metrobus. That said, approximately 192 people will use Metrorail and 78 will use Metrobus during the morning peak hour; approximately 290 people will use Metrorail and 119 will use Metrobus during the afternoon peak hour.

WMATA studied capacity of Metrorail stations in its *Station Access & Capacity Study (2008).* The study analyzed the capacity of Metrorail stations for their vertical transportation, for example the capacity of the station at elevators, stairs, and escalators to shuttle patrons between the street, mezzanine, and platforms. The study also analyzed stations capacity to process riders at fare card gates. For both analyses, vertical transportation and fare card gates, volume-to-capacity ratios were calculated for existing data (from 2005) and projections for the year 2030. According to the study, the NoMa-Gallaudet U station can currently accommodate future growth at all access points, being one.

Additionally, the *New York Avenue – Florida Avenue – Gallaudet University Station Access Improvement Study* report was published in June 2010. The purpose of the Study was to (1) identify access needs and deficiencies; (2) define ways to enhance accessibility for pedestrians and bicyclists; (3) improve the pedestrian environment; and (4) improve the connectivity and flow of Metrobuses, shuttle buses, and private automobiles at the station. The report recommended improvements to pedestrian infrastructure and bicycle facilities, increased safety through the use of staff, lighting and cameras, improved wayfinding, and repairs to the rail overpass on Florida Avenue. The majority of recommendations were deferred to the *NoMa Neighborhood Access Study and Transportation Management Plan*.

WMATA studied capacity along Metrobus routes. DC's *Transit Future System Plan* (2010) lists the bus routes with the highest load factor (a ratio of passenger volume to bus capacity). A load factor is considered unacceptable if it is over 1.2 during peak periods or over 1.0 during off-peak or weekend periods. According to this study Metrobus routes that travel near the site operate at a load factor that greatly exceeds its capacity

during peak periods of the day. As it is expected that the majority of new trips will be made via the Metrorail, and the improvements to Metrobus service discussed above, site-generated transit trips will not cause detrimental impacts to Metrobus or Metrorail service.

On-Site Transit Improvements

The proposed development will include an area on the property where a pedestrian tunnel to the NoMa-Gallaudet U Metrorail Station will be built. As mentioned earlier as part of the *NoMa Pedestrian Tunnel Feasibility Study*, the three preferred alternatives will have eastern portals at or near the project site. The developer has been coordinating with WMATA in designing the area around the future portal in order to integrate pedestrian flow to and from the Metrorail Station with the development. The design of the N Street plaza adjacent to 3rd Street will allow residents, employees, and customers to walk underneath the rail tracks without conflicting with vehicles at neighborhood streets while conveniently accessing transit.

Figure 21: Existing Transit Service

PEDESTRIAN FACILITIES

This section summarizes the existing and future pedestrian access to the site and reviews walking routes to and from the site.

The following conclusions are reached within this chapter:

- The existing pedestrian infrastructure surrounding the site provides a good walking environment. There are some gaps in the system, but there are sidewalks along all primary routes to pedestrian destinations.
- The site is not expected to generate a significant amount of pedestrian trips; however, the pedestrian trips generated by walking to and from transit will be more substantial, particularly along Florida Avenue.

PEDESTRIAN STUDY AREA

Facilities within a quarter-mile of the site were evaluated as well as routes to nearby transit facilities and prominent retail and neighborhood destinations. The site is easily accessible to transit options such as bus stops along Florida Avenue and the NoMa-Gallaudet U Metro Station. There are some barriers and areas of concern within the study area that negatively impact the quality of and attractiveness of the walking environment. This includes roadway conditions that reduce the quality of walking conditions, narrow or nonexistent sidewalks, incomplete or insufficient crossings at busy intersections, and the rail tracks that limits connectivity to the west. Figure 24 shows suggested pedestrian pathways, walking time and distances, and barriers and areas of concern.

PEDESTRIAN INFRASTRUCTURE

This section outlines the existing and proposed pedestrian infrastructure within the pedestrian study area.

Existing Conditions

A review of pedestrian facilities surrounding the proposed development shows that most facilities meet DDOT standards and provide a quality walking environment. Figure 22 shows a detailed inventory of the existing pedestrian infrastructure surrounding the site. Sidewalks, crosswalks, and curb ramps are evaluated based on the guidelines set forth by DDOT's *Public Realm Design Manual* in addition to ADA standards. Sidewalk widths and requirements for the District are shown below in Table 10.

Within the area shown, roadways in the southern portion of the study area are considered residential with a low to moderate density, while the northern portion of the study area covering the Florida Avenue Market is considered commercial (non-Downtown) and thus require wider sidewalks. Most of the sidewalks surrounding the site to the south comply with DDOT standards; however to the north there are areas which have inadequate sidewalks or no sidewalks at all, with insufficient or no buffer. All primary pedestrian destinations are accessible via routes with sidewalks, most of which met DDOT standards.

ADA standards require that all curb ramps be provided wherever an accessible route crosses a curb and must have a detectable warning. Additionally, curb ramps shared between two crosswalks is not desired. As shown in the figure, under existing conditions there are some issues with crosswalks and curb ramps near the site.

Pedestrian Infrastructure Improvements

As a result of the development, pedestrian facilities along the perimeter of the site will be improved, for example by removing the four curb cuts on 3rd Street. The development will improve sidewalks adjacent to the site such that they meet or exceed DDOT requirements and provide an improved pedestrian environment.

In addition, the Applicant has been meeting with stakeholders and has proffered a contribution toward a study of the potential for a new pedestrian tunnel and entrance to the NoMa-Gallaudet U Metro Station.

Table 10: Sidewalk Requirements

Street Type	Minimum Sidewalk Width	Minimum Buffer Width
Residential (Low to Moderate Density)	6 ft	4 ft (6 ft preferred for tree space)
Residential (High Density)	8 ft	4 ft (6 ft preferred for tree space)
Commercial (Non-downtown)	10 ft	4 ft
Downtown	16 ft	6 ft

As a result of the other planned developments and roadway improvements in the area, it is expected that pedestrian infrastructure bordering developments, particularly those within the Union Market area, will be improved to meet DDOT and ADA standards. As such, Figure 23 shows the expected detailed inventory of future pedestrian infrastructure surrounding the site.

SITE IMPACTS

This section summarizes the impacts of the development on the overall pedestrian operations in the vicinity of the site.

Pedestrian Trip Generation

The Central Armature Works development is expected to generate 132 walking trips (51 inbound, 81 outbound) during the morning peak hour and 226 walking trips (124 inbound, 102 outbound) during the afternoon peak hour. The origins and destinations of these trips are likely to be:

- Employment opportunities where residents can walk to work;
- Local areas where employees and patrons of the development reside;
- Retail locations outside of the site; and
- Neighborhood destinations such as schools, libraries, and parks in the vicinity of the site.

In addition to these trips, the transit trips generated by the site will also generate pedestrian demand between the site and nearby transit stops.

Currently the existing pedestrian network has the capacity to absorb the newly generated trips from the site. The planned sidewalk and pedestrian landscape improvements on Florida Avenue, N Street, 3rd Street, and 4th Street will further improve and expand the pedestrian network in the vicinity of the site.

On-Site Pedestrian Improvements

The proposed development will see the elimination of existing curb cuts along 3rd Street. This allows for the addition of seven on-street parking spaces along the west side of 3rd Street, creating a buffer for pedestrians. The aforementioned pedestrian tunnel to the NoMa-Gallaudet U Metrorail Station will shorten the walk to and from the Metrorail Station and reduce pedestrian-vehicular conflicts at neighborhood intersections. The open plan of the development will allow pedestrians to utilize interior walkways in between the three buildings, in addition to utilizing the sidewalks on the perimeter of the development, allowing for a better distribution of pedestrian flow.

Not only will these improvements improve the quality of pedestrian facilities for PUD residents, employees, and guests, but they will also improve the overall pedestrian environment for the entire surrounding neighborhood.

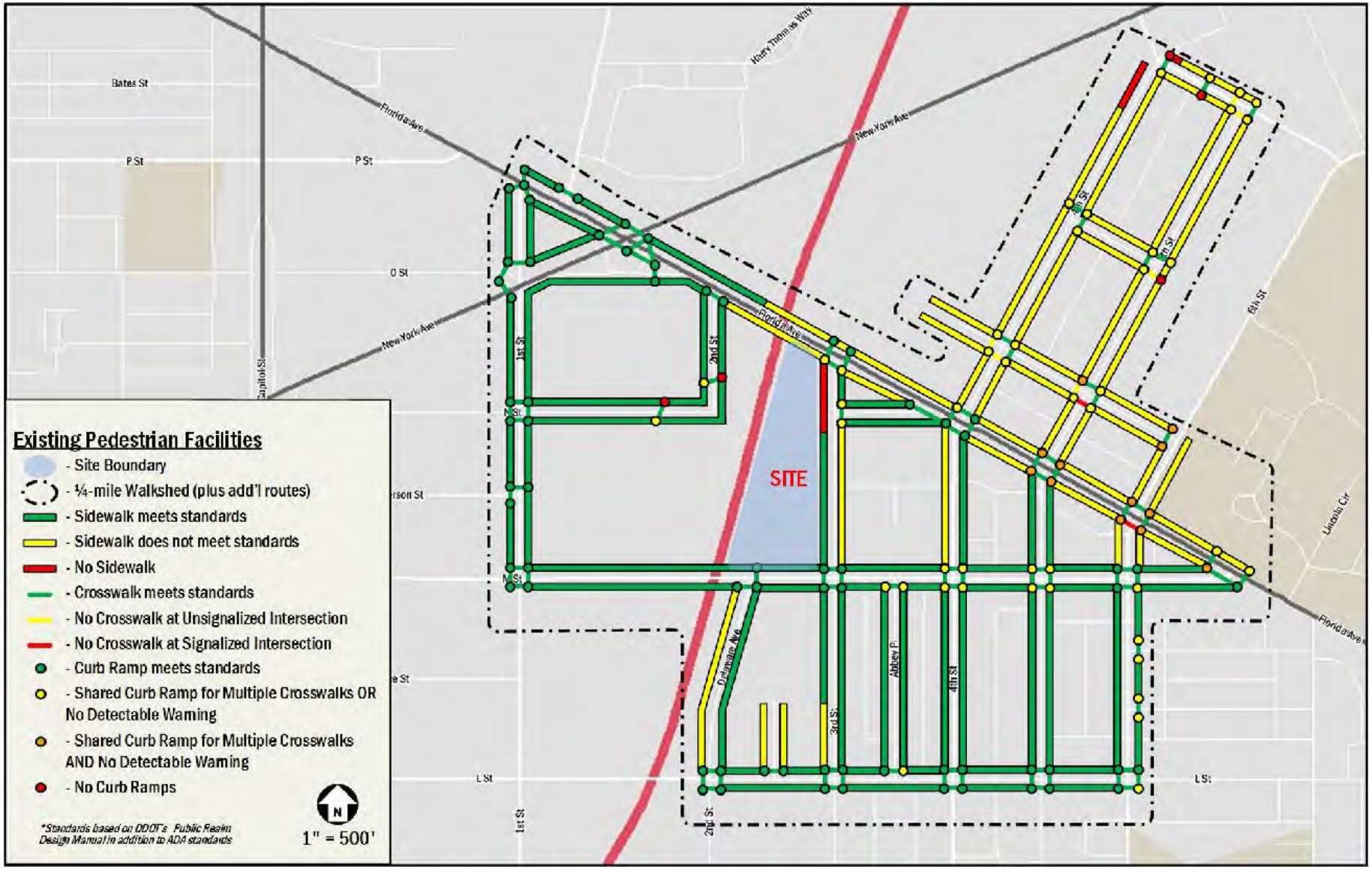

Figure 22: Existing Pedestrian Infrastructure

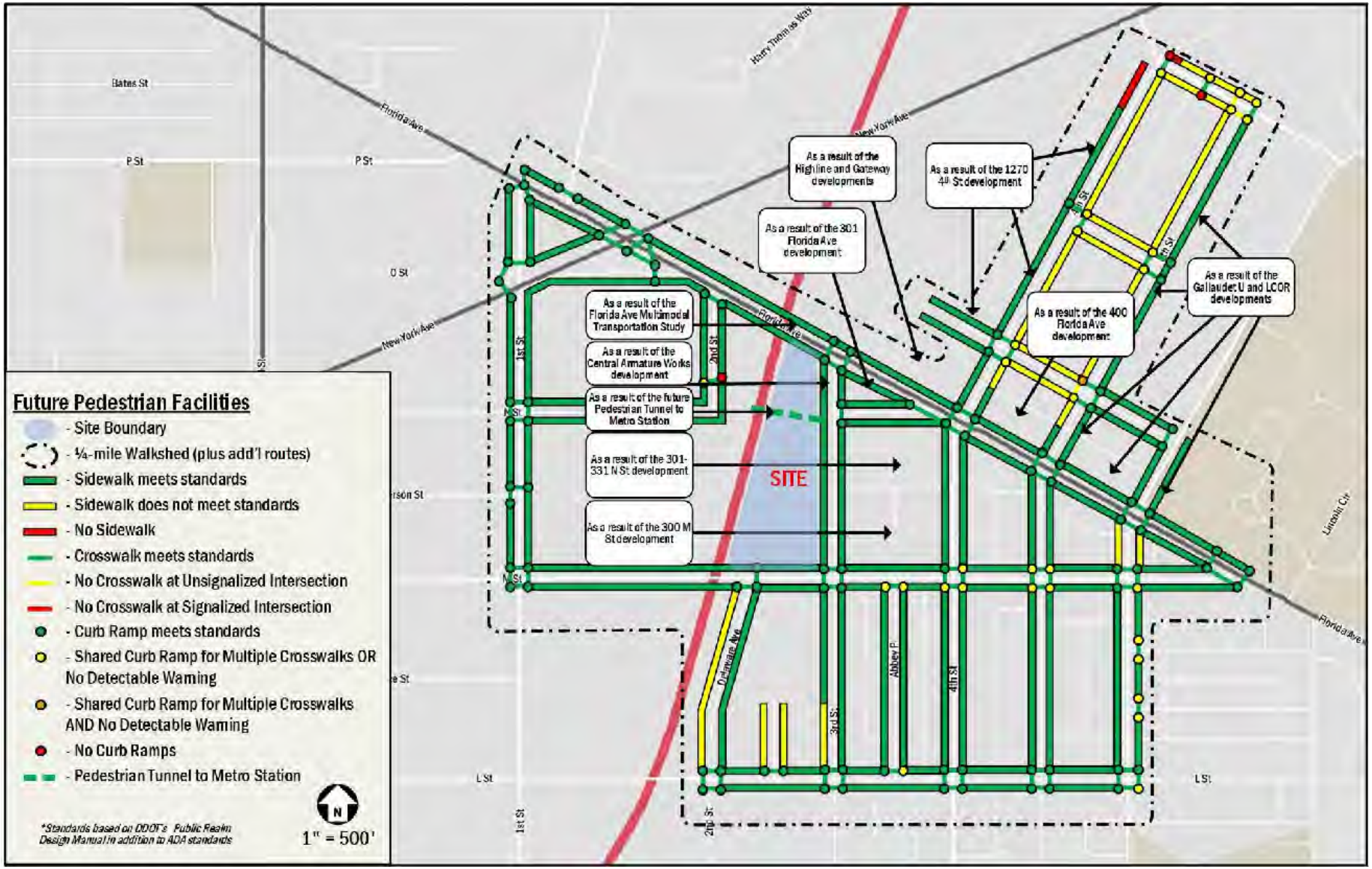

Figure 23: Expected Future Pedestrian Infrastructure

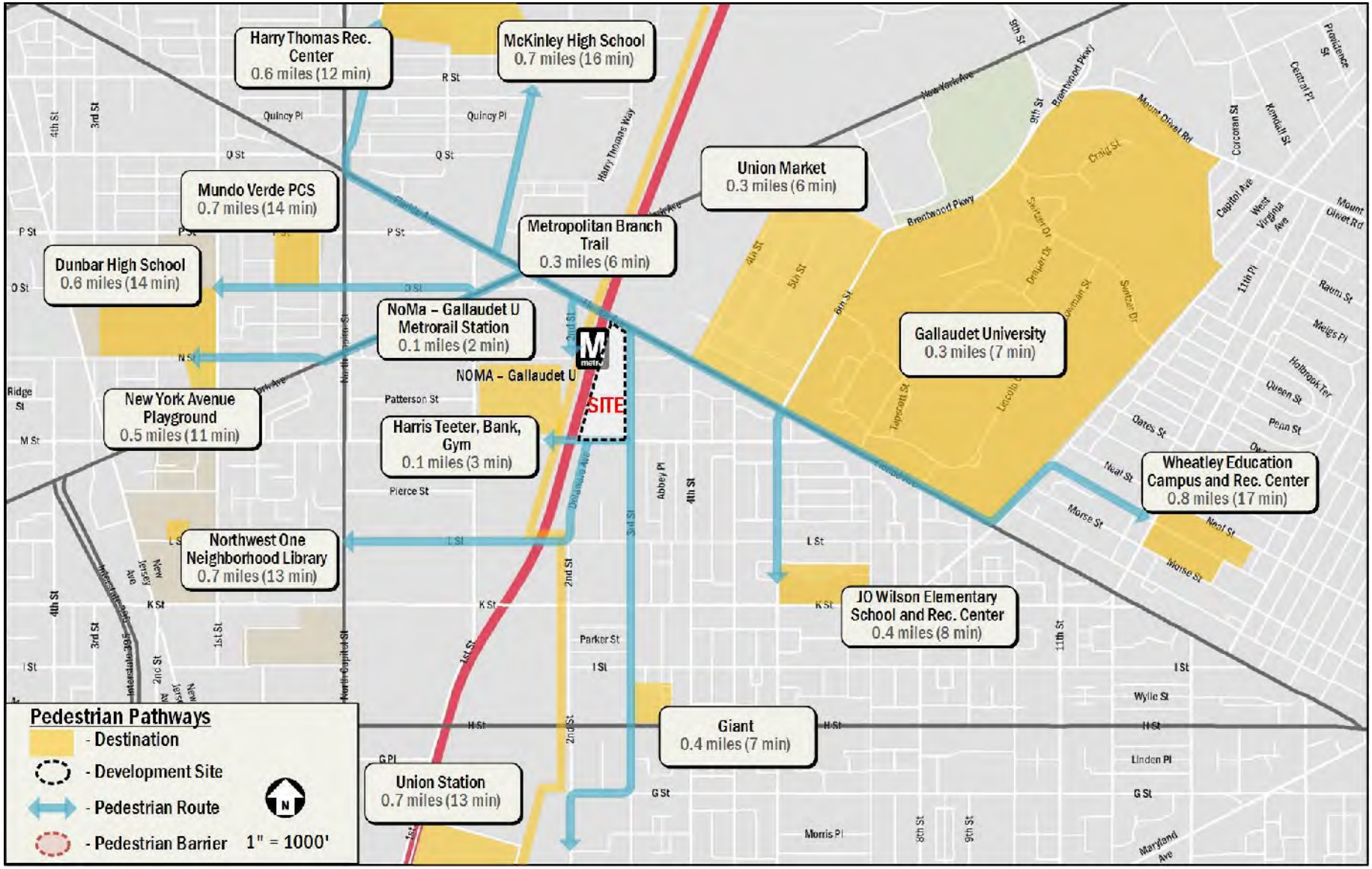

Figure 24: Pedestrian Pathways

BICYCLE FACILITIES

This section summarizes existing and future bicycle access, reviews the quality of cycling routes to and from the site, and presents recommendations.

The following conclusions are reached within this chapter:

- The site has access to one bike trail located to the west of the site, as well as existing bike lanes and cycle tracks providing access to several additional bicycle facilities.
- The site is not expected to generate a significant amount of bicycle trips, therefore all site-generated bike trips can be accommodated on existing infrastructure.
- The development will include secure bicycle parking on site, and short-term bicycle racks along the perimeter of the site.
- A Capital Bikeshare station will be installed at the site.

EXISTING BICYCLE FACILITIES

The site is well connected to existing on- and off-street bicycle facilities. East-west connectivity is provided via bike lanes along G Street, I Street, K Street, M Street, Q Street, and R Street. North-south connectivity will be primarily provided via the Metropolitan Branch Trail, which is located across M Street from the site. Figure 25 illustrates the existing bicycle facilities in the area. Under existing conditions there is no short-term bicycle parking located around the perimeter of the site.

In addition to personal bicycles, the Capital Bikeshare program provides additional cycling options for residents, employees, and patrons of the planned development. The Bikeshare program has placed over 350 Bikeshare stations across Washington DC, Arlington, and Alexandria, VA, and most recently Montgomery County, MD, with over 3000 bicycles provided. Within a quarter-mile of the site, there are two Bikeshare stations that house a total of 36 bikes. Figure 25 illustrates the existing Capital Bikeshare facilities in the area.

PROPOSED BICYCLE FACILITIES

The MoveDC plan outlines several bicycle improvements in the vicinity of the site. These improvements are broken up into four tiers that rank the priority for implementation. The four tiers are broken down as follows:

- *Tier 1*
  Investments should be considered as part of DDOT's 6-year TIP and annual work program development, if they are not already included. Some projects may be able to move directly into construction, while others become high priorities for advancement through the Project Development Process.
- *Tier 2*
  Investments within this tier are not high priorities in the early years of MoveDC implementation. They could begin moving through the Project Development Process if there are compelling reasons for their advancement.
- *Tier 3*
  Investments within this tier are not priorities for DDOT-led advancement in the early years of MoveDC's implementation. They could move forward earlier under circumstances such as real estate development initiatives and non-DDOT partnerships providing the opportunity for non-District-led completion of specific funding.
- *Tier 4*
  Generally, investments within this tier are not priorities for DDOT-led advancement and are lower priority for project development in the early years of implementation.

Due to the timeline of the proposed development, this report will focus on the Tier 1 and Tier 2 recommendations within the vicinity of the site. Tier 1 and Tier 2 recommendations include a cycle track along M Street, a trail along New York Avenue, and a cycle track along 6th Street.

Although these projects are discussed in the MoveDC plan, they are not currently funded or included in DDOT's Transportation Implementation Plan thus they will not be assumed as complete for this analysis.

As previously discussed earlier in the report, there are planned bicycle infrastructure improvements along M Street, 4th Street, and 6th Street near the site. Along M Street, the existing two-way cycle track will be extended to 4th Street NE from Delaware Avenue NE, with Shared Lane Markings from 4th Street NE to Florida Avenue NE. Along 4th Street, a two-way cycle track will replace the one-way southbound bike lane that currently exists in between Florida Avenue NE and M Street NE. Along 6th Street, a two-way cycle track will replace the existing one-way northbound and southbound bike lanes between K Street NE and Florida Avenue NE. This will be in conjunction with the

planned improvements laid forth in the *Florida Avenue Multimodal Transportation Study*. Detailed plans for each of these planned bicycle infrastructure improvements are included in the Technical Appendix. All of these planned improvement are planned to be completed before the proposed development opens.

SITE IMPACTS

This section summarizes the impacts of the development on the overall bicycle operations surrounding the site and develops recommendations for connectivity improvements.

Bicycle Trip Generation

The Central Armature Works development is expected to generate 34 bicycle trips (14 inbound, 20 outbound) during the morning peak hour and 51 bicycle trips (28 inbound, 23 outbound) during the afternoon peak hour. Although bicycling will be an important mode for getting to and from the site, with significant facilities located on site and existing and planned routes to and from the site, the impacts from bicycling will be relatively less than impacts to other modes.

On-Site Bicycle Elements

The project will provide amenities that cater to cyclists including short-term bicycle racks around the perimeter of the site and on-site secure long-term bicycle parking for residents which will increase the attractiveness of cycling to and from the site.

The development will provide approximately 220 secure bicycle parking spaces within secure bicycle parking rooms accessible from the N Street plaza, accessible to all buildings. 152 spaces will be allocated for apartment building 1 (northmost building), and 58 spaces for apartment building 2 (on southeast corner of property), meeting or exceeding the required one space per three residential units. Bicycle spaces dedicated to hotel and retail will be in the same level and house 20 spaces, exceeding the six required for these land uses. 52 Short-term bicycle parking spaces will be placed around the perimeter of the site with locations agreed upon by DDOT, set during public space permitting. This will be in the form of 26 inverted "U" shaped bicycle rack which comply with DDOT's *Bicycle Rack Design and Placement Guidelines*.

Additionally, the Applicant will fund the installation of a Capital Bikeshare station which is tentatively planned along 3rd Street, adjacent to the N Street Plaza. The final placement of the station will made in accordance with DDOT consultation. The Applicant will supply ten electric bikes and charging stations to be shared by residents and guests of the project and supply eight publically accessible electric bike charging stations.

The combination of a Capital Bikeshare station, along with the future M Street cycle track straddling the southern perimeter of the site will encourage more residents, employees, and hotel guests to seek bicycling as an alternative mode.

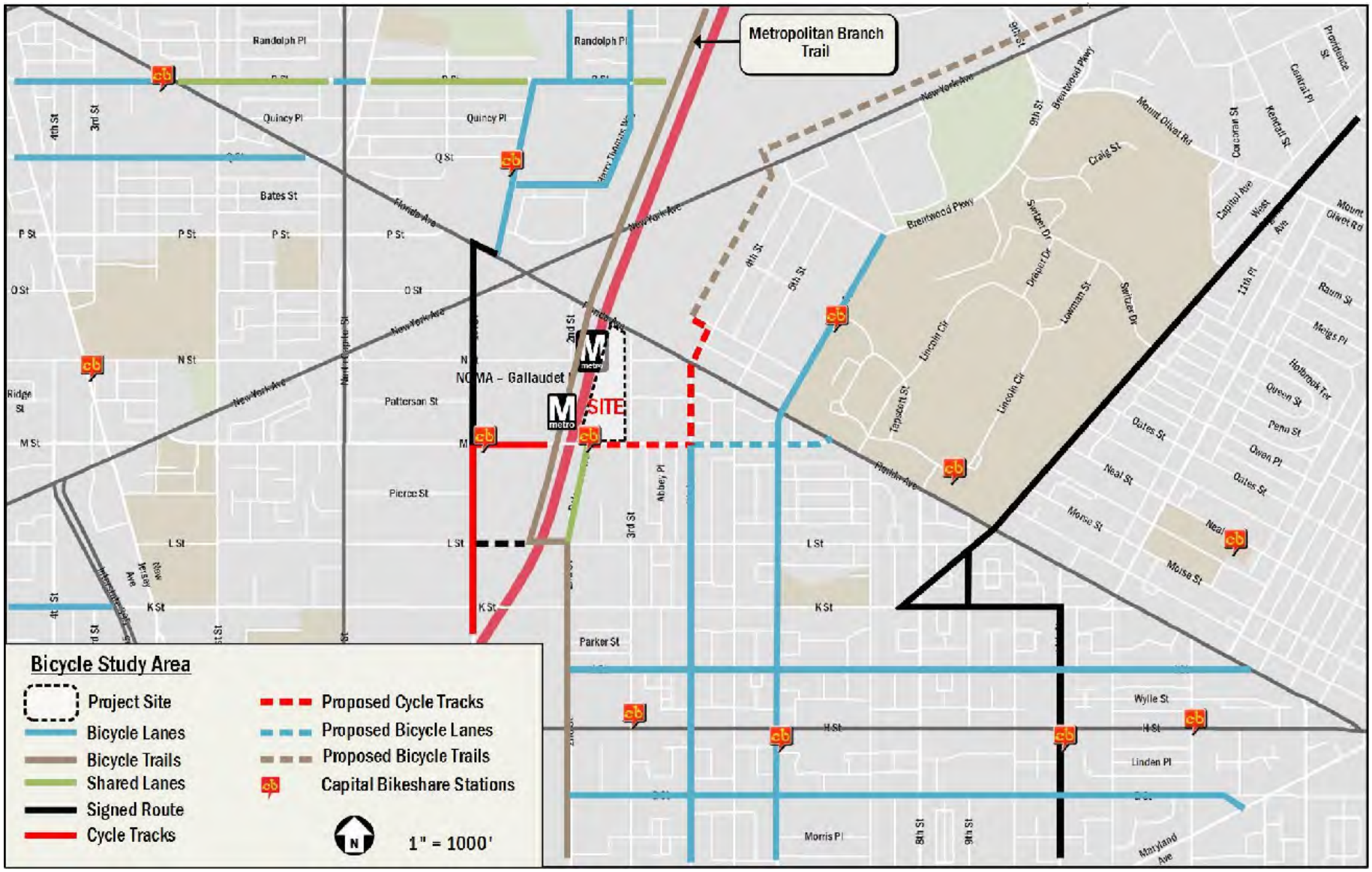

Figure 25: Existing Bicycle Facilities

CRASH DATA ANALYSIS

This section of the report reviews available crash data within the study area, reviews potential impacts of proposed development on crash rates, and makes recommendations for mitigation measures where needed.

SUMMARY OF AVAILABLE CRASH DATA

A crash analysis was performed to determine if there was an abnormally high crash rate at any study area intersection. DDOT provided the last three years of intersection crash data, from 2013 to 2016 for the study area. This data was reviewed and analyzed to determine the crash rate at each location. For intersections, the crash rate is measured in crash per million-entering vehicles (MEV). The crash rates per intersections are shown in Table 11.

According to the Institute of Transportation Engineer's *Transportation Impact Analysis for Site Development*, a crash rate of 1.0 or higher is an indication that further study is required. Seven (7) intersections in this study area meet this criterion (as shown in red in Table 11 and detailed in Table 12)

The Central Armature Works development should be developed in a manner to help alleviate, or at minimum not add to, the conflicts at these intersections.

A rate over 1.0 does not necessarily mean there is a significant problem at an intersection, but rather it is a threshold used to identify which intersections may have higher crash rates due to operational, geometric, or other issues. Additionally, the crash data does not provide detailed location information. In some cases, the crashes were located near the intersections and not necessarily within the intersection. GIS shapefile data was used to verify the physical location of crashes versus the reported location.

For these seven intersections, the crash type information from the DDOT crash data was reviewed to see if there is a high percentage of certain crash types. Generally, the reasons for why an intersection has a high crash rate cannot be derived from crash data, as the exact details of each crash are not represented. However, some summaries of crash data can be used to develop general trends or eliminate some possible causes. Table 12 contains a breakdown of crash types reported for the seven intersections with a crash rate over 1.0 per MEV.

POTENTIAL IMPACTS

This section reviews the seven locations with existing crash rates over 1.0 MEV and reviews potential impacts of the proposed development.

- *North Capitol Street & M Street*

  This intersection is over the threshold of 1.0 crashes per MEV, with a rate of approximately 1.13 crashes per MEV over the course of the 3-year study period. The majority of crashes at this intersection were rear end and side-swiped vehicles. A more exhaustive evaluation of crash data using GIS files shows approximately half of the 16 side-swiped crashes recorded and 10 of the 11 rear end crashes attributed to this intersection did not occur at the intersection. High rear end crashes are more typical at signalized intersections and may be elevated due to the

Table 11: Intersection Crash Rates

Intersection	Total Crashes	Ped Crashes	Bike Crashes	Rate per MEV*
New York Avenue & 1st Street & O Street NE	145	3	2	**2.75**
3rd Street & Florida Avenue NE	41	0	1	**2.13**
Florida Avenue & N Street NE**				0.00
Florida Avenue & 4th Street NE	16	2	0	0.66
First Street & M Street NW	30	1	0	**1.74**
North Capitol Street & M Street	53	4	2	**1.13**
First Street & M Street NE	47	5	4	**3.47**
Delaware Avenue & M Street NE	2	0	0	0.25
3rd Street & M Street NE	7	1	1	0.77
4th Street & M Street NE	11	1	0	**1.28**
2nd Street & L Street NE	8	0	1	0.70
3rd Street & L Street NE	9	1	0	0.86
2nd Street & K Street NE	27	0	1	**1.17**

** - Million Entering Vehicles; Volumes estimated based on turning movement count data*

*** - Data not available for this intersection*

atypical geometry of the northbound leg of the intersection. Side-swiped vehicles may be particularly high due to the southbound merge at North Capitol Street just past the intersection and last minute left-turning decisions from M Street to the North Capitol Street underpass or ramp. Safety concerns at this intersection are primarily due to this existing geometry. Site-generated traffic is not expected to degrade the safety at this intersection; thus no improvements are recommended as part of the PUD.

- *New York Avenue & 1st Street & O Street NE*
  This intersection is over the threshold of 1.0 crashes per MEV, with a rate of approximately 2.75 crashes per MEV. The majority of crashes at this intersection were rear-ended and side-swiped vehicles, which are consistent with crashes that could occur at intersections such as this one with the high number of turning vehicles continuing through on Florida Avenue and on to New York Avenue. GIS files show a majority of side-swiped and rear end crashes not physically occurring within the intersection. It should be noted that crash data provided by DDOT does not contain the level of detail to determine the impact that the crash rate is more a byproduct of traffic along Florida Avenue or 1st Street. As with the Florida Avenue/New York Avenue intersection, regional traffic planning solutions outside of the scope of this study are necessary to address the overall capacity and safety constraints of the Florida Avenue/1st Street intersection.

- *First Street & M Street NE*
  This intersection was found to have a high crash rate of 3.47 crashes per MEV over the course of the 3-year study period. The majority of crashes at this intersection were rear end and side-swiped vehicles. Elevated rear end and side-swiped crashes may be as a result of on-street parking along M Street and the existing traffic operations. Under existing conditions there is one lane for westbound right and left turning vehicles, which might result in vehicles attempting to maneuver past other vehicles along narrow travel lanes.

  As mentioned previously, the crash reports provided by DDOT do not provide enough information about each crash to derive what the exact causes of the high crash rate is, but a possible solution could be removing parking along the western leg of M Street near the intersection could improve visibility and reduce the instances of side-swiped vehicles.

  This report defers to DDOT's NoMa two-way conversion plan, as it is expected to address some safety concerns that currently exist at this intersection.

- *3rd Street & Florida Avenue NE*
  This intersection is over the threshold of 1.0 crashes per MEV, with a rate of approximately 2.13 crashes per MEV. The majority of crashes at this intersection were rear-ended and side-swiped vehicles. Of the 13 rear end and 22 side-swiped crashes reported, GIS data confirms only six of

Table 12: Crash Type Breakdown

Intersection	Rate per MEV	Right Angle	Left Turn	Right Turn	Rear End	Side Swiped	Head On	Parked	Fixed Object	Ran Off Road	Ped. Involved	Backing	Non-Collision	Under/Over Ride	Unspecified	Total
New York Avenue & 1st Street & O Street NE	**2.75**	11	11	9	29	51	2	2	5	0	3	7	0	0	15	**145**
		8%	*8%*	*6%*	*20%*	*35%*	*1%*	*1%*	*3%*	*0%*	*2%*	*5%*	*0%*	*0%*	*10%*	
3rd Street & Florida Avenue NE	**2.13**	0	2	1	13	22	1	0	0	0	0	1	0	0	1	**41**
		0%	*5%*	*2%*	*32%*	*54%*	*2%*	*0%*	*0%*	*0%*	*0%*	*2%*	*0%*	*0%*	*2%*	
First Street & M Street NW	**1.74**	1	2	1	6	11	0	0	2	0	1	2	0	0	4	**30**
		3%	*7%*	*3%*	*20%*	*37%*	*0%*	*0%*	*7%*	*0%*	*3%*	*7%*	*0%*	*0%*	*13%*	
North Capitol Street & M Street	**1.13**	7	5	0	11	16	0	2	3	0	4	1	0	0	4	**53**
		13%	*9%*	*0%*	*21%*	*30%*	*0%*	*4%*	*6%*	*0%*	*8%*	*2%*	*0%*	*0%*	*8%*	
First Street & M Street NE	**3.47**	2	1	2	6	19	0	4	1	1	2	4	1	0	4	**47**
		4%	*2%*	*4%*	*13%*	*40%*	*0%*	*9%*	*2%*	*2%*	*4%*	*9%*	*2%*	*0%*	*9%*	
4th Street & M Street NE	**1.28**	1	1	0	1	3	0	1	1	0	1	1	0	0	1	**11**
		9%	*9%*	*0%*	*9%*	*27%*	*0%*	*9%*	*9%*	*0%*	*9%*	*9%*	*0%*	*0%*	*9%*	
2nd Street & K Street NE	**1.17**	3	8	0	3	5	1	1	2	0	0	0	0	0	4	**27**
		11%	*30%*	*0%*	*11%*	*19%*	*4%*	*4%*	*7%*	*0%*	*0%*	*0%*	*0%*	*0%*	*15%*	

each took place at the intersection itself. These rear end and side-swiped crashes could be attributed to on-street parking along both sides of 3rd Street NE and the physical presence of the overhead railroad tracks. This report defers to the *Florida Avenue Multimodal Transportation Study*, which examined safety along the Florida Avenue corridor between New York Avenue and H Street. It is expected that the more in depth crash analyses along the corridor associated with DDOT's study will result in improved safety at this intersection, and thus decrease the number of crashes. It should be noted that crash data provided by DDOT does not contain the level of detail to determine the impact that the confined lanes created by the Florida Avenue underpass have on the crash rate.

- *4th Street & M Street NE*

  This intersection is over the threshold of 1.0 crashes per MEV, with a rate of approximately 1.28 crashes per MEV. The majority of crashes at this intersection were side-swiped vehicles. Elevated side-swiped crashes could be the result of on-street parking on both sides of the northern, eastern, and southern legs of the intersection. Side-swipe crashes can often occur when a parked vehicle attempts to merge into the travel lane. Of the three side-swipe crashes attributed to the intersection none occurred at the intersection, itself. Overall, the distribution of crash types at this intersection does not lead to one likely safety issue at the intersection.

  It should be noted that this intersection is planned to be improved by DDOT as part of the M Street, NE Cycle Track plan. It is expected that the planned intersection improvements will address the safety concerns that currently exist at this intersection.

- *First Street & M Street NW*

  This intersection is over the threshold of 1.0 crashes per MEV, with a rate of approximately 1.74 crashes per MEV. The majority of crashes at this intersection were side-swiped or rear end vehicles. GIS files show only three of the 11 and two of the six crashes occurred at the intersection itself for side-swiped and rear end crashes, respectively. Elevated rear end and side-swiped crashes may be as a result of on-street parking along M Street and the existing traffic operations. Under existing conditions there are two lanes for through traffic, which might result in vehicles attempting to maneuver past other vehicles in tight confines with parked vehicles. Side-swipe crashes can often occur when a parked vehicle attempts to merger into the travel lane. Overall, the distribution of crash types at this intersection does not lead to a likely safety issue at the intersection.

  The safety concerns at this intersection are primarily due to the existing lane configurations and operations. The site-generated traffic at this intersection is minimal and not expected to degrade the safety; thus no improvements are recommended as part of the PUD.

  It should be noted that M Street at this intersection is planned to be converted to two-way. It is expected that the planned intersection changes will address the safety concerns that currently exist at this intersection.

- *2nd Street & K Street NE*

  This intersection is over the threshold of 1.0 crashes per MEV, with a rate of approximately 1.17 crashes per MEV. The majority of crashes at this intersection were left turn and side-swiped vehicles. Elevated left turn and side swiped crashes may be as a result of the overhead railroad structure which pose an obstruction hazard turning left onto westbound M Street or turning left onto northbound 2nd Street.

  As mentioned previously, the crash reports provided by DDOT do not provide enough information about each crash to derive what the exact causes of the high crash rate is, but a possible solution could be additional signage near the intersection cautioning motorists of limited sight distance due to the overhead railroad

SUMMARY AND CONCLUSIONS

This report is a Comprehensive Transportation Review (CTR) for the Central Armature Works Planned Unit Development (PUD). This report reviews the transportation aspects of the project's Consolidated PUD application. The Zoning Commission Case Number is 16-09.

The purpose of this study is to review the design of the project and evaluate whether the project will generate a detrimental impact to the surrounding transportation network. This evaluation is based on a technical comparison of the existing conditions, and future with and without the development. This report concludes that **the project will not have a detrimental impact** to the surrounding transportation network assuming that all planned site design elements are implemented.

Proposed Project

The Central Armature Works site is currently occupied by the namesake two-story repair, supply, and construction company with an informal parking lot in the rear of the property abutting the Northeast Corridor railroad lines, which provides rail access for WMATA and Amtrak personnel. The site is bounded by M Street NE to the south, Florida Avenue NE to the north, 3rd Street NE to the east, and the Northeast Corridor rail lines to the west.

The applicant plans to develop the site into a mixed-use development including residential, retail, and hotel uses. The project will be three structures containing approximately 631 residential units, approximately 27,200 square feet of ground floor retail, and a hotel with approximately 196 rooms. Parking and loading will be accessed through a curb cut along M Street which will become the southbound approach of the existing intersection at Delaware Avenue and M Street NE.

The development will be served by a total of 356 off-street parking spaces in a below-grade parking garage, including 60 valet spaces for hotel use. The loading will be accommodated with three 30-foot loading berths and two 20-foot delivery spaces to adequately serve the demands set forth by the development program.

Pedestrian facilities along the perimeter of the site will be improved to include sidewalk and buffer widths that meet or exceed DDOT requirements. The incorporation of space for the future N Street tunnel to the NoMa Gallaudet U Metro Station will allow for greater pedestrian circulation across a major barrier in the NoMa area.

The development will supply a total of approximately 220 long-term bicycle parking spaces on the second level, exceeding the current zoning requirements.

Multi-Modal Impacts and Recommendations

Transit

The site is served by regional and local transit services such as Metrorail and Metrobus. The site is 400 feet from the NoMa-Gallaudet U Metrorail Station portal at 2nd Street and N Street, and many Metrobus stops are located within a block of the site along Florida Avenue.

Although the development will be generating new transit trips, existing facilities have sufficient capacity to handle the new trips.

Pedestrian

The site is surrounded by a well-connected pedestrian network. Most roadways within a quarter-mile radius provide sidewalks and acceptable crosswalks and curb ramps, particularly along the primary walking routes. There are some pedestrian barriers surrounding the site such as limited connectivity due to the rail tracks to the west.

As a result of the development, pedestrian facilities along the perimeter of the site will be improved, most notably by removing all existing curb cuts around the perimeter of the site and the development of a public plaza adjacent to N Street. The N Street Plaza will be the entrance to the future pedestrian tunnel connecting to the NoMa Gallaudet U Metro Station, allowing a more direct and conflict-free passageway to the other side of the railway tracks.

The development will improve sidewalks adjacent to the site such that they meet or exceed DDOT requirements and provide an improved pedestrian environment.

Bicycle

The site is very well served by existing and proposed bicycle infrastructure. The site is just blocks away from trails and bike lanes, such as the Metropolitan Branch Trail to the west and bike lanes along 4th Street and 6th Street to the east of the site. A future cycle track along M Street will provide additional connectivity.

On site, the development will provide short-term bicycle parking along the perimeter of the site and 220 on-site secure long-term bicycle parking for residents and employees of the development.

Vehicular

The site is well-connected to regional roadways such as I-395 and US-50, principal and minor arterials such as Florida Avenue and 6th Street, and an existing network of collector and local roadways.

In order to determine if the proposed development will have a negative impact on this transportation network, this report projects future conditions with and without the development of the site and performs analyses of intersection delays. These delays are compared to the acceptable levels of delay set by DDOT standards to determine if the site will negatively impact the study area.

The analysis concluded that all intersections that are impacted due to PUD generated traffic have readily implementable mitigation measures, which range from simple signal timing adjustments to making changes in the roadway configuration that are concurrent with recommendations made in DDOT planning studies of the local area.

Summary and Recommendations

This report concludes that the PUD will not have a detrimental impact to the surrounding transportation network for the following reasons:

- The vehicular trips generated by the PUD will be around one new car every 14 seconds during the busiest traffic hour of the day. Impact of new PUD traffic will be negligible when spread across the nearby roadway network.
- The analysis conducted within this report showed that all intersections that are impacted due to PUD generated traffic have readily implementable mitigation measures, which range from simple signal timing adjustments to making changes in the roadway configuration that are concurrent with recommendations made in DDOT planning studies of the local area.
- Adequate on-site parking to accommodate all residents, employees, and guests of the PUD, with additional on-street parking spaces created with the elimination of curb cuts on 3rd Street.
- The improved pedestrian network in and around the site.
- The Applicant is working with WMATA to allow the construction of a future pedestrian tunnel from the development to the NoMa-Gallaudet U Metrorail Station, creating a buffer between pedestrians and vehicular conflicts.
- The site's close proximity to Metrorail, and proposed TDM plan.
- The inclusion of secure long-term bicycle parking spaces on-site that greatly exceed zoning requirements, as well as a bike service area.
- The Applicant is funding a new Capital Bikeshare station and one year of maintenance for the neighborhood.
- The Applicant is purchasing ten electric bikes and installing ten electric bike charging stations to be shared by residents and guests. Additionally, the Applicant is installing eight publically accessible electric bike charging stations.
- The Applicant is devoting six parking spaces for electric car charging stations.
- The Applicant is providing 20 shopping carts for tenants to run daily errands and grocery shopping.
- The PUD is designed to integrate with future cycle tracks along M Street, further encouraging residents, employees, and hotel guests to use the on-site enclosed bicycle facilities.