

Exhibit C

**GATEWAY MARKET
TRANSPORTATION IMPACT STUDY
WASHINGTON, DC**

Submitted on behalf of:
Edens

Prepared by:
Wells + Associates, Inc.

October 2013

TABLE OF CONTENTS

	<u>PAGE</u>
Section 1	
INTRODUCTION	I
OVERVIEW	I
Site Location	I
Proposed Development	I
STUDY SCOPE	I
Overview	I
Study Area	I
Study Objectives	2
CONCLUSIONS AND RECOMMENDATIONS	3
Section 2	
BACKGROUND INFORMATION	4
EXISTING LAND USE	4
Site Land Use	4
Surrounding Land Use	4
ROADWAY NETWORK	4
Table 2-1: Public Roadway Network Details	4
Florida Avenue Multimodal Transportation Study	4
PUBLIC TRANSPORTATION FACILITIES AND SERVICES	5
Metrorail	5
Metrobus	5
Table 2-2: Metrobus Service (number of trips)	5
Table 2-3: Transit Headways	6
BICYCLE FACILITIES	7
Table 2-4: Bicycle Levels of Service	7
PEDESTRIAN FACILITIES	7
CAPITAL BIKESHARE	8
CAR SHARING SERVICES	8
SAFETY ANALYSIS	9
Table 2-5: Crash Data Summary	9
Section 3	
EXISTING CONDITIONS ANALYSIS	11
TRAFFIC VOLUMES	11
CAPACITY ANALYSIS	11
Table 3-1: Existing Levels of Service	12
Section 4	
FUTURE BACKGROUND CONDITIONS	13
TRAFFIC VOLUMES	13
Overview	13
Regional Growth	13
Pipeline Developments	13
Background Forecasts	14
Planned Improvements	14
CAPACITY ANALYSIS	14
Table 4-1: 2017 Background Levels of Service	15
QUEUE ANALYSIS	15
Table 4-2: 95 th Percentile Queue Summary 2017 Background Conditions	16

TABLE OF CONTENTS (CONTINUED)

	<u>PAGE</u>
Section 5	
SITE ANALYSIS	17
OVERVIEW.....	17
SITE ACCESS.....	17
SITE LOADING.....	17
Loading Requirements.....	17
<i>Table 5-1: DCMR Loading Requirements</i>	17
Proposed Loading.....	18
Loading Management.....	18
SITE PARKING	18
Vehicular Parking Requirements.....	18
Proposed Vehicular Parking.....	18
Bicycle Parking.....	19
TRANSPORTATION DEMAND MANAGEMENT MEASURES	19
TRIP GENERATION ANALYSIS	19
Total Trips.....	19
Internal Trips	19
Non-Auto Trips	20
Pass-By Trips	20
New External Vehicular Trips.....	20
SITE TRIP DISTRIBUTION AND ASSIGNMENT	20
<i>Table 5-1: Site Trip Generation Summary</i>	22
Section 6	
TOTAL FUTURE CONDITIONS	23
TRAFFIC FORECASTS	23
PROPORTIONAL IMPACT ANALYSIS	23
<i>Table 6-1: Proportional Impact Analysis</i>	23
CAPACITY ANALYSIS.....	23
<i>Table 6-2: 2017 Total Future Conditions Levels of Service</i>	24
QUEUE ANALYSIS	25
<i>Table 6-3: 95th Percentile Queue Summary (in feet) 2017 Total Future Conditions</i>	25
IMPROVEMENT ANALYSIS TO MITIGATE PROJECT IMPACTS	26
<i>Table 6-4: 2017 Total Future Conditions Levels of Service with Improvements</i>	27
<i>Table 6-5: 95th Percentile Queue Summary (in feet) 2017 Total Future Conditions with Improvements</i>	28
Section 7	
CONCLUSIONS AND RECOMMENDATIONS	29
REFERENCES	30

LIST OF FIGURES

<u>FIGURE</u>	<u>TITLE</u>
1-1	Site Location
1-2A	Site Plan – Ground Floor
1-2B	Site Plan – G1 Parking Level
1-2C	Site Plan – G2 Parking Level
2-1	Existing Lane Use and Traffic Control
2-2	Alternative Travel Modes
2-3	Bicycle Access to Metrobus and Metrorail
2-4	Pedestrian Access to Metrobus and Metrorail
3-1	Existing Peak Hour Vehicular Traffic Volumes
4-1	Existing Volumes + Regional Growth to 2017
4-2	Pipeline Trip Forecasts
4-3	2017 Background Traffic Forecasts
4-4	Background Lane Use and Traffic Control
5-1	Preferred Truck Routing
5-2	Residential Site Trips
5-3	Retail Site Trips
5-4	Total Site Trips
6-1	2017 Total Future Traffic Forecasts
6-2	Total Future Lane Use and Traffic Control

LIST OF APPENDICES

<u>APPENDIX</u>	<u>TITLE</u>
A	Scoping Document
B	New York Avenue Priority Corridor Recommendations
C	Traffic Count Data
D	DDOT Traffic Signal Timings
E	Level of Service Descriptions
F	Level of Service Reports for Existing Conditions
G	Pipeline Information
H	Level of Service Reports for 2017 Background Conditions
I	Queue Reports for 2017 Background Conditions
J	Previous Curb Cut Justification Documents
K	Trip Generation Details
L	Level of Service Reports for 2017 Total Future Conditions
M	Queue Reports for 2017 Total Future Conditions
N	Synchro Reports for 2017 Total Future Conditions with Improvements

Section I INTRODUCTION

OVERVIEW

This report presents a Transportation Impact Study (TIS) conducted in support of the Planned Unit Development (PUD) modification filed by Gateway Market Center, Inc. (herein referred to as the Applicant). If approved, the project would include a mixed-use development consisting of approximately 155,200 square feet (SF) of residential development and approximately 27,500 SF of retail on the northwest corner of the Florida Avenue/4th Street intersection in the northeast quadrant of the District. The case is scheduled to be heard by the District of Columbia Zoning Commission (ZC) on December 5, 2013 (ZC Case # 06-40C).

Site Location

The proposed site is located in Ward 5 on Square 3587, Lot 8 at 340 Florida Avenue NE, Washington, DC, as shown on Figure I-1. The site generally is bounded by Florida Avenue to the south, 4th Street to the east, and Morse Street to the north. An existing Burger King is adjacent to the site to the west.

The site is located ¼ mile from the NoMA – Gallaudet University Metro Station.

Proposed Development

The Applicant proposes to develop the vacant site with a mixed-use development consisting of residential and retail uses known as Gateway Market. The development plan includes approximately 188 residential units¹ and approximately 27,500 SF of retail space. Approximately 215 parking spaces would be provided in a two and a half-level below-grade garage. Access to the garage would be provided via a curb cut on Florida Avenue. The proposed plan

for the development is shown on Figures I-2A, I-2B, and I-2C.

The purpose of this report is to determine the impact of the proposed Gateway Market and recommend improvements required to mitigate the impact at full build out (2017).

STUDY SCOPE

Overview

This report presents the results of a transportation impact study. The scope of the study and proposed methodologies were approved by the District Department of Transportation (DDOT) prior to beginning the study. The agreed upon scoping document is included in Appendix A.

Study Area

The study area was selected based on those intersections that potentially could be affected by the proposed development. The following intersections were selected, in consultation with DDOT, for detailed analysis:

1. Florida Avenue/2nd Street,
2. Florida Avenue/3rd Street,
3. Florida Avenue/N Street,
4. Florida Avenue/4th Street,
5. Florida Avenue/5th Street,
6. Florida Avenue/6th Street,
7. 4th Street/Morse Street, and
8. New York Avenue/4th Street.

¹ At the time that this study was undertaken, up to 216 residential units were proposed. Currently, 188 residential units are planned; however, the analyses contained herein evaluated 216 residential units. The new development plan would generate eight fewer trips in both the AM and PM peaks; therefore, the analyses were left unchanged and should be considered conservative.

Study Objectives

The objectives of this study were to:

1. Evaluate existing traffic conditions at the study intersections,
2. Evaluate future traffic conditions without the proposed development,
3. Evaluate future traffic conditions with the proposed development at anticipated build out and full occupancy,
4. Identify existing mode choice alternatives,
5. Identify any traffic operational impacts associated with the proposed development,
6. Evaluate the effectiveness of the proposed loading facilities, and
7. Recommend transportation improvements to promote the safe and efficient flow of vehicular, pedestrian, and bicycle traffic associated with the proposed development.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this study are as follows:

1. The development of Gateway Market would result in a mixed-use project including approximately 188 residential units, approximately 27,500 SF of retail space (potentially comprised of a grocery store and a restaurant), and 215 parking spaces in two and a half below-grade parking levels.
2. With the proposed development, the number of curb cuts for the site will be reduced from seven to two.
3. Access to the proposed development would be provided via a right-in/right-out/left-in driveway on Florida Avenue. Left turn ingress at the driveway will be facilitated by gaps created by the adjacent signalized intersections and by the phasing at the Florida Avenue/4th Street traffic signal. Left turn egress will be restricted (details of the restriction will be determined during the public space process).
4. Loading for the site will be provided from Morse Street on the north side of the site. A loading management plan will be implemented, which includes designation of an on-site loading manager, to help facilitate loading operations.
5. The Applicant has agreed to implement a TDM program which will include strategies to encourage non-auto modes of transportation.
6. The project will include approximately 72 bicycle parking spaces located on the first garage level. The site is required to provide only 63 bicycle parking spaces.
7. DDOT has initiated a multimodal safety and planning study for Florida Avenue to evaluate safety, streetscape, and operational enhancements to improve safety for all roadway users.
8. Under existing conditions, a few study intersections have one or more lane groups that operate near or at capacity during the AM and PM peak hours.
9. Under future conditions without the proposed development, some lane groups at the study intersections will experience increased delay compared to existing conditions due to increases in traffic from growth outside the immediate site vicinity and increases associated with planned or approved but not yet constructed developments in the study area.
10. The proposed development is anticipated to generate an estimated 91 new AM peak hour vehicular trips and 158 new PM peak hour vehicular trips.
11. The proposed development will have a marginal impact on the traffic operations.
12. The following signal timing adjustments should be made at the Florida Avenue/4th Street intersection :
 - In the PM peak hour, shift one second from Phase 2 (eastbound) to Phase 6 (westbound) and shift two seconds from Phase 2 (eastbound) to Phase 8 (southbound).
13. In conjunction with the proposed streetscape improvements on Morse Street, the Applicant should install the following improvements:
 - A stop bar on Morse Street for eastbound traffic,
 - A new stop sign for eastbound traffic located adjacent to the stop bar and two feet behind the curb, and
 - A no parking sign placed such that no on-street, parallel parking is permitted within 25 feet of the stop bar or 40 feet from the edge of 4th Street (whichever is greater).

Section 2 BACKGROUND INFORMATION

EXISTING LAND USE

Site Land Use

Lots 5, 800, 802, and 809 and parcels 129/32 and 129/9 in Square 3587 were rezoned from C-M-1 to C-3-C in conjunction with the initial PUD approval granted by the Zoning Commission (Order number 06-40) on November 10, 2008. The rezoned lots have been joined together, creating Lot 8 on which the development is proposed.

The currently undeveloped site is located in Ward 5 in the Florida Market neighborhood in the northeast quadrant of the District. The site generally is bounded by Florida Avenue to the south, 4th Street to the east, Morse Street to the north, and Burger King to the west.

Surrounding Land Use

The proposed project is located within the Florida Avenue Market, which is an existing warehouse district that includes a variety of wholesale and retail uses.

Gallaudet University is located three blocks east of the site. Residential neighborhoods lie further to the east and to the south of the site. The site also lies just outside of the NoMA (North of Massachusetts Avenue) boundary.

ROADWAY NETWORK

New York Avenue (Route 50) provides regional access to the site; Florida Avenue, 1st Street, and 6th Street provide local access to the site. Direct access to the site is proposed to be provided via a curb cut on Florida Avenue between 3rd Street and 4th Street.

The roadway network characteristics for the roadways in the study area are summarized in Table 2-1. The existing lane use and traffic control is as shown on Figure 2-1.

Table 2-1
Public Roadway Network Details

Road Name	Functional Classification	ADT (vpd)*	Speed Limit (mph)
Florida Avenue	Principal Arterial	27,000	25
New York Avenue	Principal Arterial	57,000	30
2 nd Street	Local	N/A	25
3 rd Street	Local	N/A	25
4 th Street	Collector (South of Florida)	3,000	25
	Local (North of Florida)	4,200	25
5 th Street	Local	N/A	25
6 th Street	Collector (South of Florida)	7,300	25
	Minor Arterial (North of Florida)	10,000	25
N Street	Local	N/A	25
Morse Street	Local	N/A	25
* The average daily traffic (ADT) volume is based on data collected in 2010, which is the most recent data available.			

Florida Avenue Multimodal Transportation Study

In June 2013, DDOT initiated a multimodal safety and planning study for Florida Avenue between New York Avenue and H Street/Benning Road. The study is intended to evaluate safety, streetscape, and operational improvements to ensure safe access for all roadway users. The first of three public meetings for the study was held on Wednesday, June 19, 2013 in which residents expressed their desire for reduced traffic speeds, safe access for pedestrians and bicyclists, and increased connectivity for all users.

Based on our understanding, DDOT will be evaluating improvements to Florida Avenue that potentially could include reducing the number of travel lanes on Florida Avenue and increasing sidewalk widths, among others.

PUBLIC TRANSPORTATION FACILITIES AND SERVICES

The subject site is well-served by both Metrobus and Metrorail, as shown in Figure 2-2.

Metrorail

The proposed development site is located less than a ten minute walk from the NoMA-Gallaudet University Metro Station (NoMA Metro Station). The NoMA Metro Station is located at 200 Florida Avenue, NE. Access to the Metro station is provided on the east side of 2nd Street at its intersection with N Street and on M Street just west of its intersection with Delaware Avenue.

The NoMA Metro Station serves Metro's Red Line and provides direct service to Union Station, Metro Center, and stations in Montgomery County, MD. Red Line passengers can transfer to the Green and Yellow Lines at Gallery Place – Chinatown and to the Blue and Orange Lines at Metro Center.

Metrobus

The Washington Metropolitan Area Transit Authority (WMATA) currently provides public bus service near the proposed development site.

Metrobus service in the site vicinity includes the U Street-Garfield Line (Metrobus Routes 90, 92, and 93) and the Benning Road Line (Metrobus Route X3). These Metrobus routes run along Florida Avenue with multiple stops in the study area (three southbound stops between 2nd Street and 5th Street and two northbound stops between 3rd Street and 5th Street) as shown in Figure 2-2.

A total of 120 bus-trips are operated on these lines on a typical weekday, 197 bus-trips on a typical Saturday, and 168 bus-trips on a typical Sunday, as shown in Table 2-2.

Table 2-2
Metrobus Service (number of bus-trips)

Line	Weekday Service	Saturday Service	Sunday Service	Total
90,92,93: U-Street-Garfield Line	108	197	168	473
X3: Benning Road Line	12	--	--	12
Total	120	197	168	485

Table 2-3 presents the minimum, maximum, and average headways for the bus routes in the site vicinity for the weekdays and weekends.

Table 2-3
Transit Headways

Route	Headway	Weekday			Weekend		
		AM Peak (7AM-10AM)	PM Peak (4PM-7PM)	Off Peak (7PM-10PM)	Saturday Peak (8AM-6PM)	Sunday AM Peak (8AM-1PM)	Sunday PM Peak (3PM-8PM)
Northbound/Westbound							
90, 92, 93	Min	0:07	0:04	0:12	0:11	0:13	0:13
	Max	0:08	0:10	0:16	0:13	0:20	0:16
	Avg	0:08	0:09	0:14	0:12	0:15	0:15
X3	Min	0:20	N/A	N/A	N/A	N/A	N/A
	Max	0:29	N/A	N/A	N/A	N/A	N/A
	Avg	0:24	N/A	N/A	N/A	N/A	N/A
Southbound/Eastbound							
90, 92, 93	Min	0:07	0:07	0:10	0:11	0:12	0:14
	Max	0:08	0:13	0:17	0:12	0:17	0:16
	Avg	*	0:09	0:14	0:12	0:15	0:15
X3	Min	N/A	0:20	N/A	N/A	N/A	N/A
	Max	N/A	0:36	N/A	N/A	N/A	N/A
	Avg	N/A	0:32	N/A	N/A	N/A	N/A
* Route departures are scheduled every 7 to 8 minutes. Specific times are not given in the timetable; therefore, the average cannot be calculated.							
N/A – route does not run during this time.							

BICYCLE FACILITIES

Currently, there are multiple designated bicycle lanes and routes within the site vicinity. Designated bicycle lanes are present on 4th Street and 6th Street south of Florida Avenue. Additionally, bicyclists can access the Metropolitan Branch Trail via M Street and L Street south of the NoMA Metro Station.

Bicyclists must share the roads with vehicular traffic along Florida Avenue.

The District of Columbia Bicycle Master Plan¹ (the Plan) seeks to create a more bicycle-friendly city by establishing high quality bicycle facilities and programs that are safe and convenient.

The bicycle levels of service (BLOS) in the site vicinity are presented in the Plan and have been replicated in Table 2-4.

Table 2-4
Bicycle Levels of Service

Roadway	Bicycle LOS
Florida Avenue	E
New York Avenue	E
2 nd Street	N/A
3 rd Street	N/A
N Street	N/A
4 th Street (between Morse and Florida)	A
4 th Street (south of Florida Avenue)	C
4 th Street (north of Morse Street)	N/A
5 th Street	N/A
6 th Street (north of Florida Avenue)	B
6 th Street (south of Florida Avenue)	D
Morse Street	N/A

The Plan recommends the extension of the Metropolitan Branch Trail north from New York Avenue beyond Rhode Island Avenue. This extension of the Metropolitan Branch Trail north has been completed since the Plan was released. Plans for a trail or bikeway connecting Mt. Vernon Square to the National Arboretum, Fort Lincoln area, and Anacostia River Trail System in Prince George's County were also proposed in the Plan.

Finally, the Plan identifies areas and corridors that are barriers to cyclists. These barriers include “freeways, railroad and highway grade separations, neighborhoods with heavy traffic, and other impediments to bicycle travel.”² No barrier areas or corridors identified in the Plan fall within the site vicinity.

The likely bicycle routes to nearby bus stops, multi-use paths, and the NoMA Metro Station entrances are as shown on Figure 2-3.

PEDESTRIAN FACILITIES

The District of Columbia Pedestrian Master Plan³ (the Plan) strives to make Washington, DC safer and more walkable by improving sidewalks, roadway crossings, and the quality of the pedestrian environment as well as by ensuring that the District's policies and procedures support walking.

The Plan provides an overview of existing pedestrian conditions, recommends new pedestrian projects and programs, establishes performance measures, and provides a plan for implementation through 2018.

The Plan estimates areas of pedestrian activity and deficiency. Within the site vicinity, Florida Avenue contains areas of average pedestrian activity and average pedestrian deficiency, New York Avenue contains areas of moderate pedestrian activity and moderate pedestrian deficiency. Sixth Street contains areas of low pedestrian activity and low pedestrian deficiency.

As part of the Plan, eight priority corridors (one in each ward) were identified based on areas of heavy pedestrian traffic and deficient walking conditions. The priority corridor in Ward 5 is Bladensburg Road from Benning Road NE to Eastern Avenue NE and, therefore, is outside of the study area. However, the priority corridor in Ward 2 is New York Avenue from 15th Street NW to Penn Street NE. Several improvements are recommended along New York Avenue including high visibility crosswalks, new curb ramps, additional sidewalk to close existing gaps, widened islands, widened sidewalks, reduced turning radii, curb extensions, and right-turn restrictions.

The New York Avenue Priority Corridor Recommendations are included in Appendix B.

The pedestrian crossings at the signalized intersections in the study area include painted, high-visibility crosswalks with the exception of the 4th Street crossing at New York Avenue. Each signalized intersection also includes countdown pedestrian signal heads at every crossing with the exception of the western Florida Avenue crossing at the 3rd Street intersection.

The curb ramps at the signalized intersections are primarily non-compliant with the DDOT Design and Engineering Manual⁴ (DEM) requirements. Each pedestrian crossing is required to have a dedicated curb ramp with detectable warning surfaces. At the Florida Avenue/3rd Street intersection, all curb ramps are compliant with the DEM with the exception of the 3rd Street crossing on the southeast corner of the intersection. At the Florida Avenue/4th Street intersection, all of the curb ramps contain detectable warning surfaces; however, the northwest corner consists of only one curb ramp for both crosswalks. At the remaining signalized study intersections, the curb ramps on each corner are non-compliant.

The unsignalized study intersections of Florida Avenue/N Street and Morse Street/4th Street include high visibility, marked crosswalks; however, the curb ramps are not compliant with the DEM requirements as they do not include detectable warning surfaces. The unsignalized Florida Avenue/2nd Street intersection includes compliant curb ramps but does not include crosswalks. However, the approved traffic signal design for this intersection includes high visibility crosswalks on the south and east legs of the intersection.

The likely pedestrian paths from the subject site to the nearby bus stops and the NoMA Metro Station entrances are as shown on Figure 2-4.

CAPITAL BIKESHARE

Capital Bikeshare is an automated bicycle rental or bicycle sharing program that provides over 1,800 bicycles at more than 200 stations across Washington, DC Arlington, VA, and Alexandria, VA.

Membership, which is required to use Capital Bikeshare, includes six options for joining: 24 hours (\$7), three days (\$15), daily key (\$10 + \$7/day), monthly (\$25), annually (\$75), or annually with monthly installments (\$84 or 12 monthly payments of \$7). The first 30 minutes of use are free; users then are charged a usage fee for each additional 30-minute period. Bicycles can be returned to any station with an available dock.

The site's closest Bikeshare station is located at the intersection of M Street and Delaware Avenue, southeast of the NoMA Metro Station. This station includes 23 docks. Additional Bikeshare stations are located in the vicinity. All nearby Bikeshare station locations are shown on Figure 2-2.

CAR SHARING SERVICES

Zipcar is an automated car rental or car sharing system in the Washington, DC area. Zipcar users must fill out an application online and then will receive a Zipcard, which enables them to reserve Zipcars at any of the locations. Users pay either an hourly or daily rental fee to utilize the car for their reserved time slot. Cars must be returned to the same designated parking space at which it was picked up.

The nearest Zipcar location is at Constitution Square (Harris Teeter Garage, 1201 1st Street NE), which is approximately 0.4 miles from the subject site. One vehicle is stationed at this location. Additional Zipcars are located in the vicinity of the site. Zipcar locations around the site are shown in Figure 2-2.

In addition to Zipcar, Car2Go, Enterprise CarShare, and Hertz on Demand also have begun operating car-sharing services in the District. Car2Go requires a one-time application fee. Once registered, a member card is issued, which enables members to access any available car. No reservation is required and car usage is charged by the minute, with hourly and daily maximum fees. Unlike Zipcar, a Car2Go vehicle does not have to be returned to its original location; a Car2Go vehicle can be returned to any approved parking location. Car2Go currently has 400 vehicles in the District.

Enterprise CarShare began service in DC in late September 2013 with 45 vehicles and 40 locations. Membership to the car-sharing service is \$40 annually and cars can be reserved by the hour or day (hourly and daily fees are charged per usage). In the District, cars must be returned to their original location.

Hertz on Demand has no annual fee. Cars can be reserved by the hour or day (hourly and daily fees are charged per usage). In the District, cars must be returned to their original location. The nearest Hertz on Demand car location is at the nearby Courtyard Marriott (1325 2nd Street, NE). Two vehicles are stationed at this location. Additional Hertz on Demand stations are located in the vicinity. All nearby locations are shown on Figure 2-2.

SAFETY ANALYSIS

Crash data at the study intersections were obtained from DDOT. The information provided by DDOT included the total number of crashes over the latest three years of available data (i.e. 2010, 2011, and 2012) at each intersection and was further categorized by type of crash.

Based on this data, Table 2-5 shows the overall intersection crash rates at each of the study intersections.

Table 2-5
Crash Data Summary*

Intersection	Number of Crashes	Rate
Florida Avenue/2 nd Street	18	0.57
Florida Avenue/3 rd Street	46	1.40
Florida Avenue/N Street	6	0.20
Florida Avenue/4 th Street	17	0.50
Florida Avenue/5 th Street	9	0.27
Florida Avenue/6 th Street	24	0.59
4 th Street/Morse Street	23	4.26
New York Avenue/4 th Street	83	1.24

* Number of crashes presented in table is the number of crashes that occurred in 2010, 2011, and 2012 combined. The crash rate presented in the table is expressed in number of crashes per MEV.

As a point of reference, we reviewed the crash rates for the 100 intersections in the District with the highest crash rates (found in DDOT's *Traffic Safety Report Statistics 2009-2011*)⁵. The crash rates for the top 100 intersections ranged from 1.57 to 5.21. As shown in Table 2-5, the crash rates for the majority of the intersections are significantly below this range.

The Florida Avenue/3rd Street intersection is approaching the lower end of the range. More detailed information regarding causation factors and types of crashes must be evaluated to determine appropriate improvements to improve the safety of the intersection.

The crash rate at the 4th Street/Morse Street intersection falls within the range of the top 100 intersections. Although detailed information regarding causation factors was not obtained, a review of the intersection indicates that a significant amount of perpendicular parking is present on each of the approaches to the intersection. Because this parking is within the functional area of the intersection, it is possible that crashes involving back-in/back-out parking maneuvers were included in the crash data for the intersection (of note, five of the 23 crashes, or 22 percent, were coded as “backing” crashes).

Additionally, stop bars are lacking on the side street (Morse Street) approaches, and the stop signs on these approaches have low visibility when large vehicles are parked on-street.

With redevelopment of the site, the curb along the Morse Street frontage will be relocated to the north approximately 15 feet. This will allow the width of Morse Street to be reduced to a more conventional roadway width. In conjunction with the proposed streetscape improvements, the Applicant should implement the following improvements:

- Install a stop bar on Morse Street for eastbound traffic,
- Place the stop sign for eastbound traffic two feet behind the curb adjacent to the stop bar, and
- Restrict on-street parallel parking on the south side of Morse Street for a distance of 25 feet behind the stop bar and 40 feet back from the edge of 4th Street (whichever is more conservative), in accordance with the Design and Engineering Manual.

Section 3 EXISTING CONDITIONS ANALYSIS

TRAFFIC VOLUMES

Turning movement, bicycle, and pedestrian counts were conducted at the following intersections on Tuesday, March 20, 2012 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM:

- Florida Avenue/4th Street and
- 4th Street/Morse Street.

Turning movement, bicycle, and pedestrian counts were conducted at the following intersections, on Tuesday, June 5, 2012 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM:

- Florida Avenue/3rd Street,
- Florida Avenue/5th Street,
- Florida Avenue/6th Street, and
- New York Avenue/4th Street.

Turning movement, bicycle, and pedestrian counts were conducted at the Florida Avenue/2nd Street intersection on Wednesday, January 16, 2013 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM.

Based on the data collected, individual intersection peaks were determined for the study area and were used for all subsequent analyses.

Existing peak hour baseline traffic volumes are summarized on Figure 3-1. Traffic count data are included in Appendix C.

CAPACITY ANALYSIS

Capacity/level of service (LOS) analyses were conducted at the study intersections based on the existing lane use and traffic control shown on Figure 2-1, baseline traffic volumes shown on Figure 3-1, and traffic signal timings obtained from DDOT, included in Appendix D.

Synchro software (Version 7, Build 773) was used to evaluate levels of service at the study intersections during the AM and PM peak hours. Synchro is a macroscopic model used to evaluate the effects of changing intersection geometrics, traffic demands, traffic control, and/or traffic signal settings and to optimize traffic signal timings. The levels of service reported were taken from the Highway Capacity Manual 2000 (HCM) reports generated by Synchro. Levels of service descriptions are included in Appendix E.

The results of the analyses are summarized in Table 3-1. Capacity analysis worksheets are included in Appendix F.

As shown in Table 3-1, a few intersection lane groups currently are operating at or near capacity under existing conditions, as described below:

- The eastbound approach to the Florida Avenue/4th Street intersection operates at a LOS E during the AM peak hour,
- The northbound approach to the Florida Avenue/5th Street intersection operates at a LOS E during PM peak hour,
- The northbound approach to the Florida Avenue/6th Street intersection operates at a LOS F during the AM peak hour,
- The westbound approach to the New York Avenue/4th Street intersection operates at a LOS F during the AM peak hour, while the eastbound approach operates at a LOS F during the PM peak hour, and
- The New York Avenue/4th Street intersection operates at an overall LOS F during the AM and PM peak hours.

Table 3-1
Existing Levels of Service

Intersection/ Lane Group*	AM Peak	PM Peak
1: Florida Avenue/2nd Street		
NBR	B	B
2: Florida Avenue/3rd Street		
EBLTR	A	B
WBLTR	A	C
NBLTR	C	D
SBLTR	C	C
OVERALL	A	C
3: Florida Avenue/N Street		
NBR	A	A
4: Florida Avenue/4th Street		
EBLTR	E (74.9)	C
WBLTR	B	D
SBLTR	D	D
OVERALL	D	C
5: Florida Avenue/5th Street		
EBLTR	A	A
WBLTR	A	A
NBLTR	D	E (55.2)
SBLTR	D	D
OVERALL	A	A
6: Florida Avenue/6th Street		
EBLTR	A	B
WBLTR	B	C
NBLTR	F (101.7)	C
SBL	D	C
SBT	D	B
SBR	C	B
OVERALL	C	C
7: 4th Street/Morse Street		
EBTR	B	B
WBLT	C	B
NBLR	A	A
SBLTR	A	A
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh		

Table 3-1 (continued)
Existing Levels of Service

Intersection/ Lane Group*	AM Peak	PM Peak
8: New York Avenue/4th Street		
EBTR	C	F (173.1)
WBLT	F (106.7)	A
NBL	D	D
NBR	B	B
OVERALL	F (81.3)	F (91.7)
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh		

Section 4 FUTURE BACKGROUND CONDITIONS

TRAFFIC VOLUMES

Overview

In order to forecast year 2017 background traffic volumes in the study area without the proposed development, increases in traffic associated with growth outside the immediate site vicinity (regional growth) and increases in traffic associated with planned or approved but not yet constructed developments in the study area (pipeline developments) were considered.

Regional Growth

DDOT's historical average daily traffic (ADT) maps were examined to determine an appropriate growth rate for the study area. The historical ADTs indicate that traffic volumes in the study area have generally decreased. However, as agreed upon during the scoping process, a growth rate of one percent per year, compounded annually over five years (2012 to 2017) was conservatively applied to the baseline vehicular volumes shown on Figure 3-1. The resulting 2017 volumes with regional growth are shown on Figure 4-1.

Pipeline Developments

In addition to the proposed development, several other developments are planned in and around the study area and were considered as part of the background traffic growth. Twelve developments that are planned and/or approved but not yet constructed at the time our counts were conducted were included in the future background traffic forecasts. These developments are as follows:

1. NPR Headquarters (1111 N Capitol St NE)
2. Sentinel Square II (1050 1st St NE)
3. Washington Gateway (100 Florida Ave NE)
4. Camden NOMA Phase I (60 L St NE)
5. Flats 130 Addition (140 M St NE)
6. Northwest One (2 M St NE)
7. Three Constitution Square (175 N St NE)

8. Hyatt Place (33 New York Ave NE)
9. Archstone First & M (1160 1st St NE)
10. The Coliseum (1140 3rd St NE)
11. 100 K Street (100 K St NE)
12. Union Market (1309 5th St NE)

Pipeline Trip Generation

Wells + Associates (W+A) conducted traffic studies for two of the pipeline developments: Washington Gateway and Hyatt Place. Information from the Hyatt Place study⁶ was used to determine the trip generation for the proposed hotel.

The Washington Gateway study⁷ included trip generation for the proposed development; however, the trip generation included both phases of the project. Currently, only the first phase of the project has been approved; therefore, the second phase was not included as a pipeline in this study. As a result, the development program for Phase I was based on the NoMA Development Map⁸ updated April 2013. The trip generation for the project was calculated using the Institute of Transportation Engineer's (ITE's) Trip Generation.⁹

The Union Market development was not included in the NoMA study nor was it studied by W+A. Details regarding the development program were provided by Edens. The number of trips anticipated to be generated by the development was estimated based on ITE's Trip Generation¹⁰ using LUC 850 (Supermarket).

The development programs for the remaining pipeline developments also were based on the NoMA Development Map¹¹ updated April 2013 and verified through site visits, CoStar (a commercial real estate information company), and phone calls with property management companies and/or developers. The number of trips anticipated to be generated by the proposed pipeline developments was estimated using the ITE's Trip Generation.¹²

Details regarding the trip generation for the pipeline developments, including mode split, pass-by, and internal capture assumptions are included in Appendix G.

Pipeline Site Trip Distribution and Assignment

The trip distributions for the Washington Gateway project were taken from the traffic study conducted for the site, and are shown on Figure G-1 in Appendix G.

Due to its proximity to the Gateway Market site, the Union Market trip distributions were assumed to mirror the trip distribution for the retail component of Gateway Market (which is described in more detail in Section 5 of this report). The new trip distributions used for the Union Market development are shown on Figure G-2 in Appendix G. The pass-by trip and diverted-link distributions used for the Union Market development are shown on Figure G-3 in Appendix G.

The trip distributions for the remaining pipeline developments were based on the distributions assumed in the NoMA Neighborhood Access Study and Transportation Management Plan conducted by DDOT.¹³ The distributions are shown on Figure G-4 in Appendix G.

The pipeline site assignments for all of the pipeline developments combined are shown on Figure 4-2.

Background Forecasts

Background 2017 traffic forecasts without the proposed Gateway Market development were developed by combining the existing traffic volumes grown to the year 2017, shown on Figure 4-1, with the pipeline traffic volumes shown on Figure 4-2. The resulting 2017 background traffic forecasts are shown on Figure 4-3.

Planned Improvements

In conjunction with the Washington Gateway development, the traffic impact study for the site recommended the signalization of the Florida Avenue/2nd Street intersection. The traffic signal design for the intersection has been approved by DDOT and is slated to be installed prior to the 2017 build out year. Therefore, signalization of the intersection was incorporated into the background traffic analyses and carried through to the total

future analysis. The resulting background lane use and traffic control is shown on Figure 4-4.

CAPACITY ANALYSIS

Capacity/level of service (LOS) analyses were conducted at the study intersections based on the background lane use and traffic control shown on Figure 4-4, future background traffic forecasts shown on Figure 4-3, and existing DDOT traffic signal timings. Traffic signal phasing for the Florida Avenue/2nd Street intersection was obtained from the approved traffic signal plan, and the timings were optimized.

The level of service results for the 2017 background conditions without the proposed Gateway Market development are presented in Appendix H and summarized in Table 4-1.

As shown in Table 4-1, lane groups that were operating at or near capacity under existing conditions would continue to operate at or near capacity under the 2017 background conditions. The Florida Avenue eastbound approach to 4th Street would drop from a LOS E in the AM peak hour under existing conditions to a LOS F under 2017 background conditions.

Table 4-1
2017 Background Levels of Service

Intersection/ Lane Group*	AM Peak	PM Peak
1: Florida Avenue/2nd Street		
EBLTR	B	B
WBTR	D	C
NBLTR	D	C
SBLT	D	C
SBR	D	C
OVERALL	C	C
2: Florida Avenue/3rd Street		
EBLTR	A	B
WBLTR	A	C
NBLTR	C	D
SBLTR	C	C
OVERALL	A	C
3: Florida Avenue/N Street		
NBR	A	A
4: Florida Avenue/4th Street		
EBLTR	F (99.8)	B
WBLTR	B	D
SBLTR	D	D
OVERALL	D	C
5: Florida Avenue/5th Street		
EBLTR	A	A
WBLTR	A	A
NBLTR	D	E (56.7)
SBLTR	D	D
OVERALL	A	A
6: Florida Avenue/6th Street		
EBLTR	A	B
WBLTR	C	C
NBLTR	F (95.1)	C
SBL	D	C
SBT	C	B
SBR	C	B
OVERALL	C	C
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh		

Table 4-1 (continued)
2017 Background Levels of Service

Intersection/ Lane Group*	AM Peak	PM Peak
7: 4th Street/Morse Street		
EBTR	C	B
WBLT	C	B
NBLR	A	A
SBLTR	A	A
8: New York Avenue/4th Street		
EBTR	D	F (266.8)
WBLT	F (186.7)	A
NBL	D	D
NBR	B	B
OVERALL	F (136.3)	F (141.8)
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh		

QUEUE ANALYSIS

A queuing analysis was conducted for 2017 conditions without the proposed Gateway Market development. Synchro was used to conduct the analyses, using the 95th percentile queue lengths. The results are summarized in Table 4-2. Queue reports are provided in Appendix I.

As shown in Table 4-2, the majority of the lane group queues are contained within the available storage under the 2017 background conditions. However, the following lane groups experience queues beyond the available storage under the 2017 background conditions:

- Westbound Florida Avenue approach to 4th Street during the AM and PM peaks,
- Southbound 4th Street approach to Florida Avenue during the AM peak,
- Eastbound Florida Avenue approach to 6th Street during the PM peak,
- Westbound Florida Avenue approach to 6th Street during the AM peak,

- Northbound 6th Street approach to Florida Avenue during the AM and PM peaks, and
- Southbound through 6th Street approach to Florida Avenue during the AM peak.

Table 4-2
Synchro 95th Percentile Queue Summary (in feet)
2017 Background Conditions

Intersection/ Lane Group*	Available Storage [^]	AM Peak	PM Peak
1: Florida Avenue/2nd Street			
EBLTR	190'	69	152
WBLTR	400'	268	201
NBLTR	310'	47	122
SBLT	N/A	37	24
SBR	N/A	29	21
2: Florida Avenue/3rd Street			
EBLTR	380'	90	254
WBLTR	385'	93	215 ^m
NBLTR	685'	35	191
SBLTR	N/A	27	19
3: Florida Avenue/N Street			
NBR	260'	2	3
4: Florida Avenue/4th Street			
EBLTR	385'	300 [#]	66
WBLTR	235'	310	296 [#]
SBLTR	210'	229	194
5: Florida Avenue/5th Street			
EBLTR	255'	4 ^m	3
WBLTR	250'	30	21
NBLTR	305'	78	139
SBLTR	210'	39	36
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways. [^] All distances measured to nearest intersection or end of turn lane, as appropriate. ^m Volume for 95th percentile queue is metered by upstream signal. [#] 95th percentile volume exceeds capacity; queue may be longer.			

Table 4-2 (continued)
Synchro 95th Percentile Queue Summary (in feet)
2017 Background Conditions

Intersection/ Lane Group*	Available Storage [^]	AM Peak	PM Peak
6: Florida Avenue/6th Street			
EBLTR	255'	15	405 [#]
WBLTR	270'	362	245
NBLTR	150'	329	409
SBL	210'	174	204
SBT	210'	298	103
SBR	150'	93	35
7: 4th Street/Morse Street			
EBTR	140'	29	4
WBLT	230'	15	3
NBLR	190'	2	0
SBLTR	425'	3	2
8: New York Avenue/4th Street			
EBTR	>1,000'	345	906 [#]
WBLT	>1,000'	994 [#]	200
NBL	155'	43	43
NBR	155'	16	63
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways. [^] All distances measured to nearest intersection or end of turn lane, as appropriate. ^m Volume for 95th percentile queue is metered by upstream signal. [#] 95th percentile volume exceeds capacity; queue may be longer.			

Section 5 SITE ANALYSIS

OVERVIEW

Currently, 340 Florida Avenue is an unoccupied lot (Lot 8) within Square 3587 in northeast Washington, DC. The proposed development program includes a multi-story residential building with approximately 188 residential units and approximately 27,500 SF of retail space. While tenants have not been selected, it is likely that the retail space will be occupied by a grocery store tenant and a restaurant tenant. The proposed plans also include approximately 215 parking spaces within the two below-grade garage levels. For purposes of this study, occupancy of the proposed development was assumed to occur in 2017 as indicated in the approved Scoping Document.

SITE ACCESS

Currently, seven curb cuts provide access to the existing vacant site: three on Florida Avenue, three on 4th Street, and one on Morse Street. Six of the curb cuts will be abandoned with the proposed development. The proposed development will use the western-most, curb cut on Florida Avenue to provide vehicular access to the below-grade garage (the curb cut will remain the same width; however, it will be shifted slightly east from its current location). As agreed upon with DDOT, left turns out of the curb cut on Florida Avenue will be restricted. Details of the restriction will be determined during the public space process.

A second curb cut is proposed on Morse Street and will provide access for site loading operations. The remaining curb cuts will be closed with the proposed development.

The need for and appropriateness of a curb cut on Florida Avenue were evaluated in two prior memoranda by Wells + Associates. Copies of the memoranda are included in Appendix J. In summary, the evaluation concluded that existing signals located both east and west of the proposed driveway in conjunction with the signal phasing present at the Florida Avenue/4th Street intersection will help facilitate turns into and out of the proposed development. Additionally, a review of crash data at eight existing driveway intersections on Florida Avenue between 2nd Street and 6th Street indicated that these driveways, which provide full access, operate safely and, therefore, it is anticipated that the proposed site access would operate similarly.

The main pedestrian accesses to the site are proposed to be from Florida Avenue and 4th Street.

SITE LOADING

Loading Requirements

According to the District of Columbia Municipal Regulations (DCMR), in the C-3-C district, a residential land use with 50 or more dwelling units must provide one 55-foot loading berth, one 200 SF loading platform, and one 20-foot service/delivery space. Additionally, retail spaces with 20,000 to 30,000 SF of gross floor area in the C-3-C district require two 30-foot loading berths, two 100 SF loading platforms, and one 20-foot service/delivery space.¹⁴ The loading requirements for the proposed development are as shown in Table 5-1.

Table 5-1
DCMR Loading Requirements

Land Use	DCMR Requirement		
	Loading Berth	Loading Platform	Service or Delivery Space
Retail	2 @ 30'	2@100 SF	1 @ 20'
Residential	1 @ 55'	1@200 SF	1 @20'

Proposed Loading

The Applicant was previously approved for relief from the DCMR loading requirements. The Applicant will maintain this relief request and proposes to install one 55-foot loading berth, one 30-foot loading berth, and two 200 SF loading platforms. The loading facilities will be accessible via Morse Street on the northwest portion of the proposed site. Trucks will be required to access the loading area by backing into the berths from Morse Street and exiting front-first onto Morse Street. These movements will be facilitated due to the fact that Morse Street dead ends into a private drive and experiences minimal traffic.

Loading Management

In order to minimize the impact of loading for the site, the Applicant has agreed to implement a loading management plan outlining the loading operations for the proposed development. The purpose of the loading management plan is to promote safe and efficient travel for all users (e.g. cars, trucks, and pedestrians) and set forth guidelines and procedures for loading and delivery options that will avoid adverse impacts on the tenants of the proposed building and the surrounding community. The following are the proposed components of the loading management plan:

1. A member of the on-site management team will be designated as a loading coordinator (duties may be part of other duties assigned to the individual). He or she will coordinate loading activities of the building (including non-FedEx/UPS deliveries, trash disposal, retail deliveries, and residential move-in and move-out activities). The loading coordinator will be responsible for informing tenants of the guidelines and procedures for loading and delivery operations. The loading coordinator will inform residential tenants of DDOT's regulations for moving trucks and will work with tenants when applying for DDOT permits for moving trucks.
2. Preferred truck routes have been established based on the DC Truck Route mapping to determine the most direct routing to the proposed site. The truck routing in the site vicinity is shown on Figure 5-1. All residential tenants will be required to notify the loading coordinator before moving in or out so that the

loading coordinator can ensure no conflicting loading activities will occur. Residential tenants shall provide the loading coordinator the following information: time and date that the truck is anticipated to arrive, size of truck being used, and name of the moving service, if applicable.

3. The retail tenant(s) will be required to notify the loading coordinator of all regularly scheduled deliveries and of any occasional deliveries so that the loading coordinator can ensure no conflicting loading activities will occur. The retail tenant(s) shall provide the loading coordinator the following information: time and date that trucks are anticipated to arrive each day of the week, size of trucks being used, and the name of the delivery company.
4. Permits are required by DDOT for oversize and overweight vehicles in the District (e.g., trucks longer than 40 feet long or wider than 8½ feet). The loading coordinator will assist tenants in obtaining appropriate permits; however, issuance of permits is at the discretion of DDOT.
5. No truck idling shall be permitted in the loading zone.

SITE PARKING

Vehicular Parking Requirements

According to the DCMR, in the C-3-C district, one automobile parking space is required for every four residential dwelling units and for every 750 SF of retail space in excess of 3,000 SF.¹⁵ Therefore, a total of 80 automobile parking spaces would be required for the development.

Proposed Vehicular Parking

As proposed, the development would include a total of 215 parking spaces in the below-grade parking garage. Of the parking spaces provided, 107 would be allotted for retail use and the remaining 108 would be designated for residential use, including property management employees.

Bicycle Parking

Retail developments in the District are required to provide bicycle parking per the DCMR calculated at a rate of five percent of the number of required vehicular parking spaces. However, retail uses are exempt from this requirement in the C-3-C zoning district.

Residential developments are required by District law to provide one bicycle parking space for every three residential units. Therefore, 63 bicycle spaces would be required for the proposed development.

As proposed, the development would include approximately 72 bicycle parking spaces located on the first parking garage level, thereby exceeding the requirements.

TRANSPORTATION DEMAND MANAGEMENT MEASURES

While the location of the proposed development is expected to naturally encourage the use of non-auto modes of transportation, the Applicant has also identified several other strategies to limit the number of vehicle trips generated by the proposed development. Specifically, the Transportation Demand Management (TDM) plan would include:

1. Garage parking for approximately 72 bicycle spaces;
2. Providing a one-time-only car-sharing membership fee subsidy of \$40 per residential unit to the initial residential occupants upon move-in and encouraging DDOT to designate two street parking spaces adjacent to the Gateway building for car-sharing services;
3. Providing complementary SmarTrip cards with a Metro fare value of \$20 per person to the initial residential occupants upon move-in;
4. Providing links to CommuterConnections.com and goDCgo.com websites on the property management and developer websites;
5. Designating a Property Transportation Coordinator; and
6. Developing an employer outreach program to encourage the use of non-auto means of transportation by employees of Gateway's retail tenants and providing information about non-

auto transportation options via welcome packets.

TRIP GENERATION ANALYSIS²

Total Trips

The total number of trips generated by the proposed development would be comprised of vehicular trips to/from the site and non-auto trips to/from the site as well as internal trips between the on-site residential and retail uses.

The total number of trips anticipated to be generated by the proposed development was estimated based on the Institute of Transportation Engineer's (ITE's) Trip Generation.¹⁶ Land Use Codes (LUC) 220 (Apartment) and 820 (Shopping Center) were used to estimate the total number of trips to/from the proposed development. The number of dwelling units was selected as the independent variable for LUC 220 while square footage was selected as the independent variable for LUC 820.

The trip generation for the proposed development is summarized in Table 5-1 and, as shown, the proposed development would generate 181 total AM peak hour trips and 388 total PM peak hour trips based on standard ITE rates/equations.

Internal Trips

In order to estimate the number of internal trips that would occur between the residential and retail uses, the internal capture rates outlined in ITE's Trip Generation¹⁷ were used. Since internal capture rates are not provided for the AM peak hour, the AM internal capture rates were assumed to be half of the PM rates.

Based on this methodology, and estimated eight AM peak hour trips and 54 PM peak hour trips will be captured internally between the proposed residential and retail land uses.

² At the time that this study was undertaken, up to 216 residential units were proposed. Currently, 188 residential units are planned; however, the analyses contained herein evaluated 216 residential units. The new development plan would generate eight fewer trips in both the AM and PM peaks; therefore, the analyses were left unchanged and should be considered conservative.

Non-auto Trips

A portion of the trips generated by the proposed development would be made via non-auto modes of transportation. The percentage of site-generated trips that would use public transportation is dependent on the proximity of the site to transit stops, the walkability of the surrounding area, and the degree to which the use of public transit is encouraged, such as by implementation of TDM measures.

Based on these factors, the non-auto mode split for the site was estimated to be 50 percent for the residential land use and 30 percent for the retail land use. These non-auto mode splits can be attributed to trips generated by rail, by bus, or by walking/biking to the site. Based on the 2005 WMATA Ridership Survey, the 50 percent non-auto mode split for the residential trips consists of 36 percent Metrorail trips, three percent bus trips, and 11 percent walking/biking trips.

The 30 percent non-auto mode split for the retail trips consists of 13 percent Metrorail trips, four percent bus trips, and 13 percent walking/biking trips. As shown in Table 5-1, a total of 74 AM peak hour trips and 123 PM peak hour trips are projected to be made via non-auto modes of transportation.

Pass-by Trips

Some of the trips generated by the retail portion of the proposed development would be made by vehicles already using the adjacent streets to reach a different destination but stop at the site in passing. This type of trip is called a pass-by trip, and is defined by Trip Generation Handbook¹⁸ as a trip in which the retail or service destination is the secondary part of a primary trip, such as a work-to-shopping-to-home trip. An example of a pass-by trip would be one in which a driver stops at the retail uses on his/her way home from work.

ITE's Trip Generation Handbook¹⁹ was used to estimate the pass-by percentages for the site. However, the location of the subject site lends itself to similar trips from vehicles travelling on New York Avenue. These trips are known as diverted-link trips. To remain conservative, the pass-by percentage obtained from ITE (34 percent for the retail component during the PM peak hour) was divided proportionally into pass-by trips (from Florida Avenue) and diverted-link trips (from New York Avenue) based on ADT's for the respective

roadways. Accordingly, the pass-by trip percentage for Florida Avenue was 11 percent and the diverted-link trip percentage for New York Avenue was 23 percent. The AM peak hour pass-by rate was assumed to be half of the PM pass-by rate.

As shown in Table 5-1, three AM peak hour trips and 17 PM peak hour trips are projected to be pass-by trips while five AM peak hour trips and 36 PM peak hour trips are projected to be diverted-link trips.

New External Vehicle Trips

Taking into account internal trips, non-auto trips, and pass-by trips, the proposed development would generate an estimated 91 AM new peak hour external vehicular trips and 158 PM new peak hour external vehicular trips, as shown on Table 5-1.

Appendix K provides additional details on the trip generation calculations for the proposed development.

SITE TRIP DISTRIBUTION AND ASSIGNMENT

The distribution of new peak hour site trips generated by the proposed development was based on existing traffic patterns in the study area and general knowledge of commuter routes to/from the site. These distributions were presented and agreed upon in the Scoping Document. The new vehicle trips shown in Table 5-1 were assigned to the public roadway network according to the directional distributions shown on Figure 5-2 and Figure 5-3.

Pass-by site trips associated with the retail use were assumed to occur directly from Florida Avenue; therefore, the pass-by site trip distributions were based on the directional flow on the corridor. Accordingly, during the AM peak hour, 40 percent of the pass-by trips were assumed to come from the northwest on Florida Avenue and proceed southeast after stopping at the site. The remaining 60 percent of the pass-by trips during the AM peak hour were assumed to come from the southeast on Florida Avenue and continue northwest after stopping at the site. During the PM peak hour, 60 percent of the pass-by trips were assumed to come from the northwest on Florida Avenue and proceed southeast after stopping at the site. The remaining 40 percent of the pass-by trips during the PM peak hour were

assumed to come from the southeast on Florida Avenue and continue northwest after stopping at the site.

Diverted link site trips associated with the retail use were assumed to be diverted from New York Avenue; therefore, the diverted-link site trip distributions were based on the directional flow on the corridor. Accordingly, during the AM peak hour, 60 percent of the diverted-link trips were assumed to come from the northeast on New York Avenue and proceed southwest after stopping at the site. The remaining 40 percent of the diverted-link trips during the AM peak hour were assumed to come from the southwest on New York Avenue and continue northeast after stopping at the site. During the PM peak hour, 45 percent of the diverted link trips were assumed to come from the northeast on New York Avenue and proceed southeast after stopping at the site. The remaining 55 percent of the diverted link trips during the PM peak hour were assumed to come from the southwest on New York Avenue and continue northeast after stopping at the site.

Figures 5-2 and 5-3 show the total external site trips (new trips, pass-by trips, and diverted link trips combined) for the residential component and the retail component, respectively. Figure 5-4 displays the total external site trips for the entire proposed development.

Table 5-1
Site Trip Generation Summary

LAND USE	AM PEAK HOUR			PM PEAK HOUR		
	In	Out	Total	In	Out	Total
Apartments – 216 DU (LUC 220)						
Total Trips ¹	22	88	110	88	48	136
Internal Trips ²	(2)	(2)	(4)	(16)	(11)	(27)
External Trips ³	20	86	106	72	37	109
Metrorail Trips ⁴	(7)	(30)	(37)	(25)	(13)	(38)
Bus Trips ⁴	(1)	(3)	(4)	(3)	(2)	(5)
Walk/Bicycle Trips ⁴	(2)	(10)	(12)	(8)	(4)	(12)
Vehicle Trips	10	43	53	36	18	54
Pass-By Trips ⁵	-	-	-	-	-	-
Diverted Link Trips ⁵	-	-	-	-	-	-
New Vehicle Trips	10	43	53	36	18	54
Retail – 27,410 SF (LUC 820)						
Total Trips ¹	44	27	71	121	131	252
Internal Trips ²	(2)	(2)	(4)	(11)	(16)	(27)
External Trips ³	42	25	67	110	115	225
Metrorail Trips ⁴	(6)	(4)	(10)	(14)	(15)	(29)
Bus Trips ⁴	(2)	(1)	(3)	(5)	(5)	(10)
Walk/Bicycle Trips ⁴	(5)	(3)	(8)	(14)	(15)	(29)
Vehicle Trips	29	17	46	77	80	157
Pass-By Trips ^{5,6}	(2)	(1)	(3)	(8)	(9)	(17)
Diverted Link Trips ^{5,6}	(3)	(2)	(5)	(18)	(18)	(36)
New Vehicle Trips	24	14	38	51	53	104
Total Development						
Total Trips	66	115	181	209	179	388
Internal Trips	(4)	(4)	(8)	(27)	(27)	(54)
External Trips	62	111	173	182	152	334
Metrorail Trips	(13)	(34)	(47)	(39)	(28)	(67)
Bus Trips	(3)	(4)	(7)	(8)	(7)	(15)
Walk/Bicycle Trips	(7)	(13)	(20)	(22)	(19)	(41)
Vehicle Trips	39	60	99	113	98	211
Pass-By Trips	(2)	(1)	(3)	(8)	(9)	(17)
Diverted Link Trips	(3)	(2)	(5)	(18)	(18)	(36)
New Vehicle Trips	34	57	91	87	71	158

¹ Trips generated using Institute of Transportation Engineers (ITE) Trip Generation, Ninth Edition.
² Internal Capture Rates are based on methodology outlined in the ITE Trip Generation Handbook. AM internal capture rates were assumed to be half of the PM internal capture rates.
³ Mode splits were estimated based on the site's proximity to the NOMA-Gallaudet U Metro Station, journey-to-work Census data for the surrounding area, which indicates approximately 65 percent of residents travel to work via non-auto modes of transportation, and direction from DDOT.
⁴ Based on the 2005 WMATA ridership survey, the 50 percent split for the residential consists of 36 percent Metrorail trips, 3 percent bus trips, and 11 percent walking/biking trips. The 30 percent non-auto mode split for the retail consists of 13 percent Metrorail trips, 4 percent bus trips, and 13 percent walking/biking trips.
⁵ Pass-by rates are based on ITE Trip Generation Handbook. Half of the PM pass-by rate for LUC 820 was used for the AM peak hour.
⁶ Pass-by and Diverted Link combined percentage was based on the Pass-by rate according to the ITE Trip Generation Handbook. The pass-by percentage per ITE then was split between New York Avenue and Florida Avenue (diverted link trips and pass-by trips, respectively) based on the ADT of each roadway.

Section 6 TOTAL FUTURE CONDITIONS

TRAFFIC FORECASTS

Total future traffic forecasts with the proposed development were determined by combining the 2017 background traffic forecasts shown in Figure 4-3 with the site traffic volumes shown on Figure 5-4 to yield the 2017 total future traffic forecasts shown on Figure 6-1.

PROPORTIONAL IMPACT ANALYSIS

In order to determine the amount of traffic on the surrounding roadways that is attributable to the proposed development, a proportional impact assessment was conducted. That is, the total future traffic volumes were compared to the background traffic volumes to determine the impact of adding the site trips to the study intersections. Table 6-1 displays the results of the proportional impact analysis.

Table 6-1
Proportional Impact Analysis

Intersection	AM Peak	PM Peak
Florida Avenue/2 nd Street	4.1%	5.6%
Florida Avenue/3 rd Street	4.9%	7.5%
Florida Avenue/N Street	2.1%	3.7%
Florida Avenue/4 th Street	1.6%	3.3%
Florida Avenue/5 th Street	1.3%	3.1%
Florida Avenue/6 th Street	0.9%	1.7%
4 th Street/Morse Street	1.4%	7.1%
4 th Street/New York Avenue	0.33%	0.6%

As shown in Table 6-1, the traffic associated with the proposed development would increase traffic at each of the study intersections by five percent or less, with the exception of the Florida Avenue/2nd Street, Florida Avenue/3rd Street, and 4th Street/Morse Street intersections during the PM peak.

CAPACITY ANALYSIS

Capacity analyses were performed for the study intersections using the lane use and traffic control shown on Figure 6-2, the total future peak hour traffic forecasts shown on Figure 6-1, existing signal timings, and optimized signal timings for the Florida Avenue/2nd Street intersection.

The level of service results for the 2017 total future conditions with the proposed Gateway Market development are presented in Appendix L and summarized in Table 6-2.

Table 6-2
2017 Total Future Conditions Levels of Service

Intersection/ Lane Group*	AM Peak	PM Peak
1: Florida Avenue/2nd Street		
EBLTR	B	B
WBTR	D	D
NBLTR	D	C
SBLT	D	C
SBR	D	C
OVERALL	C	C
2: Florida Avenue/3rd Street		
EBLTR	A	B
WBLTR	A	C
NBLTR	C	D
SBLTR	C	C
OVERALL	A	C
3: Florida Avenue/N Street		
NBR	A	A
4: Florida Avenue/4th Street		
EBLTR	F (107.5)	B
WBLTR	B	E (55.4)
SBLTR	D	D
OVERALL	D	C
5: Florida Avenue/5th Street		
EBLTR	A	A
WBLTR	A	A
NBLTR	D	E (56.7)
SBLTR	D	D
OVERALL	A	A
6: Florida Avenue/6th Street		
EBLTR	A	C
WBLTR	C	C
NBLTR	F (94.5)	C
SBL	D	C
SBT	C	B
SBR	C	B
OVERALL	C	C
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh		

Table 6-2 (continued)
2017 Total Future Conditions Levels of Service

Intersection/ Lane Group*	AM Peak	PM Peak
7: 4th Street/Morse Street		
EBTR	C	B
WBLT	C	B
NBLR	A	A
SBLTR	A	A
8: New York Avenue/4th Street		
EBTR	D	F (270.1)
WBLT	F (188.0)	A
NBL	D	D
NBR	B	B
OVERALL	F (137.1)	F (143.6)
9: Florida Avenue/Site Driveway		
EBLT	A	A
SBR	B	A
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh		

As shown in Table 6-2, levels of service with the proposed redevelopment are projected to be consistent with background conditions. Where intersections and lane groups operate at or near capacity under background conditions, they will continue to operate at a similar LOS under total future conditions with the exception of the westbound approach at the Florida Avenue/4th Street intersection, which would drop from a LOS D to a LOS E during the PM peak hour. This impact can be offset by signal timing optimization, as more fully described on Page 26.

QUEUE ANALYSIS

A queuing analysis was conducted for 2017 total future conditions. Synchro was used to conduct the analyses, using the 95th percentile queue lengths. The results are summarized in Table 6-3 and queue reports are provided in Appendix M.

Table 6-3
Synchro 95th Percentile Queue Summary (in feet)
2017 Total Future Conditions

Intersection/ Lane Group*	Available Storage [^]	AM Peak	PM Peak
1: Florida Avenue/2nd Street			
EBLTR	190'	71	163
WBTR	400'	281	241
NBLTR	310'	47	129
SBLT	N/A	37	24
SBR	N/A	29	21
2: Florida Avenue/3rd Street			
EBLTR	380'	93	271
WBLTR	385'/190'	145	238 ^m
NBLTR	685'	35	195
SBLTR	N/A	27	19
3: Florida Avenue/N Street			
NBR	260'	3	5
4: Florida Avenue/4th Street			
EBLTR	385'/165'	309 [#]	75
WBLTR	235'	314	314 [#]
SBLTR	210'	237	214
5: Florida Avenue/5th Street			
EBLTR	255'	5	3
WBLTR	250'	30	22
NBLTR	305'	78	139
SBLTR	210'	39	35
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways.			
[^] All distances measured to nearest intersection or end of turn lane, as appropriate.			
^m Volume for 95th percentile queue is metered by upstream signal.			
[#] 95th percentile volume exceeds capacity; queue may be longer.			

Table 6-3 (continued)
Synchro 95th Percentile Queue Summary (in feet)
2017 Total Future Conditions

Intersection/ Lane Group*	Available Storage [^]	AM Peak	PM Peak
6: Florida Avenue/6th Street			
EBLTR	255'	28	419 [#]
WBLTR	270'	370	253
NBLTR	150'	331	423
SBL	210'	171	203
SBT	210'	293	103
SBR	150'	92	37
7: 4th Street/Morse Street			
EBTR	140'	29	4
WBLT	230'	15	3
NBLR	190'	3	0
SBLTR	425'	3	2
8: New York Avenue/4th Street			
EBTR	>1,000'	345	913 [#]
WBLT	>1,000'	994 [#]	203
NBL	155'	43	43
NBR	155'	16	63
9: Florida Avenue/Site Driveway			
EBTR	195	2	4
WBLT	N/A	8	10
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways.			
[^] All distances measured to nearest intersection or end of turn lane, as appropriate.			
^m Volume for 95th percentile queue is metered by upstream signal.			
[#] 95th percentile volume exceeds capacity; queue may be longer.			

As shown in Table 6-3, the intersection queue lengths under the total future conditions generally are consistent with those projected under background conditions. Where queue lengths are projected to increase with the proposed development, the projected queues remain within the available storage for that lane group or are within one car length of the queues experienced under the background conditions (for lane groups that exceed the available storage) with one exception. In the PM peak hour, the southbound 4th Street approach to Florida Avenue experienced a queue length of 194 feet under background conditions with an available storage length of approximately 210 feet. With the addition of traffic associated with the proposed development, the total future conditions are projected to increase this lane group queue to 214 feet, slightly more than the available storage length for the lane group.

Consistent with observations in the field, eastbound queues at the Florida Avenue/4th Street intersection during the AM peak hour and westbound queues at the Florida Avenue/3rd Street intersection during the PM peak hour are projected to block the proposed driveway during portions of the peak hours. However, gaps created by the adjacent traffic signals will help facilitate traffic turning into and out of the proposed driveway. Additionally, the phasing at the Florida Avenue/4th Street intersection also will help facilitate traffic turning left into the proposed driveway.

The signal at the Florida Avenue/4th Street intersection operates with split phasing on Florida Avenue. As such, westbound Florida Avenue traffic is stopped when eastbound Florida Avenue has a green signal. As a result, motorists wanting to turn left into the subject site will either arrive when eastbound Florida Avenue is already stopped at a red signal at 4th Street (thus not unduly delaying Florida Avenue traffic), or they would arrive when eastbound Florida Avenue has the green signal. Since westbound Florida Avenue traffic is stopped at this time, vehicles wanting to turn into the site would not have opposing traffic to deal with (with the exception of the occasional right turn on red from 4th Street).

IMPROVEMENT ANALYSIS TO MITIGATE PROJECT IMPACTS

As previously mentioned, the proposed development would have a minor impact during the PM peak hour at the Florida Avenue/4th Street intersection. The impact can be mitigated through signal timing adjustments. Specifically, the following adjustment was made to mitigate the projected impacts from the proposed development:

- In the PM peak hour, shift one second from Phase 2 (eastbound) to Phase 6 (westbound) and shift two seconds from Phase 2 (eastbound) to Phase 8 (southbound).

Tables 6-4 and 6-5 document the impact of the timing adjustment on the levels of service and queues, respectively. The Synchro reports are provided in Appendix N.

Table 6-4
2017 Total Future Conditions Levels of Service
With Improvements

Intersection/ Lane Group*	PM Peak
1: Florida Avenue/2nd Street	
EBLTR	B
WBTR	C
NBLTR	C
SBLT	C
SBR	C
OVERALL	C
2: Florida Avenue/3rd Street	
EBLTR	B
WBLTR	C
NBLTR	D
SBLTR	C
OVERALL	C
3: Florida Avenue/N Street	
NBR	A
4: Florida Avenue/4th Street	
EBLTR	B
WBLTR	D
SBLTR	D
OVERALL	C
5: Florida Avenue/5th Street	
EBLTR	A
WBLTR	A
NBLTR	E (56.7)
SBLTR	D
OVERALL	A
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh	

Table 6-4 (continued)
2017 Total Future Conditions Levels of Service
With Improvements

Intersection/ Lane Group*	PM Peak
6: Florida Avenue/6th Street	
EBLTR	C
WBLTR	C
NBLTR	C
SBL	C
SBT	B
SBR	B
OVERALL	C
7: 4th Street/Morse Street	
EBTR	B
WBLT	B
NBLR	A
SBLTR	A
8: New York Avenue/4th Street	
EBTR	F (270.1)
WBLT	A
NBL	D
NBR	B
OVERALL	F (143.6)
9: Florida Avenue/Site Driveway	
EBLT	A
SBR	A
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways [9.2] = unsignalized intersection control delay in sec/veh (9.2) = signalized intersection control delay in sec/veh	

Table 6-5
Synchro 95th Percentile Queue Summary (in feet)
2017 Total Future Conditions with Improvements

Intersection/ Lane Group*	Available Storage [^]	PM Peak
1: Florida Avenue/2nd Street		
EBLTR	190'	163
WBTR	400'	241
NBLTR	310'	129
SBLT	N/A	24
SBR	N/A	21
2: Florida Avenue/3rd Street		
EBLTR	380'	271
WBLTR	385'/190'	222 ^m
NBLTR	685'	195
SBLTR	N/A	19
3: Florida Avenue/N Street		
NBR	260'	5
4: Florida Avenue/4th Street		
EBLTR	385'/165'	117
WBLTR	235'	302 [#]
SBLTR	210'	209
5: Florida Avenue/5th Street		
EBLTR	255'	3
WBLTR	250'	22
NBLTR	305'	139
SBLTR	210'	35
6: Florida Avenue/6th Street		
EBLTR	255'	419 [#]
WBLTR	270'	253
NBLTR	150'	423
SBL	210'	203
SBT	210'	103
SBR	150'	37
7: 4th Street/Morse Street		
EBTR	140'	4
WBLT	230'	3
NBLR	190'	0
SBLTR	425'	2
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways. [^] All distances measured to nearest intersection or end of turn lane, as appropriate. ^m Volume for 95th percentile queue is metered by upstream signal. [#] 95th percentile volume exceeds capacity; queue may be longer.		

Table 6-5 (continued)
Synchro 95th Percentile Queue Summary (in feet)
2017 Total Future Conditions with Improvements

Intersection/ Lane Group*	Available Storage [^]	PM Peak
8: New York Avenue/4th Street		
EBTR	>1,000'	913 [#]
WBLT	>1,000'	203
NBL	155'	43
NBR	155'	63
9: Florida Avenue/Site Driveway		
EBTR	195	4
WBLT	N/A	10
* Florida Avenue and New York Avenue are assumed to be EB/WB roadways. [^] All distances measured to nearest intersection or end of turn lane, as appropriate. ^m Volume for 95th percentile queue is metered by upstream signal. [#] 95th percentile volume exceeds capacity; queue may be longer.		

Section 7

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this study are as follows:

1. The development of Gateway Market would result in a mixed-use project including approximately 188 residential units, approximately 27,500 SF of retail space (potentially comprised of a grocery store and a restaurant), and 215 parking spaces in two and a half below-grade parking levels.
2. With the proposed development, the number of curb cuts for the site will be reduced from seven to two.
3. Access to the proposed development would be provided via a right-in/right-out/left-in driveway on Florida Avenue. Left turn ingress at the driveway will be facilitated by gaps created by the adjacent signalized intersections and by the phasing at the Florida Avenue/4th Street traffic signal. Left turn egress will be restricted (details of the restriction will be determined during the public space process).
4. Loading for the site will be provided from Morse Street on the north side of the site. A loading management plan will be implemented, which includes designation of an on-site loading manager, to help facilitate loading operations.
5. The Applicant has agreed to implement a TDM program which will include strategies to encourage non-auto modes of transportation.
6. The project will include approximately 72 bicycle parking spaces located on the first garage level. The site is required to provide only 63 bicycle parking spaces.
7. DDOT has initiated a multimodal safety and planning study for Florida Avenue to evaluate safety, streetscape, and operational enhancements to improve safety for all roadway users.
8. Under existing conditions, a few study intersections have one or more lane groups that operate near or at capacity during the AM and PM peak hours.
9. Under future conditions without the proposed development, some lane groups at the study intersections will experience increased delay compared to existing conditions due to increases in traffic from growth outside the immediate site vicinity and increases associated with planned or approved but not yet constructed developments in the study area.
10. The proposed development is anticipated to generate an estimated 91 new AM peak hour vehicular trips and 158 new PM peak hour vehicular trips.
11. The proposed development will have a marginal impact on the traffic operations.
12. The following signal timing adjustments should be made at the Florida Avenue/4th Street intersection:
 - a. In the PM peak hour, shift one second from Phase 2 (eastbound) to Phase 6 (westbound) and shift two seconds from Phase 2 (eastbound) to Phase 8 (southbound).
13. In conjunction with the proposed streetscape improvements on Morse Street, the Applicant should install the following improvements:
 - a. A stop bar on Morse Street for eastbound traffic,
 - b. A new stop sign for eastbound traffic located adjacent to the stop bar and two feet behind the curb, and
 - c. A no parking sign placed such that no on-street, parallel parking is permitted within 25 feet of the stop bar or 40 feet from the edge of 4th Street (whichever is greater).

REFERENCES

- ¹ District of Columbia Bicycle Master Plan, District Department of Transportation, April 2005, [<http://ddot.dc.gov/DC/DDOT/On+Your+Street/Bicycles+and+Pedestrians/Bicycles/Bicycle+Master+Plan/DC+Bicycle+Master+Plan+-+April+2005>].
- ² Ibid.
- ³ District of Columbia Pedestrian Master Plan, District Department of Transportation, April 2009, [<http://ddot.dc.gov/DC/DDOT/On+Your+Street/Bicycles+and+Pedestrians/Pedestrians/Pedestrian+Master+Plan/Pedestrian+Master+Plan+2009>].
- ⁴ Design and Engineering Manual, District of Columbia Department of Transportation, April 2009, [<http://dc.gov/DC/DDOT/Projects+and+Planning/Standards+and+Guidelines/Design+and+Engineering+Manual/DDOT+Design+and+Engineering+Manual+-+April+2009>].
- ⁵ Traffic Safety Statistics Report For The District of Columbia (2009-2011), Howard University, Transportation Safety Data Center, February 1, 2013, [[http://dc.gov/DC/DDOT/On+Your+Street/Safety/Traffic+Safety/Traffic+Safety+Report+Statistics/Traffic+Safety+Report+Statistics+\(2009-2011\)](http://dc.gov/DC/DDOT/On+Your+Street/Safety/Traffic+Safety/Traffic+Safety+Report+Statistics/Traffic+Safety+Report+Statistics+(2009-2011))].
- ⁶ Hyatt Place Hotel Transportation Assessment, Wells + Associates, March 23, 2012.
- ⁷ Square 3584 Washington Gateway Transportation Impact Study, Wells + Associates, November 9, 2006.
- ⁸ NoMA Development Map, NoMA Bid, April 2013, [<http://www.nomabid.org/wp-content/uploads/2011/02/NoMaDevelopmentMap-Final.pdf>].
- ⁹ Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC, 2012.
- ¹⁰ Ibid.
- ¹¹ NoMA Development Map, NoMA Bid, April 2013, [<http://www.nomabid.org/wp-content/uploads/2011/02/NoMaDevelopmentMap-Final.pdf>].
- ¹² Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC, 2012.
- ¹³ NoMA Neighborhood Access Study and Transportation Management Plan, District Department of Transportation, March 31, 2010, [<http://www.nomabid.org/resource-library/>].
- ¹⁴ District of Columbia Municipal Regulations, Title 11-Zoning, Section 2201.1, 2005 Edition.
- ¹⁵ District of Columbia Municipal Regulations, Title 11-Zoning, Section 2101.1, 2013 Edition.
- ¹⁶ Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC, 2012.
- ¹⁷ Ibid.
- ¹⁸ Trip Generation Handbook, Institute of Transportation Engineers, Washington, DC, March 2001.
- ¹⁹ Trip Generation, 9th Edition, Institute of Transportation Engineers, Washington, DC, 2012.