BUZZARD POINT/DC UNITED STADIUM

TRANSPORTATION IMPACT STUDIES

WASHINGTON, DC

Part 1: Soccer Stadium Transportation Analysis – Gameday Conditions

Part 2: Buzzard Point Neighborhood Transportation Analysis – Weekday Conditions

Prepared for the District of Columbia Government

June 2015

BUZZARD POINT/DC UNITED STADIUM

SOCCER STADIUM TRANSPORTATION ANALYSIS – GAMEDAY CONDITIONS

WASHINGTON, DC

The following document contains the two transportation chapters from the Buzzard Point Stadium Environmental Mitigation Study (EMS), 'Transportation Systems', and 'Transportation System Impacts'. Combined, they provide a review of potential transportation impacts the new Buzzard Point stadium could generate on Game Days. This report contains a summary of the existing states of various modes of travel, projections of game day traffic, analyses of the impacts of game day traffic, and a summary of mitigation measures needed to provide efficient transportation operations on game days.

Prepared for the District of Columbia Government

November 12, 2014

Prepared by:

1140 Connecticut Avenue NW
Suite 600
Washington, DC 20036
Tel: 202.296.8625
Fax: 202.785.1276

3914 Centreville Road
Suite 330
Chantilly, VA 20151
Tel: 703.787.9595
Fax: 703.787.9905

15125 Washington Street
Suite 136
Haymarket, VA 20169
Tel: 703.787.9595
Fax: 703.787.9905

www.goroveslade.com

Contents

Figures

Tables

CHAPTER 1: TRANSPORTATION SYSTEMS

The transportation system that surrounds the DC United Stadium site is an evolving and multifaceted set of modes and corridors. It includes a traditional urban street grid, regional arterials, bridges, Metrobus service, Metrorail stations, private commuter bus service, sidewalks for pedestrians, and on and off-street bicycle facilities. As is the case in most urban areas, the system can become constrained, although the majority of the time the nature of the system allows neighborhood residents, commuters, regional travelers, and tourists the ability to travel fluidly through the system on several modes. The following chapter describes each portion of this network and their existing operations.

The transportation discussion and analysis contained in this document is one of three planned transportation documents assembled for the proposed soccer stadium. The other two include:

- A Transportation Management Plan (TMP) that guides the assumptions for patron travel characteristics of the proposed Stadium, including trip generation, traffic routing, and parking demand. The TMP also includes strategies to manage travel demand. A draft TMP has been prepared by Gorove/Slade for DC United, and it will serve as a source of many assumptions for this document.
- A Transportation Operations Plan (TOP) will be assembled closer to the Stadium's opening. The TOP (also known as a Traffic Operations and Parking Plan) will act as a game-day operations manual, containing a detailed list of operational measures that occur on game days. This document in conjunction with the TMP will form the strategic and analytical basis for the TOP.

In addition, the District recently completed a study of the new soccer stadium as part of the *SE/SW Special Events Study.* In order to maintain continuity and avoid duplication between the two studies, many aspects of the *Special Events Study* were kept in mind during the scoping and completion of the transportation chapters of this EMS.

TRAFFIC

Description of Roadways

Regional connectivity near Buzzard Point is excellent. The proposed DC United Stadium is served by many regional roadways including the SE/SW Freeway, I-395, I-295, and Suitland Parkway. Arterials near the site include South Capitol Street, M Street SE/SW, P Street SW, 4th Street SW, and 1st Street SE. Major collector roadways include Potomac Avenue SE/SW, Delaware Avenue SW, Canal Road SW, 2nd Street SW, and V Street SW. Figure 1 shows the functional classifications of and the annual average daily traffic (AADT) on the roadways in the study area, as classified by DDOT.

Study Area

The intersections included in the capacity analyses are listed below. They were selected based on where expected negative impacts may occur, using available sources of data from DDOT, existing traffic volumes, anticipated parking locations, and expected game day travel patterns. Figure 2 shows the location of the study intersections. Schematics of these intersections, with a focus on operational characteristics, are contained in the Technical Appendix.

1. South Capitol Street & I Street
2. South Capitol Street SB & M Street
3. South Capitol Street NB & M Street
4. South Capitol Street & N Street
5. South Capitol Street & P Street
6. South Capitol Street & Potomac Avenue
7. 1st Street & P Street, SW
8. Maine Avenue & 9th Street, SW
9. Maine Avenue & 7th Street, SW
10. M Street & 4th Street, SW
11. M Street & 1st Street, SW
12. M Street & 1st Street, SE
13. M Street & New Jersey Avenue, SE
14. M Street & 4th Street, SE
15. M Street & 8th Street, SE
16. M Street & 11th Street Bridge Ramp/12th Street, SE
17. 4th Street & Virginia Avenue EB, SE
18. 4th Street & Virginia Avenue WB, SE
19. 6th Street & Ramp from I-696, SE
20. 6th Street & Virginia Avenue WB, SE

Time Period of Analysis

A typical traffic capacity analysis focuses on the single peak hour of traffic expected for the given system. To determine the Stadium's maximum impact, the weekday evening peak hour where entering traffic for an event overlaps with the PM peak hour of commuter traffic was analyzed. This time period was chosen based on the SE/SW Special Events Study which concluded that this time period led to the highest volumes on the traffic network. To maintain a conservative analysis, this analysis assumes that the peak hour of commuting traffic will coincide with peak patron arrival for a sold out game scenario.

Analysis Methodology

Capacity analyses are typically performed using the Highway Capacity Manual (HCM) methodologies. For signalized and unsignalized intersections, the HCM calculates the delay experienced by drivers traveling through an intersection. This delay is associated with vehicles slowing in advance of an intersection, the time spent stopped at an intersection, the time spent as vehicles move up in the queue, and the time needed for vehicles to accelerate to the speed limit. Traffic delay also results from the interaction of vehicles, primarily in a state where the traffic volumes exceed the available capacity.

The results of these delay calculations is a computed average delay (seconds per vehicle) for each approach and a Level of Service (LOS) grade. LOS is based upon the traffic volume present in each lane on the roadway, the capacity of each lane at the intersection and the delay associated with each directional movement. The HCM defines six levels of service, ranging from A to F. LOS A represents the "best" operating conditions from a traveler's perspective (free-flowing conditions and little-to-no delay), and LOS F represents the "worst". Detailed LOS descriptions are contained in the Technical Attachments.

At signalized intersections, all approaches controlled by the traffic signal have a calculated average delay and associated LOS, and an overall average delay and LOS for the entire intersection are determined. At unsignalized intersections, the approaches controlled by a stop-sign have a calculated average delay and associated LOS. For all-way stop intersections, an overall average delay and LOS are also determined. For one- or two-way stop intersections, an average delay and LOS are also calculated for vehicles turning across a free-flowing approach, as the driver must yield to oncoming traffic. The major through movements and right-turns on free-flowing approaches at one- or two-way stop controlled intersections are assumed to operate with no delay.

In addition to the capacity analyses, a queuing analysis was performed at the study intersections. The 50th percentile and 95th percentile maximum queue lengths are shown for each lane group at the study area signalized intersections. The 50th percentile maximum queue is the maximum back of queue on a typical cycle. The 95th percentile queue is the maximum back of queue with 95th percentile traffic volumes. For unsignalized intersection, the 95th percentile queue is reported for each lane group (including free-flowing left turns and stop-controlled movements) based on the HCM calculations. The HCM does not give guidelines for calculating queues for an all-way stop-controlled intersection, so this information is not reported.

For this report, the analysis was performed using the Synchro, Version 7 software package, applying HCM methodologies. As stated previously, the analysis time period will consist of the weekday stadium arrival period which overlaps with the commuter rush hour. The Synchro model used to complete this analysis was provided by DDOT. The traffic model was part of the SE/SW Special Events Study's Existing Pre-Game Peak Hour Balanced turning moving counts and Synchro network and was used to allow for the greatest amount of continuity between the studies.

Existing Traffic Capacity Analysis

Utilizing the Synchro model provided by DDOT, LOS and average delay was determined for each of the intersections in the study area. The results of the capacity analyses are shown in Table 1. Detailed worksheets of these calculations in addition to the queuing analysis results for the study intersections can be found in the Technical Appendix.

Table 1: Existing Capacity Analysis Results

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
South Capitol Street & I Street	**31.2**	**C**	92.5	F	63.4	E	18.2	B	20.4	C
South Capitol Street SB & M Street	**30.0**	**C**	42.3	D	2.7	A	--	--	42.3	D
South Capitol Street NB & M Street	**21.7**	**C**	3.0	A	36.2	D	52.6	D	42.3	D
South Capitol Street & N Street	**67.8**	**E**	--	--	70.8	E	7.4	A	89.0	F
South Capitol Street & P Street	**26.3**	**C**	160.4	F	--	--	1.9	A	18.9	B
South Capitol Street & Potomac Avenue	**276.4**	**F**	537.4	F	115.6	F	33.9	C	374.8	F
1st Street & P Street SW	**20.7**	**C**	25.0	C	8.5	A	10.9	B	9.4	A
Maine Avenue & 9th Street SW	**86.7**	**F**	23.5	C	9.3	A	34.3	C	248.7	F
Maine Avenue & 7th Street SW	**22.7**	**C**	13.2	B	27.9	C	37.7	D	37.7	D
M Street & 4th Street SW	**69.4**	**E**	39.9	D	26.8	C	213.6	F	44.6	D
M Street & 1st Street SW	**23.9**	**C**	29.0	C	6.4	A	31.9	C	88.5	F
M Street & 1st Street SE	**13.2**	**B**	16.9	B	2.8	A	16.4	B	22.5	C
M Street & New Jersey Avenue SE	**16.6**	**B**	9.3	A	22.2	C	22.0	C	22.9	C
M Street & 4th Street SE	**11.5**	**B**	7.2	A	10.0	A	19.7	B	20.7	C
M Street & 8th Street SE	**12.1**	**B**	8.7	A	0.6	A	--	--	55.8	E
M Street & 11th Street Bridge	**43.3**	**D**	31.5	C	12.0	B	57.5	E	--	--
4th Street & Virginia Avenue EB SE	--	--	21.5	C	--	--	--	--	1.4	A
4th Street & Virginia Avenue WB SE	**62.7**	**E**	--	--	5.0	A	--	--	227.3	F
6th Street & Ramp from I-695 SE	**103.3**	**F**	41.3	D	--	--	274.3	F	--	--
6th Street & Virginia Avenue WB SE	**32.7**	**C**	--	--	36.8	D	26.8	C	--	--

Summary of Existing Capacity Concerns

Based on the capacity analysis results shown in Table 1, there are ten intersections in which an LOS E or F is observed during the PM peak hour. The majority of these intersections only have one or two approaches that operate at an unacceptable LOS; however, six of these intersections operate at an overall LOS E or F. A brief description of the ten intersections that operate at unacceptable conditions is listed below:

South Capitol Street & I Street

The eastbound movement of this intersection operates at an LOS F and the westbound movement operates at an LOS E. This is primarily as a result of the high volume of eastbound and westbound right turning traffic in conjunction with high through volumes along South Capitol Street. Under existing conditions there is an exclusive right turn lane along the east and westbound approaches; however, during the PM peak hour when the amount of southbound traffic along South Capitol Street is at its highest, there are few opportunities for right turns on red. For the most part, right turning traffic must wait for the green to turn which causes queue lengths that exceeds the capacity.

South Capitol Street & N Street

The overall intersection operates at an LOS E with the westbound approach operating at an LOS E and the southbound approach operating at an LOS F. Under existing conditions this intersection has a complicated geometry due to the on- and off-ramps that provide access to and from M Street. During the PM peak hour southbound traffic is particularly heavy and Excessive queues are realized along the southbound approach. The configuration of this intersection will also change as a result of the South Capitol Street Corridor Project.

South Capitol Street & P Street

The eastbound approach of this intersection operates at an LOS F. Similar to I Street, P Street has many vehicles turning right during the PM peak hour. This combined with the high southbound volumes along South Capitol Street lead to little or no gaps for right turns on red. Thus most if not all vehicles can only turn right during the green phase resulting in queues along P Street that exceed capacity.

South Capitol Street & Potomac Avenue

The overall intersection operates at an LOS F with the eastbound, northbound, and southbound approaches operating at an LOS F. Both South Capitol Street and Potomac Avenue are high volume roadways with three lanes at each approach. As South Capitol Street crosses Potomac Avenue it switches from a three lane roadway to a two lane roadway which causes excessive delay and queues for the southbound approach. This intersection will be converted to a traffic oval as part of the South Capitol Street Corridor Project to mitigate the excessive delays seen at this intersection. The traffic oval is expected to be constructed by 2019.

Maine Avenue & 9th Street SW

The overall intersection operates at an LOS F with the southbound approach operating at an LOS F. This is likely due to traffic coming from the 14th Street Bridges and exiting at 9th Street. Traffic coming from the 14th Street Bridges increases the volume along this section of 9th Street by about 50 percent. The southbound approach at 9th Street then becomes constrained by vehicles turning left onto Maine Avenue.

M Street & 4th Street SW

The overall intersection operates at an LOS E with the northbound approach operating at an LOS F. This is due to the high volume of northbound left turns. Although there is an exclusive northbound left turn lane, there is not enough time allocated to northbound traffic to accommodate left turning vehicles.

M Street & 1st Street SW

The southbound approach of this intersection operates at an LOS F. The northbound and southbound approaches of this intersection are slightly offset which requires a split phase between the two movements. Due to higher traffic volumes along the other approaches, not enough time is allocated to the southbound approach.

M Street & 11th Street Bridge Ramp/12th Street SE

The eastbound approach of this intersection operates at an LOS E. It is slightly above the threshold for a LOS E and could likely be improved through signal timing modifications.

4th Street & Virginia Avenue WB SE

The southbound approach of this intersection operates at an LOS F. Under existing conditions there is not enough time allocated to the southbound movement. More time could be allocated to the southbound movement without disrupting the westbound movement.

6th Street & Ramp from I-695 SE

The overall intersection operates at an LOS F with the northbound approach operating at an LOS F. This intersection is one of two intersections controlled under a single controller. Because of this there is less fluidity in regards to how the intersection is timed. Based on higher volumes along other approaches at the two intersections, the northbound approach is not given ample time and results in queues that exceed capacity.

Overall, the majority of capacity issues realized at the study intersections is due to the high southbound volumes along South Capitol Street and to a lesser extent, vehicles traveling along the 14th Street Bridges and exiting at 9th Street. It will be necessary to minimize the amount of patron traffic along these particular routes to have minimal effects at the intersections that operate at unacceptable conditions under existing conditions. Based on the locations of expected parking lots for use during game days, this strategy will be possible with the help of marketing techniques to direct patrons to game-day parking locations.

Figure 1: Functional Classification and AADT

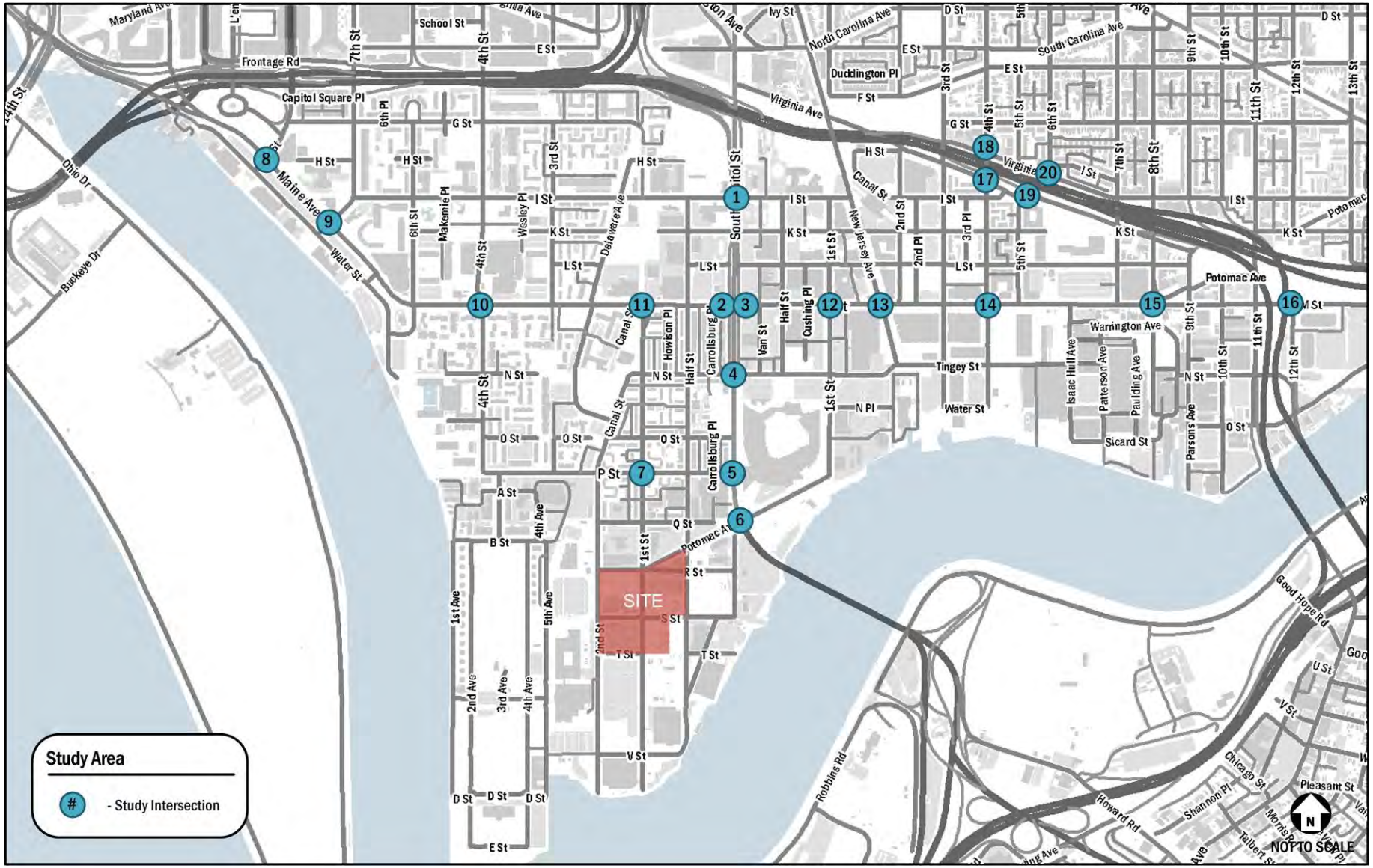


Figure 2: Study Area

PARKING

Off-Street Parking

A substantial amount of off-street parking is available near Buzzard Point. Figure 3 depicts existing parking facilities within walking distance of the proposed Stadium. These parking garages and lots are further broken down into those that are of reserved/private use, those expected to be unavailable by 2017, and those expected to serve the Stadium on game days. Nine of these locations are specifically allocated as Nationals parking lots. Several of the remaining parking lots are at office buildings.

Figure 4 shows the existing parking locations that will likely be available during the inaugural DC United season in 2017 in relation to walking time to and from the proposed Stadium. As shown, there are over 4,000 spaces within a 15-minute walk, with 1,300 of those spaces within a 10-minute walk.

On-Street Parking

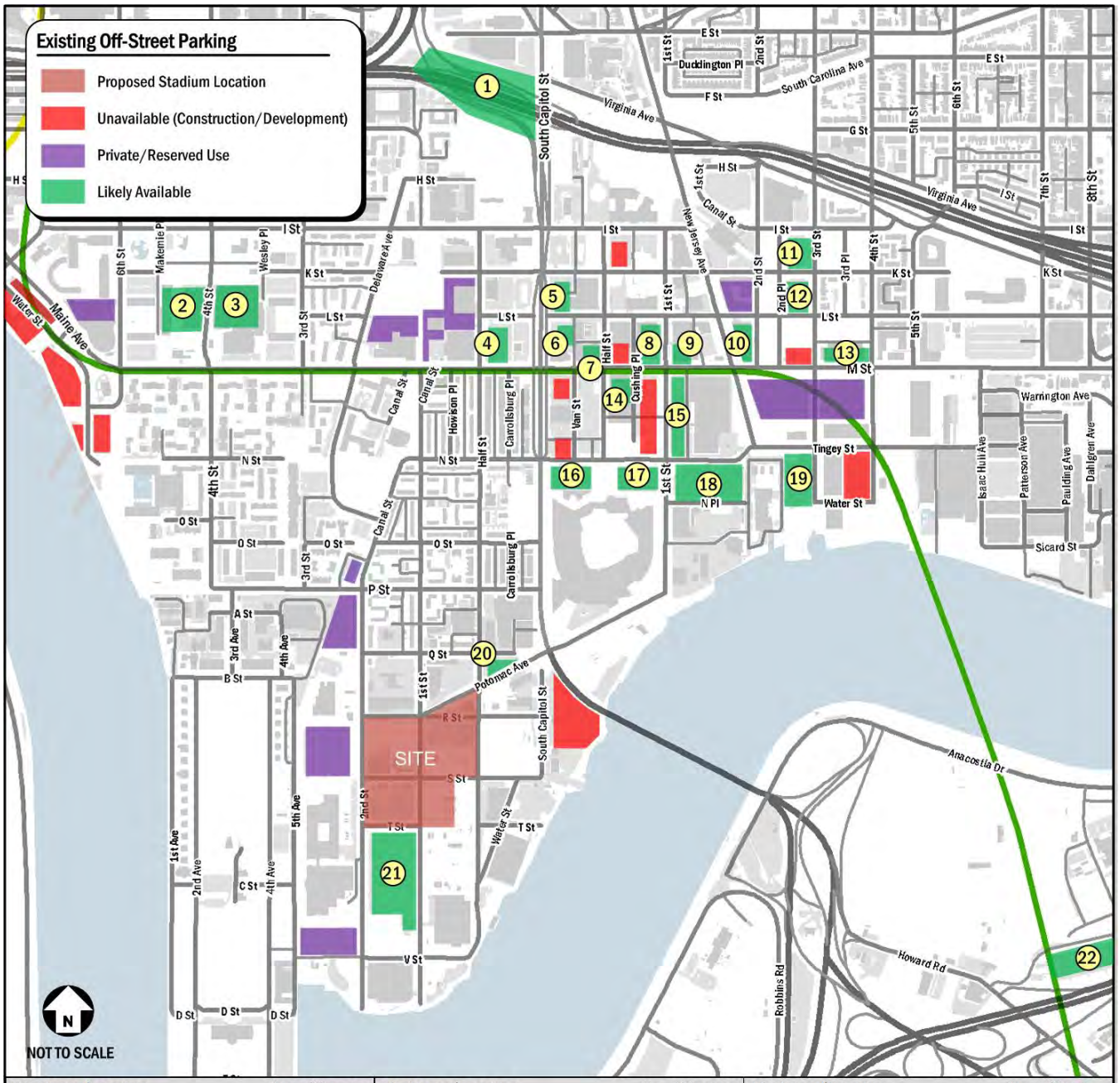
The on-street parking supply in the vicinity of the Stadium consists of residential parking permit spaces, metered spaces, and unrestricted spaces. Metered and unrestricted spaces may also have time-based restrictions such as no parking during morning or evening peak periods and/or no parking on Nationals game days.

Figure 5 shows an inventory and breakdown of on-street parking near the proposed Stadium. The figure illustrates the predominant curbside restriction on the block; however, some blocks may have multiple curbside restrictions. As shown, a large portion of the on-street parking to the north of the site (between P Street and M Street SW) is designated as residential permit parking (RPP). Some of the blocks are allocated as general RPP and some are enhanced RPP; enhanced RPP does not have a 2-hour grace period for drivers without permits. Metered spaces are most prevalent east of South Capitol Street near the Nationals Ballpark and recent multi-use developments as well as directly surrounding the proposed Stadium site along 1st and 2nd Street SW. Metered spaces east of South Capitol Street are typically restricted during Nationals game days. Fort McNair to the west provides a parking barrier as the whole area is private and gated off.

As shown in Table 2 there are approximately 1,733 off-street parking spaces. To limit the impacts to the surrounding residential area, parking will be restricted at RPP spaces as much as possible, and these spaces will not be available to game day patrons. Of the 429 metered spaces, approximately 6 are restricted during the PM peak hour, 23 during Nationals Games, and approximately 37 are part of the proposed Stadium footprint. Of the 333 unrestricted spaces, approximately 37 are restricted during the PM peak hour and 38 are part of the proposed Stadium footprint. The majority of the unrestricted parking, particularly the spaces located in Buzzard Point, do not have any signed restrictions. In total, over 600 off-street parking spaces will be available for use on game days; the majority of which are within a 10 minute walk of the Stadium.

Table 2: Summary of On-Street Parking Inventory

Curbside Restriction	Number of Parking Spaces	Spaces Available on Game Days
Metered	**429**	**363**
Residential Permit Parking	**912**	**0**
Unrestricted	**333**	**258**
Other	**59**	**0**
Total	**1,733**	**621**



ID	Name/Location	No. of Spaces	ID	Name/Location	No. of Spaces	ID	Name/Location	No. of Spaces
1	Nats Lot HH	450 spaces	9	100 M St SE	195 spaces	17	Nat's Lot C	597 spaces
2	1101 4th Street, SW	298 spaces	10	1100 New Jersey Ave SE	150 spaces	18	136 N St SE	352 spaces
3	1100 4th Street, SW	335 spaces	11	Nats Lot T	73 spaces	19	285 Tingey St SE	240 spaces
4	25 M Street	150 spaces	12	Nats Lot U	73 spaces	20	Nats Media Lot	60 spaces
5	Nats Lot K	126 spaces	13	300 M Street SE	225 spaces	21	2nd and T Street SE	610 spaces
6	Nats Lot L	100 spaces	14	55 M St	297 spaces	22	Anacostia Metro Station Garage	808 spaces
7	Nats Lot H	198 spaces	15	1200 1st Street SW	210 spaces	**Total**		**6441 spaces**
8	80 M St SW	296 spaces	16	Nat's Lot B	598 spaces			

Figure 3: Existing Off-Street Parking

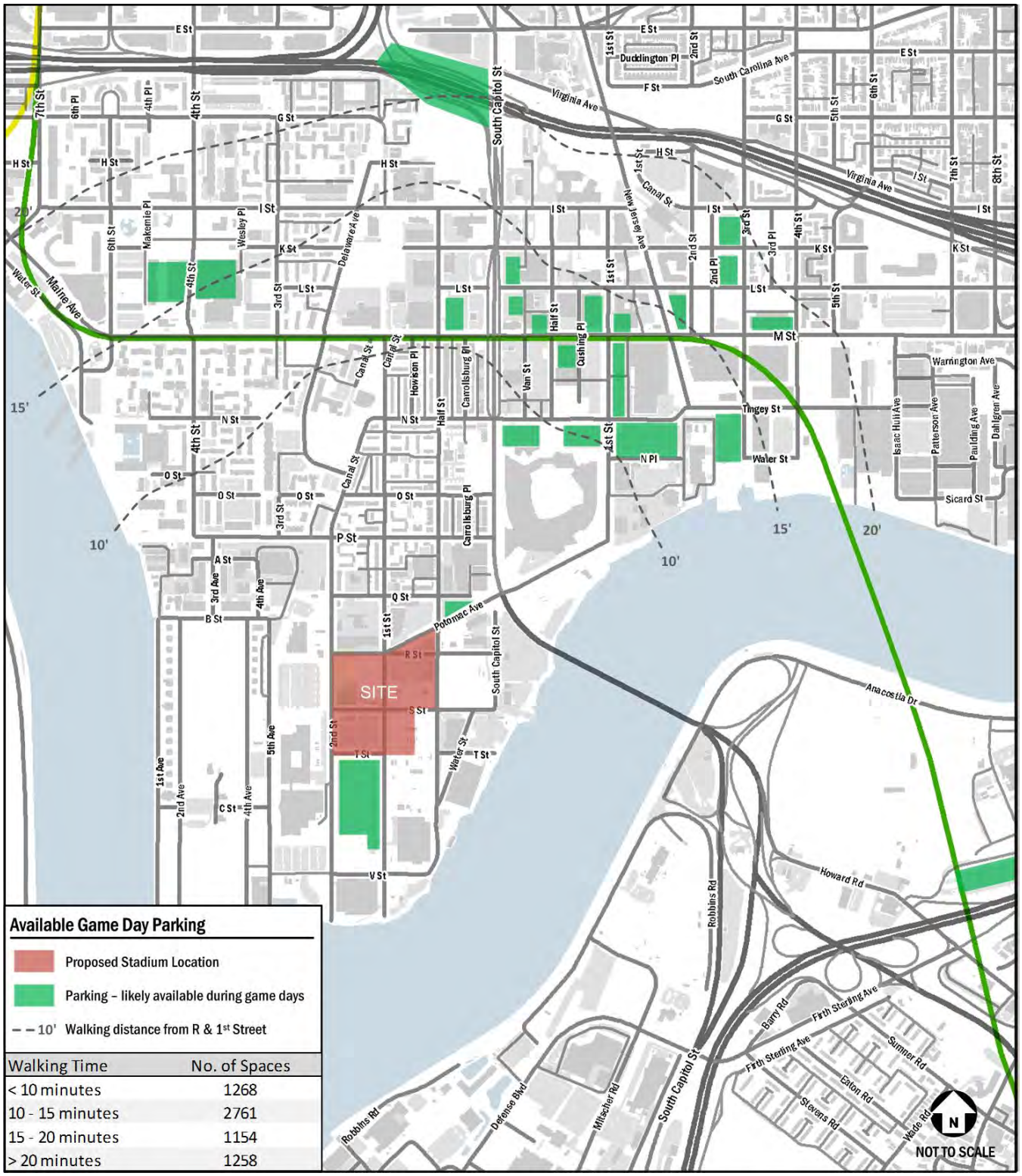


Figure 4: Available Game Day Parking

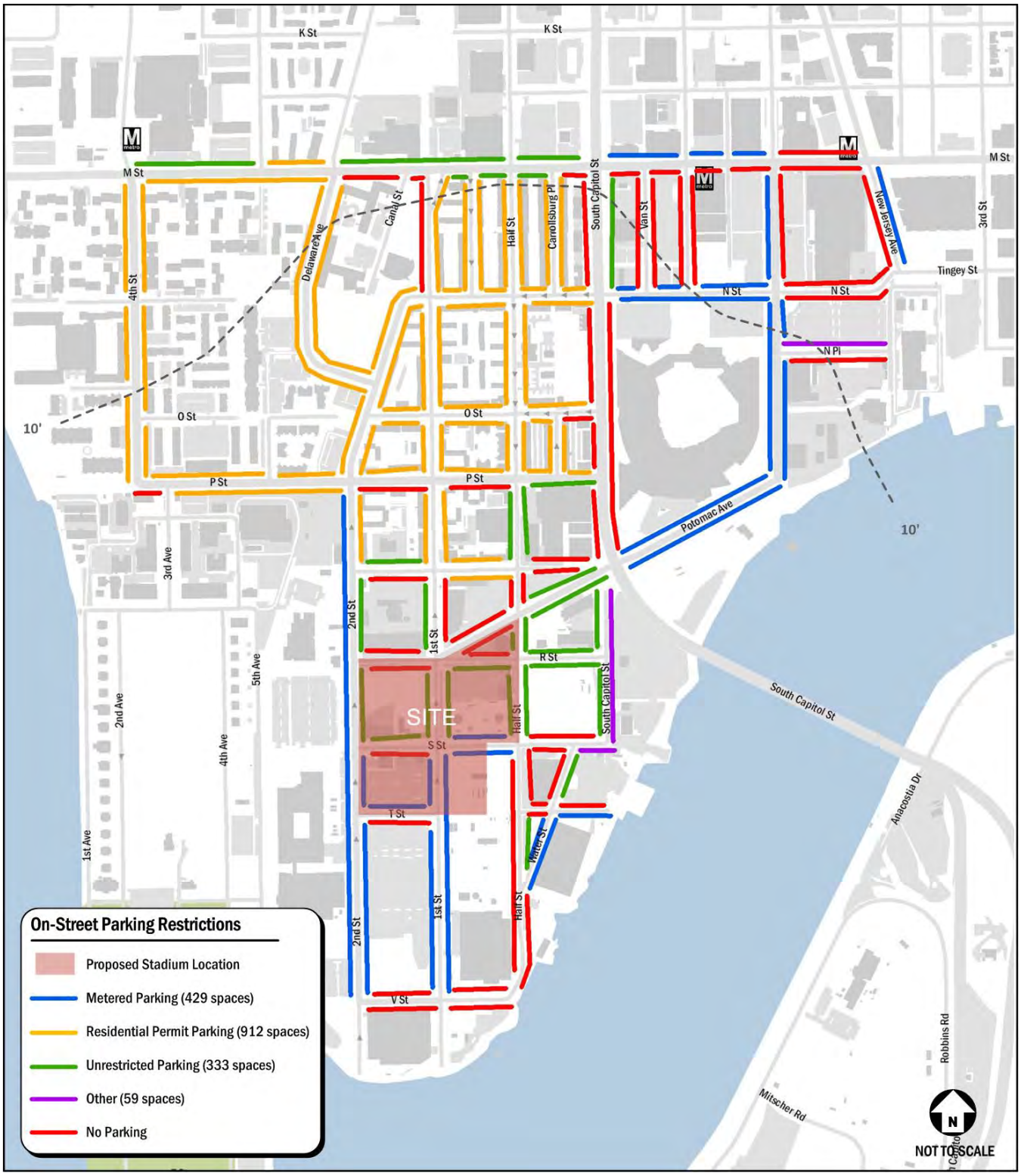


Figure 5: On-Street Parking Restrictions

TRANSIT

The predominant transit service near the site is Metrorail, with both the Waterfront Station and Navy Yard Station within walking distance of the proposed Stadium location. There are also a few Metrobus routes that travel near the proposed site. The locations of the Metrorail stations and portals, as well as key Metrobus service points are shown in Figure 6.

Existing Metrorail Service

Both the Waterfront Station and the Navy Yard Station are located approximately two thirds of a mile from the new Stadium and serve the Green Line. The Green Line connects the study with major downtown connections such as Chinatown/Gallery Place, as well as Fort Totten and Greenbelt, Maryland to the north and Branch Avenue Station in Maryland to the south. Although the site is only directly served by the Green Line, the L'Enfant Plaza Metro station is located one stop away from the Waterfront Metro station on the Green Line and provides transfers to the Orange, Blue, and Yellow Lines, which greatly improves the overall connectivity of site.

DC United games are typically scheduled on Wednesday nights, Friday nights, and on the weekends. On weekdays Metrorail service runs from 5 AM to midnight with typical headways of 10 to 15 minutes in the evenings. On Friday Metrorail service is extended to 3 AM. Weekend service starts at 7 AM and ends at 3 AM on Saturday and midnight on Sunday with headways of 6 to 15 minutes. Soccer matches have a run time of two hours with little variance, thus there will be no concern of Metrorail service closing before the end of matches.

Although the Waterfront and Navy Yard Stations are approximately equidistant from the site, the Navy Yard Station is expected to be utilized on a greater basis due to its familiarity and association with the Nationals Ballpark. The Half Street, SE portal of the Navy Yard Station has also undergone extensive renovations and improvements to handle large event transit traffic. These improvements moved the mezzanine pay area from inside the station to ground level and added several more fare gates, exit-fare vendors, and fare-card vendors. Due to the added facilities and modified layout, the Half Street, SE portal can now handle 15,000 persons per hour, as opposed to 5,000 persons per hour prior to the improvements.

It is also observed that residents of the DC metropolitan area are flexible when it comes to transit or driving options. As a result, residents who do not live near a Metrorail line have the option to use Park n' Ride, which allows users to park at many Metro stations on the outer edges of the system and take Metrorail into the city. Although most patrons do not live near a Park n' Ride facility on the Green Line, the new Stadium location has the advantage of being near many major transfer stations, including the L'Enfant Plaza Metro station, making it easy to access the Stadium from anywhere along the Metrorail System.

Existing Metrorail Volumes

The average entry and exit volume for stations near the Stadium site during the PM peak hour and average weekday time frames are provided in Table 3. The PM peak hour volumes are from May 14, 2014 and represent a typical weekday when neither DC United nor the Nationals have a home game. The average weekday volumes are an average of the entries and exits at each station for the entire month of May. These volumes are based on data provided by WMATA.

Table 3: Existing Metrorail Ridership

STATION	PM Peak Hour Typical Weekday			Average Weekday		
	Entries	Exits	Total	Entries	Exits	Total
Navy Yard (East)	1,077	260	1,337	5,409	5,667	11,076
Navy Yard (West)	252	116	368	5,105	5,130	10,235
Waterfront	468	469	937	4,024	3,921	7,945
Stadium-Armory (North)	137	276	413	2,083	1,969	4,052
Stadium-Armory (South)	96	113	209	939	886	1,825

Existing Metrorail Capacity

There are two types of Metrorail capacity, (1) station capacity, or the amount of riders a station can process at one time through escalators, fare gates, etc., and (2) line capacity, or the amount of room on train cars available to riders.

This study evaluated the station capacity at the two stations expected to be impacted the most by Stadium patrons, Navy Yard and Waterfront, along with Stadium-Armory, to provide a comparison to existing operations at RFK Stadium. Station capacity is broken down into vertical capacity which primarily involves the elements that move riders between the platform and street level such as elevators, escalators, and stairways, and horizontal capacity which analyzes elements such as fare gates and farecard vendors. Station capacity was determined based on the following assumptions:

- Fare gates can process 1,800 people per hour;
- Escalators can process 5,000 people per hour; and
- A typical 5.5 foot wide stairway can process 1,800 people per minute (double width stairways can process 3,600 people per minute).

The existing station characteristics were provided by WMATA and the vertical and horizontal capacities were calculated. The station capacity, shown in Table 4, represents the lower of the two capacities, representing the maximum number of riders can be processed at the station per hour. Based on the station capacity and the volumes determined previously, a volume to capacity ratio was calculated to determine if any stations are over capacity under existing conditions. As shown, there is ample station capacity at each of the stations analyzed.

Table 4: Existing Metrorail Station Capacity Analysis

Station	PM Peak Hour Volume (riders/hour)	Station Capacity (riders/hour)	Volume to Capacity Ratio
Navy Yard (East Portal)			
Peak Direction (Entering)	1,077	5,600	0.19
Off-Peak Direction (Exiting)	260	3,000	0.09
Total	1,337	8,600	0.16
Navy Yard (West Portal)			
Peak Direction (Entering)	252	10,000	0.03
Off-Peak Direction (Exiting)	116	5,000	0.02
Total	368	15,000	0.02
Waterfront			
Peak Direction (Entering)	468	5,000	0.09
Off-Peak Direction (Exiting)	469	5,000	0.09
Total	937	10,000	0.09
Stadium-Armory (North Portal)			
Peak Direction (Exiting)	276	10,000	0.03
Off-Peak Direction (Entering)	137	5,000	0.03
Total	413	15,000	0.03
Stadium-Armory (South Portal)			
Peak Direction (Exiting)	113	5,000	0.02
Off-Peak Direction (Entering)	96	5,000	0.02
Total	209	10,000	0.02

In addition, the line capacity of the green line entering and exiting the Navy Yard station was evaluated. The volumes entering Navy Yard were determined based on data provided by WMATA. These volumes were then compared to the "Special Event" capacity at Navy Yard to provide a base point for comparison during a game day situation. As shown, both directions are under the v/c threshold of 0.8 which is typical of rush hour conditions. Therefore, as shown in Table 5, there is available capacity on the green line in both directions under existing conditions.

Existing Metrobus Service

Metrobus options that will be available during game days include the Metrobus P6 and the Metrobus V7, V8, V9 Routes. A few other routes travel in the vicinity of the proposed Stadium site; however, these routes either do not run during typical game times or they run along South Capitol Street and do not provide a stop location convenient to the Stadium. These routes travel along M Street within the vicinity of the Stadium, the nearest stop being approximately a half mile from the Stadium. The routes serving the area connect the site to the Metrorail system and with various locations throughout the downtown business core. Table 6 shows a summary of the bus route information for the routes that serve the Stadium on game days, including service hours and headway.

Table 5: Existing Metrorail Line Capacity Analysis

	Green Line	
	To L'Enfant	To Anacostia
Volume (per hour)		
Volume entering Navy Yard station	1,710	6,729
Riders exiting trains	56	320
Riders boarding trains	1,130	199
Volume departing station	2,784	6,608
Peak Volume	2,784	6,729
"Special Event" Capacity (per hour)		
Cars per hour	70	70
Riders per Car	155	155
Total Capacity	10,850	10,850
Volume/Capacity Ratio	0.26	0.62

Table 6: Metrobus Route Information

Route Number	Route Name	Service Hours*	Headway*
P6	Anacostia-Eckington Line	Weekdays: 5:00 am – 2:00 am Saturdays: 5:30 am – 2:00 am Sundays: 6:30 am – 12:30 am	15-30 min
V7, 8, 9	Minnesota Ave-M Street Line	4:30 am – 1:30 am	30 min

* WMATA route schedules, http://wmata.com/bus/timetables/

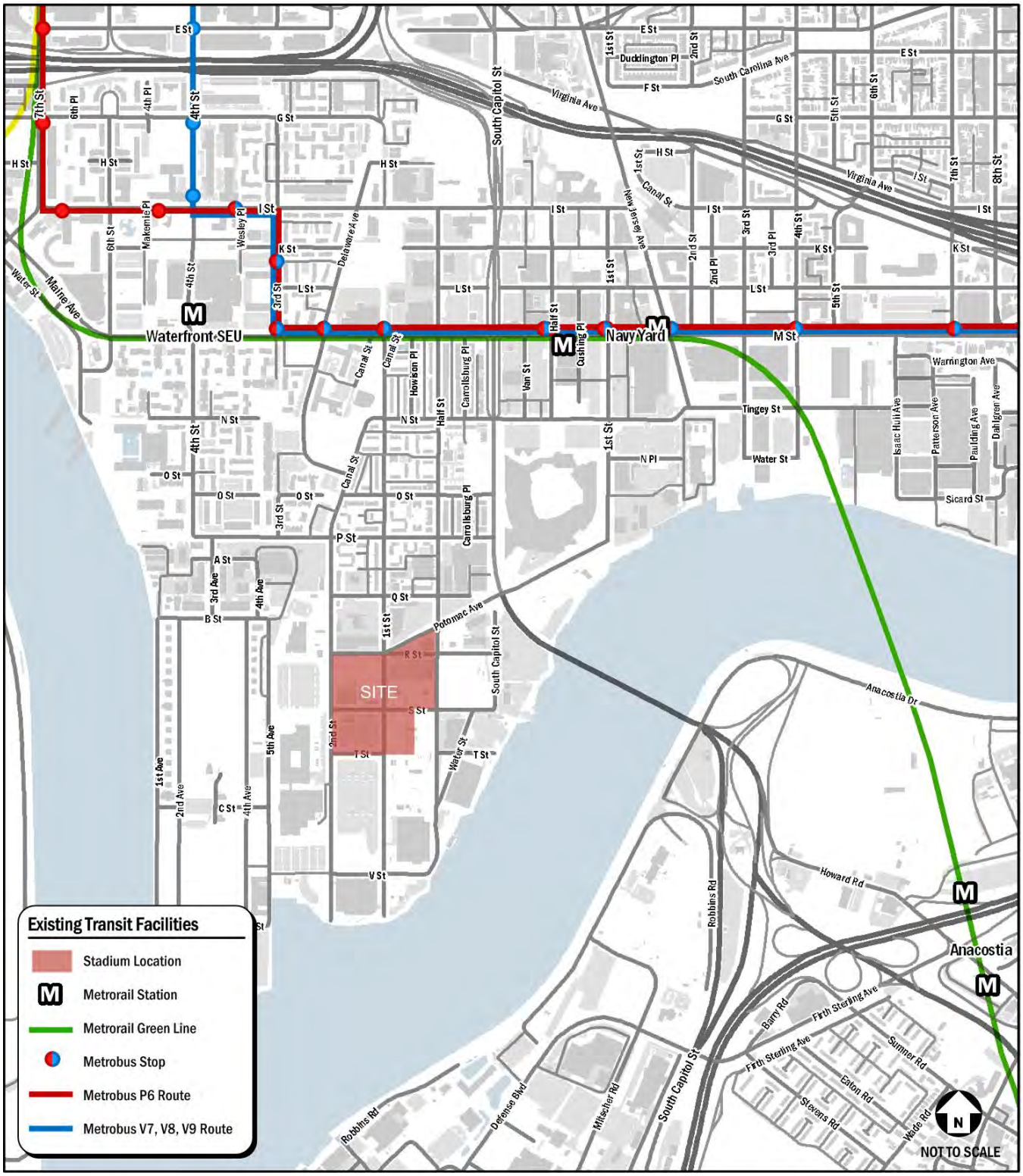


Figure 6: Existing Transit Facilities

PEDESTRIAN

Existing Pedestrian Facilities

The proposed DC United Stadium is served by a comprehensive network of pedestrian facilities. Pedestrian activity within the study area generally occurs along transit access routes, in the vicinity of transit stops, at commercial nodes along M Street, and, to a lesser extent, between residential neighborhoods and transit and commercial nodes. Many of the streets in the study area have adequate sidewalks, planted buffers between sidewalks and the curb, and on-street parking that provides an additional buffer between pedestrians and vehicular traffic. Figure 7 shows a summary of the existing pedestrian facilities in the study area.

Pedestrian access along South Capitol Street, Potomac Avenue SE, and other roadways bordering Nationals Park is excellent; wide sidewalks, crosswalks, curb-ramps, and other pedestrian-amenities are provided. Pedestrian facilities along the other roadways in the study area east of South Capitol Street and north of P Street SW are generally adequate.

While the pedestrian facilities near Nationals Park are excellent, those provided within Buzzard Point and near the Stadium are generally of lower quality. With the exception of the west side of 2nd Street SW, the majority of the roadways south of P Street SW have no sidewalks or crosswalks. North of P Street SW, within the residential neighborhood, the majority of roadways have sidewalks, crosswalks, and curb ramps. However, pedestrian routing will avoid cutting through the neighborhood. Additionally, it can be difficult and intimidating for pedestrians to cross South Capitol Street.

Compliance with DDOT Standards

A review of pedestrian facilities near the site shows that some areas have facilities that meet DDOT standards and provide a quality walking environment; however, the Buzzard Point neighborhood is extremely lacking in pedestrian facilities. Figure 8 shows a detailed inventory of the existing pedestrian infrastructure within the study area.

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 width and buffer requirements for the District are shown below in Table 7. Within the area shown, most roads are considered residential with a low to moderate density; thus, a six-foot sidewalk with a four-foot buffer is required. Some portions of M Street and roadways near the Ballpark are considered Commercial (non-downtown) and thus require a ten-foot sidewalk with a four-foot buffer.

As can be seen in Figure 8, most sidewalks near the ballpark and within the residential neighborhood north of P Street comply with these standards; however, sidewalks are largely nonexistent in the Buzzard Point neighborhood directly surrounding the site. Areas directly surrounding the site and those along primary pedestrian routes will have to be improved to create a more inviting pedestrian atmosphere around the proposed Stadium location.

ADA standards require that curb ramps be provided wherever an accessible route crosses a curb and must have a detectable warning. Curb ramps shared between two crosswalks are not desired. As shown in Figure 8 under existing conditions, most intersections east of North Capitol Street and along M Street provide crosswalks and curb ramps that are compliant with DDOT standards. The residential neighborhood has crosswalks in most areas; however, many of the curb ramps do not meet standards. Crosswalks and curb ramps are primarily nonexistent south of the residential areas. As stated above, the pedestrian facilities surrounding the Stadium and providing access to the Stadium would have to be improved as part of the development.

Table 7: DDOT Sidewalk Standards

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

Figure 7: Sidewalk Conditions

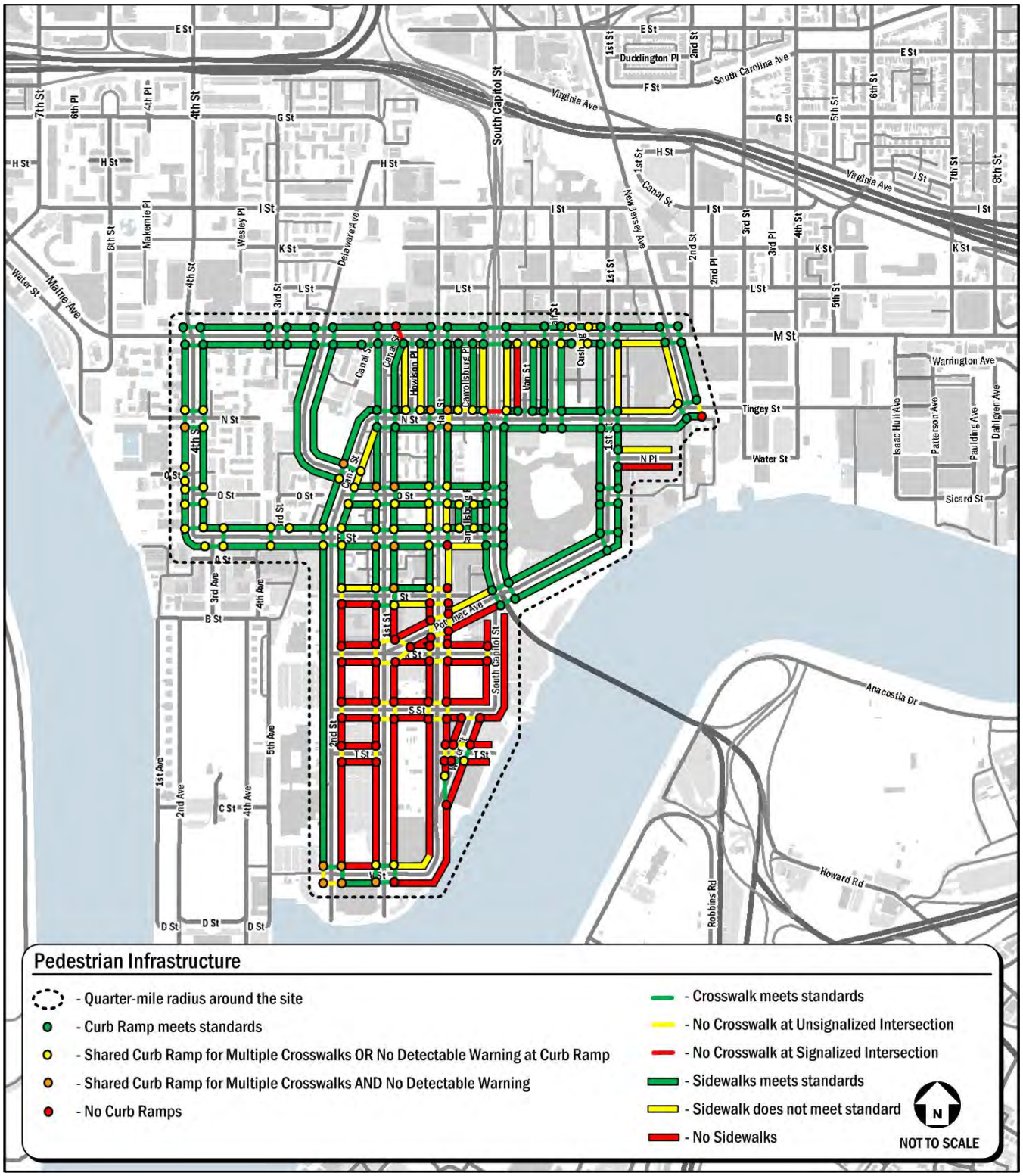


Figure 8: Pedestrian Infrastructure

BICYCLE

The cycling culture within the District has changed and progressed rapidly over the past several years. The overall bicycle mode share for commuters has increased from 2.0 percent in 2006 to 3.2 percent in 2011[1], which is one of the largest jumps in the country. The increase in bike commuters has spurred an increased focus on upgrading and developing new bicycle infrastructure within the city including on and off-street facilities and the addition of the Capital Bikeshare program.

Bike lanes, separated cycle tracks, and multi-use trails have also been constructed all over the city. According to MoveDC's *Multimodal Long-Range Transportation Plan*, completed in May 2014, there are approximately 87 miles of signed bicycle routes within the District currently, with 57 miles of these having bicycle lanes (as of August 2013), 7.6 miles of protected cycle tracks (as of December 2013), and the remainder being sharrows or low-volume, low-speed roadways that provide good cycling conditions. In addition 2,000 bicycle racks have been installed across the city since 2005 to further improve the bicycle environment.

The areas of the southwest and southeast quadrants surrounding the potential Stadium site have seen a surge of bicycle facilities over the past several years. As of 2005, no dedicated bicycle facilities existed in this area, and now there are bicycle lanes on 4th Street SW, I Street SE/SW, 1st Street SE, and Potomac Avenue SE in addition to the multi-use trail that travels along the Anacostia River. Although not completely finished, the Anacostia Riverwalk Trail provides a very safe and enjoyable bicycle route near the site. Existing bicycle facilities are shown in Figure 9.

In addition to personal bike use, the Capital Bikeshare program has placed 300 bicycle share stations across Washington, DC, Arlington and Alexandria, VA, and most recently Montgomery County, MD with over 2,500 bicycles provided. Due to the lack of development in Buzzard Point, there are no Bikeshare stations in the direct vicinity of the proposed Stadium site. Under existing conditions the nearest Bikeshare station is near Nationals Park, approximately half a mile from the Stadium. An additional five Bikeshare stations are located within a mile of the Stadium, as shown in Figure 9. Thus, in order to make Bikeshare an attractive option for patrons, more Bikeshare stations would need to be added closer to the Stadium.

[1] https://www.census.gov/acs/www/

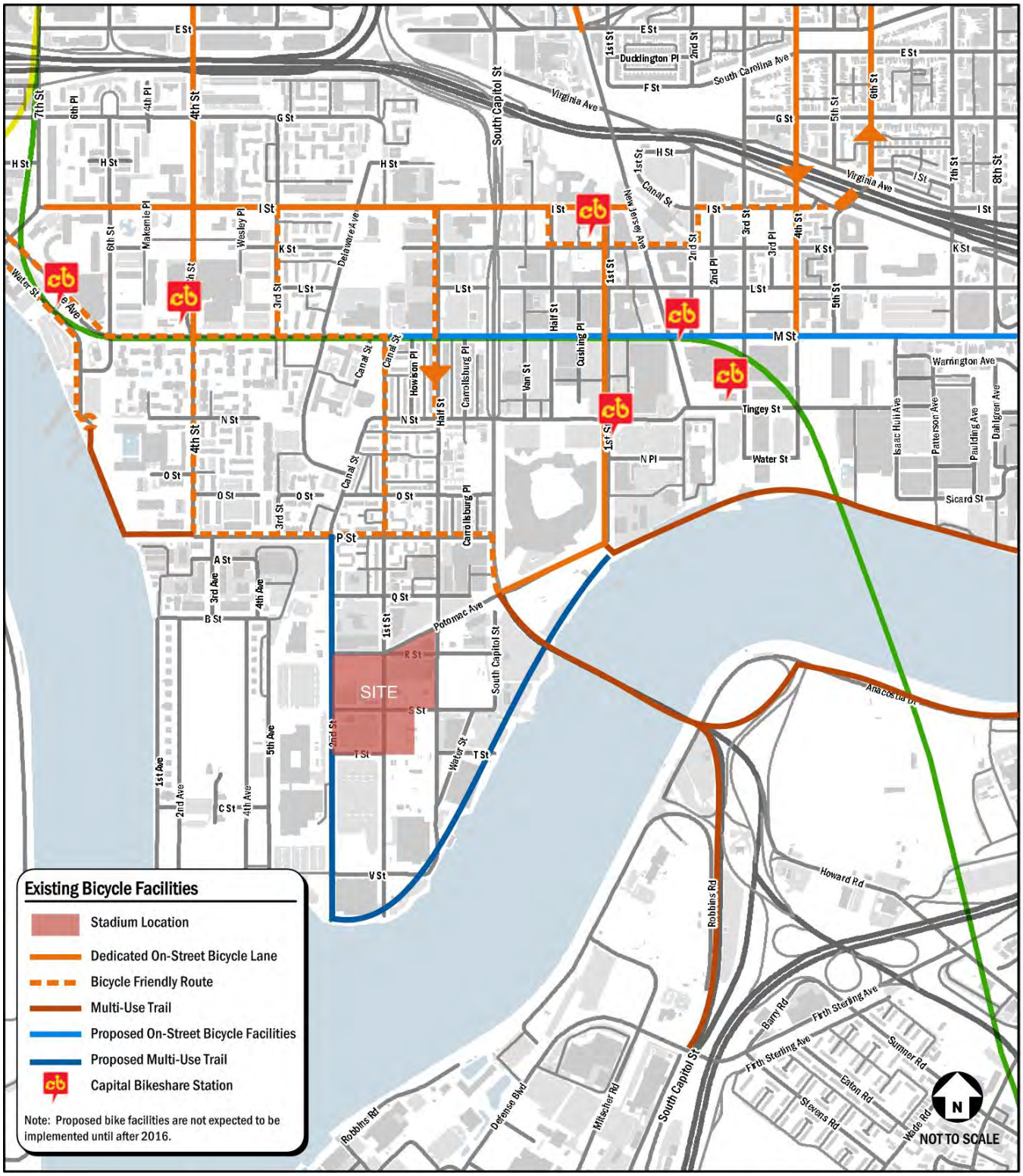


Figure 9: Existing Bicycle Facilities

CHAPTER 2: TRANSPORTATION SYSTEM IMPACTS

This chapter assesses the impacts of the Stadium on traffic, parking, transit, pedestrian, and bicycle infrastructure. Many of the assumptions used in this analysis are from analyses and discussions with DC United, summarized in the draft *DC United Transportation Management Plan* (TMP) prepared by Gorove/Slade, including trip generation, traffic routing, and parking demand. The results of this analysis will also help shape the Transportation Operations Plan (TOP), to be assembled closer to the Stadium's opening.

In addition to the transportation documents prepared specifically for the DC United Stadium, the District recently completed the *SE/SW Special Events Study,* which reviewed the long-term impacts of the new soccer stadium in conjunction with other large event venues for the year 2035. The study analyzed several scenarios events at the new DC United stadium alone and in conjunction with other events. As it was a long-term study, it assumed the North-South Streetcar to be constructed, with a stop within Buzzard Point. In addition it included the planned improvements South Capitol Street and M Street from the *South Capitol Street EIS*. In short, the study found that when there are simultaneous events on weeknights at all venues, the roadway and transit systems will be over capacity. However, when events occur individually they will generate a manageable amount of congestion with use of Traffic Control Officers (TCOs) stationed at critical intersections.

Since the *SE/SW Special Events Study* focused on the long-range impacts, the analysis within this document focused on the opening year, slated for 2017. This provides a separate perspective of potential impacts, and will form the basis of analyses that will conclude with the 2017 season TOP. This study also focuses on the weekday PM peak, as the *SE/SW Special Events Study* concluded that it presented the worst-case conditions traffic-wise, and thus would be the best time frame to analyze in this document to determine potential impacts.

The majority of events at the stadium are expected to occur on weekends. A summary of the 2014 DC United season, shown in Table 8, shows that only 25% of games occur on weeknights. Even though that is the case, this study focuses on the weeknight PM peak hour as this time period accounts for the most congested game-time scenario, combining DC United patron traffic with evening commuter traffic.

In addition to DC United games, the Stadium will host a handful of other events. Table 9 displays a list, provided by DC United, of possible events and their preliminary level of activity expected during a given year. Some of these events expect a sell-out condition and some will be much smaller events.

Table 8: Summary of 2014 Game Schedule

Game-day Schedule	Number	Percentage
Wednesday, 7:00 PM	2	10%
Wednesday, 8:00 PM	2	10%
Friday, 8:00 PM	1	5%
Saturday, 3:00 PM	1	5%
Saturday, 4:00 PM	1	5%
Saturday, 6:00 PM	1	5%
Saturday, 6:30 PM	1	5%
Saturday, 7:00 PM	8	40%
Sunday, 2:30 PM	1	5%
Sunday, 8:00 PM	2	10%
Total	**20**	**100.0%**

Table 9: Expected DC United Stadium Events Schedule

Events	Season				
	2017	2018	2019	2020	2021
DC United					
Number of Games	23	23	23	23	23
Average Attendance	19,200	19,200	19,200	19,200	19,200
International Soccer Matches					
Number of Games	5	5	5	5	5
Average Attendance	15,625	19,262	20,000	20,000	20,000
Concerts					
Number of Concerts	8	8	8	8	8
Average Attendance	20,000	20,000	20,000	20,000	20,000
Community Events					
Number of Events	10	10	10	10	10
Average Attendance	4,000	4,000	4,000	4,000	4,000
Other Events (NCAA Lacrosse/Rugby/etc…)					
Number of Events	12	12	12	12	12
Average Attendance	6,000	6,000	6,000	6,000	6,000

Mode Split

Spectator mode split was determined using data provided by DC United and WMATA including game-day attendance, parking pass sales, and Metrorail usage, using the following steps:

- For every game in the 2012 season, spectator attendance was determined using data provided by DC United on scanned tickets upon stadium entry. Scanned tickets upon entry are used instead of tickets sold since actual attendance differs, mostly due to patrons with tickets not showing up to games. DC United has indicated that the current amount of ticketed patrons that do not show-up is well over 10%, and expect a smaller but significant amount of "no-shows" at the new stadium.
- Then, using information provided by WMATA, Metrorail usage was obtained by comparing the individual game-day ridership to the average ridership on a typical non game-day (categorized by day of week) at the Stadium Armory Metrorail Station.
- An assumption was applied that 5% of patrons would arrive by means other than Metrorail or vehicle, i.e. bus, walk, and bike. Subtracting the Metrorail and 'Other' patrons from the total tickets scanned resulted in the total number of patrons assumed to have arrived by vehicle.
- This number of spectators arriving by vehicle was then compared to the number of vehicles parked in the parking lot to determine the vehicle occupancy for each game. The number of vehicles parked was derived using parking pass sales information provided by DC United. Because there was an extensive amount of Metrorail track work during 2012, games that occurred on heavy track work days (usually Saturdays and Sundays) were discounted from the data set when determining the average weekday and weekend mode.

The results of the mode split analysis are displayed in Table 10 for typical weekday games and weekend games.

Table 10: 2012 RFK Mode Split (Weeknight vs Weekend)

Day of Week	Mode Split Percentage*						Estimated Car Occupancy*
	Metrorail	Automobile	Bike	Walk	Taxi/Uber	Charter Bus/Other	
Weeknight	36%	59%	2%	1%	1%	1%	3.15
Weekend	32%	63%	2%	1%	1%	1%	3.30

*Based on data provided by DC United and WMATA

A closer examination of the mode split analysis led to the conclusion that DC United spectators are very flexible in their travel mode, because:

- When track work was in effect the average transit mode split significantly decreased. The average Metrorail mode split during heavy track work days were 25% on weekdays and 18% on weekends.
- Higher Metrorail mode splits were observed on games with higher attendance. The two highest attended games in 2012 had transit mode splits of 48% and 51%, respectively, drawing the conclusion that DC United patrons are more likely to take public transportation for a bigger game assuming that driving and parking will be more difficult.

These observations indicate that DC United spectators have access to multiple modes of travel and decide prior to the game which mode to take, taking into account travel advisories (i.e. planned Metrorail delays) and games where higher levels of traffic are anticipated. Thus, it is likely that during games at the new stadium, spectators will likely have mode splits closer to those observed at highly attended games during the 2012 season. The influence of transportation demand management measures could increase the transit mode split to over 50%, and DC United has indicated they plan to enhance their encouragement of transit and cycling to games in the new stadium to help improve the spectator experience with an overall goal of 55 percent transit and 10 percent other alternative modes (bicycle, walking, taxi/Uber, charter bus, water taxi, pedicabs, etc.). In addition, the current situation at RFK Stadium, where parking is plentiful and located adjacent to the stadium likely encourages driving as a mode, whereas a similar situation will not exist at the new stadium. Parking at the new stadium will likely be more expensive. Parking at RFK costs $20 whereas most parking within a 15 minute walk from Nationals Park ranges from $27 to $37.

Although this is the case, the analyses in this report will use a more conservative estimate of transit mode split in order to identify a 'worst-case' condition for potential traffic impacts, as presented in Table 11. Not only are these assumptions conservative because they use a lower than expected transit mode split, they also assume that all ticket holders attend the match, even though DC United predicts games will have a "no-show" factor of approximately 10%. The amount of vehicles arriving during the peak hour was assumed as 60% of the total vehicles arriving for a game.

Table 11: Mode Split and Trip Generation Assumptions Used in Analyses

Scenario	Mode Split						Capacity	Patrons by Mode						Auto Occupancy (patrons/car)	Parking Demand
	Transit	Auto	Bike	Walk	Taxi/ Uber	Charter Bus/ Other		Transit	Auto	Bike	Walk	Taxi/ Uber	Charter Bus/ Other		
Weeknight	40%	55%	2%	1%	1%	1%	20,000	8,000	11,000	400	200	200	200	3.15	3,500

PARKING

Off-Street Parking

The majority of game-day patron parking will be off-street within privately owned parking lots and garages. Most of the parking lots inventoried in Chapter 1 are used by office workers during the day and/or by Nationals patrons on game days. Therefore, this parking will be readily available for all game-time scenarios on weeknights and weekends, assuming no direct scheduling conflicts with Nationals games. This represents a typical scenario, because conflicting events are not expected to occur more than several times a year, and per the TMP will have additional transportation demand strategies employed depending on combined expected attendance and predicted start/end times.

As discussed above, the expected vehicular demand for a weeknight game will be approximately 3,500 vehicles. Although some people are likely to utilize the non-residential on-street parking within Buzzard Point, the adequacy of the existing off-street parking was analyzed based on 3,500 vehicles to maintain a conservative analysis. When determining the number of spaces that need to be provided, a 10% circulation factor should be included to accommodate for vehicles searching for spaces and any parking that may not be available that normally is. Therefore, the recommended parking supply is 3,900 spaces.

As discussed in Chapter 1, there are approximately 6,441 off-street parking spaces expected to be available for the 2017 opening season. Because the improvements to the Frederick Douglass Memorial Bridge won't be complete by 2017, this analysis worked under the assumption that patrons will not park in the Anacostia Metro Station parking garage which brings the off-street parking total down to 5,633 spaces. This amount of parking exceeds the 3,900 spaces necessary for a game.

This parking total does not take into account potential parking at the Stadium itself or office parking as a result of redevelopment in the area between now and 2017. Additional parking located on Buzzard Point is recommended as it will help spread out demand, increase the amount of parking within a short walk of the Stadium, ensure that smaller events could have an independent parking supply, and reduce pedestrian crossings at South Capitol Street. Assuming that some additional parking will be provided at or near the Stadium, two game-day parking distributions were developed:

- A **Basic** Distribution that based routing on the fastest travel routes, the shortest distance between parking zones and the Stadium, and the overall availability of parking.
- An **Influenced** Distribution that more evenly distributes vehicles throughout the parking areas and avoids areas of existing congestion.

These distributions are shown in Figure 10 and Figure 11. The basic distribution focuses more vehicles to the parking areas closest to the Stadium, particularly Zone B and some areas of Zone C and D. It should be noted that the amount of parking in Zone A, directly adjacent to the site, does not change as it is assumed that much of this parking will be pre allocated to season ticket holders.

On-Street Parking

On-Street parking is expected to be used less than off-street parking since there are fewer spaces available. Stadium site is surrounded by unrestricted and metered spaces. Additional metered parking and a limited amount of unrestricted parking is available north of M Street and east of South Capitol Street. A total of 363 metered spaces and 258 unrestricted spaces are expected to be available during weeknight games.

In addition to the metered and unrestricted parking near the Stadium, there is a large amount of Residential Permit Parking (RPP) spaces in the residential neighborhood north or the Stadium, as discussed in Chapter 1 and depicted in Figure 5. These RPP spaces are currently broken down into general RPP and enhanced RPP. Enhanced RPP does not have a 2-hour grace period for drivers without Zone specific permits.

Parking Mitigations

Off-Street Parking

Although there is enough existing parking to serve patrons of Stadium events, it will be helpful to provide parking on Buzzard Point near the Stadium. As stated above, parking on Buzzard Point would increase the amount of parking

within a short walk of the Stadium, ensure that smaller events could have an independent parking supply, and help disperse overall vehicular demand. Some of this parking could be a source for ADA parking and other priority parking, such as carpool/HOV vehicles.

In the months leading up to opening day, it will be necessary to work with owners, operators, and developers of existing parking facilities and undeveloped surface lots to determine which parking locations will be available. This list should be revised and updated leading up to and beyond opening day.

On-Street Parking

The on-street parking inventory found a mix of metered, residential permit parking, and unrestricted parking. The following changes should be made to on-street parking restrictions to better serve the Stadium and protect the surrounding neighborhood:

- Metered Parking
  Existing meters in Buzzard Point that do not serve residential uses should be converted to multi-space meters with the option of implementing special game day rates. The use of multi-space meters allows for more cars to park in the metered areas thus increasing the overall parking capacity.

- Residential Permit Parking
  Much of the RPP parking was reviewed and enhanced prior to Nationals Park opening; however there are some areas closer to the Stadium that may require additional changes to deter patron parking. Currently, the majority of residential blocks implement general RPP on one side and enhanced RPP on the other side, with restrictions that require RPP permits from 7 AM to midnight every day of the week. There are some blocks, however, that have less stringent restrictions. These spaces are only restricted from 7 AM to 9:30 PM on Monday through Saturday and are generally located closer to the Stadium site. It is suggested that all spaces with these restrictions be further protected to at least include Sunday RPP restrictions since some games will take place on Sundays. The residential neighborhood may be best served if all residential blocks required RPP permits from 7 AM to midnight, seven days a week. In addition to curbside restrictions, signs along M Street restrict non-local vehicles from entering the neighborhood streets during Nationals games. These signs will have to be modified to include DC United games. In addition, signs such as this may be needed at the south end of the neighborhood to deter vehicles from exiting the Stadium through the neighborhood as well. Such signs would likely be placed at the intersections of Q Street with 1st Street and Half Street SW. Signs could also be supplemented with use of game-day barricades at these locations, placed near the end of the game to help control the flow of vehicles leaving the Stadium.

- Unrestricted Parking
  The majority of unrestricted parking near the stadium is found in Buzzard Point. This report recommends converting the unrestricted parking to multi-space meters with the option of implementing game day rates. Blocks that serve as primary walking routes, however, should be restricted to parking on game days to allow for improved pedestrian flow. For example, operational measures to expand pedestrian space, such as barriers placed in the streets to convert the parking lane to a walkway, could be used to widen the effective walkway width of high flow pedestrian routes. The specific blocks where this strategy should be implemented will be analyzed further when a more detailed Stadium design is realized.

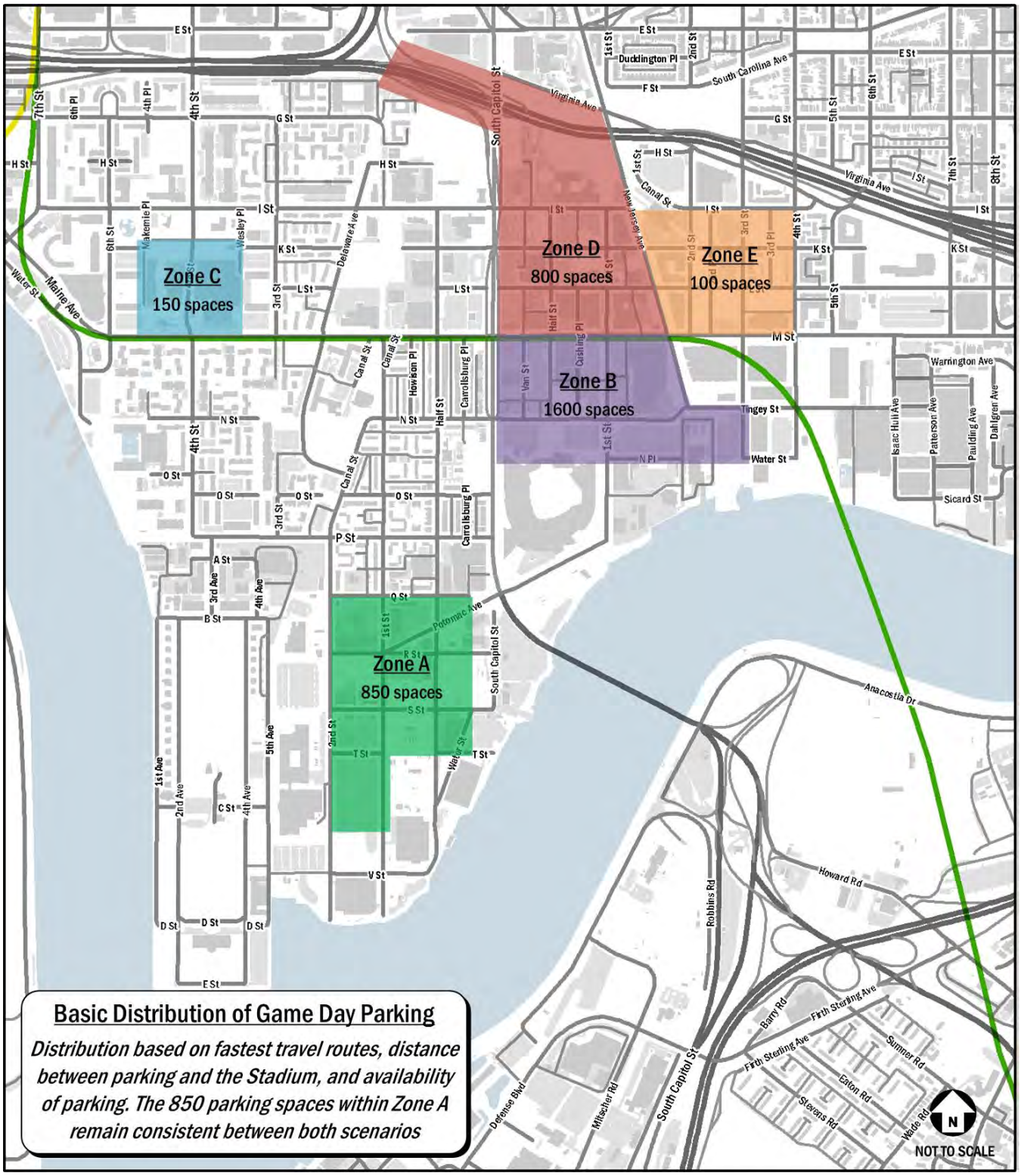


Figure 10: Basic Distribution of Game Day Parking

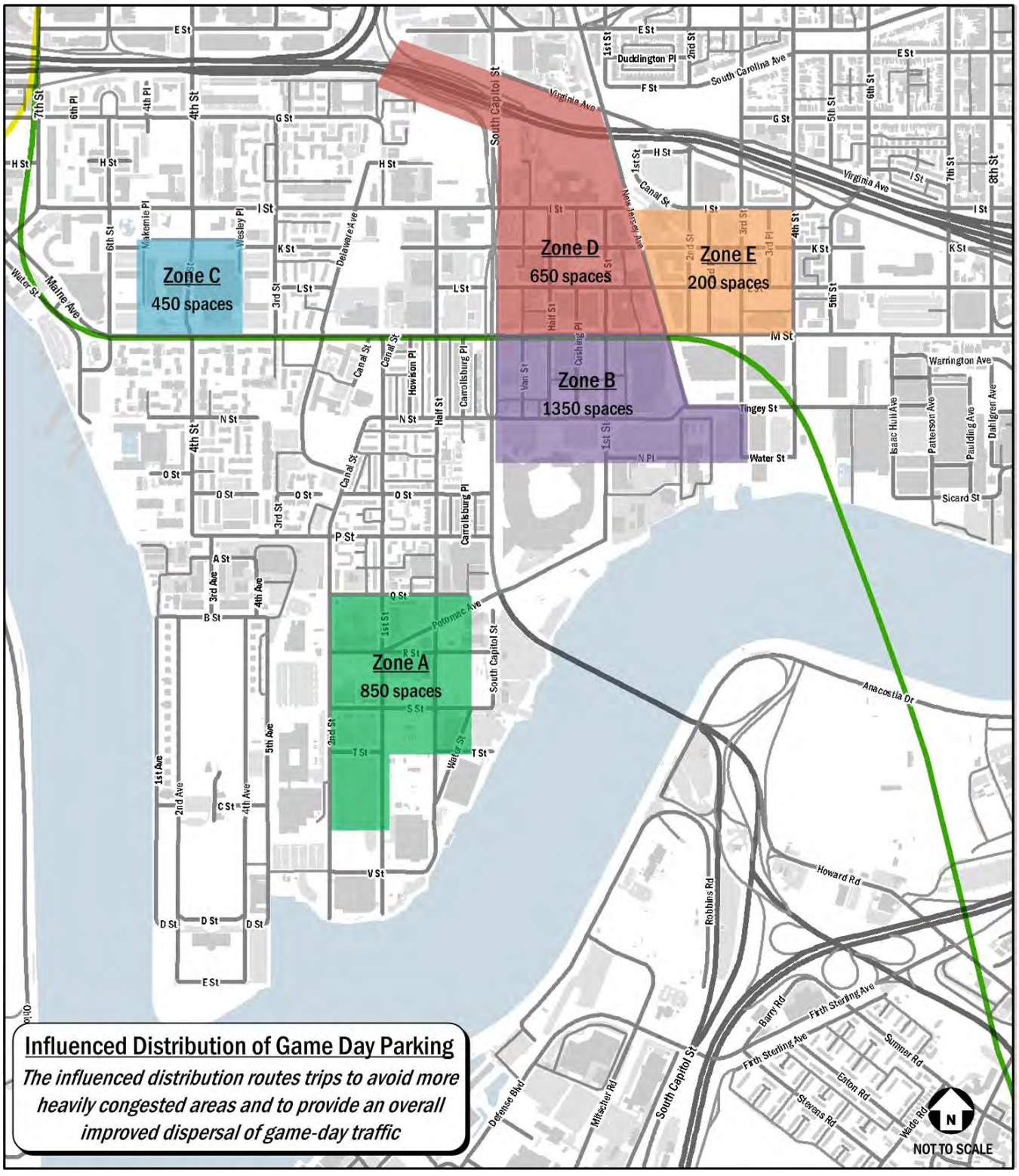


Figure 11: Influenced Distribution of Game Day Parking

TRAFFIC

The traffic analysis contained in this document focuses on determining potential mitigation measures needed to support the stadium during the 2017 season. The analysis was performed knowing that prior to the 2017 season a TOP will be produced to refine and detail operational solutions on game day (i.e. signal timing strategies, locations of traffic officers, etc.). Thus, this analysis attempts to identify mitigation measures that have a longer lead time to implement, such as physical improvements, while establishing analyses that will form the basis of the detailed operational solutions in the TOP.

The main traffic analysis, presented below, compares three future scenarios. Each is a projection of the weeknight PM commuter peak hour in the year 2017, and are as follows

- Year 2017 Weeknight PM commuter peak hour: No event (also known as background conditions)
- Year 2017 Weeknight PM commuter peak hour: Event with basic trip distribution (vehicular routing based on the shortest travel routes, the shortest distance between parking zones and the Stadium, and the overall availability of parking).
- Year 2017 Weeknight PM commuter peak hour: Event with influenced trip distribution (based routing on an improved dispersal of traffic and the avoidance of intersections with existing capacity concerns).

The difference between these three scenarios is used to determine the list of traffic mitigation measures, presented at the end of this section. The following is a summary of analysis assumptions and methodology.

Future Roadway Improvements

There are no planned and funded improvements in the study area expected to be constructed and operational prior to the 2017 DC United season, thus no improvements were taken into account for the future analysis. The South Capitol Street Corridor project will implement several transportation improvements that will alter the operations of the Stadium; however, these improvements are not expected to be complete until the end of 2018 at the earliest. Thus, this study focuses on the future conditions prior to the improvements to ensure that traffic generated by the Stadium will be manageable under year 2017 conditions.

Future Background Conditions

Background Developments

The proposed DC United Stadium is located near an area of anticipated growth and development. There are several approved developments that are projected to be completed (or have parcels completed) and occupied by 2017. Table 12 outlines these developments including their development plans and estimated date of completion and

Figure 12 shows the locations of the background developments.

Table 12: Background Developments

Development Name	Development Plan	Estimated Completion Date
1. Akridge Half Street/Square 700	280 residential units, 371,000 SF office, and 54,000 SF retail	2016
2. Arthur Capper/Carrolsburg & Capitol Quarter	Multi-family Square 882: 195 residential units in 2016 250 M: 213,000 SF office and 12,000 SF retail in 2016 Multi-family 1 Square 769: 171 residential units and 4,090 SF retail in 2016 600 M: 484,780 SF office and 15,000 SF retail in 2017	Phases complete in 2016/2017 Full completion in 2019
3. The Yards at Southeast Federal Center	Parcel D: 225 residential units and 110,000 SF retail in 2014 Park Pavilions P2A: 7,600 SF retail in 2015 Parcel N: 327 residential units and 20,000 SF retail in 2016 Park Pavilions P2B: 15,200 SF retail in 2017	Phases complete in 2014-2017 Full completion in 2027
4. The Plaza on K/Square 696, Phase 1	290,000 SF office and 14,000 SF retail	2016
5. RiverFront on the Anacostia, Phase 1	324 residential units and 18,650 SF retail	2016
6. Square 0699N (Velocity), Phase 2	287 residential units	2014
7. Square 737	Phase 1: 432 residential units Phase 2: 336 residential units and 35,000 SF retail	2014/2017
8. 1111 New Jersey Avenue	324 residential units and 11,000 SF retail	2016
9. Half Street, Phase 2	340 residential units, 196 hotel rooms, and 35,000 SF retail	2015/2017
10. 50 M Street	195 hotel rooms and 5,000 SF retail	2016
11. 1 M Street	310,000 SF office and 15,000 SF retail	2017
12. Square 701	289 residential units, 180 hotel rooms, 234,693 SF office, and 42,500 SF retail	2015
13. 1000 South Capitol Street	320,000 SF office	2017
1414. WMATA Chiller Plant Apartments	84 residential units and 5,300 SF retail	2017
15. Admiral at Barracks Row	19,000 SF office and 3,000 SF retail	2017
16. Historic Car Barn	94,400 SF retail	2017
17. The Wharf, Phase 1	901 residential units, 278 hotel rooms, 218,200 SF office, 140,943 SF retail, 6,000 person theatre, 15,500 square foot church, and a 208 berth marina	2017
18. Randall School	550 residential units, 16,000 SF retail and 40,000 SF museum	2016
19. L'Enfant Plaza	370 hotel rooms, 2,038,957 SF office, and 158,651 SF retail	2015
20. Homewood Suites	234 hotel rooms	2014
21. Parcel 69 (400 E Street SW)	214 hotel rooms	2015
22. Square 494	290,000 SF office and 17,500 SF retail	2016
23. Building 170	7,000 SF retail	2016
24. Ballpark Hotel	167 Hotel Rooms	2015
25. 20 K Street SE	400 residential units	2016

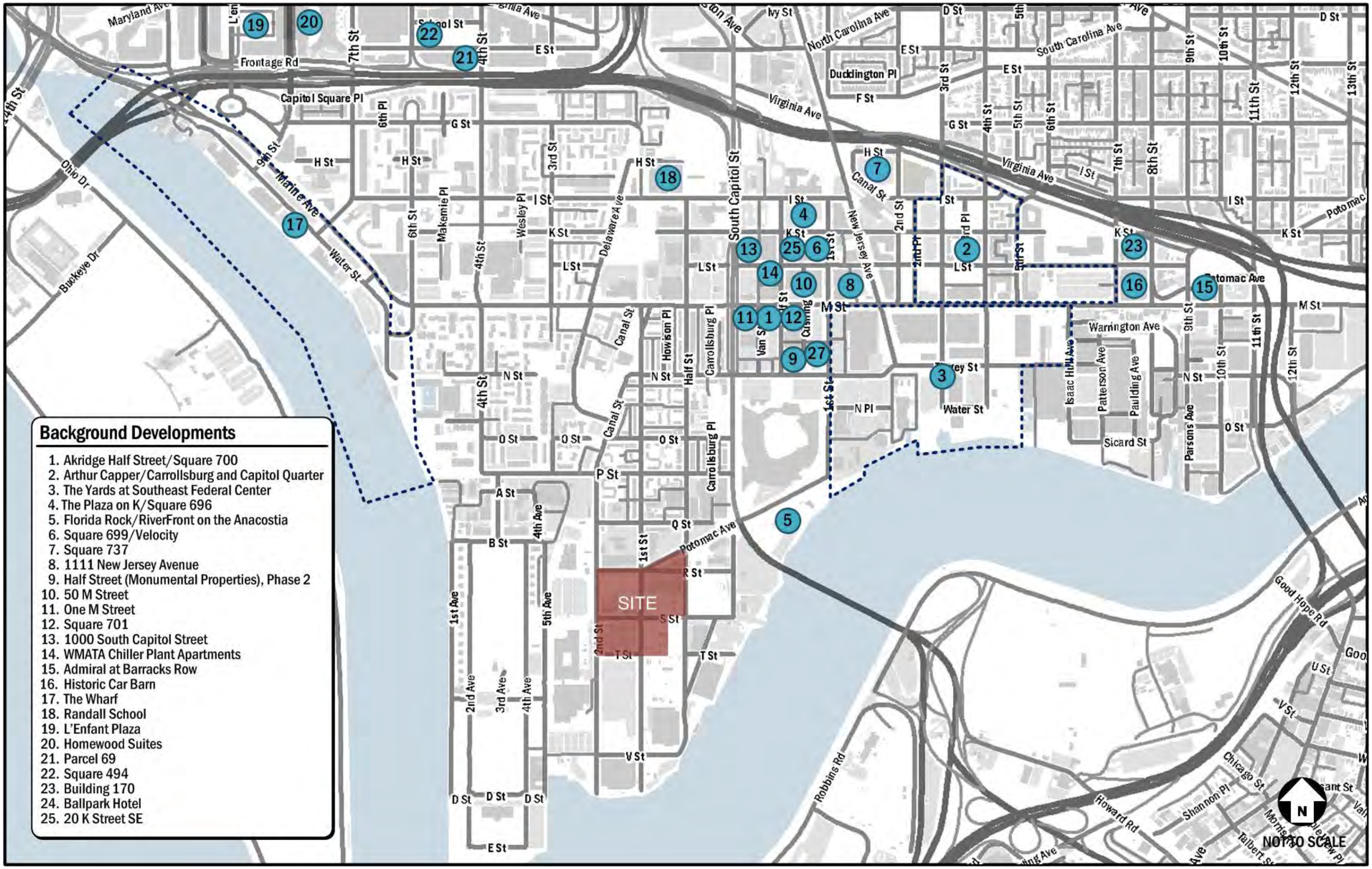


Figure 12: Background Development Map

Background Trip Generation

Available background development traffic studies were used to determine the number of trips added for the background developments. This includes the following studies:

- "Monument Ballpark – Square 700 & 701 Transportation Impact Study" performed by Wells + Associates in December 2006
- "Square 700 Development Traffic Impact Assessment" performed by Gorove/Slade in January 2009
- "RiverFront on the Anacostia PUD Transportation Impact Study" performed by Gorove/Slade in August 2012
- "Square 701 Development Transportation Impact Study" performed by Gorove/Slade in September 2012
- "Ballpark Hotel Transportation Impact Study" performed by Gorove/Slade in October 2012
- "Square 737 Traffic Impact Study" performed by Gorove/Slade in June 2011
- "DC Water Occupied Sites PUD Transportation Impact Study" performed by Gorove/Slade in October 2013
- "Southwest Waterfront Stage 1 PUD Transportation Impact Study" performed by Gorove/Slade in June 2013
- "One M Street Development Transportation Impact Study" performed by Gorove/Slade in December 2012.

These documents were used to determine the number of trips generated by the aforementioned background developments, the mode split percentages, and the trip routing. Trip generation for the other background developments was calculated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) *Trip Generation*, 9th Edition.

Table 13: Background Trip Generation

Land Use	Size		PM Peak Hour		
			In	Out	Total
Residential	23,789	dwelling units	759	416	1,174
Office	4,789,630	square feet	485	2,377	2,862
Retail	886,408	square feet	586	590	1,177
Hotel	1,834	rooms	276	268	545
Church	15,500	square feet	2	2	4
Marina	208	berths	7	5	12
Theater	6,000	persons	23	24	47
Museum	40,000	square feet	1	3	4
Total			2,139	3,685	5,825

Background Growth

In addition to the background developments, other traffic increases due to inherent growth on the study area roadways were accounted for with a 0.44% per year growth rate compounded annually over the study period (2014-2017). This rate was based on a comparison of the existing volumes (2002) and projected "No Build" scenario volumes (2030) from the *South Capitol Street Final Environmental Impact Statement.* This growth rate represents a weighted average of the growth rates experienced along South Capitol Street between I-695 and I-295. The growth rate was applied to the through movements of all study intersections.

Future Background Volumes

The traffic volumes generated by the background development and the inherent growth were added to the existing traffic volumes in order to establish the future traffic volumes without the proposed development. Trip assignments and distributions were based on previous studies performed in the area. The traffic volumes for the 2017 Background Conditions are included in the Technical Appendix.

Total Future Conditions

As discussed previously, this analysis assumes a mode split of 55 percent automobile, 40 percent transit, and 5 percent other (including walking, biking, and other transit). This amounts to an overall parking demand of 3,500 vehicles with 2,100 of those vehicles arriving during the one peak hour for the proposed Stadium. The following section discusses how these trips were distributed through the network.

Trip Distribution

Potential mitigation measures for the stadium are likely to focus on operational solutions, as infrastructure improvements are not feasible and most of the study area has already been extensively studied for infrastructure improvements. Thus, this study seeks mainly to identify what operational solutions will have the most benefit. Foremost among these is the potential to influence drivers to take routes to the stadium that avoid the existing areas of congestion identified in Chapter 1. To illustrate the magnitude of manipulating route choices, two trip distribution scenarios were analyzed:

1. A basic trip distribution that based routing on the fastest travel routes, the shortest distance between parking zones and the Stadium, and the overall availability of parking.
2. An influenced trip distribution that based routing on an improved dispersal of traffic and the avoidance of intersections with existing capacity concerns.

Patrons driving to and from the Stadium will utilize the many regional connections to reach their parking destination. In order to determine the approach routes for the Stadium, zip code data was obtained from DC United; this data consisted of zip codes for plan holders (season-ticket purchasers), game-day sales at DC United, sales for International games, and online Ticketmaster sales. The zip codes were organized and plotted to determine the areas of concentration of DCU patrons. Figure 13 shows the zip code data for the plan holders.

In order to determine the amount of drivers per approach route, the zip code data for each type of ticket purchaser was grouped based on the most-likely route that they will use to travel to the new Stadium. Figure 14 shows the zip codes of these four ticket groups. The zip codes are color-coded based on the route that patrons are expected to use to access the Stadium.

The basic trip distribution utilizes the distribution of parking shown previously in Figure 10. For the purpose of the capacity analyses, it was assumed that 60 percent of patrons will arrive during a single peak hour. This amounts to 510 vehicles traveling to Zone A, 960 traveling to Zone B, 90 traveling to Zone C, 90 traveling to Zone D, and 60 traveling to Zone E. The routing for this distribution assumed that patrons try to park closest to the Stadium and do not take into account intersections and routes that are typically busy. It also assumes that patrons use the routes typically suggested by mapping services such as Google Maps and Mapquest. The overall trip routing for the basic distribution is shown on Table 14.

The influenced trip distribution utilizes the distribution of parking shown in Figure 11. Similar to above, it was assumed that 60 percent of patrons will arrive during a single peak hour. This amounts to 510 vehicles traveling to Zone A, 810 to Zone B, 270 to zone C, 390 to Zone D, and 120 to Zone E. Vehicles were routed to avoid areas of congestion from the existing conditions capacity analysis. This method also aimed to disperse traffic over a larger area to avoid congesting singular intersections, while leaving some areas underutilized. The overall trip routing for the influenced distribution is shown on Table 15.

Game-Day Intersection Operations

To facilitate more efficient pre-game vehicular travel and to minimize the potential for vehicular and pedestrian conflicts, some operational enhancements were applied to

the intersection of South Capitol Street and Potomac Avenue, as shown in Figure 15, including way-finding signage, traffic cones, and consolidated traffic movements. These operational enhancements primarily keep the lane configuration the same as existing conditions; however, to improve the efficiency of right-turning traffic traveling northbound along South Capitol Street, the right-most lane will be coned off to serve as a right-turn only lane. Under existing conditions this approach operates as two thru lanes and one thru-right lane. This lane configuration was used in both total future capacity analyses.

Total Future Volumes

The traffic volumes generated by DC United for both trip distribution scenarios were added to the existing traffic volumes in order to establish two potential future traffic volume outcomes with the proposed development. The traffic volumes for the 2017 Total Future Conditions are included in the Technical Appendix.

Table 14: Basic Trip Distribution and Routing

Route	Parking Zone					Percent/Route
	A	B	C	D	E	
I-395/14th St Bridge	11.2%	21.0%	2.0%	10.5%	1.3%	**46.0%**
Maine Ave	1.7%	2.6%	1.4%	1.3%	0.2%	**7.2%**
12th/9th St Expressway	0.2%	0.3%	0.2%	0.2%	0.0%	**0.8%**
7th St/4th Street	0.1%	0.2%	0.1%	0.1%	0.0%	**0.5%**
3rd St Tunnel via S Capitol	2.9%	5.5%	0.4%	2.8%	0.4%	**12.1%**
Capitol Hill	0.6%	1.1%	0.0%	0.5%	0.1%	**2.4%**
11th St Bridges	5.0%	9.9%	0.1%	5.0%	0.6%	**20.6%**
South Capitol Street	2.5%	5.1%	0.1%	2.5%	0.2%	**10.4%**
Percent/Zone	**24.3%**	**45.7%**	**4.3%**	**22.9%**	**2.8%**	**100.0%**

Table 15: Influenced Trip Distribution and Routing

Route	Parking Zone					Percent/Route
	A	B	C	D	E	
I-395/14th St Bridge	11.2%	17.7%	5.9%	8.5%	2.6%	**46.0%**
Maine Ave	1.7%	0.7%	4.2%	0.3%	0.1%	**7.1%**
12th/9th St Expressway	0.2%	0.1%	0.5%	0.0%	0.0%	**0.8%**
7th St/4th Street	0.1%	0.1%	0.3%	0.0%	0.0%	**0.5%**
3rd St Tunnel via S Capitol	2.9%	4.7%	1.2%	2.2%	1.0%	**12.1%**
Capitol Hill	0.6%	1.0%	0.1%	0.5%	0.2%	**2.4%**
11th St Bridges	5.0%	9.4%	0.4%	4.5%	1.4%	**20.6%**
South Capitol Street	2.5%	4.9%	0.2%	2.4%	0.4%	**10.5%**
Percent/Zone	**24.3%**	**38.6%**	**12.9%**	**18.6%**	**5.7%**	**100.0%**

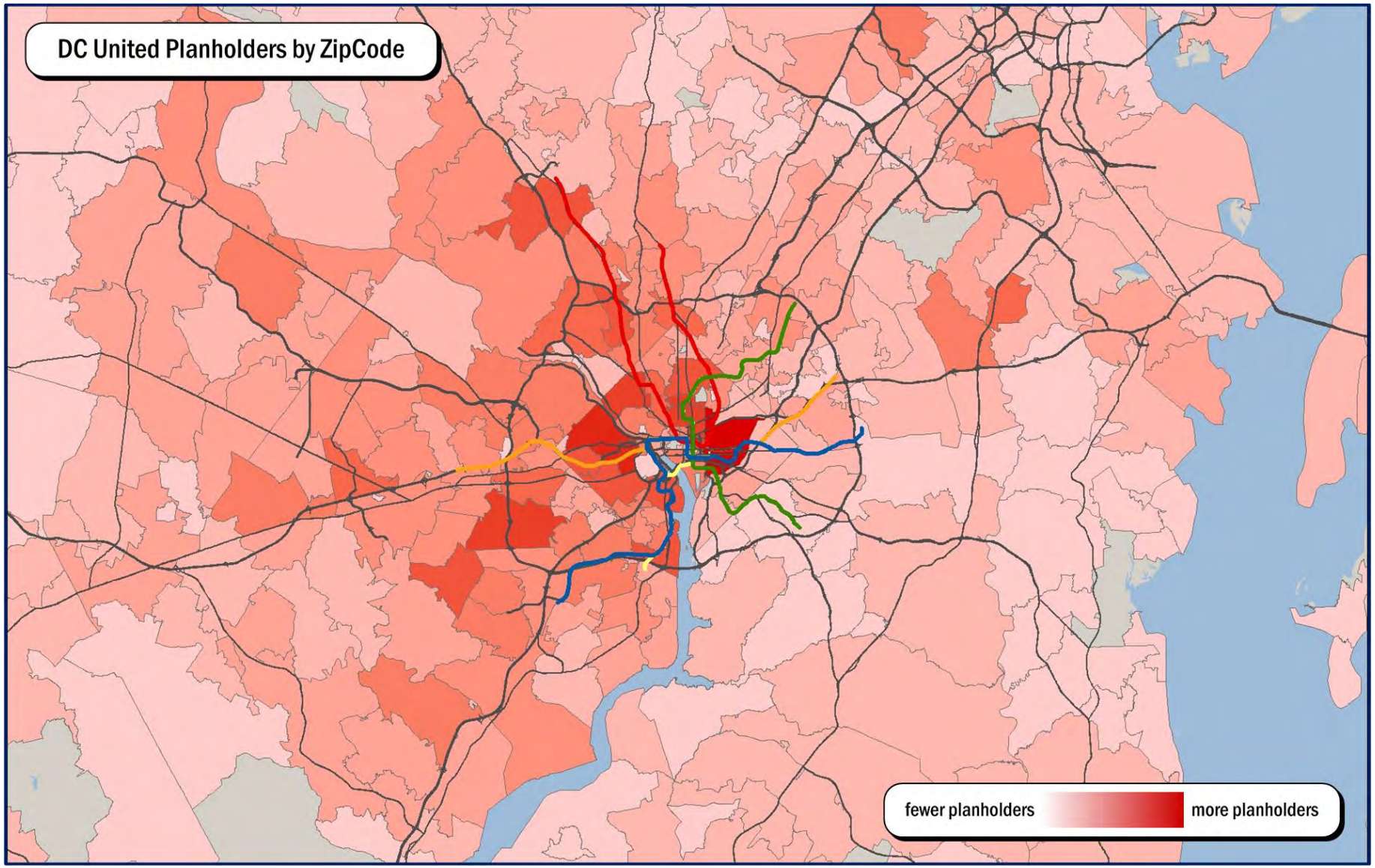


Figure 13: DC United Planholders by Zip Code

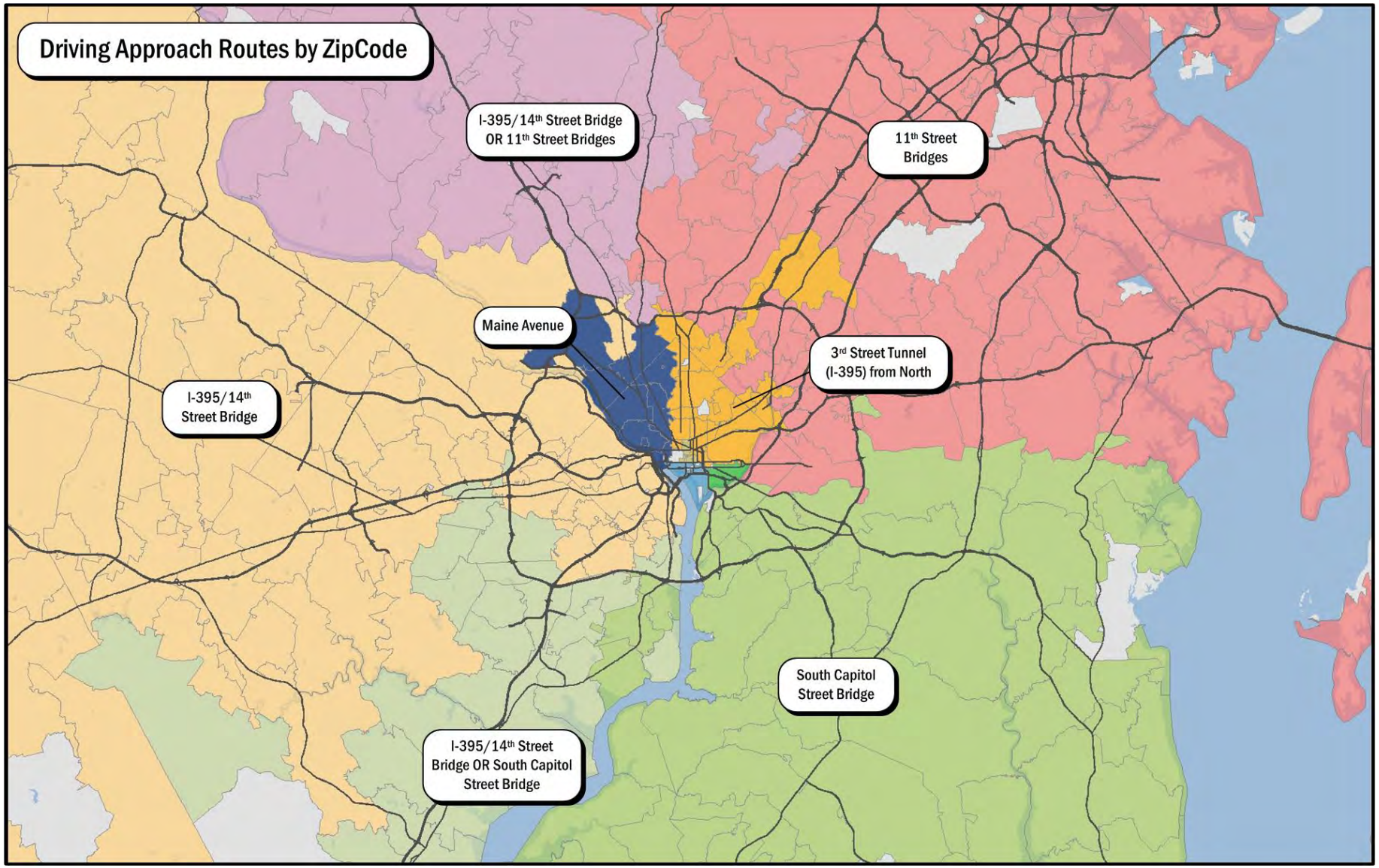


Figure 14: Driving Approach Routes by Zip Code

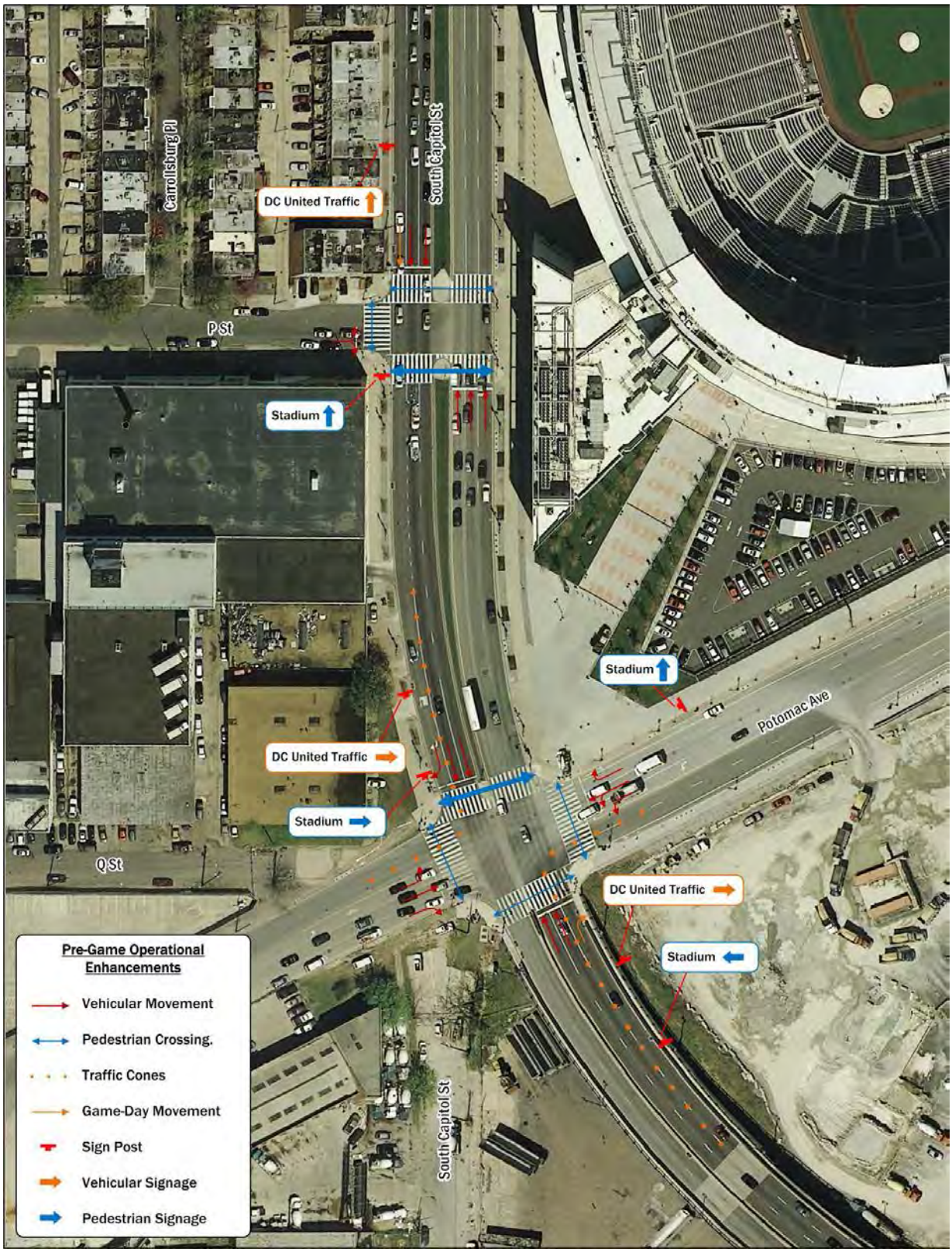


Figure 15: Pre-Game Operational Enhancements

Capacity Analysis Results

Based on the assumed 2017 roadway network and the peak hour volumes assembled, capacity analyses were performed for the Future Background and Total Future Conditions (with the Basic and Influenced Distributions). These capacity analyses used the same methodology as those performed for the existing conditions capacity analysis. The results of the capacity analyses are shown in Table 16.

Detailed worksheets of these calculations in addition to the queuing analysis results for the study intersections can be found in the Technical Appendix.

Table 16: Future Capacity Analysis Results

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
South Capitol St & I St										
BG Conditions	**273.6**	**F**	1728.5	F	296.2	F	15.6	B	27.5	C
TF Conditions - Basic Distribution	**278.9**	**F**	1733.8	F	296.2	F	15.3	B	78.7	E
TF Conditions - Influenced Distribution	**280.5**	**F**	1760.8	F	296.4	F	15.6	B	75.7	E
South Capitol St SB & M St										
BG Conditions	**62.6**	**E**	61.7	E	7.8	A	--	--	129.9	F
TF Conditions - Basic Distribution	**148.3**	**F**	135.9	F	8.2	A	--	--	294.5	F
TF Conditions - Influenced Distribution	**131.6**	**F**	104.8	F	8.5	A	--	--	284.4	F
South Capitol St NB & M St										
BG Conditions	**29.0**	**C**	6.4	A	46.6	D	73.0	E	--	--
TF Conditions - Basic Distribution	**80.4**	**F**	95.1	F	47.1	D	75.3	E	--	--
TF Conditions - Influenced Distribution	**62.9**	**E**	52.8	E	47.5	D	75.3	E	--	--
South Capitol St & N St										
BG Conditions	**151.7**	**F**	--	--	181.9	F	44.4	D	198.9	F
TF Conditions - Basic Distribution	**188.7**	**F**	--	--	181.9	F	60.3	E	273.0	F
TF Conditions - Influenced Distribution	**188.3**	**F**	--	--	181.9	F	58.8	E	273.0	F
South Capitol St & P St										
BG Conditions	**34.5**	**C**	172.4	F	--	--	2.2	A	34.7	C
TF Conditions - Basic Distribution	**50.9**	**D**	173.1	F	--	--	1.9	A	64.3	E
TF Conditions - Influenced Distribution	**50.6**	**D**	173.1	F	--	--	1.9	A	63.8	E
South Capitol St & Potomac Ave										
BG Conditions	**336.6**	**F**	546.4	F	232.2	F	54.6	D	488.0	F
TF Conditions - Basic Distribution	**342.3**	**F**	546.4	F	359.0	F	91.8	F	454.4	F
TF Conditions - Influenced Distribution	**342.3**	**F**	546.4	F	359.0	F	92.1	F	454.4	F
1st St & P St SW										
BG Conditions	**22.9**	**C**	28.2	D	8.6	A	11.1	B	9.6	A
TF Conditions - Basic Distribution	**33.4**	**D**	42.7	E	8.9	A	11.6	B	10.3	B
TF Conditions - Influenced Distribution	**33.4**	**D**	42.7	E	8.9	A	11.6	B	10.3	B
Maine Ave & 9th St SW										
BG Conditions	**119.7**	**F**	27.9	C	15.4	B	67.7	E	364.0	F

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
TF Conditions - Basic Distribution	**213.5**	**F**	43.1	D	15.7	B	67.7	E	641.5	F
TF Conditions - Influenced Distribution	**216.2**	**F**	45.7	D	15.7	B	67.7	E	648.5	F
Maine Ave & 7th St SW										
BG Conditions	**27.7**	**C**	17.2	B	34.2	C	37.8	D	42.3	D
TF Conditions - Basic Distribution	**76.8**	**E**	111.7	F	34.1	C	37.8	D	42.5	D
TF Conditions - Influenced Distribution	**80.5**	**F**	118.1	F	34.1	C	37.8	D	42.4	D
M St & 4th St SW										
BG Conditions	**123.3**	**F**	153.6	F	35.9	D	216.5	F	44.8	D
TF Conditions - Basic Distribution	**220.2**	**F**	316.4	F	35.0	D	216.5	F	45.0	D
TF Conditions - Influenced Distribution	**232.2**	**F**	336.4	F	35.0	C	216.5	F	44.9	D
M St & 1st St SW										
BG Conditions	**27.7**	**C**	31.4	C	15.1	B	35.5	D	88.5	F
TF Conditions - Basic Distribution	**50.9**	**D**	70.8	E	15.7	B	35.6	D	88.5	F
TF Conditions - Influenced Distribution	**41.0**	**D**	54.2	D	15.6	B	35.6	D	88.5	F
M St & 1st St SE										
BG Conditions	**97.6**	**F**	187.0	F	15.9	B	31.9	C	29.1	C
TF Conditions - Basic Distribution	**273.8**	**F**	541.1	F	21.7	C	35.0	C	30.3	C
TF Conditions - Influenced Distribution	**236.5**	**F**	474.9	F	21.5	C	35.0	D	30.3	C
M St & New Jersey Ave SE										
BG Conditions	**29.9**	**C**	35.8	D	24.6	C	22.9	C	26.0	C
TF Conditions - Basic Distribution	**49.2**	**D**	76.3	E	30.3	C	22.9	C	26.0	C
TF Conditions - Influenced Distribution	**52.5**	**D**	83.4	F	30.4	C	22.9	C	26.0	C
M St & 4th St SE										
BG Conditions	**25.6**	**C**	32.9	C	15.3	B	32.2	C	23.9	C
TF Conditions - Basic Distribution	**39.7**	**D**	33.0	C	23.3	C	151.0	F	30.2	C
TF Conditions - Influenced Distribution	**36.1**	**D**	33.2	C	23.4	C	114.4	F	28.7	C
M St & 8th St SE										
BG Conditions	**13.2**	**B**	10.3	B	1.8	A	--	--	49.7	D
TF Conditions - Basic Distribution	**12.6**	**B**	10.9	B	3.5	A	--	--	50.0	D
TF Conditions - Influenced Distribution	**12.6**	**B**	10.9	B	3.5	A	--	--	50.0	D
M St & 11th St Bridge										
BG Conditions	**43.2**	**D**	30.1	C	12.0	B	57.5	E	--	--
TF Conditions - Basic Distribution	**206.5**	**F**	29.8	C	12.0	B	266.5	F	--	--
TF Conditions - Influenced Distribution	**207.4**	**F**	29.8	C	12.0	B	267.5	F	--	--
4th St & Virginia Ave EB SE										
BG Conditions	--	--	94.9	F	--	--	--	--	1.6	A
TF Conditions - Basic Distribution	--	--	Err	F	--	--	--	--	4.7	A

Intersection	PM Peak Hour Capacity Analysis Results									
	Overall		Eastbound		Westbound		Northbound		Southbound	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
TF Conditions - Influenced Distribution	--	--	Err	F	--	--	--	--	3.5	A
4th St & Virginia Ave WB SE										
BG Conditions	**56.4**	**E**	--	--	10.1	B	--	--	259.5	F
TF Conditions - Basic Distribution	**73.6**	**E**	--	--	18.5	B	--	--	330.9	F
TF Conditions - Influenced Distribution	**69.5**	**E**	--	--	16.6	B	--	--	317.0	F
6th St & Ramp from I-695 SE										
BG Conditions	**289.8**	**F**	152.9	F	--	--	703.8	F	--	--
TF Conditions - Basic Distribution	**333.6**	**F**	238.2	F	--	--	703.8	F	--	--
TF Conditions - Influenced Distribution	**330.7**	**F**	232.0	F	--	--	703.8	F	--	--
6th St & Virginia Ave WB SE										
BG Conditions	**35.4**	**D**	--	--	38.3	D	33.2	C	--	--
TF Conditions - Basic Distribution	**38.0**	**D**	--	--	38.3	D	37.9	D	--	--
TF Conditions - Influenced Distribution	**37.5**	**D**	--	--	38.3	D	37.1	D	--	--

Summary of Future Capacity Concerns

Based on the capacity analyses, there are four main conclusions drawn in regards to the study area and the impacts of the DC United Stadium upon the study area:

1. The study area is congested under existing conditions and becomes even more so with the addition of background developments and Stadium traffic. As can be seen in the table above, most intersections that operate at an unacceptable level of service do so regardless of whether an event occurs at the new Stadium. Exceptions to this include the northbound South Capitol Street ramp at M Street, 7th Street at Maine Avenue, and the 11th Street Bridge ramp at M Street, which degrade to an overall LOS of E or F with the addition of Stadium traffic.
2. The influenced distribution improves some intersections, particularly along South Capitol Street. It causes some increase in delay at intersections along Maine Avenue, but overall, it has a positive effect. Due to the exacerbated system, however, the influenced distribution does not bring any intersections to an acceptable level of service when compared to the basic distribution. Many intersections show a decrease in delay, but an LOS E or F is still projected at many intersections. It should also be noted that the basic distribution does not take into account additional circulation of traffic. Without any influence on patron routing, it is much more likely that patrons will spend time circulating within the study area in order to find available parking.
3. Infrastructure changes within the area are largely infeasible due to roadway constraints and the overall plan for the area. Several major changes are expected to be implemented along South Capitol Street and M Street to help mitigate some of these capacity issues, thus it would not be practical to make changes along these roadways. A more practical solution to some of these capacity issues would be dynamic signal timing. This would require DDOT personnel to determine whether or not a signal timing at a particular intersection should be adjusted during game days. Some intersections may even be manually operated by Traffic Control Officers (TCOs) to manage the conflicting movements of vehicles and pedestrians.

Traffic Mitigation

Promote Non-Auto Modes

Modes such as Metrorail, existing and new bus/Circulator routes, potential water taxi service, bicycling, and walking should be promoted. Extensive information should be outlined on the DC United website to inform patrons about available non-auto travel modes.

Information Dissemination

Since weeknight games will overlap with the commuter peak hour, the commuting public surrounding the stadium should be made aware of the stadium's event schedule. A joint information campaign with Nationals Park and other event spaces nearby could be used to help commuters make transportation decisions to help alleviate traffic.

Influencing Routing of Spectators

DC United should provide information to spectators that drive to games on appropriate parking and routing decisions that help achieve less congestion, as demonstrated in this report's comparison of basic and influenced routing scenarios. This could be achieved through various methods, including information provided during ticketing, information compiled on a website, and through mobile applications.

Signal Timing

Enhanced signal timing strategies, using dynamic timing patterns during events, could help reduce congestions spots where game-day traffic overlaps with commuter traffic. This report recommends that during development of the TOP, various signal timing strategies are developed (such as separate ones for weeknight and Saturday games) in collaboration with DDOT for use on game days.

Game-day operational measures

Some intersections and parking garage access points may need game day specific operational measures, such as short street closings, limitations of some turning movements, and barriers. Since these measures are highly influenced by the expected parking locations and stadium design, this report recommends that during the development of the TOP, an examination of the usefulness of operational measures be explored and plans developed for various game day scenarios.

TRANSIT

Planned Transit Improvements

There will be several transit improvements implemented in the southwest/southeast waterfront area over the next several years including an extension of an existing Circulator route, two additional Circulator routes that are expected to end near the Waterfront Metro station and two Streetcar Lines that will terminate in Buzzard Point. Although the routes are not finalized at this time, the proposed routes are depicted in Figure 16.

The Union Station-Navy Yard Circulator route is planned to be extended from the Navy Yard Metro to the Waterfront Metro, likely adding one or two stops that are closer to the new stadium than under existing conditions. The two proposed Circulator routes are expected to travel between the Convention Center and the southwest waterfront and between Dupont Circle and the southwest waterfront. This will provide links to areas such as Metro Center, Farragut Square, and the Tidal Basin. According to the *DC Circulator 2014 Transit Development Plan* (DDOT, Draft: September 2014) the Union Station-Navy Yard route is part of the Phase 1 improvements that are expected to be complete by 2017 in time for the DC United inaugural season. The Convention Center route is part of Phase 2 with a timeline of 2018-2020 and the Dupont Circle route is part of Phase 3 with a timeline of 2021-2024. Although only one of these routes is expected to be added prior to the inaugural season, the additional Circulator routes will add transit capacity to the Buzzard Point area over time and allow for direct transit service to reach a wider range of the city.

The District's streetcar plan, as discussed in DC's *Transit Future System Plan* (DDOT, April 2010), includes two planned lines that are expected to terminate in Buzzard Point. The planned routes for these lines will connect Buzzard Point with Takoma to the north and with Anacostia to the south. They are part of the 22 mile priority system that also includes the Georgetown Waterfront to Benning Road Line. All three lines are expected to be completed between 2018 and 2020. Therefore, streetcar service will not be available as a transit option during the inaugural season. Although Streetcar will be advantageous to have in the future, it is anticipated that Metrorail will continue to act as the primary transit option to and from the Stadium. Metrorail provides an overall higher capacity than Metrobus, Circulator, and Streetcar systems due to shorter headways and the high capacity per train. The Navy Yard station has already been enhanced to adequately serve game-day transit volumes and will continue to do so in the future.

Future Transit Demand

Future Metrorail volumes were assembled for the Navy Yard and Waterfront stations using the following methodology:

- Transit trips generated by Future Background developments were estimated based on the mode split assumptions contained in their traffic impact studies.
- Similar to the traffic analyses, a growth factor was applied. According to the Metrorail Station Access and Capacity Study performed by WMATA in April 2008, trend forecasts predict an average annual growth of 1.7 percent between the years 2005 and 2035. Thus a 1.7 percent annual growth rate was applied over the study period (2014 – 2017).
- Total future transit trips for the weeknight game day traffic were estimated based on the assumptions outlined previously in Table 13.
- Similar to vehicular trips, it was assumed that 60 percent of transit trips are taken during the peak arrival hour which amounts to 4,800 arrival trips. Of these trips, it is assumed that 80 percent will arrive and depart from the Navy Yard station and 20 percent from the Waterfront station. Use of the Navy Yard Metro station will be emphasized because of its familiarity with District residents, its design to handle game-day transit capacity, and the fact that it's not located in a residential area. The perception of walking time is enhanced from the Navy Yard Metro station due to the greater sidewalk capacity and an enhanced sense of arrival due to the proximity to restaurants and the Nationals Park.
- All future transit volumes were summed with the existing volumes to determine the future Metrorail volume estimates shown in Table 17

Table 17: Future Metrorail Volumes

PM Peak Volumes (riders/hour)	Navy Yard (East)			Navy Yard (West)			Waterfront		
	Entries	Exits	Total	Entries	Exits	Total	Entries	Exits	Total
Existing Volumes	1077	260	1337	252	116	368	468	469	937
Background Growth	55	13	68	13	6	19	24	24	48
Background Developments	892	784	1676	1317	833	2150	252	265	517
Future Background Traffic	947	797	1744	1330	839	2169	276	289	565
Game-Day Arrivals	0	192	192	0	3648	3648	0	960	960
Total Future Traffic	2024	1249	3273	1582	4603	6185	744	1718	2462

The ability of the Metrorail system to accommodate these riders was evaluated by calculating the future line and station capacity with and without DC United Stadium traffic. The station capacity calculations, shown in Table 18, provide a volume-to-capacity ratio for the stations. Of note, it was assumed that two of the three escalators at the Navy Yard west portal would be traveling upwards as opposed to typical PM peak hour conditions where only one escalator travels upwards, in order to accommodate the additional exiting traffic associated with game days.

Table 18: Future Metrorail Station Capacity Analysis

Station	Future Background Conditions (weeknight PM peak hour)			Game Day Conditions (weeknight PM peak hour)		
	PM Peak Hour Volume	Station Capacity (per hour)	V/C Ratio	PM Peak Hour Volume	Station Capacity (per hour)	V/C Ratio
Navy Yard (East Portal)						
Peak Direction (Entering)	2,024	5,600	0.36	2,024	5,600	0.36
Off-Peak Direction (Exiting)	1,057	3,000	0.35	1,249	3,000	0.42
Total	3,081	8,600	0.36	3,273	8,600	0.38
Navy Yard (West Portal)						
Peak Direction (Entering)	1,582	10,000	0.16	1,582	5,000	0.32
Off-Peak Direction (Exiting)	955	5,000	0.19	4,603	10,000	0.46
Total	2,537	15,000	0.17	6,185	15,000	0.41
Waterfront						
Peak Direction (Entering)	744	5,000	0.15	744	5,000	0.15
Off-Peak Direction (Exiting)	758	5,000	0.15	1,718	5,000	0.34
Total	1,502	10,000	0.15	2,462	10,000	0.25

Table 19: Future Metrorail Line Capacity Analysis

	Green Line			
	Future Background Conditions (weeknight PM peak hour)		Game Day Conditions (weeknight PM peak hour)	
	To L'Enfant	To Anacostia	To L'Enfant	To Anacostia
Volume (per hour)				
Volume entering Navy Yard station	2,675	8,782	2,675	12,046
Riders exiting trains	878	1710	878	4974
Riders boarding trains	3,065	302	3,065	541
Volume departing station	4,862	7,374	4,862	7,613
Peak Volume	4,862	8,782	4,862	12,046
"Special Event" Capacity (per hour)				
Cars per hour	70	70	70	70
Riders per Car	155	155	155	155
Total Capacity	10,850	10,850	10,850	10,850
Volume/Capacity Ratio	0.45	0.81	0.45	1.11

The line capacity calculations, shown in Table 19 , provides a volume to capacity ratio for the Green line. DC United patrons were distributed between the two lines based on WMATA origin and destination data.

As shown in the tables, there will be adequate capacity at the Navy Yard and Waterfront Metrorail stations to accommodate existing, future background, and DC United Metrorail demand. The recent updates made to the Navy Yard west portal to accommodate Nationals Ballpark transit traffic, will more than suffice in handling DC United game-day traffic.

Only one portion of the Metrorail system will be constrained from Stadium operations, the section of the Green line traveling to Navy Yard from downtown during the PM peak hour prior to a sold-out weeknight game. According to estimates of how many riders can fit onto a single Metrorail car, during the peak hour of travel prior to a sold-out weeknight game, every car on trains between L'Enfant and Navy Yard will be completely full with commuters and DC United patrons. It should be noted, however, that this analysis assumed that the peak hour of both commuters and Stadium patrons occurs at the same time. It is likely that these peaks will be at least slightly offset from each other. It is also likely that commuters in particular may choose to travel by transit at different times to avoid the peak rush of game-day patrons or choose another transit option if available.

Transit Mitigation

Because the nearest Metro stations are not directly adjacent to the site it will be necessary to install DC United signage within the Metro System to direct patrons to the Stadium. It is vital to create a "sense of place" for patrons in order to enhance the perceived walk-time between the proposed Stadium and the Navy Yard Metrorail Station. This may include temporary markers such as DC United-branded flags and vendors/food trucks prior to games, or more permanent amenities including decorative pavers and enhanced lighting.

It will be necessary to coordinate with the Stadium architect to ensure that new streetcar service can be accommodated within the site design. This may include designing some sidewalks to include a raised streetcar platform and ensuring that there will be enough room for a streetcar turnaround at the terminus of the lines.

Coordination with WMATA in regards to the projected number of attendees and riders during the season will be essential. Scheduled construction disruptions that may take place on weekends during game days must be discussed to ensure that game day operations will not be drastically impacted. Coordination with WMATA will be necessary to review overall operation considerations at the Buzzard Point region and the new Stadium and to assess site impacts while the system is being constructed. Although the new streetcar system may provide service directly adjacent to the Stadium, Metrorail will still serve as the highest capacity transit option in the area. Therefore, since the new Stadium is located over half a mile from the nearest transit options, it may be necessary to implement a handicap accessible shuttle between the Metro station and Stadium. These practices should be monitored during the season and continually modified to determine the best practices for game day transit.

The available transit options for the new Stadium should be adequately promoted to ensure that people are aware of all potential transportation options to the Stadium. Marketing within the Metro system itself will be necessary. This may include adding DC United logos or specific Stadium-branding to Metro maps and signage. The nearest Metro station is currently branded as the Navy Yard – Ball Park station. Given the addition of the Stadium to the area, the name may be altered to market it as the primary station for DC United patrons in addition to Nationals patrons. In addition to marketing within the Metro system, DC United will have to encourage use of transit by providing Metro subsidies to season ticket holders equal to any parking subsidies that are typically provided.

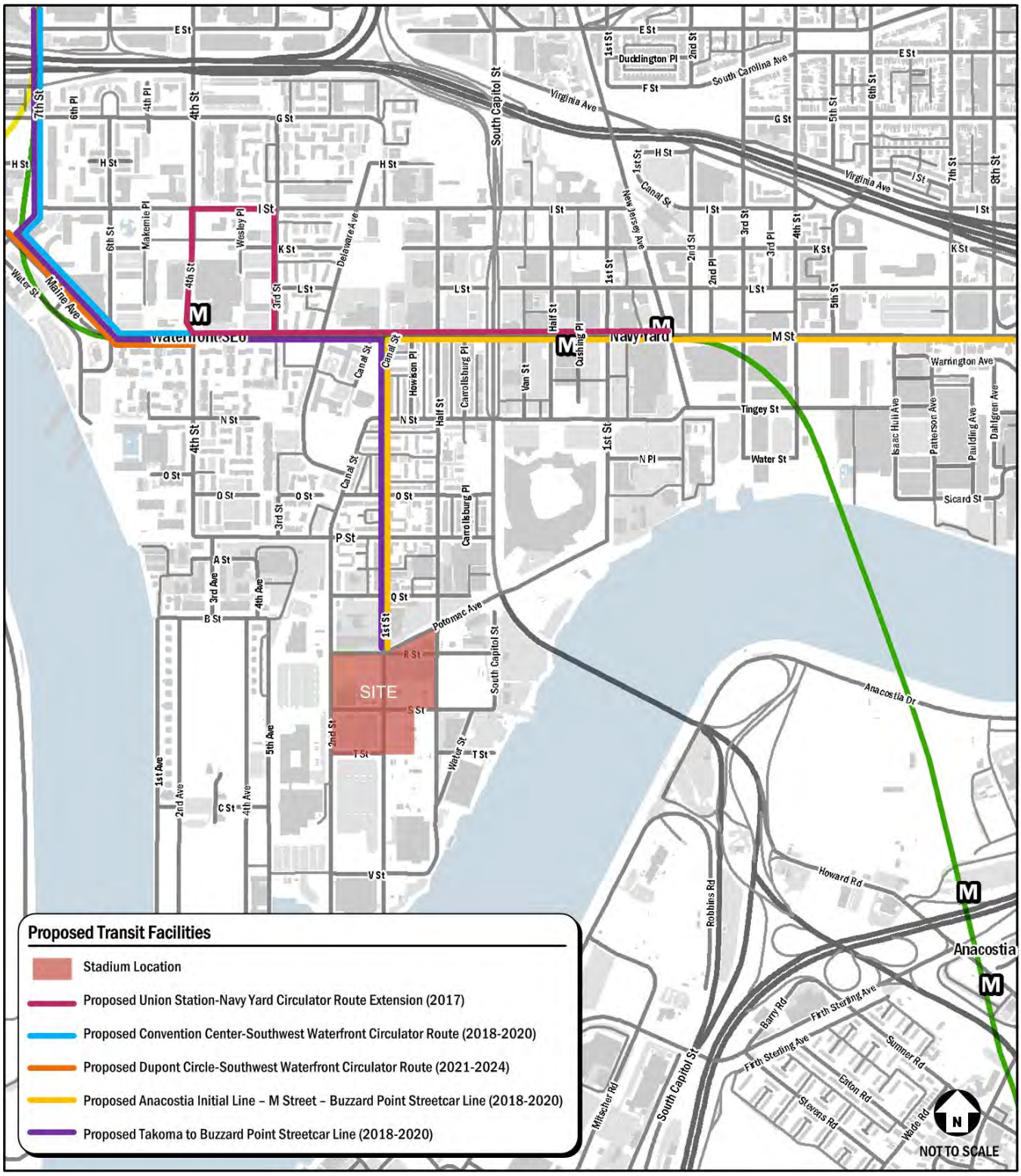


Figure 16: Proposed Transit Facilities

PEDESTRIAN

This section will discuss the expected game-day pedestrian volumes, how they impact the existing pedestrian infrastructure, and what permanent and temporary mitigation measures are necessary for adequate game-day operations.

Pedestrian Routing

Pedestrians walking to and from the Stadium will primarily be traveling in between the site and the parking zones outlined previously and nearby Metrorail stations, focusing on the Navy Yard Metro station and to a lesser extent the Waterfront Metro station. A smaller number of trips generated by the Stadium will be walking trips from residential areas.

In order to determine the pedestrian routing for the Stadium, the number of trips generated by the Stadium during a typical weeknight game were distributed on the most-likely walking routes between the site and the Metrorail and parking zones previously shown on Figure 11 for the influenced distribution, while attempting to utilize the existing wide sidewalks near the Nationals Park and avoid the residential neighborhood north of the Stadium. Generally, the pedestrian routing follows similar roadways as the vehicular routing, including South Capitol Street, Potomac Avenue, 1st Street SE, M Street SE/SW, and 4th Street SW; roadways that are avoided include those between South Capitol Street and 4th Street SW north of P Street SW and south of M Street SW within the residential neighborhood north of the Stadium.

The total number of pedestrian trips were assumed for a combination of the patrons riding transit and traveling in vehicles in order to determine the maximum pedestrians per route. Based on the trip generation established for the Stadium, just under 10,000 pedestrians will be accessing the site during the peak arrival hour. Patrons expected to park at or adjacent to the Stadium were not included in the pedestrian routing volumes. For routing purposes, it was assumed that 20 percent of Metrorail riders use the Waterfront station and 80 percent use the Navy Yard station. For those using the Navy Yard station, it was assumed that 95 percent would use the west portal (which will be advertised as the Stadium exit) and 5 percent will use the east portal (to account for those at the front of the train and/or those attempting to avoid the crowds at the west portal). The total number of pedestrian trips projected on each roadway during the single peak hour is shown on Figure 17. Although other pedestrian routes may be used, pedestrian way-finding signage will direct patrons along these routes. Other routes will only generate small amounts of pedestrian traffic and are not analyzed as a part of this study.

Pedestrian Capacity Analyses

Multiple methodologies were utilized to analyze the capacity and level of service of the existing pedestrian system with the addition of game-day pedestrian traffic. These include the following:

- HCM 2010 link analysis which provides a level of service for pedestrian segments based on the perceived quality of the segment
- HCM 2010 capacity analyses for all major walking routes (over 200 pedestrians/hour)
- HCM 2010 pedestrian service time and crosswalk LOS at signalized intersections within the study area expected to generate a significant amount of pedestrian traffic (over 500 pedestrians/hour)
- HCM 2010 pedestrian space analysis at corners with high pedestrian volumes (limited to the intersection of South Capitol Street and Potomac Avenue)

HCM 2010 Pedestrian Link Analysis

"Chapter 17: Urban Street Segments" of the Highway Capacity Manual 2010 (HCM) outlines a methodology for evaluating the performance of an urban street segment in terms of its service to pedestrians. The HCM link analysis provides an evaluation of the pedestrian perception of service along a roadway as opposed to the sidewalks compliance with standards.

Methodology

Due to data collection constraints, the overall methodology outlined in HCM was simplified slightly. The modified step-by-step methodology is outlined below:

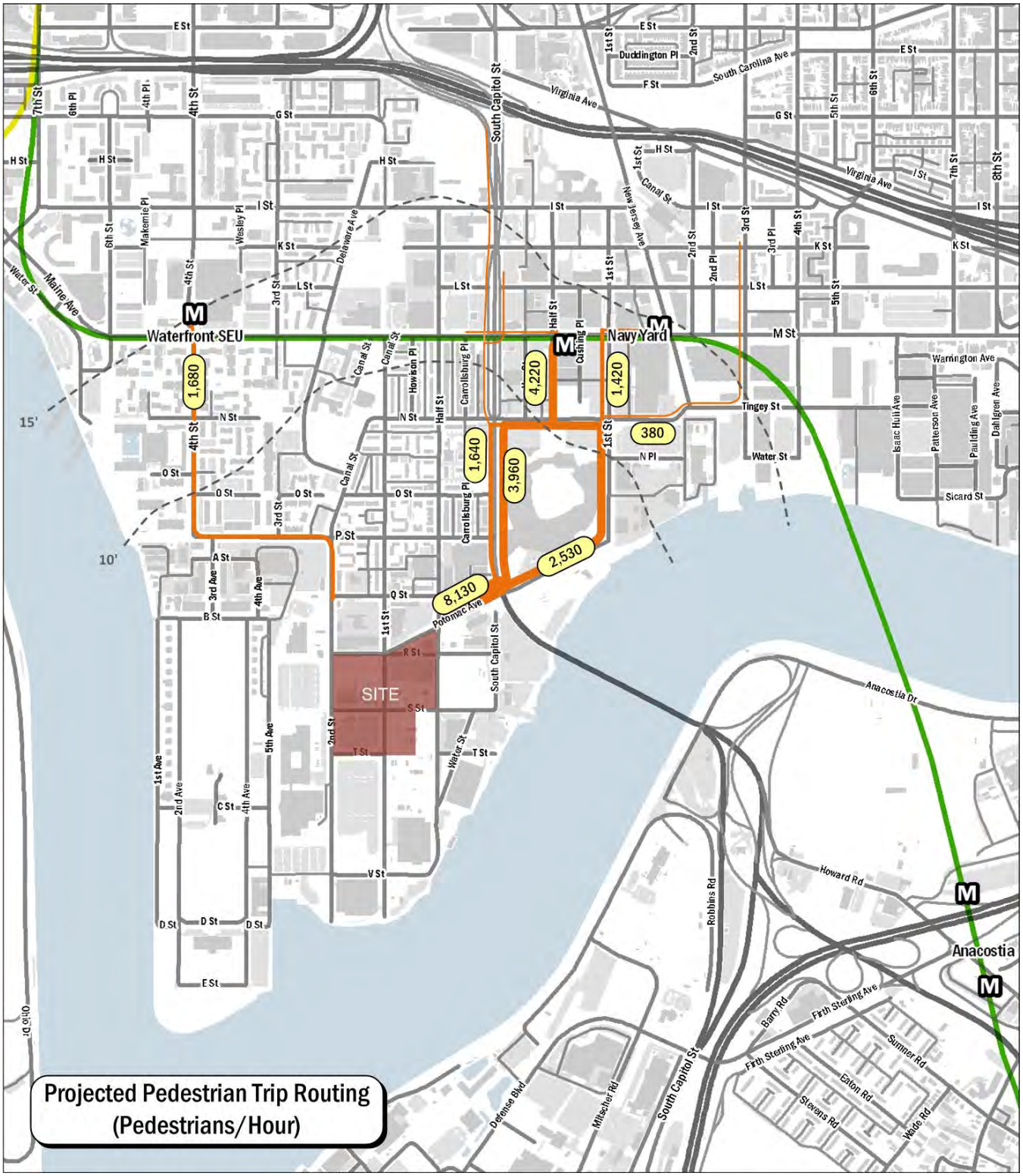


Figure 17: Projected Pedestrian Trip Routing

Step 1: Determine Free-Flow Walking Speed

The average free-flow speed reflects conditions in which there are negligible pedestrian-to-pedestrian conflicts and primarily takes into account pedestrian age and sidewalk grade. For the purpose of this analysis, a free-flow walking speed of 4.4 feet/second was used. This value is used for a pedestrian population that is less than 20% elderly (i.e. 65 years of age or older), which is consistent with US Census age distribution data for the census tract of the site. It was assumed that sidewalks in the area do not have a significant enough upgrade (10% or greater) to reduce the average free-flow speed.

Step 2: Determine Average Pedestrian Space

Average pedestrian space indicates if a pedestrian has an adequate amount of space to maneuver along the sidewalk and avoid fellow pedestrians and obstacles. The average pedestrian space is determined based on the effective sidewalk width, pedestrian flow rate, and walking speed. For this report, this step was replaced with a more detailed examination of sidewalk capacity, a discussion of which follows this section.

Step 3: Determine Pedestrian Level of Service (LOS) Score

The pedestrian LOS score takes into account the overall cross section of the roadway and sidewalk, including the width of travel lanes, parking lanes, bike lanes, sidewalk buffers, and sidewalks. The link score has high sensitivity to the separation between pedestrians and moving vehicles in addition to the speed and volume of vehicles along the adjacent roadway. Collected traffic counts were used to determine the volumes along many roadways. For roadways without available data, a volume was assumed based on the functional classification of the roadway. AADT volumes provided by the district were inventoried by functional classification and used to determine an appropriate average volume based on functional class.

Table 20: Pedestrian LOS Parameters

Pedestrian LOS Score	Pedestrian LOS
< 2.00	A
> 2.00 - 2.75	B
> 2.75 - 3.50	C
> 3.50 - 4.25	D
> 4.25 - 5.00	E
> 5.00	F

Step 4: Determine Link LOS

The link LOS is determined based on the LOS score and the average pedestrian space. As discussed above, the average pedestrian space was assumed to be above 60 square feet per person; thus, the pedestrian LOS is determined based on the pedestrian LOS score shown in Table 20. LOS results range from “A” being the best to “F” being the worst, based on the pedestrian traveling experience and perception of service quality along the sidewalk segment.

Results

To perform the pedestrian link analysis, extensive data was collected at every sidewalk segment in the pedestrian study area. This data was collected on Wednesday, May 28, 2014, Monday, June 2, 2014, Monday, June 23, 2014, Wednesday, July 2, 2014, and Thursday, July 10, 2014. A full inventory of data collection and analysis results is included in the Technical Attachments. Figure 18 summarizes the pedestrian link LOS results for the PM peak hour scenario.

The analysis concludes that the majority of study segments in the study area, with the exception of those that do not have sidewalks, are perceived as acceptable based on an LOS of C or better. The west side of South Capitol Street between Potomac Avenue and N Street is the only section with an LOS D. This is due in large part to the extremely high southbound volumes along South Capitol Street during the PM peak hour and the relatively higher speed, compared to the remainder of the study area. Although these sidewalks provide an ample amount of space, the high volume along South Capitol Street leads to a degraded perception of the pedestrian environment. Overall, the remainder of the blocks that provide sidewalks have an overall positive perception from those walking on them.

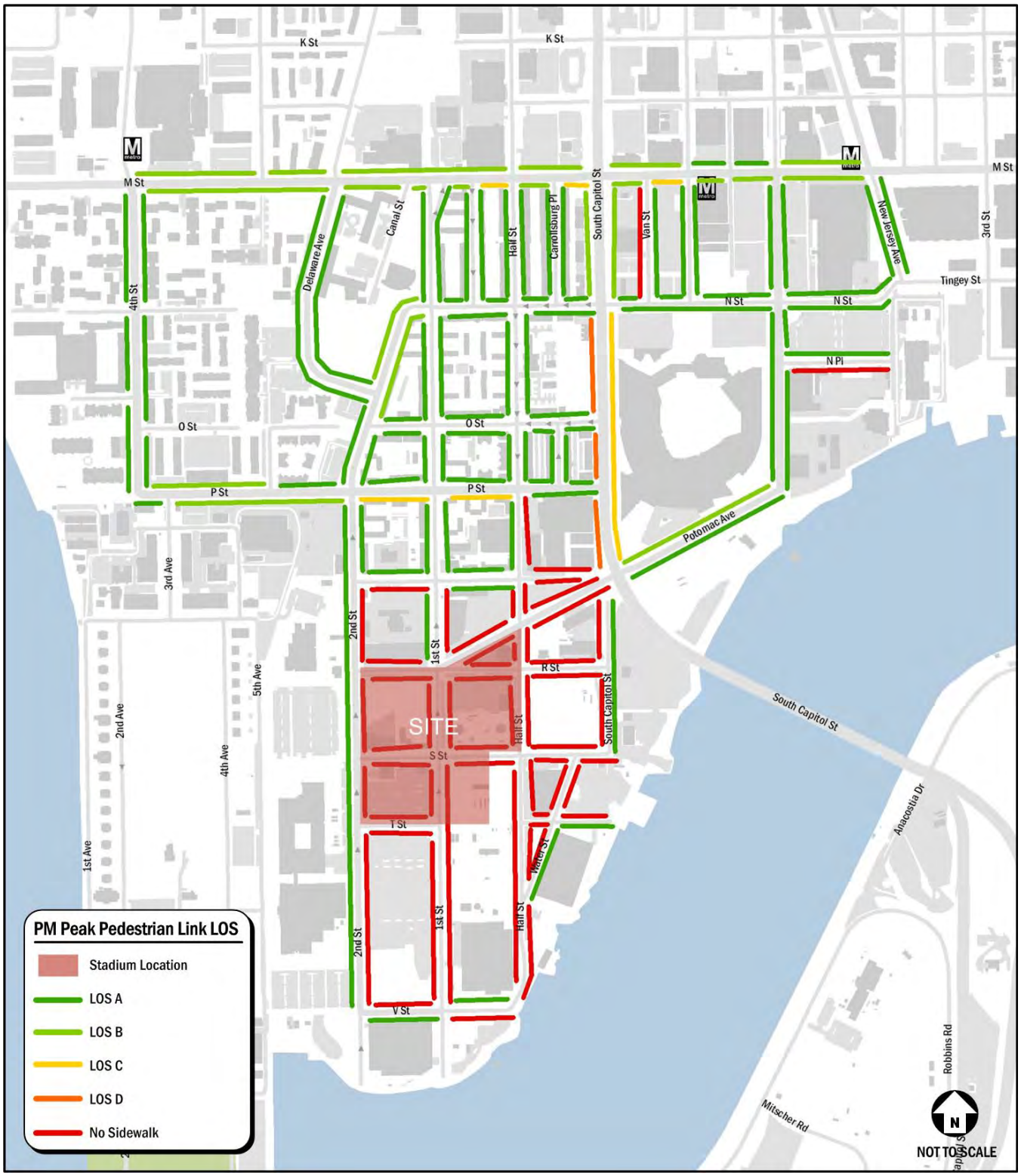


Figure 18: PM Peak Pedestrian Link LOS

Link Capacity Analysis

Capacity analyses were performed for all major walking routes that are expected to carry over 200 event spectators per hour. These routes primarily stem from Metrorail stations and parking garages. The preliminary breakdown of pedestrian volumes shown previously in Figure 17 was broken down further for pedestrians accessing the site west of South Capitol Street and east of South Capitol Street. Figure 19 and Figure 20 show the more detailed pedestrian routes and their projected volumes.

In addition to pedestrian volumes, these graphics also outline the hourly pedestrian capacity. Sidewalk capacity is determined based on the methodologies laid out in Chapter 23: Off-Street Pedestrian and Bicycle Facilities of the Highway Capacity Manual 2010. According to Exhibit 23-2, the level of service for walkways (under a platooning condition) does not reach LOS E until the flow rate reaches 660 pedestrians/hour/foot (of effective walking space).

As shown in the figures, there is only one block in the study area in which the peak pedestrian flow exceeds the capacity: north side of Potomac Avenue between South Capitol Street and Half Street SW, which currently has no sidewalk. A sidewalk would have to be constructed here in conjunction with construction of the Stadium. In order to provide enough capacity for the amount of pedestrians expected to travel along this route, an effective sidewalk width of 15 feet would be necessary. The existing right of way allows for this width; however, the parking lane along the north side of Potomac Avenue could be restricted during game days and blocked with jersey barriers to further extend the effective pedestrian walkway.

Pedestrian Capacity at Signalized Intersections

This section evaluates pedestrian operations at the intersection level. Pedestrian delay at crossings, crosswalk level of service, and crosswalk service time were evaluated at all signalized intersections with over 500 expected pedestrian crossings per hour based on methodologies outlined in Chapter 18: Signalized Intersections of the Highway Capacity Manual 2010 (HCM).

Crosswalk Level of Service Analysis

Crosswalk level of service (LOS) was determined for each individual crosswalk at all signalized intersections with over 500 expected pedestrian crossings per hour. All unsignalized intersections within the study area that are expected to generate significant pedestrian traffic are 4-way stop-controlled intersections. 4-way stop-controlled intersections are assumed to result in negligible delay for pedestrians, as vehicles are required to stop and wait for conflicting vehicular and pedestrian traffic. Therefore, they were not included in this analysis.

Crosswalk delay and LOS is based on several factors including walk time, lane configurations, vehicular volumes, and vehicular speeds. Based on field measurements and Synchro files provided by DDOT, the crosswalk LOS for all applicable crossings was determined as shown in Table 21. It should be noted, however, that crosswalk LOS does not take into account pedestrian flow rates as pedestrian delay is not typically constrained by capacity unless the pedestrian flow rate exceeds 5,000 passengers per hour. This is only the case at the intersection of South Capitol Street and Potomac Avenue as shown on Figure 19.

Only the crosswalk on the southern side of South Capitol Street and Potomac Avenue results in an LOS E and three intersections total have one or more crosswalk with an LOS D. All of the crosswalks with an LOS of D or E involve crossing South Capitol Street at Potomac Avenue, P Street, and N Street.

Table 21: Signalized Intersection Crosswalk Level of Service Results

Intersection	Crosswalk Location at Intersection	Crosswalk Length (ft)	Cycle Length (s)	Effective Ped Green Time (s)	Ped Delay (s)	Ped LOS Score	Ped LOS
South Capitol Street & Potomac Avenue	Southern Side	66	150	23	53.8	4.7	E
	Northern Side	85	150	30	48.0	3.9	D
	Eastern Side	65	150	25	52.1	2.5	B
	Western Side	69	150	26	51.3	2.4	B
South Capitol Street & P Street	Southern Side	90	150	33	45.6	3.7	D
	Northern Side	88	150	33	45.6	3.7	D
	Western Side	43	150	20	56.3	1.9	A
South Capitol Street & N Street	Southern Side	90	150	33	45.6	3.8	D
	Eastern Side	47	150	21	55.5	2.1	B
	Western Side	31	150	21	55.5	1.5	A
South Capitol Street (SB) & M Street	Southern Side	43	120	13	47.7	2.2	B
	Northern Side	30	120	14	46.8	2.6	B
	Western Side	91	120	30	33.8	3.4	C
South Capitol Street (NB) & M Street	Southern Side	27	120	17	44.2	2.0	B
	Northern Side	32	120	19	42.5	1.9	A
	Eastern Side	72	120	26	36.8	3.1	C
M Street & New Jersey Avenue, SE	Southern Side	55	80	19	23.3	2.2	B
	Northern Side	45	80	19	23.3	2.1	B
	Eastern Side	85	80	28	16.9	2.9	C
	Western Side	71	80	28	16.9	2.9	C
M Street & 1st Street, SE	Southern Side	52	80	23	20.3	2.7	B
	Northern Side	54	80	23	20.3	2.3	B
	Eastern Side	69	80	27	17.6	2.9	C
	Western Side	67	80	27	17.6	3.0	C
M Street & 4th Street, SW	Southern Side	56	120	20	41.7	2.5	B
	Northern Side	51	120	20	41.7	2.2	B
	Eastern Side	89	120	24	38.4	2.9	C
	Western Side	89	120	28	35.3	3.4	C

Crosswalk Service Time

Crosswalk service time represents the elapsed time starting with the first pedestrian's departure from the corner to the last pedestrian's arrival at the far side of the crosswalk, thus accounting for platooning pedestrian patterns. The methodology for determining service time takes into account the length and width of the crosswalk, signal timings, and pedestrian flow rate. Service time is determined for both directions of travel separately with this methodology, but for the purpose of this analysis, only crosswalks and directions of travel that are expected to generate significant pedestrian traffic as a result of the Stadium were included.

Pedestrian volumes used in the analysis are projected future volumes along the preferred and expected pedestrian routes. Existing pedestrian volumes from the DDOT provided Synchro files were not incorporated into the analysis since they did not include the directionality of pedestrians are very low in comparison with the game-day pedestrian traffic (their inclusion would not have altered the results of the analysis).

The results of this analysis are provided in Table 22. According to the results of the service time analysis, there are four intersections which observe higher crosswalk service times than the allotted effective pedestrian green time due to game-day pedestrian traffic.

Table 22: Crosswalk Service Times

Intersection	Crosswalk Location (Ped Travel Direction)	Crosswalk Length (ft)	Crosswalk Width (ft)	Cycle Length (s)	Effective Ped Green Time (s)	Pedestrian Flow Rate (ped/hr)	Crosswalk Service Time
South Capitol Street & Potomac Avenue	Northern Side (WB)	85	26	150	30	5230	43
South Capitol Street & P Street	Southern Side (WB)	90	25	150	33	1260	30
	Western Side (SB)	43	24	150	20	1640	21
South Capitol Street & N Street	Southern Side (WB)	90	16	150	33	1390	33
	Eastern Side (SB)	47	21	150	21	2570	27
	Western Side (SB)	31	15	150	21	250	13
South Capitol Street (SB) & M Street	Western Side (SB)	91	16	120	30	250	27
South Capitol Street (NB) & M Street	Eastern Side (SB)	72	16	120	26	370	23
M Street & New Jersey Avenue, SE	Western Side (SB)	71	19	80	28	580	22
M Street & 1st Street, SE	Southern Side (WB)	52	21	80	23	320	17
	Eastern Side (SB)	69	20	80	27	100	21
	Western Side (SB)	67	21	80	27	720	21
M Street & 4th Street, SW	Eastern Side (SB)	89	16	120	24	840	29
	Western Side (SB)	89	16	120	28	840	29

Overall Results

Based on the crosswalk level of service and crosswalk service time analyses there are four intersections that should provide require operational mitigations based on a crosswalk LOS of D or a crosswalk service time that exceeds the effective pedestrian green time. These mitigation options are as described below:

South Capitol Street and Potomac Avenue

At least two traffic control officers should be placed at this intersection to help direct pedestrian and vehicular traffic and avoid any potential conflicts. This intersection would also benefit from additional pedestrian green time along the South Capitol Street crossing.

South Capitol Street and P Street

One traffic control officer should be placed at this intersection to avoid conflicts between pedestrian and vehicular traffic. The service time crossing P Street is only slightly higher than the allotted pedestrian green time therefore it may not be necessary to increase the pedestrian green time.

South Capitol Street and N Street

This intersection would benefit from one traffic control officer and additional pedestrian green time along the South Capitol Street crossing.

M Street and 4th Street, SW

This intersection would benefit from one traffic control officer and additional pedestrian green time along the M Street crossing.

South Capitol Street and Potomac Avenue

Due to high pedestrian volumes, high vehicular volumes, and some deficiencies with the existing pedestrian facilities, the intersection of South Capitol Street and Potomac Avenue was evaluated further to determine more extensive mitigation options and game-day operations. This evaluation looks at both pre- and post-game scenarios to ensure that queuing and circulation space is adequate.

Pedestrian circulation area at high pedestrian volume corners was determined as a baseline for potential mitigations or operational provisions. Pedestrian circulation area at the intersection corners was based on methodologies outlined in Chapter 18: Signalized Intersections of the 2010 HCM. The methodology takes into account sidewalk geometry, signal timings, and pedestrian flow rates to determine the circulation area per pedestrian. The 2010 HCM describes pedestrian conditions based on circulation space as shown in Table 23.

Table 23: Pedestrian Space Descriptions

Pedestrian Space (ft^2/ped)	Description	LOS Equivalent
>60	Ability to move in desired path, no need to alter movements	A
>40-60	Occasional need to adjust path to avoid conflicts	B
>24-40	Frequent need to adjust path to avoid conflicts	C
>15-24	Speed and ability to pass slower pedestrians restricted	D
>8-15	Speed restricted, very limited ability to pass slow pedestrians	E
≤8	Speed severely restricted, frequent contact with other users	F

Pre-Game Conditions

As stated previously, 60 percent of patrons are expected to arrive during the peak hour. This amounts to the pedestrian flow rates shown in Figure 19. Based on the arrival routing patterns, the most constrained pedestrian area under pre-game conditions is expected to be the northeast corner of South Capitol Street and Potomac Avenue. At this corner, 5,320 pedestrians during the peak hour could lead to excessive queues. Circulation was also evaluated at the northwest corner as many pedestrians are expected to walk along the west side of South Capitol Street to access the site. Under existing conditions, there is no sidewalk along the north side of Potomac Avenue west of South Capitol Street. Therefore, the corner circulation analysis was used to determine the minimum effective sidewalk width to be constructed along this section in order to accommodate pedestrians. Results from this analysis are shown in Table 24. As shown, both corners provide an adequate amount of pedestrian circulation space as long as a sidewalk with an effective width of 15 feet is constructed along Potomac Avenue. Further adjustments in excess of providing traffic control officers to help facilitate vehicular and pedestrian interactions will not be necessary during pre-game conditions. In addition, the circulation space will increase if additional pedestrian green time is added to the South Capitol Street crossing. An overview of vehicular and pedestrian operations along South Capitol Street is shown in Figure 22.

Table 24: Pre-Game Corner Circulation Analysis Results

Pre-Game Conditions									
Intersection	**Corner Location**	**Sidewalk Width 1 (ft)**	**Sidewalk Width 2 (ft)**	**Radius (ft)**	**Cycle Length (s)**	**Major Roadway Effective Ped Green Time (s)**	**Minor Roadway Effective Ped Green Time (s)**	**Circulating Pedestrians per Cycle**	**Corner Circulation Space (ft^2/ped)**
South Capitol St & Potomac Ave	Northwest	70	74	28	150	30	25	218	814.5
	Northeast	15	21	24	150	30	26	339	26.9

Post-Game Conditions

Although a post-game routing scenario was not compiled as a part of this report, approximately 75 percent of patrons will exit the Stadium within the first *half hour*. This amounts to a pedestrian flow rate of 24,525 patrons per hour leaving the Stadium. It should be noted that this high flow rate indicates that all patrons have exited the stadium in less than one hour and that the flow rate is higher than the amount of patrons in attendance. The high flow rate is intended to represent the worst-case scenario within the first half hour after the game ends. The post-game routing was altered slightly from the pre-game routing to align with the sidewalk capacity along South Capitol Street. The expected pedestrian flow rates and the routing distribution result in the pedestrian flow rates shown in Figure 21.

Because there is an ample amount of space on the northeast corner, and no queueing is expected there, the post-game scenario only analyzed the northwest corner. Under existing conditions (and assuming the additional sidewalk along Potomac Avenue) the corner does not have nearly enough capacity to serve the expected number of pedestrians, as shown in Table 25.

.

Table 25: Post-Game Corner Circulation Conditions - Existing Conditions

Exiting Post-Game Conditions									
Intersection	**Corner Location**	**Sidewalk Width 1 (ft)**	**Sidewalk Width 2 (ft)**	**Radius (ft)**	**Cycle Length (s)**	**Major Roadway Effective Ped Green Time (s)**	**Minor Roadway Effective Ped Green Time (s)**	**Circulating Pedestrians per Cycle**	**Corner Circulation Space (ft^2/ped)**
South Capitol St & Potomac Ave	Northwest	15	21	24	150	30	26	847	-27.8

Therefore, several mitigation measures and operational provisions should be made during post-game conditions as described below and shown in Figure 23.

- Potomac Avenue west of South Capitol Street will be limited to outbound traffic only allowing the westbound traffic lanes to be coned off for pedestrian use. At a minimum, cones should designate 18 feet of roadway for pedestrians.
- The two west-most southbound travel lanes along South Capitol Street north of Potomac Avenue will be tapered off using cones and the additional space will be used for pedestrians. Again a minimum of 18 feet of roadway should be designated for pedestrians. Tapering the southbound movement down to one lane at this intersection also allows for the vehicular operations benefits. As shown, the westbound right turn lane of Potomac Avenue will be coned off to allow for a more efficient movement of vehicles out of the site.
- Traffic control officers should be placed at both Potomac Avenue and P Street along South Capitol Street. If pedestrian volumes become too high they can coordinate to clear the roadway segment between Potomac Avenue and P Street to allow for a mass pedestrian crossing.

By implementing these recommendations, the pedestrian circulation at the northwest corner greatly increases and allows for a more effective movement of pedestrians, as shown in Table 26.

Pedestrian Mitigation

Based on the analyses above several mitigation and game-day operation strategies are suggested to improve the overall pedestrian environment at and approaching the Stadium.

Sidewalk Construction

There are several areas surrounding the Stadium that currently do not provide sidewalks. As part of Stadium construction sidewalks along the perimeter and within the Stadium footprint will be constructed to properly handle the expected pedestrian volumes at the Stadium. In addition, pedestrian accommodations will be necessary along 1st Street and Half Street south of Q Street where none currently exist. Sidewalks will need to be constructed along Potomac Avenue west of South Capitol Street leading up to the Stadium. It would also be desirable to add sidewalks to the east side of 2nd Street south of Q Street., although this is not completely necessary as long as pedestrians are directed to use the sidewalk on the west side of the street.

Traffic Control Officers

Traffic Control Officers (TCOs) should be placed at intersections that result in significant pedestrian crossings, particularly at areas that have high vehicular volumes as well. These areas are called out in Figure 24 and Figure 25. TCOs will mainly be responsible for preventing and resolving conflicts between pedestrians and vehicles.

Table 26: Post-Game Corner Circulation Conditions - with Operational Enhancements

Post-Game Conditions with Operational Enhancements									
Intersection	**Corner Location**	**Sidewalk Width 1 (ft)**	**Sidewalk Width 2 (ft)**	**Radius (ft)**	**Cycle Length (s)**	**Major Roadway Effective Ped Green Time (s)**	**Minor Roadway Effective Ped Green Time (s)**	**Circulating Pedestrians per Cycle**	**Corner Circulation Space (ft^2/ped)**
South Capitol St & Potomac Ave	Northwest	33	39	24	150	30	26	847	15.2

Way-finding Signage

Pedestrian-oriented way-finding signage should be installed on roadways leading to the Stadium. Specific locations where way-finding signage will be necessary are shown on Figure 24 and Figure 25. Signage should also be placed within the Navy Yard Metro station to direct patrons to the west portal, which has been upgraded to handle game-day transit traffic.

Pedestrian and Traffic Barriers

In addition to TCOs, temporary traffic barriers such as cones or Jersey barriers may be used to control the vehicular flow and ensure separation between vehicles and pedestrians at the high conflict intersections. In addition, barriers should be placed at sidewalks along the perimeter of the residential neighborhood to deter patrons from walking through the neighborhood before and after the game, as shown on Figure 24 and Figure 25. This will also help corral pedestrians to the designated pedestrian routes that provide TCOs.

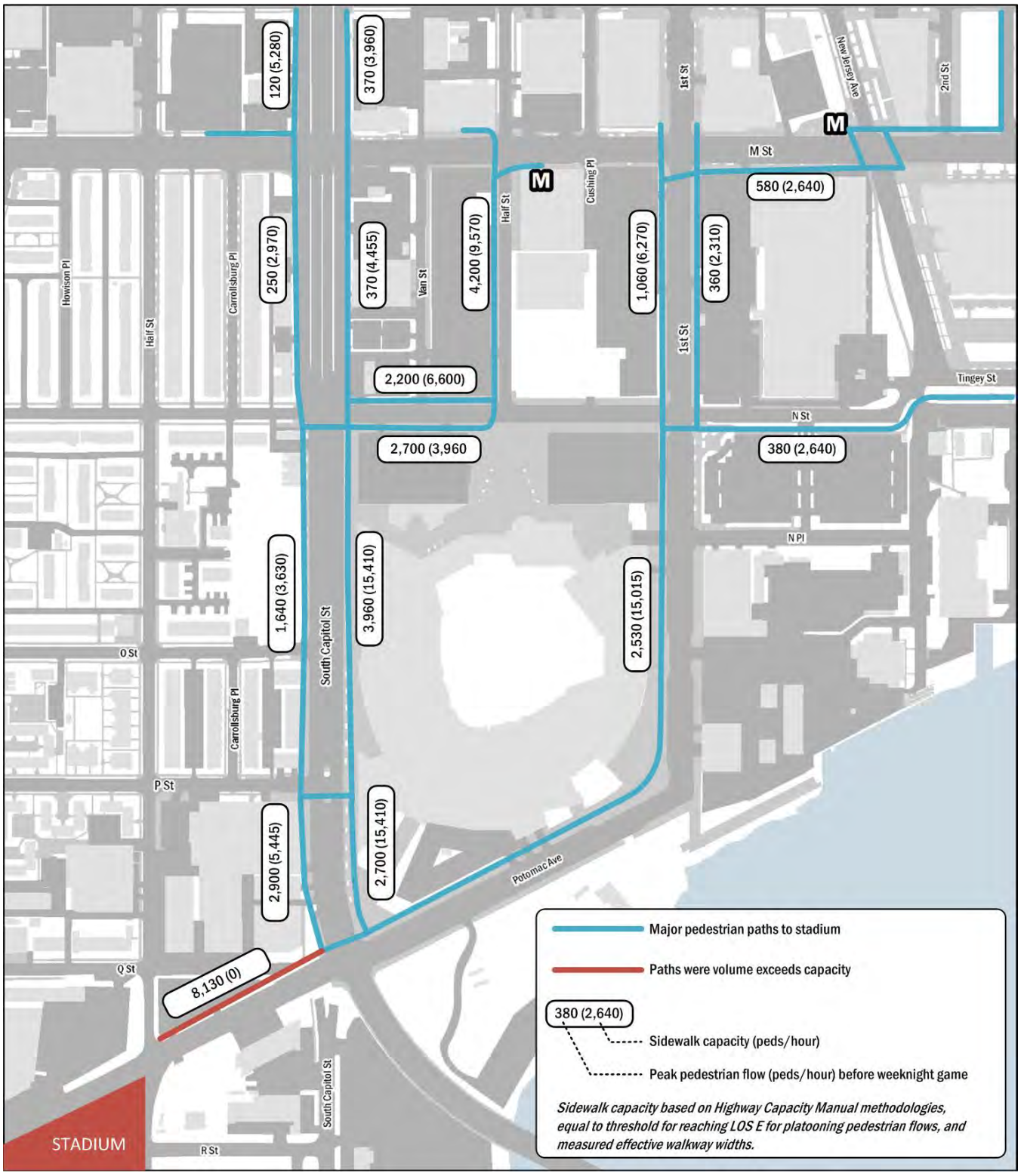


Figure 19: Pedestrian Link Analysis - East of the Stadium

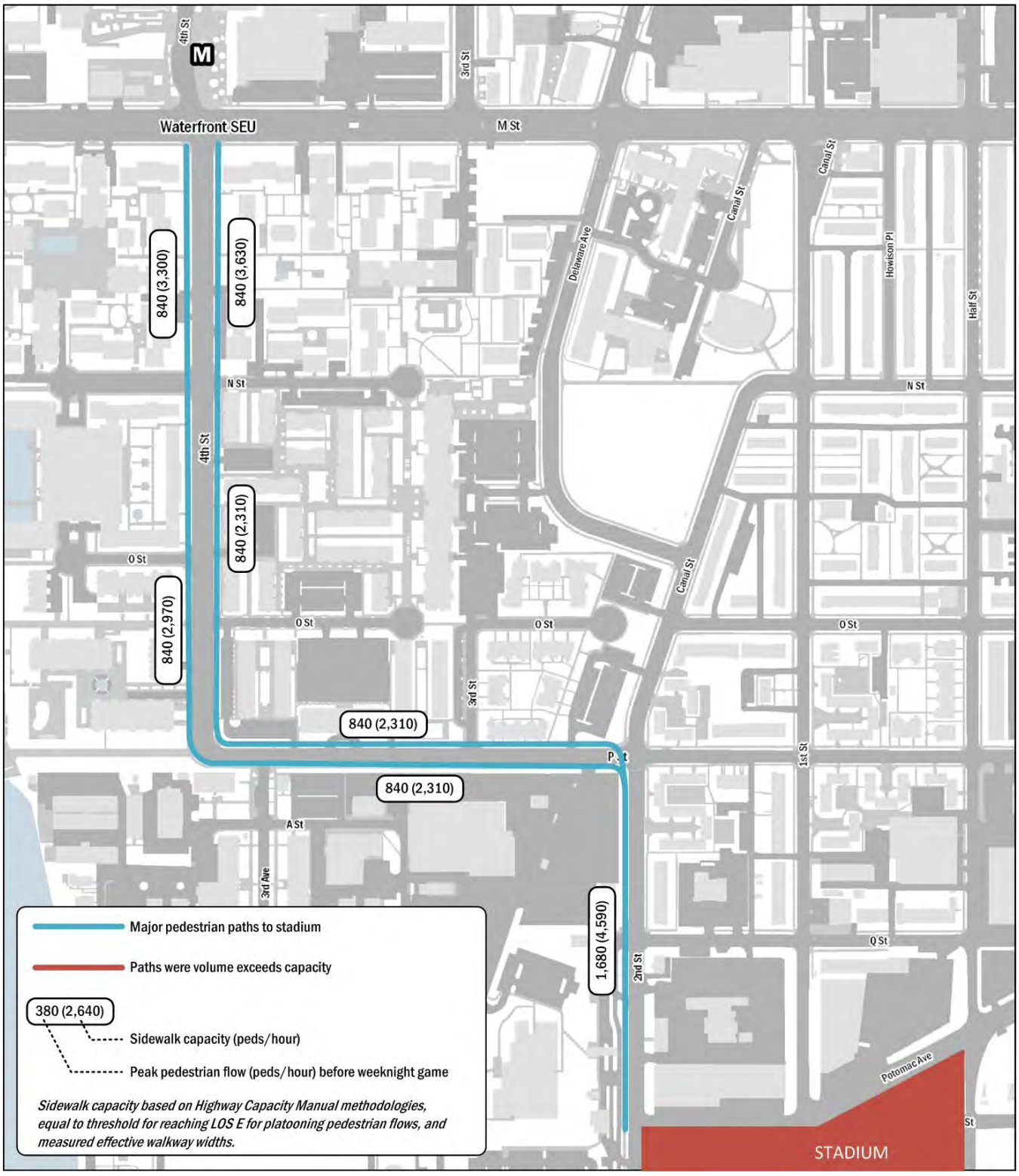


Figure 20: Pedestrian Link Analysis - West of the Stadium

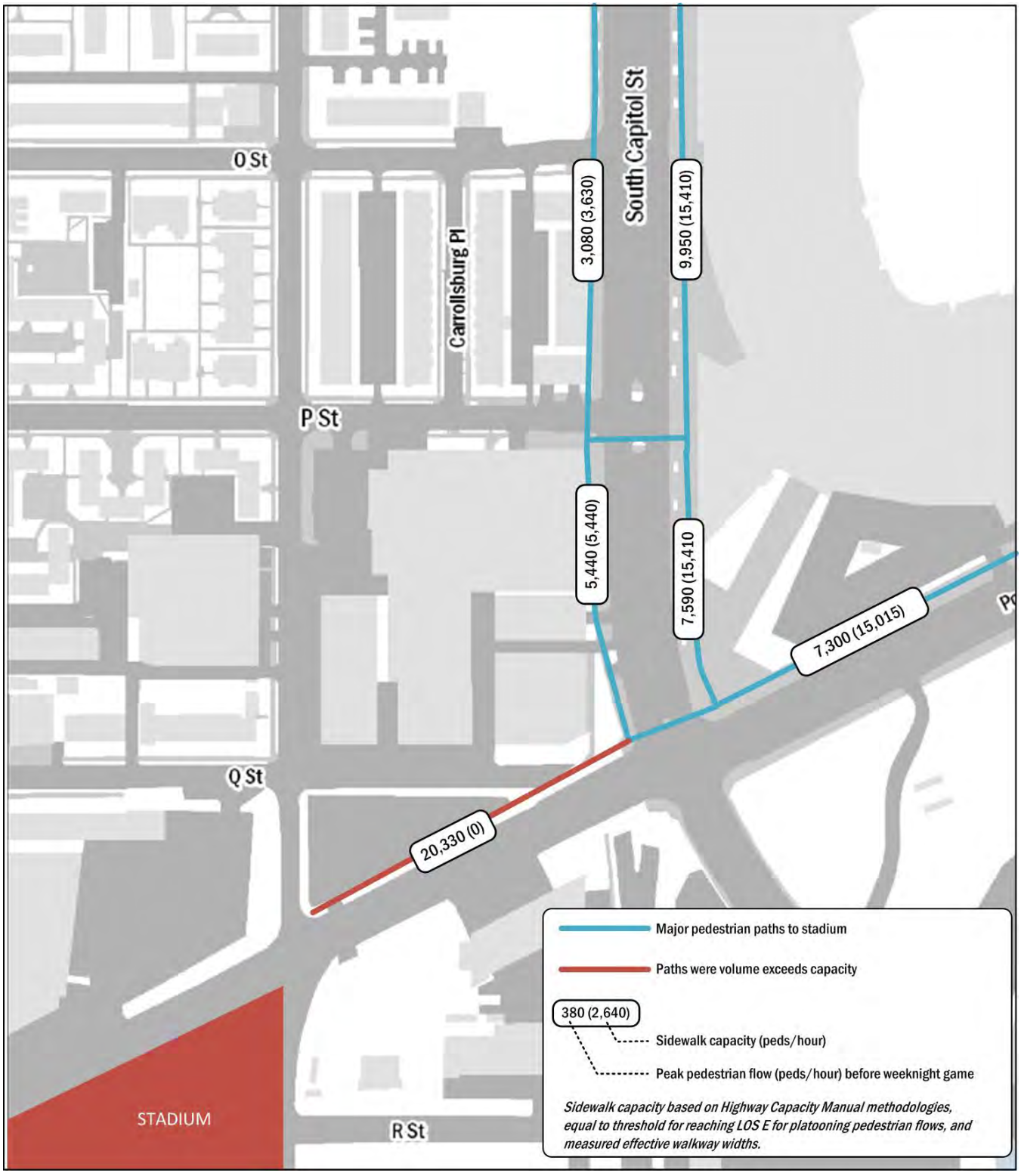


Figure 21: Post-Game Pedestrian Volumes

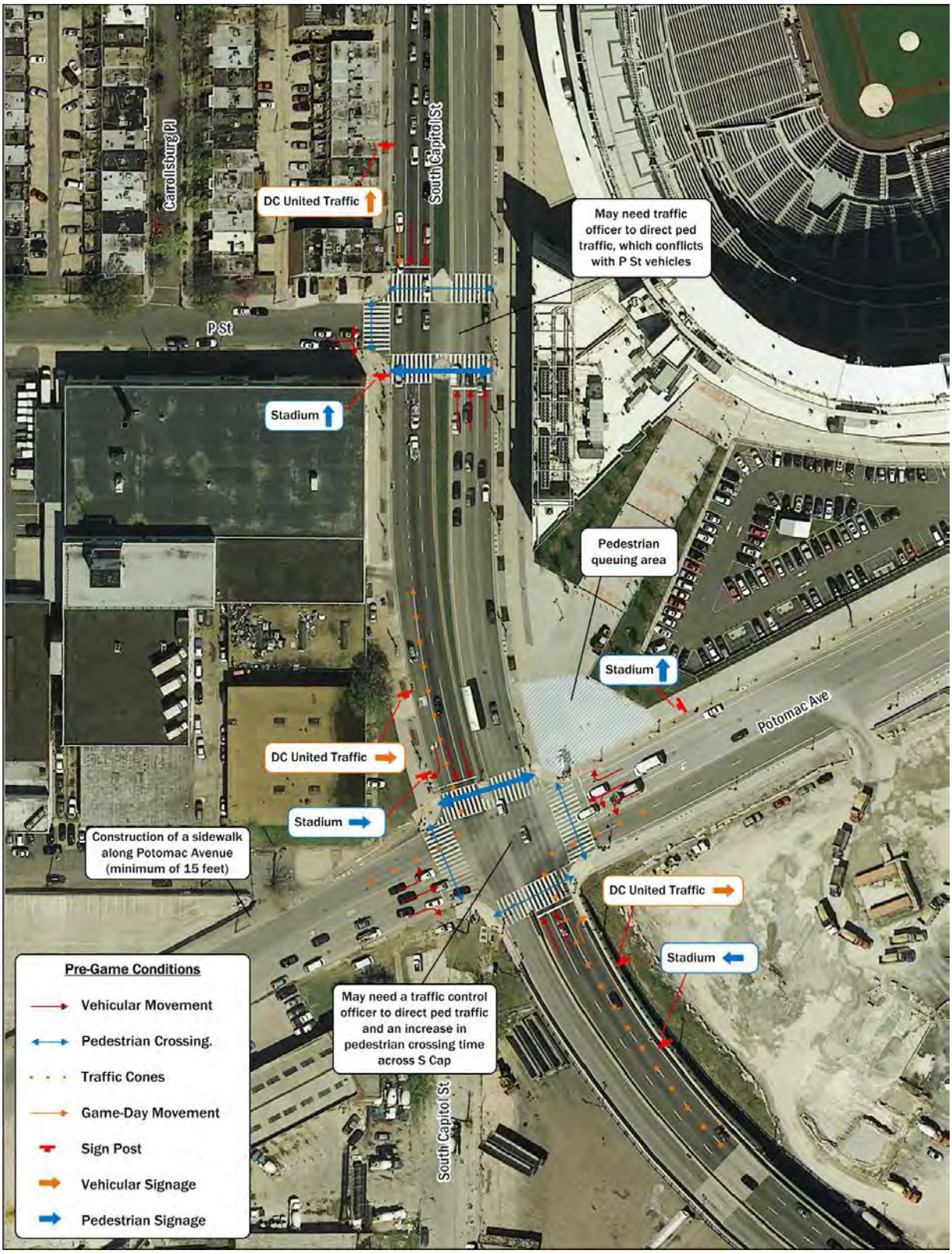


Figure 22: Pre-Game Pedestrian Conditions (South Capitol Street and Potomac Avenue)

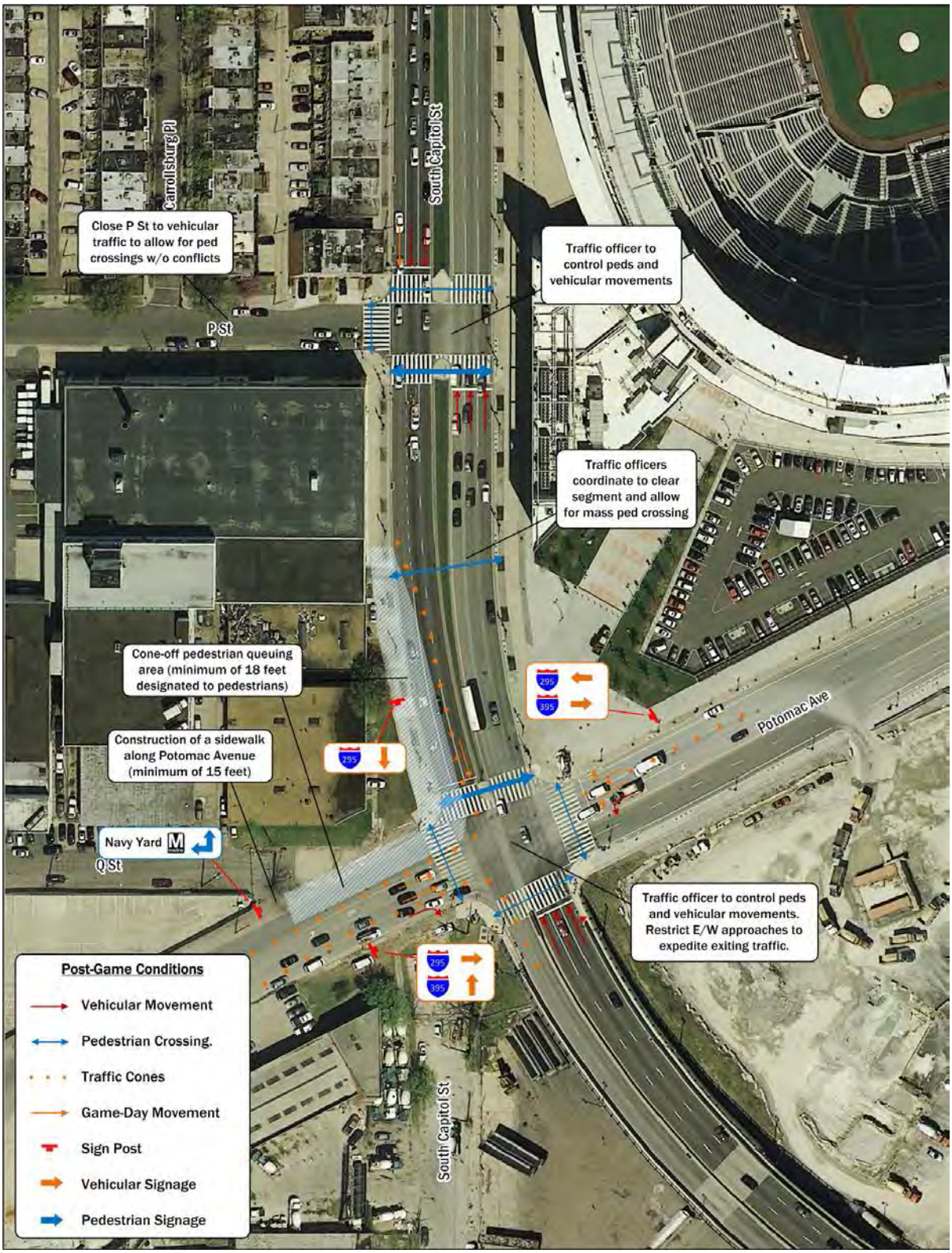


Figure 23: Post-Game Pedestrian Conditions (South Capitol Street and Potomac Avenue)

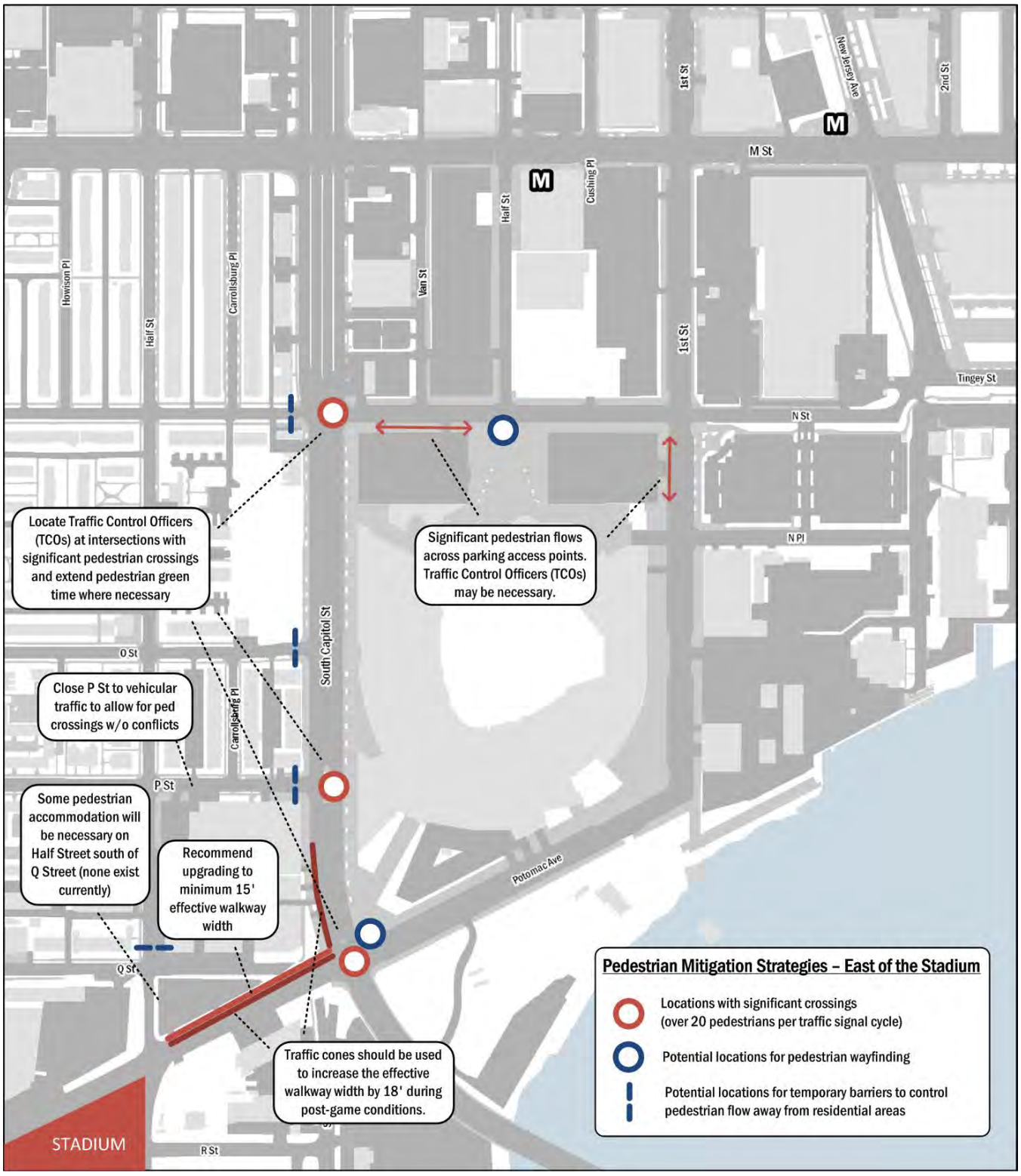


Figure 24: Pedestrian Mitigation Strategies – East of the Stadium

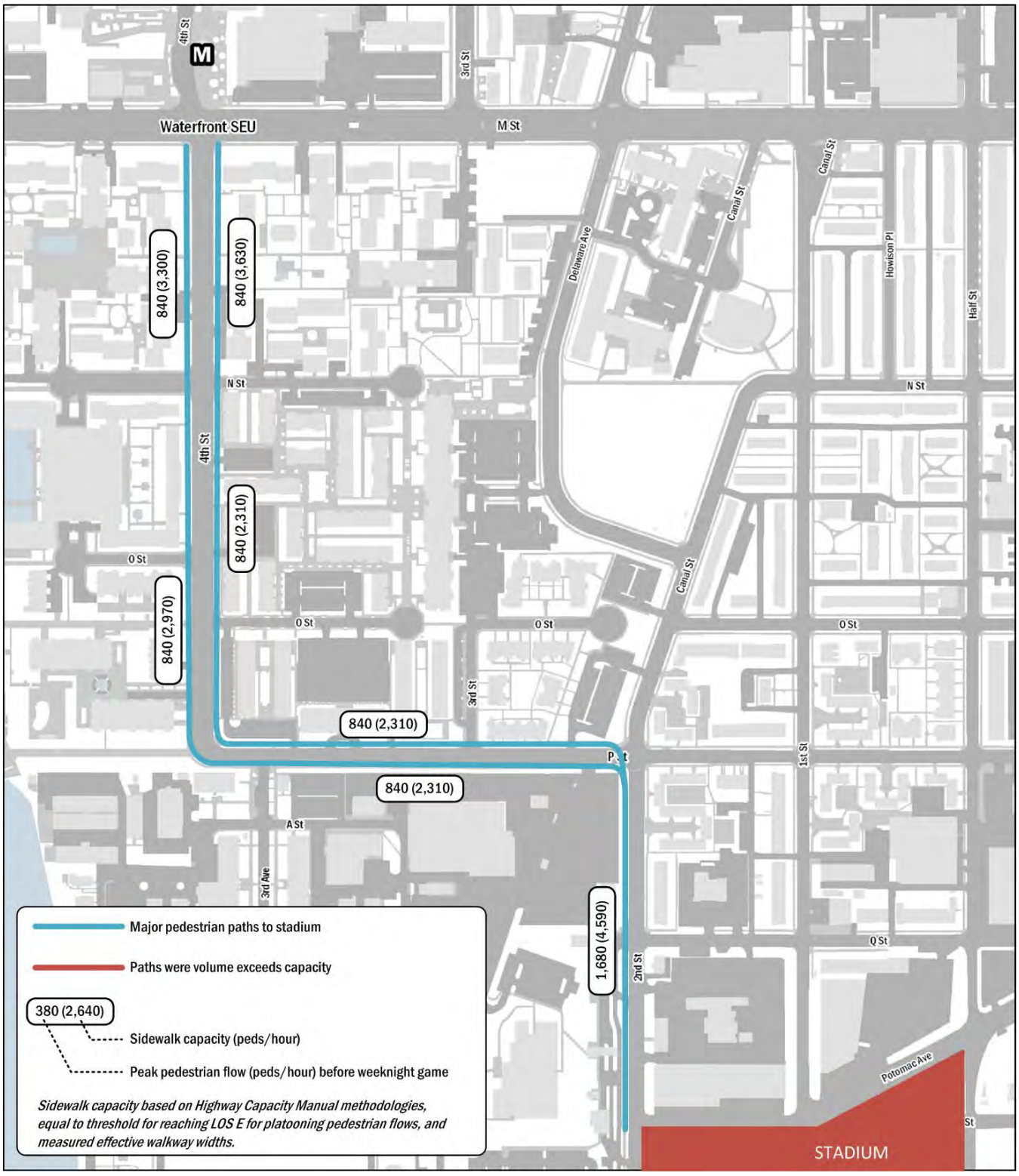


Figure 25: Pedestrian Mitigation Strategies - West of the Stadium

BICYCLE

For the purpose of accessing the Stadium, cyclists have access to multi-use trails, on-street bike facilities, signed bike routes, and local and residential streets that facilitate cycling. Although there are no planned improvements anticipated to be complete prior to the opening season, the existing bicycle network provides good accessibility to the Stadium. This section discusses the suggested routes, qualitatively analyzes the bicycle conditions near the Stadium, and discusses on-site improvements that will help improve the overall bicycle environment around the Stadium.

Review of Routes

There are five primary routes to and from the Stadium that utilize the existing facilities ranging from low- to high-quality, as summarized in Figure 26. Two routes along 4th Street SW and 4th/6th Street SE can be categorized as high quality routes. Portions of 4th Street SW contain bike lanes and all other areas along the roadway provide a safe bicycling environment. 4th Street SW also has the advantage of connecting the site to the Pennsylvania Avenue cycle track and the downtown DC area. Although there are some areas in which the pavement quality is poor, the width of the bicycle facilities in these areas allow for cyclists to have a clear, smooth path.

Southbound and northbound bike lanes are provided on 4th and 6th Street SE, respectively. The bike lanes extend from G Street SE to Florida Avenue NE providing 1.8 miles of bike lanes in both directions. Nearby, New Jersey Avenue also serves as a good bike route and has bike lanes along a portion of it. New Jersey Avenue may be particularly useful for the northbound traffic as access to the 6th Street bike lane from Virginia Avenue can be tricky for novice cyclists. This system of bike lanes and routes creates excellent connectivity with many of the residential neighborhoods in Capitol Hill and the surrounding areas, and links fairly seamlessly with bicycle facilities in southeast and southwest DC near the site such as the I Street SE/SW bike lane and the 1st Street/Potomac Avenue SE bike lanes. Both bike lanes are in very good condition, with parts of the I Street bike lane having just been repaved within the last year.

The bicycle routes along Maine Avenue and the 11th Street Bridge are categorized as moderate quality routes due to some deficiencies along the routes. Maine Avenue connects the Stadium with the 14th Street Bridge and the 15th Street cycle track; however, the complicated roadway network surrounding the Francis Case Memorial Bridge and the 14th Street Bridge combined with the lack of clear cycling routes may create confusion for novice cyclists. Additionally there are some areas with little to no buffer between bicycle facilities and high speed roadways.

The 11th Street Bridges have recently been reconstructed in which updated bicycle facilities have been implemented that provide an important connection to areas of the District on either side of the Anacostia River. The 11th Street Bridges connect to the Anacostia Riverwalk Trail which leads to the Stadium. For the most part this route provides excellent connectivity; however, parts of the trail connecting to the Stadium are sometimes closed and would result in traveling along M Street, which does not provide as good of cycling conditions. Additionally, the Anacostia Riverwalk Trail will likely serve as a major pedestrian route during games; thus it's likely that near the Stadium bicycles will have to dismount their bikes and walk along the trail to avoid conflicts.

The route along the Frederick Douglass Memorial Bridge which connects the Stadium with Anacostia is currently a low quality route. Although the bridge and some connections across the river are considered multi-use trails, they are in poor quality and require enhancements. The proposed improvements to South Capitol Street and the Frederick Douglass Bridge will greatly enhance bicycle routes to the south.

Although there are several existing bicycle facilities in the area, there is also a lack of facilities in the Buzzard Point area due to the lack of a roadway grid and little development in the area thus far. Another issue that arises in the area is high-volume and high-speed roadway crossings primarily along South Capitol Street. These may prove challenging for novice cyclists, but likely won't be seen as a problem to most cyclists in the area.

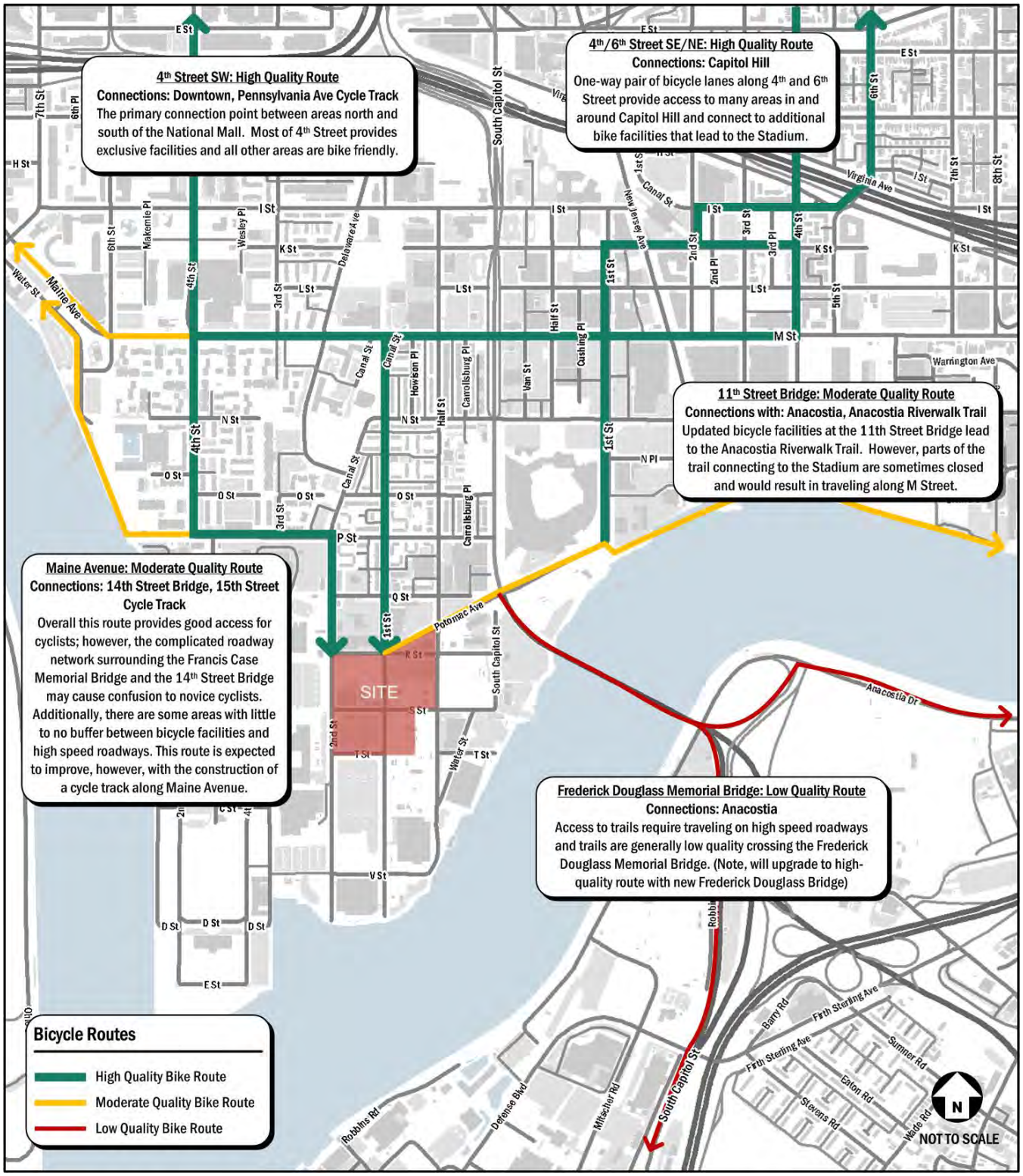


Figure 26: Bicycle Routes

Bicycle Link Analysis

"Chapter 17: Urban Street Segments" of the *Highway Capacity Manual 2010* (HCM 2010) outlines a methodology for evaluating the performance of an urban street segment in terms of its service to bicyclists.

Methodology

The methodology for bike link analyses involves a six step process; however, two of these steps can be used as a stand-alone method requiring less-intensive data collection. This approach is often taken by local, regional, and state transportation agencies. Thus, the two-stop process was used in lieu of the six-step process and continued to provide the desired quantitative level of service (LOS) results.

Step 1: Determine Bicycle LOS Score for Link

The bicycle link LOS score is determined through several inputs that primarily consist of the vehicular profile of the roadway, cross-section of the roadway (including if an exclusive bicycle facility is provided), and the pavement condition.

Similar to the methodology used for the pedestrian link analysis, collected traffic counts were used to determine the vehicular volumes along many roadways. For roadways without available data, a volume was assumed based on the functional classification of the roadway. AADT volumes provided by the District were inventoried by functional classification and used to determine an appropriate average volume based on functional class. A similar method was used to determine the heavy vehicle percentage along each roadway. AADT volumes categorize the type of vehicles counted; thus, an average heavy vehicle percentage was determined for each functional classification and applied to the study area links.

Table 27: Bicycle LOS Parameters

Bicycle LOS Score	Bicycle LOS
< 2.00	A
> 2.00 - 2.75	B
> 2.75 - 3.50	C
> 3.50 - 4.25	D
> 4.25 - 5.00	E
> 5.00	F

Pavement condition rating is expressed on a scale of 0 to 5, 0 being the worst and 5 being the best. For the purpose of this analysis, and to eliminate subjectivity within the data collection process, a pavement condition of 3 was assumed for all roadways, consistent with a roadway that has some rutting and patching and provides an acceptable ride for low-speed traffic.

Step 2: Determine Link LOS

The bicycle link LOS is determined exclusively from the bicycle link LOS score determined in Step 1. This score is compared to the thresholds shown in Table 27 to determine the bicycle link LOS. LOS results range from "A" being the best to "F" being the worst on the basis of the cyclists traveling experience and perception of service quality along the roadway segment.

Results

Data collected for the bicycle link analysis was collected in conjunction with data collected for the pedestrian link analysis. This data was collected on Wednesday, May 28, 2014, Monday, June 2, 2014, Monday, June 23, 2014, Wednesday, July 2, 2014, Thursday, and July 10, 2014. A full inventory of data collection and analysis results is included in the Technical Attachments. Figure 27 summarizes the pedestrian link LOS results for the PM peak hour scenario.

The analysis concludes that most roadways in the study area are perceived as an LOS C or better; thus, most cyclists feel comfortable riding on the roadways surrounding the site. Primary exceptions to this finding are segments of M Street and North Capitol Street. This is expected due to high volumes on these roadways and, in some cases, slightly higher speeds. Additionally, some segments of 4th Street, P Street, and Potomac Avenue are also perceived as an LOS D. Although these streets may be intimidating to novice cyclists, the majority of roadways provide acceptable cycling conditions to experienced cyclists.

Bicycle Mitigation

Bicycle specific infrastructure that should be incorporated into the Stadium and surrounding area includes bike racks, a bike valet system, one or more Capital Bikeshare

stations, way-finding signage along the bike routes, and improved surface conditions through repaving. Based on the approximate cycling mode share that was experienced at Nationals Park during playoffs, it is estimated that typically 1 to 2 percent of game-day trips will arrive by bike. This amounts to approximately 400 bike trips per game on the high end.

Therefore, it will be essential to provide ample bicycle parking at the Stadium to account for these trips. It is suggested that approximately 60 percent of parking spaces are accommodated by bike racks and the remainder accommodated by the bike valet system. The racks should be placed all along the perimeter of the Stadium; however they should be centralized along the north and east sides of the Stadium as more cyclists are likely to be traveling from these directions.

The bike valet system would be best located along the north side of the Stadium to serve the largest amount of people. At least one new Capital Bikeshare station will have to be added to Buzzard Point as all existing Bikeshare stations are located north of M Street and east of South Capitol Street. Again, the location of a station would be most valuably served on the north side of the Stadium and incorporated into the site design as such. To direct people to the Stadium, way-finding signs should be placed along the bike facilities that direct cyclists towards Buzzard Point. Because there are no current bike facilities in Buzzard Point, these signs would act as a way to direct bikes along the suggested routes, including 4th Street, P Street, 2nd Street, 1st Street, and Potomac Avenue.

DC United should also promote and market available bicycle routes and parking for the new Stadium, including encouraging use of cycling by providing benefits to season ticket holders in a similar manner to parking/transit benefits

Temporary way-finding signage should also be used specifically on game days to direct people towards the bike valet location and to other bike parking locations. Temporary cones and barriers could also be used along the access routes to direct bicycle traffic to the Stadium before the match and away from the Stadium at the end. To provide a safer environment for both bicycles and pedestrians, DC United should coordinate with DC Police to employ traffic control officers at adjacent intersections pre- and post-game, particularly at some of the busier intersections. Overall, the new Stadium should become one of, if not the most bike friendly soccer Stadium in the country. Therefore DC United should coordinate with the Washington Area Bicyclist Associated (WABA) on strategies to create a bike friendly environment at the Stadium.

Based on the bicycle data collection efforts, a few infrastructure improvements are suggested to improve the quality of the expected bicycle routes:

- Improvements should be made to the L curve at 4th and P Street where it connects with the Anacostia Riverwalk Trail. Under existing conditions, there is only “Stop For Pedestrian” signage with no signage in regards to the interaction between vehicles and bikes. Currently cars drive through this L curve without slowing much making it a relatively difficult place for bikes to cross. This route is regarded as a bike route thus signage should be installed that warns vehicles about potential bike traffic. This would provide for safer interactions between bicycles and vehicles.
- Pavement improvements should be made along First Street between the Stadium and P Street. This will likely be a main bicycle route and is currently in very poor condition.

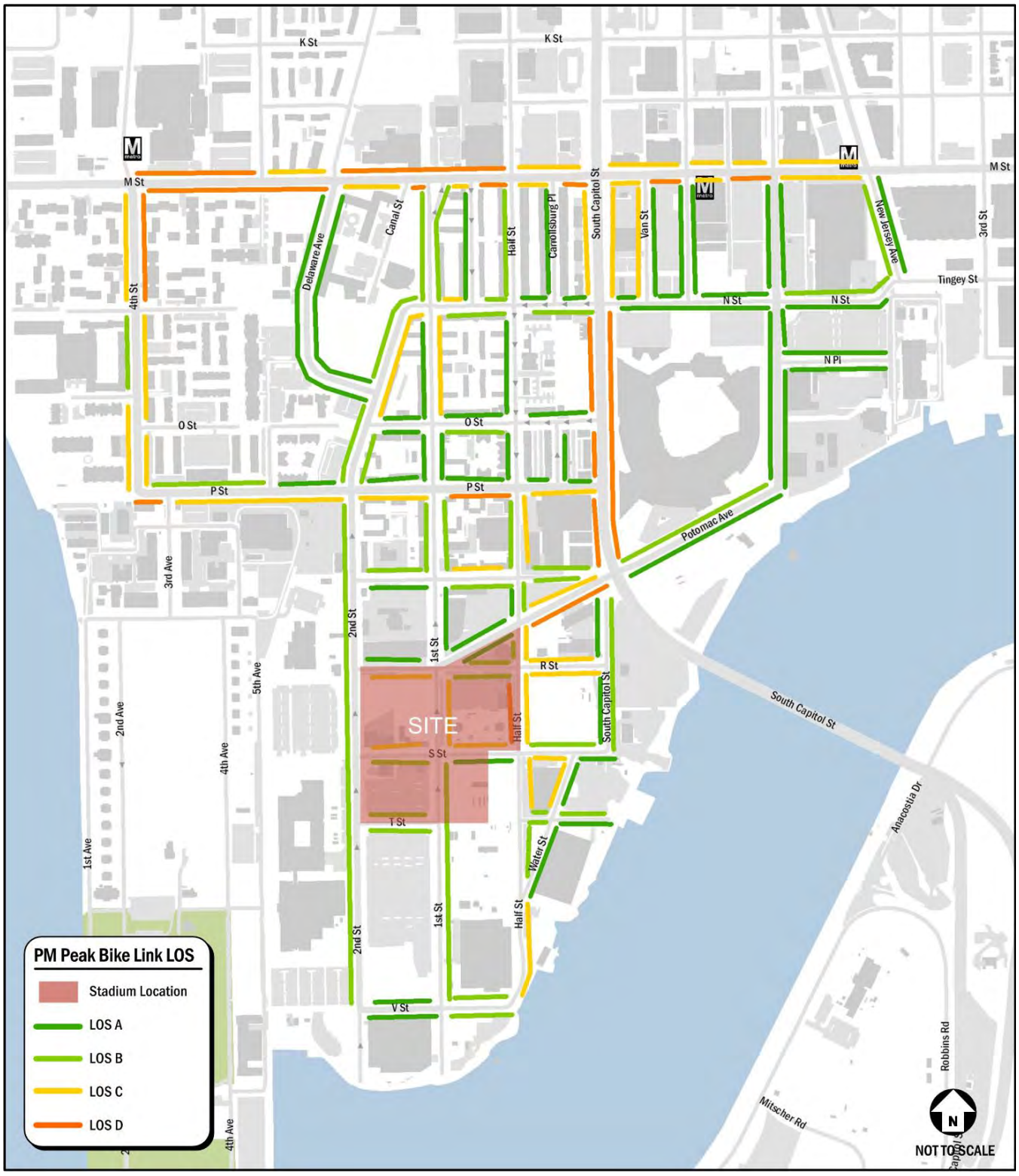


Figure 27: PM Peak Bike Link LOS

INDIRECT IMPACTS

The Stadium site, and the parcels surrounding it on Buzzard Point, is located on land currently zoned for high-density mixed-use development. Although this is the case, no significant development has occurred on Buzzard Point since the parcels were rezoned years ago. Part of the reasoning for locating the new stadium on Buzzard Point is for the stadium to serve as a catalyst for development.

The stadium will generate a different type of transportation demand than the potential envelope of development on its component parcels. The demand generated by the stadium will be concentrated and occur at predetermined intervals, while a mixed-use development would generate regular traffic including significant amounts of traffic that overlaps with the commuter peak hours. The overall transportation impact from the stadium will be far less in aggregate than an equivalent amount of high-density mixed use development, especially during the times when the transportation network is used the most.

Thus, building the stadium in Buzzard Point will generate an indirect positive impact during weekday commuter hour traffic. All of the long-range traffic models that have analyzed this area of the District have included a projected amount of development based on the current zoning on Buzzard Point, thus with the stadium in place all of these models will have overestimated commuter traffic going to/from Buzzard Point.

The levels of development included in long-range models are based on information from the Metropolitan Washington Council of Governments (COG), summarized by geographical areas known as Traffic Analysis Zones (TAZ). The table below shows projections for the Buzzard Point TAZ, which is bounded by the Anacostia River to the south, South Capitol Street to the east, Q Street SW to the north, and Fort MacNair to the west.

The COG forecasts show a large increase in development, focused on new employment, between 2020 and 2025. This fits the zoning of the current parcels and the slow timeframe of current development. The stadium site will have two indirect impacts to these projections. First, the stadium may accelerate new development to occur prior to 2025. Second, the stadium will decrease the overall amount of new employees that can be added to Buzzard Point.

A conservative estimate of development potential on the stadium parcels is 2.32 million square feet of commercial space. A standard estimate of employees per square feet is three per thousand. Thus, constructing the stadium decreases the amount of potential new commuting employees by 773. This equates to 8.5% of all new employees projected to be added to Buzzard Point between now and 2040. It is possible that this indirect impact of reducing the everyday commuting traffic generated by Buzzard Point will offset potential negative impacts associated with stadium generated traffic.

Table 28: Buzzard Point TAZ Projections

Year	Employment Forecast	Households Forecast
2010	4,934	17
2015	4,934	18
2020	4,934	62
2025	13,672	62
2030	13,672	62
2035	13,672	63
2040	14,003	66

Source: *Round 8.2 Cooperative Forecasting*, MWCOG, July 2013

Summary of Mitigation Measures

The DC United stadium, situated near major transportation facilities, has the potential to have a quality transportation experience on game days. This report identified mitigation measures necessary to achieve this goal, including reducing the impact the stadium has on the surrounding neighborhood and guiding spectators to efficient routes for various modes.

The following is a summary of mitigation measures described in detail in the prior sections of the report. Many of these will be refined between now and the opening of the stadium, including development of a stadium Transportation Operations Plan (TOP).

- Parking
  - Off-Street Parking
    - Provide some parking on Buzzard Point near the Stadium to increase the amount of parking within a short walk of the Stadium, ensure that smaller events could have an independent parking supply, and help disperse overall vehicular demand.
    - In the months leading up to opening day, work with owners, operators, and developers of existing parking facilities and undeveloped surface lots to determine which parking locations will be available.
  - On-Street Parking
    - Existing meters in Buzzard Point that do not serve residential uses should be converted to multi-space meters with the option of implementing special game day rates.
    - Review Residential Permit Parking (RPP) near stadium for enhancement, for example adding Sunday restrictions where none currently exist.
    - Employ adding signs to help deter drivers from searching from parking in residential neighborhoods.
    - Convert unrestricted parking to multi-space meters with the option of implementing game day rates.
- Traffic
  - Promote transit and bicycle usage
  - Inform commuting public surrounding the stadium of the stadium's event schedule.
  - Provide information to spectators that drive to games on appropriate parking and routing decisions.
  - Develop various signal timing strategies during the TOP process in collaboration with DDOT for use on game days.
  - Examine special operational measures at intersections (closures, turn restrictions, etc.) during development of the TOP.
- Transit
  - Install DC United signage within the Metro System to direct patrons to the Navy Yard station.
  - Create a "sense of place" for patrons in order to enhance the perceived walk-time between the proposed Stadium and the Navy Yard Station.
  - Coordinate the stadium design to ensure that new streetcar service can be accommodated within the site design.
  - Coordinate with WMATA in regards to the projected number of attendees and riders during the season.
  - Promote and market available transit options for the new Stadium , including encouraging use of transit by providing Metro subsidies to season ticket holders equal to any parking subsidies that are typically provided
- Pedestrian
  - Add pedestrian accommodations along 1st Street and Half Street south of Q Street where none currently exist.
  - Construct ample sidewalks along Potomac Avenue west of South Capitol Street leading up to the Stadium.
  - Place Traffic Control Officers (TCO) at intersections with significant pedestrian crossings, particularly at areas that have high vehicular volumes as well. TCOs will mainly be responsible for preventing and resolving conflicts between pedestrians and vehicles.
  - Install pedestrian way-finding signage on pathways leading to the Stadium. Signage should also be placed within the Navy Yard Metro station

to direct patrons to the west portal, which has been upgraded to handle game-day transit traffic.
    - Explore using temporary traffic barriers such as cones or Jersey barriers to control the vehicular flow and ensure separation between vehicles and pedestrians at the high conflict intersections, and at sidewalks along the perimeter of the residential neighborhood to deter patrons from walking through the neighborhood before and after the game.
- Bicycle
    - Incorporate bike infrastructure into the Stadium and surrounding area includes bike racks, a bike valet system, one or more Capital Bikeshare stations, and way-finding signage along the bike routes
    - Explore temporary way-finding signage on game days to direct people towards the bike valet location and to other bike parking locations.
    - Consider infrastructure improvements to improve access routes:
        - Improvements could be made to the L curve at 4th and P Street where it connects with the Anacostia Riverwalk Trail.
        - Pavement improvements could be made along First Street between the Stadium and P Street. This will likely be a main bicycle route and is currently in very poor condition.
    - Market available bicycle routes and parking for the new Stadium , including encouraging use of cycling by providing benefits to season ticket holders in a similar manner to parking/transit benefits.

BUZZARD POINT FRAMEWORK PLAN TRANSPORTATION STUDY

WASHINGTON, DC

The following document is a transportation study of Buzzard Point and proposed future development. Specifically, it reviews the potential transportation impacts of the future development outlined in the District Office of Planning's *Buzzard Point Vision Framework + Implementation Plan*. The purpose of this report is to review the transportation aspects of the Framework Plan, focusing on analyzing the traffic impacts of the potential new development outlined in the plan and developing minimum roadway requirements for Buzzard Point streets. This report includes recommendations on the circulation and cross-sections of Buzzard Point roadways to accommodate future traffic, pedestrian, cyclist, and transit needs.

Prepared for the District of Columbia Government

June 15, 2015

Prepared by:

1140 Connecticut Avenue NW
Suite 600
Washington, DC 20036
Tel: 202.296.8625
Fax: 202.785.1276

3914 Centreville Road
Suite 330
Chantilly, VA 20151
Tel: 703.787.9595
Fax: 703.787.9905

15125 Washington Street
Suite 136
Haymarket, VA 20169
Tel: 703.787.9595
Fax: 703.787.9905

www.goroveslade.com

Contents

Figures

Tables

INTRODUCTION

This report presents the findings of a transportation study of Buzzard Point and proposed future development. Buzzard Point, located in Southwest DC along the bank of the Anacostia River, is a peninsula currently dominated by industrial uses. The District is working with DC United to locate a new soccer stadium on several underutilized and unattractive parcels. The establishment of such a visitor attraction offers a catalytic opportunity to spur redevelopment within the area.

To help guide the redevelopment of Buzzard Point, the District Office of Planning assembled the *Buzzard Point Vision Framework + Implementation Plan*. The purpose of the Framework Plan is to identify the future of Buzzard Point and establish expectation for stakeholders.

The purpose of this report is to review the transportation aspects of the Framework Plan, focusing on analyzing the traffic impacts of the potential new development outlined in the plan and developing minimum roadway requirements for Buzzard Point streets.

This report is split into two sections. The first provides a summary of existing major transportation features near and adjacent to the site including reviewing roadways, transit facilities, bicycle facilities, and pedestrian facilities. The purpose of this section is to outline connectivity needs of all modes to and from the study area. This information was used to help develop the roadway recommendations presented in the second section of the report.

The second presents an analysis of weekday traffic operations and provides multi-modal recommendations for the neighborhood. This includes an analysis of potential future demand, comparisons with demand assumed in prior DDOT studies, capacity analysis, and recommendations. The recommendations are based on the technical analysis of internal roadways within the study area, and the review of connectivity to and from the study area presented in the first section.

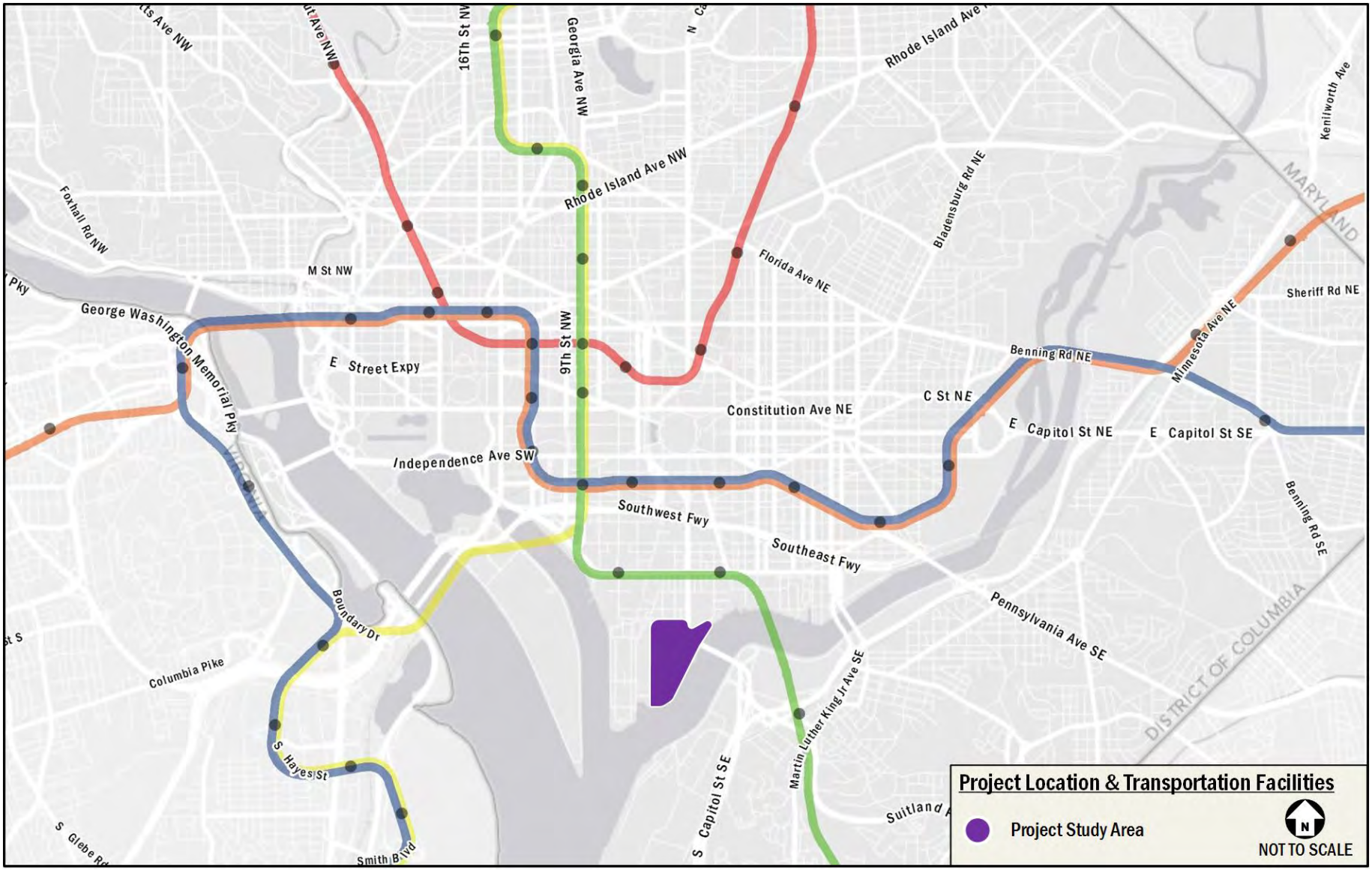


Figure 1: Site Location

EXISTING AND PROPOSED NETWORK

Buzzard Point is located in the Southwest quadrant of Washington, DC and is generally bounded by P Street to the north, South Capitol Street to the east, the Anacostia River to the south, and Fort McNair to the west. The area is served by many regional roadways and arterials including Interstate 395, Interstate 695, Interstate 295, Maine Ave SW, M Street SW/SE, and South Capitol Street.

Figure 1 identifies the project study area within the district. The area is accessible via these roadways, along with a network of collector and local streets.

The area is served by public transportation, including Metrorail and Metrobus service. The area is also served by a pedestrian network consisting of sidewalks and crosswalks along the local streets and surrounding the project site. In addition to pedestrian accommodations, the site is served by a bicycle network, which consists of mixed-use trails and bike lanes.

TRANSIT

The study area is well served by heavy rail, commuter bus, and local bus service. Combined, these transit services provide local, city wide, and regional transit connections and link Buzzard Point with major cultural, residential, employment, and commercial destinations throughout the region. Figure 2 identifies the major transit routes, stations, and stops in the area.

Metrorail and Metrobus services connect the area with other District neighborhoods and the Washington Metropolitan region. The area is primarily serviced by Metrobus along the M Street corridor with some local service within the neighborhood. The routes serving this area connect the site to various locations throughout the District and the downtown

Table 1: Bus Route Information

Route Number	Route Name	Service Hours[1],[2]	Headway[1]
74	Convention Center-Southwest Waterfront Line	Weekdays: 5:03AM – 12:03AM	15 min – 20 min
315	Columbia/Silver Spring to Washington DC	Weekdays: Inbound: 4:36AM – 7:45 AM Outbound: 2:40PM – 7:53PM	20 – 30 min
735	Charlotte Hall/Waldorf to Washington DC	Weekdays: Northbound 4:20AM – 7:00AM Southbound 12:15PM – 5:25PM	20 – 30 min
A9	Martin Luther King Jr. Ave. Limited Line	Weekdays: Northbound 5:55AM – 8:50AM Southbound 3:35PM – 6:52PM	15 min
A42,46,48	Anacostia-Congress Heights Line	Weekdays: 4:00AM – 12:00 AM Weekends: 4:04AM – 12:40 AM	15 – 30 min
D300	Dale City-Washington Navy Yard	Weekdays: Inbound: 4:36AM – 6:43 AM Outbound: 12:13PM – 7:42PM	30 – 90 min
DCN22	Union Station - Navy Yard Circulator	Winter: 6:00AM- 7:00PM Summer: 6:00AM - 9:00PM Sundays: 7:00AM - 9:00PM	5 – 40 min
LCC	Loudoun County to Washington DC	Weekdays: Inbound: 5:00AM – 9:09 AM Outbound: 3:42PM – 5:00PM	25 – 45 min
P6	Anacostia-Eckington Line	Weekdays: 5:05AM – 2:04 AM Weekends: 8:27AM – 11:56 PM	15 – 30 min
P17,P19	Oxon Hill-Fort Washington Line	Weekdays: Northbound 4:47AM – 9:53AM Southbound 2:57PM – 7:10PM	5 – 15 min
V7, V8, V9	Minnesota Avenue-M Street Line	Weekdays: 4:38AM – 2:01 AM	30 min
W9	South Capitol Street Limited Line	Weekdays: Southbound 6:15AM – 9:07AM Northbound 3:15PM – 6:15PM	15 – 30 min
W13	Bock Road Line	Weekdays: Northbound 4:52AM – 9:02AM Southbound 3:35PM – 7:53PM	5 – 15 min

[1] WMATA route schedules, http://wmata.com/bus/timetables/

[2] MTA route schedules http://mta.maryland.gov/commuter-bus

business core. Table 1 shows a summary of the bus route information for the Lines that serve the area's vicinity, including service hours, and headway.

The Waterfront-SEU and Navy Yard Metrorail stations, which serve the Green Line, are in the vicinity of the study area. The Green Line connects the study area with major downtown connections such as Chinatown/Gallery Place, as well as Fort Totten and Greenbelt, Maryland to the north and Branch Avenue station in Maryland to the South. Metrorail trains run approximately every three minutes during the morning and afternoon peak hours. They run about every 5-6 minutes during weekday non-peak hours, every 10-15 minutes on weekday evenings after 7:00 pm and 6-15 minutes on the weekends.

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 the DC's Transit Future System Plan report published by DDOT in April 2010. This plan includes the reestablishment of streetcar service in the District and in the vicinity of the proposed development.

The streetcar system will consist of modern low-floor vehicles that operate on surface tracks embedded in the roadways. Stops will generally be located every ¼- to ½-mile along the routes. The District's streetcar plan includes two planned lines that are expected to terminate in Buzzard Point. The planned routes for these lines will connect Buzzard Point with Takoma/Silver Spring to the north (North-South Corridor) and with Anacostia to the south.

DDOT is currently conducting a study for the North-South Corridor which provides three different route alternatives for Buzzard Point. These routes show two-way streetcar travel along 2nd Street or a one-way loop around Buzzard Point. All route concepts would include construction of a maintenance facility located within the Buzzard Point neighborhood at the terminus of the line. More information regarding the North-South Streetcar Corridor can be found at the following link: http://www.dcstreetcar.com/projects/future-lines/northsouth/.

Since it is currently unknown where streetcar tracks will be installed within Buzzard Point, this study considered all three alternatives when developing recommended cross-sections later in this report. The main concern is separating bicycle facilities from tracks, and developing alternatives for facilities that provide bicycle connectivity for all three streetcar routing options.

Exiting Bicycle Facilities

Within the study area bicycles have access to multi-use trails, on-street bike lanes, signed bike routes, and local and residential streets that facilitate cycling. The bicycle network provides good conditions for local trips and there are several routes for trips between the study area and other areas within the District.

Directly east of the study area is an access point to the Anacostia Riverwalk Trail which travels north-south and connects Anacostia with the National Mall Trails system. Although the trail has some breaks between the two destinations, signed bike routes lead users along safe routes back to the trail. Additionally there are bike lanes that connect the study area in all directions. The 4th Street SW (north and southbound) and Potomac Avenue SE (eastbound) bike lanes provide connectivity to locations around the study area and link cyclists to other bicycle facilities in the District. A map of the existing bicycle facilities in the vicinity of the site is shown in Figure 3.

In addition, the Capital Bikeshare program allows for an additional cycling option. Users can choose to join the program for one day, three days, a month, or a year. Therefore this program is perfect for both visitors and residents of the area. Users can rent a bike from the nearest docking station, ride the bike to their destination, and return the bike to a different docking station, making the system convenient for one-way and two-way trips. The Capital Bikeshare program has placed over 300 bicycle-share stations across Washington, DC, Arlington and Alexandria, VA, and Montgomery County, MD with over 2,500 bicycles provided. There are five stations within a half-mile radius of the northern edge of the study area contributing to a total of 113 docking stations as summarized in Table 2.

Table 2: Bikeshare Locations and Docking Stations

Bikeshare Location	Number of Docking Stations
1st and K St SE	15 docking stations
4th and M St SW	23 docking stations
M St and New Jersey Ave SE	17 docking stations
3rd and Tingey St SE	19 docking stations
1st and N St SE	39 docking stations
Total	**113 docking stations**

PROPOSED BICYCLE FACILITIES

The MoveDC plan outlines several bicycle improvements in the vicinity of the project area. 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.

  One Tier 1 improvement is adjacent to the study area, a cycletrack along 4th and P Streets connecting Maine Avenue, Anacostia Riverwalk Tail, and the future traffic oval. This analysis assumes that a connection will occur along this alignment when recommending bicycle routes within the study area.

- *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.

  Included in Tier 2 are bicycle lanes along Potomac Avenue within the study area.

- *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 3 improvements adjacent to the study area include bicycle trails alongside South Capitol Street. This analysis did not assume this route is in place when making recommendations for bicycle routes.

- *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.

  There are no Tier 4 bicycle improvements within or near the study area.

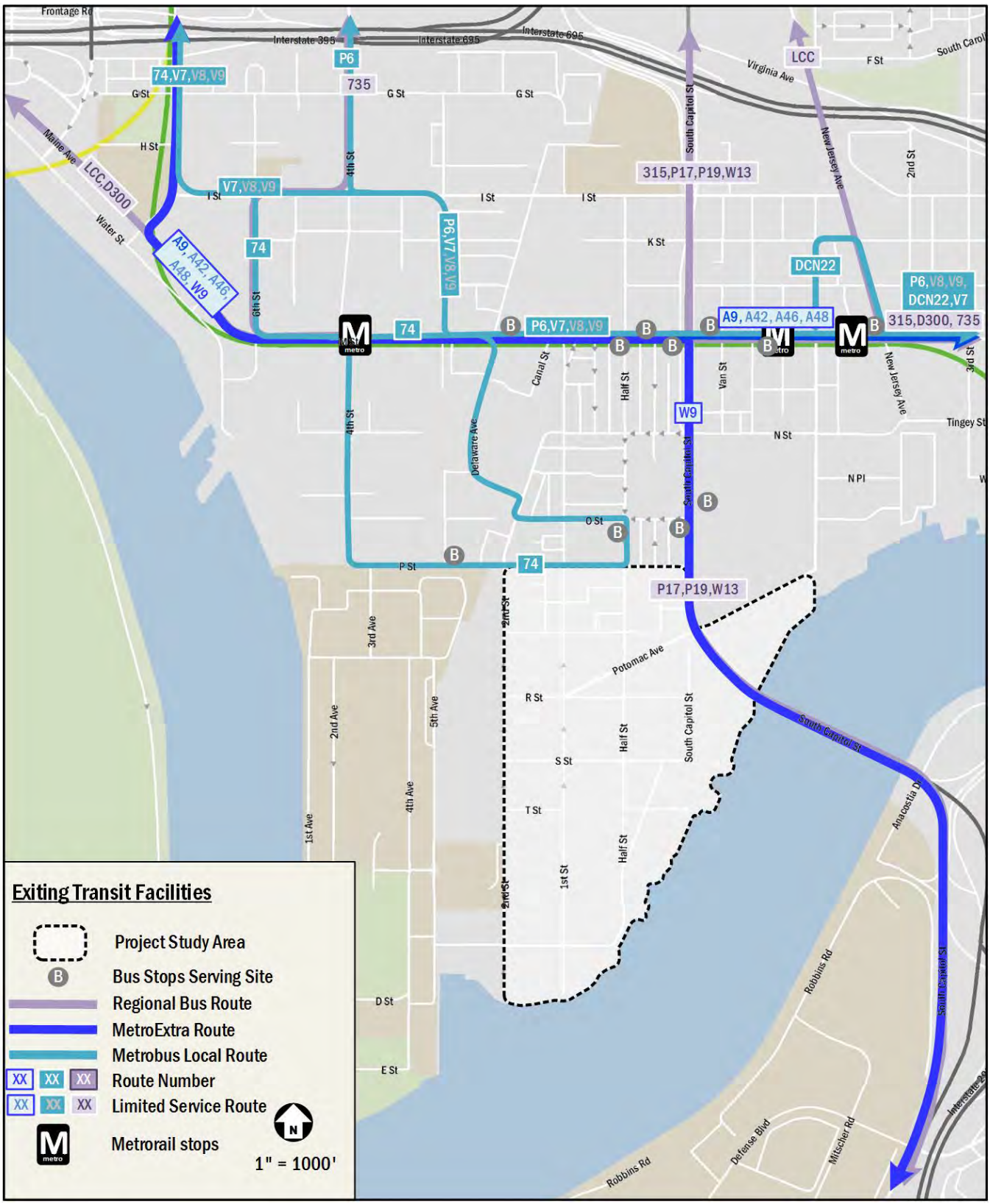


Figure 2: Existing Transit Facilities

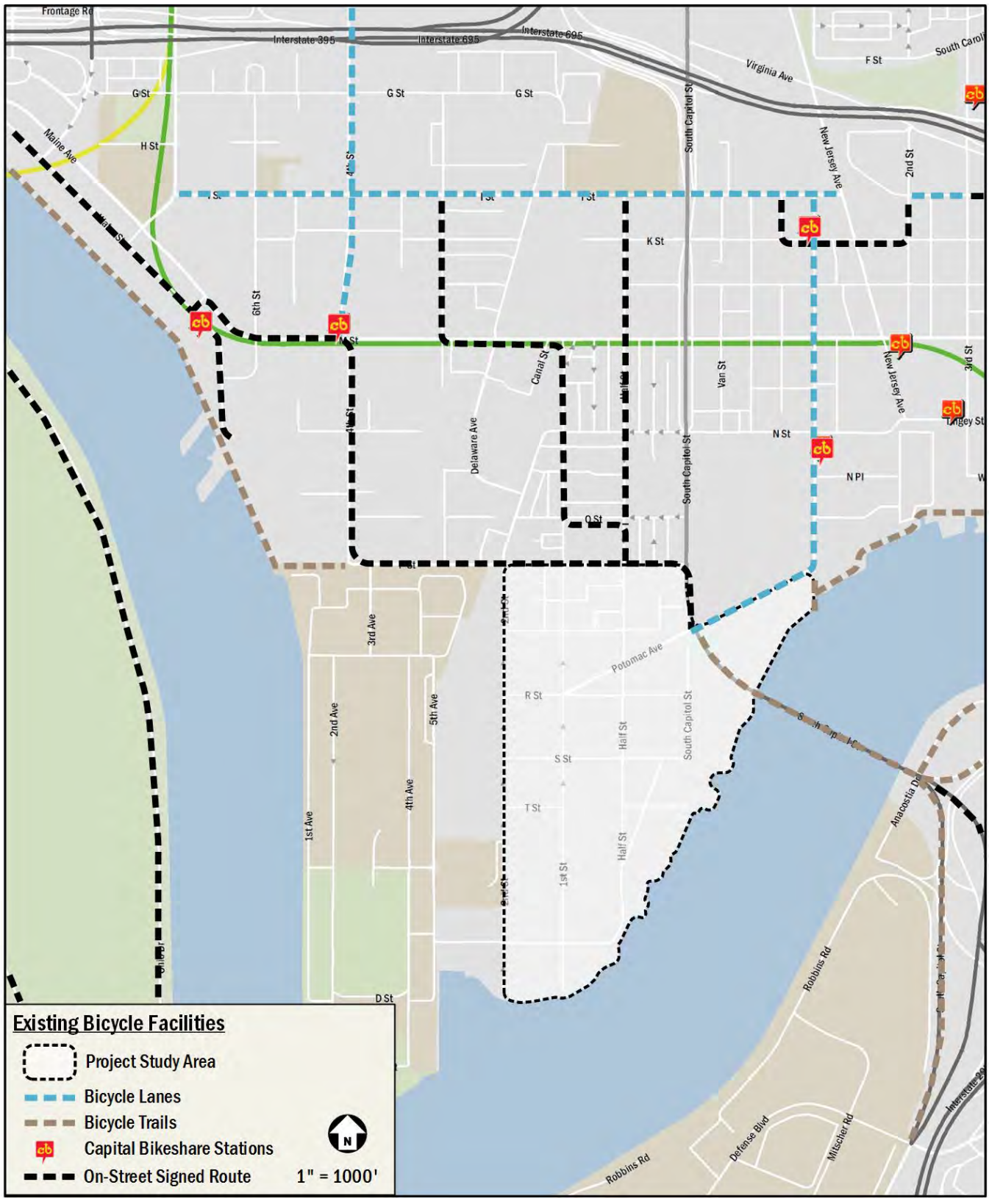


Figure 3: Existing Bicycle Facilities

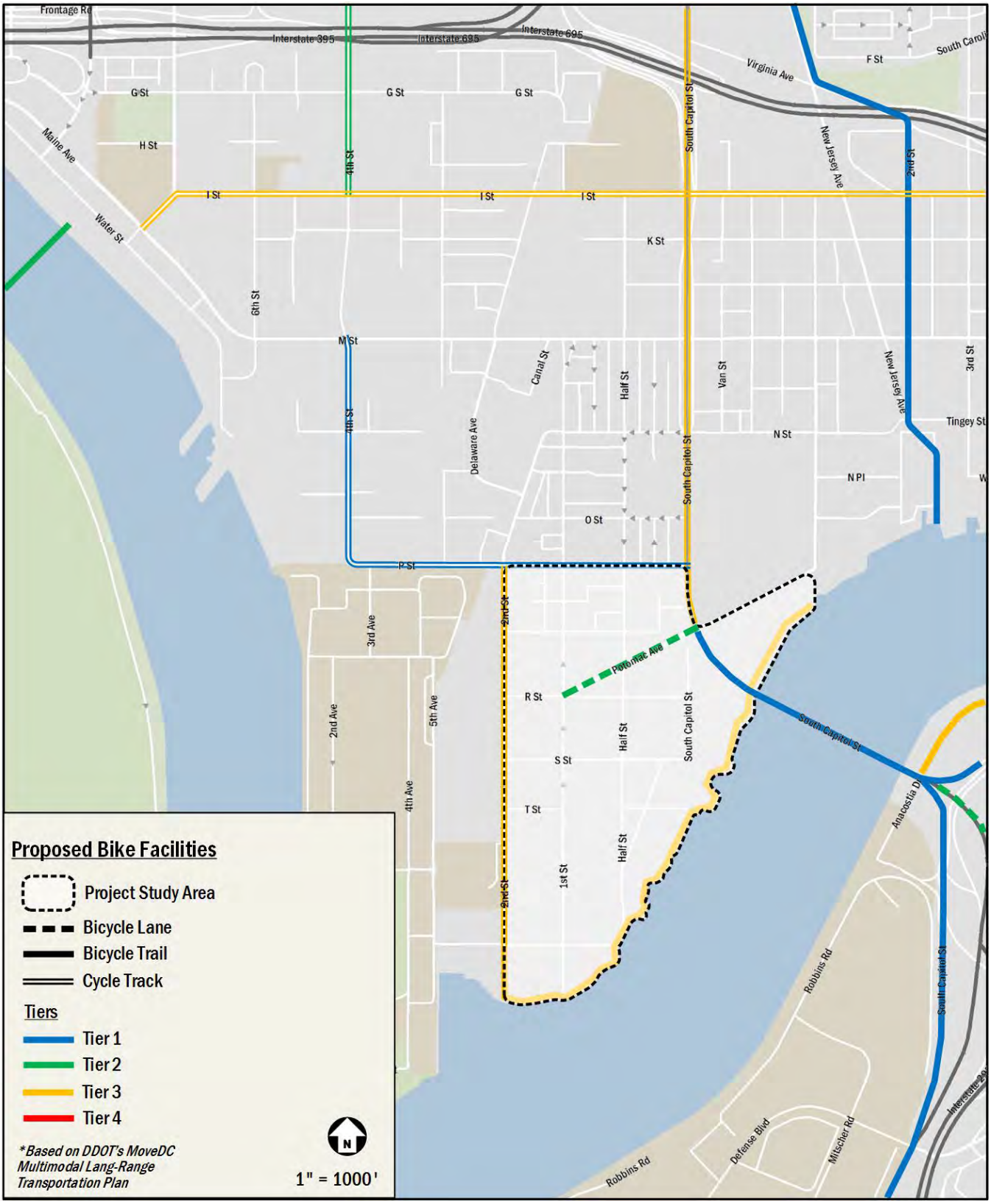


Figure 4: Proposed Bicycle Facilities

PEDESTRIAN FACILITIES

This section provides an inventory of the existing pedestrian access facilities and deficiencies. Overall, the pedestrian facilities within the study area provide a poor walking environment. There is good pedestrian access to the area along most adjacent streets.

The study area has good pedestrian access to nearby transit. The Waterfront-SEU and Navy Yard Metrorail stations are located in the vicinity of the site. The study area is also within walking distance to many bus routes along M Street, South Capitol Street and P Street SE that provide local and commuter service between the study area and additional destinations within the District.

There are a few barriers or areas of concern within the study area that negatively impact the quality and attractiveness of walking, including walking distances between the study area and some major destinations, manmade and natural barriers that increase walking distances, and roadway conditions that reduce the quality of walking conditions, including narrow sidewalks, lengthy freeway overpasses/underpasses, and lengthy crossings at some intersections. These are primarily due to the area's proximity to South Capitol Street and the Anacostia River. Figure 5 illustrates major walking routes and pedestrian barriers in the vicinity of the site.

A detailed review of pedestrian facilities near the study area shows that most facilities inside the study area do not meet DDOT standards, while most outside of the study area provide a quality walking environment. Figure 6 shows a detailed illustration of the existing pedestrian infrastructure within a quarter-mile walkshed of the study area. 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 width and buffer requirements for the District are shown below in Table 2. Within the quarter-mile walkshed, most roads are considered residential with a low to moderate density. The majority of sidewalks comply with an 8 foot sidewalk width and most have a 4 to 6 foot buffer. Even if no buffer exists between the edge of the sidewalk and the roadway, most roadways allow on-street parking which creates an additional buffer between pedestrians and vehicular traffic. ADA standards require that all curb ramps be provided wherever an accessible route crosses a curb and must have a detectable warning. Additionally, shared curb ramps between two crosswalks is not desired. As shown in the figure, under existing conditions there are occasional issues regarding curb ramps and for the most part, these issues are due to a lack of detectable warning strips.

The results of the pedestrian facilities review show that within the study area there are significant pedestrian deficiencies that will need to be addressed as redevelopment occurs. The cross-section recommendations made later in this report take this into account, providing sufficient room to meet or exceed DDOT standards.

Table 3: 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

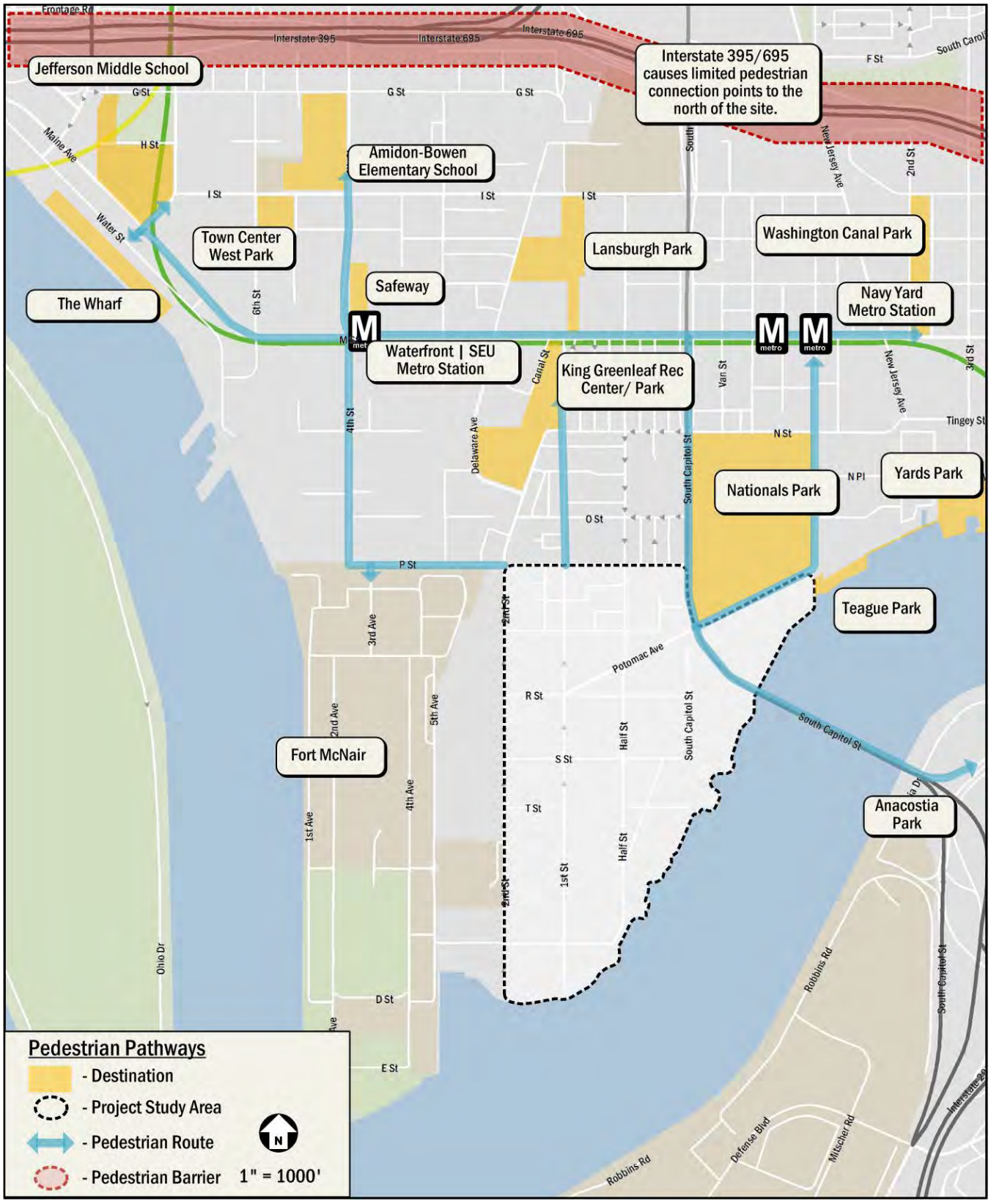


Figure 5: Pedestrian Facilities

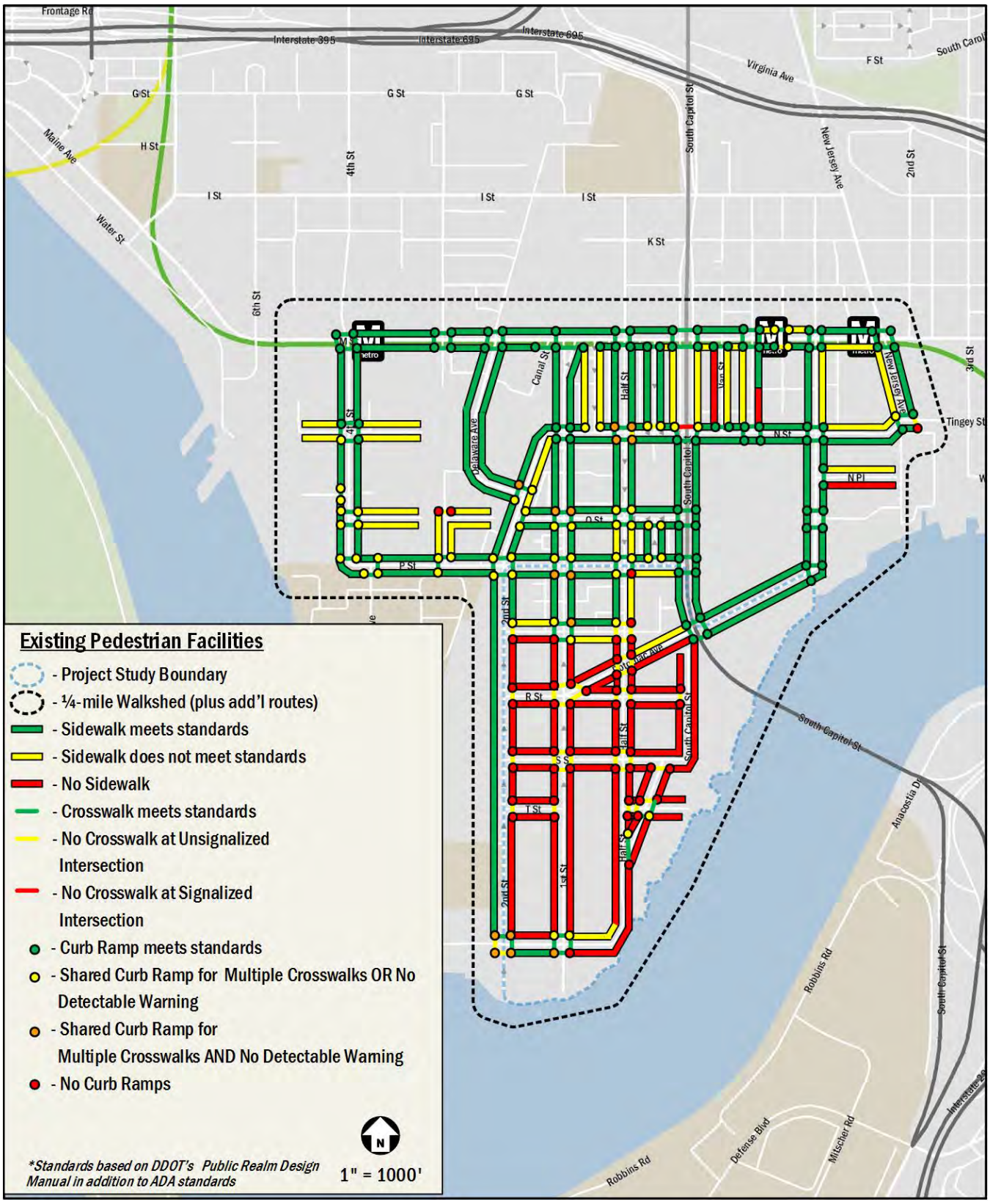


Figure 6: Pedestrian Infrastructure

2035 Future Conditions

The Buzzard Point neighborhood is expected to undergo significant changes over the next 20 years, as outlined in the Buzzard Point Framework Plan. The neighborhood is currently dominated by industrial uses and surface parking lots which offer an opportunity for redevelopment. This analysis gives recommendations for the overall transportation network within this neighborhood as a result of major transportation projects and developments.

Major Transportation Projects and Developments

The projects and developments expected to significantly impact the Buzzard Point neighborhood can be broken down into the following four categories:

- *South Capitol Street Environmental Impact Statement (EIS)*
  The purpose of the South Capitol Street project is to improve safety, mobility, and accessibility and to support economic development in the vicinity of the project. The project will: (1) correct the design and deteriorating condition of the transportation infrastructure which creates safety concerns for vehicular, pedestrian, and bicycle traffic and transit riders; (2) construct missing critical regional roadway connections of vehicles, pedestrian, and bicycles; (3) correct mobility barriers that limit access to activity centers in the study area; and (4) support economic growth in order to improve the density of employment and residential development.

  In the vicinity of Buzzard Point the Preferred Alternative from the Final EIS includes construction of a traffic oval to connect South Capitol Street, Potomac Avenue, R Street, and Q Street. The full EIS can be found at the following link: http://southcapitoleis.com/documents/

- *Buzzard Point Stadium*
  DC United is proposing to relocate their Stadium to the Buzzard Point neighborhood, generally bounded by R Street/Potomac Avenue to the north, T Street to the south, 2nd Street to the west, and 1st Street/Half Street to the east. This project is expected to act as a catalyst for further redevelopment in the Buzzard Point neighborhood.

- *Streetcar Service*
  The District Department of Transportation (DDOT) is conducting a planning study to examine opportunities for a streetcar connection along the North-South corridor between Takoma/Silver Spring area to the Buzzard Point/Southwest area. The study has developed four route alternatives, which use Half Street and/or 2nd Street. Additionally, a streetcar connection between the Anacostia/South Capitol area and the Buzzard Point/Southwest area is proposed as part of the 22-mile Priority Streetcar Network. This line will presumably have the same alignment within Buzzard Point as the North-South corridor line.

- *General Redevelopment*
  Expected redevelopment within the Buzzard Point neighborhood has been projected as stated in the *Buzzard Point Framework Plan*. Trips generated by these developments will help form the basic framework of roadways, lane configurations, traffic operations, and multi-modal needs within the neighborhood. The projected trip generation of the Buzzard Point redevelopment is discussed in the following section.

Buzzard Point Vision Framework Trip Generation

The first step in reviewing the impacts of the potential development outlined in the Framework Plan was to determine the new transportation demand the development would generate. This was accomplished by taking the potential development program provided in the Framework Plan, which was presented in square footage of residential and commercial space, and converting it to variables used in transportation demand models. For residential this variable used is dwelling units, and this analysis used the same assumption the Framework Plan did, which was 1,098 square feet per dwelling unit. For the commercial space, this analysis assumed a 90/10 split between office and retail use. In addition to these variables, the total number of residents and employees was calculated to provide a comparison with prior transportation studies performed by DDOT. The assumptions used to convert residential and commercial variables to residents and employees were based on those contained in the *M Street SE/SW Waterfront Transportation Planning Study*, which were originally provided by the DC Office of Planning. Table 4 provides a summary of the development assumptions by Square and Figure 7 shows a map of the corresponding Square locations within Buzzard Point and their assumed access schemes.

Of note, the existing uses and demand within the study area are not incorporated into this analysis. The Framework Plan assumes each existing building redeveloped as part of its calculations of potential future development on Buzzard Point. As such, this analysis is only based on the potential development presented in Table 4, and not a combination of existing buildings and planned future development.

The development potential contained in the Buzzard Point Framework Plan exceeds what has previously been assumed in prior DDOT studies. The *M Street SE/SW Waterfront Transportation Planning Study*, and studies related to the South

Table 4: Summary of Development Assumptions

Square #	Residential Units	Office Space (SF)	Retail Space (SF)	Residents	Employees
656	270	144,600	16,100	577	547
657	641	343,000	38,100	1,371	1,297
658	319	170,700	19,000	682	646
660	177	94,700	10,500	378	358
661	634	339,300	37,700	1356	1283
662 & 662E	604	323,600	36,000	1,292	1,224
708S	181	85,000	9,400	387	321
664	226	120,900	13,400	483	457
664E	132	82,700	9,200	282	313
610	403	216,000	24,000	862	817
612	210	131,400	14,600	449	497
609 & 611	1,593	972,000	108,000	3,406	3,676
613	291	266,400	29,600	622	1008
666	178	266,500	29,600	381	1,008
667S	64	42,300	4,700	137	160
Total	**5,923**	**3,599,100**	**399,900**	**12,665**	**13,612**

Table 5: Summary of Resident/Employee Estimates

Source of Population Estimates	Residents	Employees
Buzzard Point Framework Potential	12,665	13,612
Assumptions for TAZ 192 from M St SE/SW Study (Year 2035)	380	17,217
Difference	**12,285**	**-3,605**

Capitol Street EIS both used assumptions based on modified versions of the MWCOG Round 8.0 regional model, adjusted based on development plans for Buzzard Point. TAZ 192 in the MWCOG model correlates closely to the study area of this analysis, and as shown on Table 5 the total amount of residents and employment do not line up with the MWCOG-based projections. The main difference is the amount of residential development.

The potential development program was used to develop projections of traffic demand, using standard industry estimates, adjusted for the urban nature of Buzzard Point. The adjustments are in the form of mode split estimates, which reduce the total amount of traffic generated by taking into account the amount of people who will walk, bike or take transit instead of driving. The estimates used in the analysis, based on census data and MWCOG's *State of the Commute* report, are displayed in Table 7:

Table 7: Mode Split Assumptions

Mode	Residential	Retail	Office
Drive	30%	15%	40%
Transit	45%	15%	45%
Bike	5%	10%	5%
Walk	20%	60%	10%

Using the mode split assumptions, the total traffic generated by the future development during the commuter peak hours was calculated. Table 6 shows a summary of the calculations, details are attached to this document.

Table 6: Trip Generation Assumptions

Square	AM Peak Hour			PM Peak Hour		
	In	*Out*	*Total*	*In*	*Out*	*Total*
656	100 veh/hr	46 veh/hr	146 veh/hr	53 veh/hr	102 veh/hr	155 veh/hr
657	19 veh/hr	76 veh/hr	95 veh/hr	72 veh/hr	39 veh/hr	111 veh/hr
658	115 veh/hr	53 veh/hr	168 veh/hr	61 veh/hr	115 veh/hr	176 veh/hr
660	71 veh/hr	31 veh/hr	102 veh/hr	38 veh/hr	77 veh/hr	114 veh/hr
661	201 veh/hr	102 veh/hr	303 veh/hr	113 veh/hr	201 veh/hr	314 veh/hr
662	194 veh/hr	98 veh/hr	291 veh/hr	108 veh/hr	194 veh/hr	302 veh/hr
708S	66 veh/hr	31 veh/hr	96 veh/hr	37 veh/hr	73 veh/hr	110 veh/hr
664	87 veh/hr	39 veh/hr	125 veh/hr	46 veh/hr	90 veh/hr	136 veh/hr
664E	63 veh/hr	25 veh/hr	87 veh/hr	32 veh/hr	69 veh/hr	101 veh/hr
610	139 veh/hr	66 veh/hr	205 veh/hr	75 veh/hr	139 veh/hr	213 veh/hr
612	91 veh/hr	38 veh/hr	129 veh/hr	45 veh/hr	94 veh/hr	138 veh/hr
609 & 611	472 veh/hr	251 veh/hr	723 veh/hr	282 veh/hr	513 veh/hr	795 veh/hr
613	159 veh/hr	57 veh/hr	216 veh/hr	68 veh/hr	152 veh/hr	221 veh/hr
666	156 veh/hr	44 veh/hr	199 veh/hr	56 veh/hr	146 veh/hr	202 veh/hr
667S	36 veh/hr	14 veh/hr	50 veh/hr	20 veh/hr	49 veh/hr	69 veh/hr
Total	**1967 veh/hr**	**969 veh/hr**	**2936 veh/hr**	**1105 veh/hr**	**2051 veh/hr**	**3156 veh/hr**

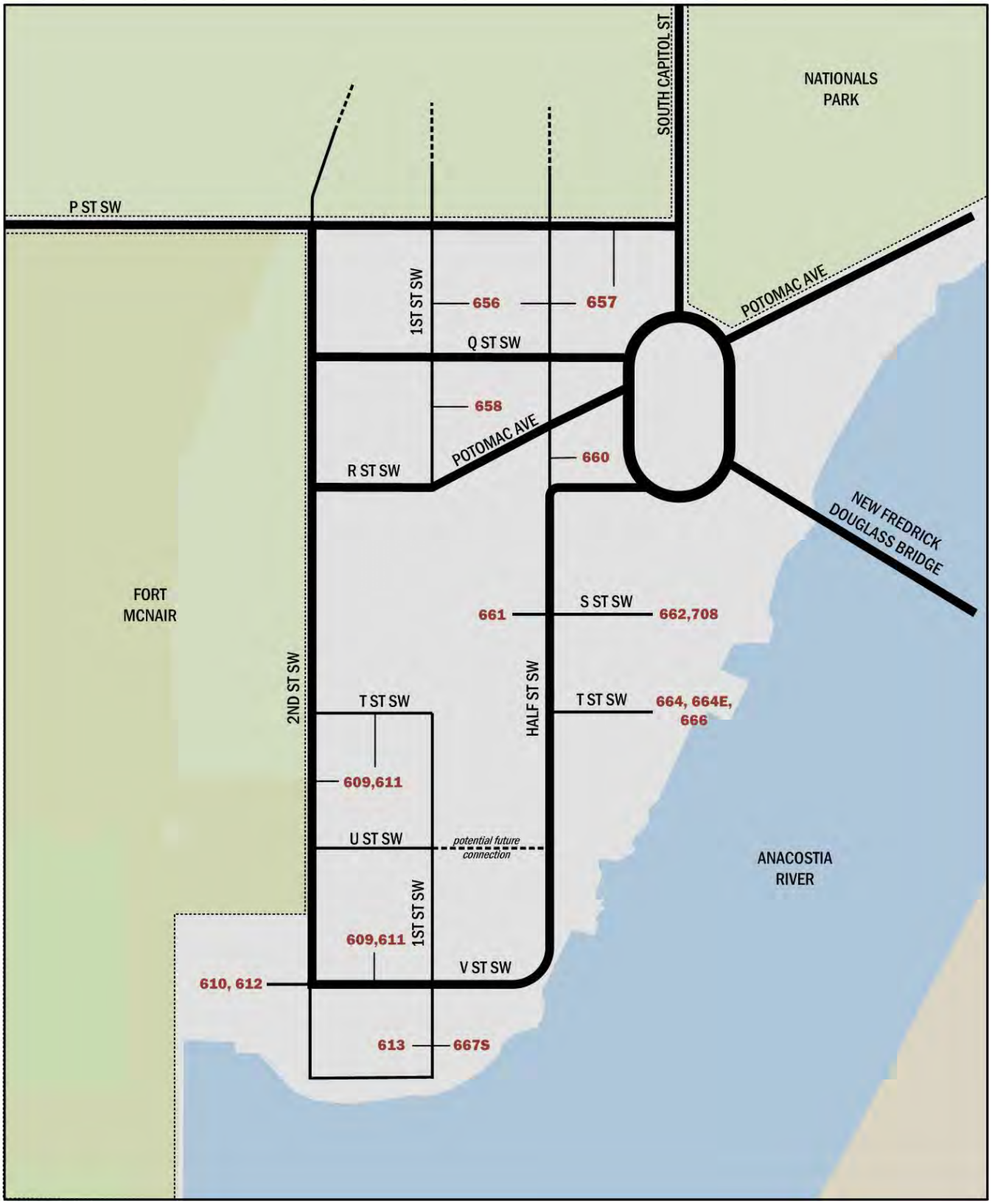


Figure 7: Square Locations and Access Schemes

Roadway Circulation Alternatives

A general roadway circulation plan for Buzzard Point was developed in the *Buzzard Point Framework Plan* based on the footprints of planned developments and their projected access locations. The circulation plan aims to build off the South Capitol Street Corridor improvements while creating a primary loop of two-way streets around Buzzard Point with additional secondary vehicular connections where viable in order to disperse traffic throughout a local streets network. A schematic of this circulation plan, labeled *Option 1: Two-Way Traffic on 2nd and Half Streets*, is shown in Figure 8.

As part of this analysis, Gorove/Slade developed an alternative plan that creates a counter-clockwise one-way loop. The thought behind this plan is that it could reduce the number of conflicting turning movements throughout the neighborhood while maintaining full access to the South Capitol Street oval. This type of plan has the potential for operational and safety benefits, although the one-way loop could increase trip lengths via circuitous routing. This plan, labeled *Option 2: One-Way Traffic on 2nd and Half Streets*, is also shown in Figure 8.

Transportation Operations

This section provides a summary of an analysis of the overall transportation operations in the Buzzard Point neighborhood. This analysis first determines the vehicular capacity needs along the proposed street network, and then based on these results, arranges pedestrian, bicycle, and transit infrastructure within the remaining roadway right-of-way to create a network that best serves the needs of all modes of transportation.

This analysis was based on the PM peak hour of traffic. The PM peak has a higher overall trip generation with a much higher proportion of outbound traffic. Outbound traffic will be more difficult to accommodate due to the configuration of the South Capitol Street oval, therefore the scenario with more outbound traffic provides a better basis for recommendations. Additionally, DDOT provided signal timings for the South Capitol Street oval for the PM peak hour, allowing this study to build upon prior ones.

Traffic Volume Assumptions

Base PM peak hour traffic volumes for 2035 were estimated along P Street and South Capitol Street based on existing traffic counts performed by Gorove/Slade for the transportation elements of the *Buzzard Point Soccer Stadium Environmental Mitigation Study* and the Synchro files from the *M Street Southeast-Southwest Special Events Study Final Report* performed in May of 2014. As stated previously, existing volumes on the local roads within Buzzard Point will not be included in the analysis. Under the Framework Plan, all existing buildings generating significant amounts of traffic are included as redevelopment parcels and thus are accommodated for in the redevelopment trip generation.

Lane Configuration & Operational Assumptions

Signal timings and lane configurations for the South Capitol Street oval were provided by DDOT and were not altered as part of this analysis. These plans were joined with the proposed Buzzard Point circulation plans to create a general roadway network of the neighborhood. For the initial analysis, all intersections outside of the South Capitol Street oval were assumed to be stop-controlled until a signal was warranted by either vehicular or pedestrian volumes. The results of the subsequent analyses and refined lane configurations are discussed later in this report.

Trip Assignment

Trip distribution and assignment for the Buzzard Point neighborhood was based on census data for nearby residential and office land uses, as well as expected travel patterns to and from the neighborhood, keeping in mind turning restrictions surrounding the residential neighborhood to the north. The distribution used for redevelopment sites is shown in Table 8.

Table 8: Trip Distribution Assumptions

Direction of Approach	Percentage
South Capitol Street (to/from the South)	40%
South Capitol Street (to/from the North)	40%
M Street SW (to/from the West)	20%

Of note, trips traveling to and from M Street SW were expected to enter and exit the Buzzard Point neighborhood via 4th Street and P Street SW. Trips traveling to and from the north via South Capitol Street were primarily expected to use the South Capitol Street oval; however, some trips generated by the redevelopment sites, particularly those north of R Street were routed to the intersection of South Capitol Street and O Street and very minimally through the neighborhood to the north. Thus, the South Capitol Street oval will process the cast majority of Buzzard Point traffic in the future, becoming the vehicular 'front door' for the neighborhood.

At this stage in the analysis**, the second circulation plan, Option 2, with a one-way loop configuration was eliminated** for the following reasons:

- Inbound trips to developments within Squares 661, 662, 708, 664, 664E, and 666 would become cumbersome due to forced routing around Buzzard Point instead of more direct access.
- Although a reduction in conflicts occurred at some intersections, the increase in overall traffic along 2nd Street, U Street, and Half Street was deemed too high to outweigh the positive impacts. The higher traffic along these roadways has the potential to decrease the amount of right-of-way designated towards non-auto modes of transportation.
- More stress was observed along P Street as outbound trips to M Street SW were concentrated along Half Street as opposed to being more evenly distributed along Half Street and 2nd Street.

For these reasons, it became clear that the Framework Plan's recommendation of a two-way street network was preferable than a one-way network, and the one-way network was eliminated from further analysis. As such, Figures 9 through 13, which depict volumes, lane configurations, and capacity analysis results are only presented for Option 1. This is because the methodology in this report set lane configurations based on the minimum necessary roadway needs to achieve acceptable capacity results. As the analysis progressed, it was not possible to create feasible lane configurations for Option 2 to achieve acceptable results, for the reasons stated above.

Although Option 1 was selected for analysis, this report notes that the eventual development phasing, site access points, and land uses per parcel all may differ from the assumptions made in this analysis. Thus, minor changes in street directionality (for short distances), may be acceptable even with Option 1, depending on the exact details at the time of redevelopment.

The study area was based on the intersections expected to observe the greatest impact from the Buzzard Point redevelopment are as follows:

1. P Street & 2nd Street, SW
2. P Street & First Street, SW
3. P Street & Half Street, W
4. P Street & South Capitol Street
5. Q Street & 2nd Street, SW
6. Q Street & First Street, SW
7. Q Street & Half Street, SW
8. Q Street & South Capitol Street
9. South Capitol Street at Oval Access
10. R Street & 2nd Street, SW
11. R Street/Potomac Avenue & First Street, SW
12. Potomac Avenue & Half Street, SW
13. Potomac Avenue & South Capitol Street SB
14. R Street & Half Street, SW
15. R Street & South Capitol Street SB
16. S Street & Half Street, SW
17. T Street & 2nd Street, SW
18. T Street & Half Street, SW
19. U Street & 2nd Street, SW
20. U Street & Half Street, SW
21. V Street & 2nd Street, SW
22. V Street & First Street, SW

PM peak hour volumes for the first circulation plan, based on the above trip distribution and assignment are shown in Figure 9 and Figure 10 for the study area.

Analysis Methodology & Capacity Analysis Results

Based on the projected 2035 volumes and the *Highway Capacity* Manual (HCM) analysis methodology, intersection lane configurations and traffic operations were determined for the study area such that all intersections operate at an acceptable LOS. The exception to this is some intersections directly along the South Capitol Street oval. Lane configurations and traffic operations at these intersections were not altered from those shown in the Synchro files provided by DDOT.

The subsequent lane configurations and traffic control at the study area intersections are shown in Figure 11 and Figure 12. The resulting LOS results are shown in Figure 13 and Figure 14. Based on the proposed lane configurations within Buzzard Point to accommodate vehicular traffic, multi-modal elements of the streetscape were then determined. The multi-modal elements were added within the remaining roadway right-of-way width to best satisfy the current and future needs of the site. The findings and recommendations for the roadway layout and configuration within the Buzzard Point neighborhood is discussed below.

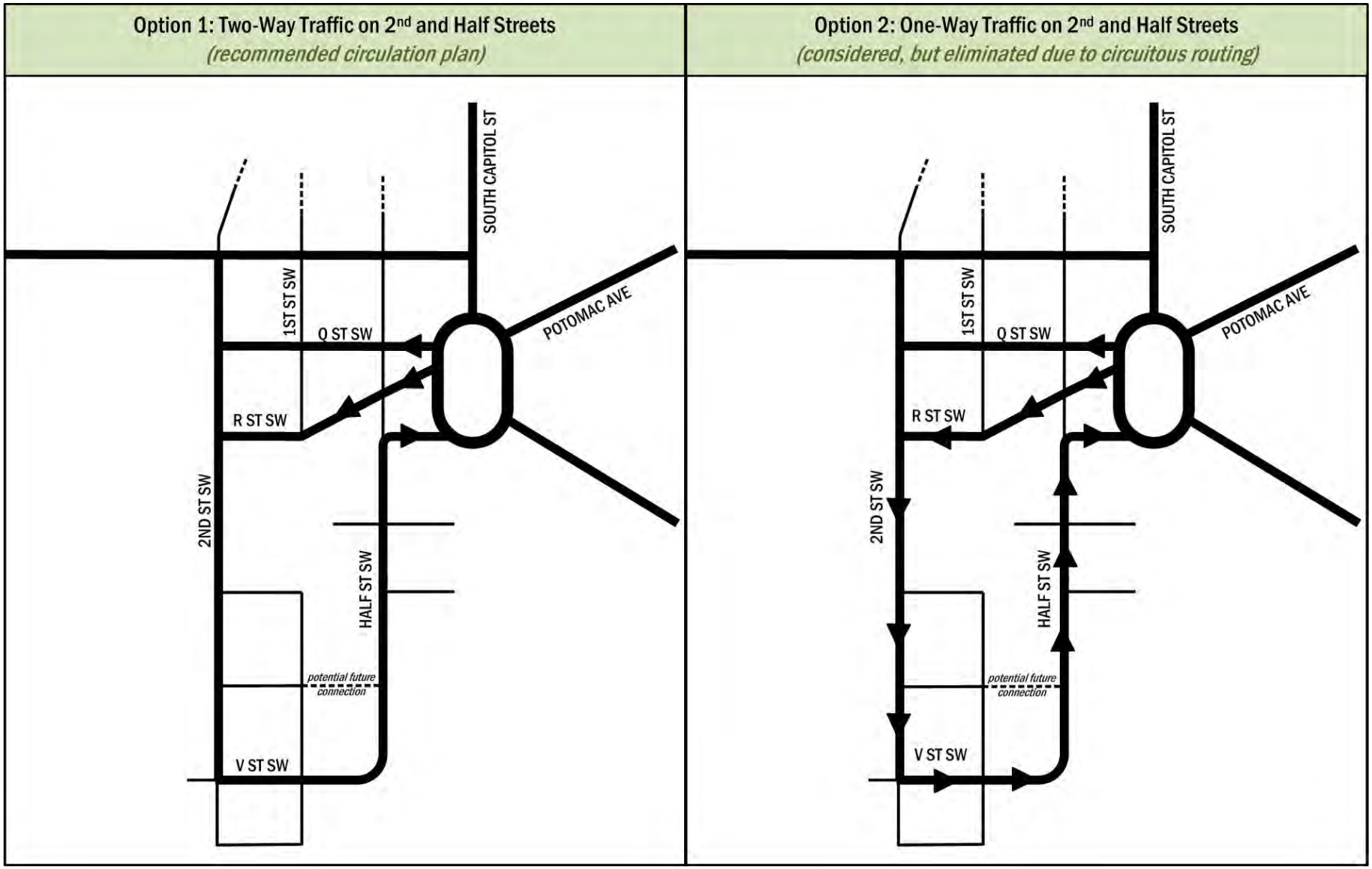


Figure 8: Circulation Plan Alternatives

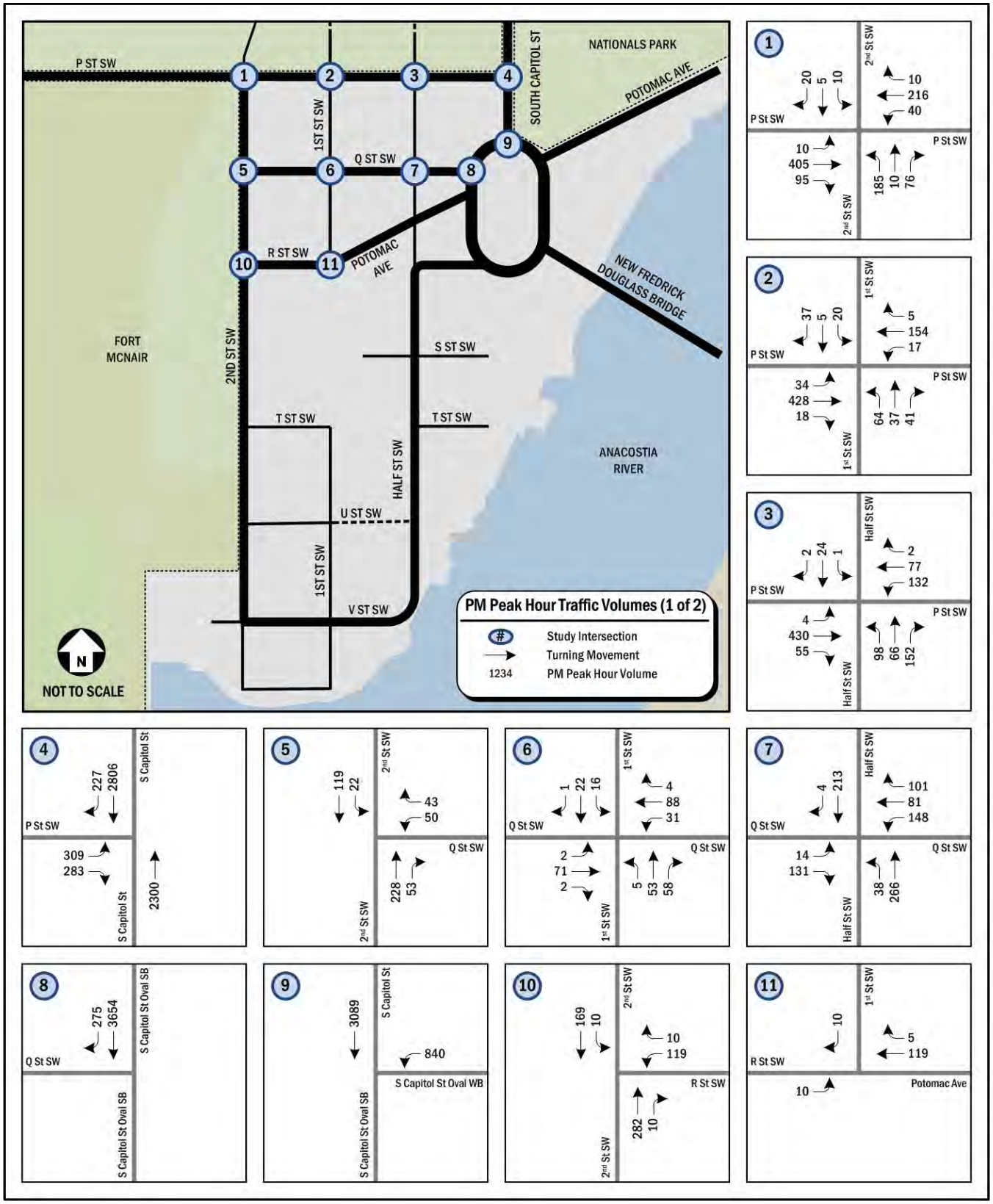


Figure 9: PM Peak Hour Traffic Volumes (1 of 2)

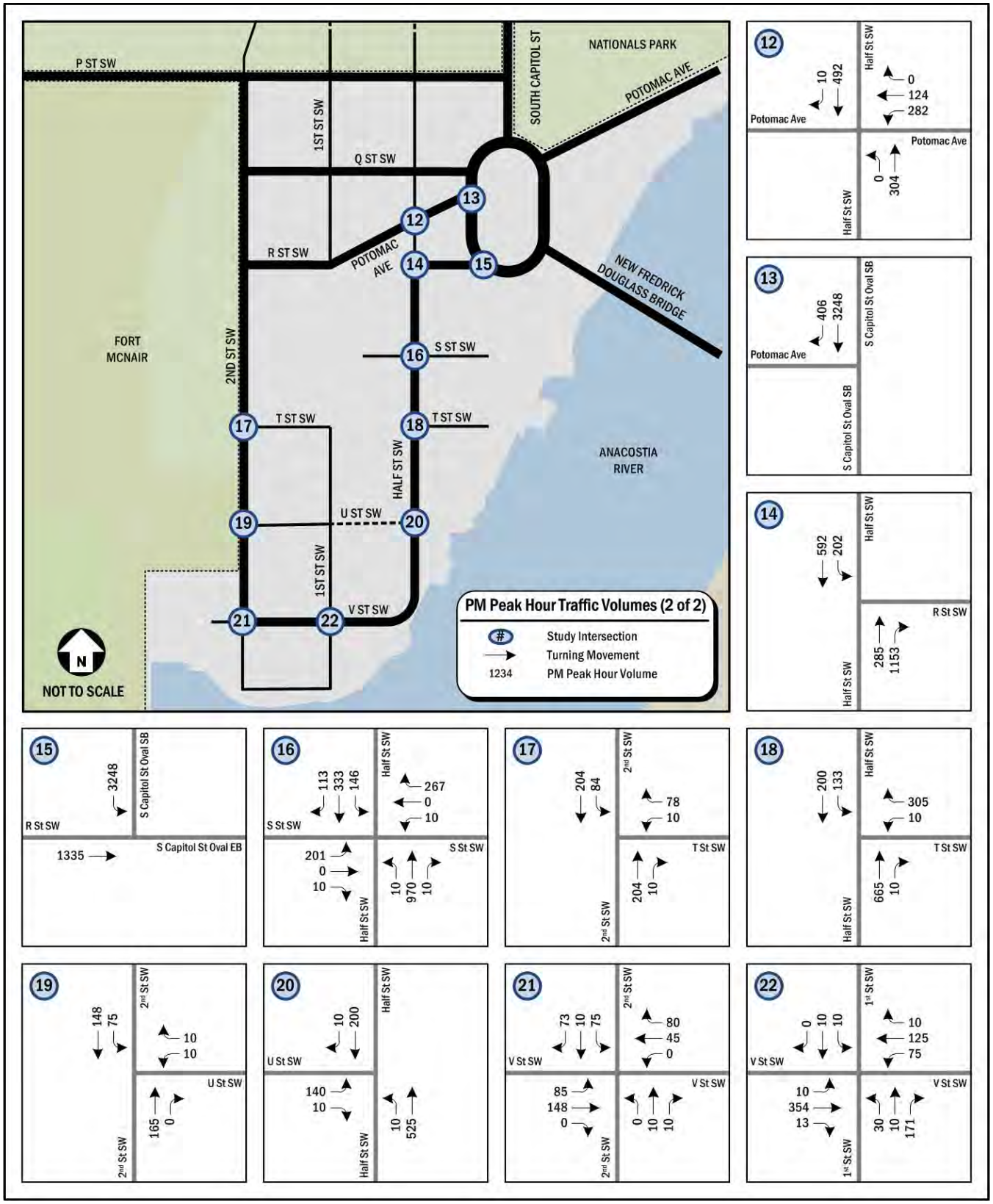


Figure 10: PM Peak Hour Traffic Volumes (2 of 2)

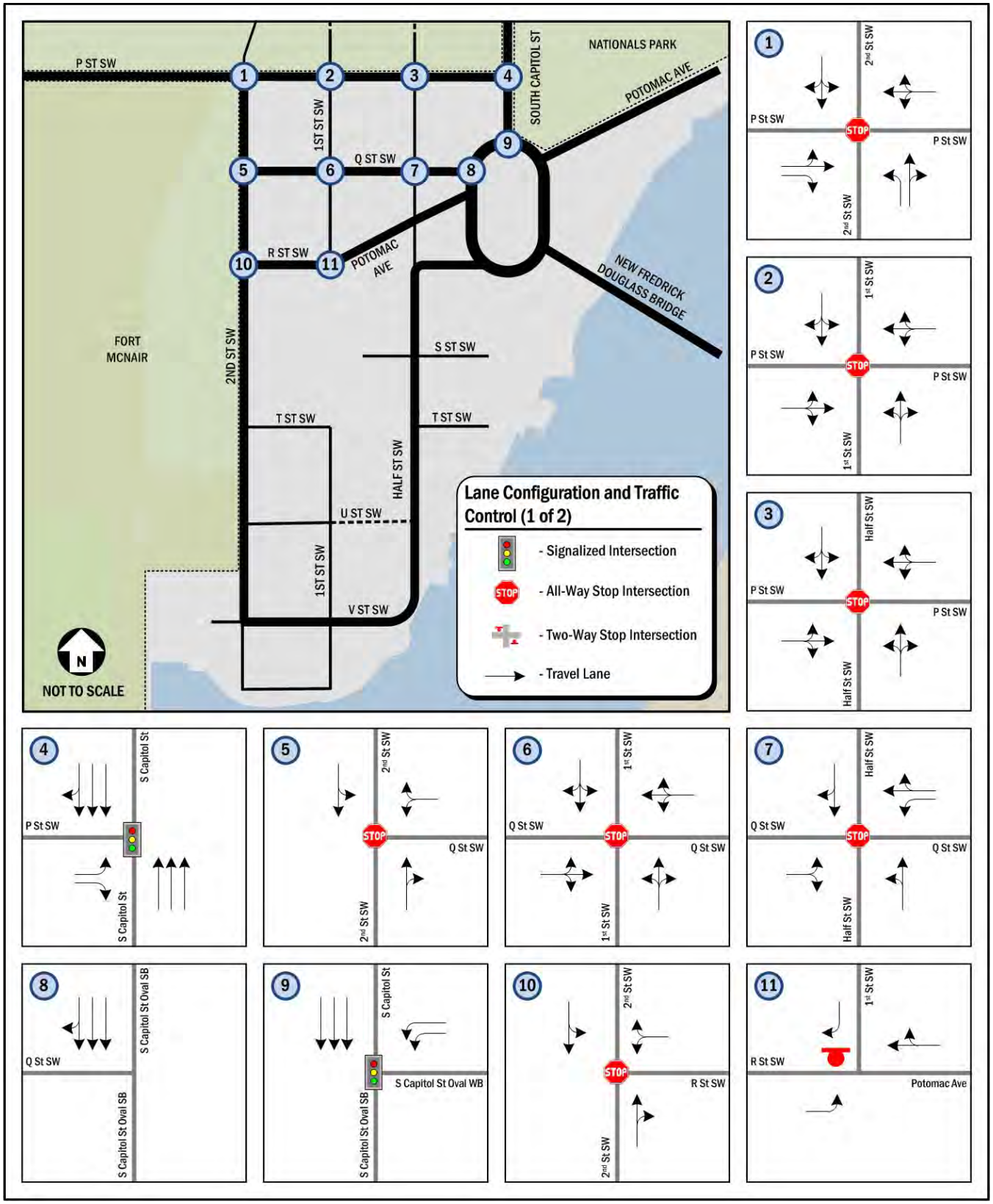


Figure 11: Lane Configuration and Traffic Control (1 of 2)

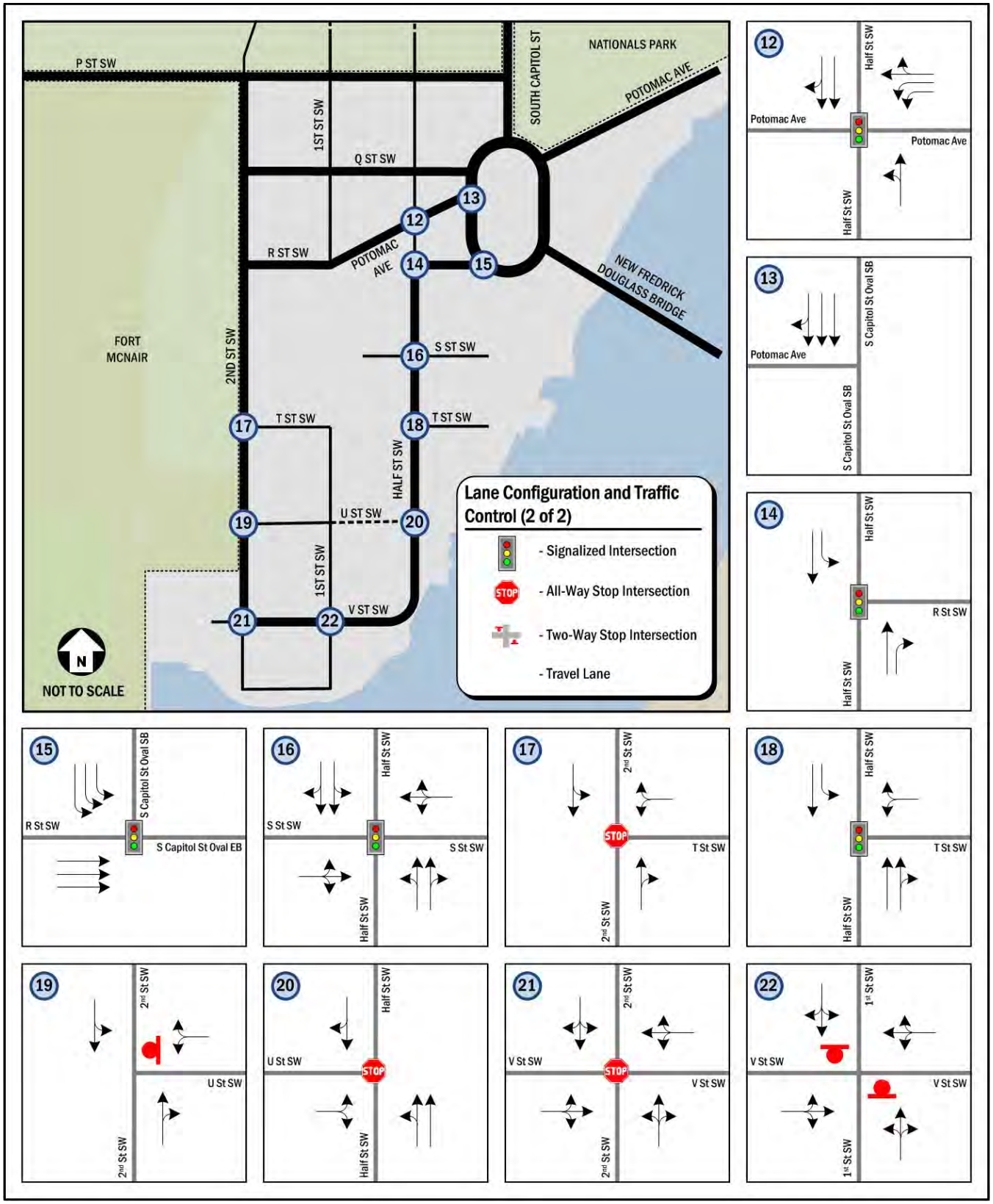


Figure 12: Lane Configuration and Traffic Control (2 of 2)

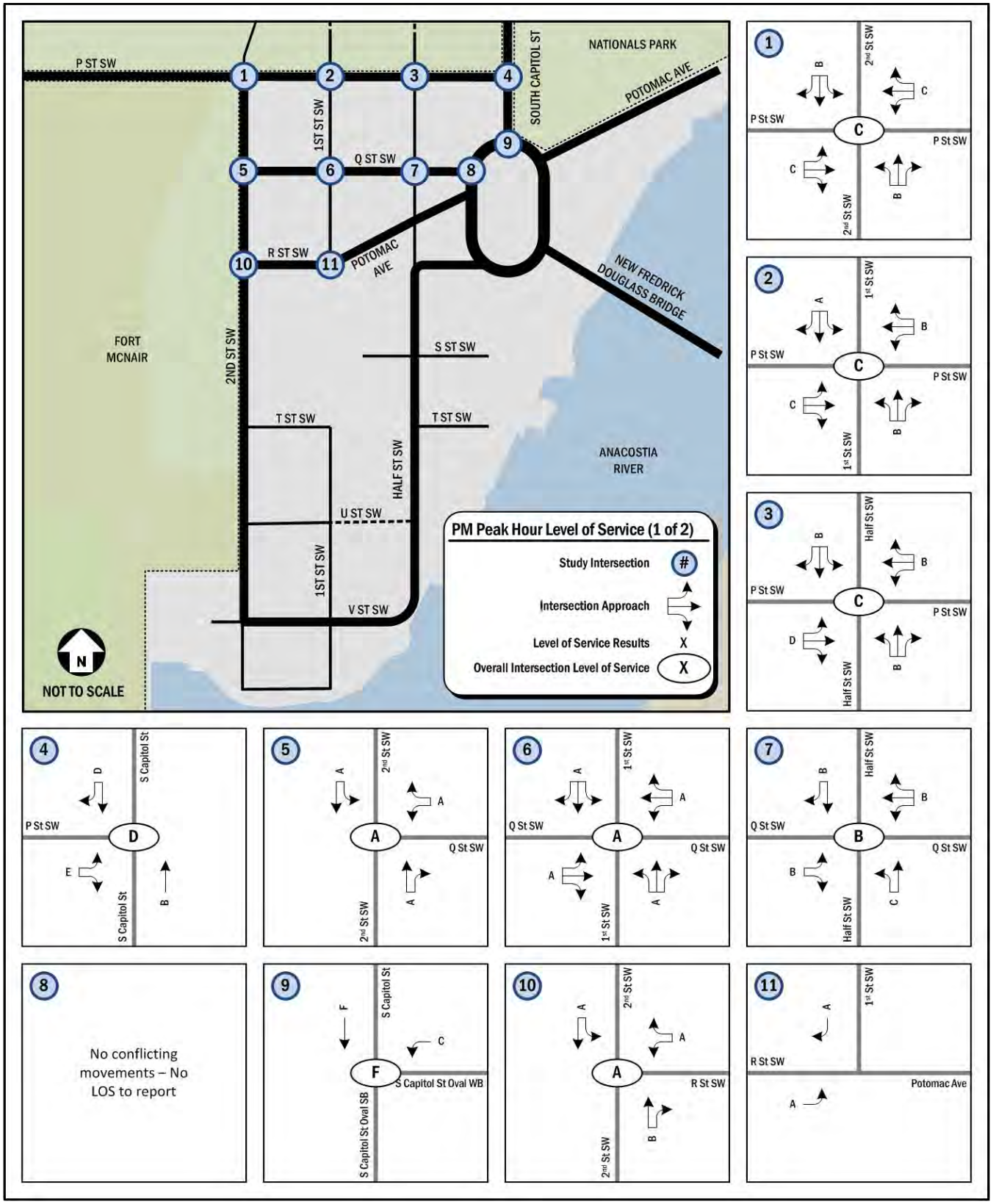


Figure 13: PM Peak Hour Level of Service (1 of 2)

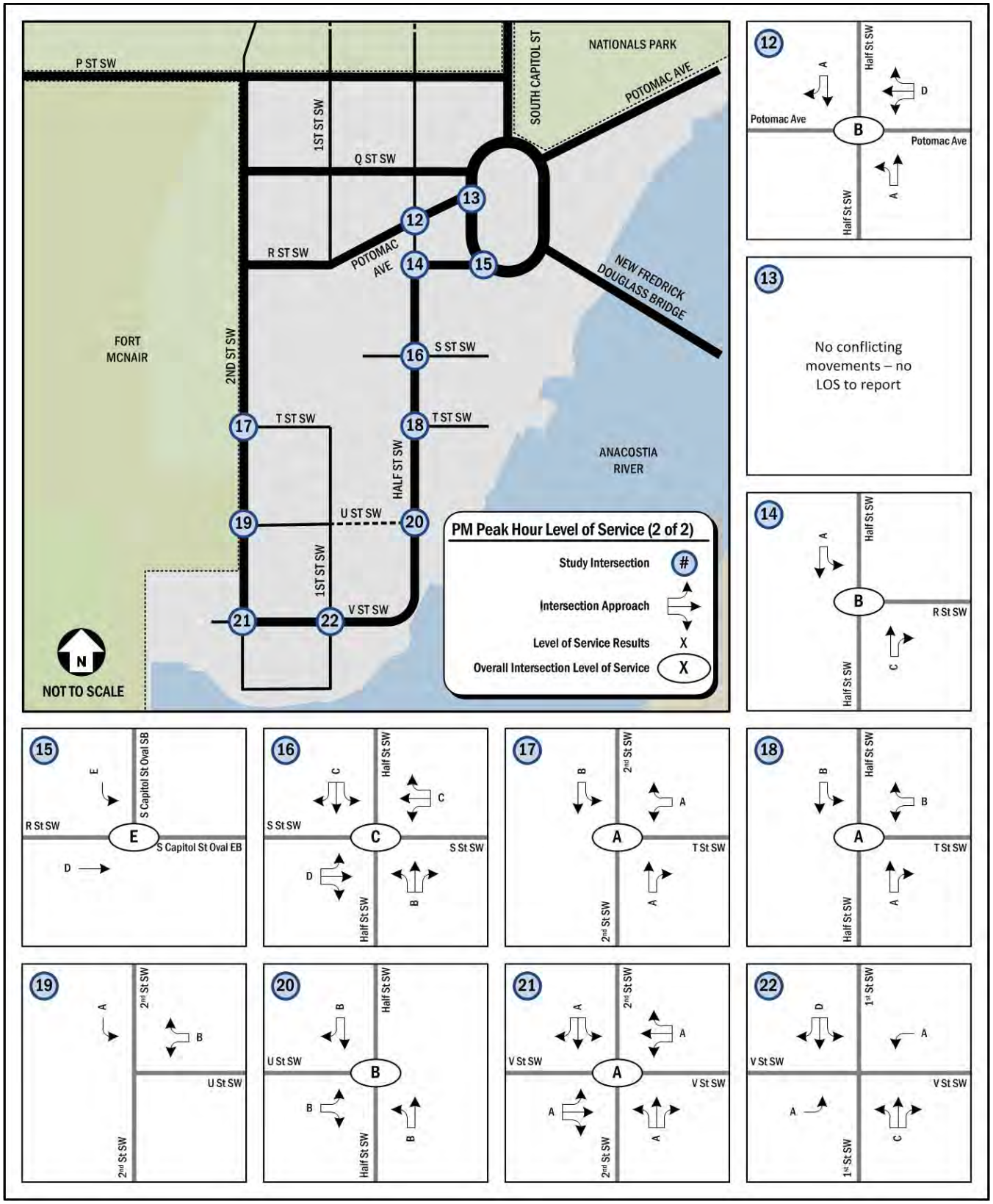


Figure 14: PM Peak Hour Level of Service (2 of 2)

FINDINGS AND RECOMMENDATIONS

The following summarizes the overall transportation findings and recommendations for the Buzzard Point neighborhood. These recommendations are meant to first satisfy the vehicular needs of the site, while allocating remaining roadway right-of-way to multi-modal transportation infrastructure. These recommendations take into account potential streetcar plans and how they would impact vehicular, bicycle, and pedestrian operations; the location of bicycle infrastructure in relation to vehicular traffic and overall connectivity; enhanced pedestrian infrastructure along primary pedestrian routes; and the overall functionality of a cohesive multi-modal transportation system. The focus of this analysis is on curb-to-curb needs, with the specifics on how pedestrian infrastructure will be laid out to be determined when the needs of each site are refined. The findings and recommendations are also represented graphically on Figure 15 and Figure 16.

The following recommendations are intended to be flexible. The eventual development phasing, site access points, and land uses per parcel all may differ from the assumptions made in this analysis. Thus, minor changes that fit within the following recommendations may be needed, such as street directionality (for short distances), traffic signal locations, locations of turn lanes, and other details.

As such, this report recommends that developers of the Buzzard Point parcels coordinate with DDOT at an early stage in the approvals process to ensure that developments are consistent with the Urban Design Framework. Deviations from the Framework Plan, especially regarding site access, may alter the findings of this analysis.

ROADWAY CONFIGURATION AND TRAFFIC CONTROL

- The roadway layout and circulation plan laid out in the *Buzzard Point Framework Plan* generally works well. No changes to directionality are proposed and only minor changes to traffic control are recommended.
- Roadway cross-section recommendations are intended to be flexible and can be broken up into three "roadway types" as follows (and shown on Figure 15):
    - Type A (Half & V Streets): These are 80' (ROW streets with a recommended 40' curb-to-curb width. The usage of the 40' will change depending on the block with the two inside lanes always being one travel lane in each direction, but the outside lanes being either: (1) peak hour restricted parking, (2) permanent on-street parking, or (3) turn lanes. The remaining ROW, 20' on each side, could be allocated for sidewalk, planting strips/tree boxes, café seating or bike lanes.
    - Type B (2nd Street): This is a 90' ROW street, but it appears Fort McNair has built into the ROW by around 10', making it an 80' street for practical purposes. This road only needs one travel lane in each direction to accommodate future development demand. This analysis recommends:
        - If streetcar tracks use Half Street in both-directions: A 44' curb-to-curb width, with two travel lanes and two dedicated streetcar lanes. On the Fort side, it is recommended that 12' be set aside for a cycle track (10' plus 2' buffer), and a small (6') sidewalk. That leaves 18' on the Stadium side for sidewalk/planting.
        - If streetcar tracks are not located on Half Street, or only in one direction: A 38' cross-section should be used to accommodate travel lanes and on-street parking on both sides. In this configuration, streetcars would operate in mixed-travel. On the Fort side, it is recommended that 18' be set aside for a cycle track (10' plus 2' buffer), and a small (6') sidewalk. That leaves 24' on the Stadium side for sidewalk/planting.
    - Type C (all remaining streets): These need just one travel lane in each direction (no turn lanes necessary). The rest of the ROW can be distributed based on the specific needs of the surrounding sites with parking lanes, sidewalks, etc. (with the exception of the bike lane recommendations for Q and V as discussed below). Until specific development plans are known, it may be beneficial to provide on-street parking along these roadways that can be used as additional travel/turn lanes as needed. For example, a curb-to-curb with of 40' can be used for one lane in each direction at 11' wide each, plus an 8' parking lane on each side. Thus, if

future plans differ from those analyzed in this study, or access points change in a manner that more travel lanes are required, the 40' curb to curb width, could provide either two travel lanes at 12' each and two parking lanes at 8' each, or four travel lanes at 10' each.

An 80' to 90' total ROW for these streets is recommended, which would accommodate 20' to 25' on each side of the road for sidewalk, planting strips/tree boxes, café seating or bike lanes. An exception to this is Potomac Avenue, which has a current ROW of 160'. This report recommends maintaining that ROW, even under a 40' curb to curb condition.

- Four new traffic signals are projected based on this analysis. Two locations, Half Street's intersections with Q Street and Potomac Avenue were included as signals in the South Capitol Street EIS. The need for two additional ones, at Half Street's intersections with S and T Streets, depends on the exact location and driveways, access routes, and the development program. There will also likely be a signal on the 2nd Street side if the streetcar is present and needs a switch to turn-around, and to process pedestrian crossings from a stop. Other traffic signals not shown on the plan may be necessary to accommodate pedestrian and bicycle flows and connectivity depending on the final layout of those facilities and desire lines.

- The traffic analysis shows that P Street's approach to South Capitol Street may need to expand to two lanes, one each dedicated to right and left turns. This can be done when the adjacent Square is redeveloped. At the time the curb line can be moved a few feet to the south.

- This analysis did not propose any changes to the proposed South Capitol Street oval design, or the configuration of Potomac Avenue.

Bicycle Facilities

This analysis recommends some modifications to the bicycle network from that proposed in the Buzzard Point Framework Plan, as summarized in Figure 16.

- As mentioned above, a two-way off-street cycle track is recommended along 2nd Street adjacent to the Fort for the following reasons:
  - There will be no vehicles turning over the cycle track because there are limited access points to the Fort along 2nd Street.
  - It places cyclists off the potential streetcar routes, avoiding potential bicycle/track conflicts and operational issues.

- Bike lanes along V Street are recommended since this roadway will act as a connection between the cycle track and the Riverwalk Trail. A connection straight across U Street is also desirable, but that roadway will not be constructed until the adjacent PEPCO building is discontinued and redeveloped.

- Bike lanes on Q Street are recommended to help provide a more direct connection from the new bridge to 2nd Street. The accommodations around the Oval are not ideal for cycling, so there will be a strong desire to cut-through Buzzard Point instead of biking on the sidewalk up to P Street and then heading west. Note that this includes a contra-flow bike lane on the block of Q St adjacent to the Oval.

- A similar recommendation is made for Potomac Avenue and R Streets between the 2nd Street and the traffic oval. The wide ROW of Potomac Avenue can be used to create a high quality two-way facility, providing direct connectivity from the traffic oval towards the Buzzard Point stadium.

- Bike lanes along Half Street should be considered as an additional connection if streetcar tracks are not located on Half Street.

Transit Accommodations

Significant upgrades to transit facilities in Buzzard Point will be necessary with full build out of the plan. The amount of development potential in the Framework Plan presented in Table 4 represents a significant amount of transit demand. Based on the mode split assumptions contained in Table 7, ridership demand at peak hours would be approximately 4,500 persons per hour.

The existing facilities, shown on Figure 2, are not sufficient to serve this demand. Although many parcels within Buzzard Point are within a comfortable walk of Metrorail stations, many parcels are not, and additional surface transit will be needed. This can come in the form of extensions of existing WMATA or DC Circulator routes, new bus routes, or the planned streetcar lines that serve Buzzard Point.

This report recommends a flexible transit plan that adds supply as demand rises. The exact transit needs will not be known until each individual parcel redevelops, adding more demand to the network. The transit plans should include an ongoing evaluation of service and capacity, as these needs will change over time.

Pedestrian Facilities

The pedestrian facilities in Buzzard Point will evolve over time, as each parcel redevelops, eventually improving the deficiencies noted in Figure 6. Notably the South Capitol Street EIS and Buzzard Point stadium projects will improve many pedestrian connections and sidewalks in the study area.

As parcels are redeveloped the pedestrian infrastructure should be reviewed to ensure that all pedestrian desire lines are accommodated. Depending on the order to redevelopment, this may require temporary facilities be installed over parcels yet to be redeveloped.

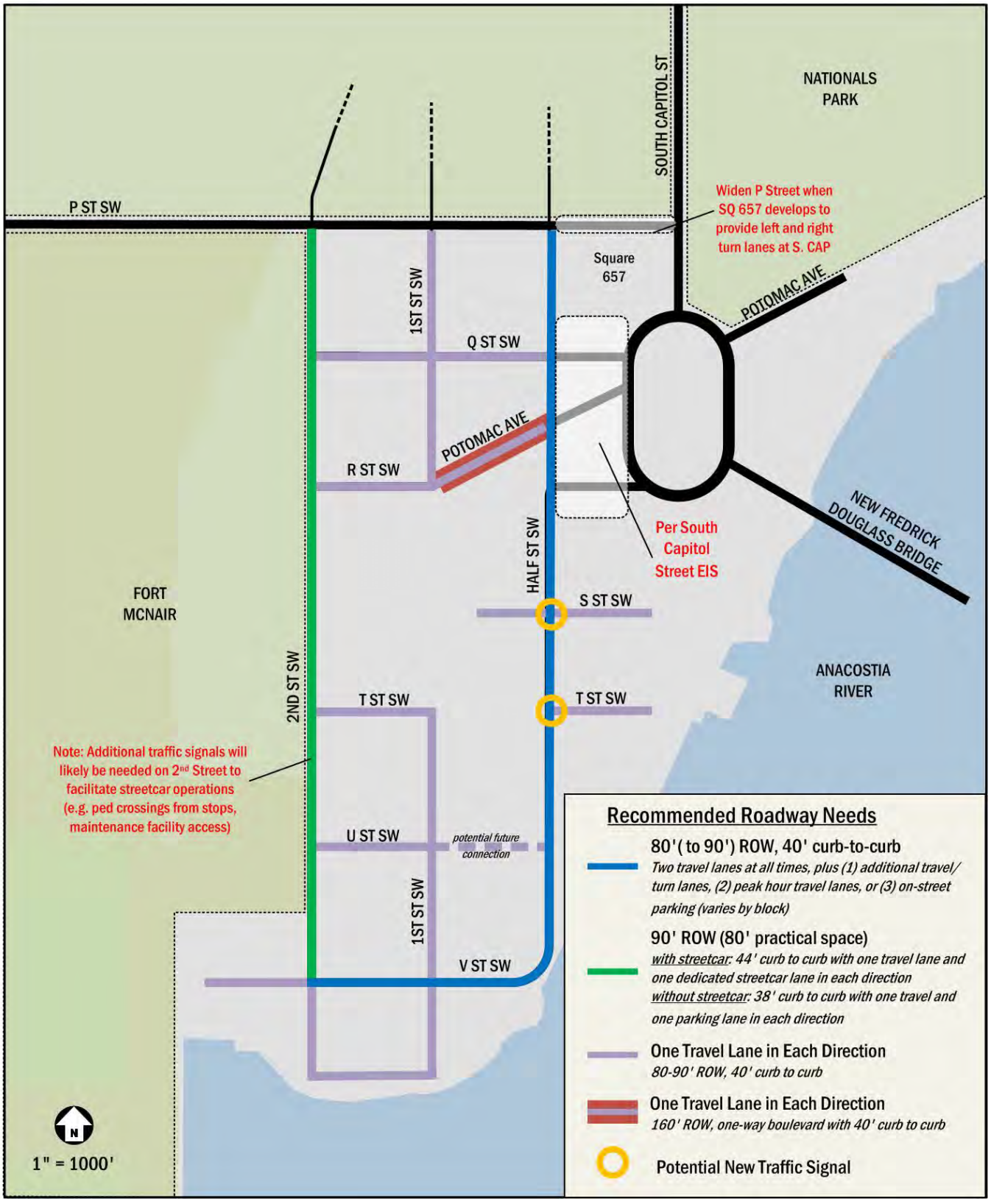


Figure 15: Recommended Roadway Needs

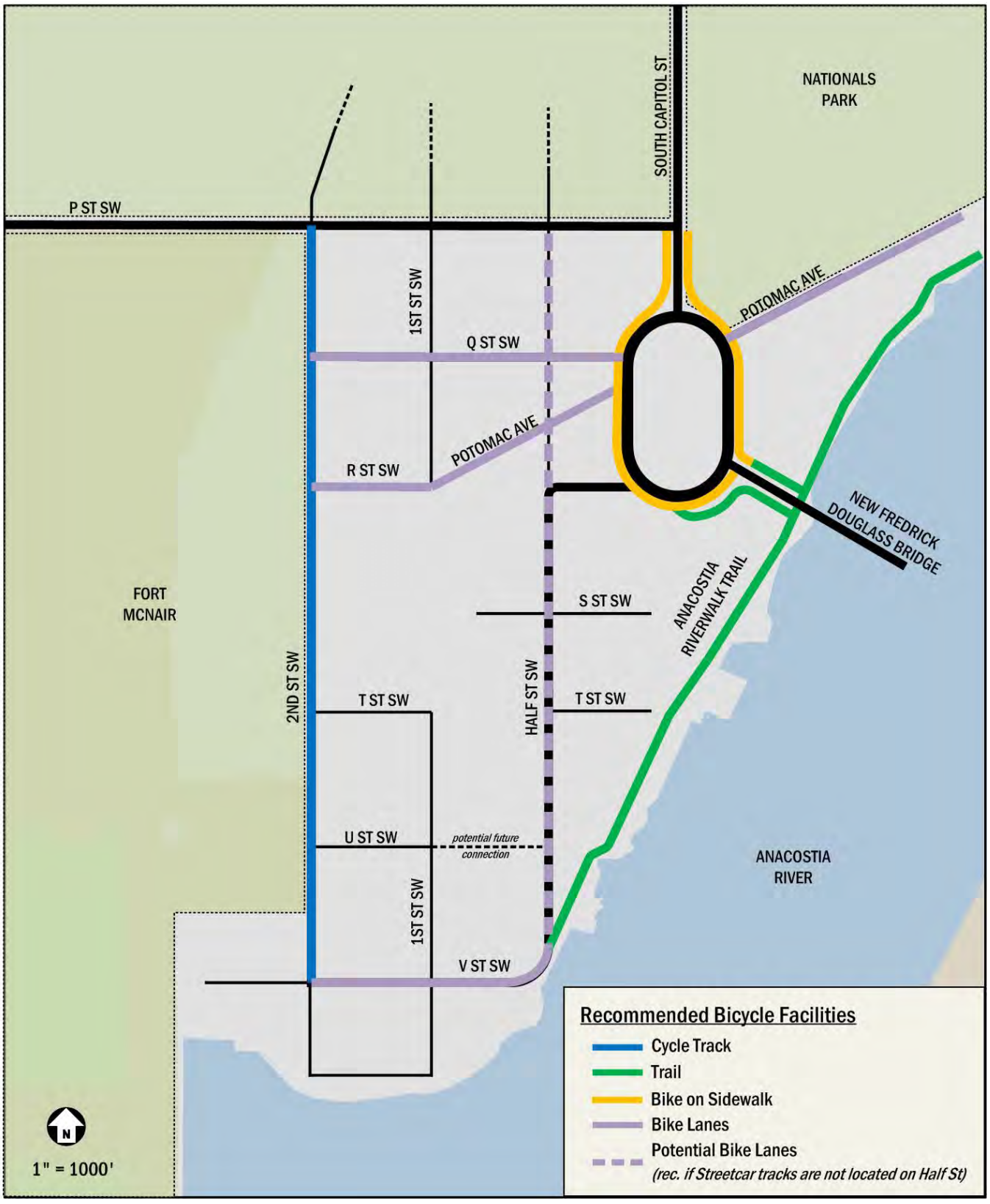


Figure 16: Recommended Bicycle Facilities