

# C STREET NE MULTIMODAL CORRIDOR STUDY

## FINAL REPORT



# C STREET NE MULTIMODAL CORRIDOR STUDY

JANUARY 2016

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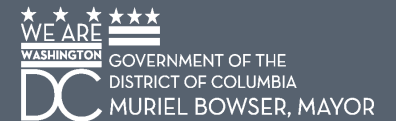
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# EXECUTIVE SUMMARY

## SECTION 1

## EXECUTIVE SUMMARY

Historically, C Street NE has functioned as the gateway to Capitol Hill for heavy commuter traffic, but it also functions as a neighborhood street with large numbers of students from schools and local recreation centers crossing the street daily, residents walking along its shaded sidewalks, and families accessing the adjacent Anacostia Riverwalk Trail. In recent years, the reconstruction of the 11th Street Bridge and Benning Road NE have reduced travel demand on C Street NE, opening up the opportunity to reallocate street space. Many residents and users of the corridor seek a street that more adequately accommodates all users while improving safety and livability for the neighborhood. The purpose of the C Street NE Multimodal Corridor Study is to improve safety and comfort for all right-of-way users while ensuring improved neighborhood connectivity and mobility for all modes within and through the study area.

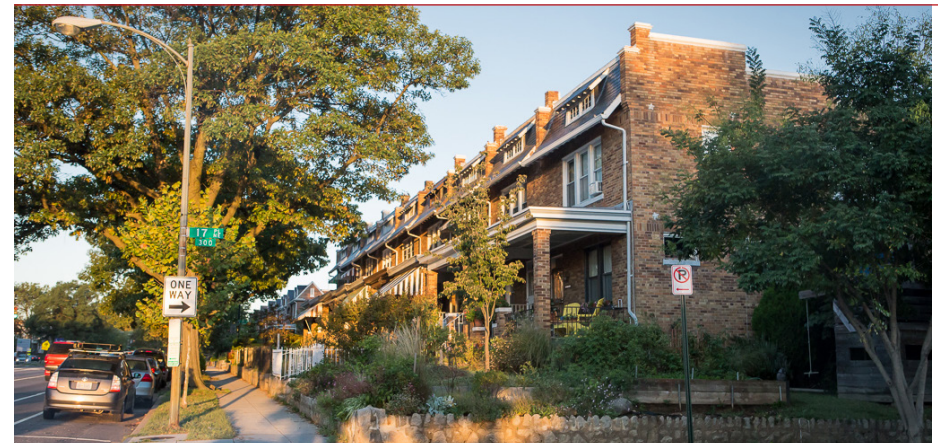
The limits of the study area extend along C Street NE and North Carolina Avenue NE from 16th Street NE to 21st Street NE/Oklahoma Avenue NE. The District Department of Transportation, in close consultation with the community and key stakeholders, developed project needs to evaluate the safety, comfort, connectivity, and mobility of the C Street NE corridor (and its surrounding streets), including the following key factors:

- High automobile speeds;
- Uncomfortable and unsafe pedestrian crossing conditions;
- A significant decrease of auto traffic due to the completion of the Benning Road streetscape project and the 11th Street Bridge, ultimately leading to underutilized roadway space;
- Maintaining automobile access, particularly for regional corridor trips and trucks;
- Lack of protected bicycle facilities within the study area;
- Lack of non-auto access to Anacostia Park;
- History of high severity crash rates; and,
- Resident requests for improved multimodal conditions.

These identified project needs informed the specific data to collect, required analysis to perform, and appropriate stakeholders to include in the process. As a result of the supporting analysis and community feedback, three alternatives were developed for further study and evaluation. The specifics of each alternative are summarized in the following table. At a minimum, all recommendations include the conversion of one or more travel lanes along C Street NE to additional green space and protected bicycle facilities. A comparison of each alternative, including the Recommended Alternative C, is detailed in **Table 1**.



*Posted speed limits on the study corridor. Measured speeds are well above both posted speeds.*



*While C Street NE is designed to accommodate heavy commuter traffic, the area is predominantly residential.*

**TABLE 1. CONCEPT DESIGN DETAILS MATRIX**

FEATURE	EXISTING	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C (RECOMMENDED)
<b>Number of travel lanes</b>	2 eastbound travel lanes	1 eastbound travel lane	1 eastbound travel lane	1 eastbound travel lane
	3 westbound travel lanes	3 westbound travel lanes	3 westbound travel lanes during AM peak period and 2 westbound travel lanes with on-street parking during all other times	2 westbound travel lanes
<b>On-street parking</b>	On-street parking in both directions	Maintain on-street parking in both directions	Maintain eastbound on-street parking	Maintain on-street parking in both directions
			Allow parking in westbound travel lane except during AM peak period	
<b>Left turn lanes</b>	Eastbound left-turn lane at 21st St NE	Westbound left-turn lane at 17th St NE	Westbound left-turn lane at 17th St NE	Westbound left-turn lane at 17th St NE
		Eastbound left-turn lane at 19th St NE	Eastbound left-turn lane at 19th St NE	Eastbound left-turn lane at 19th St NE
		Eastbound left-turn lane at 21st St NE	Eastbound left-turn lane at 21st St NE	Remove existing eastbound left-turn lane at 21st St NE/Oklahoma Ave NE
<b>Pedestrian facilities</b>	5-6 foot sidewalks on both sides of streets	Maintain existing sidewalks and add curb extensions	Maintain existing sidewalks and add curb extensions	Maintain existing sidewalks and add curb extensions
	Crossing distances of approximately 90 feet	Crossing distances of approximately 54 feet	Crossing distances of approximately 54 feet	Crossing distances of approximately 43 feet
	Some recent ADA upgrades and pedestrian refuges were made in 2014	Add raised crosswalks on side streets at 16th St NE, 17th St NE, 18th St NE, 20th St NE, and 21st St NE/Oklahoma Ave NE	Add raised crosswalks on side streets at 16th St NE, 17th St NE, 18th St NE, 20th St NE, and 21st St NE/Oklahoma Ave NE	Add raised crosswalks on side streets at 16th St NE, 17th St NE, 18th St NE, 20th St NE, and 21st St NE/Oklahoma Ave NE
<b>Bicycle facilities</b>	Standard 5-foot bike lanes in both directions	Protected 7-foot bike lanes in both directions	Protected 7-foot bike lanes in both directions	Protected 7-foot bike lanes in both directions
<b>Transit facilities</b>	Standard bus stops with signage, but no shelters or benches	Consolidate westbound bus stops at 18th St NE/18th St NE	Consolidate westbound bus stops at 18th St NE/18th St NE	Consolidate westbound bus stops at 18th St NE/18th St NE
		Move eastbound bus stop at 19th St NE from nearside to farside and consolidate with existing bus stop at 21st St NE	Move eastbound bus stop at 19th St NE from nearside to farside and consolidate with existing bus stop at 21st St NE	Move eastbound bus stop at 19th St NE from nearside to farside and consolidate with existing bus stop at 21st St NE
<b>Green Space</b>	5-foot swales with trees	Increase permeable space by 23% through bio-retention, rain gardens, and tree swales.	Increase permeable space by 27% through bio-retention, rain gardens, and tree swales.	Increase permeable space by 31% through bio-retention, rain gardens, and tree swales.





# BACKGROUND AND EXISTING CONDITIONS

## SECTION 2

## BACKGROUND AND EXISTING CONDITIONS

### STUDY HISTORY AND BACKGROUND

The limits of the C Street NE Multimodal Corridor Study extend along C Street NE and North Carolina Avenue NE from 16th Street NE to 21st Street NE/Oklahoma Avenue NE. These study limits, identified in **Figure 1**, make up a short portion of C Street NE that functions differently than the rest of C Street NE (and adjacent streets) due to its roadway functional classification and the number of travel lanes. C Street NE is a minor arterial in the District's Functional Classification system (see **Figure 2**), but historically, the C Street NE Corridor has functioned as a neighborhood street as well as a major westbound route toward the Capitol and Downtown. Eliot-Hine Middle School, Eliot Recreation Center, and Eastern Senior High School are located in the C Street NE study area, which results in large numbers of children crossing the corridor at various times of day. The recent reconstruction of the 11th Street Bridge has created an interchange that establishes a link between I-295 to Capitol Hill, thus

reducing travel demand on C Street NE and opening up the opportunity to reallocate street space to improve comfort and livability for the neighborhood and provide more viable options for multimodal travel.

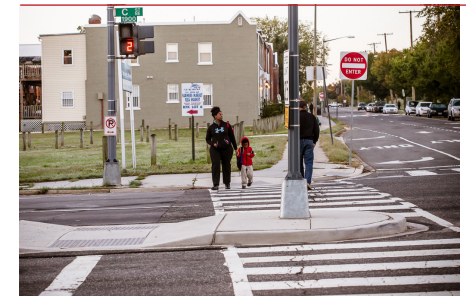
The C Street NE corridor has been evaluated through two previous planning studies: the Capitol Hill Transportation Study in 2006 and the C Street NE Traffic Calming Study in 2010. Likewise, numerous other studies and construction projects have occurred since the early 2000s. The Capitol Hill Transportation Study was a year-long effort to document a full range of transportation characteristics, identify issues and problems, and propose short-, medium-, and long-term improvements for the Capitol Hill area of the District of Columbia. C Street NE was identified as one of 13 priority locations as it included high auto speeds and high traffic volumes. Preliminary recommendations included a bike lane (which had already been proposed in the 2005 Bike Master Plan) as well as traffic calming to address pedestrian safety concerns. Some of the recommendations from the study have already been implemented, including bike lanes on C Street NE, the two-way conversion of Constitution Avenue NE, and recent upgrades to ramps, sidewalks, and median pedestrian refuges throughout the study area.

The C Street NE Traffic Calming Study, a similar effort to this ongoing Multimodal Corridor Study, developed three concepts for C Street NE in close consultation with the community and relevant stakeholders. This previous study was completed at a time when

several major construction projects were taking place in the District, specifically Benning Road and the 11th Street Bridge. These projects likely impacted how residents and commuters were using C Street NE at the time, particularly compared to how it is used today. Traffic volumes have decreased substantially on C Street NE since these construction projects were completed, and therefore it was necessary to revisit the previous concepts to better understand how they may operate in future conditions.

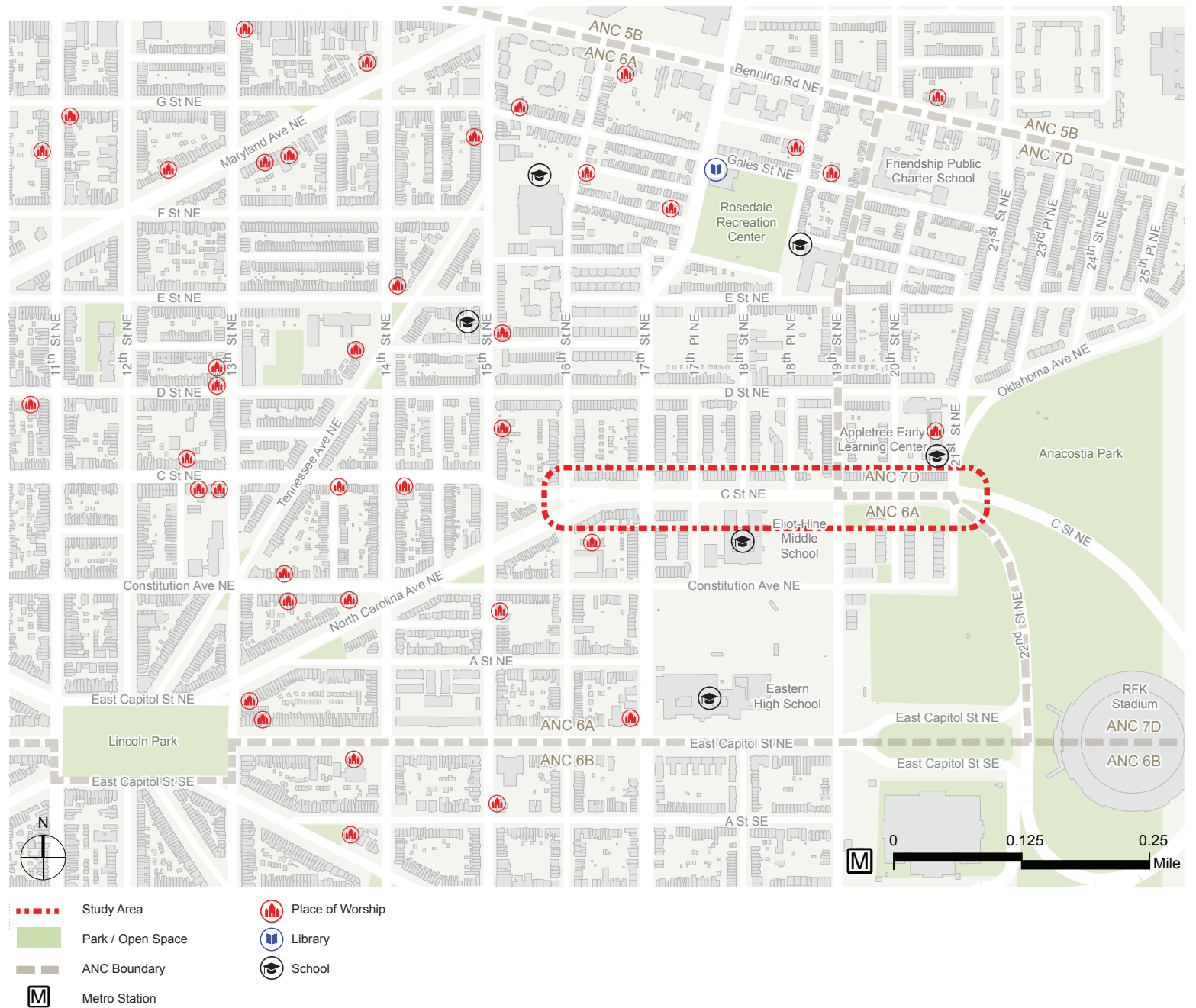
As a follow-up to the previous 2010 study, the District Department of Transportation (DDOT) has conducted a multimodal corridor study of C Street NE between 16th Street NE and 21st Street NE. Building on the work from the previous study, DDOT conducted this study to evaluate the current and future multimodal transportation conditions along the corridor and to refine previous recommendations and concepts for improving safety and mobility for all users. The concepts developed for the previous study identified a range of measures to improve conditions for non-automobile users, expand streetscaping and green infrastructure, and balance the needs of passenger and freight vehicles. Much has changed in the area since 2010, including completion of the construction projects on Benning Road NE and the 11th Street Bridges. These completed projects have substantially affected how C Street NE is being used by motorists today. As a result, this study relied on a range of new data and analysis to better understand how the previous

concepts, including potentially revised concepts, affect how the corridor will be used in the future. Beyond the extents of the study on C Street NE, DDOT has also worked to better understand any impacts these potential changes may have on users and residents in areas adjacent to the study area.

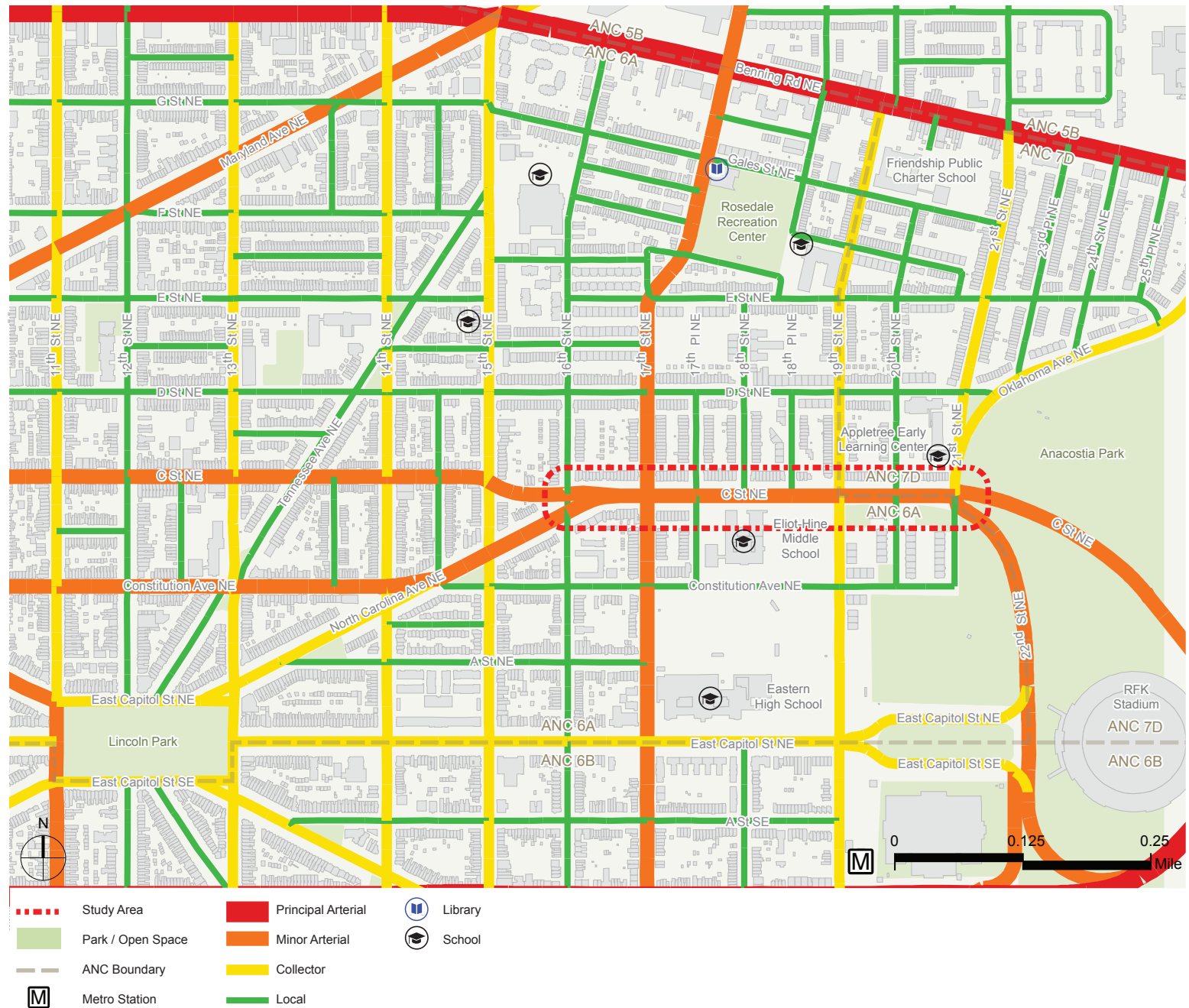


*C Street NE includes long pedestrian crossings. Some are not signal controlled while others do not line up well with median refuges.*

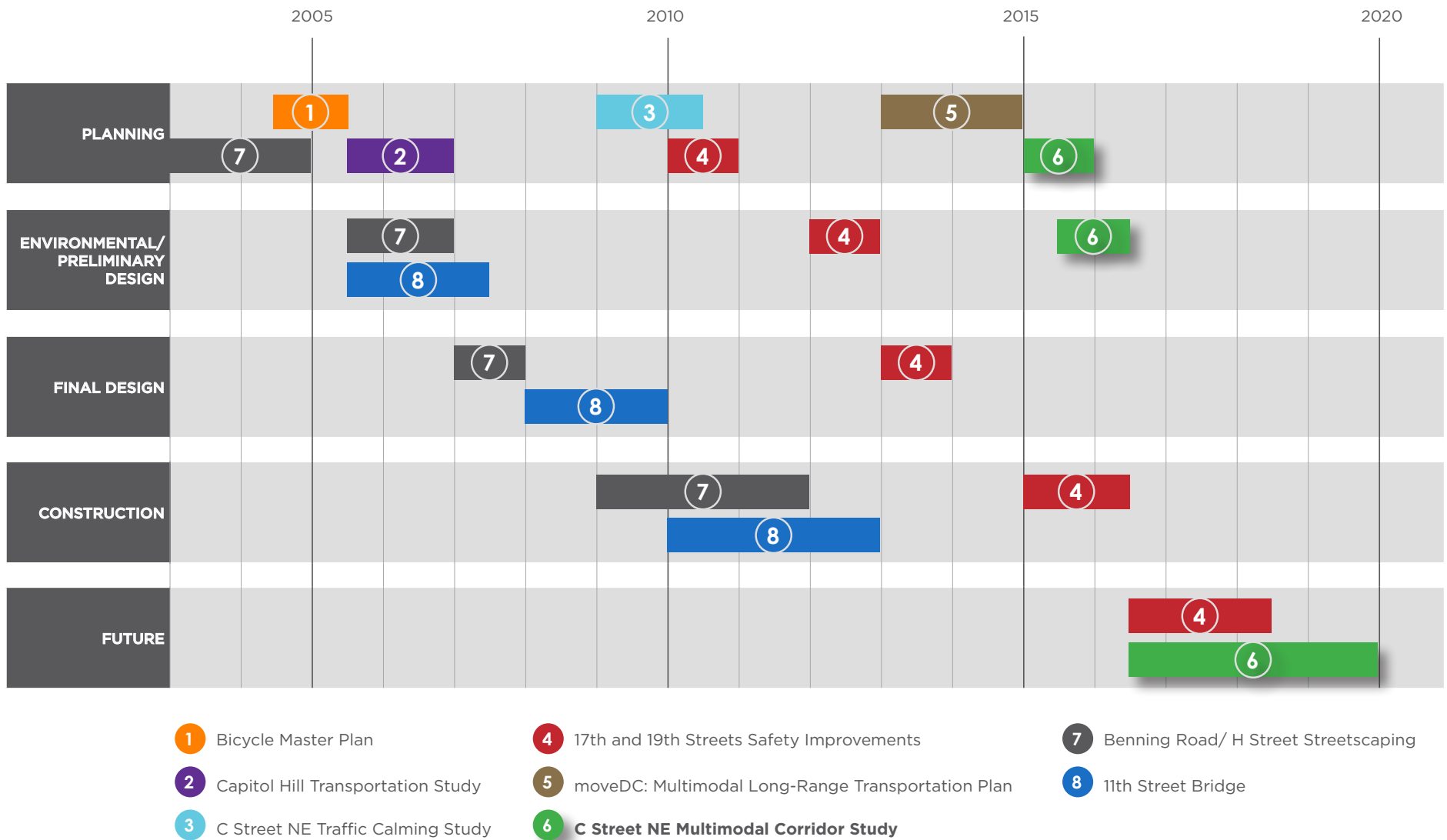
FIGURE 1. STUDY AREA



**FIGURE 2. FUNCTIONAL CLASSIFICATION OF STREETS IN STUDY AREA**



**FIGURE 3. PROJECTS AFFECTING THE STUDY AREA**



## STUDY PURPOSE AND NEED

The purpose of the C Street NE Multimodal Corridor Study is to improve safety and comfort for all right-of-way users while ensuring improved neighborhood connectivity and mobility for all modes within and through the study area. The need to evaluate the safety, comfort, connectivity, and mobility of the C Street NE corridor (and its surrounding streets) includes the following key factors:

- High automobile speeds;
- Uncomfortable and unsafe pedestrian crossing conditions;
- A significant decrease of auto traffic due to the completion of the Benning Road streetscape project and the 11th Street Bridge, ultimately leading to underutilized roadway space;
- Maintaining automobile access, particularly for regional corridor trips and trucks;
- Lack of protected bicycle facilities within the study area;
- Lack of non-auto access to Anacostia Park;
- History of high severity crash rates; and,
- Resident requests for improved multimodal conditions.

These project needs informed decisions about the specific data to collect, required analysis to perform, and appropriate stakeholders to include in the planning process.



*Waiting in the median on C Street NE is an uncomfortable experience for many pedestrians.*



*Traffic on C Street NE is very directional during the morning and afternoon periods, particularly the westbound direction during the morning peak period.*



*Bus access can be challenging due to limited on- and off-street facilities.*

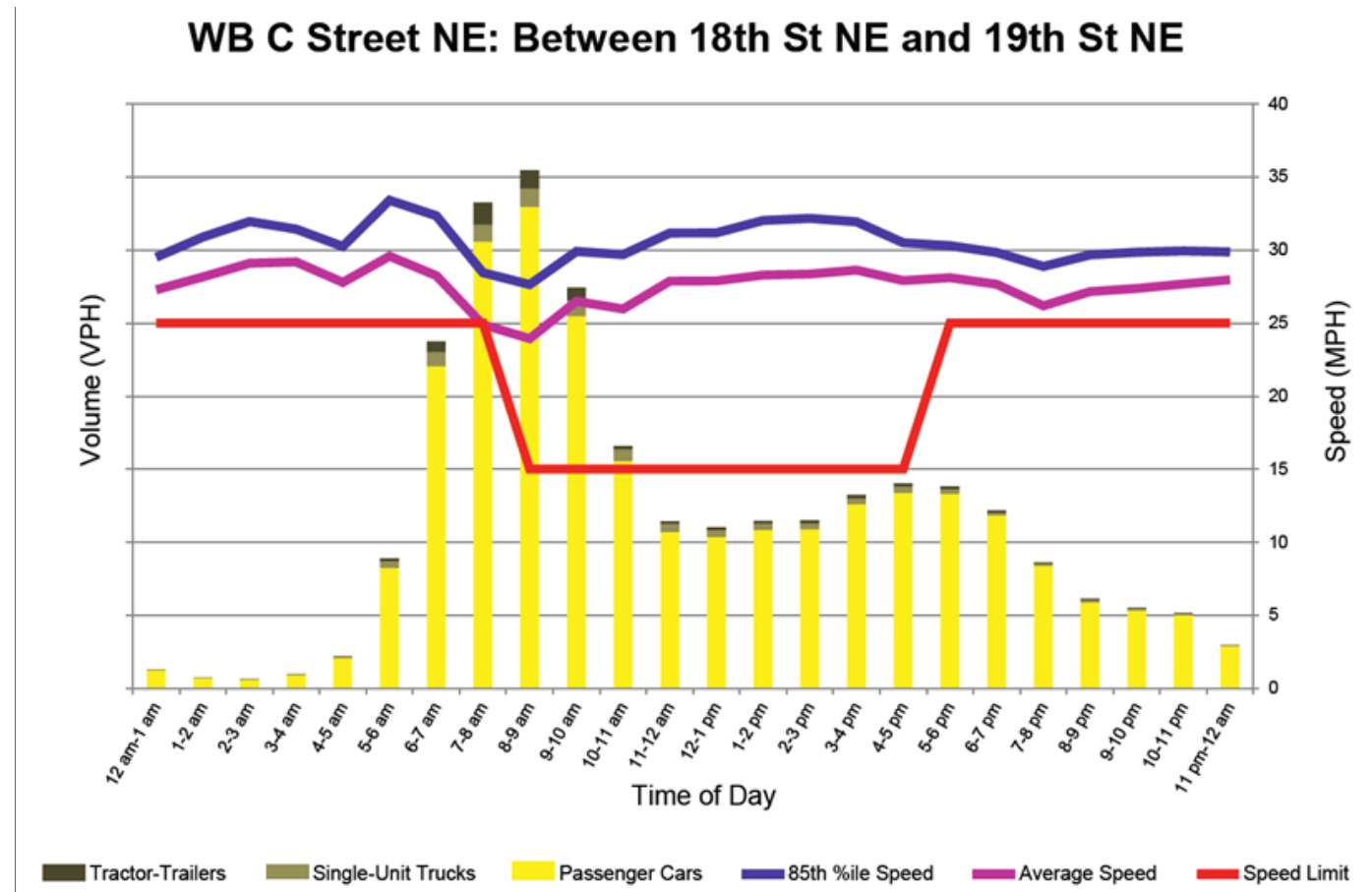


*Although bike lanes are provided on C Street NE, it is still an uncomfortable endeavor for many bicyclists.*

## HIGH AUTOMOBILE SPEEDS

Volume, speed, and vehicle classification counts were conducted at three locations along C Street NE. Posted speed limits in the study area are 25 mph during non-school hours and 15 mph while school is in session (8 AM – 5 PM) between 17th Street and 21st Street NE. A speed camera is located in the median on the west approach of the 18th Street NE/C Street NE intersection. The measured average daily 85th percentile speeds were the same as or higher than the posted 25 mph speed limit at each location, ranging from 25 to 41 mph. The average daily 85th percentile speed at the location closest to the speed camera was 32 mph in the eastbound direction and 30 mph in the westbound direction. As shown in **Figure 4** for westbound traffic between 18th and 19th Street, motorist speeds appear to not be affected by the 15 mph speed limit during school hours and in some cases are actually higher than many non-school hours.

**FIGURE 4.** WESTBOUND C STREET NE AUTO SPEEDS



The posted speed on C Street NE is 25 mph during non-school hours.



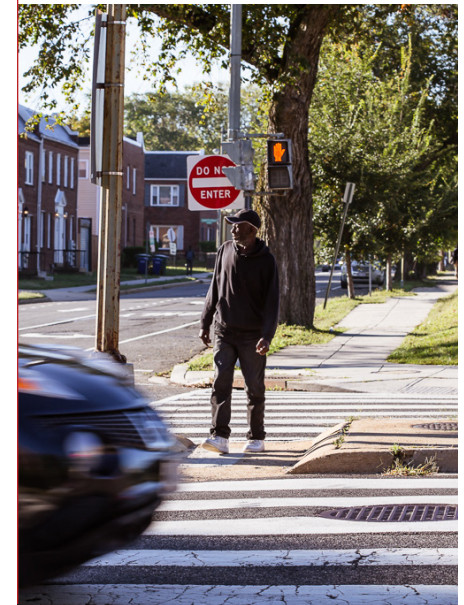
Low traffic volumes during most of the day likely results in auto speeds considerably higher than the posted speed limit.

## PEDESTRIAN CROSSING CONDITIONS

Pedestrian crossings on C Street NE are a combination of controlled and uncontrolled crossings, with average crossing distances of approximately 90 feet. Pedestrians must cross five (5) travel lanes, two (2) on-street parking lanes, two (2) bike lanes, and a median. Assuming an average walking speed of 3.5 feet per second, on average it may take pedestrians approximately 26 seconds to cross C Street NE in a single crossing. Most signals in the study area are set up with two-stage pedestrian crossings, where pedestrians must wait in the median (i.e., there is not enough time to cross in a single pedestrian phase) of C Street NE before crossing to the other side. With a two-stage crossing, the delay experienced by pedestrians when crossing C Street NE is at least 70 seconds and can reach up to 180 seconds. For comparison, in auto delay terms, the threshold between LOS D and E (i.e., not adequate according to DDOT standards) is 55 seconds, which is significantly lower than what is measured along C Street NE. Additionally, this design forces pedestrians to wait in a generally narrow island adjacent to vehicles traveling at excessive speeds, creating an uncomfortable condition for pedestrians.



Many pedestrians are not able to cross C Street NE in a single phase due to signal timing and crossing distance.



Pedestrians waiting in median refuge areas are exposed to high auto speeds.



In some instances, poor spacing of controlled crossings results in unsafe pedestrian activity.



## DECREASED TRAFFIC VOLUMES

Traffic volumes were collected on C Street NE for the 2010 study and for this study in early 2015. During the peak hour, peak direction (AM westbound, PM eastbound), traffic volumes decreased by 30% and 28%, respectively over this five-year period (i.e., 1,090 AM peak hour westbound vehicles and 210 PM peak hour eastbound vehicles). The volume decrease in the westbound direction is perhaps the most critical as the peak hour, peak direction volumes are considerably higher to accommodate morning commuter traffic. The eastbound direction volumes are significantly lower because motorists likely use other more direct routes in the afternoon to access the Anacostia Freeway, eastern DC, or suburban Maryland. As a result, with the exception of a couple of hours in the AM peak period, the roadway is very underutilized by auto traffic.

**TABLE 2. C STREET NE TRAFFIC VOLUME CHANGES**

LOCATION	AM PEAK HOUR			PM PEAK HOUR		
	EXISTING (2015)	PREVIOUS STUDY (2010)	% CHANGE	EXISTING (2015)	PREVIOUS STUDY (2010)	% CHANGE
<b>EASTBOUND</b>						
<b>West of 17th St</b>	75	95	-21%	535	745	-28%
<b>18th to 19th St</b>	185	214	-14%	900	1,182	-24%
<b>East of 21st St NE</b>	380	280	+36%	1,170	1,277	-8%
<b>WESTBOUND</b>						
<b>West of 17th St</b>	2,185	2,673	-18%	515	646	-20%
<b>18th to 19th St</b>	2,310	2,925	-21%	585	707	-17%
<b>East of 21st St NE</b>	2,540	3,630	-30%	665	910	-27%

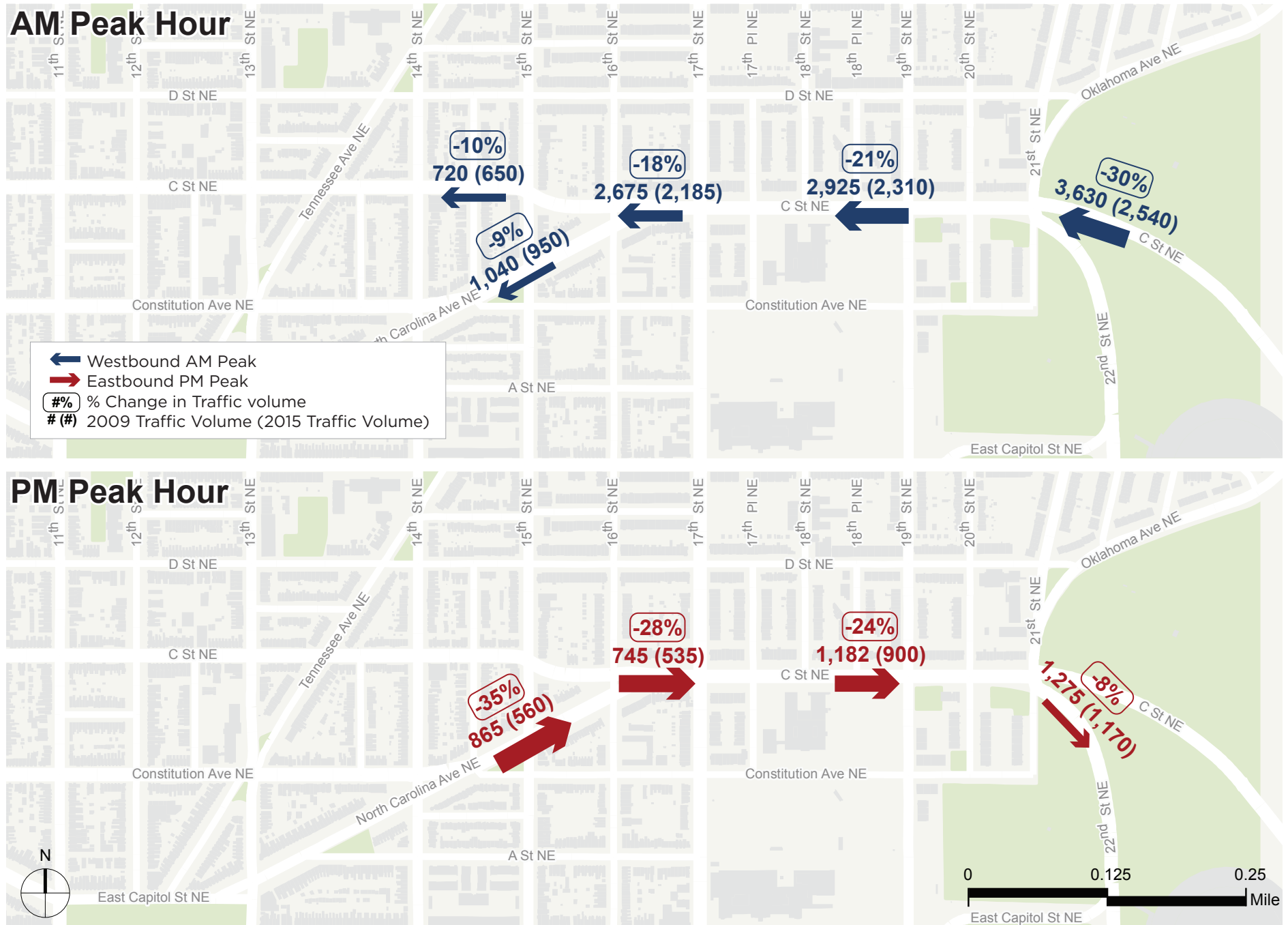


Westbound traffic volumes during the AM peak period are relatively steady for 1-2 hours.



But outside of the AM peak period, traffic volumes are relatively low.

**FIGURE 5. TRAFFIC VOLUME CHANGES BETWEEN 2010 AND 2015**



## MAINTAINING MOTOR VEHICLE ACCESS

In general, the vehicle operations along the corridor can be described as acceptable (level of service D or better) with relatively little delay at most of the intersections under existing conditions. The exceptions include the following intersections and movements:

- At the C Street NE/21st Street NE intersection, the southbound approach of 21st Street NE operates at LOS E during the AM peak hour and LOS F during the PM peak hour, with 71.2 seconds of delay per vehicle and a 95th-percentile queue of 265 feet during the AM peak hour and 97.7 seconds of delay per vehicle and a 95th-percentile queue<sup>1</sup> of 345 feet during the PM peak hour.
- The westbound 95th-percentile queue at C Street NE/21st Street NE extends to 370 feet during the AM peak hour and 100 feet during the PM peak hour. This is considerably shorter than the westbound queue noted in the previous C Street NE Traffic Calming Study.

**Table 3** highlights the existing conditions peak hours with the highest concentration of traffic volumes (AM westbound, PM eastbound). As shown, these approaches maintain LOS A, B, and C during peak hour conditions.

<sup>1</sup> 95th-percentile queue is the queue (or "backup") of vehicles that has a 5-percent probability of being exceeded during a peak analysis period. It is commonly used to represent a worst-case scenario for queuing vehicles and does not necessarily reflect what a user may experience on an average day. It is typically used to assess whether vehicle storage is adequate.

**TABLE 3. C STREET NE EXISTING TRAFFIC CONDITIONS**

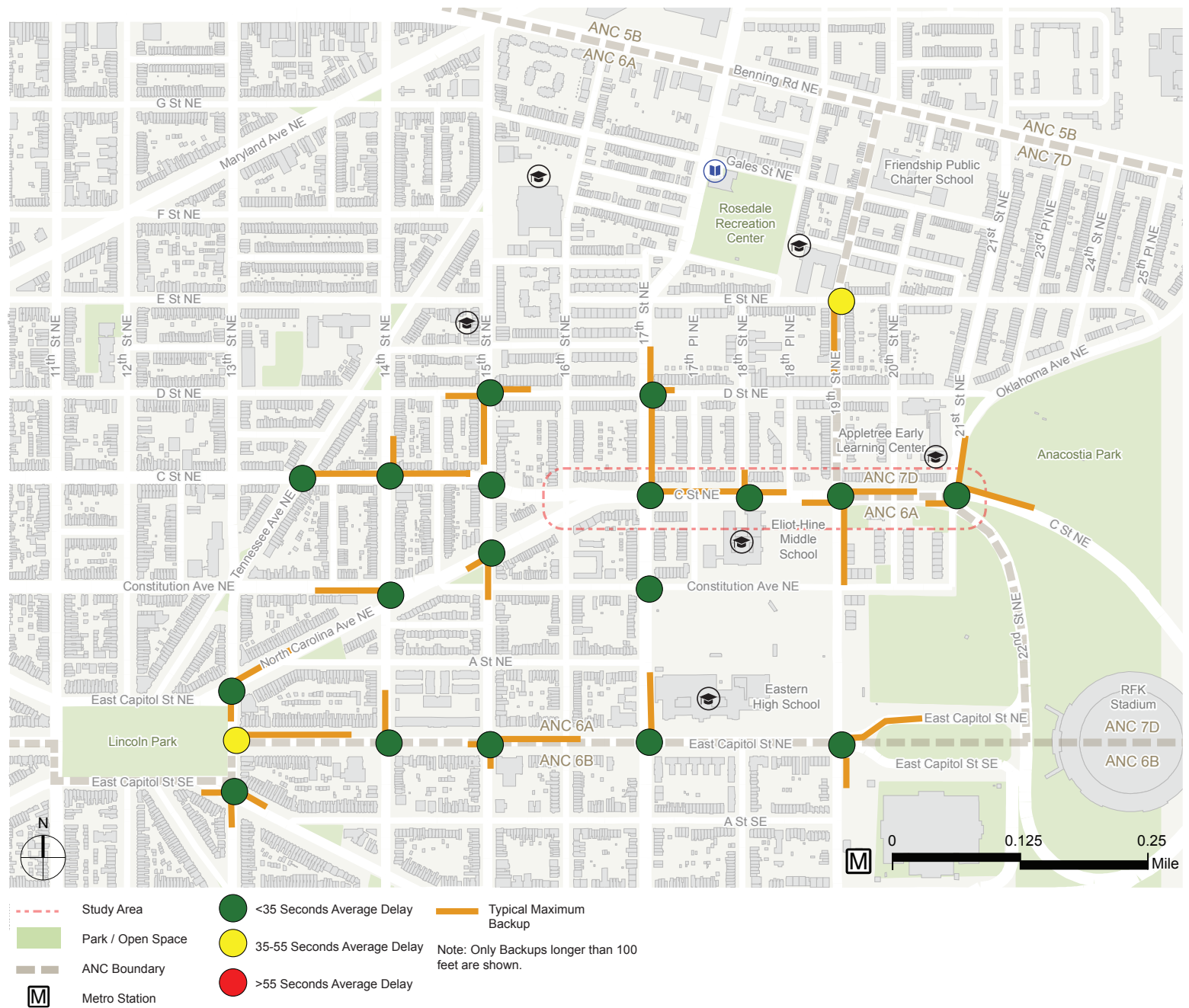
INTERSECTION	APPROACH	PEAK HOUR	LOS	DELAY (SEC)	V/C	Q95 (FT)
<b>C Street NE/ 17th Street NE</b>	EB	AM	A	4.1	0.04	10
		PM	C	28.4	0.27	240
	WB	AM	B	13.6	0.93	60
		PM	B	10.2	0.25	135
<b>C Street NE/ 18th Street NE</b>	EB	AM	A	0.8	0.08	15
		PM	A	4.3	0.36	10
	WB	AM	A	0.6	0.56	15
		PM	A	1.0	0.17	25
<b>C Street NE/ 19th Street NE</b>	EB	AM	A	1.7	0.11	10
		PM	B	14.8	0.47	320
	WB	AM	A	4.5	0.73	65
		PM	A	1.3	0.20	10
<b>C Street NE/ 21st Street NE</b>	EB	AM	A	3.0	0.08	20
		PM	A	1.6	0.35	25
	WB	AM	B	13.5	0.70	370
		PM	B	17.2	0.24	100

Due to the significant decrease in traffic volumes since construction of Benning Road and the 11th Street Bridge, traffic delay and queuing along the C Street NE corridor are minimal. A two-hour period in the AM peak period westbound direction remains the primary time of day where C Street NE acts as a minor arterial, accommodating both regional and local trips. Regional trips likely occur throughout the day, but are seen as minimal when compared with the AM peak period.

Despite the decreased traffic volume, C Street NE continues to carry freight traffic, with few east-west opportunities in the study area for these types of trips. The highest truck percentages were observed in the westbound lanes, east of 21st Street NE. Here single-unit trucks made up 8.5 percent

of the observed traffic and tractor trailers made up 2.7 percent of the observed traffic. At the other locations and directions, single unit trucks typically made up four to five percent of the observed traffic, and tractor trailers typically made up one to three percent of the observed traffic.

**FIGURE 6. EXISTING TRAFFIC OPERATIONS (AM PEAK HOUR)**



## LACK OF PROTECTED BICYCLE FACILITIES

C Street NE serves as an important bicycle connection between Capitol Hill and the Anacostia River, supporting commuter and recreational trips. Standard bicycle lanes are present on C Street NE within the study area. With ongoing investment in the Anacostia Riverwalk Trail, it is becoming an increasingly popular recreational opportunity for District residents, while the number of commuter bicyclists has been increasing in the District for the past few years.

C Street NE is the direct connection to the Trail in this area of the District. Residents seeking to access the Trail range in age and biking experience. The numbers of children biking to the Trail make up a larger proportion of overall bicyclists when compared to other parts of the District, thus requiring a more “protected” facility. The high auto speeds along the corridor also suggests that a standard bike lane exposed to auto traffic may not be appropriate on C Street NE. DC’s Multimodal Long Range Transportation Plan, moveDC, recommends a protected bike facility (i.e., cycle track) along this stretch of C Street NE.



*Although there are bike lanes on C Street NE, many bicyclists still find it too uncomfortable to bike on the street and instead use the sidewalk.*

## LACK OF NON-AUTO ACCESS TO ANACOSTIA PARK

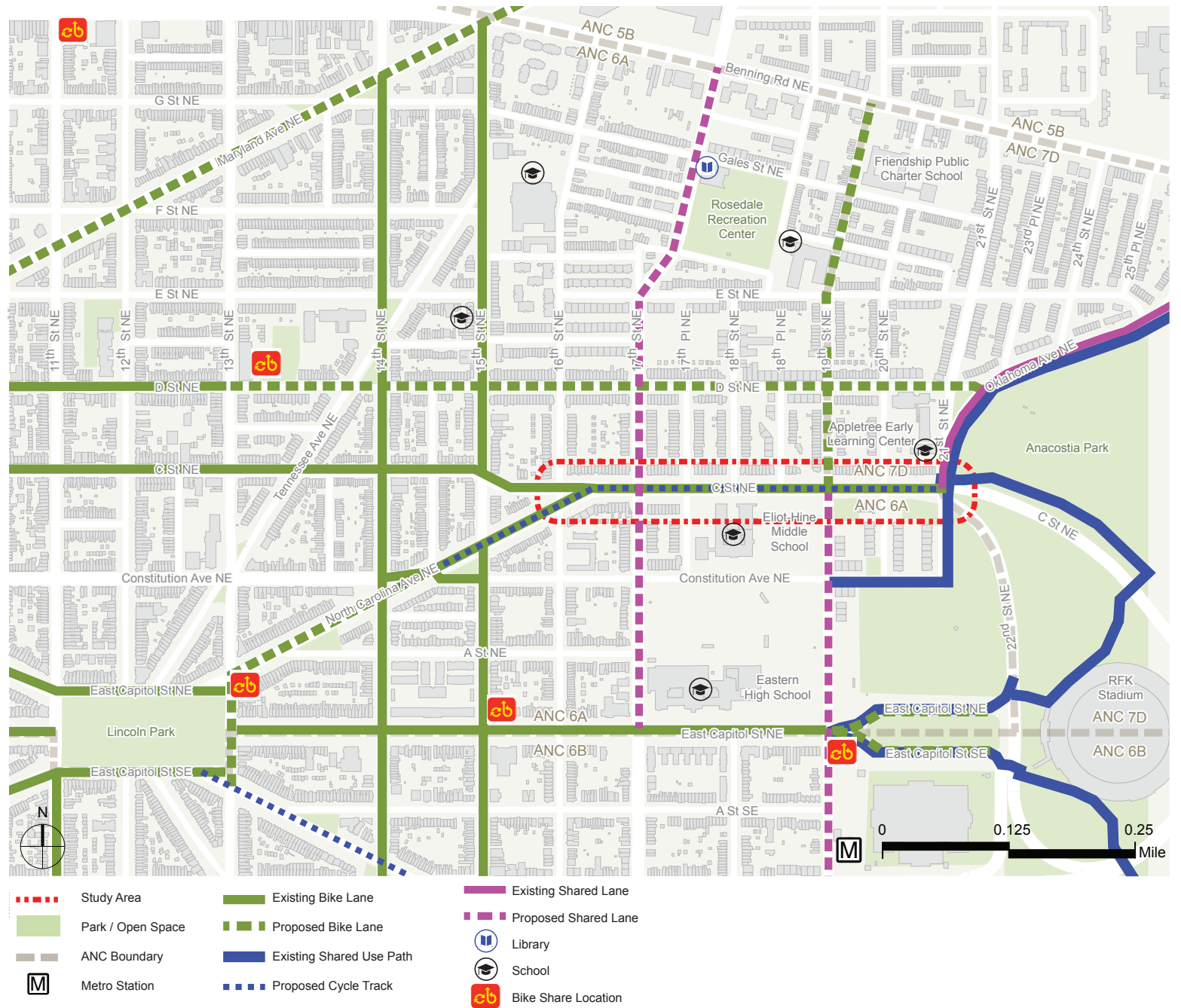
The District of Columbia continues to invest in the development of park and trail infrastructure along the Anacostia Waterfront to promote recreational opportunities, including walking and biking. With few safe or comfortable ways to access the waterfront in east Capitol Hill, C Street NE currently provides the most direct access to the waterfront in this area. C Street NE includes standard bike lanes, sidewalks that are in above-average condition, and some shade from mature

street trees. However, on-street bike lanes likely do not serve the needs of all bicyclists wishing to access the waterfront, particularly those inexperienced riders or those uncomfortable riding on surface streets. Past and ongoing research indicates that a large percentage of Americans are interested in biking, but are only willing to tolerate a small level of traffic stress. This large majority, commonly referred to as the “interested by concerned” user group is often the target audience for developing bike facilities that accommodate the largest percentage of existing and potential bicyclists.



*Residents in the District bike for many reasons beyond commuting, including taking their kids to school and accessing park space.*

**FIGURE 7. BICYCLE FACILITIES IN STUDY AREA**



## CRASH HISTORY

The project team obtained crash data from DDOT for 22 intersections within the study area for the three-year period from 2012 to 2014. A review of the crash data highlighted several of the study area's highest crash rate or highest crash-severity intersections; severity was judged by the ratio of injury crashes to property damage crashes.

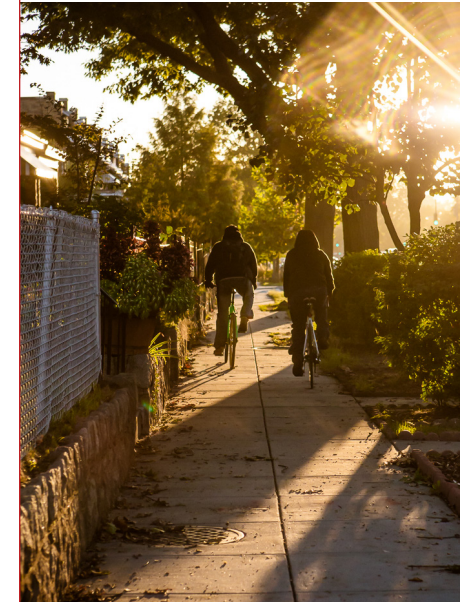
According to the Traffic Safety Statistics Report for the District of Columbia (2012), the Districtwide average of injuries as a percentage of total crashes is 29 percent. The four C Street NE study intersections included injuries that included 44 to 83 percent of total crashes, well above the District-wide average. Also, the Districtwide average for pedestrian and bicycle crashes are 5% and 3.5% of total crashes, respectively. The C Street NE intersections of 17th, 19th, and 21st Streets exceed the averages for pedestrian crashes, and 19th Street also exceeds the average for bicycle crashes. The intersections do not exceed Districtwide average crash rates, primarily because of the lower total crashes in relationship to the traffic volumes. However, the high percentage of those crashes that result in injury potentially suggests higher speed crashes are occurring.



A speed camera is located on C Street NE, just west of 18th Street NE.



Those not in cars are the most at-risk users on C Street NE. Bus riders are pedestrians before and after their bus trip.



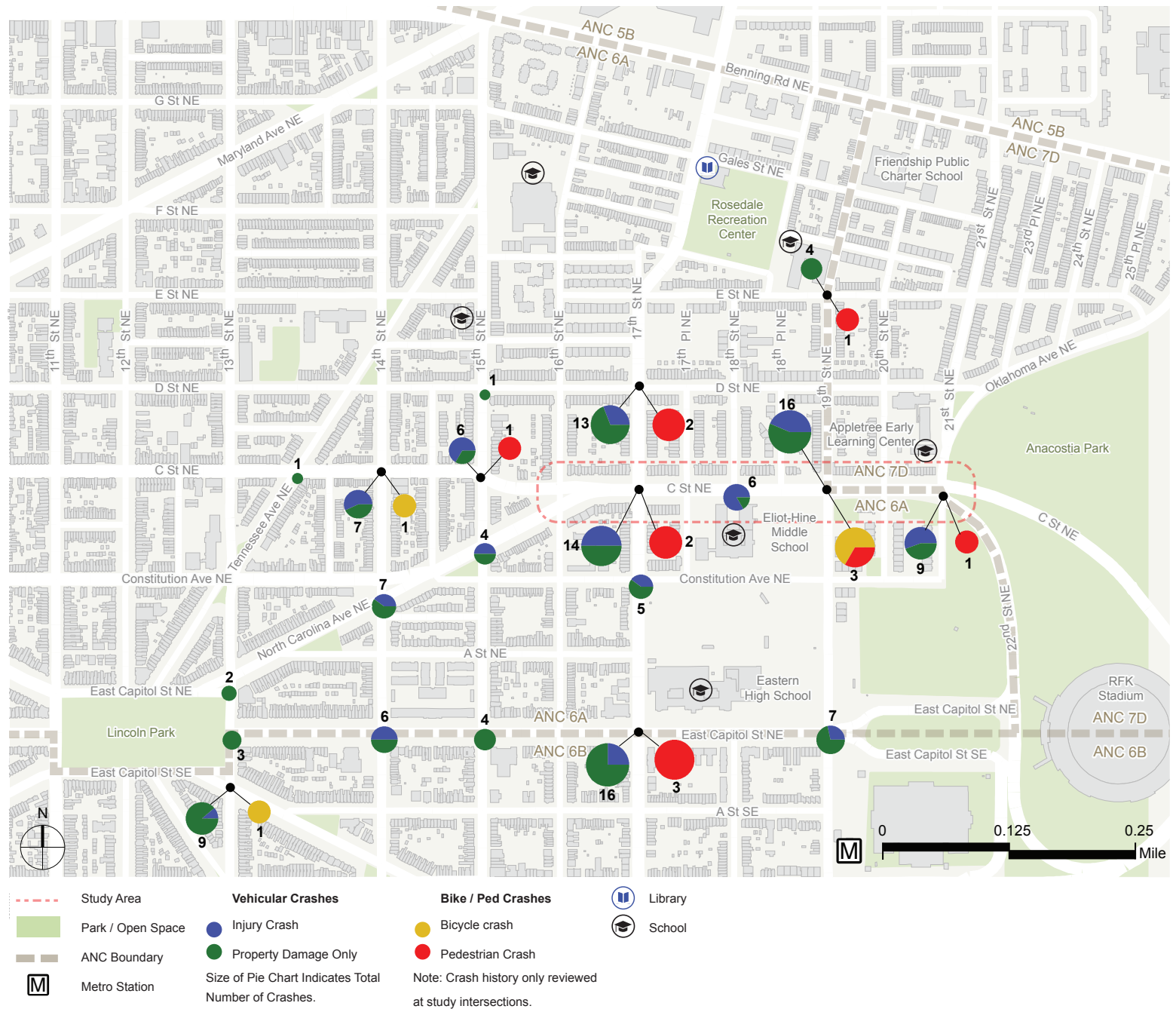
Bicyclists choosing the "safer" and more comfortable route.

**TABLE 4. C STREET NE CRASH HISTORY**

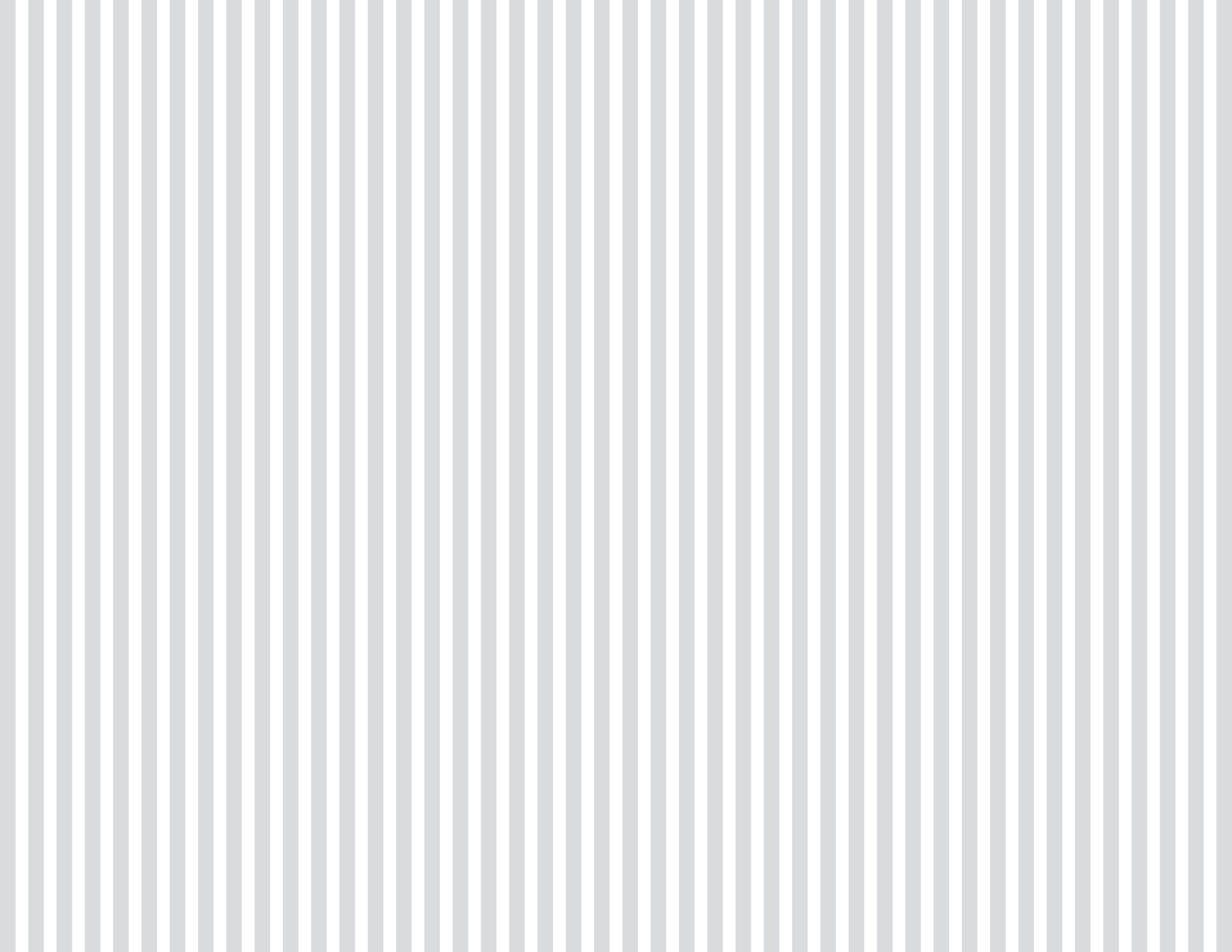
INTERSECTION	YEAR	FATAL CRASHES	INJURY CRASHES	PDO* CRASHES	TOTAL CRASHES
<b>C St and 16th St NE</b>	2012-2014	0	0	3	3
<b>C St and 17th St NE</b>	2012-2014	0	7 (50%)	7	14
<b>C St and 18th St NE</b>	2012-2014	0	5 (83%)	1	6
<b>C St and 19th St NE</b>	2012-2014	0	7 (44%)	9	16
<b>C St and 21st St NE</b>	2012-2014	0	5 (56%)	4	9

\* Property Damage Only

**FIGURE 8. CRASH HISTORY IN STUDY AREA**









# PUBLIC AND STAKEHOLDER ENGAGEMENT

## SECTION 3

## PUBLIC AND STAKEHOLDER ENGAGEMENT

All aspects of the C Street NE Multimodal Corridor Study were informed by an extensive program of public engagement. Due to the importance of the corridor to the community and region, stakeholders represent many different groups of people that interact with the corridor today and may be affected by its changes, including:

- Area residents;
- Commuters passing through the study area on C Street NE and surrounding roadways;
- Transit riders using local bus routes and/or Blue and Orange Metro lines at the Stadium Armory Metro Station;
- Students and faculty at area schools, including Eliot-Hines Middle School and Eastern High School;
- Users of area resources, including Anacostia Park and Rosedale Recreation Center; and,
- Freight and delivery operators.

## ENGAGEMENT PROGRAM AND STRATEGIES

The project team's public engagement approach builds upon community knowledge gained during the planning of completed and ongoing projects. That planning helped to create a group of stakeholders familiar with and fully engaged in public facilities planning. These community leaders and advocates were brought together by the project team to form the Civic Engagement Advisors (CEA).

The CEA includes Advisory Neighborhood Commissioners, neighborhood and community organizations, and other residents familiar with neighborhood concerns. The public engagement process was iterative and flexible in response to particular requests, needs, and interests of groups affected by the corridor. The CEA members were tasked with helping to spread the word to their communities about public meetings, website and interactive map addresses ([www.cstreetstudy.com](http://www.cstreetstudy.com)), and other engagement opportunities. The CEA also served as a "sounding board" for ongoing community events, discussions, outreach opportunities, and general community perspectives.

Coordination among government agencies was accomplished through regular meetings with the Agency Working Group (AWG) assembled for the project, including DDOT Administrations, WMATA, DC Office of Planning, MWCOG, and SHPO.

**d.**  
District Department of Transportation

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### C Street NE Multimodal Corridor Study

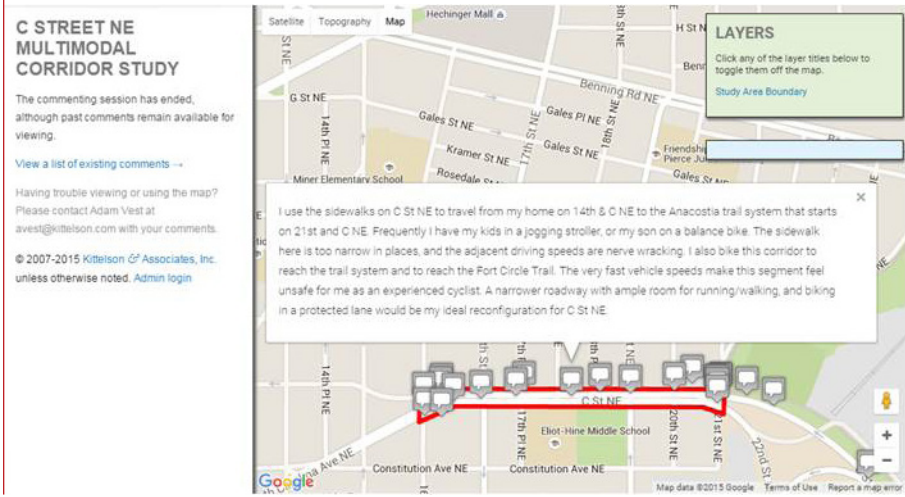
#### Study Purpose

The DC Department of Transportation (DDOT) is conducting a multimodal corridor study of C Street NE between 16th Street NE and 21st Street NE ([study area map](#)). Building on the hard work from the previous C Street study in 2010, DDOT is conducting this study to evaluate the current and future multimodal transportation conditions along the corridor, and to refine previous recommendations and concepts for improving mobility and safety for all users. The concepts developed for the previous study ([located here](#)) identified a range of measures to improve conditions for non-auto users, expand streetcaping and "green" infrastructure, and balance the needs of passenger and freight vehicles. Much has changed in the area since 2010, including completed construction projects on Benning Road and the 11th Street Bridge. These completed projects have substantially affected how C Street NE is being used by motorists today. As a result, this study will be relying on a range of new data and analysis to better understand how the previous concepts, including potentially revised concepts, affect how we will use the corridor in the future. While the specific extents of the study include C Street NE between 16th Street NE and 21st Street NE, DDOT will also be working to understand any impacts these potential changes may have on users and residents of adjacent streets in the study area.

Screen shot of the project website: [www.cstreetstudy.com](http://www.cstreetstudy.com).

The public engagement process centered on in-person meetings and interaction informed by the local knowledge of the members of the CEA. However, a project website was used to gain additional comments from community members unable to attend meetings or who wanted to leave additional written feedback. The project website, [www.cstreetstudy.com](http://www.cstreetstudy.com), included an interactive mapping feature that allowed community members to indicate their area of concern and

attach a comment. The website was used to promote the public community meetings, as well as report the activities and outcomes of those meetings after they occurred. Contact information for project staff was also available.



Screen shot of the online commenting tool.

The project team facilitated several meetings, including two CEA meetings, two public meetings, and four Agency Working Group (AWG) meetings. The team also had access to the previous study's materials, including public input. In addition to comments and feedback received at public meetings and via email, several comments have been made on the project website's comment mapping tool. Key issues/concerns identified by the community include:

- Lack of protected bike facilities;
- Need for increased "greening" (i.e., trees, rain gardens, bio-swales);
- High number of children unsafely crossing C Street NE; and,
- Lack of Pedestrian Scale Lighting.
- High vehicle speeds;
- Low volumes that promote high speeds and noise;
- Poor signal progression;
- Traffic Congestion at some key movements;
- Sidewalk Obstacles;
- Unsafe and long pedestrian crossings;



## C Street NE Multimodal Corridor Study

### PUBLIC MEETING!

**When: Wednesday, June 17th  
6:00 – 8:00 PM**

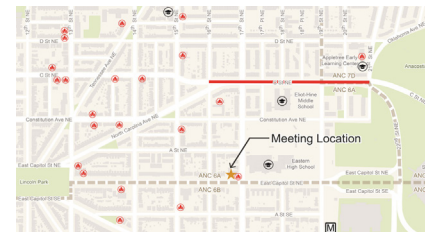
**Where: Mount Moriah Baptist Church  
1636 E. Capitol Street NE**

**Open House Begins at 6:00 followed by a presentation at 6:30**

The **District Department of Transportation (DDOT)** is hosting a second and final public meeting to guide the **C Street NE Multimodal Corridor Study**. Building on the hard work from the previous C Street study (2010), DDOT is conducting this study to evaluate the current and future multimodal transportation conditions along the corridor, and to refine previous recommendations and concepts for improving mobility and safety for all users.

Whether you walk, drive, ride a bike or the bus, at this meeting you will be able to:

- Receive updates on study progress
- Learn about preliminary recommendations
- Provide input on recommendations



For more information:  
[www.CStreetStudy.com](http://www.CStreetStudy.com)

Contact:  
Colleen Hawkinson  
District Department of Transportation  
[colleen.hawkinson@dc.gov](mailto:colleen.hawkinson@dc.gov)  
202.671.2228

The **District Department of Transportation (DDOT)** is committed to ensuring that no person is excluded from participation in, or denied the benefits of, its projects, programs, activities, and services on the basis of race, color, national origin, gender, age, or disability as provided by Title VI of the Civil Rights Act of 1964, the Americans with Disabilities Act and other related statutes.

In accordance with the D.C. Human Rights Act of 1977, as amended, D.C. Official Code sec. 2-1401.01 et seq. (Act), the District of Columbia does not discriminate on the basis of actual or perceived: race, color, religion, national origin, sex, age, marital status, personal appearance, sexual orientation, gender identity or expression, familial status, family responsibilities, matriculation, political affiliation, genetic information, disability, source of income, status as a victim of an intrafamily offense, or place of residence or business. Sexual harassment is a form of sex discrimination which is prohibited by the Act. In addition, harassment based on any of the above protected categories is prohibited by the Act. Discrimination in a violation of the Act will not be tolerated. Violators will be subject to disciplinary action.

If you need special accommodations or language assistance services (translation or interpretation) please contact Lisa Gregory [lisa.gregory@dc.gov](mailto:lisa.gregory@dc.gov) (202) 671-2628 72-hours in advance of the meeting date. These services will be provided free of charge.

Outreach flyer for the June 2015 public meeting. Hundreds of flyers were distributed in the community prior to public meetings.

## PUBLIC MEETING #1

The first community meeting was held on Thursday, April 30, 2015 at Rosedale Recreation Center from 6:00 to 8:00 p.m. and featured an open-house to discuss and review display materials, a presentation of the materials, and an open discussion for questions and comments. The meeting was advertised through the distribution of several hundred flyers to the community and was attended by approximately 40 local residents.

The DDOT team presented a summary of the project history and background, an overview of existing and projected future conditions on C Street NE and the surrounding area, and discussion about next steps. The presentation focused on the purpose and need of the study and the recent decline in traffic volumes, coupled with high automobile speeds. For the most part, residents voiced frustration over the lack of progress in corridor implementation dating back to the previous study in 2010. Likewise, residents were concerned over current traffic speeds on the corridor, the severity of past crashes, and the difficulty crossing C Street NE on foot, particularly the large numbers of school children who must cross it daily. There was also overwhelming consensus from the group with moving forward with Concept C, which eliminates one travel lane in each direction.

## PUBLIC MEETING #2

The second community meeting was held on Wednesday, June 17, 2015 at Mount Moriah Baptist Church from 6:00 to 8:00 p.m. The meeting was conducted as an open-house and allowed attendees to circulate through the room to review boards and plans, including analysis findings and comparison of alternatives based on a number of performance measures. The meeting was advertised through the distribution of several hundred flyers to the community. At this meeting the DDOT team shared with the attendees that Alternative C is the Recommended Alternative, displaying a number of boards explaining the trade-offs with this recommendation and potential impacts it may have on the community. A majority of attendees supported the recommendation, although some voiced concern over traffic impacts to adjacent streets.



*Residents identify unique features of Concept C.*



*Public meeting presentation at the Rosedale Recreation Center.*

## OTHER MEETINGS

Other meetings included civic engagement advisors (CEA) meetings and agency working group (AWG) meetings.

## CIVIC ENGAGEMENT ADVISORS

Approximately one week prior to each community meeting, the study team solicited input from Civic Engagement Advisors. The CEA group included ANC commissioners and other community leaders, and these advisors were responsible for both vetting information and ideas based on their assessment of the concerns of their respective groups and for ensuring that all stakeholders were aware of upcoming community meetings and other opportunities for input. CEA members were crucial in fact-checking results suggested by the analysis and other study findings. While many communication strategies were used to ensure that as many stakeholders as possible had the opportunity to attend meetings, review study analysis and proposals, and provide ideas, input, and feedback, the person-to-person outreach performed by the CEA was one of the most important strategies.

## INTERAGENCY MEETINGS

The study was led by DDOT's Policy, Planning, and Sustainability Administration (PPSA) but required cooperation with other DDOT Administrations, including the Traffic Operations Administration (TOA), Infrastructure Project Management Administration (IPMA), Progressive Transportation Services Administration (PTSA), and WMATA. Regular meetings were held to encourage communication among these administrations and address any questions or concerns that they had relating to the project. Input was also received from the State Historic Preservation Office (SHPO) to determine any potential impact on the designated and eligible historic resources within the study area.

## SELECTION OF MEETING LOCATIONS

Numerous sites for the CEA and public meetings were reviewed to ensure convenient and comfortable locations for community members. Likewise, the team worked to find locations that were located within or proximate to many neighborhoods within the study area. For instance, the first Civic Engagement Advisors meeting was held just south of the study corridor at Eastern Senior High School. The first public meeting was held just north of the study area at Rosedale Recreation Center. Finally, the second CEA and public meeting were each held at Mt. Moriah Baptist Church, just south of the study area.

Numerous other meeting locations were also reviewed (e.g., Eliot-Hine Middle School, Maury Elementary School, DC Armory, and Miner Elementary), but due to conflicts,



*Civic Engagement Advisors and team members review preliminary concepts for C Street NE.*

costs, or other on-site constraints these locations were not ultimately used. A detailed overview of potential meeting locations and the team's effort to contact and schedule these meetings is detailed in Appendix A.5 - Civic Engagement Materials.

**FIGURE 9. WHAT WE HEARD FROM THE COMMUNITY**

## INFRASTRUCTURE AND OPERATIONS

### GENERAL

- Long and unsafe pedestrian crossings
- Underutilized travel lanes
- Poor signal progression
- Inadequate bicycle protection
- Reduced parking not acceptable on north side (Alternative B)
- Minimal auto delay and queuing throughout day
- Remove large trucks that shake the houses while speeding down C Street toward 19th Street to catch the green light
- Widen the green area between the sidewalk and roadway so that trees can have an easier time growing.
- There are a couple of narrow pinch points on the north sidewalk that are hard to navigate around with the jogging stroller I use for my kids. If this goes to construction, street light and sign poles should be relocated so that the sidewalk is effectively wider.

### LOCATION

- 1 No pedestrian/bicycle access across bridge
- 2 Concern over traffic diversion D Street and 21st Street/Oklahoma Avenue
- 3 Inadequate crossing times 17th, 18th, 19th, 21st
- 4 Southbound queuing issues during evening peak conditions. Motorists appear confused about lane assignments and turn from both lanes causing additional traffic issues. Southbound green time is also inadequate during the evening peak. 21st St
- 5 If westbound lanes from are reduced from 3 to 2, consider measures to mitigate the use of 21st as cut-through for west-bound commuters who may try to use D St NE and/or Benning Road. Do this by narrowing the westbound lane not at 21st St NE, but several hundred feet east of 21st Street.
- 6 No trash receptacles between 16th Street NE and 17th Place NE
- 7 The south side of C Street here lacks sidewalks. This triangle park could also use some landscaping. 16th Street

## SAFETY AND COMFORT

### GENERAL

- High traffic speeds
- High numbers of walking children
- Crashes and high speeds late at night
- Pedestrians would be better served by having raised crosswalks that extend into the intersection. This would have the benefit of providing increased visibility of and for the pedestrians, with a corresponding reduction in traffic speed.
- I use the sidewalks on C Street to travel from my home on 14th Street/C Street to the Anacostia trail system 21st Street/C Street. The sidewalk here is too narrow in places, and the adjacent driving speeds are nerve wracking. I also bike this corridor to reach the trail system and to reach the Fort Circle Trail. The very fast vehicle speeds make this segment feel unsafe for me as an experienced cyclist. A narrower roadway with ample room for running/walking, and biking in a protected lane would be my ideal reconfiguration for C Street NE.
- Planting shade trees in the median strip all along C Street NE will add a sorely lacking aesthetic quality

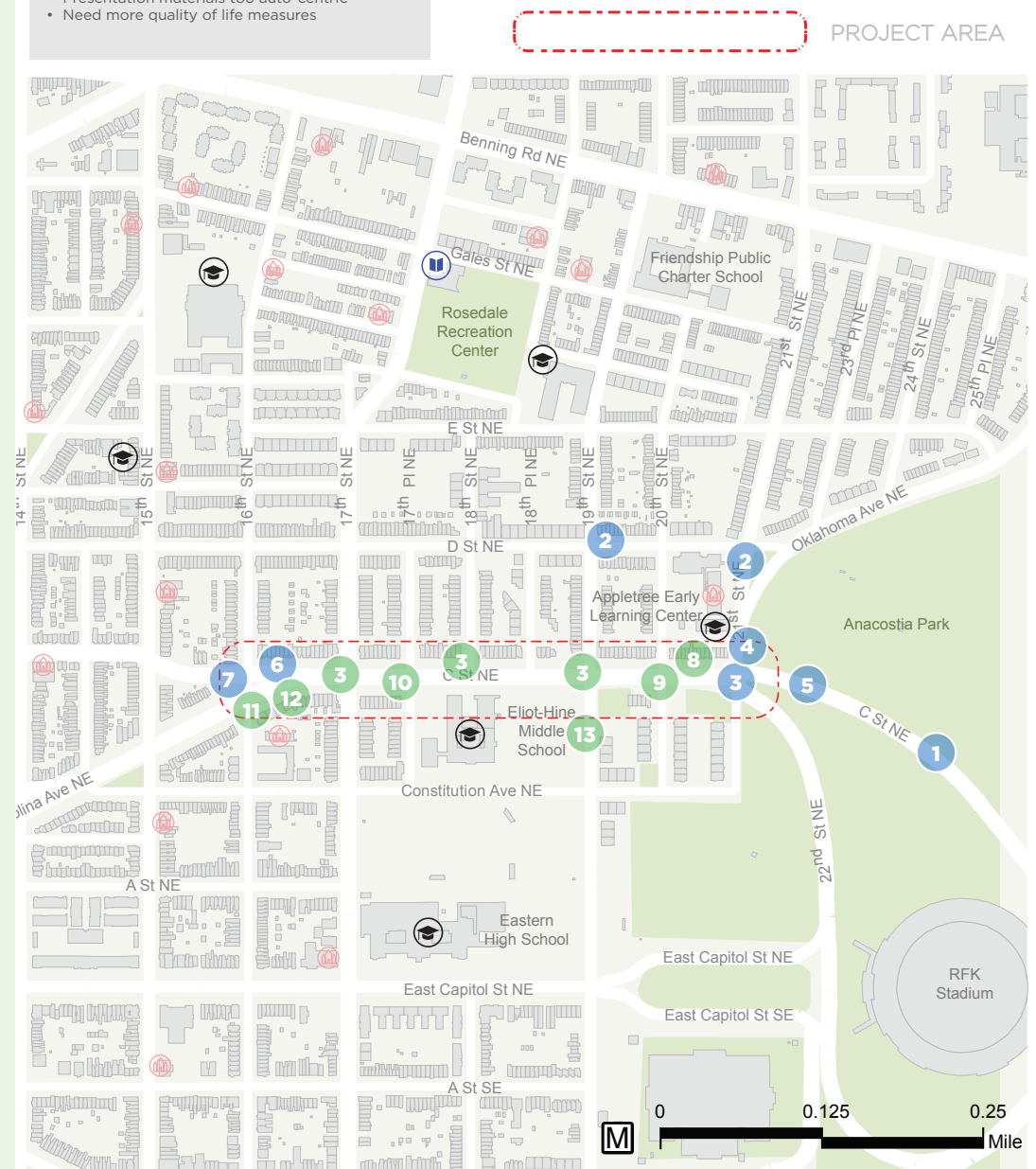
### LOCATION

- 8 Speed camera should be located between 20th and 21st to slow motorists coming from the bridge
- 9 Need crosswalk at 20th Street for children and seniors to cross C Street safely.
- 10 Many children cross at 17th Place NE to get to Hine, EHS and the tennis courts. Please consider adding a signal and pedestrian crossing at 17th Place NE.
- 11 Traffic picks up speed around this corner, with little visibility of what's ahead. Traffic speed needs to be reduced here. 16th Street EB
- 12 The block between 16th and 17th Street is poorly lit at night, with inadequate street lighting for pedestrians and cyclists.
- 13 Include measures to reduce the speeding on 19th Street. Three lanes of cars race northward on 19th and merge into one lane in front of our house. With all the children on this street, it is so incredibly dangerous.

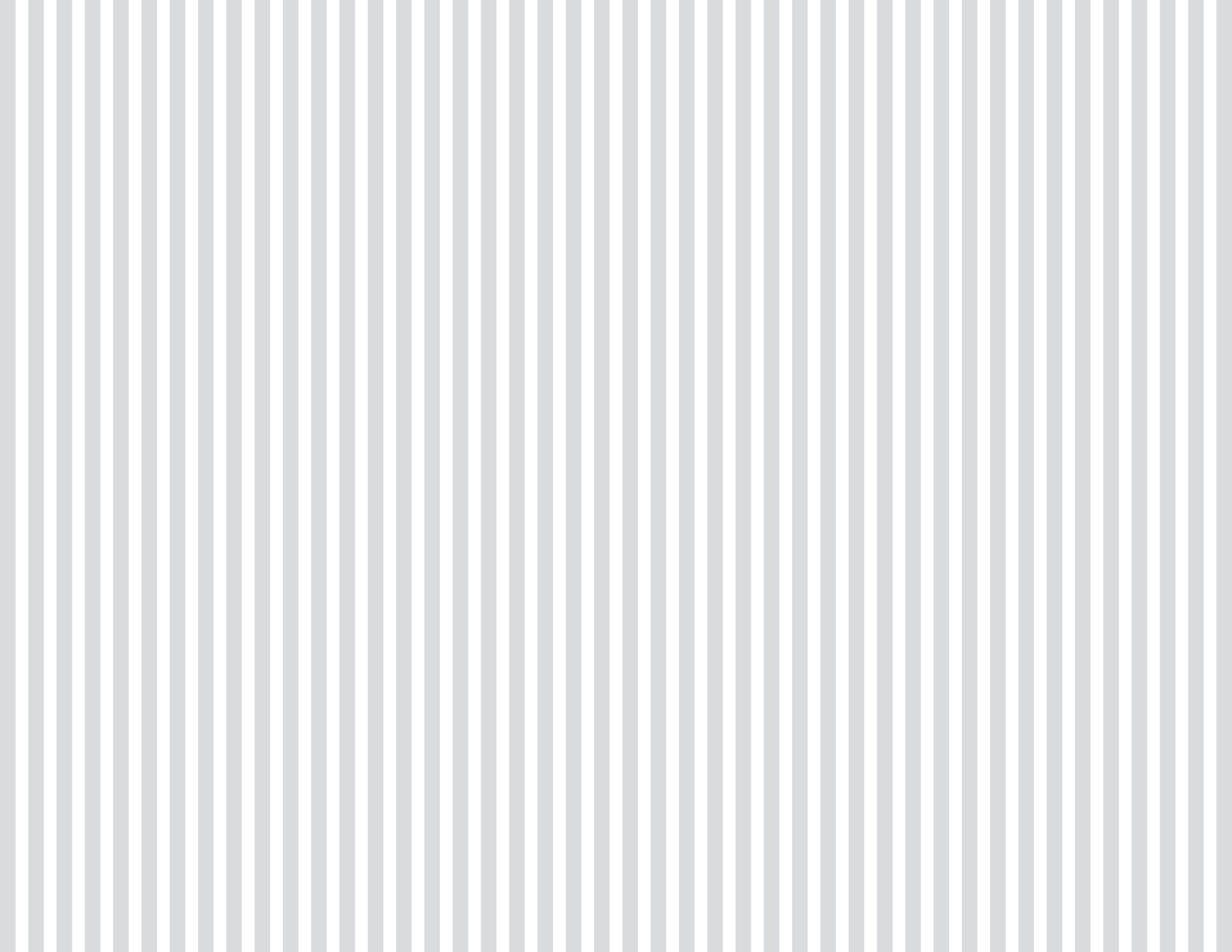
## PROJECT AND MATERIALS

### GENERAL

- Frustration over lack of progress
- Presentation materials too auto-centric
- Need more quality of life measures









# ALTERNATIVES DEVELOPMENT

## SECTION 4

## ALTERNATIVES DEVELOPMENT

Three alternatives were developed for the corridor in response to input from the community and stakeholders, analysis of existing conditions, and recognition of C Street NE's functional classification as a minor arterial. The original development of these three concepts occurred during the C Street NE study in 2010, and the concepts have been modified to reflect current conditions, effects on users, and impacts to the community. Starting with Concept A, each subsequent concept provides a more aggressive approach to reallocating existing automobile space to other modes and community assets. The three concepts were developed in response to the project and community needs, including the following:

- High automobile speeds;
- Uncomfortable and unsafe pedestrian crossing conditions;
- A significant decrease of auto traffic due to the completion of the Benning Road streetscape project and the 11th Street Bridge, ultimately leading to underutilized roadway space;

- Maintaining automobile access, particularly for more regional corridor trips and trucks;
- Lack of protected bicycle facilities within the study area;
- Lack of non-auto access to Anacostia Park;
- History of high severity crash rates;
- Resident requests for improved multimodal conditions;
- Poor traffic signal progression;
- Sidewalk obstacles;
- Need for increased "greening" (i.e., trees, rain gardens, etc.);
- High number of children unsafely crossing C Street NE; and
- Lack of pedestrian-scale lighting.

The primary goal of each concept alternative was to balance the vision of the community, existing physical constraints, and the regional role C Street NE serves beyond the immediate neighborhood. The cross sections displayed on the following pages provide an overview of the existing and alternative roadway layouts. Today, the curb-to-curb cross section of C Street NE is approximately 90 feet in the study area. The 90 feet working space includes on-street parking on both sides of the street, standard bike lanes in each direction separating the parking from travel lanes, three westbound travel lanes, two eastbound travel lanes, and a nine-foot grass median. The right-of-way also includes six-foot sidewalks and a four- to five-foot buffer of grass and trees between the curb and sidewalk.

The unbalanced number of lanes (three westbound, two eastbound) is a result of the corridor's heavy morning westbound traffic volume and the much lower afternoon eastbound traffic volumes.

Some proposed design features are included in each of the three concept alternatives, with some minor design modifications for each, including: a protected bike facility in each direction separated from parked vehicles and/or travel lanes by a curb and varying levels of "greening", curb extensions at all intersections, raised crosswalks on each minor street approach excluding 17th Street and 19th Street NE, a westbound left-turn lane at 17th Street NE, an eastbound left-turn lane at 19th Street NE, and removal of a travel lane in the eastbound direction. The predominant differentiating element in each Alternative includes the number of travel lanes in the westbound direction:

- Concept Alternative A maintains three travel lanes in the westbound direction;
- Concept Alternative B includes a curbside morning travel lane that is a parking lane during non-morning peak period conditions; and,
- Concept Alternative C removes a travel lane in the westbound direction, resulting in two westbound travel lanes.

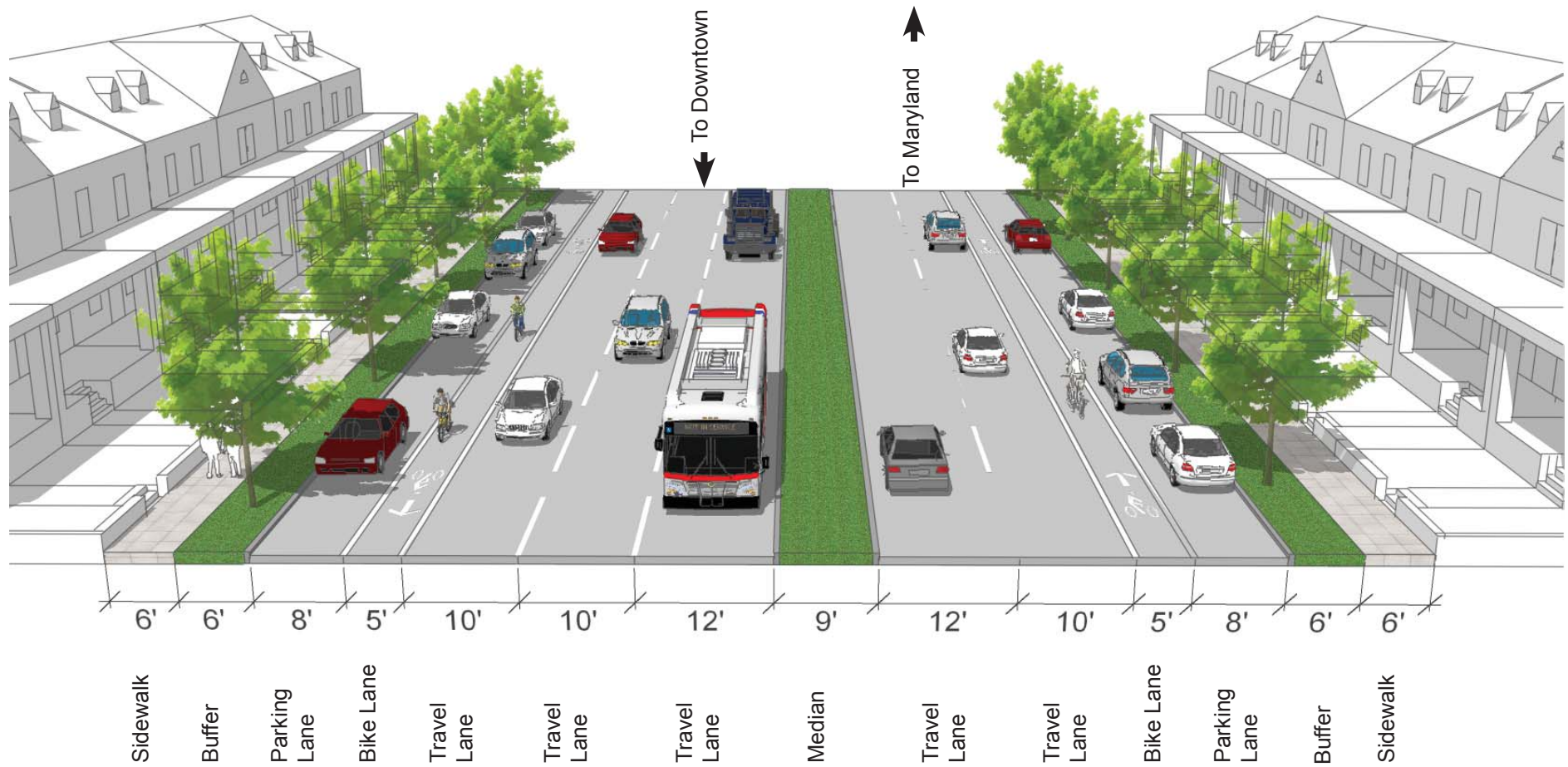


Among other things, the proposed Alternatives sought to improve bicycling and improve pedestrian crossing conditions.

**TABLE 5. CONCEPT DESIGN DETAILS MATRIX**

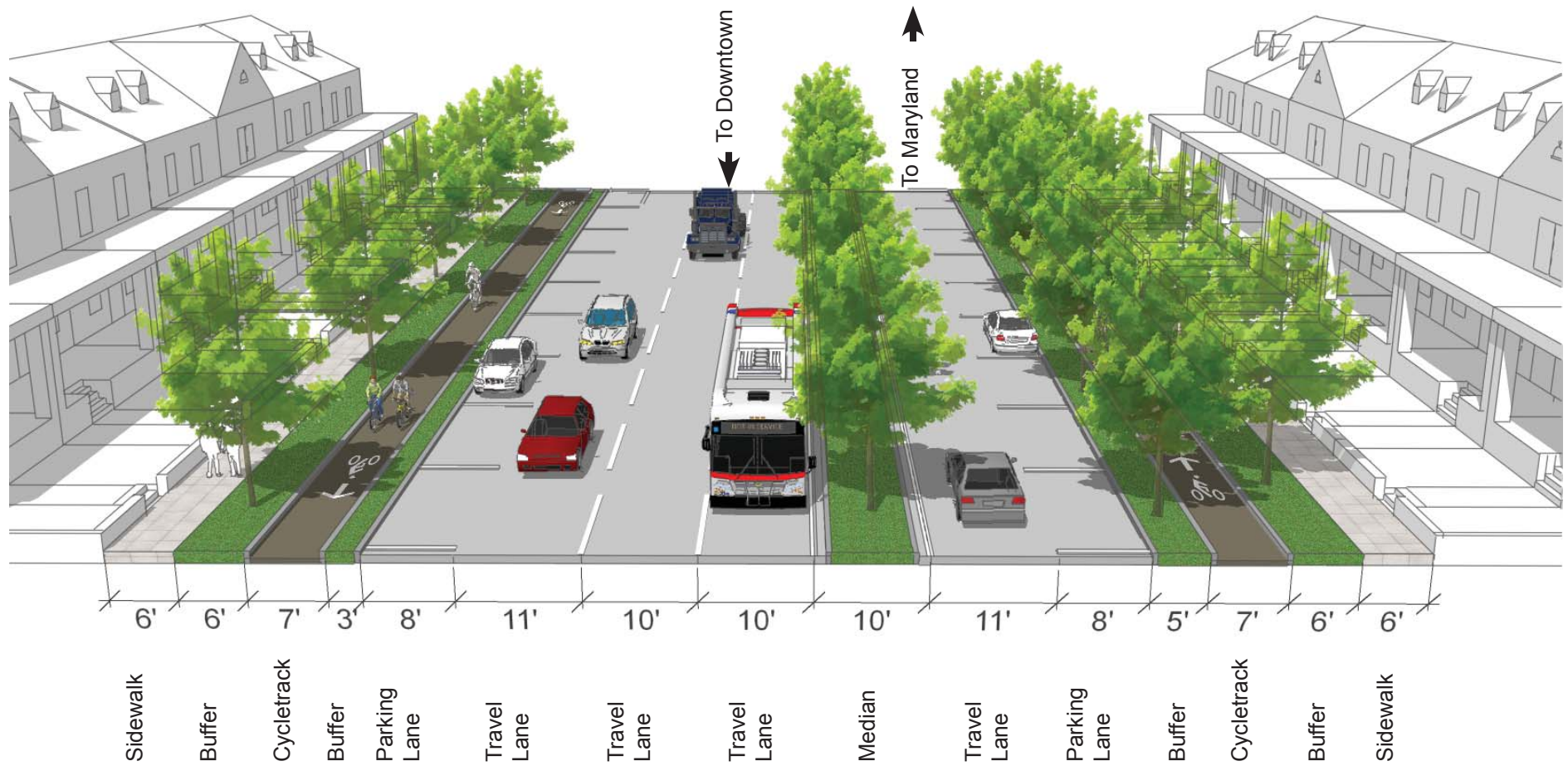
FEATURE	EXISTING	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C (RECOMMENDED)
<b>Number of travel lanes</b>	2 eastbound travel lanes	1 eastbound travel lane	1 eastbound travel lane	1 eastbound travel lane
	3 westbound travel lanes	3 westbound travel lanes	3 westbound travel lanes during AM peak period and 2 westbound travel lanes with on-street parking during all other times	2 westbound travel lanes
<b>On-street parking</b>	On-street parking in both directions	Maintain on-street parking in both directions	Maintain eastbound on-street parking	Maintain on-street parking in both directions
			Allow parking in westbound travel lane except during AM peak period	
<b>Left turn lanes</b>	Eastbound left-turn lane at 21st St NE	Westbound left-turn lane at 17th St NE	Westbound left-turn lane at 17th St NE	Westbound left-turn lane at 17th St NE
		Eastbound left-turn lane at 19th St NE	Eastbound left-turn lane at 19th St NE	Eastbound left-turn lane at 19th St NE
		Eastbound left-turn lane at 21st St NE	Eastbound left-turn lane at 21st St NE	Remove existing eastbound left-turn lane at 21st St NE/Oklahoma Ave NE
<b>Pedestrian facilities</b>	5-6 foot sidewalks on both sides of streets	Maintain existing sidewalks and add curb extensions	Maintain existing sidewalks and add curb extensions	Maintain existing sidewalks and add curb extensions
	Crossing distances of approximately 90 feet	Crossing distances of approximately 54 feet	Crossing distances of approximately 54 feet	Crossing distances of approximately 43 feet
	Some recent ADA upgrades and pedestrian refuges were made in 2014	Add raised crosswalks on side streets at 16th St NE, 17th St NE, 18th St NE, 20th St NE, and 21st St NE/Oklahoma Ave NE	Add raised crosswalks on side streets at 16th St NE, 17th St NE, 18th St NE, 20th St NE, and 21st St NE/Oklahoma Ave NE	Add raised crosswalks on side streets at 16th St NE, 17th St NE, 18th St NE, 20th St NE, and 21st St NE/Oklahoma Ave NE
<b>Bicycle facilities</b>	Standard 5-foot bike lanes in each direction	Protected 7-foot bike lanes in both directions	Protected 7-foot bike lanes in both directions	Protected 7-foot bike lanes in both directions
<b>Transit facilities</b>	Standard bus stops with signage, but no shelters or benches	Consolidate westbound bus stops at 18th St NE/18th St NE	Consolidate westbound bus stops at 18th St NE/18th St NE	Consolidate westbound bus stops at 18th St NE/18th St NE
		Move eastbound bus stop at 19th St NE from nearside to farside and consolidate with existing bus stop at 21st St NE	Move eastbound bus stop at 19th St NE from nearside to farside and consolidate with existing bus stop at 21st St NE	Move eastbound bus stop at 19th St NE from nearside to farside and consolidate with existing bus stop at 21st St NE
<b>Green Space</b>	5-foot swales with trees	Increase permeable space by 23% through bio-retention, rain gardens, and tree swales.	Increase permeable space by 27% through bio-retention, rain gardens, and tree swales.	Increase permeable space by 31% through bio-retention, rain gardens, and tree swales.

FIGURE 10. EXISTING TYPICAL SECTION



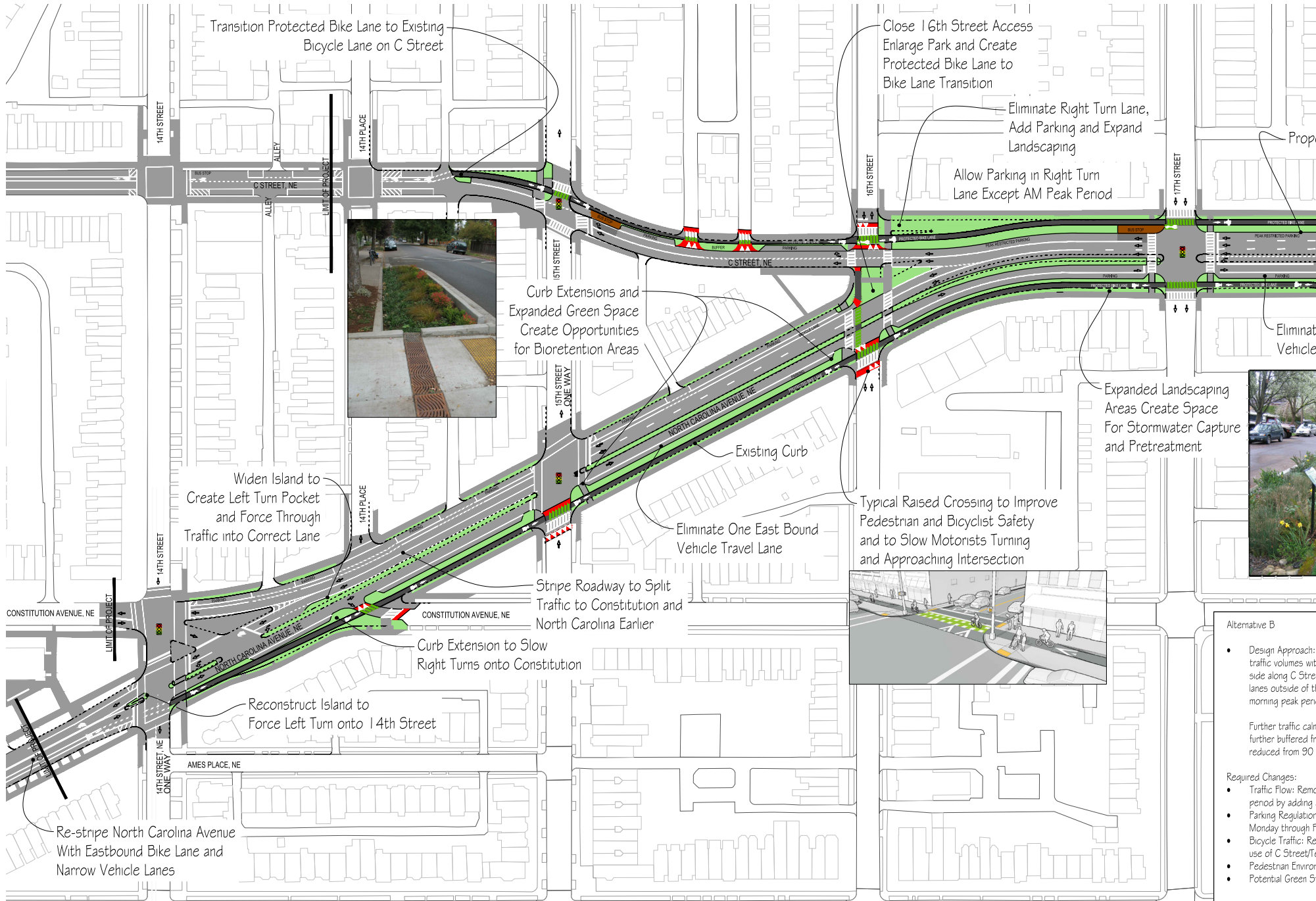
EXISTING CONDITIONS

FIGURE 11. ALTERNATIVE A TYPICAL SECTION



CONCEPT A

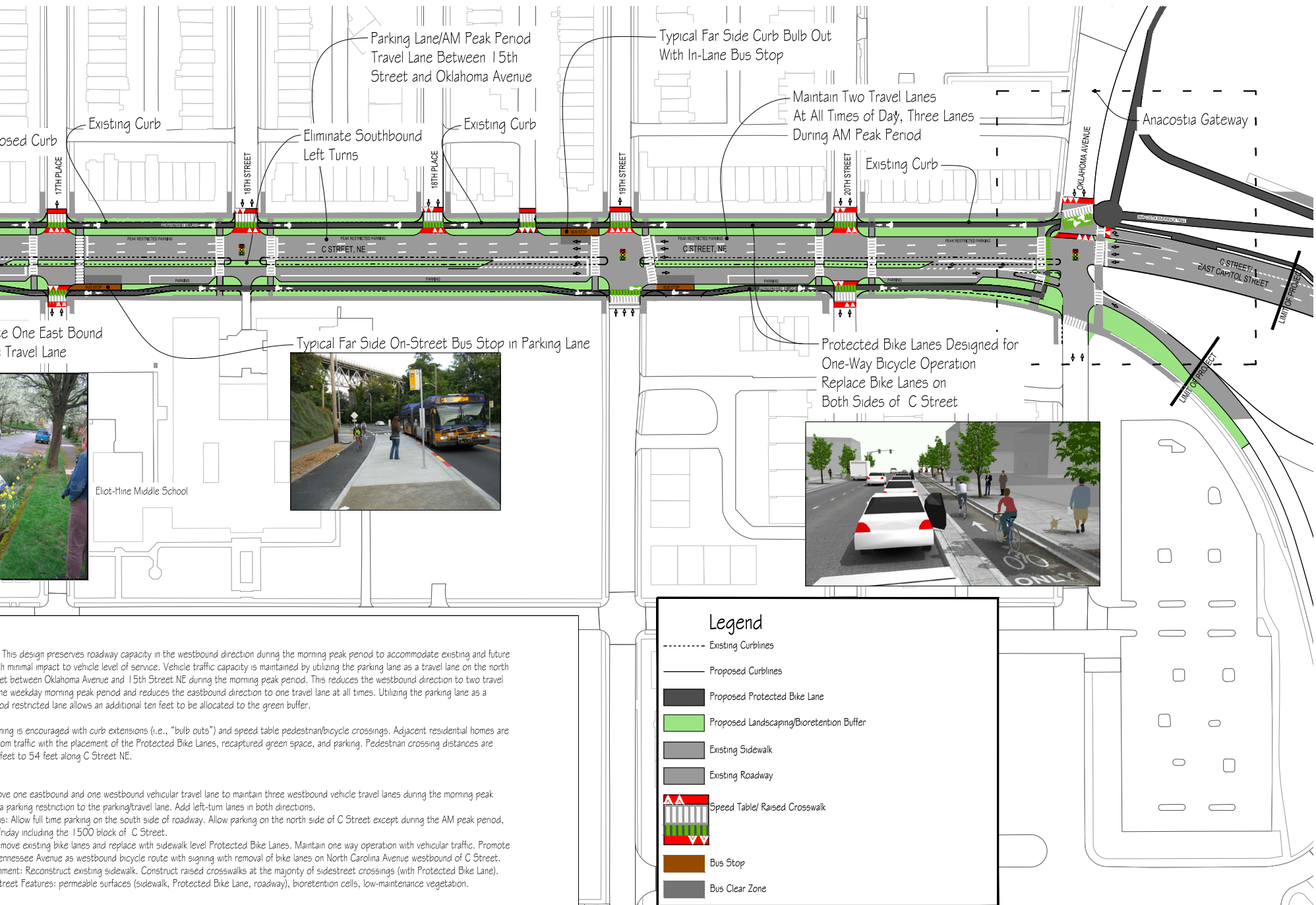
**FIGURE 12. ALTERNATIVE A CONCEPT**



**Alternative B**

- Design Approach: traffic volumes with side along C Street lanes outside of the morning peak period
- Further traffic calm further buffered from reduced from 90
- Required Changes:
  - Traffic Flow: Remove period by adding
  - Parking Regulation Monday through Friday
  - Bicycle Traffic: Reduce use of C Street/T
  - Pedestrian Environment
  - Potential Green Space





Existing Curb

Parking Lane/AM Peak Period Travel Lane Between 15th Street and Oklahoma Avenue

Typical Far Side Curb Bulb Out With In-Lane Bus Stop

Maintain Two Travel Lanes At All Times of Day, Three Lanes During AM Peak Period

Anacostia Gateway

Eliminate Southbound Left Turns

Existing Curb

One East Bound Travel Lane

Typical Far Side On-Street Bus Stop in Parking Lane

Protected Bike Lanes Designed for One-Way Bicycle Operation Replace Bike Lanes on Both Sides of C Street



Eliot-Hine Middle School



This design preserves roadway capacity in the westbound direction during the morning peak period to accommodate existing and future demand with minimal impact to vehicle level of service. Vehicle traffic capacity is maintained by utilizing the parking lane as a travel lane on the north side of C Street between Oklahoma Avenue and 15th Street NE during the morning peak period. This reduces the westbound direction to two travel lanes during the weekday morning peak period and reduces the eastbound direction to one travel lane at all times. Utilizing the parking lane as a travel lane allows an additional ten feet to be allocated to the green buffer.

Walking is encouraged with curb extensions (i.e., "bulb outs") and speed table pedestrian/bicycle crossings. Adjacent residential homes are protected from traffic with the placement of the Protected Bike Lanes, recaptured green space, and parking. Pedestrian crossing distances are increased to 54 feet along C Street NE.

Maintain one eastbound and one westbound vehicular travel lane to maintain three westbound vehicle travel lanes during the morning peak period. Add a parking restriction to the parking/travel lane. Add left-turn lanes in both directions.

Allow full time parking on the south side of roadway. Allow parking on the north side of C Street except during the AM peak period, Monday including the 1500 block of C Street.

Remove existing bike lanes and replace with sidewalk level Protected Bike Lanes. Maintain one way operation with vehicular traffic. Promote walking along Tennessee Avenue as westbound bicycle route with signing with removal of bike lanes on North Carolina Avenue westbound of C Street.

Implementation: Reconstruct existing sidewalk. Construct raised crosswalks at the majority of sidestreet crossings (with Protected Bike Lane).

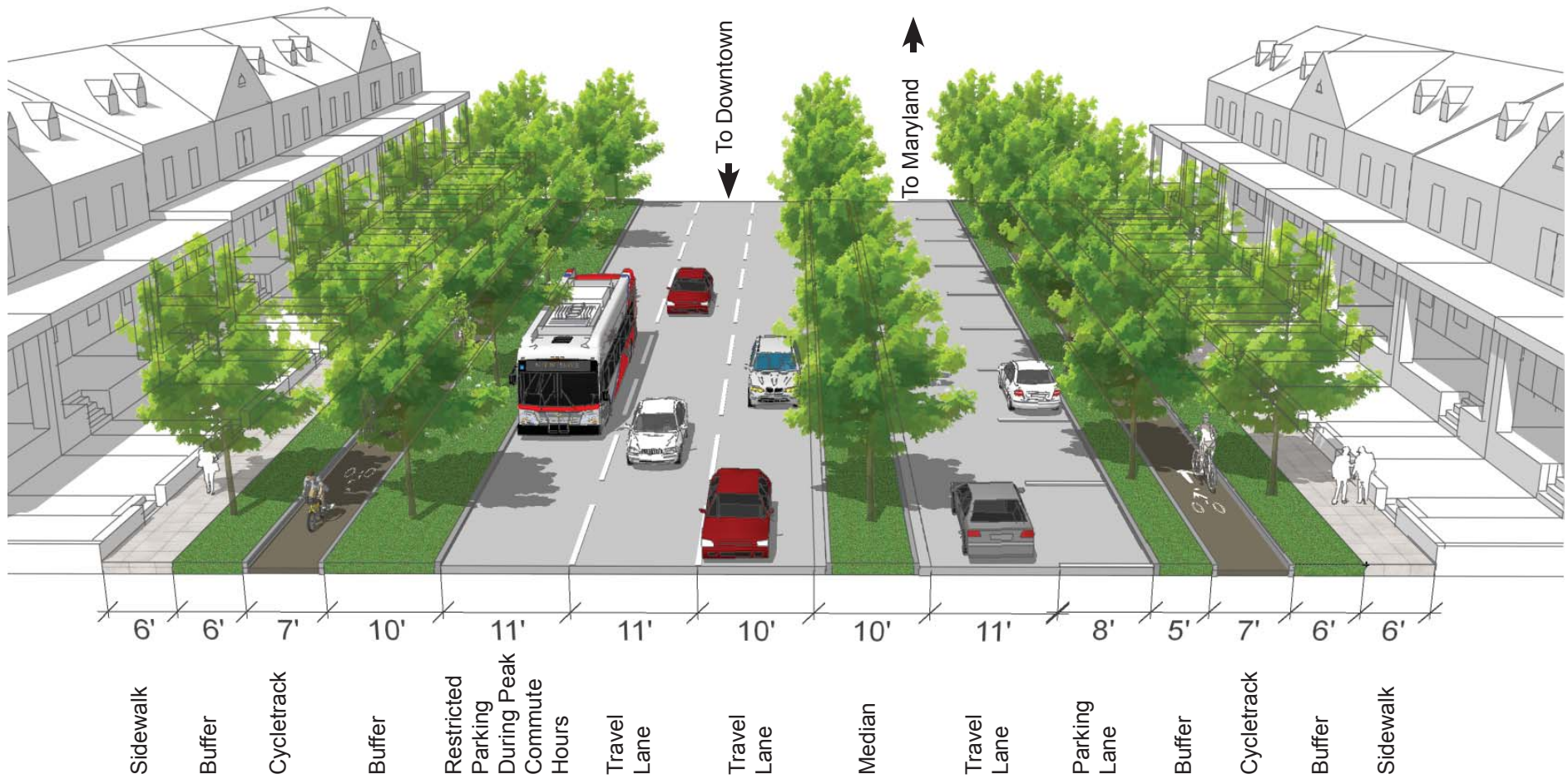
Street Features: permeable surfaces (sidewalk, Protected Bike Lane, roadway), bioretention cells, low-maintenance vegetation.

### Legend

- Existing Curblines
- Proposed Curblines
- █ Proposed Protected Bike Lane
- █ Proposed Landscaping/Bioretention Buffer
- █ Existing Sidewalk
- █ Existing Roadway
- ⚠ Speed Table/ Raised Crosswalk
- █ Bus Stop
- █ Bus Clear Zone

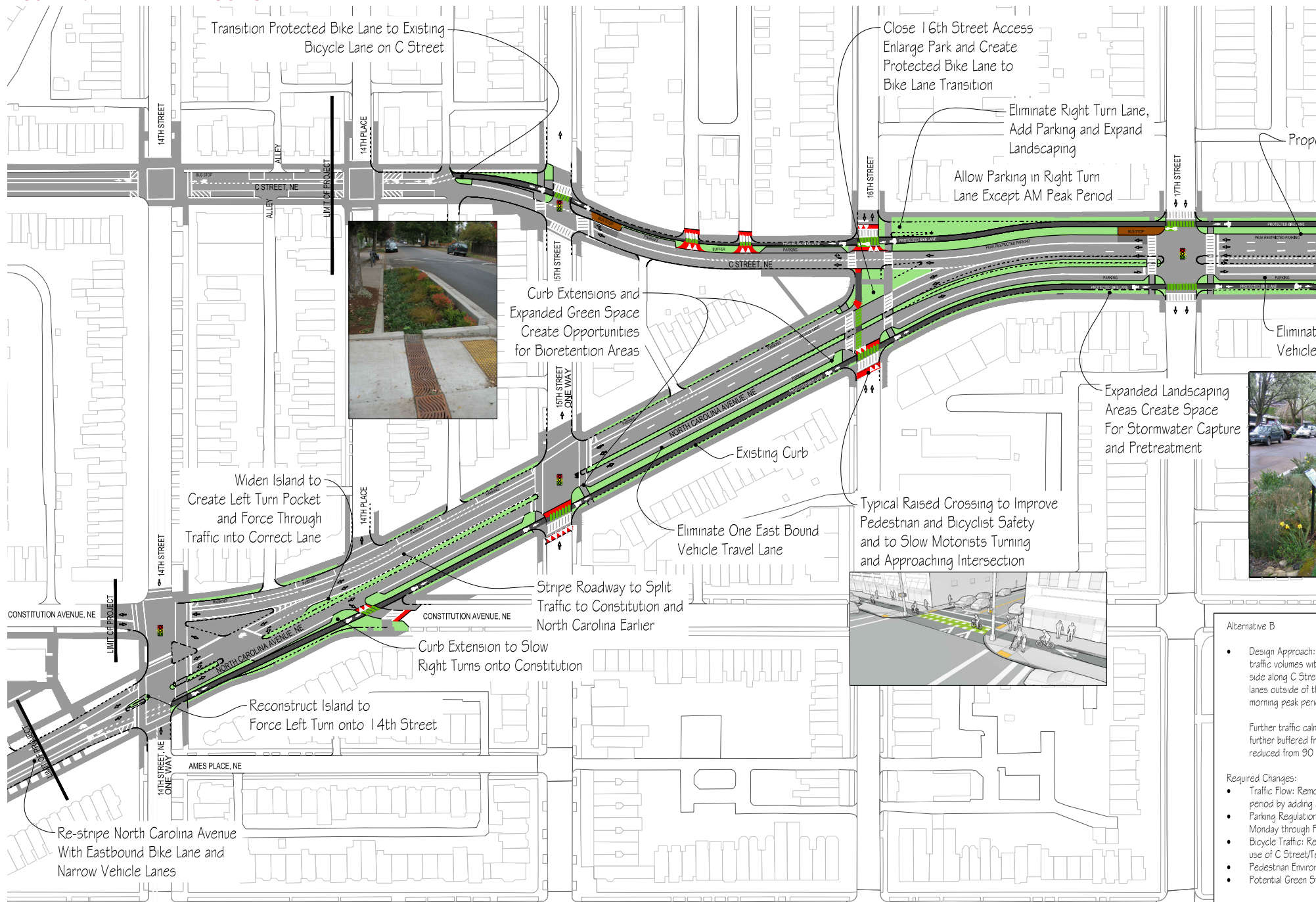


FIGURE 13. ALTERNATIVE B TYPICAL SECTION



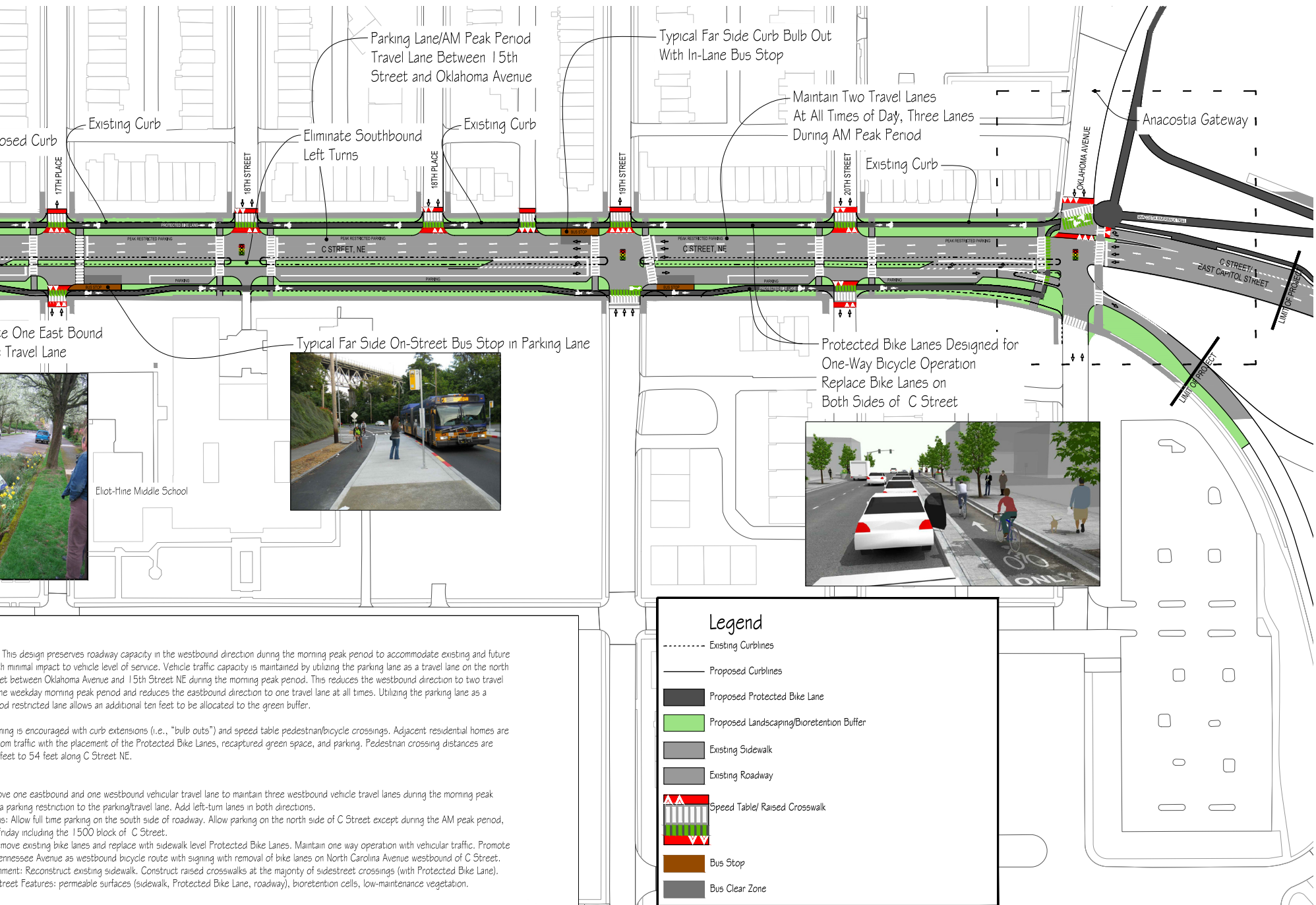
CONCEPT B

**FIGURE 14. ALTERNATIVE B CONCEPT**



Alternative B

- Design Approach: traffic volumes with side along C Street lanes outside of the morning peak period.
- Further traffic calm further buffered from reduced from 90
- Required Changes:
  - Traffic Flow: Remove period by adding
  - Parking Regulation Monday through Friday
  - Bicycle Traffic: Re-use of C Street/T
  - Pedestrian Environment
  - Potential Green S



Existing Curb

Existing Curb

Parking Lane/AM Peak Period Travel Lane Between 15th Street and Oklahoma Avenue

Eliminate Southbound Left Turns

Existing Curb

Typical Far Side Curb Bulb Out With In-Lane Bus Stop

Maintain Two Travel Lanes At All Times of Day, Three Lanes During AM Peak Period

Existing Curb

Anacostia Gateway

One East Bound Travel Lane

Typical Far Side On-Street Bus Stop in Parking Lane

Protected Bike Lanes Designed for One-Way Bicycle Operation Replace Bike Lanes on Both Sides of C Street



Eliot-Hine Middle School



This design preserves roadway capacity in the westbound direction during the morning peak period to accommodate existing and future demand with minimal impact to vehicle level of service. Vehicle traffic capacity is maintained by utilizing the parking lane as a travel lane on the north side of C Street between Oklahoma Avenue and 15th Street NE during the morning peak period. This reduces the westbound direction to two travel lanes during the weekday morning peak period and reduces the eastbound direction to one travel lane at all times. Utilizing the parking lane as a travel lane allows an additional ten feet to be allocated to the green buffer.

Walking is encouraged with curb extensions (i.e., "bulb outs") and speed table pedestrian/bicycle crossings. Adjacent residential homes are protected from traffic with the placement of the Protected Bike Lanes, recaptured green space, and parking. Pedestrian crossing distances are increased to 54 feet along C Street NE.

Maintain one eastbound and one westbound vehicular travel lane to maintain three westbound vehicle travel lanes during the morning peak period. Add a parking restriction to the parking/travel lane. Add left-turn lanes in both directions.

Allow full time parking on the south side of roadway. Allow parking on the north side of C Street except during the AM peak period, including the 1500 block of C Street.

Remove existing bike lanes and replace with sidewalk level Protected Bike Lanes. Maintain one way operation with vehicular traffic. Promote walking and bicycling along Tennessee Avenue as westbound bicycle route with signing with removal of bike lanes on North Carolina Avenue westbound of C Street.

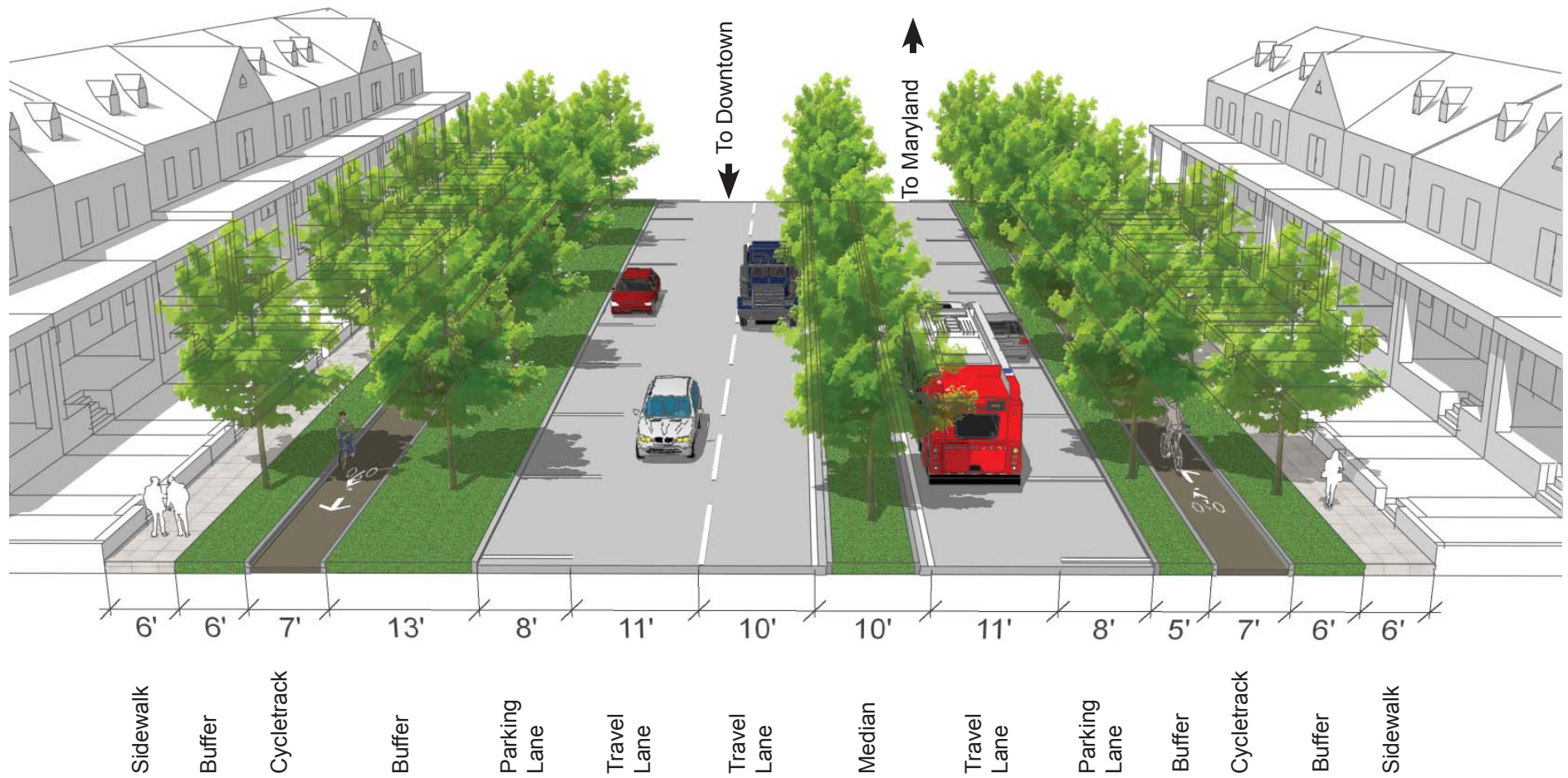
Implementation: Reconstruct existing sidewalk. Construct raised crosswalks at the majority of sidestreet crossings (with Protected Bike Lane). Street Features: permeable surfaces (sidewalk, Protected Bike Lane, roadway), bioretention cells, low-maintenance vegetation.

### Legend

- Existing Curblines
- Proposed Curblines
- █ Proposed Protected Bike Lane
- █ Proposed Landscaping/Bioretention Buffer
- █ Existing Sidewalk
- █ Existing Roadway
- █ Speed Table/ Raised Crosswalk
- █ Bus Stop
- █ Bus Clear Zone

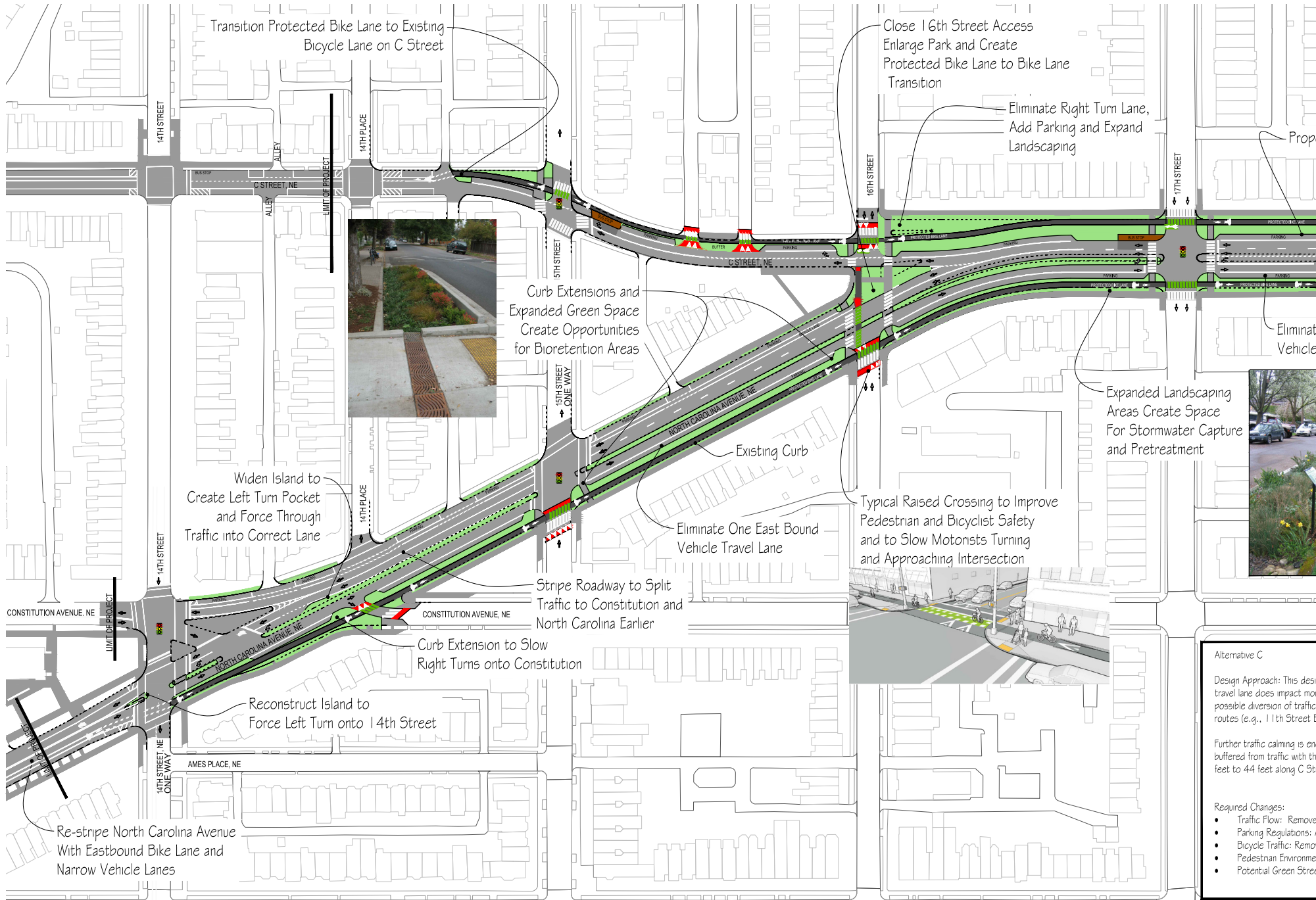


FIGURE 15. ALTERNATIVE C TYPICAL SECTION



CONCEPT C

**FIGURE 16. ALTERNATIVE C CONCEPT**



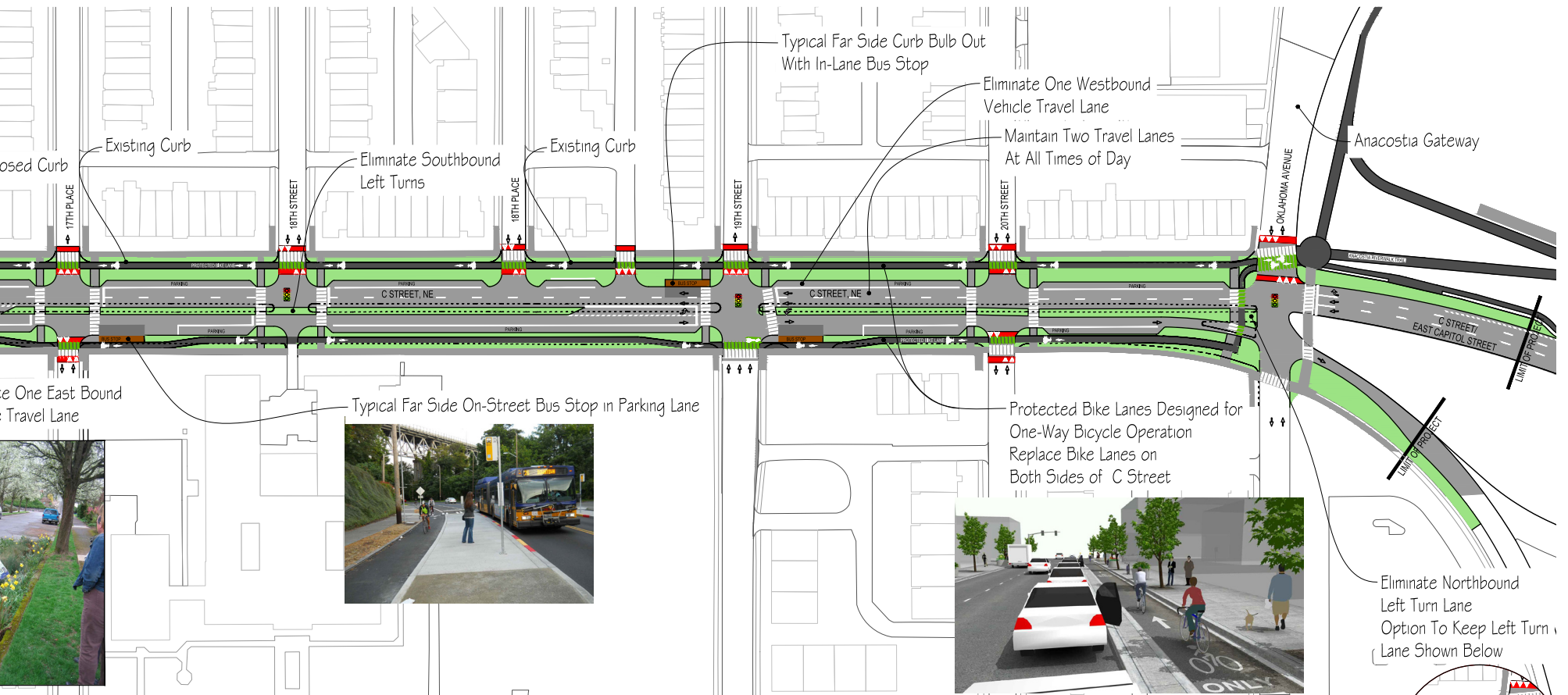
**Alternative C**

Design Approach: This design approach does impact more possible diversion of traffic routes (e.g., 11th Street)

Further traffic calming is implemented with 44 feet along C Street

- Required Changes:
- Traffic Flow: Remove
  - Parking Regulations: Add
  - Bicycle Traffic: Remove
  - Pedestrian Environment: Add
  - Potential Green Street: Add





Eliminate One East Bound Vehicle Travel Lane



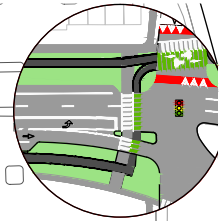
Typical Far Side On-Street Bus Stop in Parking Lane



Protected Bike Lanes Designed for One-Way Bicycle Operation Replace Bike Lanes on Both Sides of C Street



Eliminate Northbound Left Turn Lane Option To Keep Left Turn Lane Shown Below



Design eliminates one travel lane in each direction and allows full-time parking on both sides of the street. The elimination of a westbound travel lane during peak period traffic in the westbound direction, likely resulting in increased delay and queuing (i.e., vehicle "backups"), with the goal of reducing traffic to less congested parallel streets (e.g., E. Capitol Street, Constitution Avenue, D Street NE, and Benning Road) or other regional roads (e.g., the Anacostia Gateway).

Encouraged with curb extensions (i.e., "bulb outs") and speed table pedestrian/bicycle crossings. Adjacent residential homes are further protected by the placement of the Protected Bike Lanes, recaptured green space, and parking. Pedestrian crossing distances are reduced from 90 feet to 60 feet on C Street NE.

Remove one eastbound and one westbound vehicular travel lane. Add left turn lanes in both directions. Allow full time parking on both sides of roadway. Replace existing bike lanes and replace with sidewalk level Protected Bike Lanes. Maintain one way operation with vehicular traffic. Reconstruct existing sidewalk. Construct raised crosswalks at the majority of sidestreet crossings (with Protected Bike Lane). Street Features: permeable surfaces (sidewalk, Protected Bike Lane, roadway), bioretention cells, low-maintenance vegetation.

### Legend

- Existing Curblines
- Proposed Curblines
- █ Proposed Protected Bike Lane
- █ Proposed Landscaping/Bioretention Buffer
- █ Existing Sidewalk
- █ Existing Roadway
- ▲▲▲ Speed Table/ Raised Crosswalk
- █ Bus Stop
- █ Bus Clear Zone



# EVALUATION OF ALTERNATIVES

## SECTION 5

## EVALUATION OF ALTERNATIVES

A comparative evaluation was conducted for the three concept alternatives to assess their individual impacts to the street network and users, all framed by the stated project needs. The following elements were all assessed through a range of measures, both quantitatively and qualitatively, to provide a comprehensive perspective on each concept alternative. A detailed matrix (Figure 20) is also provided comparing concept alternatives based on project needs.

### SAFE AND COMFORTABLE WALKING AND BIKING CONDITIONS

Corridor safety for all users includes a range of considerations, including auto speeds, adequate sidewalk width and crossing facilities for pedestrians, dedicated space for bicyclists, and signal timing and phasing that minimizes conflicting movements. A detailed crash analysis was completed in the study area using the last three years of

available crash data (2012-204), but research and best practices were used to assess potential impacts of the proposed concept alternatives. Safety considerations include the following:

- Adding left-turn lanes at urban, four-leg intersections can result in a 19% reduction in total crashes, while injury crashes can be expected to decrease by 17% .
- Automobile speeds have a direct relationship to the severity and likelihood of crashes, with a pedestrian fatality risk of 45% at speeds between 30 and 35 mph and 85% at speeds greater than 40 mph.
- Wider travel lane widths are shown to have a direct correlation to higher vehicle speeds , which in turn, increases the likelihood of crashes and crash severity.

The perception of safety is a key consideration when assessing the facilities for pedestrians and bicyclists along a roadway and at intersections. If these users do not feel safe, then regardless of available crash data results, the facility should not be considered safe. Including improved pedestrian and bicycle amenities can improve the safety for these users, including wider sidewalks, shorter crossing distances, buffers and trees between travel lanes and sidewalks, dedicated and marked space for bicyclists, human-scale lighting, and slower traffic speeds.

Many of these safety considerations are included in all concept alternatives, including buffers between sidewalks, bicycle

facilities, and the street; improved lighting; fewer travel lanes to potentially reduce speeds; and travel lanes no wider than 11 feet. The primary difference in the concept alternatives is the number of westbound travel lanes and buffer widths between the street and protected bike facility. The number of lanes will undoubtedly have an impact on automobile speeds and, as a result, will affect the comfort of pedestrians and cyclists along the roadway and crossing the roadway. Likewise, speeds will affect the severity of potential crashes involving non-automobile roadway users. Lastly, the number of lanes will also affect crossing times of C Street NE, with longer crossings resulting in more exposure to traffic and a greater potential for users to be “stranded” in the median.



*While some areas of the study area are comfortable for walking, the Alternatives seek to improve upon this, particularly for crossing conditions.*



*High speeds on C Street NE often result in unsafe and uncomfortable biking conditions.*

## AUTOMOBILE ACCESS, SAFETY AND MOBILITY

Measuring impacts to vehicular delay and mobility includes many factors which can be measured quantitatively, including delay and congestion, queuing, speeds, and traffic impacts to streets in the study area. A comprehensive traffic operations and diversion analysis was completed to understand these auto impacts to motorists, non-motorists, residents, and business owners in the area. The 2040 No-Build and Build Traffic Operations summary (**Figures 17 and 18**) provides a high level comparison of intersection operations by total intersection level of service and 95th percentile queuing for each concept alternative under AM peak hour conditions. The figures include only AM peak hour conditions due to the heavy morning traffic volumes, while the PM peak hour volumes are uncharacteristically low and not a prominent factor in assessing traffic impacts.

As detailed in **Figure 18**, there are few instances under all Alternatives where the delay is shown to have substantial negative impacts in future conditions. The most noteworthy impact is the queuing under Alternative C in the westbound direction, where traffic is projected to queue through some intersections during AM peak hour conditions. The potential queuing issues would likely occur for no more than two hours per day and are not a factor during PM peak hour conditions.

Potential traffic diversion was also considered under future build conditions for each alternative.

Under Alternatives A and B, no traffic diversion was modeled, primarily because both alternatives maintain three westbound travel lanes during the AM peak hour. However, under Alternative C, some traffic diversion is projected due to the removal of a westbound travel lane. As noted in **Figure 19**, AM Peak Hour Traffic Diversion, approximately nine percent of the AM peak hour traffic is expected to divert elsewhere, with minor increases in traffic volumes expected to occur on some parallel facilities, including D Street, Constitution Avenue, and East Capitol Street. Approximately three percent of AM peak hour traffic is projected to divert before crossing the C Street NE Bridge, most of it to Benning Road or the 11th Street Bridge.

Parking impacts under Alternatives A and C will be mostly negligible with a slight increase in parking supply because curb extensions allow vehicles to park closer to intersections. The parking supply would increase from 105 total on-street spaces to 120 on-street spaces for Alternatives A and C. Under Alternative B, on-street parking would be restricted during the AM peak period to allow for a third westbound travel lane, thereby reducing the on-street parking supply significantly (from 105 spaces to 60 spaces).

As noted in the assessment of walking and biking conditions, the impacts of several of the design modifications under all alternatives would likely improve safety conditions on the corridor. In particular, the expected reduction in auto speeds and inclusion of dedicated left-turn lanes will likely



*Relatively heavy westbound morning commuter traffic approaching 21st Street NE from the E. Capitol Street Bridge.*

result in less severe crashes and a reduction in left-turn angle and sideswipe crashes. The elimination of the eastbound left-turn lane and restriction of left turns at 21st Street NE will also decrease the overall number of potential safety conflicts on the corridor.

## ACCESS TO TRANSIT

All transit users are pedestrians before and after a bus or Metro ride. In many ways, ensuring safe access to transit includes many of the elements that also improve conditions for pedestrians, including wider sidewalks and waiting areas, slower automobile speeds, and safer and shorter crossing facilities. Many of these elements are discussed in the previous assessment of walking and biking conditions.

Additionally, by consolidating two closely spaced bus stops in the westbound direction (18th Place NE and 18th Street NE), moving the westbound stops into the outside travel lane (as opposed to curbside), and moving all near-side bus stops to the far side of intersections, bus travel times will likely improve due to fewer stops, reduction in traffic signal delay, and because buses will no longer be required to pull-out into oncoming traffic. The downside of such a recommendation is that the bus stop at 18th Street NE will be removed, and the closest stop will be at 19th Street NE, which is approximately 325 feet to the east. According to Fall 2014 data from WMATA, the stop at 18th Street NE accommodates an average of 35 boardings and 8 alightings per day during the week, which suggests that this stop could be combined with another stop as previously noted.



*Lack of transit facilities (e.g., shelters, benches, adequate space) on C Street NE is substantially improved under all proposed Alternatives.*

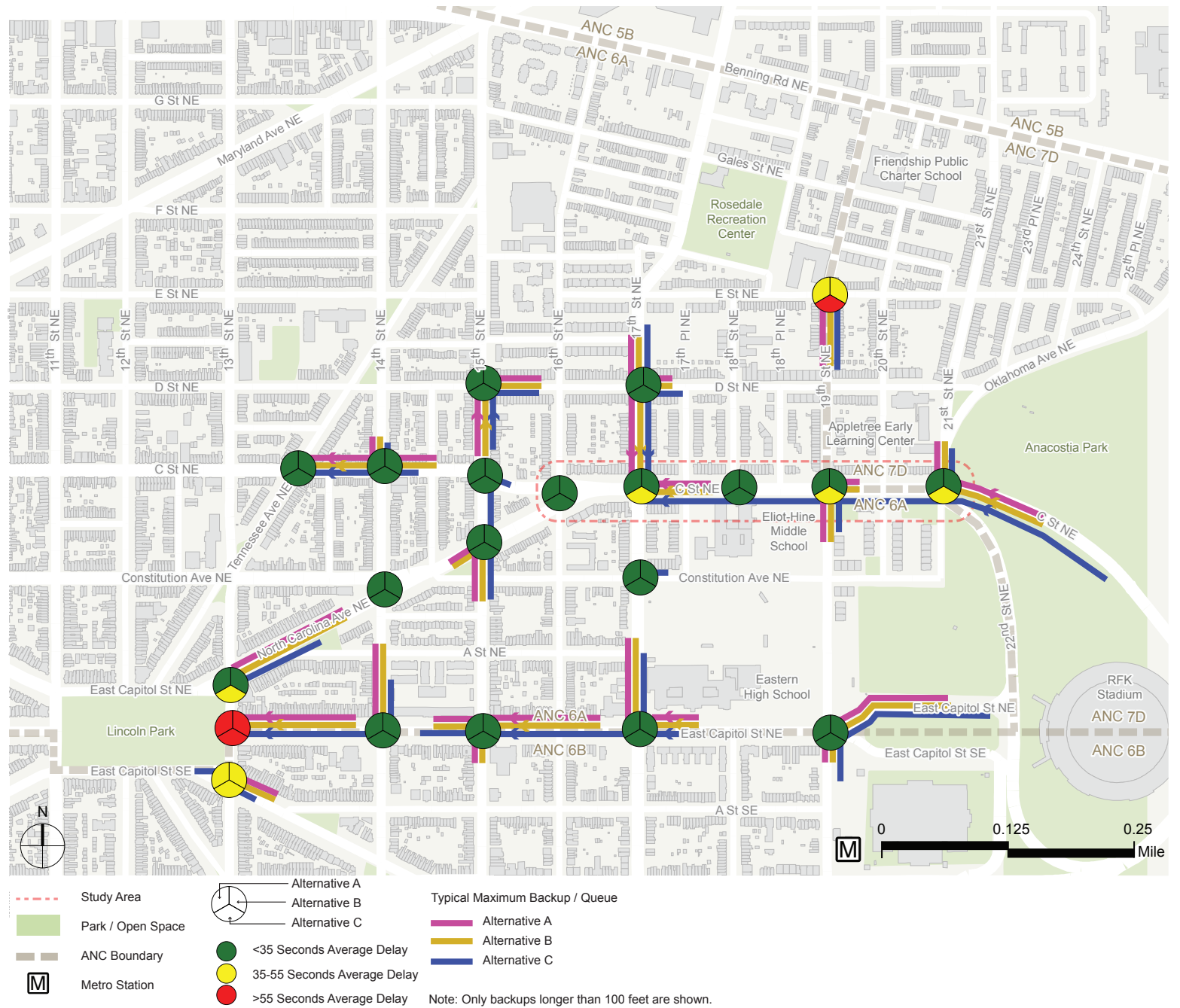
## COMPARING ALTERNATIVES

**Figure 20**, Alternatives Evaluation, provides a comparable evaluation of the aforementioned needs and measures for each of the Alternatives on C Street NE. While the circles indicating “More Desirable,” “Desirable” and “Less Desirable” offer a simplified comparison of analysis results, they do reflect the quantitative and qualitative evaluation conducted to address all of the stated project needs.

**FIGURE 17. 2040  
NO-BUILD TRAFFIC  
OPERATIONS (AM PEAK  
HOUR)**

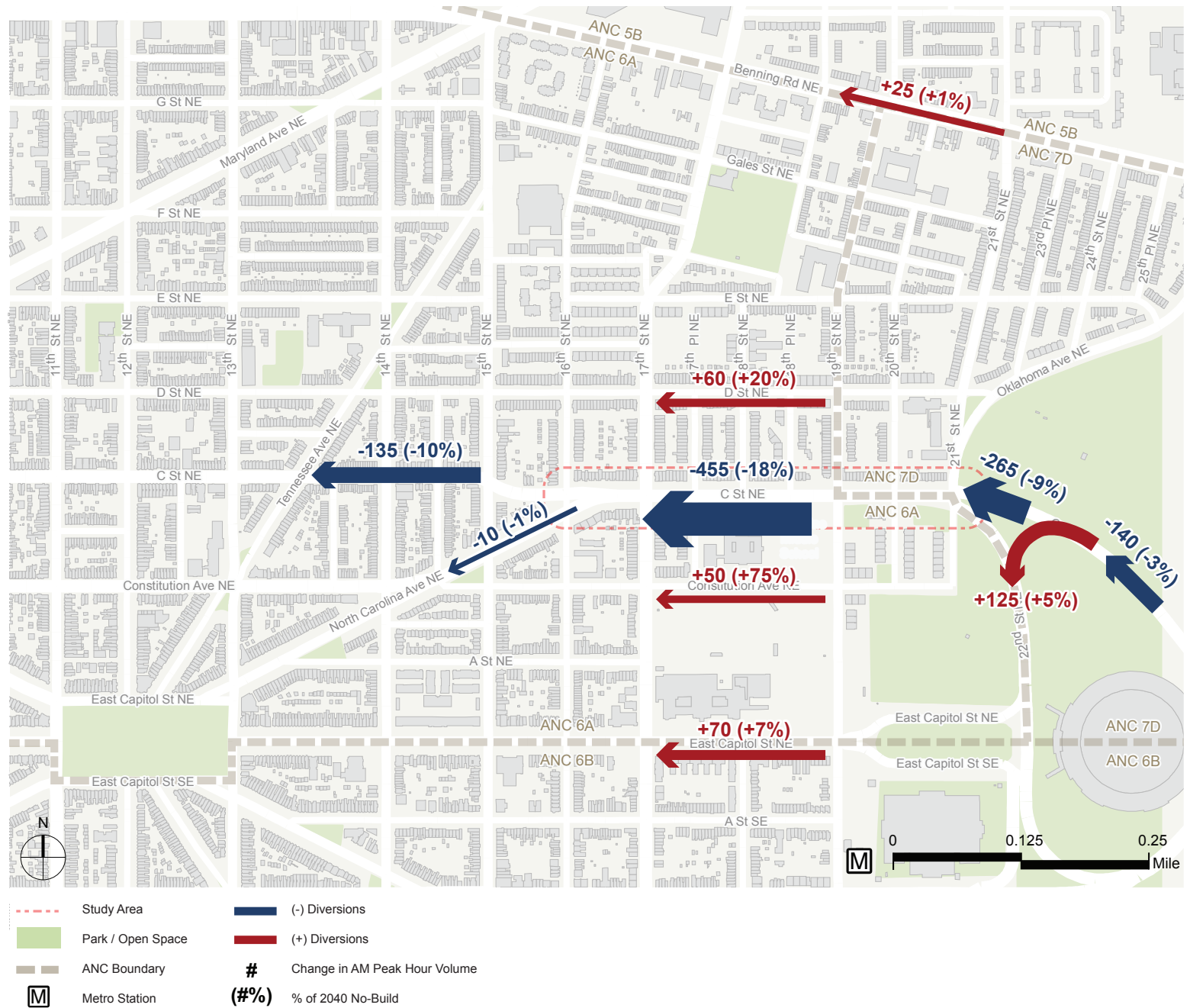


**FIGURE 18. 2040 BUILD TRAFFIC OPERATIONS (AM PEAK HOUR)**





**FIGURE 19. POTENTIAL TRAFFIC DIVERSION FOR 2040 ALTERNATIVE C (AM PEAK HOUR)**



**FIGURE 20. ALTERNATIVES EVALUATION MEASURES**

FOCUS AREA	PERFORMANCE MEASURE	EVALUATION METHOD	NO-BUILD	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVES		
							A	B	C
Safe and Comfortable Pedestrian Conditions	1A Crossing Distance / Time	Crossing Distance Between Curbs / Average Crossing Time Between	88 feet / 26 seconds	54 feet / 16 seconds	54 feet / 16 seconds	43 feet / 13 seconds			
	1B Buffer From Moving Traffic	Buffer Width Between Sidewalk and Auto Travel Lane	19 feet	31 feet	31 feet / 41 feet	44 feet			
	1C Auto Speeds	85th-Percentile Auto Speeds	High	Medium	Medium	Low			
	1D Auto Volumes	Westbound AM Peak Hour Auto Volume	2,800 vehicles per peak hour	2,800 vehicles per peak hour	2,800 vehicles per peak hour	2,400 vehicles per peak hour			
Safe and Comfortable Bicycling Conditions	2A Buffer from Moving Traffic / Parked Vehicles	Buffer Width Between Bicycle Facility and Roadway	None	3 feet	11 feet	14 feet			
	2B Auto Speeds	85th-Percentile Auto Speeds	High	Medium	Medium	Low			
	2C Auto Volumes	Westbound AM Peak Hour Auto Volume	2,800 vehicles per peak hour	2,800 vehicles per peak hour	2,800 vehicles per peak hour	2,400 vehicles per peak hour			
Automobile Access, Safety, and Mobility	3A Vehicle Delay	Average AM Peak Delay at 4 Signalized Intersections	20 seconds per vehicle	27 seconds per vehicle	27 seconds per vehicle	31 seconds per vehicle			
	3B Queuing	95th-Percentile Queue, Westbound AM at C Street / 21st Street	500 feet	625 feet	625 feet	950 feet			
	3C Neighborhood / Local Street Impact (Traffic Diversion)	Average Delay and Queuing at Non-C Street Intersections	Low	Low	Low	Medium			
	3D Availability of On-Street Parking	Number of Parking Spaces	105 spaces	120 spaces	120 Off-Peak / 60 AM Peak spaces	120 spaces			
	3E Safety Impacts	Safety Conflicts	124	112	112 AM / 96 PM	96			
Access to Transit	4A Bus Shelter / Amenity Zone Space	Available Space for Waiting Area	No Shelter, Limited Space	Good	Good	Very Good			
	4B Crossing Distances	Crossing Distance Between Curbs	88 feet	54 feet	54 feet	43 feet			
Environmental	5A Green Infrastructure / Permeable Space	% Permeable Space	20%	23%	27%	31%			
	5B Noise	Traffic Volume and Speed	2,800 vehicles per hour / High Speed	2,800 vehicles per hour / Medium Speed	2,800 vehicles per hour / Medium Speed	2,400 vehicles per hour / Low Speed			

More Desirable  
 Desirable  
 Less Desirable

## RECOMMENDING AN ALTERNATIVE

Recommending a single alternative for C Street NE is an act of balancing the needs of all users, as well as maintaining perspective on the role of the roadway in the larger transportation network. The development of a corridor vision has progressed since the 2010 C Street NE study. Likewise, working with a range of community advisors and residents has enabled the project team to document the most important elements for the community as it relates to C Street NE and the surrounding street network. At times, the function of a street may come at odds with how the surrounding community desires for the street to operate, but these various opinions on the future of C Street NE shape the Purpose and Need statement and the resulting analysis and public outreach that must occur to balance the range of views.

## STREET FUNCTION

The role of C Street NE in moving people can be traced to its classification of “minor arterial” in the District’s functional classification system. While C Street NE is important for the mobility of all modes, it also creates a barrier between residents and schools. Additionally, C Street NE is identified as a “Boundary Street” in the original L’Enfant Plan, so potential changes to the street need to be sensitive to its historic function. The District Department of Transportation can make recommendations on context-based design for the corridor, with



Residents discussing Alternatives at Public Meeting #2.

the understanding that C Street NE must still carry travelers efficiently between communities east of the Anacostia River and other areas of the District.

## COMMUNITY VISION

Decreasing traffic volumes on C Street NE have changed the user perspective of how the corridor should look and function. For years, C Street NE has been a vital artery into Capitol Hill for commuters from other areas of the District and beyond. Conversely, the street acts as a front door to two major neighborhood schools, as well as many residences, and the number of non-auto users has been increasing. C Street NE is a major link in the District’s transit system and is a key connection between major bus routes and the Stadium/Armory Metro station. Residents of the C Street NE study area seek improved

conditions for moving about the corridor in a safe and convenient multimodal manner. During the study, residents of the study area and community leaders all expressed a desire to provide safer conditions for walking, bicycling, and residing along C Street NE, while also maintaining on-street parking access and a degree of mobility for autos and emergency vehicles. High vehicle speeds, long pedestrian crossing distances, and poor bus stop conditions all result in an uncomfortable experience for non-auto users. Past studies, including the 2010 Capitol Hill transportation study, all recognized the importance of this corridor in serving a wide range of activities and a large number of users.

## OTHER CONSIDERATIONS

Choosing a recommended alternative for C Street NE

ultimately balances the intended use of the corridor as a regional facility, with the desires by many stakeholders for it to serve the residents’ needs. These two items must be checked against physical constraints present in the corridor (i.e., adequate space and historic preservation). Three Alternatives were developed, analyzed, and shared with the community during the public meetings. The community expressed overwhelming support for Alternative C during the public outreach process. Refinements to the Alternative have also been made that closely consider community comments and desires, as well as the supporting analysis.

## RECOMMENDATION

*The project team recommends moving forward with preliminary design on Alternative C.*

This best addresses many of the issues encountered in the study area and listed in the project purpose and need, and it has the strong support of the community. While there are noted queuing issues at a few locations for 1 to 2 hours in the AM peak period, no other operational issues are shown to occur under future build conditions for the remaining 22 hours of the day. With that being said, the impacts of diverted trips to residents on parallel facilities (most notably D Street NE, Constitution Avenue NE, and East Capitol Street) should not be discounted. These potential impacts were broadly communicated to the public on two separate occasions.

## FEATURES OF THE RECOMMENDED ALTERNATIVE

The Recommended Alternative (Alternative C) is considered the most balanced of the three Alternatives and broadly includes the following elements and considerations for each transportation mode:

### PEDESTRIAN CONDITIONS

By removing a lane in each direction of C Street NE, the pedestrian crossing distances across C Street NE become approximately 22 to 24 feet shorter. This corresponds to a six- to eight-second reduction in the length of time required for average pedestrians to cross C Street NE (assuming a 3.5 feet per second walking speed), and additional curb extensions may make crossing distances and times even shorter. A shorter crossing distance also reduces the length of pedestrian exposure to motor vehicle traffic, making it safer to cross the street. This is particularly important given the number of schools and bus stops along the corridor. It will also be important to incorporate ADA-compliant facilities into the Recommended Alternative Design, including upgraded ramps. Additional ADA upgrades will include paved crossing locations spaced at equal intervals throughout the bio-retention zone, between the bicycle facility and parking area. The crossing locations will allow pedestrians to easily access the sidewalk from the street, eliminating the need to walk through the planted drainage area or walking to the end of the block to access the sidewalk.



*An example on Sherman Avenue NW where a curb extension and median refuge provides a shorter crossing distance and reduces exposure to moving traffic.*

Finally, slower motor vehicle speeds associated with the reduced number of travel lanes will likely make it more comfortable for walking and potential incidents may be less severe.

### BICYCLING CONDITIONS

While bike lanes are already provided in both directions of C Street NE, the Recommended Alternative (Alternative C) includes fully-separated seven-foot wide bike lanes, which will make it much more comfortable for bicyclists to ride the corridor. Additionally, slower auto speeds associated with the reduced number of lanes on C Street NE in the Recommended Alternative will make it more comfortable for bicycling. Bicycle facilities such as those proposed in the Recommended Alternative are a major step in accommodating a relatively large percentage of the population that are interested in bicycling but are still too uncomfortable to bike on our City streets, even those like C Street NE where standard bike lanes are present. Protected bike facilities such as those proposed have been shown across the country to attract a larger demographic of bicyclists

of varying skillsets, including children and senior citizens. It also ensures that the Anacostia Park can more readily be accessed by those on foot and bicycle.

### AUTO CONDITIONS

The auto capacity on C Street NE is reduced for the entire length of the corridor in both directions, but in reality, the demand will be well below capacity for much of the typical weekday. Although the number of lanes is reduced in the Recommended Alternative, the reduced pedestrian crossing times will actually allow for more green time to be allocated to C Street NE from the side street movements during peak travel periods, if necessary. The reduced roadway cross section of C Street NE will likely reduce speeds to be closer to the posted speed limit.

### TRANSIT ACCESS CONDITIONS

The additional green space and buffer between the roadway and sidewalk, as well as reduced traffic noise due to slower auto speeds, will improve the waiting environment

at bus stops and walking to and from bus stops along C Street NE. Additionally, the removal and/or relocation of some bus stops will improve route travel times by consolidating stops with low ridership.

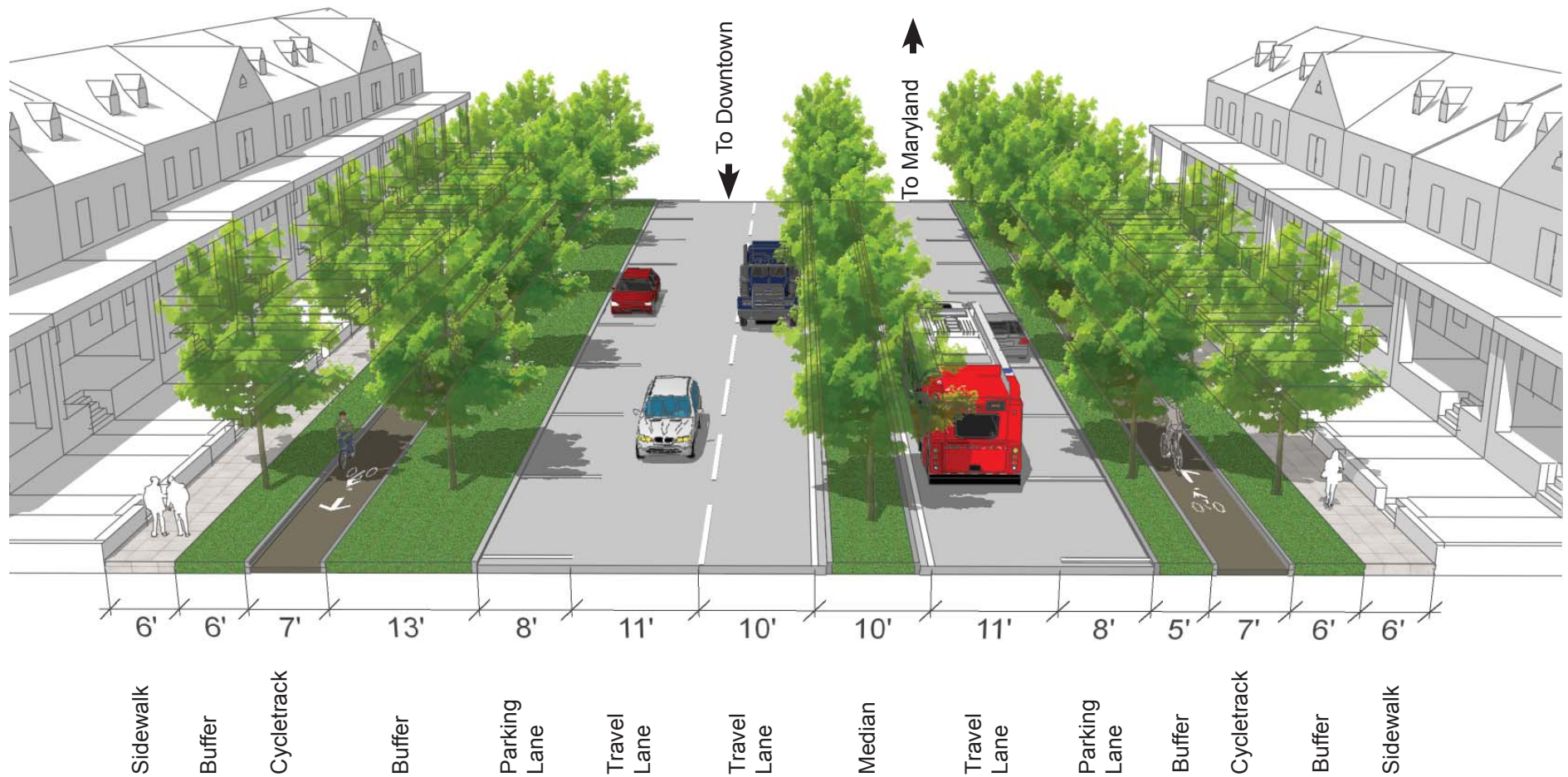
### LOW IMPACT DEVELOPMENT

In addition to addressing transportation challenges, the Recommended Alternative results in substantial environmental benefits. By reducing the number of travel lanes and dedicating space to provide bio-swales, rain gardens, trees, planting strips, and other Low Impact Development (LID) tools and strategies, the recommended improvements result in a net increase in permeable surfaces throughout the study area.



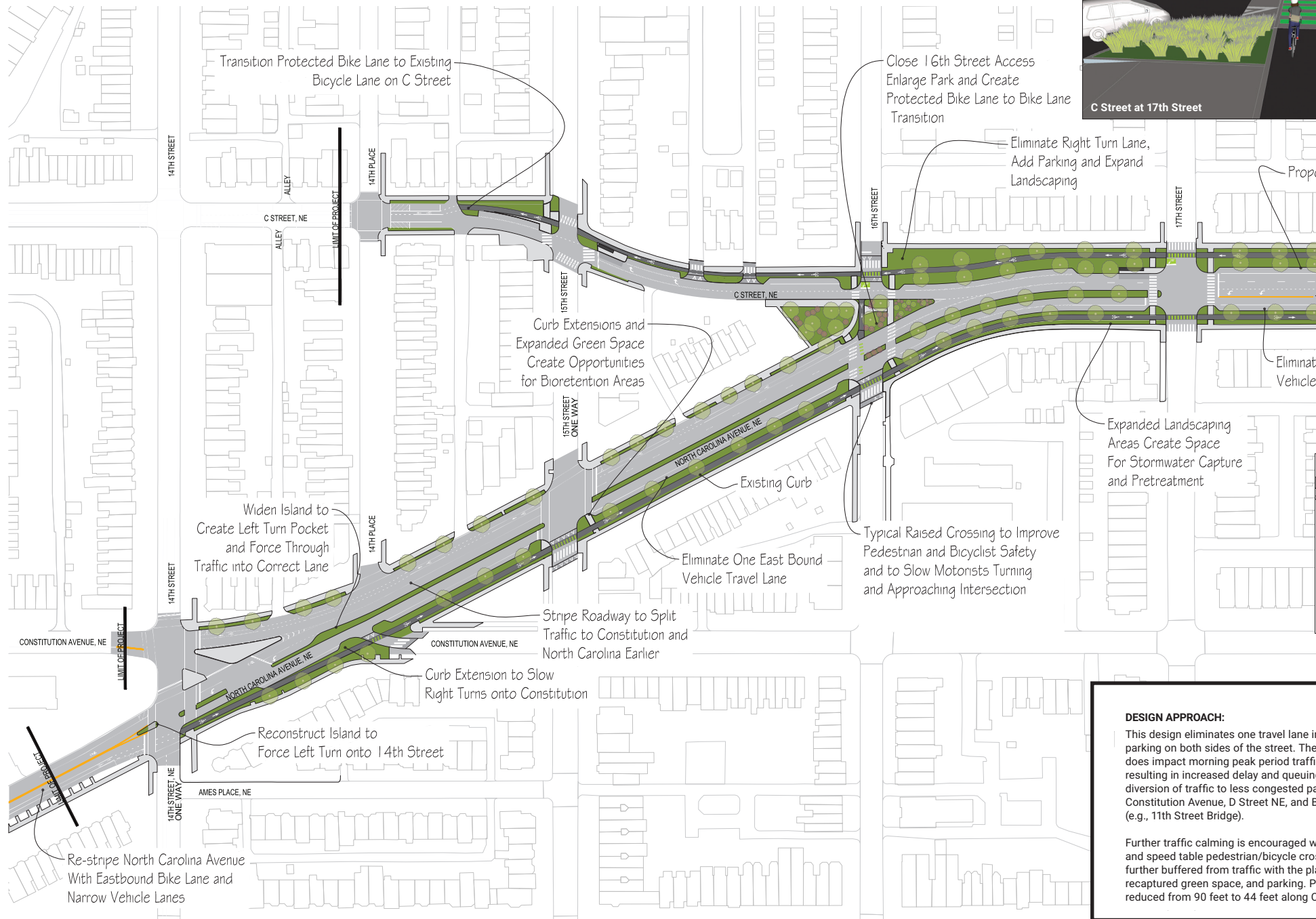
*Low impact development at Navy Yard on 3rd Street SE.*

FIGURE 21. RECOMMENDED ALTERNATIVE CROSS SECTION



RECOMMENDED ALTERNATIVE

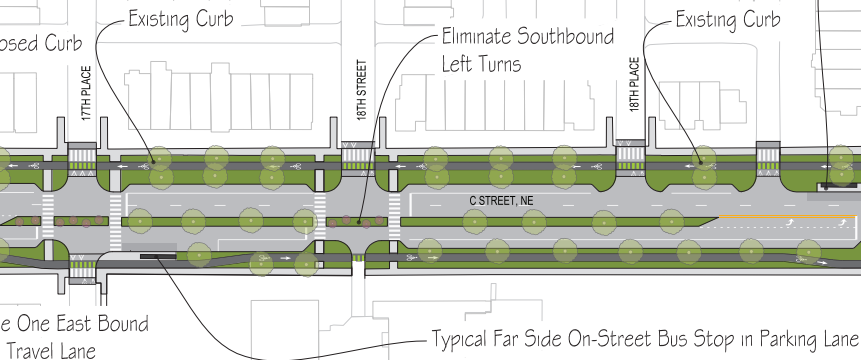
**FIGURE 22. RECOMMENDED ALTERNATIVE CONCEPT**



**DESIGN APPROACH:**

This design eliminates one travel lane in parking on both sides of the street. This does impact morning peak period traffic resulting in increased delay and queuing. Diversion of traffic to less congested parts of Constitution Avenue, D Street NE, and E Street NE (e.g., 11th Street Bridge).

Further traffic calming is encouraged with speed table pedestrian/bicycle crossings further buffered from traffic with the planted and captured green space, and parking. Parking is reduced from 90 feet to 44 feet along C Street.



Typical Far Side Curb Bulb Out With In-Lane Bus Stop

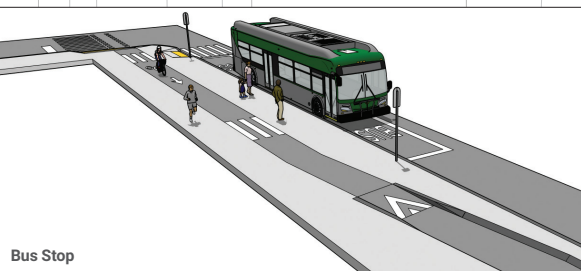
Eliminate One Westbound Vehicle Travel Lane

Maintain Two Travel Lanes At All Times of Day

Eliminate One East Bound Travel Lane

Typical Far Side On-Street Bus Stop in Parking Lane

Protected Bike Lanes Designed for One-Way Bicycle Operation Replace Bike Lanes on Both Sides of C Street



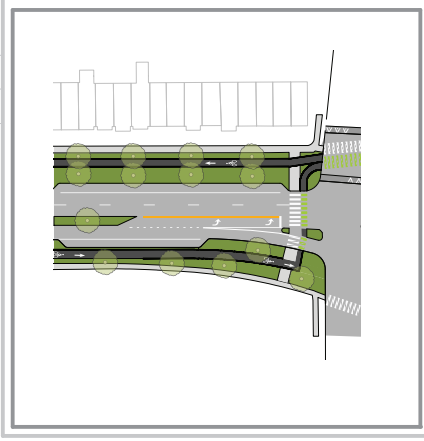
Bus Stop



C Street at Oklahoma Avenue/21st Street



Eliminate Northbound Left Turn Lane Option To Keep Left Turn Lane Shown Below



**REQUIRED CHANGES:**

- **Traffic Flow:** Remove one eastbound and one westbound vehicular travel lane. Add left turn lanes in both directions.
- **Parking Regulations:** Allow full time parking on both sides of roadway.
- **Bicycle Traffic:** Remove existing bike lanes and replace with sidewalk level Protected Bike Lanes. Maintain one way operation with vehicular traffic.
- **Pedestrian Environment:** Reconstruct existing sidewalk. Construct raised crosswalks at the majority of sidestreet crossings (with Protected Bike Lane).
- **Potential Green Street Features:** permeable surfaces (sidewalk, Protected Bike Lane, roadway), bioretention cells, low-maintenance vegetation.

in each direction and allows full-time elimination of a westbound travel lane in the westbound direction, likely causing vehicle "backups", with possible impacts on parallel streets (e.g., E. Capitol Street, Benning Road) or other regional routes

with curb extensions (i.e., "bulb outs") at intersections. Adjacent residential homes are the placement of the Protected Bike Lanes, pedestrian crossing distances are increased on C Street NE.

## CONSIDERATIONS FOR PROJECT DEVELOPMENT AND DESIGN

Addressing safety and mobility needs on C Street NE may improve conditions for many users but may also present specific design challenges that must be addressed during the design phase of the project. Likewise, the rethinking of how the corridor operates and serves its users may also present opportunities that must be considered during the design phase of the project.

### EASTBOUND LEFT-TURN LANE AT 21ST STREET NE/ OKLAHOMA AVENUE NE

One key component in addressing traffic operations for the Recommended Alternative is the C Street NE/21st Street NE/Oklahoma Avenue NE intersection, which currently has a dedicated left-turn lane and a protected left-turn phase from eastbound C Street NE to northbound 21st Street NE/Oklahoma Avenue NE. The presence of this left turn phase limits the amount of available green time for the westbound movement, which has heavy demand during the morning rush hour. Under today's current layout with three westbound lanes this presents no mobility issues, but with the recommended removal of a westbound travel lane on C Street NE, the green time becomes more crucial to processing the heavy morning westbound traffic volumes.

Traffic counts show that the eastbound left-turn demand is low and varies from approximately



*Eastbound left-turn lane at 21st Street NE/Oklahoma Avenue NE.*

30 vehicles per hour during the morning to 80 vehicles per hour in the evening. Additionally, the curved alignment of C Street NE through the intersection creates longer pedestrian crossings than at other intersections along the corridor. To provide more westbound capacity at the intersection and to increase the amount of pedestrian refuge space in the median, the project team is recommending removal of the eastbound left-turn lane. Eastbound left turns will be diverted two blocks to the west at 19th Street NE and then one block to the north at D Street NE.

Considerations were also given to an eastbound left-turn permissive phase and various signal timing and phasing modifications at 21st Street to promote connectivity in the area,

but due to sight distance issues and lack of improvement with various signal timing modifications, the presence of a left-turn is problematic to providing efficient auto mobility in the area.

### ROADWAY TRANSITION EAST OF 21ST STREET NE/ OKLAHOMA AVENUE NE

An additional design consideration for the Recommended Alternative is the transition of C Street NE westbound from three to two westbound lanes east of 21st Street NE. Currently the westbound approach includes three westbound through lanes (this is consistent with the number of lanes on the bridge) with a right-turn lane of approximately 275 feet. The recommendation is to "fill in" the existing right-turn lane and convert the outside through lane to a right-turn lane. This outside lane effectively becomes a trap lane for motorists traveling through the intersection and will require a merge into through lanes. Due to higher speeds coming across the bridge, signing and pavement markings detailing this lane-shift maneuver should be installed well before the intersection to allow adequate time and space for motorists to merge into the two through lanes.



## DESIGN ELEMENTS AT THE C STREET NE AND NORTH CAROLINA AVENUE NE "SPLIT"

Westbound C Street NE currently transitions from three to two lanes at the intersection with North Carolina Avenue NE by allowing motorists in the center lane to choose between C Street NE and North Carolina Avenue NE. Two travel lanes continue onto North Carolina Avenue NE and two lanes continue on C Street NE, but one of the through lanes on C Street NE becomes a right-turn lane at 15th Street. With the reduced lane configuration in the Recommended Alternative, both lanes of C Street NE will continue onto North Carolina Avenue NE, and only motorists in the right lane will be able to continue onto C Street NE.

This proposed configuration is more consistent with the number of receiving lanes, and also eliminates the drop lane that exists today that causes some queuing in the morning. Bike lanes are currently located on C Street NE and North Carolina Avenue NE, and the configuration requires westbound bicyclists to merge across two lanes of traffic in order to continue onto North Carolina Avenue NE. The Recommended Alternative will require westbound bicyclists wishing to travel on North Carolina Avenue to make a two-state left-turn crossing at 16th Street, utilizing a queue box at 16th Street and then traveling through the refuge area between C Street NE and North Carolina Avenue NE.

Currently, eastbound North Carolina Avenue NE consists of one lane west



Westbound "split" where C Street NE continues to the immediate west as westbound only and North Carolina Avenue NE travels southwest towards Lincoln Park as a two-way street.

of 14th Street NE and two lanes from 14th Street NE to C Street NE. Under the Recommended Alternative, eastbound North Carolina Avenue NE will be reduced to one lane from 14th Street NE to C Street NE in order to maintain a continuous number of lanes. Similar to C Street NE, there is excess capacity on North Carolina Avenue NE, and the space from the removed lane can be converted into additional green space and a protected bike facility.



Recommended modifications at the C Street NE/North Carolina Avenue NE intersection.

## DESIGN ELEMENTS AT NORTH CAROLINA AVENUE NE/ CONSTITUTION AVENUE NE/14TH STREET NE

Tying the eastbound through movement on North Carolina Avenue NE into the proposed configuration on C Street NE will result in one eastbound travel lane and a protected bike facility on North Carolina Avenue NE, basically matching what is proposed on C Street NE. The proposed eastbound lane reduction on North Carolina Avenue NE will occur between 14th Street NE/Constitution Avenue NE and 16th Street NE/C Street NE (approximately 1,000 feet).

This proposed configuration reduces an issue that occurs today where the westbound left-turn lane at 14th Street NE is used as a through movement towards Lincoln Park. The public voiced concerns about crashes and "close calls" due to the confusion of the intersection and the proposed configuration should improve this, while potentially reducing speeds, and providing an eastbound protected bicycle facility.



*Recommended modifications at the North Carolina Avenue NE/Constitution Avenue NE/14th Street NE intersection.*

## PROTECTED BIKE LANE DESIGN ELEMENTS

The proposed protected bike facility on C Street NE and North Carolina Avenue NE, also known as a “cycle track,” is not unique to the District of Columbia. Cycle track design variations currently exist on 15th Street NW (two-way on west side of street), Pennsylvania Avenue (two-way in center of street), M Street NW (one-way westbound), L Street NW (one-way eastbound), 1st Street NE (two-way on east side of street), and 6th Street NE (two-way on east side of street). However, the proposed bike facilities for this project will be the first facilities in the District that include physically separated, landscaped protection from moving traffic, whereas others utilize combinations of paint, flex posts, and parked vehicles.

The proposed bike facilities will be located adjacent to the existing curb but will be elevated to sidewalk level. The raised bike facilities will result in several unique attributes:

- The elevation of the cycle track will prevent a “roller coaster” effect at driveways and intersections with raised crosswalks that would occur if it was located at street level.
- The elevated facility means pedestrians will not need to step down and back up to cross the facility if they are accessing parked vehicles.
- The elevation increases the available storage space for bio-retention and therefore results in less direct storm runoff.

- The elevated facility is slightly more expensive than a facility at street level (utilizing existing pavement and curb).

Because the facility will not be adjacent to motor vehicle traffic and possibly not as visible, raised crosswalks and bicycle crossings are proposed at most minor street approaches to slow motorists and also to increase visibility of pedestrians and bicyclists. Raised crossings are not proposed at 17th and 19th Street NE due to heavier traffic volumes at these locations.



*Raised crosswalk and bike crossing at 17th Street NE.*



*Raised crosswalk and bike crossing and curb extensions at 17th Street NE.*

## LOW-IMPACT DEVELOPMENT OPPORTUNITIES

In addition to addressing transportation challenges, the Recommended Alternative results in substantial environmental benefits. By replacing pavement in selected areas with trees, planting strips, and other Low Impact Development (LID) tools and strategies (e.g., bio-swales, rain gardens, permeable pavements), the recommended improvements result in a net increase in permeable surfaces throughout the study area. LID is an approach to stormwater management that emphasizes the use of small-scale, natural drainage features integrated throughout the District to slow, clean, infiltrate, and capture urban runoff and precipitation, thus reducing water pollution, replenishing local aquifers, and increasing water reuse. Due to the urban context of the study area and the limited space available within the right-of-way, LID opportunities emphasize space-efficient tools and strategies that support and enhance, rather than conflict with, proposed improvements to the roadway and pedestrian environment. In addition to their environmental functions, these tools also result in aesthetic and placemaking benefits that enhance the physical character and appeal of the public realm. This is of particular importance given the proximity of the project to the Anacostia River.

Due to the raised nature of the bike facility, special design considerations must be made to accommodate drainage and water runoff because the raised bike facilities will cover existing drainage inlets. The proposed bio-swales will capture most stormwater runoff, but connections



*This is representative of the treatment that may be included at the intersection corners to capture stormwater runoff before it can reach the storm sewers.*

to the existing drainage infrastructure will be required to route overflow from the bio-swales.

The low-impact development will also include paved crossing locations spaced at equal intervals throughout the area. The crossing locations will allow pedestrians to easily access the sidewalk from the street, eliminating the need to walk through the planted drainage area or walking to the end of the block to access the sidewalk.

## STREETSCAPE ENHANCEMENT OPPORTUNITIES

The Recommended Alternative provides a range of streetscape and public realm enhancements that improve pedestrian and bicyclist accessibility, safety, and comfort. At the same time, these improvements enhance the corridor's overall visual character and sense of community.

The recommended streetscape enhancements preserve existing curb cuts and maintain access to adjacent land uses. Moreover, existing or relocated bus stops are coordinated with existing or newly-planted street trees to ensure safe and easy access to bus stops.

## HISTORIC RESOURCES

Potential impacts of the Recommended Alternative on cultural resources were evaluated within the study area, which is large enough to consider historic resources that could be directly or indirectly impacted by the project. Existing documentation was reviewed to generate a list of historic resources within the study area that are listed or have been determined eligible for listing in the National Register of Historic Places and/or the D.C. Inventory of Historic Sites. Historic resources in the immediate study area include:

- Langston Terrace
- East Capitol Street Car Barn
- Anacostia Park

- Lincoln Park
- Capitol Hill Historic District

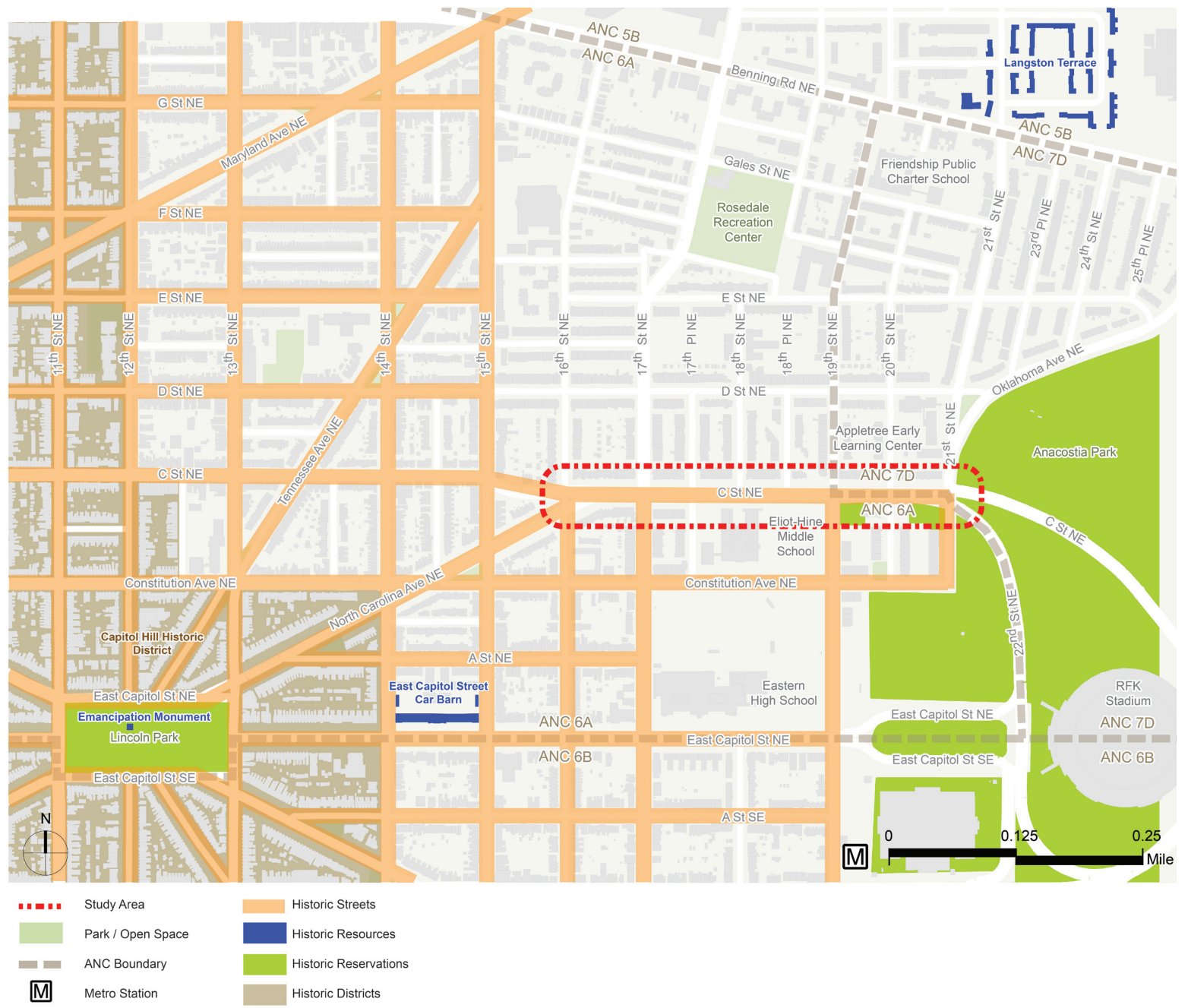
The team met with the State Historic Preservation Office (SHPO) and noted the project will not likely affect any historical elements of the street and neighborhood, primarily because the study area does not lie within the Capitol Hill Historic District and not part of the original L'Enfant Plan. Further evaluation will be required in the environmental phase of the study to ensure historic resources are not impacted by the Recommended Alternative.

Finally, the Recommended Alternative results in a narrowing of C Street NE, which as an original boundary street is a contributing element of The Plan of the City of Washington. However, these proposed modifications would have no impact on the spatial organization of the street's historic right-of-way or associated views.



*This is representative of the type of bioretention area that is recommended along the north side of C Street NE; however, the design will include walkways for providing access between the on-street parking and the sidewalk area.*

**FIGURE 23. HISTORIC RESOURCES IN STUDY AREA**



## TRAFFIC OPERATIONS FOR RECOMMENDED ALTERNATIVE

As shown in **Table 6**, C Street NE is expected to experience an increase in delay and queuing between the 2040 No-Build and 2040 Recommended Alternative. The primary reason for this change is the reduction in the number of westbound lanes on C Street NE from three lanes to two lanes. However, this also means that speeds on the corridor will likely decrease during peak and off-peak periods. The change in delay is minimal during the AM peak hour but some of the resulting queuing may back up through previous intersections for one to two hours of the AM peak period.

As noted previously, the regional travel demand model projects some traffic diversion to parallel and alternate roadways due to the reduction in auto capacity along C Street NE. The majority of traffic diversion is expected to occur in the westbound direction, which is the peak direction during the morning peak period. Instead of traveling on westbound C Street NE to reach Capitol Hill and surrounding areas, some commuters may shift to other facilities prior to the East Capitol Street Bridge. West of the bridge, some commuters may divert to D Street NE or Benning Road NE.

**Figure 24** displays the locations where traffic volumes are expected to increase if the Recommended Alternative is implemented, as opposed to leaving C Street NE in its current configuration.

**TABLE 6. TRAFFIC OPERATIONS SUMMARY**

LOCATION	PEAK HOUR	EXISTING			2040 NO BUILD			2040 RECOMMENDED ALTERNATIVE		
		LOS	DELAY (SEC)	V/C	LOS	DELAY (SEC)	V/C	LOS	DELAY (SEC)	V/C
C Street NE / 17th Street NE	AM	B	17.0	0.91	D	37.6	<b>1.04</b>	D	41.4	<b>1.04</b>
	PM	C	20.9	0.51	D	38.8	0.64	B	12.8	0.67
C Street NE / 18th Street NE	AM	A	0.9	0.54	A	0.9	0.60	A	2.1	0.72
	PM	A	3.4	0.37	A	4.3	0.48	A	1.8	0.49
C Street NE / 19th Street NE	AM	A	10.0	0.76	B	11.1	0.85	D	47.2	<b>1.01</b>
	PM	B	18.3	0.58	C	23.4	0.70	B	19.5	0.70
C Street NE / 21st Street NE	AM	C	20.9	0.75	C	22.3	0.84	D	52.1	0.91
	PM	C	21.7	0.48	C	22.0	0.55	B	15.6	0.67

**Table 7** highlights some of the expected 95th-percentile queues for the Recommended Alternative during peak hour conditions. Despite operating at level of service D, some queueing may still emerge. The table shows the peak direction (westbound during the AM peak hour, eastbound during the PM peak hour) queues under the existing, 2040 no-build, and 2040 Recommended Alternative volumes, as well as the available distances to the nearest upstream intersection. Note that the Recommended Alternative results in a decrease in some peak-direction queues. This can mainly be attributed to signal timing adjustments and the C Street NE/21st Street NE/Oklahoma Avenue intersection, which will limit (meter) the amount of westbound traffic that can reach the downstream intersections.

**TABLE 7. PROJECTED QUEUING SUMMARY**

LOCATION	DIRECTION	PEAK HOUR	QUEUING (FT) – 95TH PERCENTILE				KEY CONSIDERATIONS
			EXISTING	2040 NO-BUILD	RECOMMENDED ALTERNATIVE	AVAILABLE	
C Street NE / 17th Street NE	WB	AM	60	775	10	440	Traffic metered at 21st St NE intersection for the Recommended Alternative
	EB	PM	240	320	190	360	
C Street NE / 18th Street NE	WB	AM	15	15	130	440	
	EB	PM	10	80	125	440	
C Street NE / 19th Street NE	WB	AM	65	65	<b>925</b>	540	Queues through 21st St NE intersection for the Recommended Alternative
	EB	PM	320	315	355	440	
C Street NE / 21st Street NE	WB	AM	370	490	1005	-	Westbound queues increase for the Recommended Alternative
	EB	PM	25	30	265	530	

**FIGURE 24. TRAFFIC OPERATIONS COMPARISON OF RECOMMENDED ALTERNATIVE**





## COST ESTIMATE

Construction cost estimates were prepared for each C Street NE alternative. While the level of design for this study is preliminary, the team was able to identify key cost considerations, including the costs of new curbs, upgraded sidewalks, upgraded traffic signals, fill and pavement for the protected bike facilities, infrastructure for bio-retention and low impact development, and upgraded traffic signals. Additional cost considerations have been assigned a percentage of the overall construction budget to account for unknown design details for drainage, maintenance of traffic, lighting, landscaping, mobilization, and design and construction engineering. The total estimated cost for C Street NE Recommended Alternative is approximately \$8.1 million. A summary table of costs is provided in this section but a detailed breakdown of costs is located in the Appendix.

**TABLE 8. COST ESTIMATE**

CONSTRUCTION ELEMENTS	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C (RECOMMENDED ALTERNATIVE)
<b>Sidewalk and Ramps</b>	\$412,000	\$412,000	\$438,700
<b>Curb</b>	\$924,000	\$924,000	\$924,000
<b>Pavement Marking and Signing</b>	\$69,800	\$68,000	\$67,100
<b>Excavation and Fill</b>	\$282,700	\$329,300	\$371,700
<b>Pavement</b>	\$376,400	\$360,700	\$346,300
<b>Lighting and Signals</b>	\$1,546,400	\$1,556,200	\$1,564,800
<b>Low Impact Development</b>	\$199,300	\$267,700	\$300,500
<i>Subtotal</i>	\$3,810,600	\$3,917,900	\$4,013,100
<b>Drainage and E&amp;S (10%)</b>	\$381,060	\$391,790	\$401,310
<b>Maintenance of Traffic (10%)</b>	\$381,060	\$391,790	\$401,310
<b>Landscaping (5%)</b>	\$190,530	\$195,895	\$200,655
<b>Utility Modifications (10%)</b>	\$381,060	\$391,790	\$401,310
<b>Mobilization (10%)</b>	\$381,060	\$391,790	\$401,310
<i>Subtotal</i>	\$5,525,370	\$5,680,955	\$5,818,995
<b>Construction Contingency (25%)</b>	\$1,381,343	\$1,420,239	\$1,454,749
<i>Subtotal</i>	\$6,906,713	\$7,101,194	\$7,273,744
<b>Engineering (10%)</b>	\$690,671	\$710,119	\$727,374
<b>Design (12%)</b>	\$828,806	\$852,143	\$872,849
<i>Subtotal</i>	\$8,426,189	\$8,663,456	\$8,873,967
<b>Total</b>	<b>\$8,426,189</b>	<b>\$8,663,456</b>	<b>\$8,873,967</b>

## AIR QUALITY EVALUATION

Per the federal 1990 Clean Air Act, transportation investments must not compromise an area's progress towards attainment of the federal health-based air quality standards. To demonstrate this, non-exempt transportation improvement projects must at a minimum be included in a conforming Transportation Improvement Program and Plan. The federal conformity regulation (40 CFR 93.11) also requires a project level conformity determination for non-exempt transportation projects (DDOT, 2013). The District of Columbia is currently designated by the United States Environmental Protection Agency (EPA) as a non-attainment area for O<sub>3</sub> and PM<sub>2.5</sub> and a maintenance area for CO. Hence, a project level conformity determination must be completed before a DDOT project may progress beyond the planning stage to ensure that National Environmental Policy Act (NEPA) requirements have been satisfied.

The transportation conformity rule (40 CFR 93.11) requires that conformity analysis be based on the latest planning assumptions in effect at the time of the analysis. This includes the motor vehicle emissions model approved by EPA. Since December 2012, the emissions model required and approved by EPA for hot spot analysis is the Motor Vehicle Emissions Simulation model (MOVES), which is the state-of-the-art model for estimating emissions from motorized on-the-road vehicles. The current version of MOVES is MOVES2014, released in 2014. Concentrations of

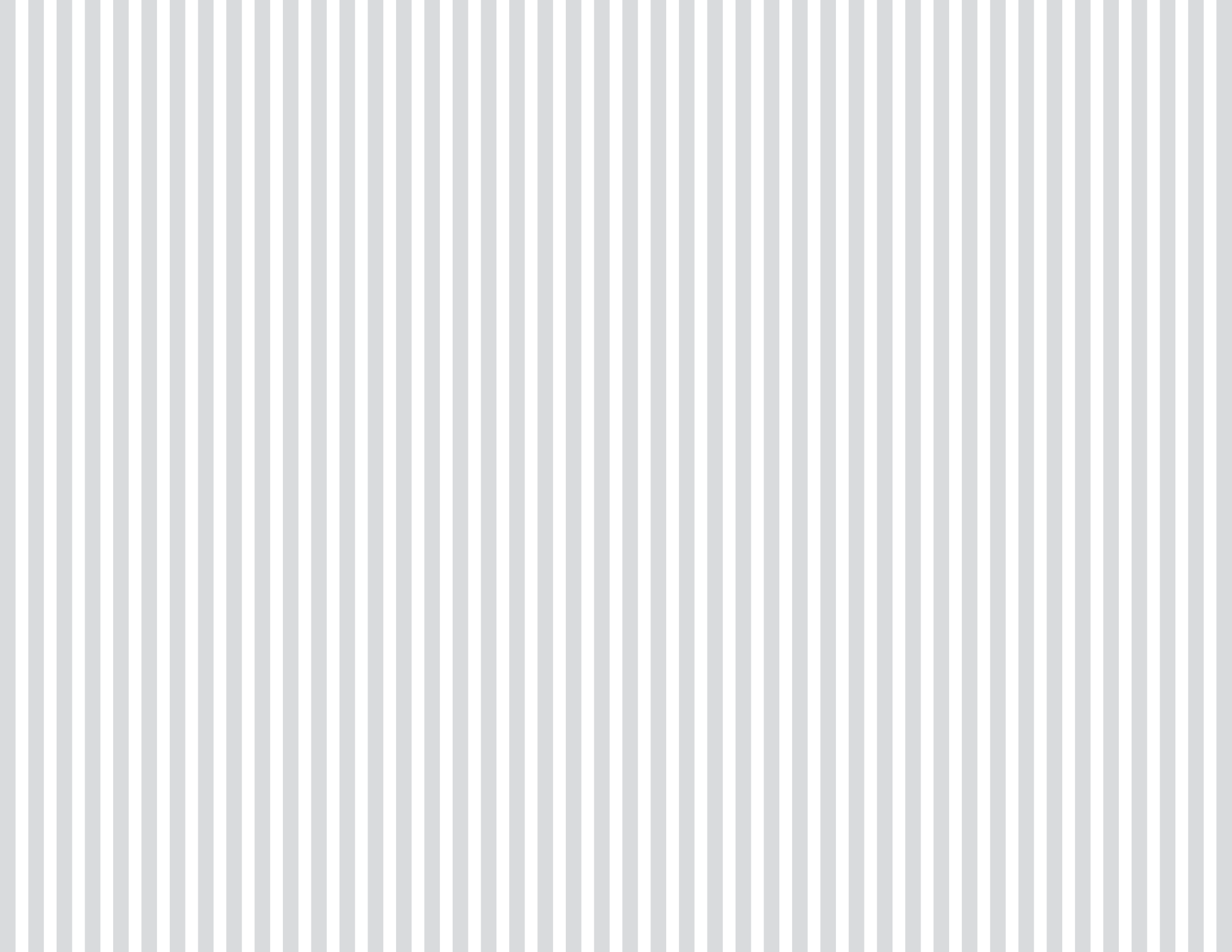
primary pollutants are estimated using a dispersion model. Based on the federal regulations, DDOT recommends the CAL3QHC model be used for analyzing effects of CO and PM<sub>2.5</sub> concentrations at roadway intersections.

EPA requires a quantitative assessment of those intersections that are determined to be operating at LOS D or worse. Although not a specific screening measure, the 95th percentile queue results for critical movements were also compared relative to the movement LOS for reasonableness and potential queue spill-back conditions into adjacent upstream intersections. Excessive queue lengths can provide a better indication of poor vehicle operating conditions that can result in excessive on-road mobile source emissions.

An air quality hot spot analysis was performed for the deficient intersections under 2020 (opening year) and 2040 (horizon year) scenarios. Three intersections, including C Street NE/17th Street NE, C Street NE/19th Street NE, and C Street NE/21st Street NE/Oklahoma Avenue, are expected to operate at level of service D or worse based on Synchro traffic software. The screening assessment reveals the need for CO hot spot analysis, but not for PM<sub>2.5</sub>. The hot spot analysis showed that under 2020 No-Build, 2020 Recommended Alternative, 2040 No-Build, and 2040 Recommended Alternative conditions an exceedance of the federal air quality standards for CO or PM<sub>2.5</sub> would not occur.



*The air quality analysis ensures that changes to the roadway do not negatively impact air quality in the immediate study area.*





# PERFORMANCE MEASUREMENT

## SECTION 6

## PERFORMANCE MEASUREMENT

Project purpose and need statements dictate the goals of a project and the resulting measures that inform whether goals are being met. These goals and measures can inform the types of analysis and evaluation that should occur. Understanding these goals and objectives at the early stages of a project informs the data needed to support and accurately measure the impacts infrastructure projects have on users. Transportation infrastructure projects have far-reaching effects on Washington, DC residents and neighborhoods, and the ability to accurately represent this change and then use the results to effectively communicate these impacts to residents, agency staff, and elected officials is an invaluable tool.

The project purpose and need was developed using existing data and analysis, as well as incorporating elements from the community's priorities. An evaluation measures matrix of these needs and relevant measures was presented at Public Meeting #2 to compare the three alternatives on a range of project needs using quantifiable measures where possible. As such,

performance measures can be broken into two categories:

- Measures used to compare a number of alternatives, such as the matrix presented at Public Meeting #2.
- Measures used to determine the impacts of an implemented solution (i.e. used in a before-and-after scenario).

The comparative evaluation matrix identified the benefits and drawbacks of each alternative, thus providing a simple method for comparison that informs the design details of the Recommended Alternative. However, once a recommended alternative is chosen and implemented, DDOT must be able to then reflect on the design to determine how well the recommendation addresses the originally stated project needs. The development of appropriate performance measures should be completed assuming a before-and-after evaluation will be prepared at some point in the future to determine how particular roadway modifications addressed the project needs.

Performance measures should be relatively easy to determine and should be quantitative when possible; however, there are times when qualitative measures are also appropriate. For example, in the evaluation of safety improvements, there is an important distinction between changes in the perception of safety and changes in the actual or substantive safety. Addressing automobile-related safety relies more heavily upon reported crash data, whereas pedestrians and bicyclists



*Performance measurement ensures a quantitative evaluation that balances quality of life and transportation mobility issues.*

are more likely to use facilities that evoke the perception of safety. The following table provides a summary of performance measures used for this study to address project needs.

**TABLE 9. PERFORMANCE MEASURES**

KEY PROJECT FACTORS	PERFORMANCE MEASURES	DATA	CONSIDERATIONS
<b>High automobile speeds</b>	85th-percentile speed	Tube-recorded auto speeds	Plot 85th-percentile speed per hour across an entire day to better understand speeds during peak periods and potential effectiveness of variable speed limits (e.g., lower speed limit during school hours)
<b>Uncomfortable and unsafe pedestrian crossing conditions</b>	Pedestrian crossing distance and times at crosswalks	Aerial imagery and field review	Determines likelihood of slower walkers being stranded in the middle of the street or median, as well as overall exposure to traffic
	85th-percentile auto speeds	Tube-recorded automobile speeds	Chance of a pedestrian fatality is 5% if hit at 20 mph versus 45% if hit at 30 mph
	Width of buffer between sidewalk and automobile travel lanes	Aerial imagery and field review	Street trees, on-street parking, and other elements that may enhance the buffer to increase pedestrian comfort
	Available crossing time for one-stage crossing	Aerial imagery and field review; signal timing information	Measures whether pedestrians are provided enough crossing time ("Walk" signal plus "Flashing Don't Walk" signal)
	Presence of channelized right turns and/or uncontrolled crossings	Aerial imagery and field review	These conditions increase the likelihood of severe pedestrian incidents at higher speeds
<b>Decrease of automobile traffic</b>	Peak period and daily traffic volumes	Tube-recorded auto volumes; turning movement counts	Observe volumes on the study street but also consider parallel facilities to determine if and where volumes may have shifted due to construction projects, new development, etc.
<b>Maintaining automobile mobility</b>	Automobile delay, queuing, and level of service	Intersection turning movement counts; signal timing information	LOS D is DDOT threshold for operational acceptance, however queuing and signal progression are also key considerations.
	% Reduced/Diverted Traffic	Before-After traffic counts	Applied to determine historic changes in traffic and potential traffic diversion after roadway modifications
<b>Lack of protected bicycle facilities within the study area</b>	Width of buffer between bicycle facility and automobile travel lanes	Aerial imagery and field review	Street trees, on-street parking, and other elements that may enhance the buffer to increase bicyclist comfort
	Inventory of bike facilities on higher classification roadways	DC functional classification map; inventory of existing and proposed bike facilities	Roadways with arterial classifications often also have high auto speeds that warrant some physical protection between auto and bicycle facilities. Consideration should also be given to developing through bike facilities on streets with lower traffic volumes and speeds.
<b>Lack of non-automobile access to Anacostia Park</b>	Analysis of pedestrian and bicycle network connectivity	Aerial imagery and field review	Other area bicycle and pedestrian facilities, demographic data; potentially consider Level of Traffic Stress (LTS) analysis if dealing with a larger network issue
<b>History of high severity crashes</b>	Crash frequency and severity	DDOT Crash Reports; list of DDOT high-crash locations	Compare crash frequency with similar intersection within the District
	Crash rate	DDOT Crash Reports; intersection volumes; DC high-crash locations	Compare crash rate per million entering vehicles with similar intersections within the District
		DDOT Crash Reports	Fatal and severe crashes, particularly those where pedestrian and bicyclists are involved should be evaluated individually to better understand crash related characteristics.
<b>Resident requests for improved multimodal conditions</b>	Pedestrian crossing distance/times at crosswalks	Aerial imagery and field review	Determines likelihood of slower walkers being stranded in the middle of the street or median, as well as overall exposure to traffic
	85th-percentile auto speeds	Tube-recorded automobile speeds	Plot 85th-percentile speed per hour across an entire day to better understand speeds during peak periods and potential effectiveness of variable speed limits (e.g., lower speed limit during school hours)
	Width of buffer between sidewalk and automobile travel lanes	Aerial imagery and field review	Street trees, on-street parking, and other elements that may enhance the buffer to increase pedestrian comfort
	Width of buffer between bicycle facility and automobile travel lanes	Aerial imagery and field review	Street trees, on-street parking, and other elements that may enhance the buffer to increase bicyclist comfort
	Pedestrian and bicycle delay	Signal timing information	Off-peak signal timing; High pedestrian and bicycle delays may encourage unsafe behavior





# NEXT STEPS

## SECTION 7

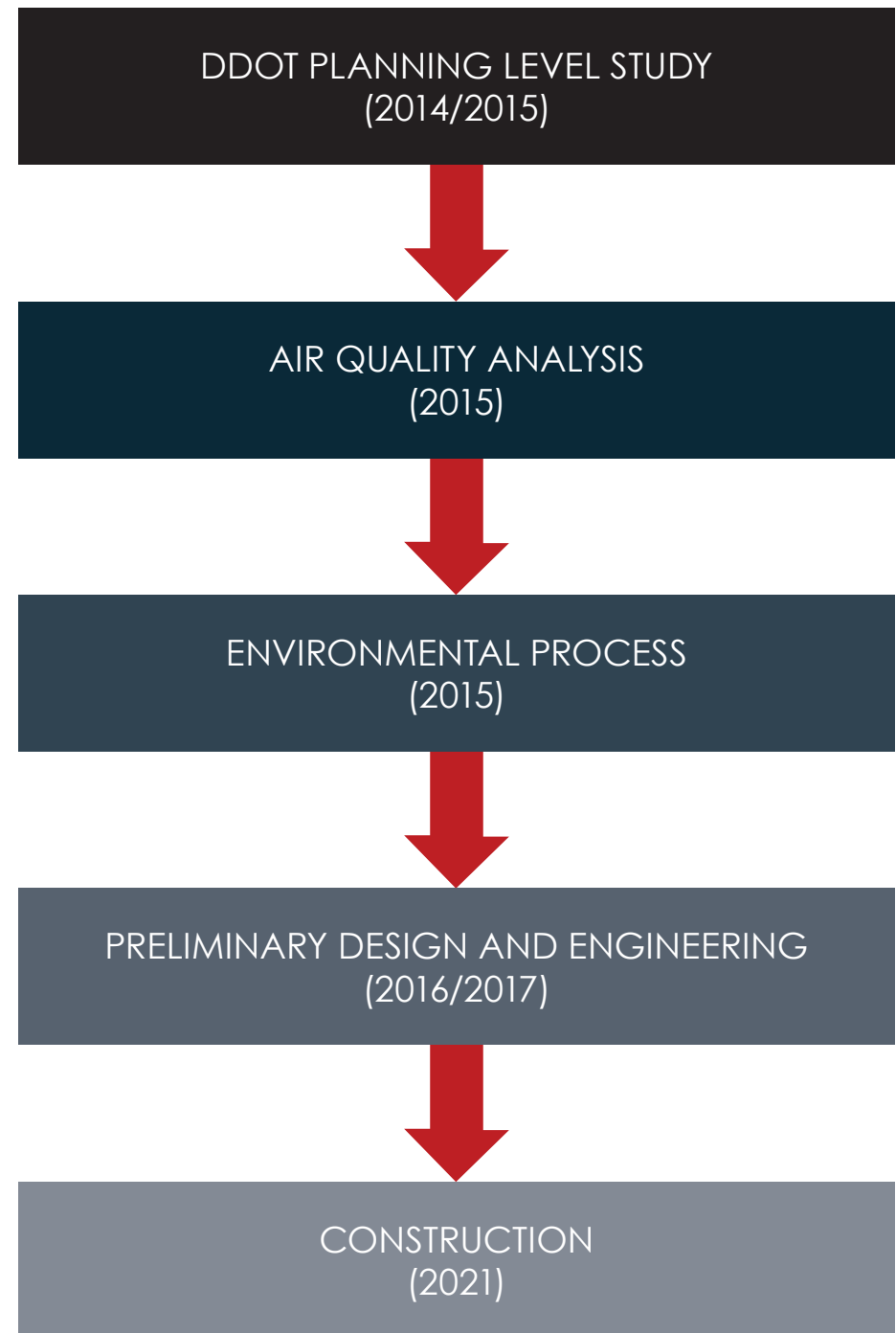
before the completion of the NEPA process or as part of the NEPA process. Therefore, no DDOT project should move forward into full design, right-of-way acquisition, or construction without ensuring that transportation conformity and NEPA requirements have been satisfied." This evaluation is currently ongoing for the C Street NE corridor and should be completed by the end of the year, where it will then be submitted to MWCOG for the following year.

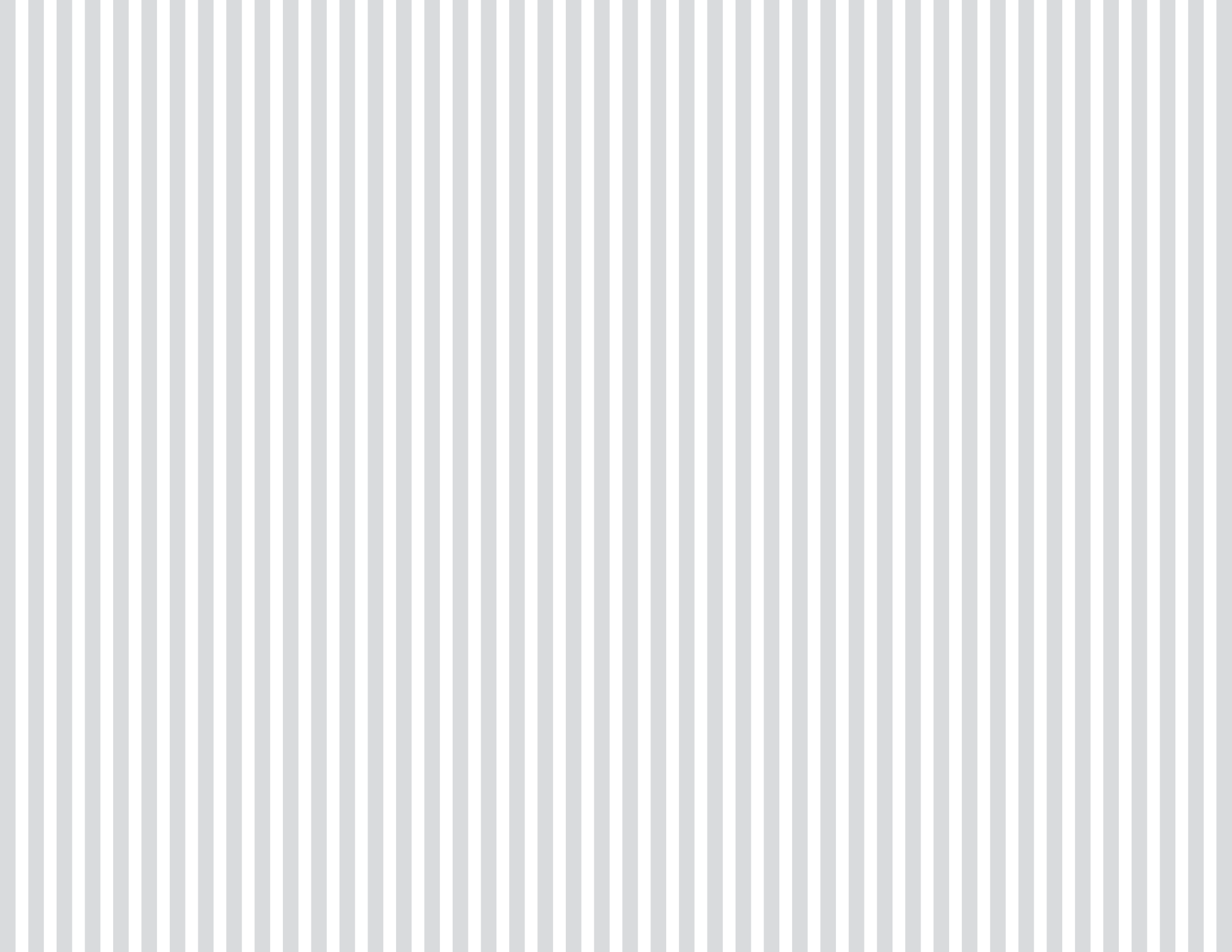
As the process continues, DDOT will be working with design firms to develop a full design of C Street NE between 16th Street NE and 21st Street NE. Pending funding availability, reconstruction of C Street NE could occur in 2021, or sooner. The District Department of Transportation expects and encourages ongoing dialogue about C Street NE and surrounding streets beyond this planning study. Project milestones and next steps will continue to be shared with the Civic Engagement Advisors group and regular check-ins with ANCs.

## NEXT STEPS

Upon the completion of the planning level C Street NE Multimodal Corridor Study, several additional steps must take place before any of the major changes associated with the alternatives can be implemented. The Metropolitan Washington Council of Governments (MWCOG) has a prescribed approval process for any project that makes changes to regionally significant transportation routes. DDOT has made a submission to the MWCOG air quality conformity process for 2016. C Street NE, as a minor arterial is considered regionally significant. Assuming some of the study intersections are at LOS D or worse, which they are for this study, a project-level air quality analysis is required.

As documented in DDOT's Hot Spot Analysis Guidelines, "DDOT is responsible for ensuring that project-level conformity determination is made for its non-exempt federal highway or transit projects prior to the first time that project is adopted, accepted, approved or funded. Additionally, with the District being in a non-attainment area for O3 and PM2.5 and maintenance area for CO, the project level conformity determination must be completed







# APPENDICES



# APPENDIX A PROJECT DATA AND MATERIALS





# APPENDIX A.1

## TURNING MOVEMENT COUNTS



# APPENDIX A.2

## AUTO TRAFFIC RECORDER (ATR) COUNTS



# APPENDIX A.3

## CRASH HISTORY



# APPENDIX A.4

## BUS RIDERSHIP





# APPENDIX A.5

## CIVIC ENGAGEMENT MATERIALS



# APPENDIX A.5.1 PUBLIC MEETING #1



# APPENDIX A.5.2

## PUBLIC MEETING #2



# APPENDIX B

## TRAVEL DEMAND MODEL PLOTS





# APPENDIX C

# SYNCHRO REPORTS



# APPENDIX D DELIVERABLES



# APPENDIX D.1 EXISTING CONDITIONS ANALYSIS



# APPENDIX D.2

## PURPOSE AND NEED





# APPENDIX D.3

## TRAVEL DEMAND MODEL VALIDATION



# APPENDIX D.4

## TRAFFIC OPERATIONS ANALYSIS



# APPENDIX D.5

## AIR QUALITY HOT SPOT ANALYSIS



# APPENDIX D.6

## PROJECT DEVELOPMENT AND ENVIRONMENTAL EVALUATION