



# Cycle Tracks and Green Lanes in Washington, DC

## Overview and Research Results

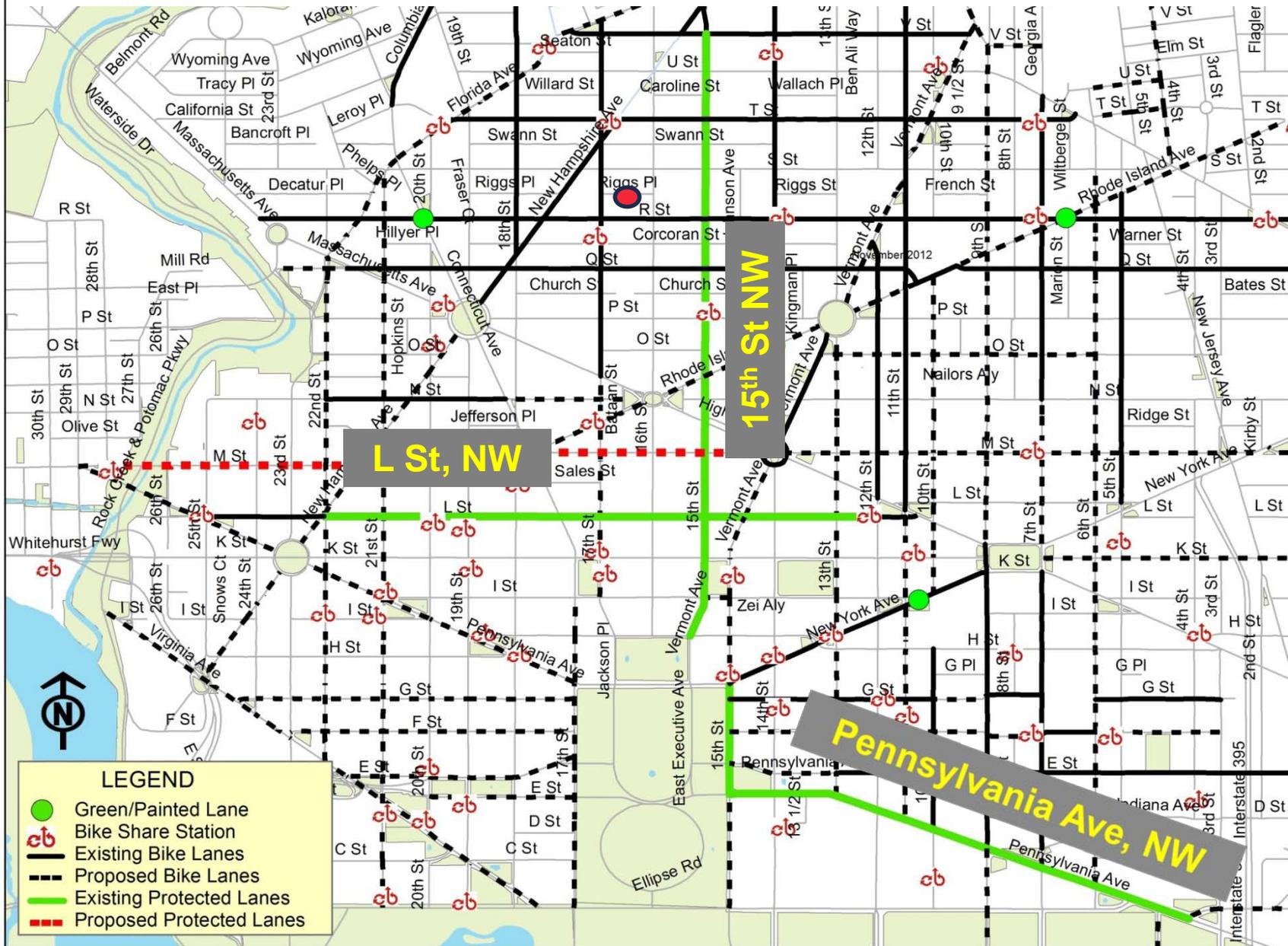
Regional Bicycle and Pedestrian Subcommittee  
Item #5

Mike Goodno, Bicycle Program Specialist  
District Department of Transportation (DDOT)

March 19, 2013



# Context—D.C.'s Downtown Bike Network



**LEGEND**

- Green circle: Green/Painted Lane
- Red 'cb': Bike Share Station
- Solid black line: Existing Bike Lanes
- Dashed black line: Proposed Bike Lanes
- Solid green line: Existing Protected Lanes
- Dashed red line: Proposed Protected Lanes

# 15<sup>th</sup> Street, NW “Cycle-Track”

- The first physically separated bike lanes in the City
  - Two-way cycle track
  - Protected by Parking Lane

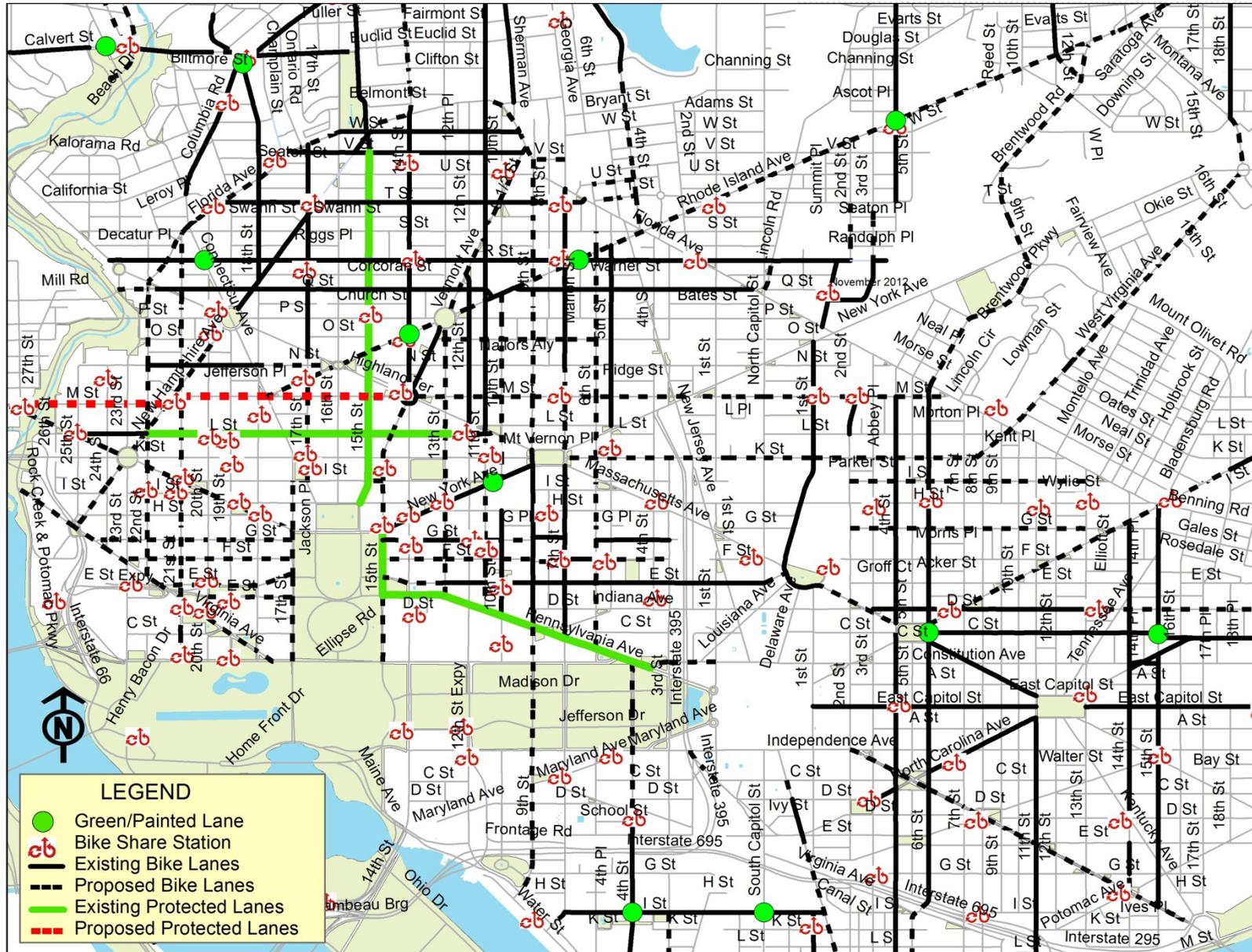


# Pennsylvania Avenue, NW



- Center median bike lanes with buffers
- Turn lane and signals for cars turning left across the bike path

# Green Paint



# Green Paint



# 15th Street, NW Cycle Track



Two-way for Bikes  
Residential

One Way North  
for Cars

Two Way  
for Cars



Two-way for Bikes

Downtown CBD



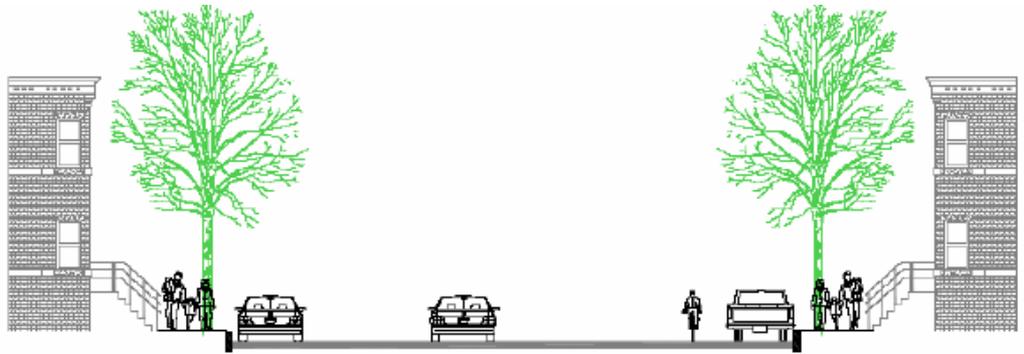
# 15<sup>th</sup> Street Before

## North Half

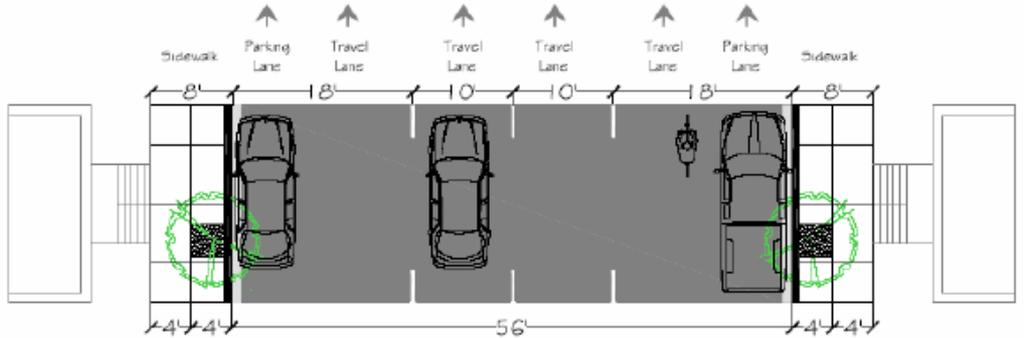
- 4 lanes 1-way North
- Residential Neighborhood
- Concerns of safety, traffic speeds
  - Posted speed 25
  - 85<sup>th</sup> Percentile between 36-45 mph
- Excess capacity
  - 6 to 12,000 ADT

## South Half

- 6 to 7 lanes, 2-way
- Downtown



15th Street, NW - Existing lane configuration  
(One Way, 4 travel lanes, 2 parking lanes)



# 15<sup>th</sup> St. After

## North Half

- Removed 1 NB auto lane
- Protected left-turns
- LOS drop of one letter grade at most intersections

## South Half

- Removed 1 auto lane



One Way North

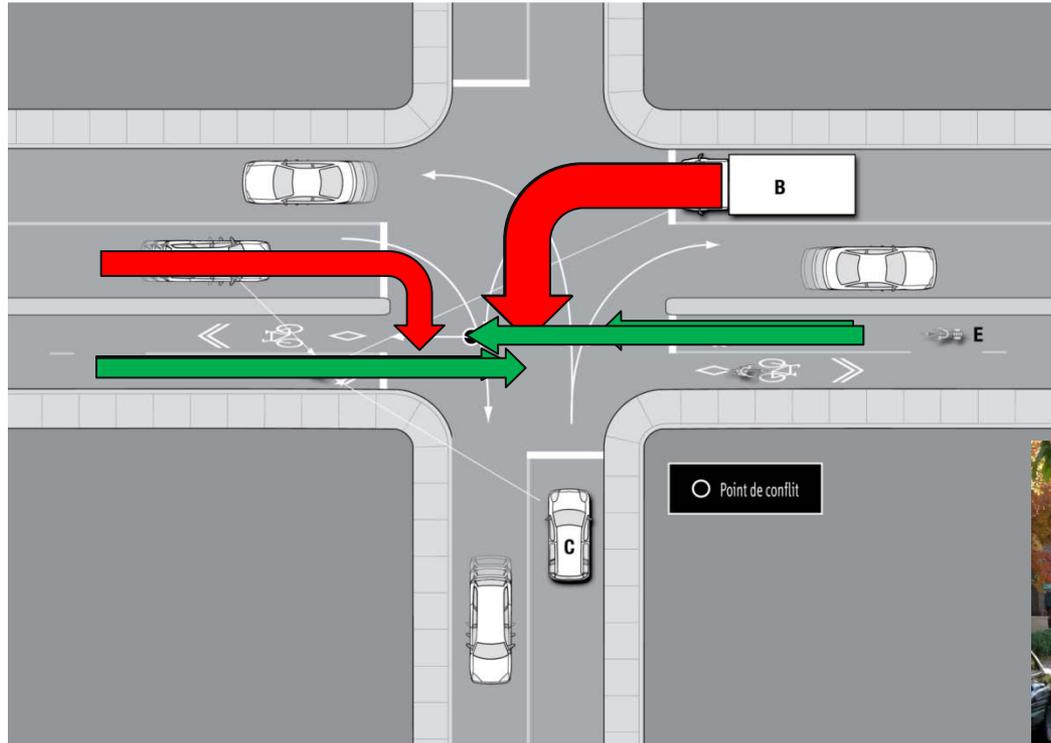
Residential



CBD

Two Way

# Signalization Challenges of Separated Cycle Tracks



15<sup>th</sup> St has 46 Intersections

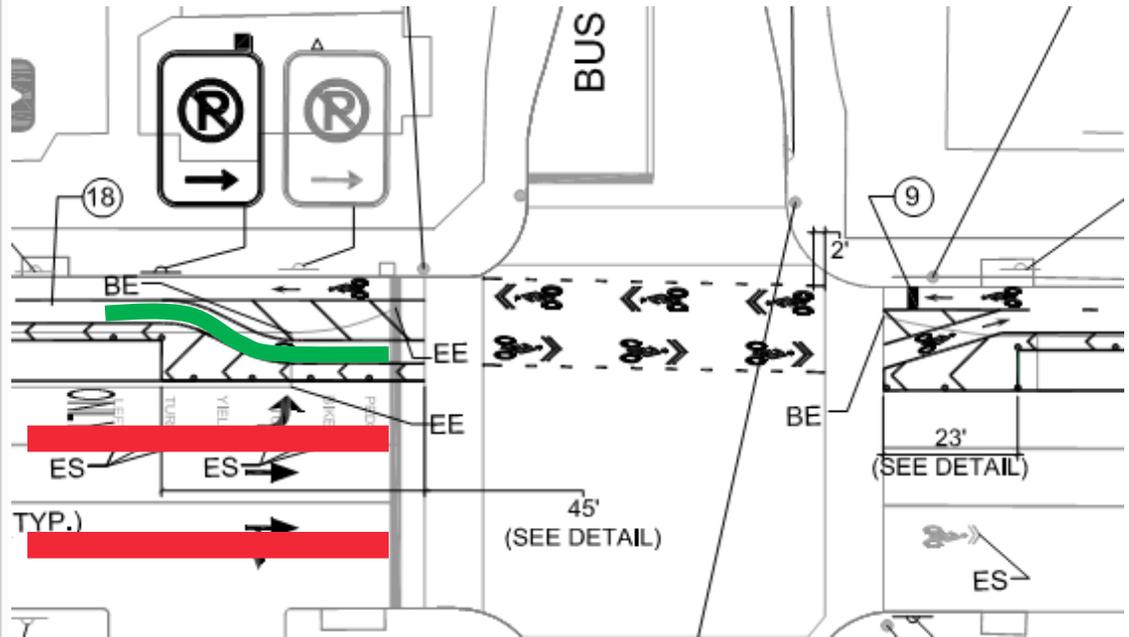
- 21 signal control
- 6 uncontrolled minor streets
- 4 parking garage drives
- 1 hotel driveway
- 11 alleys
- 3 residential driveways

Same direction bicyclist crashes with left turning vehicles is the primary danger where utilizing two way roadway and cycle track designs...



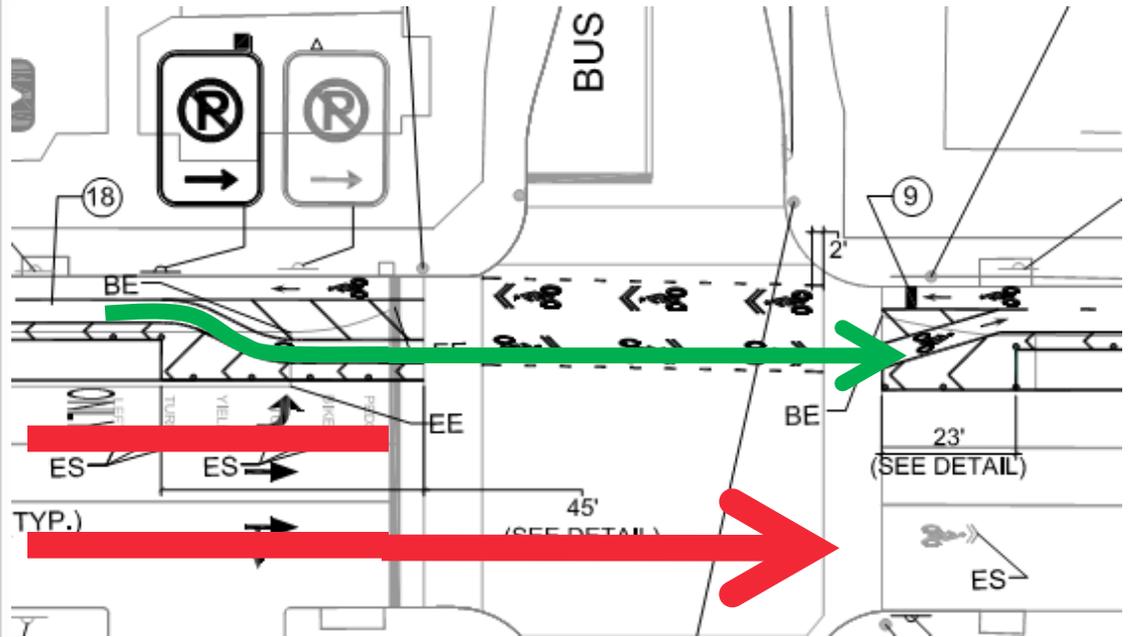
## Controlled Intersection. Left Turn Conflict Mitigation, one-way section

- Separate phasing
  - Left arrow/lane
  - Leading bike/ped phase
- Parking restriction
  - Bike SSD 50 feet
- Chicane bike approach designed for 10 mph
  - Shifts cyclist to line of sight of approaching motorists
  - Flex post keep cars in lane
- No color in bike xwalk



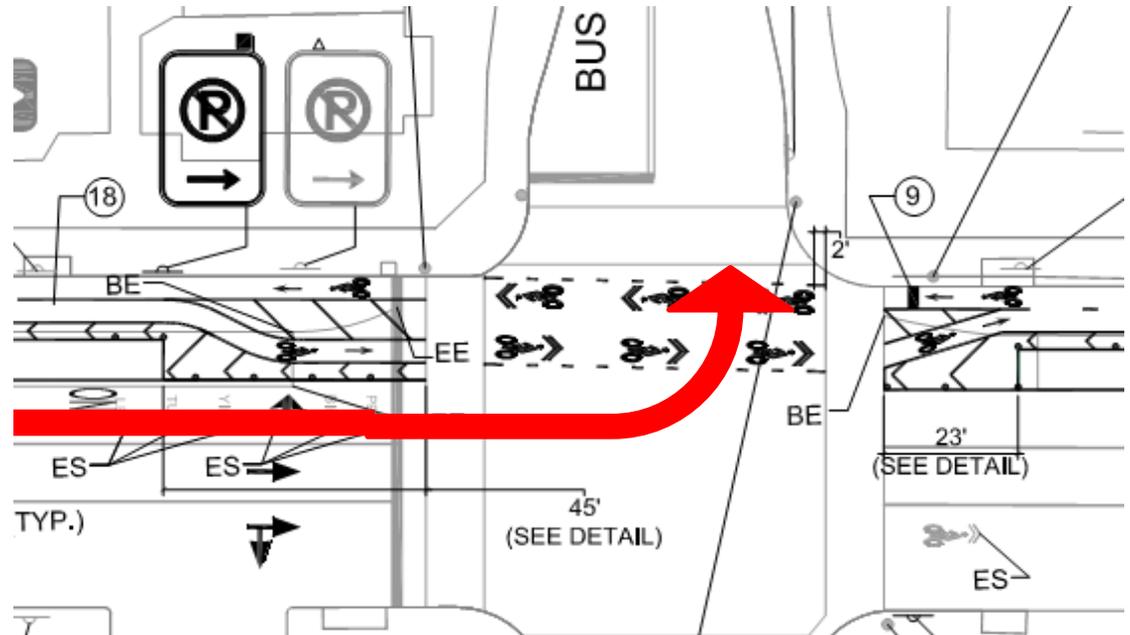
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# Controlled Intersection. Left Turn Conflict Mitigation, one-way section

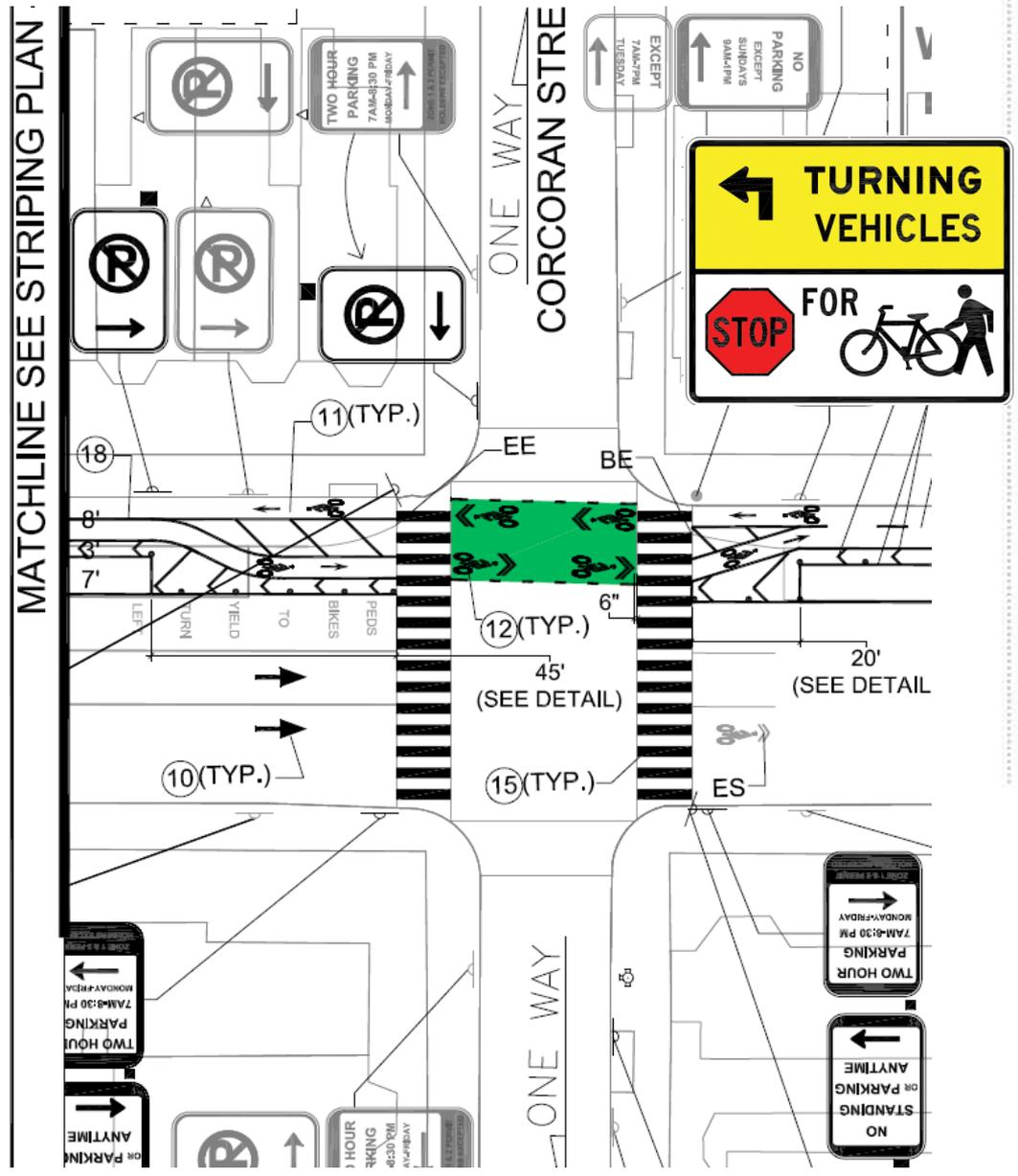
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# Uncontrolled Intersection Mitigations

- Parking restriction on approach
- Chicane cycle track approaching conflict
- Flex posts up to crosswalk
- Bike symbols within conflict zone
- Signs

Replace parking to minimize complaints





# Measures of Success:

## Goals of 15<sup>th</sup> St Cycle Track Pilot



- Increase bicycle trips
- Improve safety for all modes
- Calm traffic
- Minimize motorist delay
- Provide more options for cyclists
- Provide DDOT with a better understanding for future cycle tracks

# Research Overview

- One Year
- Three projects:
  - 16<sup>th</sup>, U, New Hampshire
  - Pennsylvania Avenue
  - 15<sup>th</sup> Street
- Safety
  - Compliance with traffic laws
  - Modal interactions
  - Crash analysis
- Traffic volumes
- Operations
  - Multi-modal LOS
- Convenience
  - Multi-modal travel time
- Comfort
  - Intercept & neighborhood surveys



15<sup>th</sup> St, NW



16<sup>th</sup> St, U St, New  
Hampshire Ave NW



15<sup>th</sup> St, NW



16<sup>th</sup> St, U St, New  
Hampshire Ave NW

# Highlights of Research Results – 15<sup>th</sup> St

- Increase bicycle trips
  - Over 500% increase in bicyclist volumes
- Improve safety for all modes
  - Bicycle crashes increased but remained similar when adjusted for exposure
  - No increase for other modes
- Calm traffic
  - > 45 mph -98%
  - > 25 mph -60%
- Minimize motorist delay
  - Motor vehicle volumes remained the same
  - Minor changes in LOS
- Provide DDOT with a better understanding for future cycle tracks
  - Bicycle signals are important, but be cautious which intersection you choose to signalize
  - Consider coloring conflict zones
  - Improve signal progression for southbound (contra-flow) movement



# Highlights of Research Results – 15<sup>th</sup> St

## Cyclists

- Cyclists believe that the cycle track makes riding a bicycle safer (96%), easier (98%), more convenient (98%), and would go out of their way to ride in it (93%).
- Up to 39% of riders do not understand what traffic signal they should follow.
- Cyclists violate traffic signals 41% of the time.

## Residents

- 81% agree that DC should be investing in projects that encourage more people to ride bicycles for transportation.
- 83% think that the cycle track is a valuable neighborhood asset
- Only 45% think bicycling in DC is safe.



## Safest Places to Bike RANKING

### STATES

1. South Dakota
2. Vermont
3. Oregon
4. Nebraska
5. North Dakota
6. Colorado
7. Montana
8. Wyoming
9. Idaho
10. Washington

### CITIES

1. Honolulu
2. Milwaukee
3. Omaha
4. Washinaton. DC
5. Portland, OR
6. San Francisco
7. Sacramento
8. Boston
9. Minneapolis
10. Austin

2012 Benchmarking Report

# Pennsylvania Ave. Before



- Dozen **WMATA bus** routes
- **Tour bus** loading zones
- **Flush median** – portions with parking
- **Limited curb side parking** with some VIP and valet
- High **pedestrian** volumes (up to 2,000/hr/intersection)

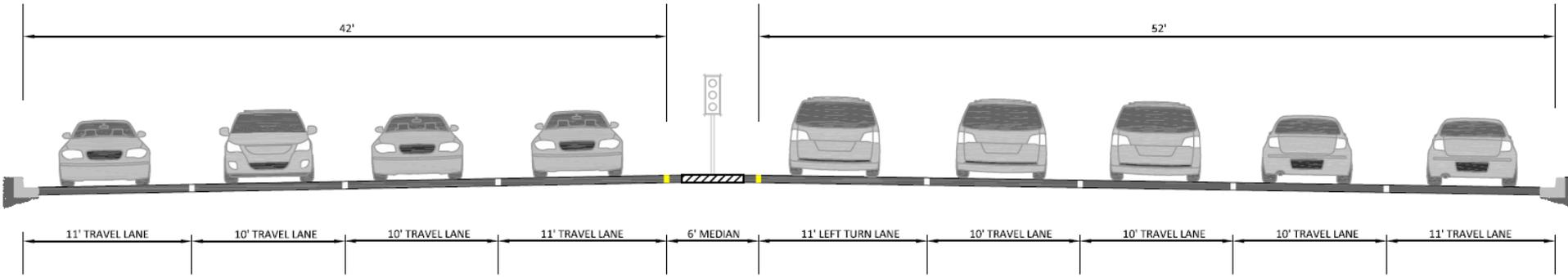
# Pennsylvania Ave. Before

- **Mix of left turn treatments** (protected /restricted /permitted)
- **Excellent Vehicular LOS**

Intersection	Level of Service	Volume-to-Capacity Ratio	Average Delay
Pennsylvania Avenue at 6 <sup>th</sup> Street	B (C)	0.38 (0.58)	15.2 (27.5)
Pennsylvania Avenue at 7 <sup>th</sup> Street	C (C)	0.66 (0.51)	20.6 (20.7)
Pennsylvania Avenue at 9 <sup>th</sup> Street	B (C)	0.47 (0.69)	10.0 (21.1)

- **ADT - 35,000 vehicles per day**
- **Not a through route** – all vehicles turn off to congested north/south routes
- **Inauguration Parade** & other local & national events

# Pennsylvania Ave. – Before

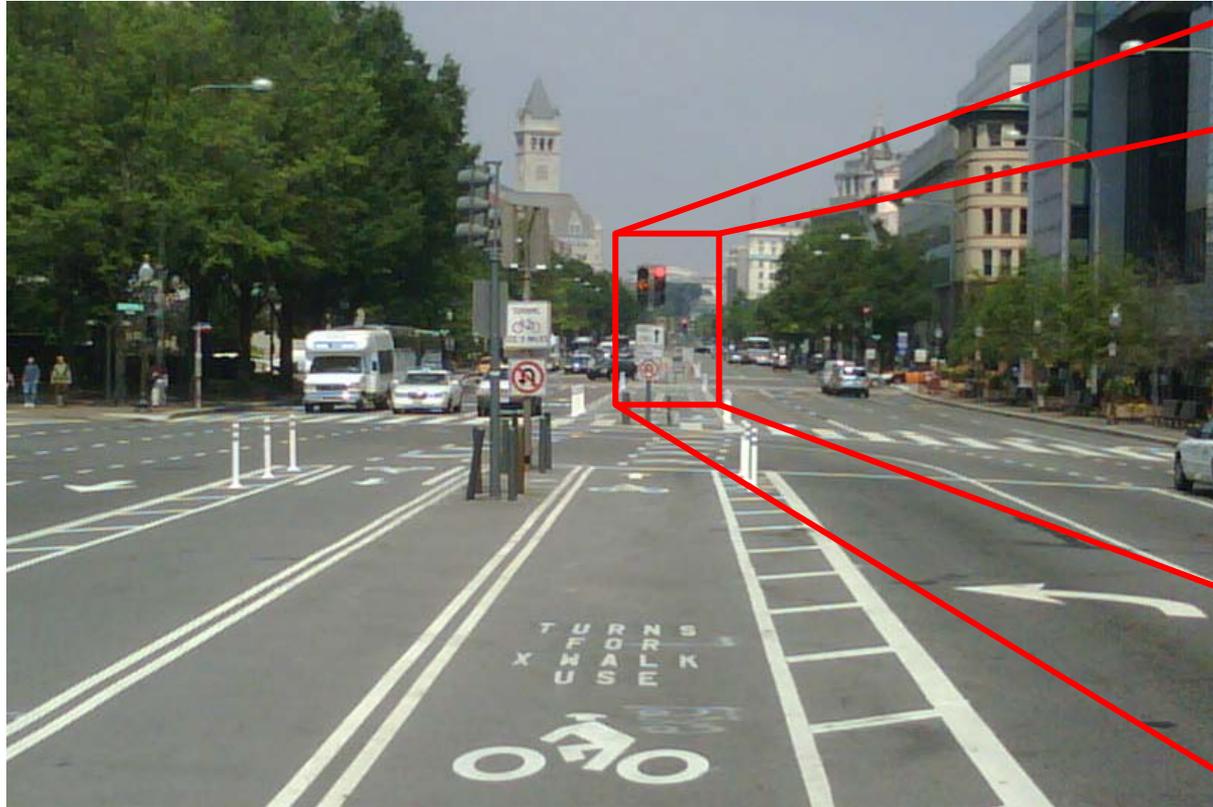


# Pennsylvania Ave. After

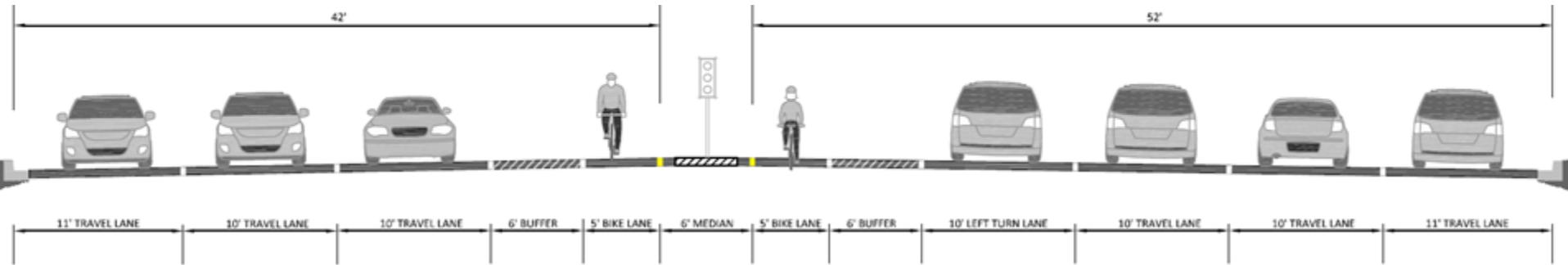
- **Median cycle track**
  - Avoids bus & other curb conflicts
  - No Left Turn easier to enforce than No Right Turn
- **Auto left turns prohibited or changed to protected only phasing**
- **Bike turns via crosswalks, following ped signals**



# Pennsylvania Ave. – After



# Pennsylvania Ave. – After



# Pennsylvania Ave. – After





# Highlights of Research Results – Pennsylvania Ave, NW

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- Arterial LOS was similar for motor vehicles before and after the bicycle facilities were installed.
- Motor vehicle volumes decreased between 15% and 21% since the installation of the bike facilities.

## **Cyclists**

- Cycling volume increased over 300%.
- Cyclists believe that the center bike lanes make riding a bicycle safer (90%), easier (94%), more convenient (92%), and would go out of their way to ride in it (86%).
- Cyclists understand what traffic signal to follow, but frequently don't obey: 42% violate the red signal indication.
- 26% indicated that they would stop in the crosswalk, a potential safety hazard due to the path of left-turning vehicles.
- Bicycle crashes have increased: 16 in 14 months versus 9 during previous 4 years.

## **Pedestrians**

- 75% notice fewer cyclists on the sidewalks since the installation of the center bike lanes.
- 33% feel that crossing the street is more difficult with the center bike lanes.

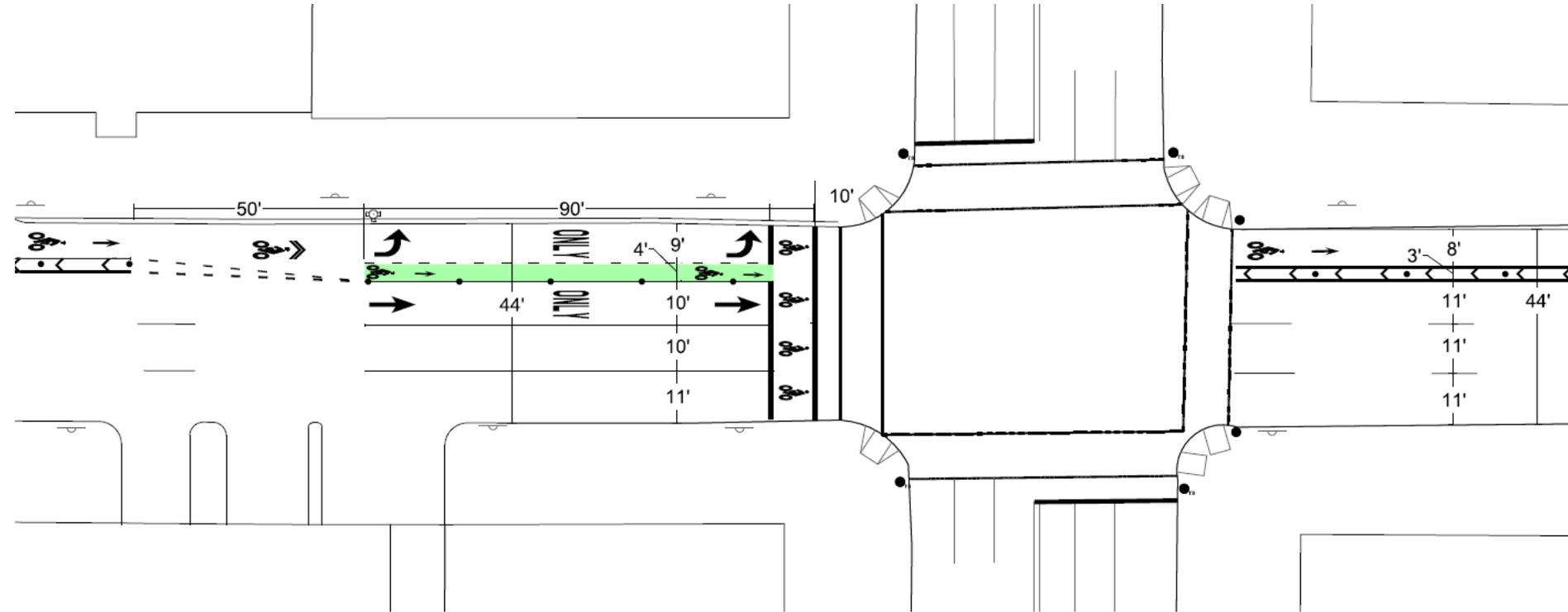
## **Motorists**

- 69% think that there are fewer cyclists in the car lanes due to the bike facility.
- 84% like that bicycles are separated from the motor vehicle traffic.

## **Residents**

- 74% agree that DC should be investing in projects that encourage more people to ride bicycles for transportation.
  - 71% think that the cycle track is a valuable neighborhood asset.
  - Only 33% think bicycling in DC is safe.
- 

# L Street NW – Left Turn Typical



- Car/bike merge area – cars must yield to through bikes
- Left-turn lane
- Green through bike lane

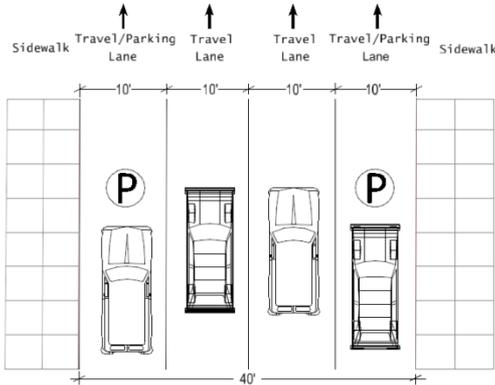
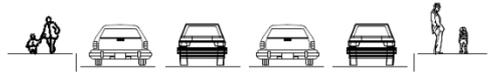
# L Street Parking and Loading Impacts

- North Side Parking Removed
- South Side Parking during non rush-hours
- Loading zones on south side and side streets
- Reduction in redundant signs/clutter

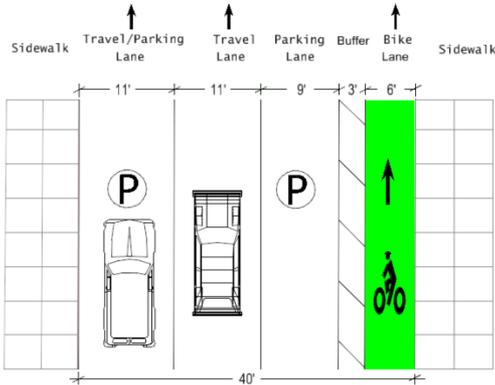
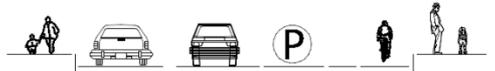


# 14<sup>th</sup> St to Connecticut

EXISTING 40' CROSS SECTION  
(East of Connecticut Ave)

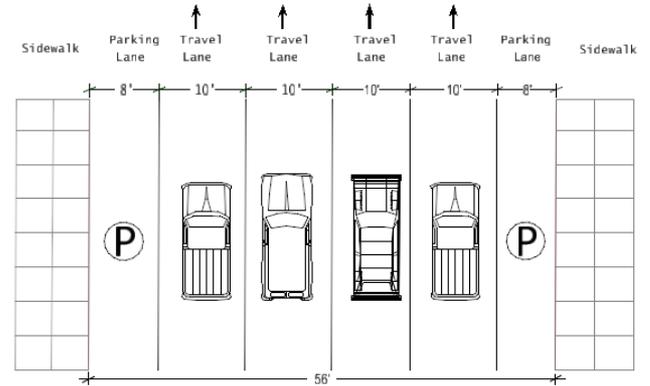
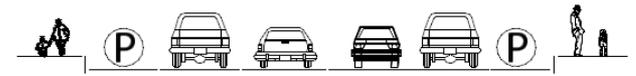


PROPOSED 40' CROSS SECTION  
(East of Connecticut Ave)

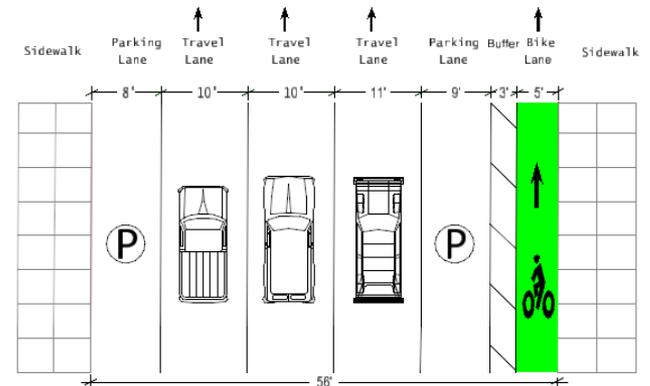
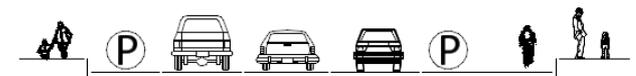


# Connecticut Ave to 28<sup>th</sup>

EXISTING 56' CROSS SECTION  
(West of Connecticut Ave)

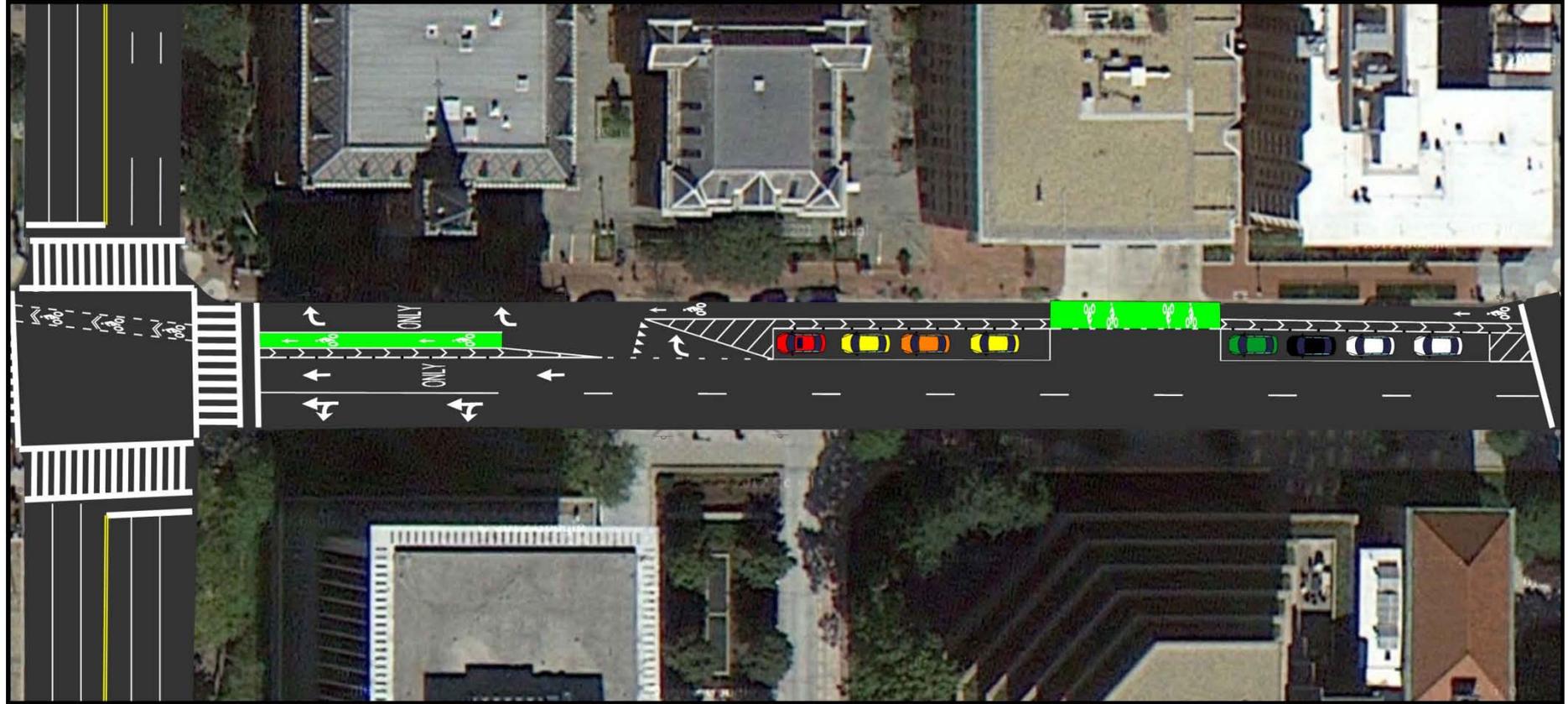


PROPOSED 56' CROSS SECTION  
(West of Connecticut Ave)



**M  
STREET,  
NW**

# M Street NW – Right Turn Typical Section





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