Identifying Neighborhood Greenway Possibilities in Philadelphia

November 2018

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

The Delaware Valley Regional Planning Commission is the federally designated Metropolitan Planning Organization for a diverse nine-county region in two states: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey.

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

DVRPC's vision for the Greater Philadelphia Region is a prosperous, innovative, equitable, resilient, and sustainable region that increases mobility choices by investing in a safe and modern transportation system; that protects and preserves our natural resources while creating healthy communities; and that fosters greater opportunities for all.

DVRPC's mission is to achieve this vision by convening the widest array of partners to inform and facilitate data-driven decision-making. We are engaged across the region, and strive to be leaders and innovators, exploring new ideas and creating best practices.

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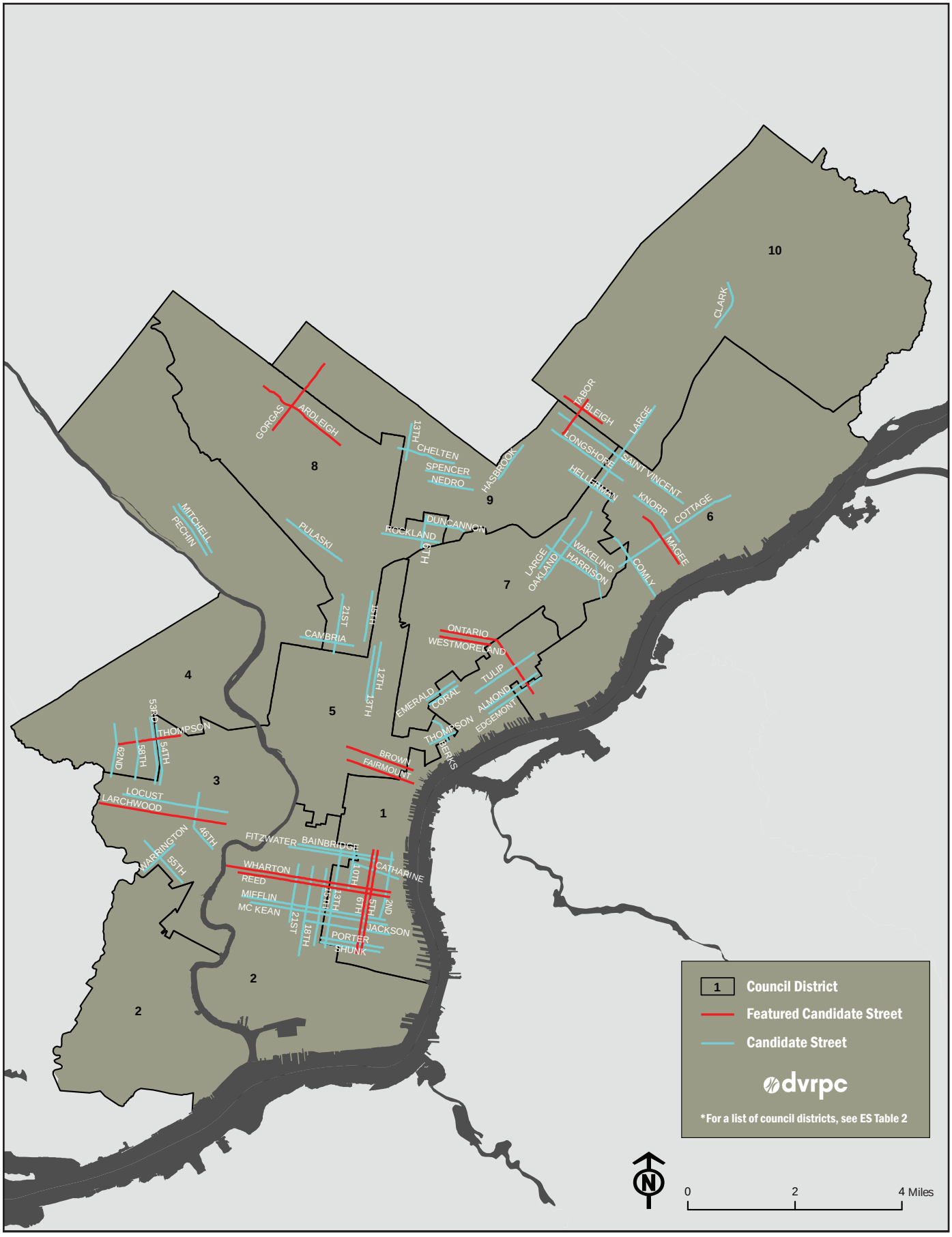


Sources: DVRPC, 2017; City of Philadelphia, 2017

Executive Summary

Despite its large population of individuals that bike and walk to work, Philadelphia's narrow streets and high demand for on-street parking have made it difficult to build comfortable, low-stress and dedicated bicycle and pedestrian facilities in many parts of the city. One possible mechanism to address this issue could be neighborhood greenways. Neighborhood greenways, sometimes referred to as *bicycle boulevards* or *neighborhood bikeways*, are low-volume, low-speed streets optimized for pedestrians and bicyclists using signage, pavement markings, traffic calming, auto traffic reduction, and intersection crossing treatments. Neighborhood greenways can help the city meet the objectives of its Vision Zero policy, which addresses transportation safety; and its Traffic and Safety Initiative, which seeks to slow vehicular traffic in residential neighborhoods, discourage cut-through traffic, and make the city more walkable and bike friendly.

This study used best practices from the National Association of City Transportation Officials, Portland State University, and Portland Bureau of Transportation to develop a two-part geographic information system (GIS) methodology that identifies suitable streets to build neighborhood greenways in each of Philadelphia's 10 city council districts (see ES Tables 1 and 2). All segments that fit the primary criteria for a neighborhood greenway, as defined by this study, are shown in Figure ES 1. One featured candidate street is also shown in each district. These streets fit the primary criteria and best fit the secondary criteria.

ES Table 1 | Study Criteria

Primary Criteria: *Used to remove segments*
Posted speeds greater than 25 miles per hour (mph)
Annual average daily traffic (AADT) greater than 3,500
Streets without recorded traffic volumes
Street segments less than half-mile in length
One-way street segments that change direction
Segments with five or more traffic lights per mile
Existing surface transit route
Existing bicycle facility
Secondary Criteria: *Used to identify candidate segments*
Favorable Criteria:
Potential to improve access to existing bicycle network
Walkable commercial corridors
Schools (Community Schools are specially marked*)
Parks and recreation centers
Proximity to Southeastern Pennsylvania Transportation Authority (SEPTA) stations
Number of people in the census tract that walk and bike to work
Unfavorable criteria:
Steep terrain
Crossings with high-volume/high-speed streets
One-way streets without an opposite direction one-way parallel street with neighborhood greenway characteristics, or an existing dedicated bike facility, to ensure bidirectional travel
Redundancy to other candidate streets that met more of the candidate street criteria

*Community Schools are schools in high-need areas that also provide services, such as medical care and job training for students, families, and community members.

ES Table 2 | Featured Candidate Streets by Council District

Council District	Street(s)	Extents	Length (mi.)
1	S 5th St. and S 6th St.	Bainbridge St. to Oregon Ave.	2.1 (ea)
2	Wharton St. and Reed St.	Schuykill Ave. to Front St.	3 (ea)
3	Larchwood Ave.	43rd St. to Cobbs Creek Pkwy.	2.15
4	Thompson St.	61st St. to Lancaster Ave.	1.15
5	Fairmount Ave. and Brown St.	Fairmount Ave.: Broad St. to Delaware Ave. Brown St.: Broad St. to Front St.	1.3 (ea)
6	Magee Ave.	Brown Ave. to New State Rd.	1.35 (ea)
7	Ontario St. and Westmoreland St.	Kensington Ave. to Glenwood Ave.	1.5 (ea)
8	Ardleigh St.	Haines St. to Roumfort Rd.	1.8
9	Gorgas Ln.	Williams Ave. to Chew Ave.	1.4
10	Bleigh Ave. and Tabor Ave.	Bleigh Ave.: Rockwell Ave. to Algon Ave. Tabor Ave.: Napfle Ave. to Tyson Ave.	1.15 (ea)

Chapter 1: Introduction

Identifying Neighborhood Greenway Possibilities in Philadelphia is part of a program of conceptual design work for bicyclist and pedestrian facilities in Philadelphia. This project is done as part of the Delaware Valley Regional Planning Commission's (DVRPC) Bicycle and Pedestrian Planning Program. Developing designs to improve conditions for those walking and biking in selected Philadelphia locations is the primary intention of work done under the conceptual design project.

Philadelphia has one of the highest bicycle commute mode shares of any large city in the United States at 2.2 percent, with census tracts in some parts of the city as high as 18 percent. Despite its large population of bicyclists, in much of the city, bicycle lanes and trails are largely disconnected. The development of a more connected network of bicycle facilities is hindered, in part, by the city's grid of narrow neighborhood streets and high demand for on-street parking. Despite the lack of connected bicycle lanes, Philadelphia has many contiguous, low-speed, and low-volume streets that could be retrofitted to be neighborhood greenways: streets where bicycles, pedestrians, and neighbors are given priority over auto traffic.

The city of Philadelphia and DVRPC selected this project, which uses a subtractive GIS methodology based on criteria identified through best practice research, to locate street segments in the city of Philadelphia with the appropriate characteristics for conversion to neighborhood greenways. As low-stress, bicycle-friendly streets, they could play an important role in building a more complete network for bicycling and walking in the city.

Why does Philadelphia need neighborhood greenways?

Figure 1 shows the city of Philadelphia's existing bike lane network, as well as the percentage of people who commute by bike for each census tract. Although there are over one hundred miles of bike lanes, some of the areas with the highest levels of bike commuting do not have access to dedicated bike facilities. In part, this is a result of the common street cross section in these areas, an example of which is Catherine Street in South Philadelphia, shown below. At 25–30 feet wide, with one travel lane and two parking lanes, these streets do not have space for dedicated bicycle facilities without removing parking. This is challenging because of high demand for on-street parking.

However, these areas are still in need of connected facilities and better, more comfortable bicycling routes to accommodate existing bicyclists and to attract new bicyclists. Creating neighborhood greenways on key streets is a way to work within the existing cross section to create much-needed low-stress facilities.

Catherine Street near Fourth Street in Philadelphia City Council District 1
Source: Google

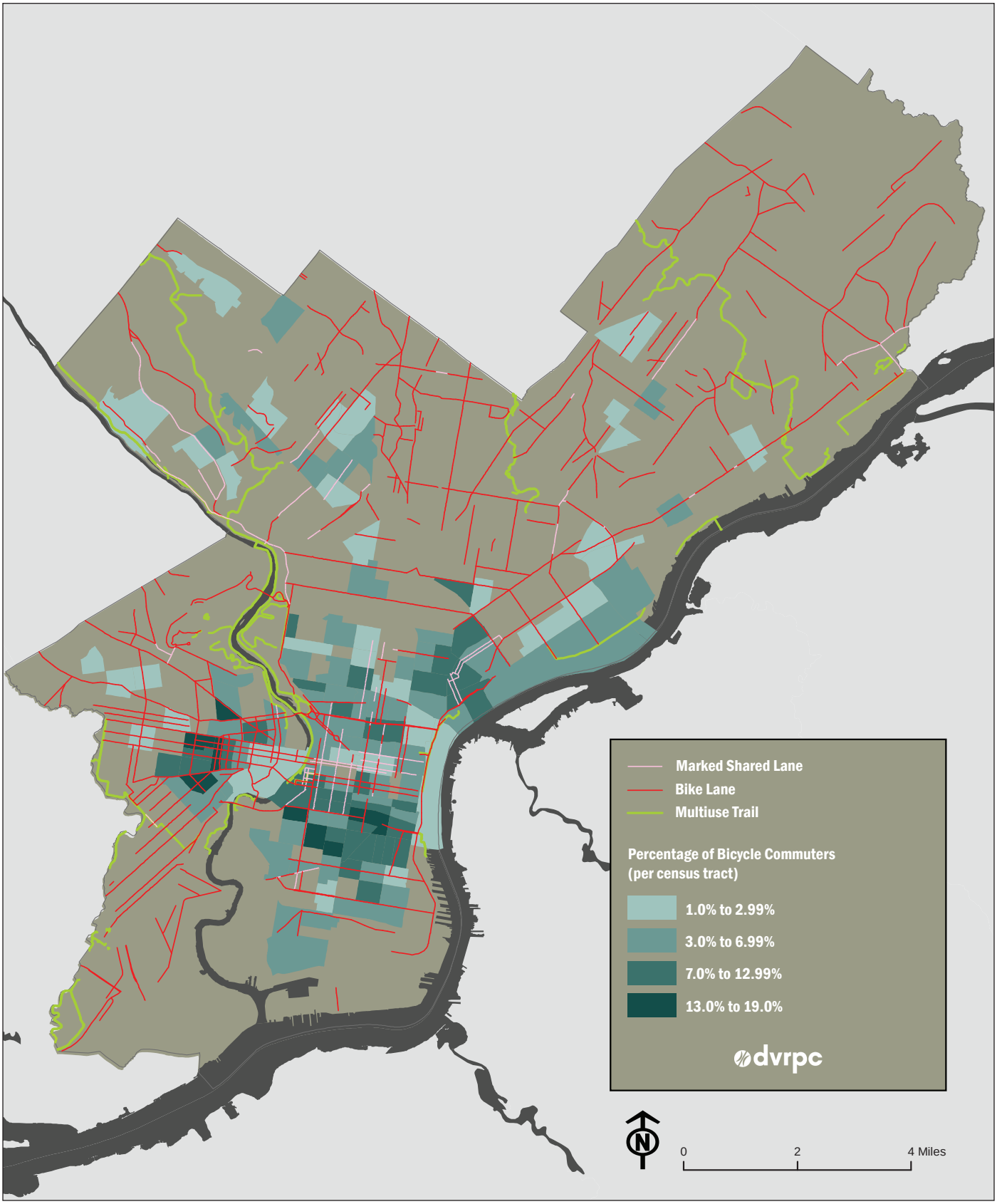
13th and 15th Street Neighborhood Bikeway Project

13th Street Bikeway near McKean Street in South Philadelphia
Source: Google

The 13th and 15th Street Neighborhood Bikeway Project is an ongoing, three-phase project to build continuous north-south connections between South Philadelphia and North Philadelphia. Phase one and two of the bikeway were completed in 2017 and 2018, respectively, and consist of wayfinding signage and greenback sharrows between Christian Street and Oregon Avenue. A future phase will expand the bikeway north to Lehigh Avenue in North Philadelphia and plans to include green-backed sharrows, painted edgelines, and restriped bicycle lanes and crosswalks. The bikeway will introduce some neighborhood greenway treatments to the City of Philadelphia.

Signage example from the 13th and 15th Street Neighborhood Bikeway Project
Source: City of Philadelphia

Figure 1 | Existing Bicycle Facilities and Percentage of Bicycle Commuters per Census Tract



Sources: DVRPC, 2017; City of Philadelphia, 2017; US Census, 2016

What is a neighborhood greenway?

Neighborhood greenways are a type of bike facility that has benefits for all street users. Throughout the country these facilities have a number of names, including bicycle boulevards, neighborhood bikeways, local street bikeways and bicycle priority streets, among others. These shared roads utilize a variety of tools to decrease auto traffic volumes and speeds to provide a low-stress environment for bicyclists and pedestrians.

To create a street that is comfortable for bicyclists of all ages and skill levels, traffic calming, traffic reduction, signage and pavement markings, and intersection crossing treatments are used. These treatments and tools are described in more detail starting on page 34. Additionally, neighborhood greenways are most successful when they are logical, direct, and continuous routes that are well marked and signed. It is important that they provide convenient access to destinations and that they minimize bicycle delay. Lastly, intersections with larger streets need to be made comfortable and safe to cross using additional treatments.

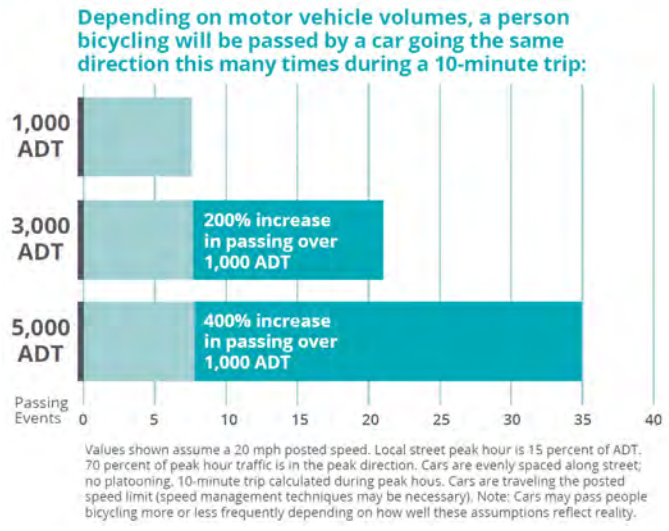
Although vehicle access is preserved on these streets, the above tools discourage vehicle trips that are not to local destinations. Figures 2 and 3 demonstrate the importance of having low speeds and low volumes on local streets. Fatality rates from collisions greatly decrease as vehicles slow. Fewer vehicles on a street reduces the number of times a car will pass a cyclist, which is one of the most stressful elements of bicycle trip making, especially where bicycles and vehicles do not have dedicated space and must share the road.

For example, various treatments have been used to create a neighborhood greenway on Northeast Going Street in Portland, Oregon, detailed in Figure 4. This 4.5-mile facility has modified street signs, non-motorized-only crossings, stop sign removal, wayfinding, and sharrows. Between 2010 and 2014, bicyclist volumes on the greenway increased from 46 to 179 people bicycling during the PM commute, showing the preference bicyclists have for low-stress, comfortable routes. Additionally, the city put great effort into making safe crossings at the arterial roads, and this demonstrated the value of the project to pedestrians and transit users, as well as to bicyclists. The crossing of Going and Martin Luther King Jr. Boulevard (#3 in the figure) shows how a bicycle and pedestrian median allows non-motorized users to cross one side of the road at a time.

Figure 2 | Effects of Vehicle Speeds on Breaking Distance and Fatality Rate in Collisions

Source: Portland Bureau of Transportation, 2015

Figure 3 | Number of Times a Bicyclist Will Be Passed Based on Vehicle Volumes



Source: Portland Bureau of Transportation, 2015

Figure 4 | Neighborhood Greenway Example: Northeast Going Street, Portland, Oregon

Source: Google, 2017

Sharrows, a residential speed limit, neighborhood greenway signage, and a street mural painted by neighbors
Source: Google, 2017

Speed tables are used between intersections to keep auto speeds low without impairing cyclists
Source: Google, 2017

Non-mountable median barrier with bike person symbol
Source: Google, 2017

This two-way stop with a neighborhood greenway identifier on top of the street sign gives right-of-way to crossing traffic
Source: Google, 2017

Chapter 2: Criteria and Methodology

This project used a two-part GIS process, based on criteria identified through best practice research, to locate candidate street segments in the city of Philadelphia with the appropriate characteristics for conversion to neighborhood greenways.

Methodology

Criteria

DVRPC's methodology for identifying candidate streets for neighborhood greenways used a two-part, subtractive approach. These criteria are based on best practices for neighborhood greenways from the National Association of City Transportation Officials (NACTO), Portland Bureau of Transportation (PBOT), and Portland State University, and were further tailored to local conditions and locally available data (see Table 1). Beginning with all streets, DVRPC removed street segments that did not fit the criteria found in the upper portion of Table 2 on page 9.

This methodology found 109 street segments with the appropriate criteria. To select the featured candidate streets, staff assessed segments based on the secondary criteria found in the lower portion of Table 2 on page 9. DVRPC mapped these streets by city council district, identifying at least one feasible street or couplet per district for inclusion in the final candidate set.

This approach sought to provide more equitable analysis throughout the city and a platform for developing strong, low-stress bicycle networks outside of the city core. Council members are also important actors who can advocate for, and communicate the benefit of, these types of facilities.

Chapter 3 shows the resultant maps.

Table 1 | Recommended Characteristics of Neighborhood Greenways

	GUIDANCE			
PRIMARY CRITERIA	**NACTO**	**PBOT**	**PORTLAND STATE**	**PHILADELPHIA**
VEHICLE SPEEDS	• 25 mph at 85th percentile • 20 mph preferred	• 20 mph at 85th percentile	• Speed differential no more than 15 mph • Max speed 25 mph	• Max speed 25 mph
AADT	• No more than 3,000 • 1,500 preferred • Higher-volume streets should have lower speed limits	• 1,000 as goal • 1,500 acceptable • 2,000 max • Over 2,000 triggers change	• Less than 3,000-4,000 vehicles per day • Below 1,500 preferred • Higher volumes can be retrofitted	• Less than 3,500 AADT • Below 1,500 preferred
CONNECTIVITY/ROUTE	• Follow desire lines • Long and continuous routes	No guidance	• Alignments based on connectivity to key destinations • Terrain should be considered when developing route	• Long and continous routes (roughly half-mile or greater)
EMERGENCY VEHICLE ROUTES	• Develop emergency response route map • Routes should be on main roads and form a grid	No guidance	• Map existing routes and engage with local officials	• Routes not defined
INTERSECTION CONTROLS	• Best where bicyclists have right-of-way or where it can be established	• Best practice limits the number of stops for cyclists	• Frequency of intersections and turning movements should be considered	• Five or more traffic signals per mile on a segment
PAVEMENT	• Pavement should be in fair to good condition	• Rough pavement can result in fewer rides	• Quality of pavement should be considered	• Data incomplete
TRANSIT ROUTES	No guidance	No guidance	• Generally not recommended • Consider transit frequency and length of shared street	• No segments on streets with buses, trolleys, or existing bicycle lanes

Sources:
National Association of City Transportation Officials, *Urban Bikeway Design Guide, Second Edition,* 2014
Portland Bureau of Transportation, *Portland's Neighborhood Greenways Assessment Report,* 2015
Portland State University and Alta Planning and Design, *Fundamentals of Bicycle Boulevard Planning and Design,* 2009

Table 2 | Study Criteria

Primary Criteria: *Used to remove segments*
Posted speeds greater than 25 mph
AADT greater than 3,500
Streets without recorded traffic volumes
Street segments less than half-mile in length
One-way street segments that change direction
Segments with five or more traffic lights per mile
Existing surface transit route
Existing bicycle facility
Secondary Criteria: *Used to identify candidate segments*
Favorable Crieria
Potential to improve access to existing bicycle network
Walkable commercial corridors
Schools (Community Schools are specially marked*)
Parks and recreation centers
Proximity to SEPTA stations
Number of people in the census tract that walk and bike to work
Unfavorable Criteria
Steep terrain
Crossings with high-volume/high-speed streets
One-way streets without an opposite direction one-way parallel street with neighborhood greenway characteristics, or an existing dedicated bike facility, to ensure bidirectional travel
Redundancy to other candidate streets that met more of the candidate street criteria

*Community Schools are schools in high-need areas that also provide services, such as medical care and job training for students, families, and community members.

Limitations

A drawback of the study was that AADT data was not available for all road segments. Neighborhood greenways tend to lose functionality as low-stress facilities if traffic volumes exceed 3,500 AADT. Because of this uncertainty, the methodology did not include street segments without recorded traffic volumes.

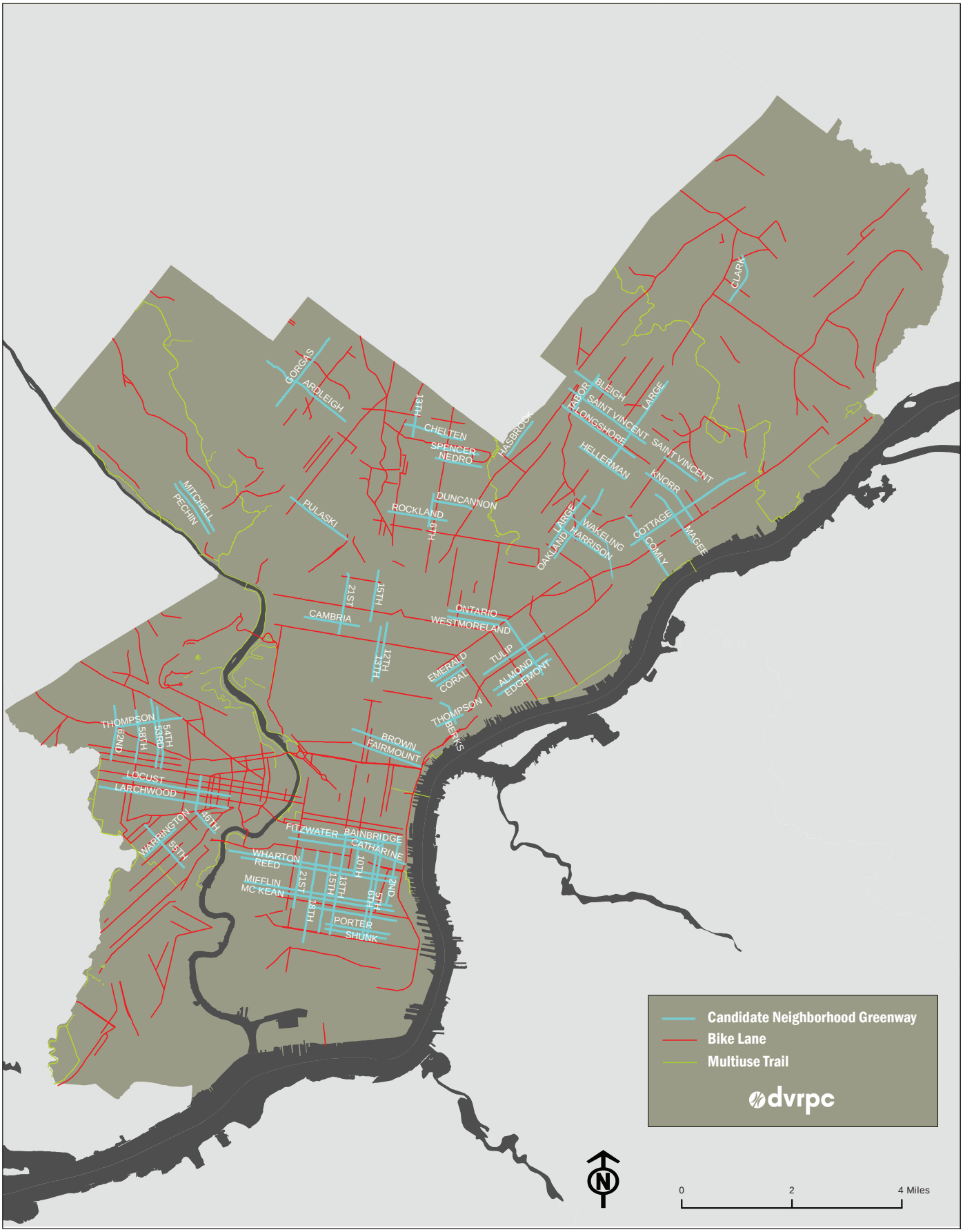
In a similar vein, AADTs for road segments in the study were generalized to a single volume. This typically occurred because only one volume was on record for the segment. For segments with multiple AADTs, the lowest AADT recorded within the last 10 years was used.

Some streets included as candidate streets are just beyond the AADT threshold detailed in the methodology. These streets were included because they formed couplets with a parallel street that met the study criteria or represented a potentially important network link. Streets that exceed the AADT threshold can have volumes brought to an acceptable level using the toolbox of treatments discussed later in this report.

Additionally, many streets recommended in the study have AADTs that are five or more years old and may no longer be fully representative of the street's current traffic volumes. Traffic volumes can be influenced by a multitude of development and travel patterns. With this in mind, new traffic volumes should be collected if a street is chosen for conversion to a neighborhood greenway.

Finally, posted speed limit (or the city's unposted speed limit of 25 mph) was used as the measure for vehicle speeds. Prior to designing a street or segment for implementation, current speeds should be measured to determine functional speed and temper it as necessary.

Figure 5 | Candidate Streets and Existing Bicycle Facilities



Sources: DVRPC, 2017; City of Philadelphia, 2017

Chapter 3: Results

DVRPC mapped streets with the highest potential to be successful neighborhood greenways; these candidate streets are mapped alongside Philadelphia's existing bicycle facilities and multiuse trails in Figure 5. For each of the ten city council districts, one or more potential routes or couplets have been identified as a candidate street, with a profile provided for those identified as the top candidate for that district. Maps of each city council district can be found in Figures 6–16.

Council District 1 Candidate: 5th and 6th Streets

Extents: Bainbridge Street to Oregon Avenue
Length: 2.1 miles (each)
Width: 26 feet
Configuration: Couplet
AADT: 6th Street: 3,269 (2013)
5th Street: 3,816 (2014)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	✓
SEPTA Station	
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Would create a long and continuous north-south connection in an area with large populations of bicycle and pedestrian commuters.

Strategies and Opportunities

- 5th Street volumes are just over the recommended limit, meaning that additional traffic calming and measurement would be required.
- Street widths in the area are narrow, so a passing zone treatment like the one shown on pages 40 and 41 might be considered to help create a comfortable condition for cyclists.
- Enhanced crossing improvements are needed at Washington Avenue and Snyder Avenue.

5th Street at Fitzwater Street
Source: Google

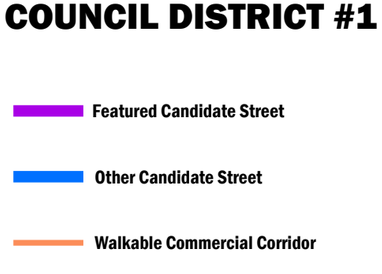

5th Street at Snyder Avenue
Source: Google

6th Street at Earp Street
Source: Google

6th Street at Wolf Street
Source: Google

COUNCIL DISTRICT #1

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



North Section

South Section

0 0.5 1 Miles

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Figure 6 | Council District 1: North

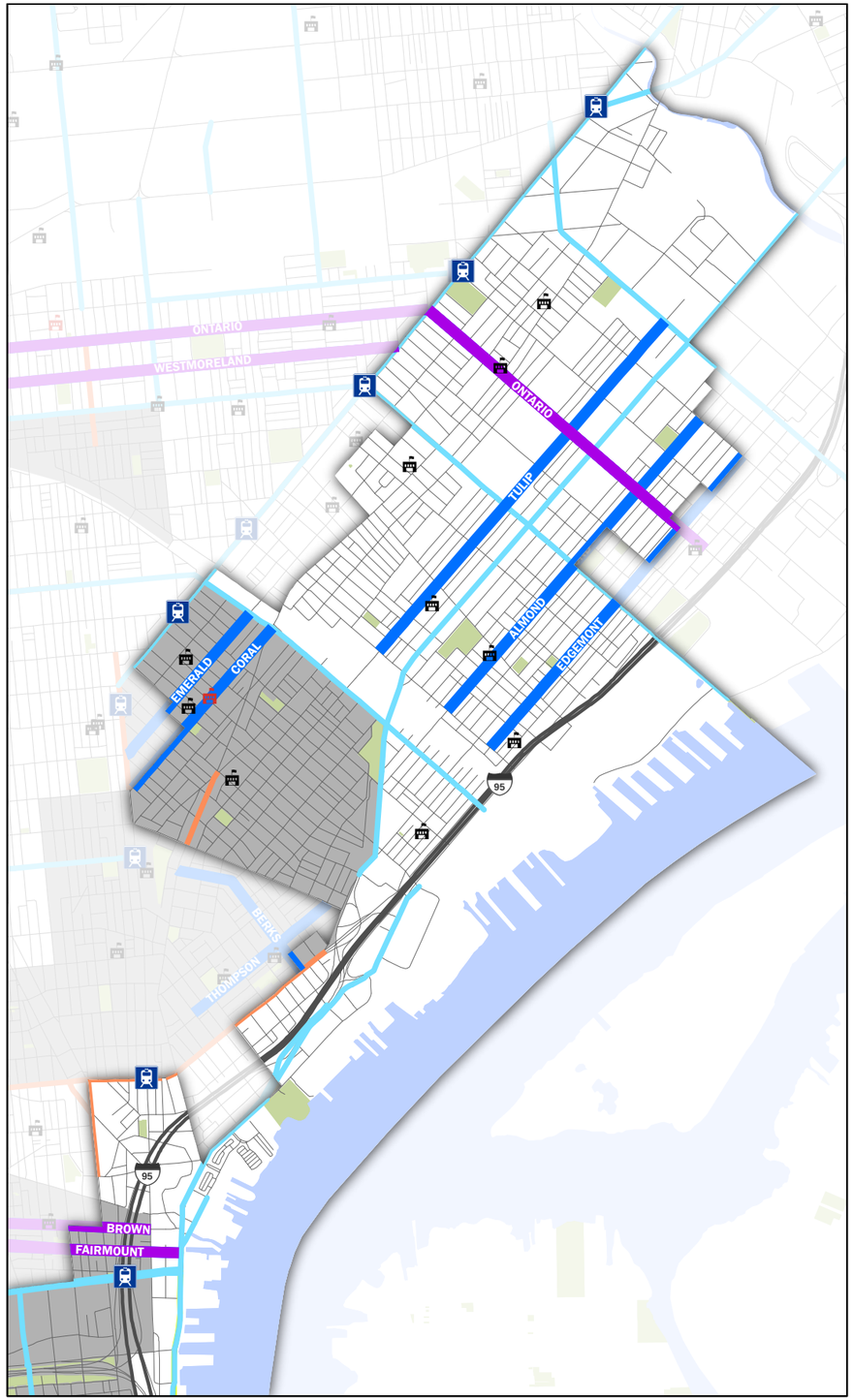
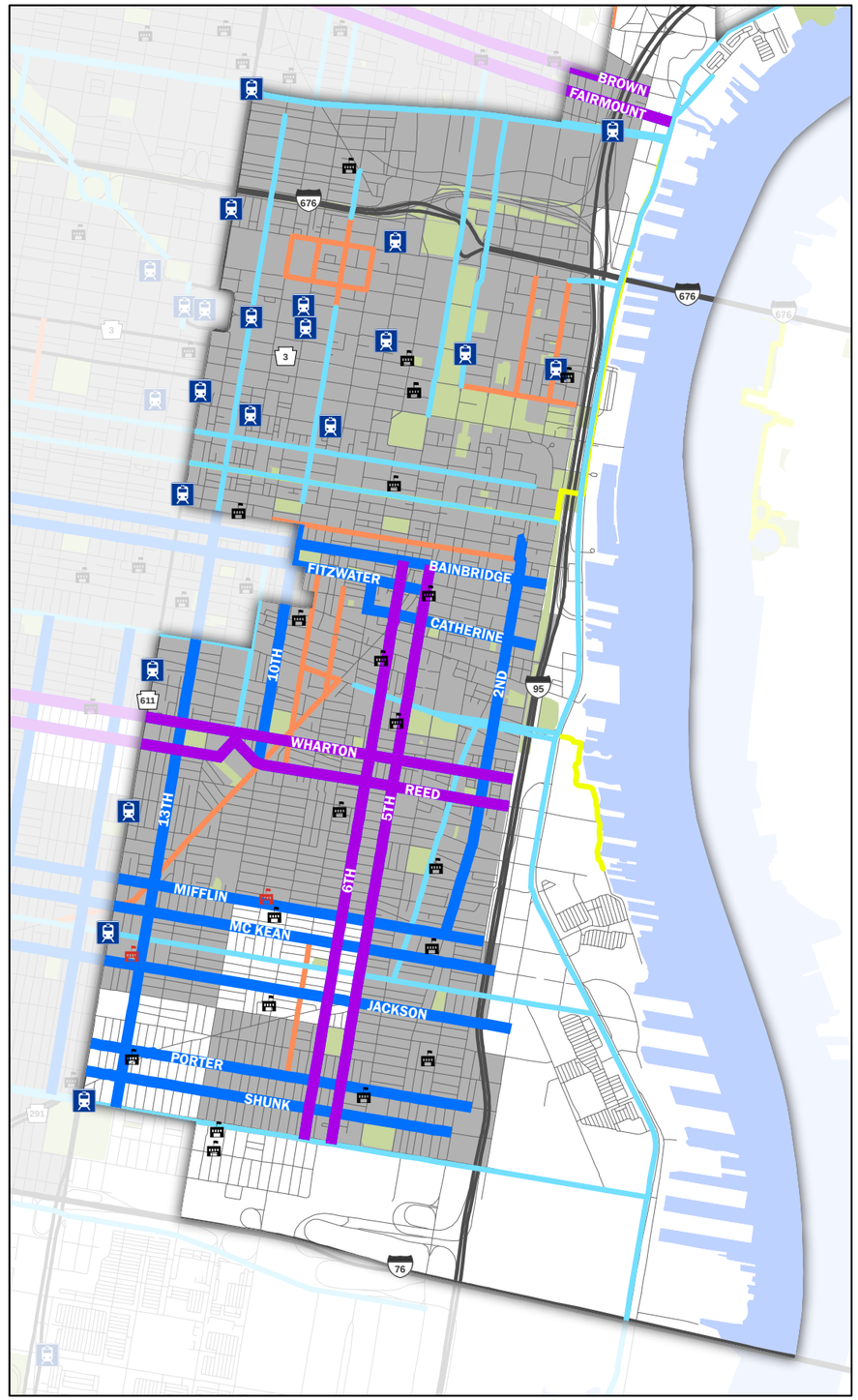
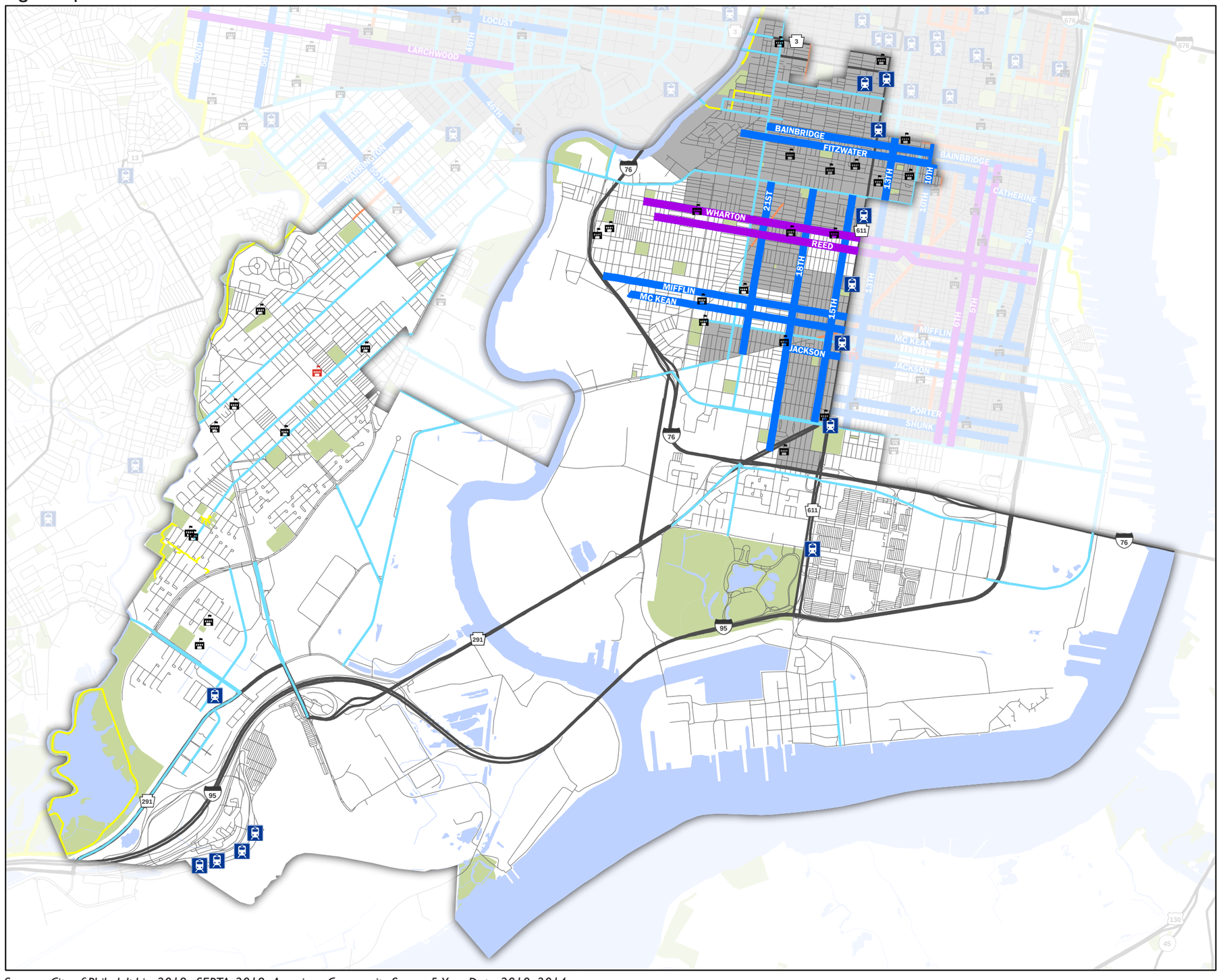


Figure 7 | Council District 1: South



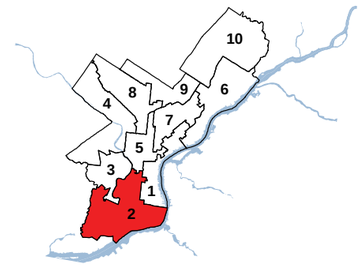
Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Figure 8 | Council District 2



COUNCIL DISTRICT #2

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Council District 2 Candidate: Wharton and Reed Streets

Extents: Reed Street: 33rd Street to Front Street
Wharton Street: Schuykill Avenue to Front Street
Length:
Wharton Street: 3 miles
Reed Street: 2.8 miles
Width: 25 feet
Configuration: Couplet
AADT: Wharton Street: 3,600 (2001)
Reed Street: 3,200 (2014)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	✓
SEPTA Station	✓
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Would provide a long, continuous connection across South Philadelphia;
- would provide connection to the Grays Ferry Crescent Trail and planned swing bridge trail across the Schuykill River; and
- segments already have "Share the Road" signage throughout.

Strategies and Opportunities

- Crossing improvements would be needed at 25th, Broad, Moyamensing, and 11th streets.
- Wharton Street requires updated traffic counts.
- Reed Street between 9th and 12th streets would require additional study to address volumes and intersection at 11th Street.
- Street widths in the area are narrow, so a passing zone treatment like the one shown on pages 40 and 41 might be considered to help create a comfortable condition for cyclists.

Reed Street near 5th Street
Source: Google

Wharton Street near Columbus Square Park (13th Street)
Source: Google

Reed Street at 25th Street
Source: Google

The entrance to the DuPont Crescent Trail at Wharton Street and Schuykill Avenue
Source: Google

Council District 3 Candidate: Larchwood Street

Extents: 43rd Street to Cobbs Creek Parkway
Length: 2.2 miles
Width: 32 feet
Configuration: Bidirectional
AADT: 1,654 (2017)

Destinations Served	
School	
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	✓
SEPTA Station	
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Wide enough for vehicles to comfortably pass bicyclists; and
- has existing high-quality pedestrian infrastructure.

Strategies and Opportunities

- It would fill an east-west gap in the district's bicycle network closer to Baltimore Avenue.
- Larchwood currently discontinues for one block at Mercy Philadelphia Hospital between 53rd and 54th Street. Osage and Addison streets could be used to bridge this short east-west gap.
- Enhanced crossing treatments are needed at Cobbs Creek Parkway to access Cobbs Creek Trail.

Larchwood Street between 45th and 46th streets, looking west
Source: Google


Larchwood Street at 51st Street near Malcolm X Park
Source: Google

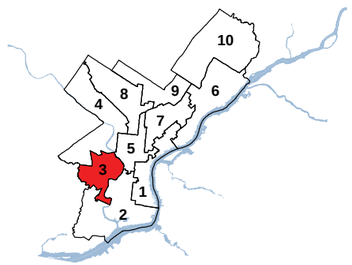

Larchwood Street between 57th and 58th streets
Source: Google

Larchwood Avenue near Cobbs Creek Parkway
Source: Google

Figure 9 | Council District 3

COUNCIL DISTRICT #3

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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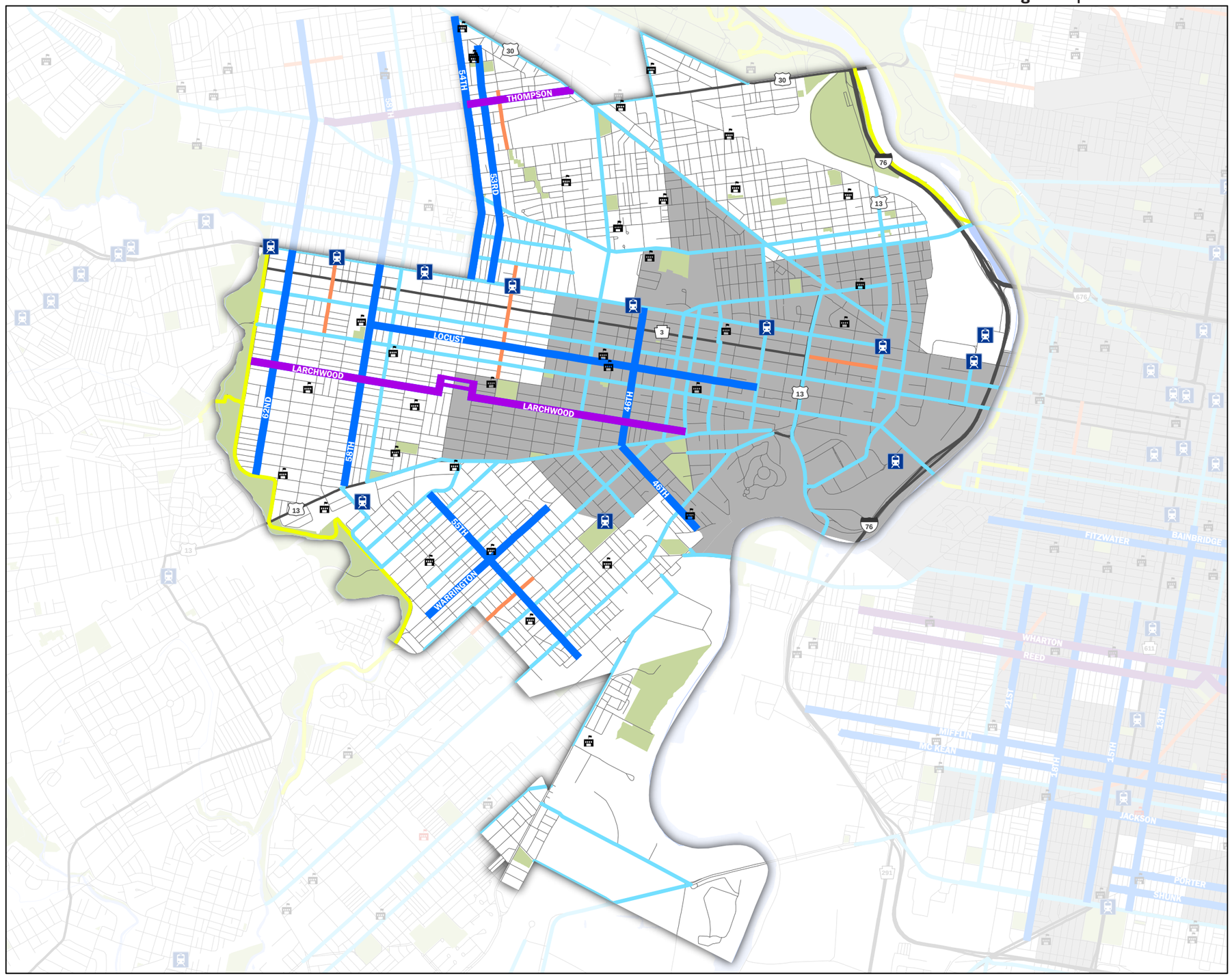
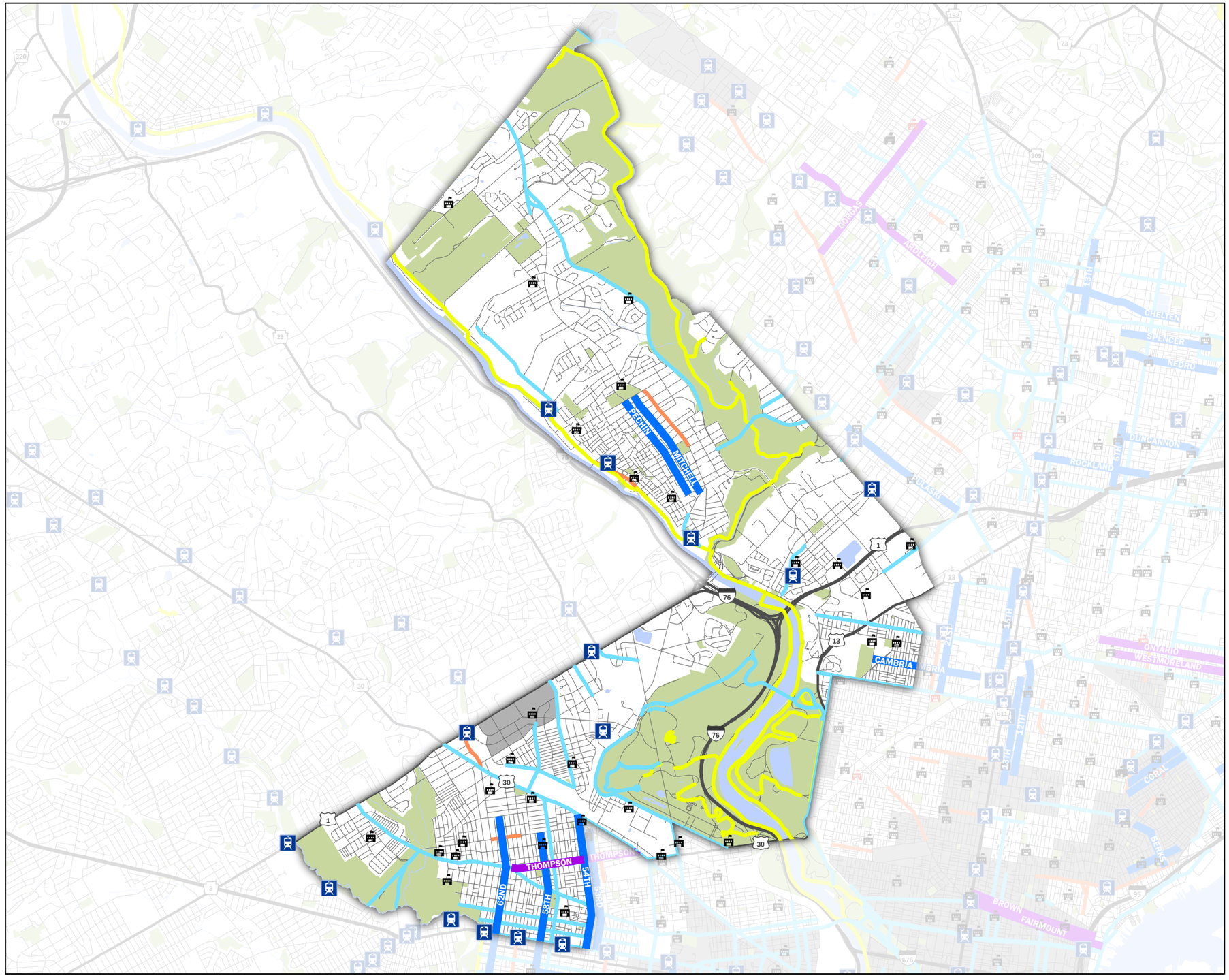


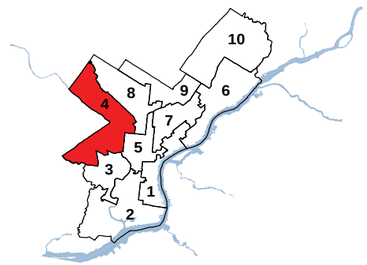
Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Figure 10 | Council District 4



COUNCIL DISTRICT #4

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Council District 4 Candidate: Thompson Street

Extents: 61st Street to Lancaster Avenue
Length: 1.15 miles
Width: 34 feet
Configuration: Bidirectional
AADT: 1,802 (1996)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	
SEPTA Station	✓
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Long and continuous route that connects a dense, walkable residential neighborhood with a commercial corridor, a park, and several existing bicycle facilities; and
- wide enough for vehicles to comfortably pass bicyclists.

Strategies and Opportunities

- Updated traffic counts are needed.
- Additional crossing treatments at the intersection with 52nd Street could improve pedestrian and bicycle comfort.

Thompson Street near 49th Street
Source: Google

Thompson Street at 53rd Street
Source: Google

Thompson Street at 61st Street
Source: Google

Thompson Street near Wanamaker Street
Source: Google

District 5 Candidate: Fairmount Avenue and Brown Street

Extents: Fairmount Avenue: Broad Street to Delaware Avenue
Brown Street: Broad Street to Front Street
Length: 1.3 miles (each)
Width: 34 feet
Configuration: Couplet
AADT: Fairmount Avenue: 3,588 (2006)
Brown Street: 1,453 (2007)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	✓
SEPTA Station	✓
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Creates a long and continuous east-west connection through neighborhoods with many bicycle and pedestrian commuters; and
- would connect to several bike facilities, including the Delaware River Trail.

Strategies and Opportunities

- Improved lighting beneath I-95 and SEPTA Regional Rail overpasses could improve feelings of safety.
- Street widths in the area are narrow, so a passing zone treatment like the one shown on pages 40 and 41 may help to create a comfortable condition for cyclists.

Brown Street near 4th Street
Source: Google

Brown Street near Percy Street
Source: Google

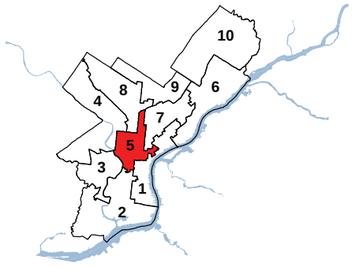
Fairmount Avenue near 2nd Street
Source: Google

Fairmount Avenue near 11th Street
Source: Google

Figure 11 | Council District 5

COUNCIL DISTRICT #5

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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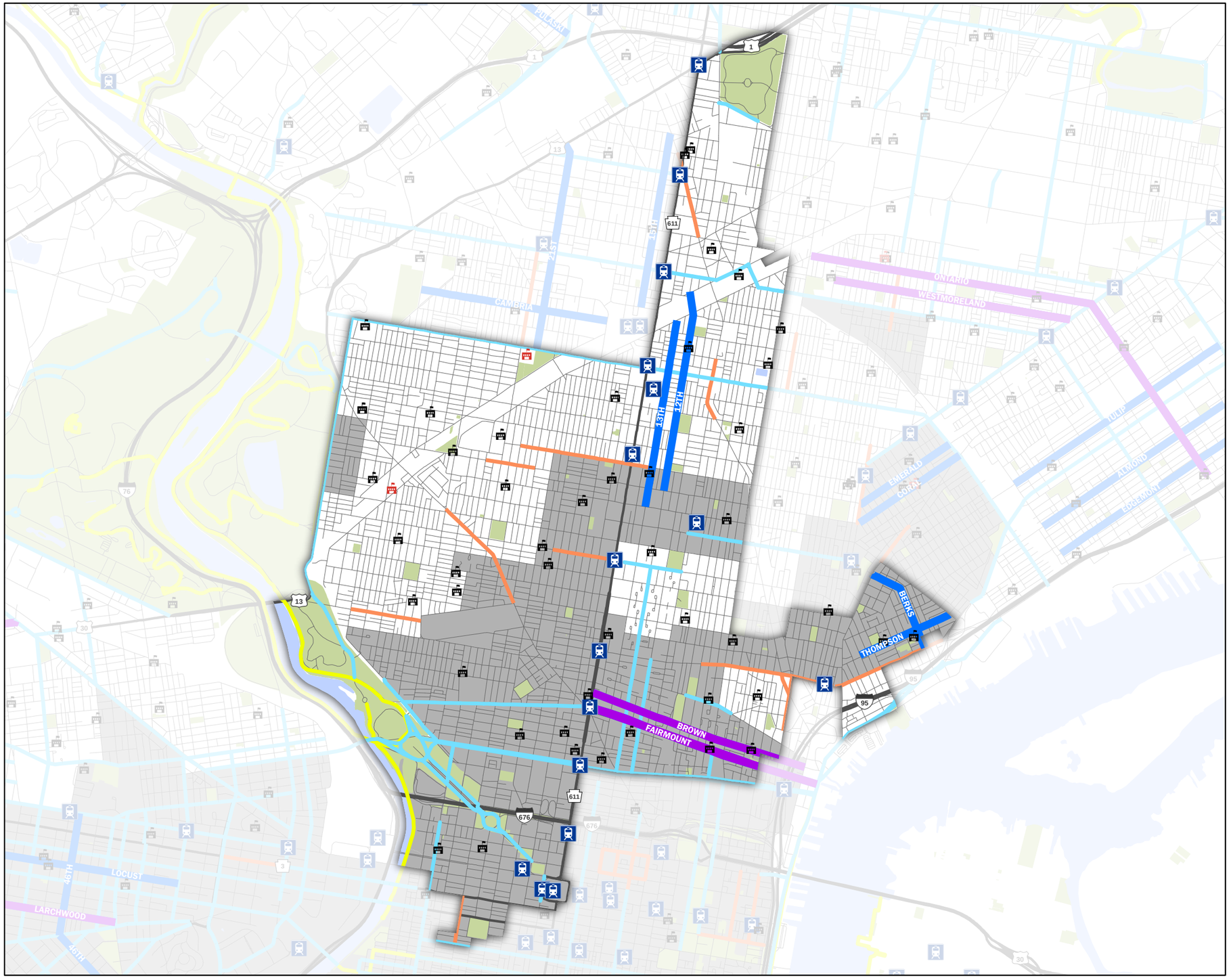
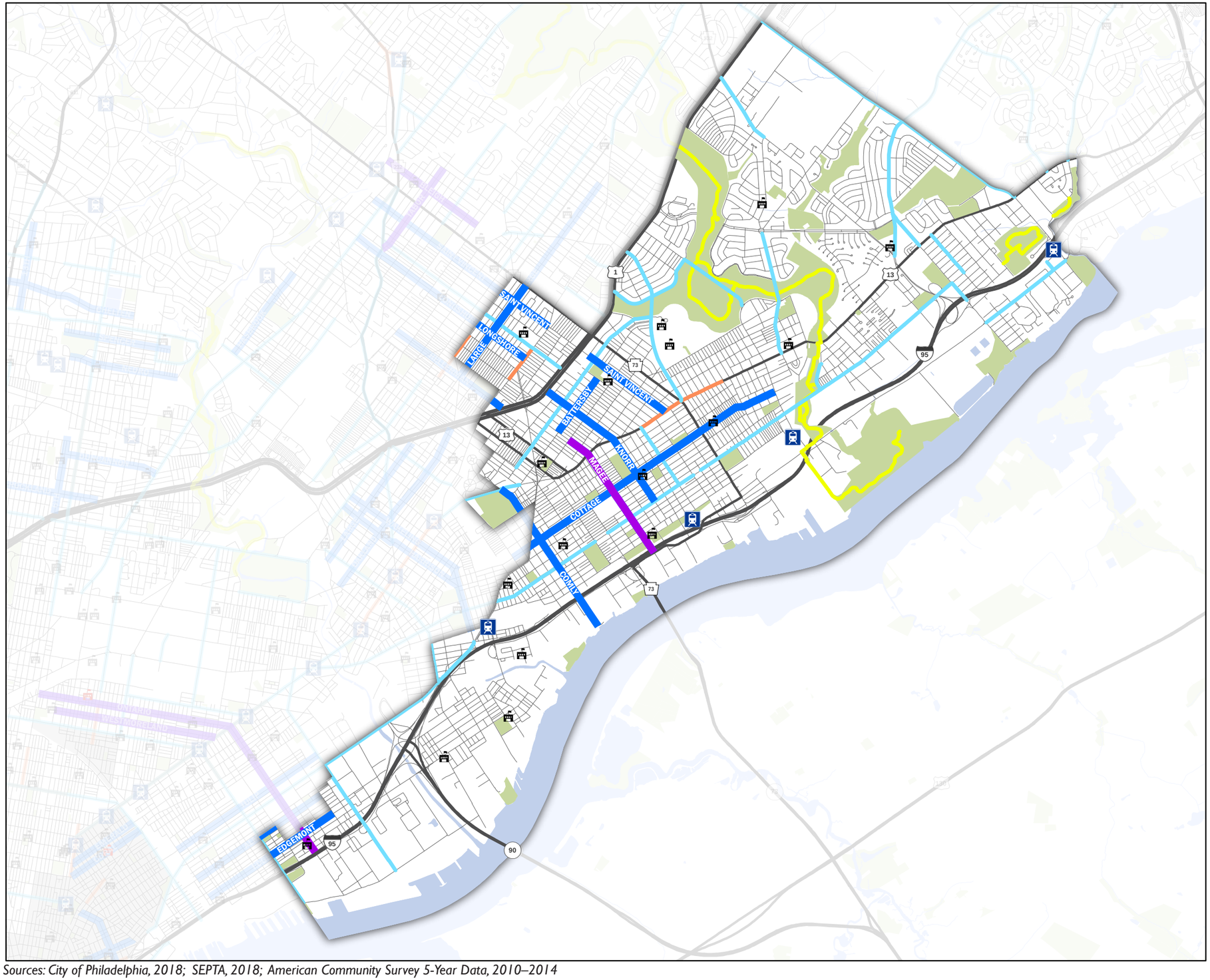


Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Figure 12 | Council District 6



COUNCIL DISTRICT #6

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters

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Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Council District 6 Candidate: Magee Avenue

Extents: Brous Avenue to New State Road
Length: 1.35 miles
Width: 34–50 feet
Configuration: Bidirectional
AADT: 3,106 (2005)

Destinations Served	
School	
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	
SEPTA Station	
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths:

- Wide enough for vehicles to comfortably pass bicyclists; and
- would create a connection to the K&T Trail along the Delaware River waterfront.

Strategies and Opportunities:

- Updated traffic volumes are needed.
- Additional crossing treatments at the intersection with Frankford Avenue could improve pedestrian and bicycle comfort.
- West of Frankford Avenue, travel lanes are as wide as 17 feet, which may encourage vehicles to speed. Narrowing the travel lanes by moving the edge striping and implementing speed controls such as speed cushions can help to improve comfort for bicycle and pedestrian users (see Table 5 on page 35 for more information about speed reduction measures).

Magee Avenue near Frankford Avenue
Source: Google

Magee Avenue at Keystone Street
Source: Google

Magee Avenue near Brous Avenue
Source: Google

Magee Avenue near Ditman Street
Source: Google

District 7 Candidate: Ontario and Westmoreland Streets

Extents: Kensington Avenue to Glenwood Avenue
Length: 1.5 miles (each)
Width: 26 feet
Configuration: Couplet
AADT: Ontario: 2,980 (1996)
Westmoreland: 2,913 (2007)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	
SEPTA Station	✓
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	

Strengths

- Would provide an improved bicycle and pedestrian connection to the Community School at William Cramp Elementary.

Strategies and Opportunities

- Street widths in the area are narrow, so a low-stress intersection treatment like the ones shown on pages 40 and 41 may help to create a comfortable condition for cyclists.
- This candidate requires updated traffic counts.

Ontario Street near 4th Street
Source: Google

Ontario Street near I Street
Source: Google

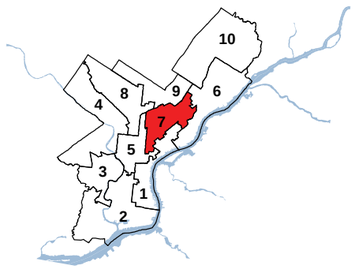

Westmoreland Street and B Street
Source: Google

Westmoreland Street and Water Street
Source: Google

Figure 13 | Council District 7

COUNCIL DISTRICT #7

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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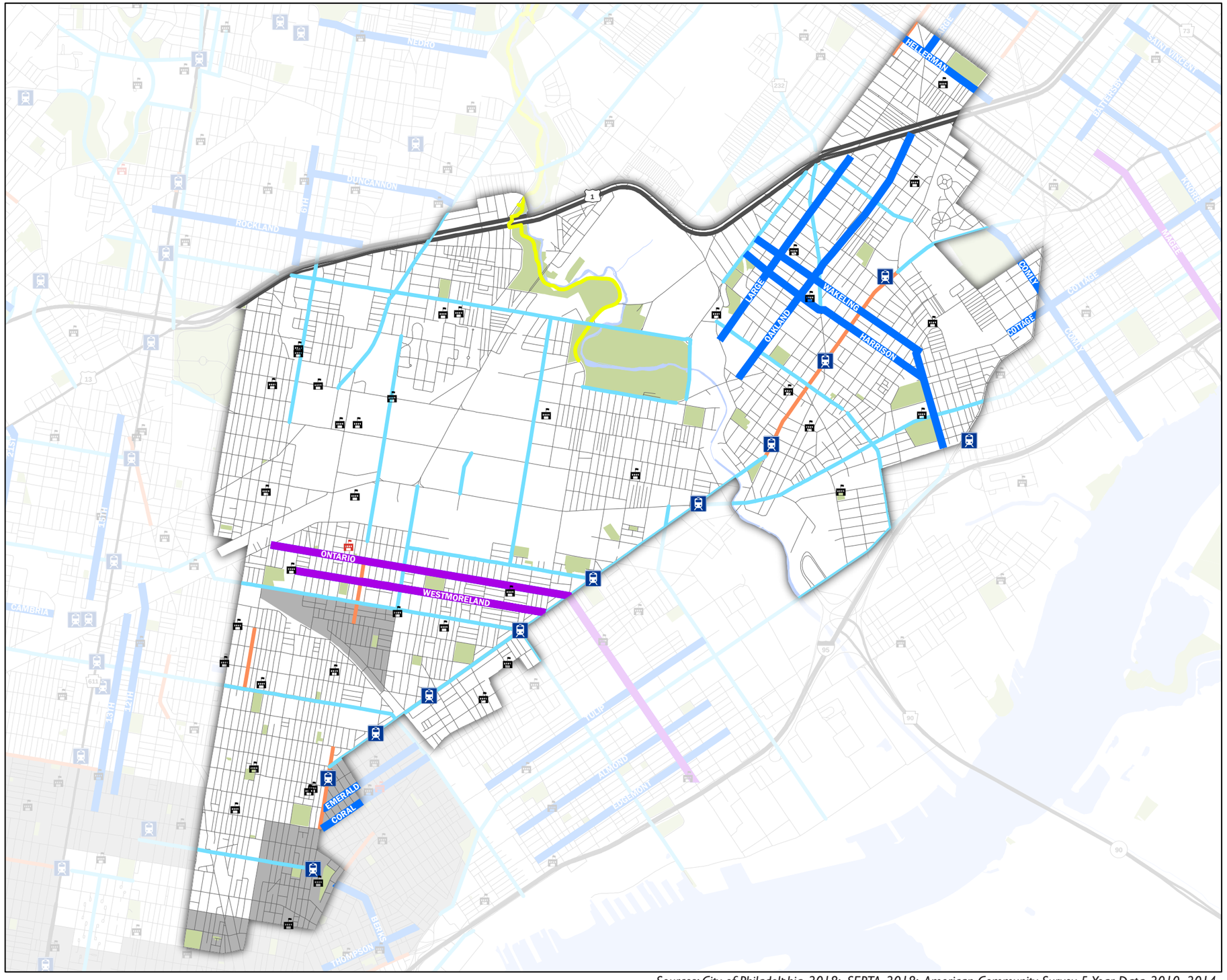
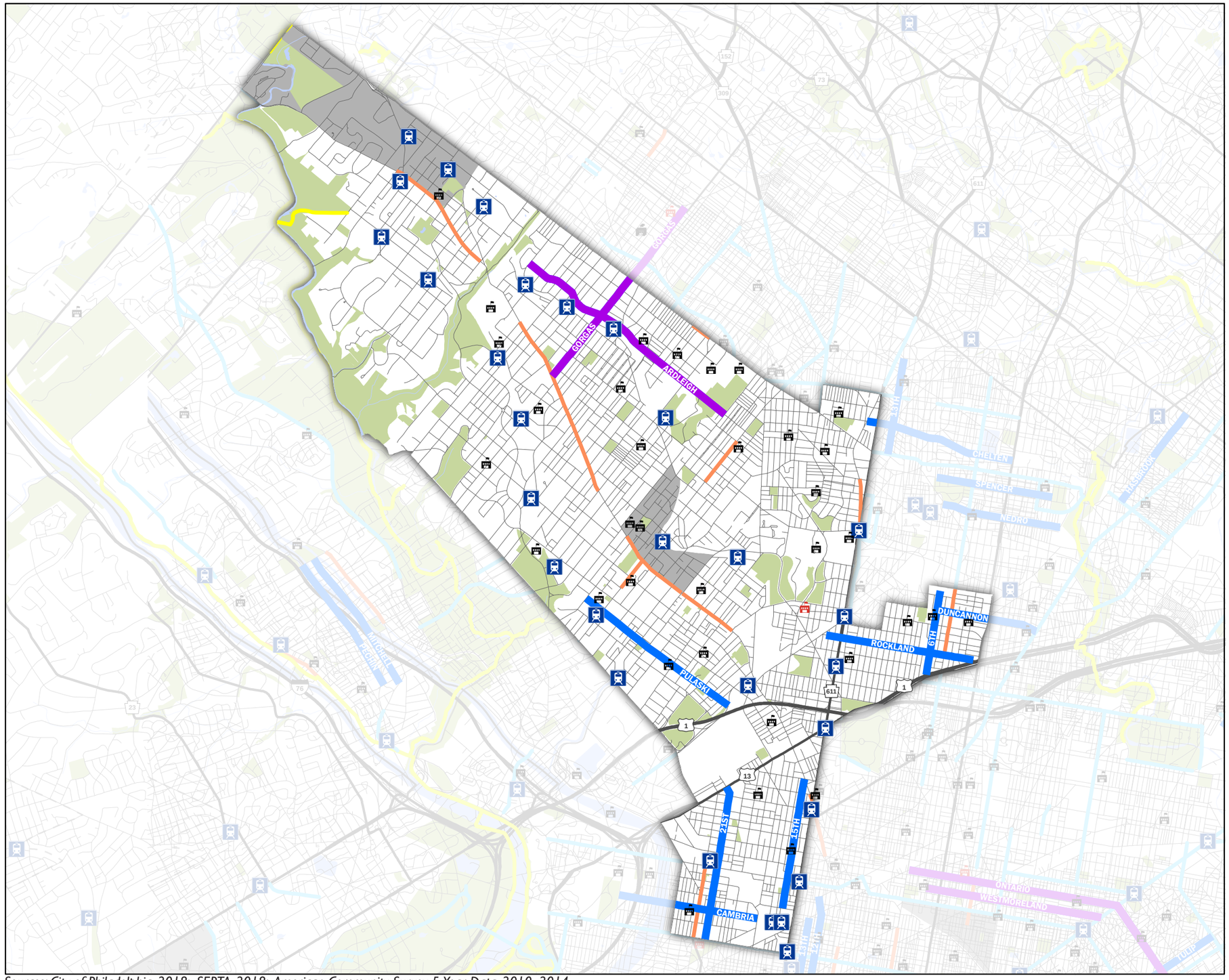


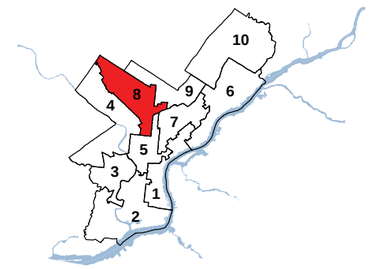
Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Figure 14 | Council District 8



COUNCIL DISTRICT #8

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Council District 8 Candidate: Ardleigh Street

Extents: Haines Street to Roumfort Road
Length: 1.8 miles
Width: 34 feet
Configuration: Bidirection
AADT: 2,855 (2002)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	✓
SEPTA Station	✓
Commercial Corridor	

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Wide enough for vehicles to comfortably pass bicyclists; and
- connects to Stenton and Sedgwick stations on SEPTA's Chestnut Hill East Line.

Strategies and Opportunities

- Higher traffic counts at the eastern extent of Ardleigh may require the use of additional volume and speed controls.
- The intersection at Vernon Road may require additional crossing treatments to improve comfort for cyclists.
- The western end of Ardleigh Street has steep inclines that may be challenging for some riders.

Ardleigh Street near Gowen Street
Source: Google


Ardleigh Street near Vernon Road
Source: Google

Ardleigh Street at Vernon Road
Source: Google

Ardleigh Street near Haines Street
Source: Google

Council District 9 Candidate: Gorgas Lane

Extents: Williams Avenue to Chew Avenue
Length: 1.4 miles
Width: 36 feet
Configuration: Bidirectional
AADT: 3,173 (2009)

Destinations Served	
School	✓
Park or Recreation Center	✓
High Bicycle and Pedestrian Commuter Census Tract	
SEPTA Station	✓
Commercial Corridor	

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	✓
Fills Existing Gap in Bicycle Network	✓

Strengths

- Wide enough for vehicles to comfortably pass bicyclists;
- serves F. S. Edmonds Elementary, one of Philadelphia's nine Community Schools; and
- intersects with District Eight's priority, Ardleigh Street.

Strategies and Opportunities

- The street's wide cartways and lower on-street parking demand allows for more flexibility in the type of speed reduction tools that can be used (e.g, chicanes, curb extensions, etc.).

Gorgas Lane at Chew Avenue
Source: Google

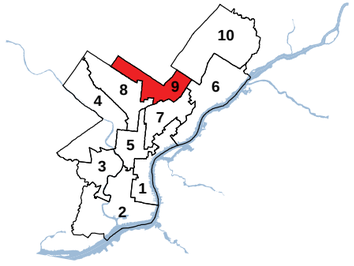
Gorgas Lane at Williams Avenue near F. S. Edmonds Elementary School
Source: Google

Gorgas Lane at Mansfield Avenue
Source: Google

Figure 15 | Council District 9

COUNCIL DISTRICT #9

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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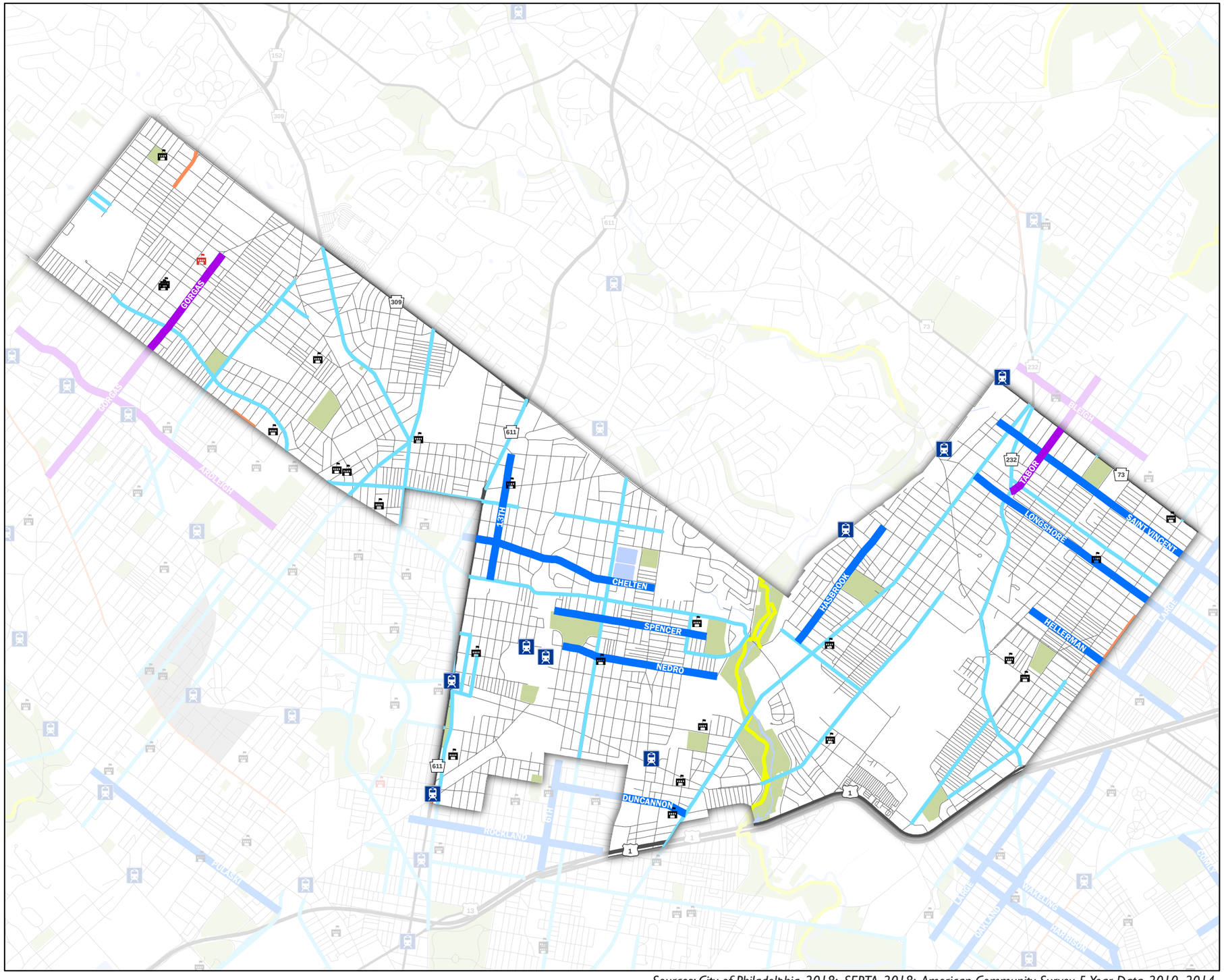
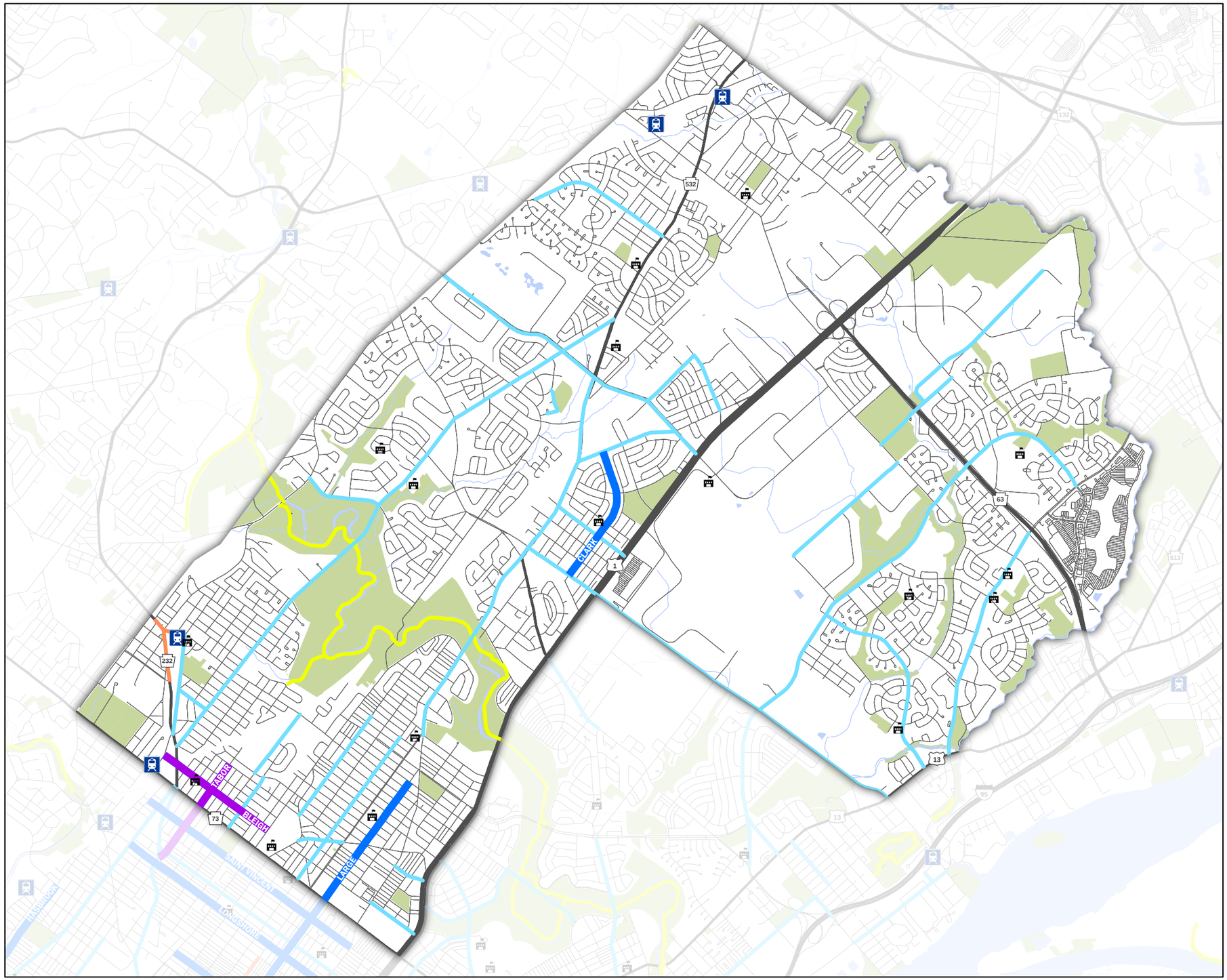


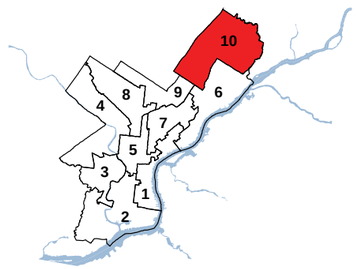
Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

Figure 16 | Council District 10



COUNCIL DISTRICT #10

- Featured Candidate Street
- Other Candidate Street
- Walkable Commercial Corridor
- Bike Lane
- Major Road
- SEPTA Rail Station
- Park
- Community School Building
- Public School Building
- Existing Circuit Trail
- Census Tract with Greater Than City Median Percentage (11%) of Bicycling and Walking Commuters



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Sources: City of Philadelphia, 2018; SEPTA, 2018; American Community Survey 5-Year Data, 2010–2014

District 10 Candidate: Bleigh Avenue and Tabor Avenue

Extents: Bleigh Avenue: Rockwell Avenue to Algon Avenue
Tabor Avenue: Napfle Avenue to Tyson Avenue
Length: 1.2 miles
Width: 34 feet
Configuration: Bidirectional
AADT: Bleigh Avenue: 1,839 (2001)
Tabor Avenue: 2,087 (2001)

Destinations Served	
School	✓
Park or Recreation Center	
High Bicycle and Pedestrian Commuter Census Tract	
SEPTA Station	✓
Commercial Corridor	✓

Network Connections	
Intersects with Bicycle Lane or Trail	✓
Adjacent to Major Street	
Fills Existing Gap in Bicycle Network	✓

Strengths

- Wide enough for vehicles to comfortably pass bicyclists; and
- the streets combine to create a useful local bike network.

Strategies and Opportunities

- This candidate requires updated traffic counts.
- Enhanced crossing treatments may be needed for Bleigh Avenue at Oxford Avenue and for Tabor Avenue at Cottman Avenue and Tyson Avenue.
- Bicycle facilities on Rockwell Avenue and Cottman Avenue that connect to the neighborhood greenway on Bleigh Avenue could improve bicycle access to the Ryers SEPTA Regional Rail station.

Bleigh Avenue at Palmetto Street
Source: Google

Bleigh Avenue at Penway Street
Source: Google

Tabor Avenue near Napfle Avenue
Source: Google

Tabor Avenue near Princeton Avenue
Source: Google

Chapter 4: Design Treatments and Next Steps

A number of design treatments are used to build neighborhood greenways. These treatments help assure that neighborhood greenways are highly recognizable, easy to understand, and safe and comfortable to use. The following chapter describes engineering and design tools that can be used together to create high-quality neighborhood greenways and identifies the next steps in the planning and implementation process.

Neighborhood Greenway Treatments

Each candidate street identified in this study will require a design tailored to its unique characteristics. With this in mind, a variety of design elements (shown in the following tables) can be used to build a successful neighborhood greenway.

The *Bicycle Boulevard and Design Guidebook* (2009) developed by Alta Planning and Portland State University outlines six key standards that the design of a neighborhood greenway should meet to function optimally. Design tools should be mixed and matched to:

1. Reduce or maintain low motor vehicle volumes.
2. Reduce or maintain low motor vehicle speeds.
3. Create a logical, direct, and continuous route.
4. Create access to desired destinations.
5. Create comfortable and safe intersection crossings.
6. Reduce cyclist delay.

Designs should also maintain or increase the comfort and safety of pedestrians and the pedestrian experience by increasing visibility, especially at intersections, and reducing crossing distances, for example.

Some of the streets identified in the previous chapter may require more interventions than others. For example, streets that are used by cut-through auto vehicle traffic or cross high-volume arterials may require more data collections and controls to achieve these standards.

The following design tools are taken from best practice guides including the NACTO *Urban Bikeway Design Guide*, Pennsylvania Department of Transportation's *Pennsylvania Traffic Calming Handbook,* and Alta Planning and Portland State University's *Fundamentals of Bicycle Boulevard Planning and Design.* All of these techniques have been used nationally on neighborhood greenways, despite the fact that some elements may not yet be approved in local guidelines or the *Manual on Uniform Traffic Control Devices*. As with any treatment, final designs must consider proper Americans with Disabilities Act access, emergency vehicle access, general issues and changes with drainage, and plowing during winter operations. Also, some elements might have spillover effects to adjacent streets, like volume controls; this potential outcome should be considered.

Tables 3, 4, 5, and 6 on the following pages present design and infrastructure tools that are grouped by their main purpose as it relates to neighborhood greenways. Each item includes an example graphic, a description of how it is used, and finally what it is used for, which aligns to the six design element principles above. Many design tools help to achieve multiple goals.

Table 3 | Signage

TOOLS	PHOTO	PURPOSE	HOW IT HELPS
1. Modified Street Signs		Increase visibility of a neighborhood greenway by attaching a unique identifier such as a bicycle symbol to the standard road sign.	• Distinguishes path
2. Wayfinding Signs		Provide direction, distance, and estimated travel times to points of interest in the area. Wayfinding signs can also be used to help with branding of neighborhood greenways.	• Distinguishes path
3. Warning Signs		Should be placed at major street intersections to alert drivers to watch for cyclists, pedestrian crossings, and traffic calming. Required Signage: R4-11 (May Use Full Lane), W11-1 (Bicycle Symbol), W-11-15 (Pedestrians), W16-9P (Ahead).	• Improves driver awareness
4. Stop Sign Removal/ Yield Signs		Neighborhood greenways should have fewer stops or delays than a local street. To minimize delay for neighborhood greenway users, all intersections with minor streets should require stop signs for cross traffic only. "Cross Traffic Does Not Stop" and neighborhood greenway signage should be added at cross streets as well. Required signage: W4-4P (Cross Traffic Does Not Stop)	• Distinguishes path • Reduces friction for cyclists
5. Speed Limits		Speed limits should be no higher than 25 mph (20 mph or less preferred).	• Reduces speeds
6. Lawn Signs		Yard signs can be used by neighbors to improve the visibility of neighborhood greenways and raise awareness about how they should be used.	• Distinguishes path • Educates users

Photo Credits:
1. Courtesy of Jonathan Maus
2. Bicycle Coalition of Greater Philadelphia
3. Federal Highway Administration
4. Alta Planning
5. City of Albuquerque
6. Portland Bureau of Transportation

Table 4 | Bicycle and Pedestrian Prioritization

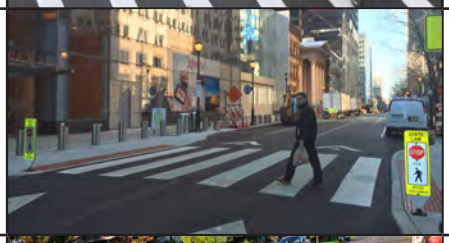
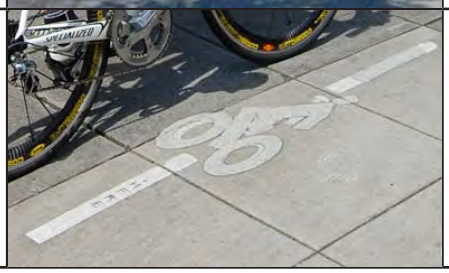
TOOLS	EXAMPLE	PURPOSE	HOW IT HELPS
7. Bicycle Boxes		Designated areas located at the head of a traffic lane at a signalized intersection provide bicyclists with a safe and visible way to get ahead of queuing traffic during a signal phase. Boxes are usually painted green and sometimes feature a short curbside lane that helps create space for cyclists to move to the front of the vehicle queue.	• Distinguishes path • Improves bicyclist visibility in the street
8. Crossbike		Crossbikes help to guide bicyclists through intersections by providing clear and direct paths using arrows and dashes.	• Distinguishes path
9. High-Visibility Crosswalk		Should be installed to create a highly visible crossing location for cyclists and pedestrians. Can be combined with curb extensions to reduce crossing distance.	• Distinguishes path • Reduces speeds • May reduce vehicle volumes
10. Sharrow		Helps users to stay on the route and to brand the neighborhood greenway. Also indicates to drivers that bicyclists may use the full traffic lane and that the street is a neighborhood greenway.	• Distinguishes path
11. Painted and Patterned Surfaces in Conflict Areas		Indicate potential conflict areas between vehicles and bicyclists. Can also help with traffic calming.	• Distinguishes path • May reduce speeds
12. Bicycle and Pedestrian Activated Signals		Allow bicyclists and pedestrians to request a green signal at a high-volume intersection by either pushing a button or triggering an actuated signal (loop, video, or microwave).	• Safer crossing • Reduces delay for bicyclists and pedestrians

Photo Credits:
7. Bicycle Coalition of Greater Philadelphia
8. NACTO
9. Courtesy of Dan McQuade
10. Bike Portland
11. Plan Philly
12. NACTO
13. DVRPC
14. NACTO
15. Courtesy of Andrew Price
16. NACTO
17. Courtesy of Steven Vance
18. NACTO

Table 5 | Speed Reduction

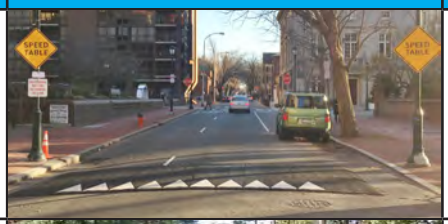
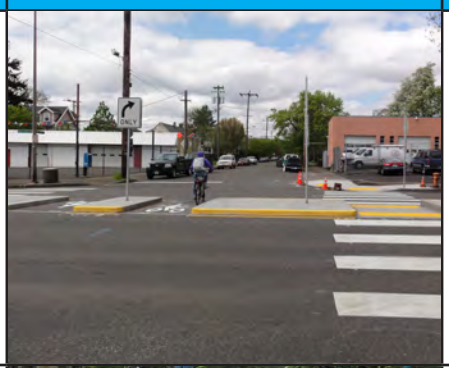
TOOLS	EXAMPLE	PURPOSE	HOW IT HELPS
13. Speed Tables and Speed Cushions		Provide vertical deflection that reduces vehicle speeds without slowing down bicyclists.	• Reduces speeds • May reduce vehicle volumes • Safer crossing
14. Chicanes		Chicanes use curb extensions to shift travel in a serpentine-like manner.	• Reduces speeds • May reduce vehicle volumes
15. Curb Extensions		Curb extensions extend the sidewalk or curb line (using various materials) out into the parking lane, which reduces the street crossing distance. These bump-outs can increase the visibility of pedestrians and serve as a traffic-calming feature.	• Safer crossing • May reduce speeds
16. Neighborhood Traffic Circle		Neighborhood traffic circles help lower speeds at minor intersection crossings by guiding traffic counter clockwise around a round center median. Depending on the setting, the center median can be mountable for emergency vehicles or include plantings (as shown).	• Reduces speeds

Table 6 | Volume Reduction

TOOLS	EXAMPLE	PURPOSE	HOW IT HELPS
17. Non-Motorized-Only Crossings		A non-motorized-only crossing uses diverters to prevent vehicles from making left turns and through movements at an intersection with a major street. These facilities may reduce vehicle volumes by up to 70 percent and typically include median refuges for pedestrians and cyclists. Required signage: R1-1, R4-7c, R3-5R, R3-2	• Reduces vehicle volumes • Safer crossing
18. Partial Non-Motorized-Only Crossings		Reduce through traffic by requiring vehicles to turn while allowing through movements by cyclists. May reduce traffic volumes by as much as 60 percent. Required Signage: R5-1 (Do Not Enter)	• Reduces vehicle volumes • Safer crossing

Philadelphia-Specific Treatments

This two-part analysis identified many streets that are similar in type to the streets where neighborhood greenways have been constructed in other cities. Larchwood Street in West Philadelphia is an example, shown on page 16. It is bidirectional and low volume, and vertical and horizontal deflection could be readily installed. Given the directionality and width, vehicles could pass bicyclists as necessary.

The analysis also identified a set of streets unlike neighborhood greenways in other cities, as they have been designed and implemented so far. These streets, like Wharton and Reed streets on page 15, present three design challenges particular to Philadelphia:

- the majority of streets being one way;
- a cross section with one travel lane and two lanes of parking; and
- all-way stops as the typical intersection control.

With one-way streets, bidirectional bicycle traffic is not possible while maintaining the mixing of modes at low speeds that characterizes neighborhood greenways. To address the need for safe, low-stress routes for both directions of travel, all prioritized one-way streets have an identified couplet to provide for full network connectivity. Issues with typical intersection controls and the creation of passing zones are described in more detail in the following sections.

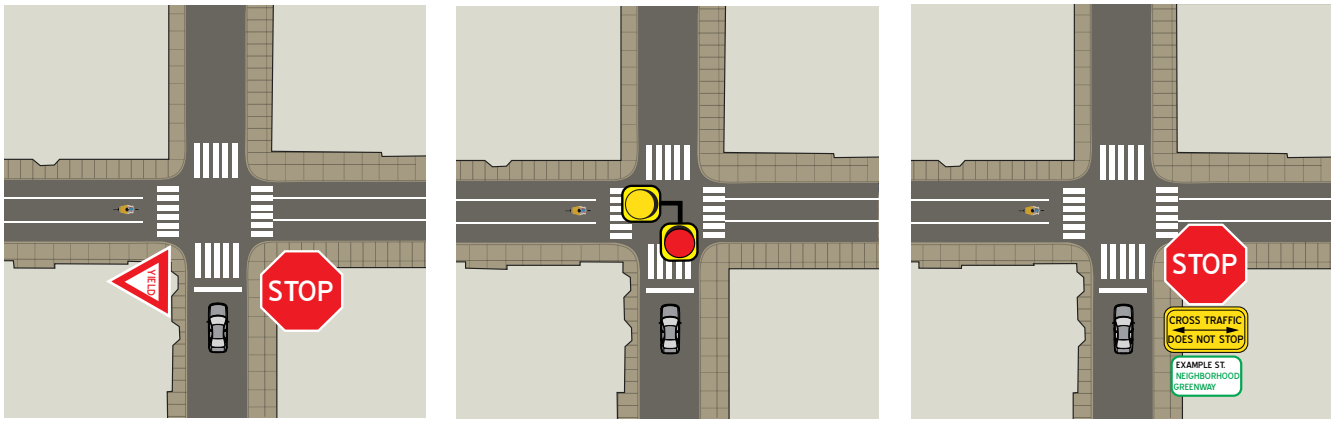
Intersection Design

All-way stops are the most common intersection control used on streets identified for neighborhood greenways. Most neighborhood greenways in other cities remove or turn stop signs at intersections, forcing cross traffic to give right-of-way to neighborhood greenway users. For all-way stops, there is concern with simply removing stop signs on the neighborhood greenways because road users are used to, and expect, an all-way stop condition since it is used so extensively in Philadelphia. To address that concern, a number of intersection treatments were identified, from new signage to using a flashing signal (see Figure 17).

Low-Stress Intersection Concepts

Many of the streets identified in the study have the same basic cross section: one travel lane and two lanes of on-street parking. While this cross section often provides the benefit of keeping speeds and traffic volumes low, it can also create a more stressful environment for bicyclists because vehicles are not able to safely pass. Many bicyclists do not feel comfortable taking the lane or having a vehicle travel behind them due to concern about driver behavior.

Figure 17 | All-Way Stop Alternatives for Neighborhood Greenways



Source: DVRPC, 2017

Additionally, on-street parking commonly occurs right up to the intersection. This creates visibility issues and impacts driver-yielding behavior.

Three possible solutions were identified to address these problems. The first would be to remove a lane of parking on these streets. Because this parking is well used, that would likely be difficult.

The second option would be the extensive use of volume management techniques to reduce vehicle traffic on these streets (to under 1,000 AADT) so that bicyclist-vehicle interactions were limited. A vehicle would still not be able to legally or comfortably pass, but the number of times this would be necessary would be far fewer. Both of these options would also include setting back the remaining parking from the intersection to improve visibility. Without aggressive enforcement, this measure for visibility would likely break down quickly. However, elements of the low-stress intersections concepts (shown on the following pages) could be used to physically delinate this space.

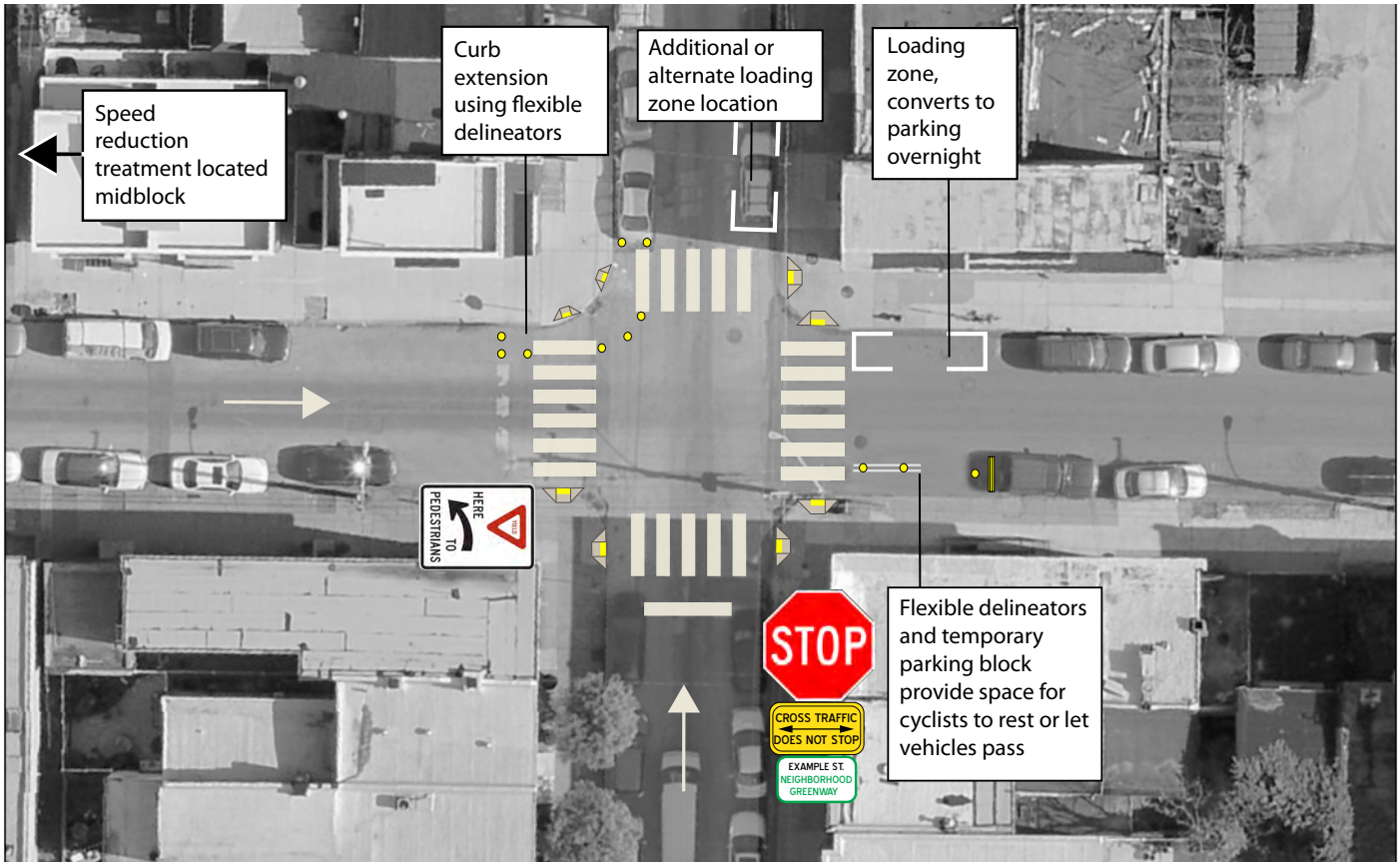
A third proposed solution would be to create passing zones on these streets with a package of other measures to address pedestrian visibility at intersections. Figures 18, 19, and 20 show how this concept could be implemented incrementally, first by piloting it and then by improving the treatments over time, as determined. These treatments would allow vehicles to pass bicyclists at the intersection and would also help to daylight corners for increased pedestrian safety. The curb extensions also reduce the crossing distance and time, another safety measure for pedestrians. The daylighting and curb extensions could be designed so as to not rely on enforcement to ensure the preservation of these safety measures. Passing zones should be used adjacent to intersections where conflicts with right-turning vehicles are not an issue because of restricted turns or one-way streets, or shifted to the opposite side of the street.

Finally, along all neighborhood greenways, loading zones, potentially designated for portions of the day, are proposed to reduce double parking. When not occupied, these loading areas can improve visibility at the intersections and increase space for vehicles to safely pass bicyclists.

20th and McKean Street in South Philadelphia
Source: Google, 2017

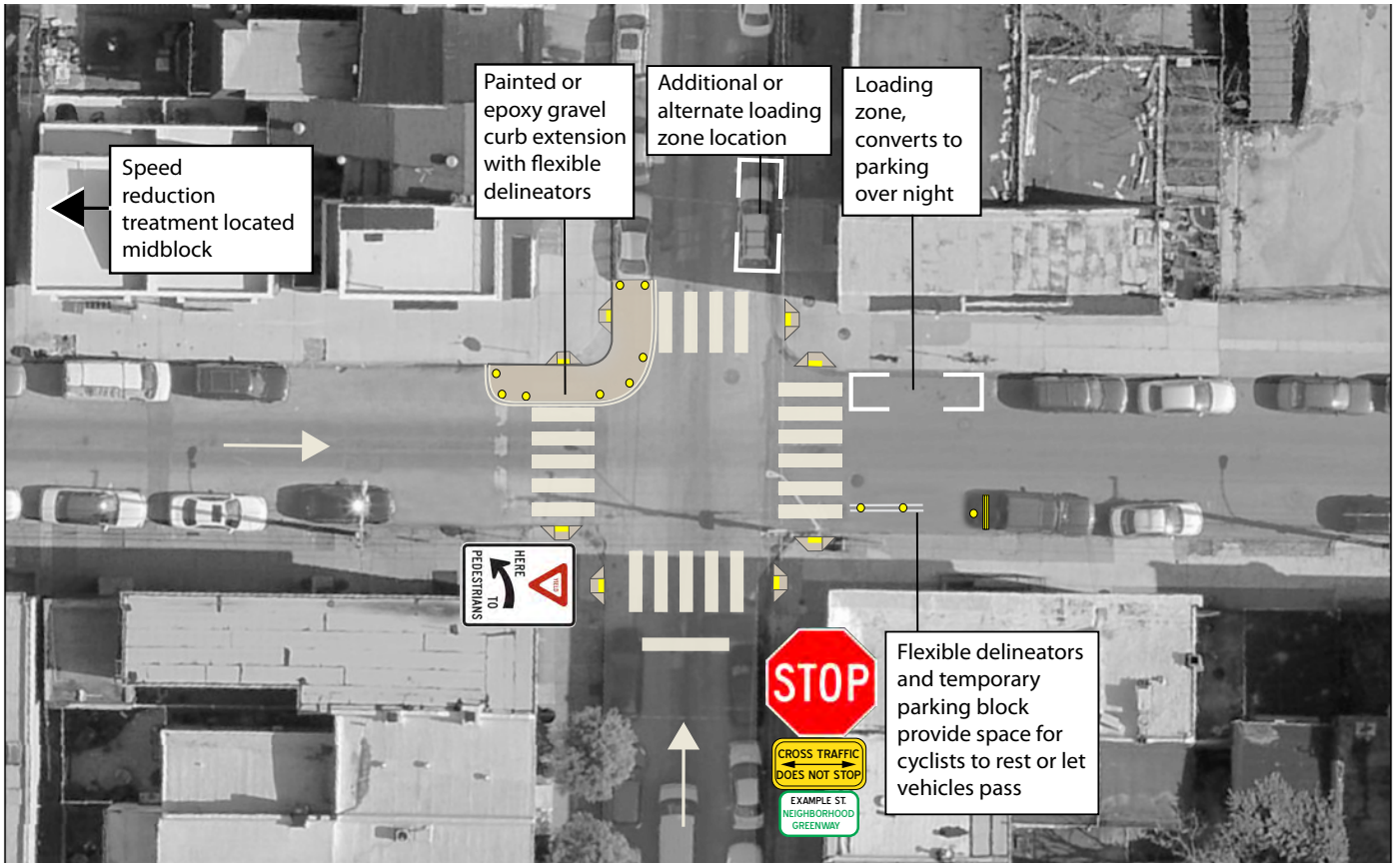
Low-stress intersection treatments in Hoboken, New Jersey
Source: Google, 2017

Figure 18 | Pilot Intersection Treatment



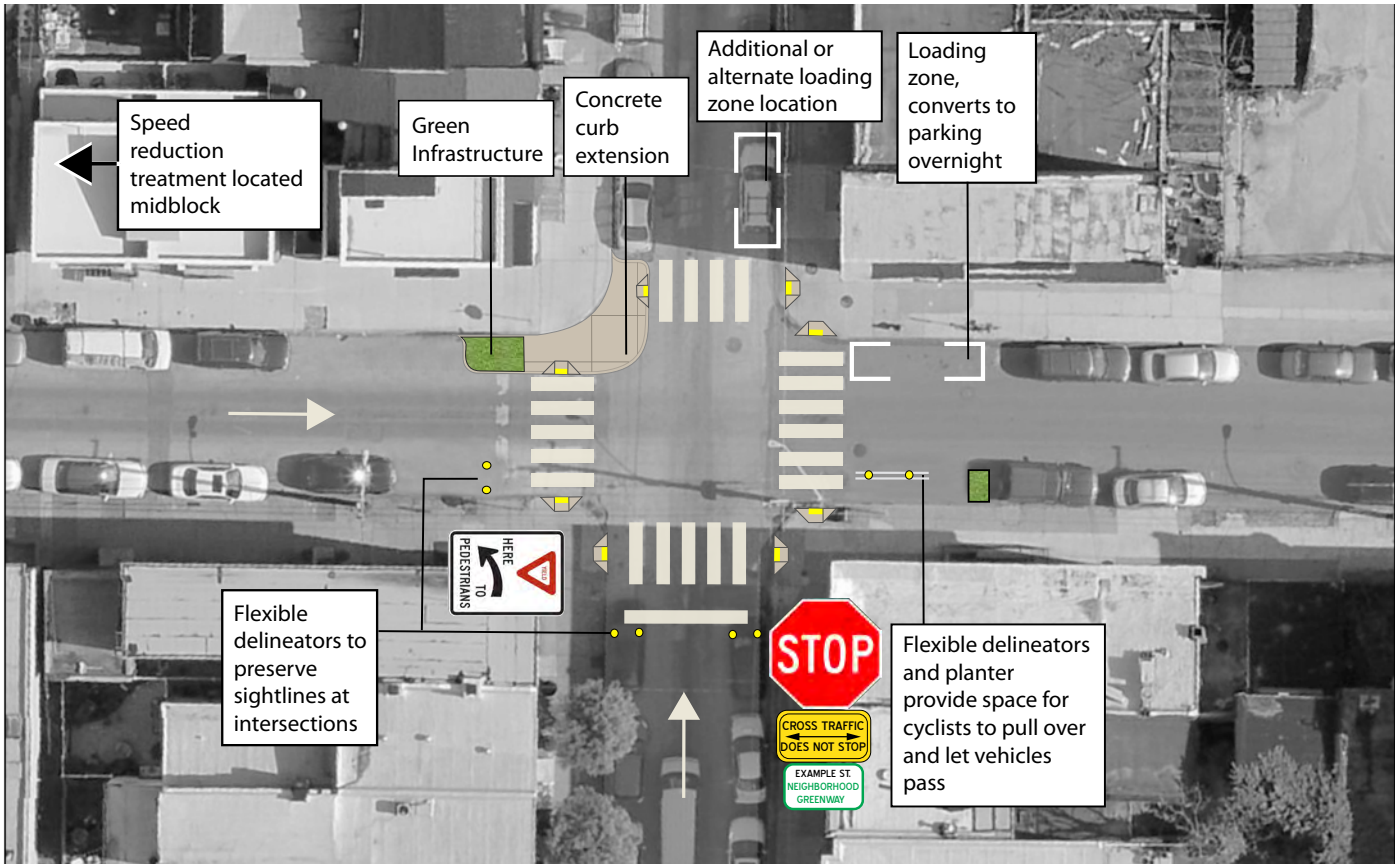
Source: DVRPC, 2018

Figure 19 | Interim Intersection Treatment



Source: DVRPC, 2018

Figure 20 | Premium Intersection Treatment



Source: DVRPC, 2018

Next Steps

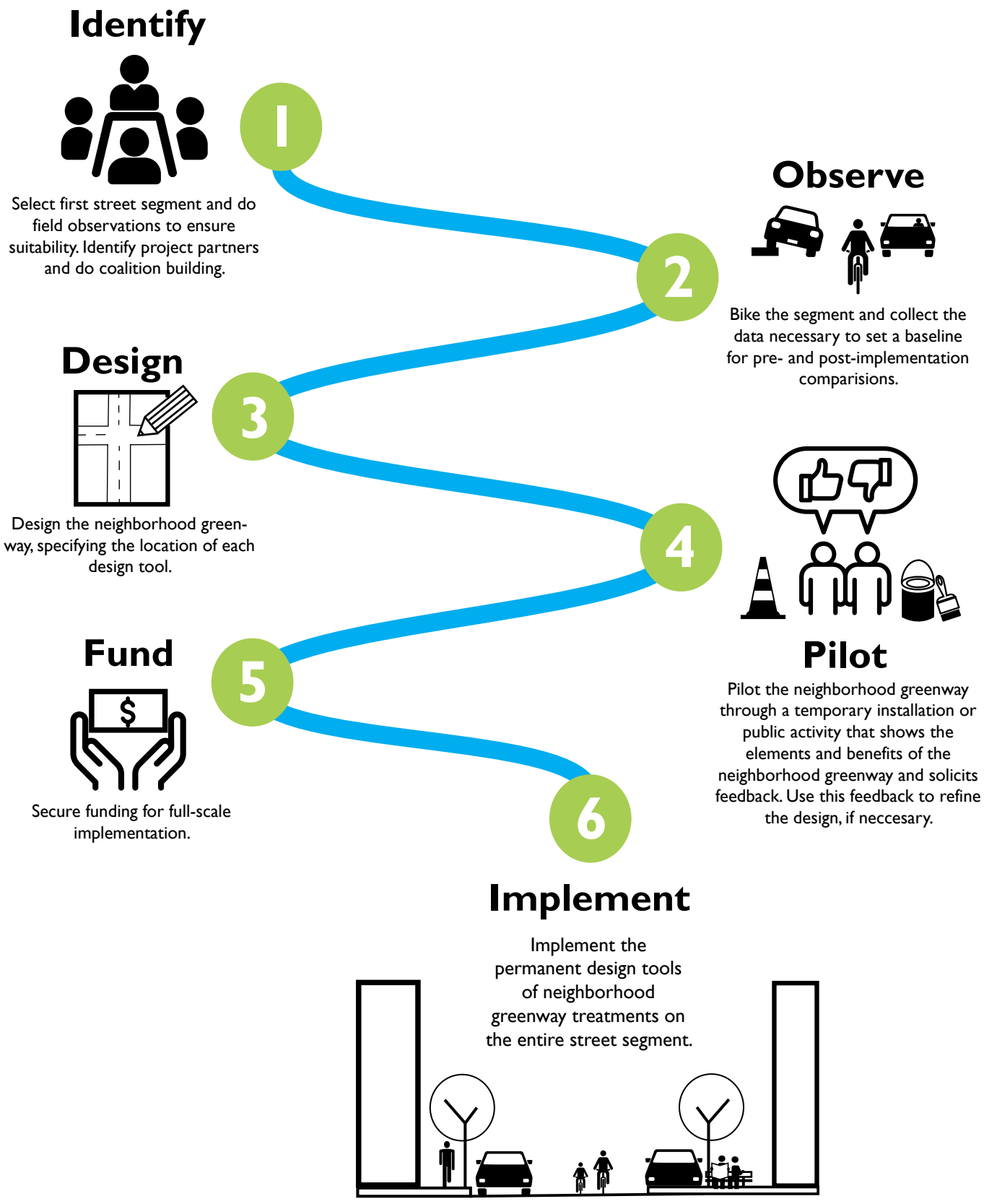
- [ ] **Pilot a neighborhood greenway.**
- [ ] **Include candidate streets in updated bicycle and pedestrian plan.**
- [ ] **Review paving plan for implementation opportunities.**

Recommended next steps are for the City of Philadelphia to pilot a neighborhood greenway on one of the bidirectional streets that is more typical of neighborhood greenways in other cities. A pilot of a neighborhood greenway on a one-way, narrow cross section could also be initiated, and the design tools outlined in this project could be tried, including testing the passing zones. Applications submitted for the Neighborhood Slow Zone Program that align with locations of candidate streets could reveal opportunities for implementation in places where there is already community support for these types of projects and goals.

Neighborhood greenways have been included in the city's draft Vision Zero Action Plan and may be a mechanism through which to achieve the plan's safety goals. Further, candidate neighborhood greenways should be included in any update of the city's bicycle and pedestrian plan. The city should also review upcoming paving schedules to identify opportunities for piloting and implementing the candidate streets. Other opportunities many be found through ongoing coordination and discussion with the Philadelphia Water Department about their construction, reconstruction, and maintenance projects.

Figure 21 shows a sample implementation process for neighborhood greenways in Philadelphia.

Figure 21 | Sample Implementation Process



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Identifying Neighborhood Greenway Possibilities in Philadelphia

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Geographic Area Covered: City of Philadelphia

Key Words: Philadelphia, Bicycle, Pedestrian, Neighborhood Greenway, Bicycle Boulevard

Abstract: This study used best practices from the National Association of City Transportation Officials, Portland State University, and Portland Bureau of Transportation to develop a two-part geographic information system methodology that identified suitable streets to build neighborhood greenways in each of Philadelphia's 10 city council districts. Neighborhood greenways are low-volume, low-stress streets that prioritize bicycle and pedestrian travel over vehicles.

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