Bicycle Route Alternatives Between Overpeck County Park and the George Washington Bridge

Prepared for the Borough of Leonia, Bergen County, NJ

2019

NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

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The report was authored by staff at the Alan M. Voorhees Transportation Center (VTC) at Rutgers, The State University of New Jersey, and reviewed by Sustainable Jersey and the NJTPA.

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The Alan M. Voorhees Transportation Center is a national leader in the research and development of innovative transportation policy. Located within the Edward J. Bloustein School of Planning and Public Policy at Rutgers University, VTC has the full array of resources from a major research university on transportation issues of regional and national significance.

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Table of Contents

Executive Summary

Complete Streets are streets designed for all users, all modes of transportation, and all ability levels. They balance the needs of drivers, pedestrians, bicyclists, transit riders, emergency responders, and goods movement based on local context.

-State of New Jersey Complete Streets Design Guide

This report identifies three bicycle route alternatives between the George Washington Bridge (GWB) and Overpeck County Park in the boroughs of Leonia and Fort Lee, in Bergen County, New Jersey (Figure 1). Although the most direct alternative uses Fort Lee Road, its steep slopes make it challenging to all but the most experienced cyclists and its combination of high traffic volumes and right-of-way constraints present significant engineering challenges to the installation of bicycle infrastructure. Given the option, most bicyclists will be content to use longer northern or southern alternatives that have less traffic and fewer steep slopes. This report identifies a number of potential infrastructure improvements for each alternative that are intended to make bicycling safer and easier. All of the potential treatments identified by this report require further evaluation from an engineering perspective.

The most significant obstacle to bicycling in the area is the presence of the Palisades cliff between Leonia and Fort Lee (Figure 2). The Palisades create steep slopes that are physically challenging and discomforting for most bicyclists, particularly novice cyclists. Additionally, the area is densely populated with limited space to expand roadways to create dedicated bicycle infrastructure. The lack of dedicated bicycle corridors forces bicyclists to share narrow roadways with heavy vehicular traffic. The three routes identified in this report allow bicyclists to cover the distance between the two destinations while avoiding the steep slope as much as possible and minimizing the use of high-traffic corridors.

The Borough of Leonia submitted an application to the NJTPA's competitive Complete Streets Technical Assistance grant program in 2018. The borough was one of nine communities selected out of 17 applications to receive up to $10,000 in technical assistance. Leonia requested assistance with the development of a bicycle network plan, specifically with the goal of providing a safe bicycle route between Overpeck County Park and the GWB.

The GWB is the only way for bicyclists to access Manhattan from New Jersey under their own power. According to the Port Authority of New York and New Jersey, 345,000 bicyclists and 205,000 pedestrians crossed the span each year. Many of the bicyclists cross through Leonia on their way to or from Overpeck County Park, a popular 811-acre park. Leonia is also interested in promoting bicycling within the borough, as an alternative method for residents to access local businesses and services. In July 2018, the borough passed a complete streets policy as its first step in achieving this goal.

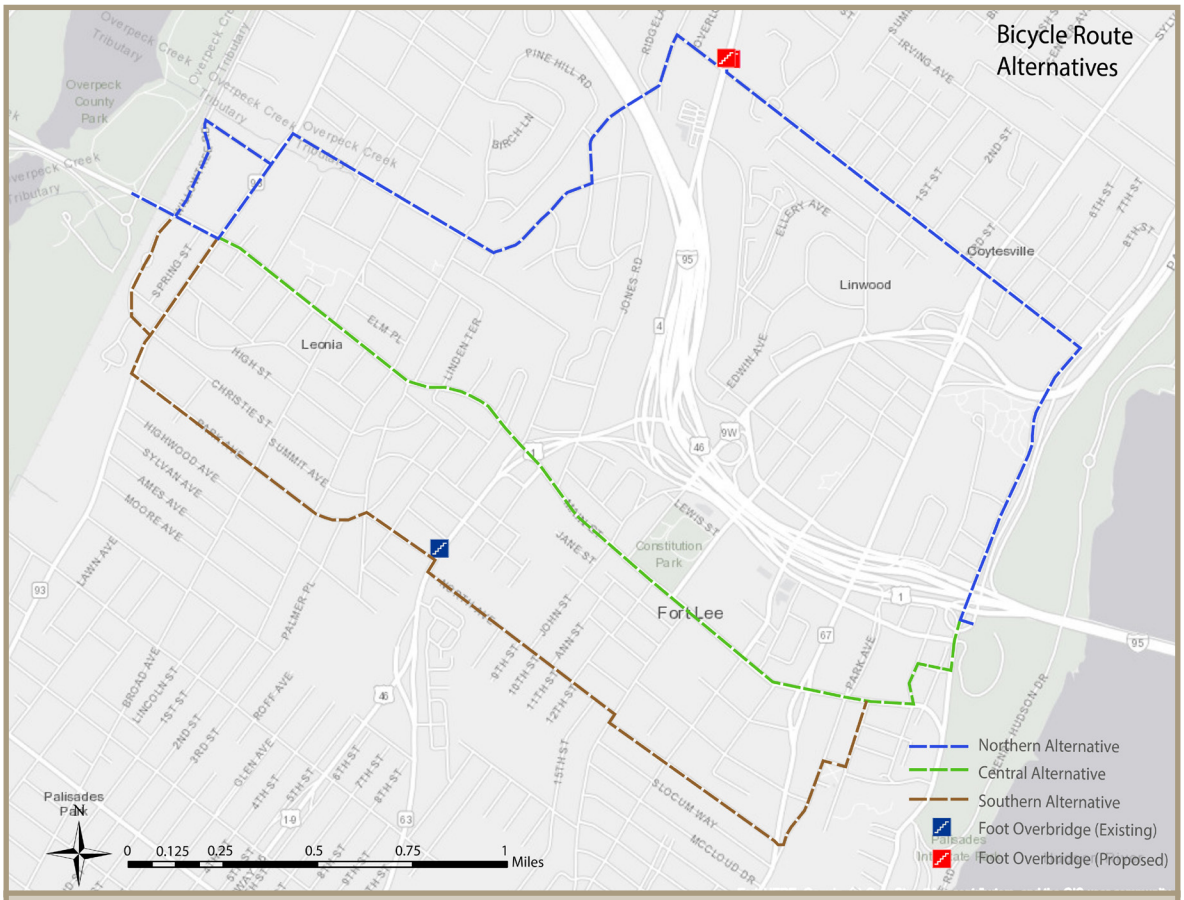


Figure 1. Map showing the three bicycle route alternatives discussed in this report.

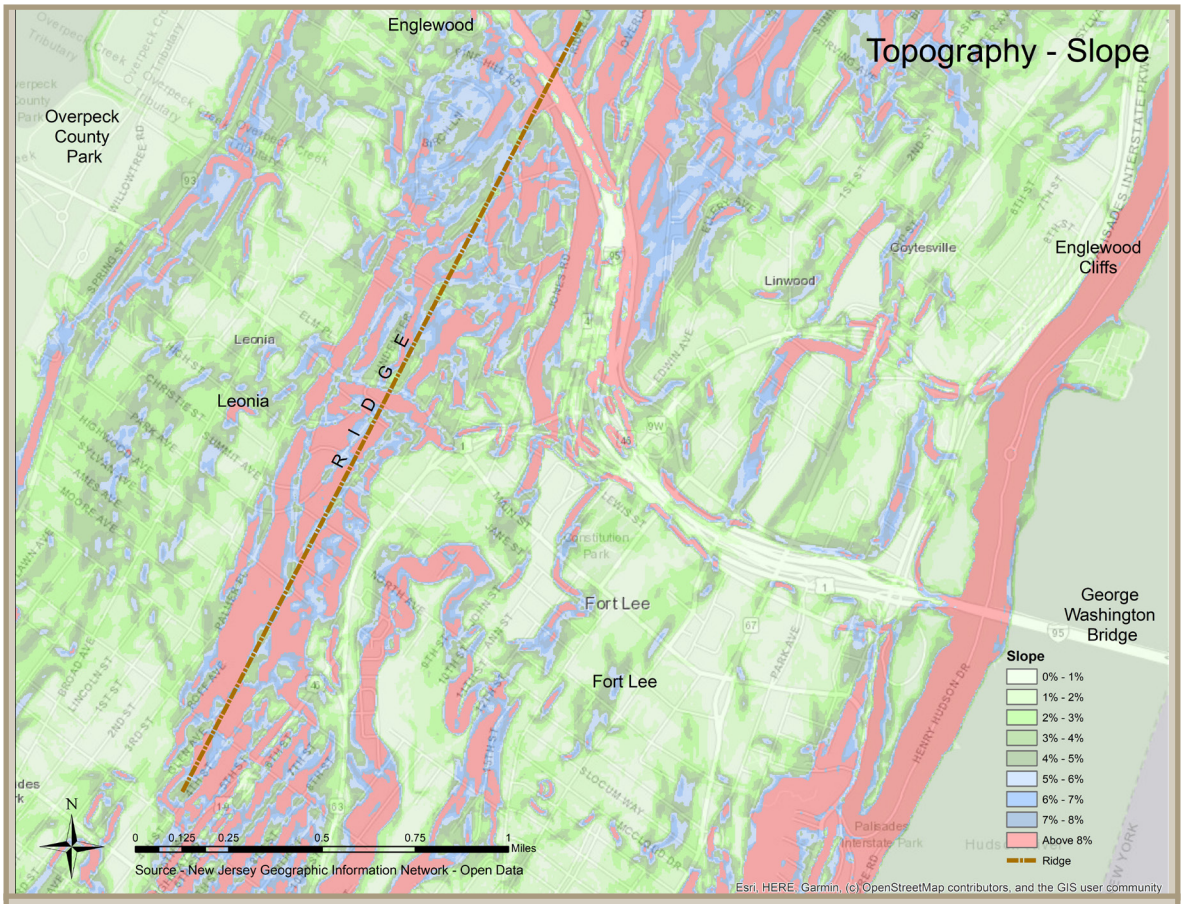


Figure 2. Map of the topography in the study area, showing the ridge between Leonia and the Hudson River.

Background

The North Jersey Transportation Planning Authority (NJTPA) created the Complete Streets Technical Assistance (CSTA) Program in 2018 to assist municipalities in advancing or implementing complete streets, which was a need identified through the Together North Jersey consortium. Sustainable Jersey (SJ) and the Alan M. Voorhees Transportation Center (VTC) at Rutgers University were retained to provide technical assistance for this program. The CSTA Program was designed to support nine municipal governments seeking to implement complete streets in their communities. Municipalities were selected for the program based on the following criteria: the need for technical assistance, commitment to implementation, stakeholder support, and the strength of the municipal team.

The Borough of Leonia is located in the southeastern section of Bergen County, NJ, which is one of the more densely populated areas of the country. The borough sits between Fort Lee to the east, Teaneck to the west, Palisades Park to the south, and Englewood to the north. Overpeck County Park surrounds the Overpeck Creek, a Hackensack River tributary, in Leonia, Palisades Park, Ridgefield Park and Teaneck. This area is home to the western approach to the George Washington Bridge (GWB), which runs from Fort Lee in New Jersey to northern Manhattan in New York. According to the Port Authority of New York and New Jersey (PANYNJ) the GWB provides a path for bicyclists and pedestrians to cross the Hudson River with an average of 345,000 bicyclists and 205,000 pedestrians crossing the bridge every year 1.

Over the past few years, Leonia has taken various steps to address traffic issues and to improve conditions for pedestrians and bicyclists. The Leonia Police Department (LPD) has identified pedestrian injuries and fatalities as a significant traffic concern. In August 2014, a Fort Lee woman was struck and killed at the intersection of Fort Lee Road and Broad Avenue, Leonia's busiest intersection. After this crash, the borough worked with the county to change the traffic signal phasing at the intersection to provide a 26 second pedestrian-only phase every other cycle. The borough has also worked to improve safety at other intersections by adding crossing guards on busy roads, striping high visibility crosswalks, and installing pedestrian signage. In July 2018, the borough adopted a complete streets resolution. No additional pedestrians were killed in Leonia until August 2019, when a pedestrian was killed in a crosswalk at the intersection of Grand Avenue and Station Parkway.

Making the borough's streets safer and more accommodating to bicyclists and pedestrians is a high priority for the administration as well as the Leonia Transportation Committee (LTC). The LTC is a volunteer committee created to advise the mayor and council on issues related to improving traffic and pedestrian safety in Leonia. A key goal of the LTC is to have the borough apply to the New Jersey Department of Transportation (NJDOT)'s Safe Routes to School Program, which would help reinforce a culture of walking and bicycling throughout the borough and reduce the number of cars driving to and from schools. Leonia also plans to install additional traffic calming measures, such as a bicycle lane along the length of Broad Avenue to encourage greater levels of bicycle and pedestrian activity and safety. The overall goal of the borough is to work with neighboring towns to create a larger network of bicycle facilities so residents and commuters will have a safe and convenient alternative to driving.

In its application to the CSTA Program, the Borough of Leonia expressed interest in improving bicycle connectivity between Overpeck County Park and the GWB. This infrastructure improvement would increase safety for bicyclists currently using the route, and hopefully encourage more area residents to bicycle instead of drive, thus reducing vehicular traffic congestion in the borough.

1. "George Washington Bridge Project," New Jersey Bike and Walk Coalition, 2016. https://njbwc.org/cycling-advocates-take-on-george-washington-bridge-path-closure-concerns/

Additionally, more than 50.5 million eastbound automobiles buses and trucks traveled across the bridge in 2015, making it one of the busiest bridges in the world.

What is a Complete Street?

Complete streets are streets designed for all users, all modes of transportation, and all ability levels. They balance the needs of drivers, pedestrians, bicyclists, transit riders, emergency responders, and goods movement based on local context (Figure 3). Complete streets should be tailored to the specific needs of the surrounding environment. A school zone, for instance, may require reduced speed limits, narrower travel lanes, and wider sidewalks to induce a safer setting for students. Meanwhile, streets along transit routes will incorporate the needs of bus and rail commuters by installing benches, shelters, and enhanced lighting and signs.

Regardless of the context, complete streets should be designed to improve safety for pedestrians and bicyclists who are the most vulnerable road users. Reduced speed limits, raised medians, and other design elements can be used to create a safer environment for seniors, children, and people with disabilities.

To put traffic speeds into perspective, a 10 mph reduction in vehicle speed dramatically decreases the chance of pedestrian fatalities in a collision. The U.S. Department of Transportation (USDOT) cites collisions in which pedestrians are struck by a vehicle traveling 40 mph as being fatal 85 percent of the time. Comparatively, at 30 mph, pedestrian fatality rates drop to 45 percent, and down to 5 percent at 20 mph (Figure 4)[2]. Complete streets recognize that users of all transportation modes, whether it be car, bus, train, or taxi, at some point during their journey become a pedestrian. Creating a safer environment benefits everyone.

Figure 3. A complete street, as seen in New Brunswick, New Jersey. No two complete streets are alike, as they should always reflect the context of the street and the character of the community.

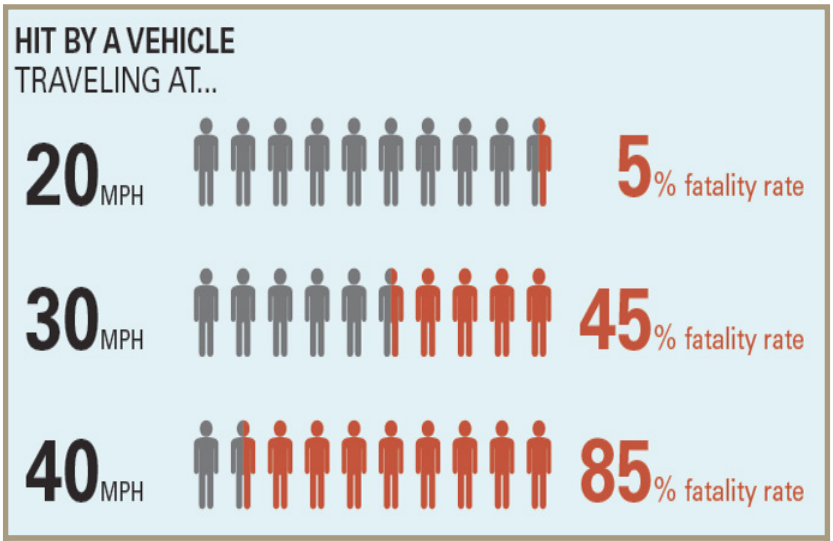


Figure 4. Graphic showing increased fatality rate as vehicle speeds increase.

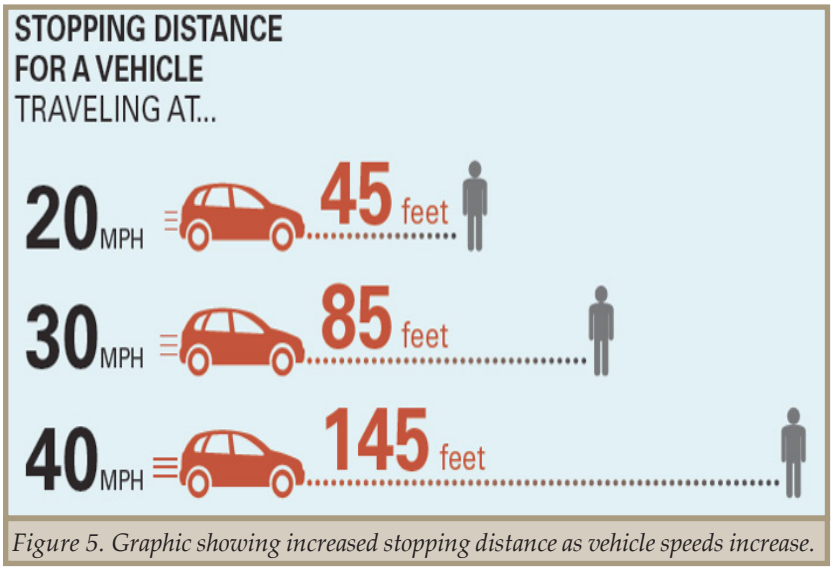


Figure 5. Graphic showing increased stopping distance as vehicle speeds increase.

2. Leaf, William A., and David F. Preusser. 1999. Literature review on vehicle travel speeds and pedestrian injuries. DOT HS 809 021. Washington, DC: U.S. Department of Transportation. http://www.nhtsa.dot.gov/people/injury/research/pub/HS809012.html.

Benefits of Complete Streets

While the primary benefit of complete streets is improved safety for all roadway users, there are other positive outcomes. Complete streets create better places to live, work, and do business. These benefits include mobility, equity, health, quality of life, economic vitality, and environmental health.

Mobility

Creating or enhancing multi-modal transportation options creates mobility opportunities for everyone, including non-drivers, youth, and senior citizens (Figure 6). In turn, increased mobility improves access to jobs and services, which is crucial for people who cannot afford or choose not to own a car, as well as those who are unable to drive due to a disability or their age.

Figure 6. When a street lacks accessible sidewalks and ramps, it is not complete.

Equity

Complete streets decrease the need for people to have automobiles to access opportunity Transportation costs comprise a significant portion of a household budget, approximately 20 percent in the United States. Much of this is due to the high cost of automobile ownership, including insurance, fuel, maintenance, registration fees, and financing. However, household transportation costs drop to just 9 percent in communities with improved street connectivity and accommodations for other modes. Connected communities allow residents to use less energy and spend less money to get around, allowing for fewer car trips and the use of other less expensive modes of transportation like bicycling, walking, or public transit. Providing a variety of transportation choices across different price points allows families to free up more money for housing or other needs.

Figure 7. Trails, such as this one in Monroe, New Jersey, can encourage exercise and lead to improved health.

Health

Complete streets enhance opportunities for increased walking and bicycling which in turn leads to the numerous health benefits associated with increased physical activity. The Center for Disease Control (CDC) supports complete streets as a means to prevent obesity.

Quality of Life

Livable, walkable communities diminish the need for automobiles. Walking or bicycling around town creates a sociable environment, fostering interactions between family, friends, or clients and increasing community involvement. These interactions, in turn, entice users to enjoy the surroundings they would otherwise ignore in a car. A reduction in vehicle use can also increase the quality of life thanks to reductions in noise and stress associated with congestion and crashes (Figure 8).

Figure 8. Complete Streets in Asbury Park help foster a lively social environment.

Economic Vitality

Improving streetscapes revitalizes business districts. Complete streets generate more foot traffic when they create great places where people want to be, which can encourage both residents and visitors to spend more money at local shops and restaurants that they may have driven past before. Such is the experience in Somerville, New Jersey, where one block of Division Street was converted to a pedestrian plaza. The area witnessed a sharp decline in vacant commercial properties; vacancy dropped from 50 percent to zero after the plaza was developed (Figure 9)[3].

Figure 9. Division Street in Somerville was converted into a pedestrian plaza that has become a popular gathering space.

Environmental Health

By reducing automobile use, complete streets can contribute to cleaner air. Additional sustainable design elements installed along complete streets can also bring other environmental benefits. For example, landscape improvements (green streets) can reduce impervious cover, reduce or filter stormwater runoff, and contribute to water quality improvement.

Complete Streets in New Jersey and Leonia

New Jersey is a leader in the complete streets movement. In 2009, the NJDOT was among the first state DOTs in the nation to adopt an internal complete streets policy. In 2010, the National Complete Streets Coalition ranked NJDOT's complete streets policy first among 210 state, regional, county, and municipal policies nationwide. Communities of all sizes throughout the state have joined NJDOT in adopting complete streets policies. Of New Jersey's 21 counties, eight have adopted complete streets policies. Additionally, 153 municipalities have implemented complete streets policies affecting 3.8 million (44 percent) of the state's residents[4]. In July of 2018, the Borough of Leonia passed a resolution authorizing the adoption of a complete streets policy. As of July 2019, Bergen County does not have a policy.

3. "Complete Streets Case Study: Somerville, New Jersey," Alan M. Voorhees Transportation Center, 2016.
4. New Jersey Bicycle and Pedestrian Resource Center, "NJ Complete Streets Policy Atlas," 2018. http://njbikeped.org/complete-streets-2/.

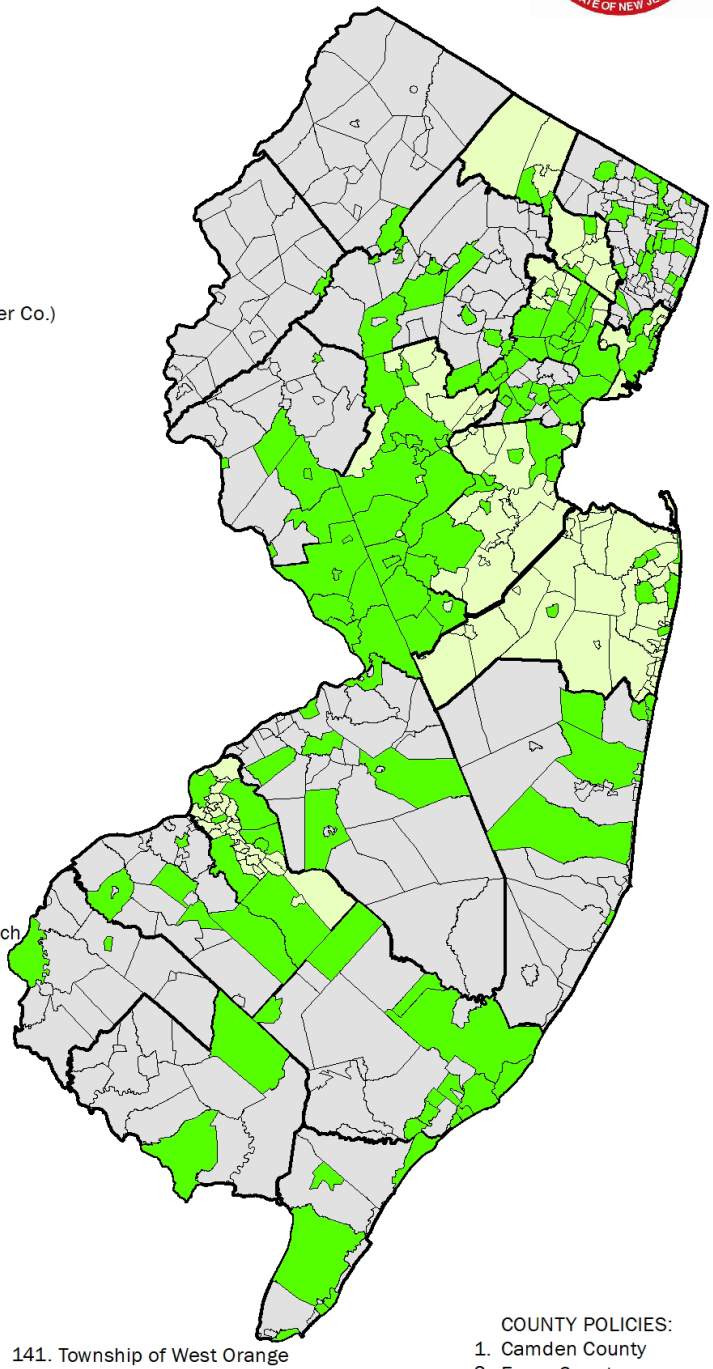
Figure 10. Three bicyclists entering Overpeck County Park from Fort Lee Road in Leonia, New Jersey.

New Jersey Complete Streets Policies

as of June 20, 2019

MUNICIPAL POLICIES:

1. City of Asbury Park
2. City of Atlantic City
3. Borough of Bay Head
4. Township of Bedminster
5. Borough of Bergenfield
6. Berkeley Heights Township
7. Township of Bloomfield
8. Borough of Bloomingdale
9. Township of Bordentown
10. Borough of Bound Brook
11. Township of Bridgewater
12. City of Brigantine
13. Borough of Buena
14. City of Burlington
15. Borough of Caldwell
16. Borough of Califon
17. City of Camden
18. City of Cape May
19. Borough of Chatham
20. Township of Cherry Hill
21. Township of Chester
22. Township of Cranford
23. Township of Denville
24. Town of Dover
25. Township of Downe
26. Township of East Amwell
27. City of East Orange
28. Township of East Windsor
29. Borough of Eatontown
30. City of Egg Harbor
31. City of Elizabeth
32. Borough of Emerson
33. Township of Ewing
34. Borough of Fair Haven
35. Borough of Fanwood
36. Borough of Far Hills
37. Borough of Flemington
38. Borough of Fort Lee
39. Twnshp of Franklin (Hunterdon)
40. Twnshp of Franklin (Somerset)
41. Borough of Freehold
42. Borough of Frenchtown
43. City of Garfield
44. Borough of Gibbsboro
45. Borough of Glassboro
46. Borough of Glen Ridge
47. Township of Gloucester
48. City of Hackensack
49. Town of Hackettstown
50. Borough of Haddon Heights
51. Township of Hamilton
52. Town of Hammonton
53. Borough of Harvey Cedars
54. Borough of Haworth
55. Borough of Highland Park
56. Borough of Hightstown
57. Township of Hillsborough
58. City of Hoboken
59. Borough of Hopatcong
60. Borough of Hopewell
61. Township of Hopewell
62. Township of Irvington
63. City of Jersey City
64. Township of Lacey
65. Township of Lakewood
66. City of Lambertville
67. Township of Lawrence
68. Leonia Borough
69. City of Linden
70. City of Linwood
71. Township of Little Falls
72. Township of Livingston
73. City of Long Branch
74. Township of Long Hill
75. Borough of Madison
76. Township of Mantua
77. Borough of Manville
78. Township of Maplewood
79. City of Margate
80. Borough of Maywood
81. Township of Medford
82. Borough of Metuchen
83. Township of Middle
84. Township of Millburn
85. Borough of Milltown
86. Township of Monroe (Gloucester Co.)
87. Township of Montclair
88. Township of Montgomery
89. Borough of Montvale
90. Township of Moorestown
91. Town of Morristown
92. Borough of Mount Arlington
93. Borough of Netcong
94. City of New Brunswick
95. Borough of New Milford
96. Borough of New Providence
97. City of Newark
98. Borough of North Haledon
99. City of North Wildwood
100. City of Northfield
101. Borough of Northvale
102. City of Ocean City
103. Township of City of Orange
104. Pemberton Township
105. Borough of Pennington
106. Township of Pennsville
107. City of Perth Amboy
108. Township of Plainsboro
109. City of Pleasantville
110. Borough of Point Pleasant
111. Borough of Point Pleasant Beach
112. Borough of Pompton Lakes
113. Princeton
114. Borough of Ramsey
115. Township of Randolph
116. Borough of Raritan
117. Township of Raritan
118. Borough of Red Bank
119. Village of Ridgewood
120. Borough of River Edge
121. Township of River Vale
122. Township of Robbinsville
123. Borough of Roselle
124. Borough of Roselle Park
125. Borough of Rutherford
126. Township of Scotch Plains
127. Borough of Sea Bright
128. Town of Secaucus
129. City of Somers Point
130. Borough of Somerville
131. Township of South Brunswick
132. Township of S. Orange Village
133. City of Summit
134. Borough of Tenafly
135. Township of Toms River
136. City of Trenton
137. City of Union City
138. City of Ventnor
139. City of Vineland
140. Township of Voorhees
141. Township of West Orange
142. Township of West Windsor
143. Township of Westampton
144. Town of Westfield
145. Borough of Westwood
146. City of Wildwood
147. Township of Winslow
148. Borough of Woodbine
149. Township of Woodbridge
150. City of Woodbury
151. Borough of Woodstown
152. Township of Woolwich
153. Township of Galloway



COUNTY POLICIES:

1. Camden County
2. Essex County
3. Hudson County
4. Mercer County
5. Middlesex County
6. Monmouth County
7. Passaic County
8. Somerset County

NJDOT Complete Streets Policy

County Complete Streets Policies

Municipal Complete Streets Policies

Figure 11. Complete Streets Policies in New Jersey, as of June 20, 2019.

Study Area

The Borough of Leonia is home to approximately 9,191 residents and comprises an area of 1.5 square miles. The median age is 43.7, and 58 percent of residents have a college degree. The community enjoys a 59 percent homeownership rate, with an estimated median household income of $89,744. Fifty-eight percent of residents drive alone to work, 18 percent use public transit, 13 percent carpool, 2 percent walk, and 1 percent bicycle to work (US Census Bureau, 2017). Thirty-six percent of residents commute to jobs in New York City , and 5 percent work within Leonia (US Census Bureau, 2015).

Located in Bergen County, Leonia is a hilly borough with steep slopes that is sandwiched among a variety of municipalities and highways. To the west, Leonia is bordered by Overpeck County Park, Overpeck Creek, and a lightly used freight rail line . Only one roadway, Fort Lee Road (Bergen County Route 12), provides access through Overpeck Park and beyond to Teaneck. The number of roads in and out of the north and east side of the municipality are limited due to the presence of Interstate 95 on two sides of the borough. The southeastern border of the municipality is defined by another highway, North Bergen Boulevard (signed as Route 1, Route 9, and Route 46). Once again, the only road across the highway is Fort Lee Road. All other local roads terminate at North Bergen Boulevard.. The southeast border of Leonia is contiguous with the municipality of Palisades Park, with major roads, including Grand and Broad avenues, continuing into that borough.

When Interstate 95 becomes congested, many drivers exit the highway and attempt to use Fort Lee Road and other local streets through Leonia to bypass the traffic. Walking and bicycling to neighboring towns is impeded by lack of safe routes due to the barrier formed by the highways. This impediment results in local residents using cars for most trips. Leonia does not have train service, but NJ TRANSIT and Rockland Coaches provide bus service across the GWB into New York. Additional buses provide local connections. There are plans to extend the Hudson-Bergen Light Rail (HBLR) through Leonia in the future.

Assessment of Need

In 2017, the LTC conducted a travel survey of families with school-aged children. The LTC received 417 responses to the survey. The survey found that parents cite both speed and the amount of traffic within the borough as reasons they do not let their children walk or bicycle to school. The LTC presented this data to the mayor and council at the end of 2017. Since that time, the borough has made and continues to make strides to implement the goals of this survey through grant applications and council approved initiatives.

While data is not available on the number of bicyclists that currently travel through Leonia on their way to the GWB, the area is known as a popular bicycle route both for commuters and weekend leisure riders. Figure 12 shows a heat map generated by Strava, a popular fitness application used by some cyclists to track their rides. The map confirms that many riders use Fort Lee Road in Leonia as they travel between Overpeck Park and the GWB.

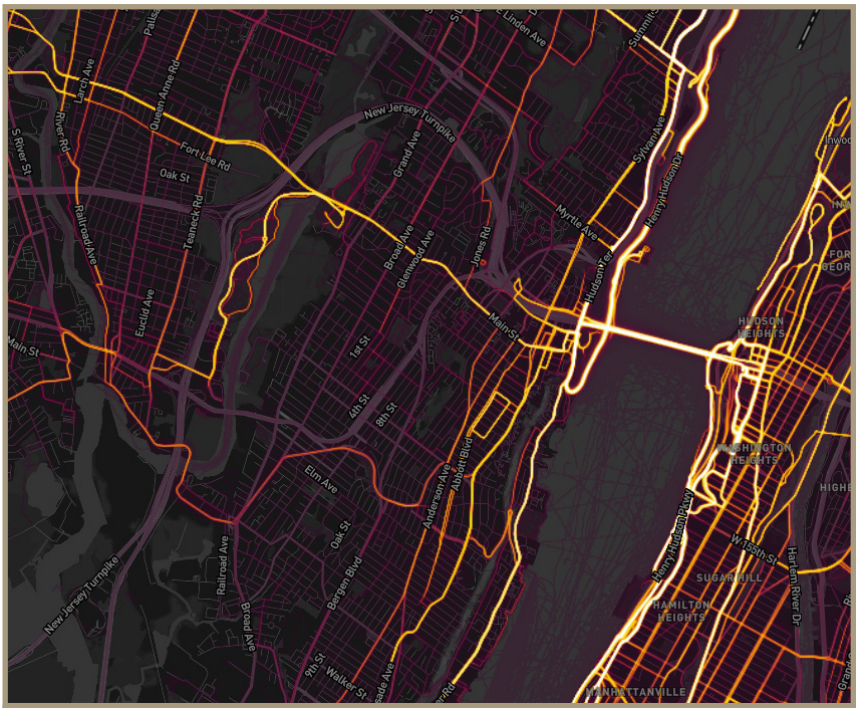


Figure 12. Map showing popular routes used by cyclists. Source: 2018 Strava, OpenStreetMap.

Data

Traffic

A 2014 weekday traffic count conducted by NJDOT found an annual average daily traffic (AADT) volume of 24,198 on the section of Fort Lee Road that bisects Overpeck Park. A 2013 traffic count found an AADT of 15,400 on Fort Lee Road just south of North Bergen Boulevard. This confirms that many drivers are cutting across Leonia to reach North Bergen Boulevard, likely to continue onto I-95. Traffic studies conducted by NJDOT on North Bergen Boulevard found an AADT of 60,772 in 2014.Within Leonia, a 2010 count on Grand Avenue, south of Fort Lee Road, found an AADT of 22,099. In the same year, 1,870 vehicles were counted on Hillside Avenue east of Grand Avenue.

Crash History

Between 2014 and 2018, 33 collisions involving pedestrians or bicyclists were reported (Figure 12 and Table 1). Most collisions were along Fort Lee Road, with 170 motor vehicle crashes occurring near the intersection of Fort Lee Road and Grand Avenue. Crashes involving bicyclists and pedestrians have also been clustered near Fort Lee Road, primarily near the intersection with Broad Avenue.

Figure 13. Map showing number and location of crashes along the study corridor, 2014-2018.

Table 1. Pedestrian and bicycle crashes in Leonia, 2014-2018.

Location	Date	Time	Crash Type	Pedestrian Age	Pedestrian Gender	Severity	Intersection	Lighting
Fort Lee Road (CR-56) & Broad Ave	3/6/2014	6:31 PM	Pedestrian	NA	Female	No Apparent Injury	Yes	Dark - Street Lights On (Continuous)
433 Highwood Ave	4/29/2014	10:32 PM	Pedestrian	47	Female	Suspected Serious Injury	No	Dark - Street Lights Not Present
Ridge Ave & Vintage Cir	12/11/2014	12:45 AM	Pedestrian	13	Male	Possible Injury	Yes	Daylight
Fort Lee Road (CR-56) & Glenwood Ave	3/9/2017	5:15 PM	Pedestrian	87	Male	Possible Injury	Yes	Dusk
Glenwood Ave & Oakdene Ave	12/4/2017	7:57 AM	Pedestrian	62	Female	Suspected Minor Injury	Yes	Dark - Street Lights On (Spot)
Fort Lee Road (CR-56) & Broad Ave	12/7/2017	3:21 PM	Pedestrian	12	Male	Possible Injury	No	Daylight
Nordhoff Drive & Grandview Terr	9/16/2017	3:49 PM	Bicyclist	62	Male	Possible Injury	Yes	Daylight
Fort Lee Road (CR-56) & Broad Ave	1/4/2015	6:04 PM	Pedestrian	23	Female	Possible Injury	No	Dusk
Grand Ave (NJ 93) & Fort Lee Rd	2/18/2015	12:10 PM	Pedestrian	57	Female	Possible Injury	Yes	Daylight
Grand Ave (NJ 93) & Fort Lee Rd (CR-56)	3/4/2015	8:12 AM	Pedestrian	29	Female	Possible Injury	Yes	Daylight
Fort Lee Road (CR-56) & Broad Ave	5/27/2015	1:31 PM	Pedestrian	52	Male	Suspected Minor Injury	Yes	Daylight
Van Orden & Grand Ave (NJ 93)	7/22/2015	10:36 AM	Pedestrian	NA	Male	No Apparent Injury	No	Daylight
Broad Ave & Magnolia Place	8/14/2015	3:26 PM	Bicyclist	53	Male	No Apparent Injury	Yes	Daylight
Fort Lee Road (CR-56) & Broad Ave	8/30/2015	5:25 PM	Pedestrian	NA	Male	No Apparent Injury	No	Daylight
Elm Pl & Broad Ave	10/10/2015	6:18 PM	Pedestrian	62	Female	Suspected Minor Injury	No	Daylight
Fort Lee Road (CR-56) & Glenwood Ave	10/11/2015	8:22 AM	Pedestrian	68	Female	Possible Injury	Yes	Daylight
Fort Lee Road (CR-56) & Broad Ave	11/10/2015	6:48 PM	Pedestrian	54	Female	Possible Injury	Yes	Dark - Street Lights On (Continuous)
Fort Lee Road (CR-56) & Broad Ave	11/16/2015	10:46 AM	Pedestrian	32	Female	Possible Injury	Yes	Dark - Street Lights On (Spot)

Location	Date	Time	Crash Type	Pedestrian Age	Pedestrian Gender	Severity	Intersection	Lighting
Boro Pl & Broad Ave	12/22/2015	8:00 AM	Bicyclist	12	Male	Possible Injury	Yes	Daylight
Fort Lee Road (CR-56) & Glenwood Ave	7/8/2015	5:30 PM	Bicyclist	23	Male	No Apparent Injury	No	Daylight
Lakeview Avenue & Broad Avenue	2/10/2016	2:22 PM	Pedestrian	35	Female	Possible Injury	Yes	Dark - Street Lights On (Spot)
Broad Ave & Magnolia Place	2/24/2016	1:45 PM	Pedestrian	62	Male	Possible Injury	No	Daylight
Broad Avenue & Oakdene Avenue	4/8/2016	4:27 PM	Pedestrian	33	None	Possible Injury	Yes	Daylight
Fort Lee Road (CR-56) & Cumley Ter	8/31/2016	6:25 PM	Bicyclist	15	Male	Suspected Minor Injury	Yes	Daylight
Glenwood Ave & Woodland Pl	9/25/2016	10:23 AM	Pedestrian	10	Male	Suspected Minor Injury	No	Daylight
Broad Ave & Christie Heights	11/6/2016	6:45 AM	Bicyclist	112	Male	No Apparent Injury	Yes	Daylight
Fort Lee Road (CR-56) & Highland Ave	12/1/2016	3:12 PM	Pedestrian	111	Male	Suspected Serious Injury	Yes	Dark - Street Lights On (Continuous)
Grand Ave (NJ 93) & Fort Lee Rd (CR-56)	7/31/2018	7:29 AM	Pedestrian	82	NA	Possible Injury	Yes	Dark - Street Lights On (Continuous)
Fort Lee Road (CR-56) & Glenwood Ave	6/25/2018	6:00 PM	Bicyclist	18	Male	Suspected Minor Injury	Yes	Daylight
Fort Lee Road (CR-56) & Glenwood Ave	7/25/2018	5:38 PM	Pedestrian	52	Male	Possible Injury	Yes	Dark - Street Lights On (Continuous)
NJ 93 & NJ 56 / Fort Lee Rd	4/24/2018	9:28 PM	Pedestrian	43	Male	Suspected Minor Injury	Yes	Daylight
Grand Ave (NJ 93) & Palisade Ave	5/16/2018	8:50 PM	Pedestrian	NA	Female	Suspected Serious Injury	Yes	Daylight

Analysis

In February of 2019, the CSTA Project Team met with municipal officials and stakeholders to discuss current bicycling conditions in the borough. The team looked over maps and discussed the real and perceived challenges and opportunities to choosing to bicycle in the borough. As mentioned during that discussion, notable challenges to developing bicycle infrastructure have included limited road space, high traffic volumes, major highways, and steep hills. After the meeting, the project team drove to the GWB to observe and document existing conditions in the area in order to develop initial recommendations.

Over the next few months, the project team developed a series of maps to compare potential bicycle routes. The project team looked at slope grades, traffic volumes, crash data, and roadway widths in order to identify three potential route alternatives. All of the potential treatments identified by this report require further evaluation from an engineering perspective.

Analysis of Topography

The local topography of an area determines the amount of time, the distance covered, and the effort needed to bicycle from one destination to another. In Leonia, the change in topography presents a significant challenge to bicycling. Research has shown that terrain with a slope of more than 8 percent is considered unacceptable for bicycling[1]. Slopes that are less than 8 percent may be used for bicycle routing, although routes on slopes between 5-8 percent are only suitable for short distance uphill cycling and require consideration of the need of cyclists to stop and rest. Areas with a slope of 0-3 percent are excellent for bicycling. As such, an analysis of the topography was one of the most important factors in identifying alternative bicycle routes.

The access point to the GWB is atop the Palisades cliff that runs parallel to the Hudson River. (Figure 14). A plethora of slopes ranging from above 8 percent grade (shown in red), to 5-8 percent (shown in blue) and 5 percent or less (shown in green) lie between Leonia and the cliff.

A tool developed by the University College London based on a technique called Space Syntax (Bartlett, 2019) was used to identify preferred bicycle routes independent of the existing street network. Using this technique, all the spaces that have a slope of more than 8 percent were marked non-accessible and three maps were created for slopes between 0-3 percent, 3-5 percent and 5-7 percent. For each successive map, all the spaces with a slope higher than the reference category were marked inaccessible. The analysis revealed the spaces with the highest connectivity. The three maps were then overlaid on each other and the lines that were common in each of them were traced first, and then their further connections. This exercise was done first for all lines running parallel to the primary ridge (north-south) and then for all lines running perpendicular to the primary ridge (east-west).

As a result of this analysis, the project team generated a map that contained all the connections that allow bicyclists to cross the ridge while avoiding the steepest gradient. The project team generated two sets of connector lines, one set running parallel to the ridge coded as primary routes, and another set perpendicular to the ridge coded as connector routes (Figure 15 and Figure 16). This created a network similar to the street network, but one which was based entirely on the natural slope of the land. It assisted in identifying the streets that could be used to design the bicycle routing with minimum intervention and the most comfortable route for daily commuters. The next step was to identify the specific streets that could be used for the bicycle routes by overlaying the slope maps on the existing road network.

1. Ribeiro, P., Rodrigues, D. S. & Taniguchi, E., 2014. Road gradient for cycling infrastructures: Standard and Low-Cost measurement. Recent Advances in Environmental Science and Biomedicine, November, pp. 113-120.

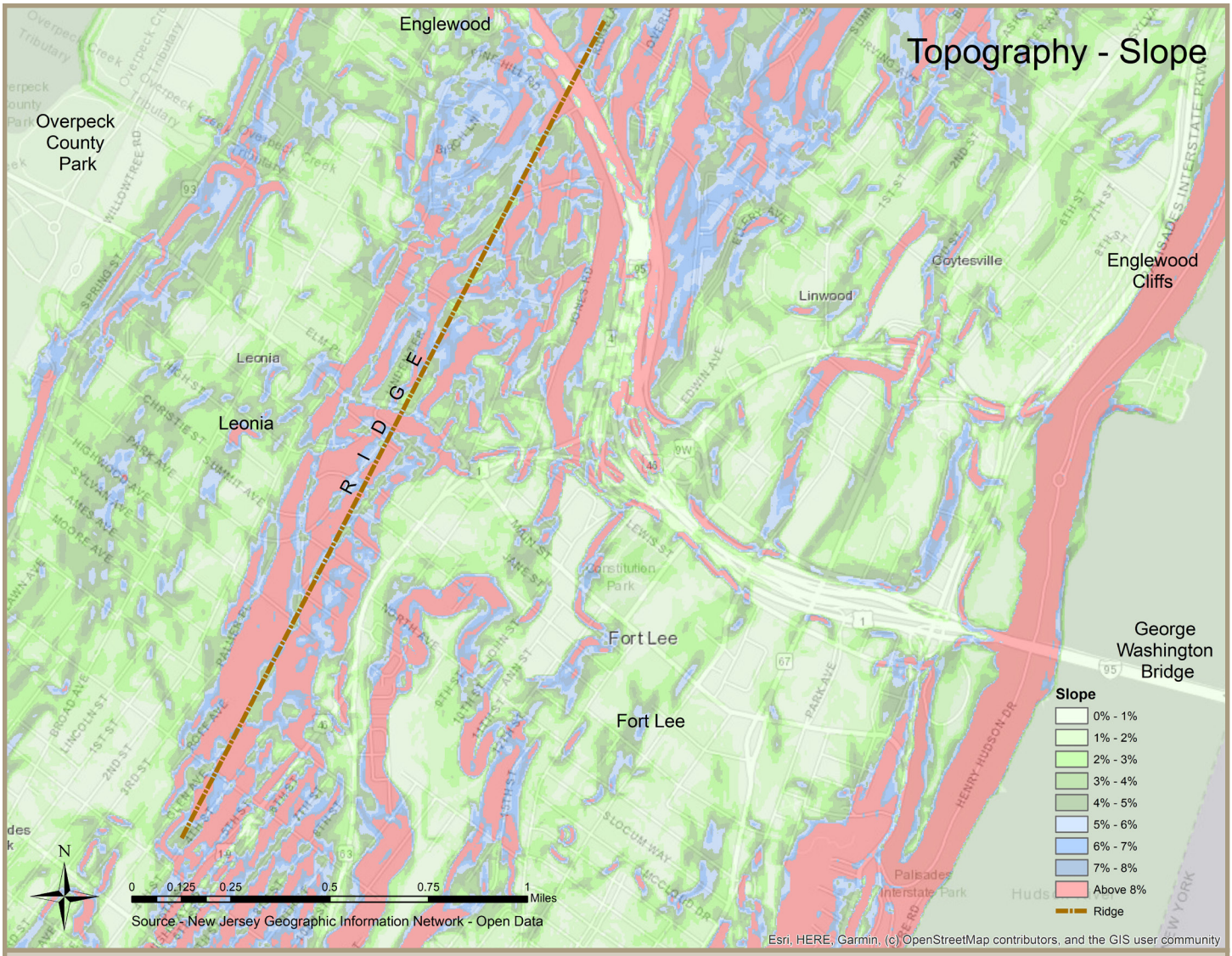


Figure 14. Map showing the topography of the study area.

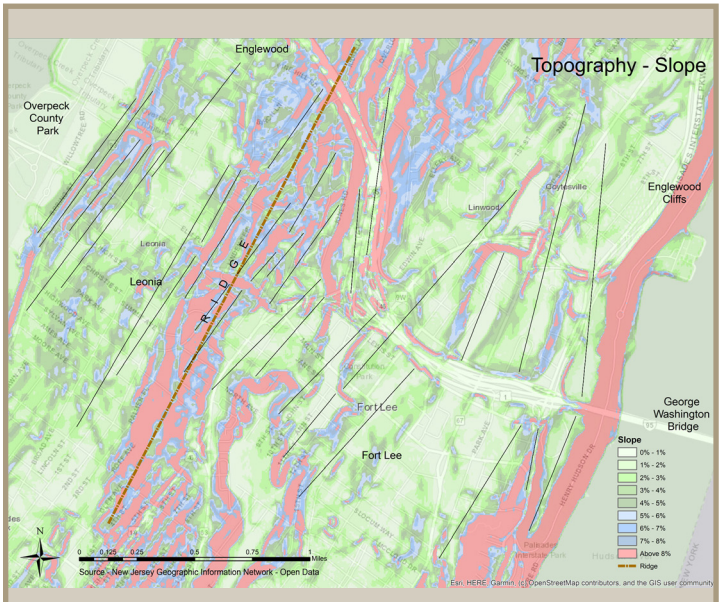


Figure 15. Topography map showing north-south routes with smallest changes in grade.

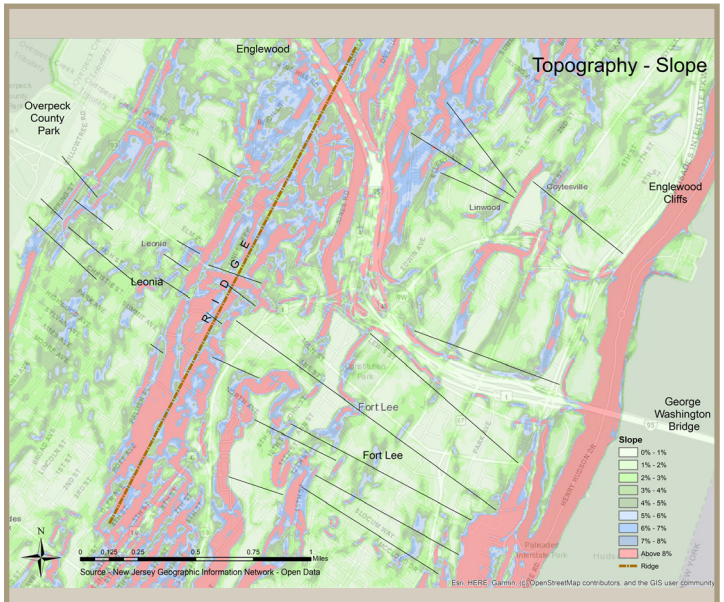


Figure 16. Topography map showing east-west routes with smallest changes in grade.

Analysis of Street Network

Using the street centerline dataset, the project team mapped the area street network to identify potential streets that could be used to plan the best bicycle routes. Figure 17 shows a slope map with the preferred bicycling routes (in purple) over the existing street network.

Streets were then classified based on their level of vehicular traffic and the existing speed limit. The crash data map was overlaid on the street network map to identify the streets that are crash prone and should be avoided. The result was an identification of streets with minimal crashes involving pedestrians and bicyclists.

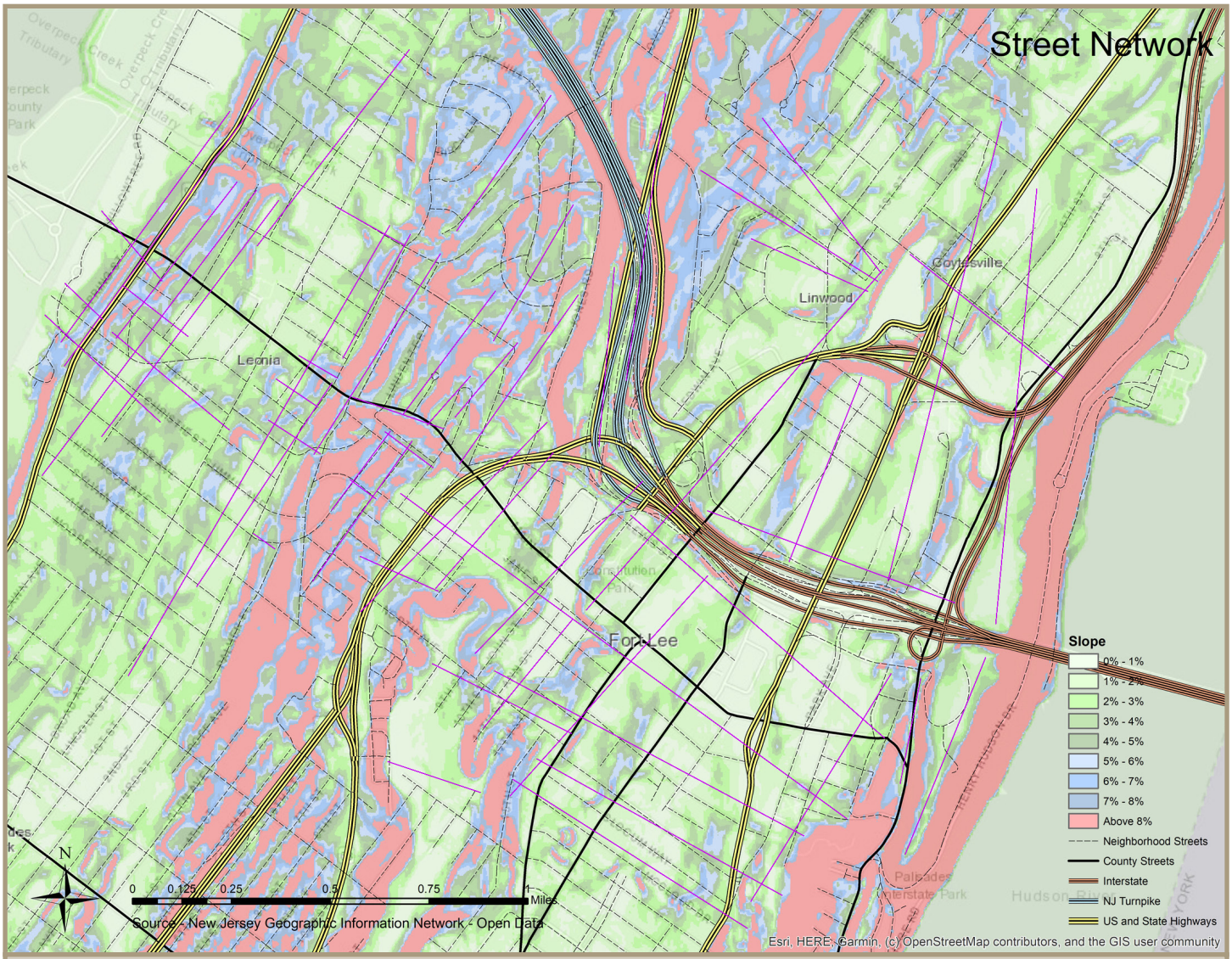


Figure 17. Leonia Area street network overlaid on topography map.

Recommended Routes

The project team combined the slope analysis with the analysis of the street network to identify three potential bicycle routes alternatives between the GWB and Overpeck County Park (Figure 18). The Central and Southern alternatives are entirely within Leonia and Fort Lee, and the Northern alternative traverses Leonia, Fort Lee, Englewood and Englewood Cliffs.

The individual route maps indicate if the slope is steep or gentle. When parallel roads were available, preference was given to the streets with lower expected traffic volumes and lower speed limits to ensure rider comfort and safety.

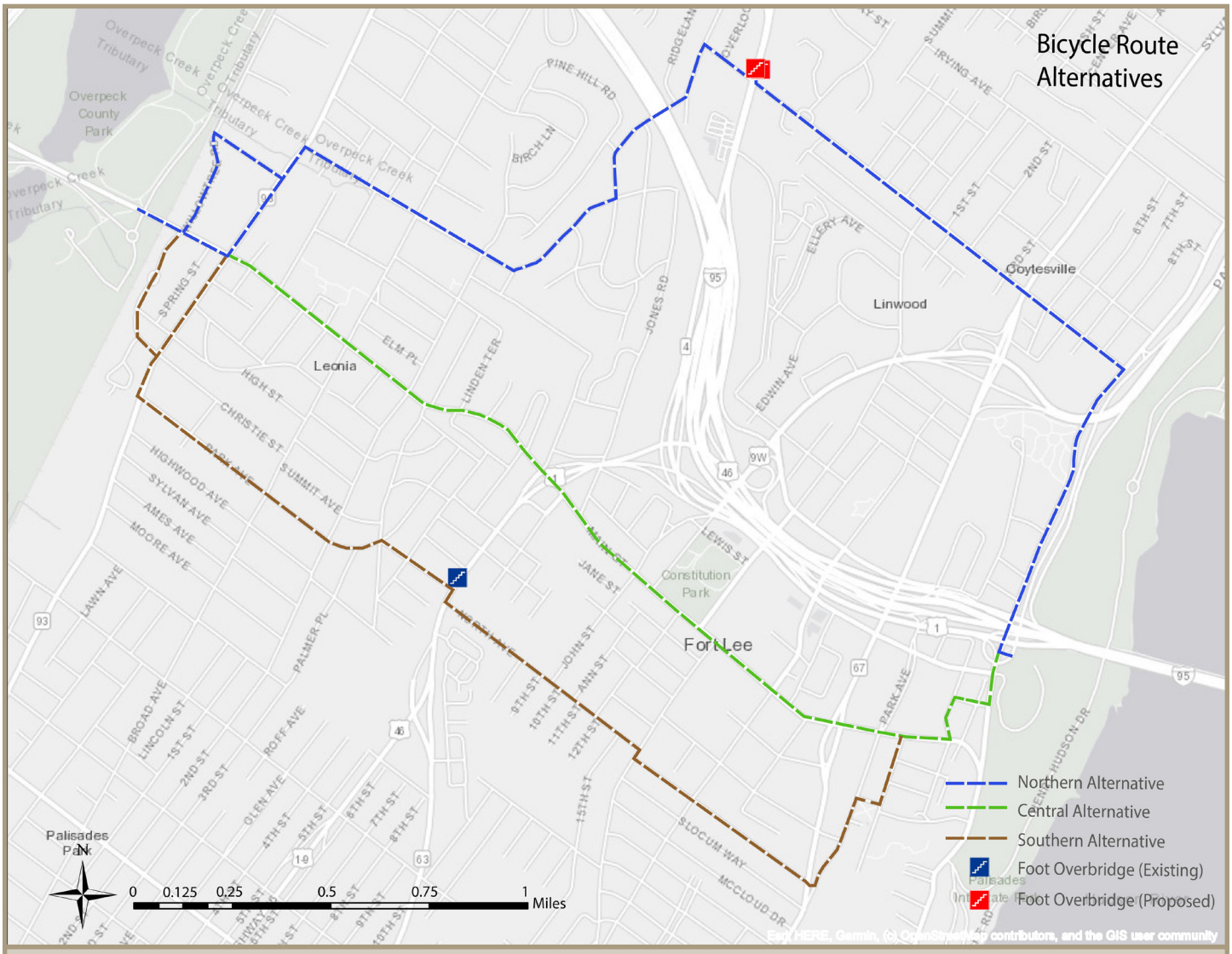


Figure 18. Map showing the three route alternatives.

Northern Alternative

Total Length - 3.16 miles

The Northern Alternative route directs bicyclists north from through Englewood Cliffs and Englewood (Figure 15). Advancement of this alternative requires engagement with, and approval by, Englewood and Englewood Cliffs. Benefits include the use of lower speed local roads, a favorable topography, and limited exposure to high-traffic roads. This alternative provides bike route access from Englewood and Englewood Cliffs to Overpeck County Park and the GWB. Advancement of this alternative also requires the construction of a new bicycle and pedestrian bridge across Route 4 because there is currently no place to cross the highway. This study did not examine the cost or feasibility of bridge construction. Provided that a bridge can be constructed, implementation of the route can be accomplished through the installation of a number of treatments, which vary street by street (Table 2).

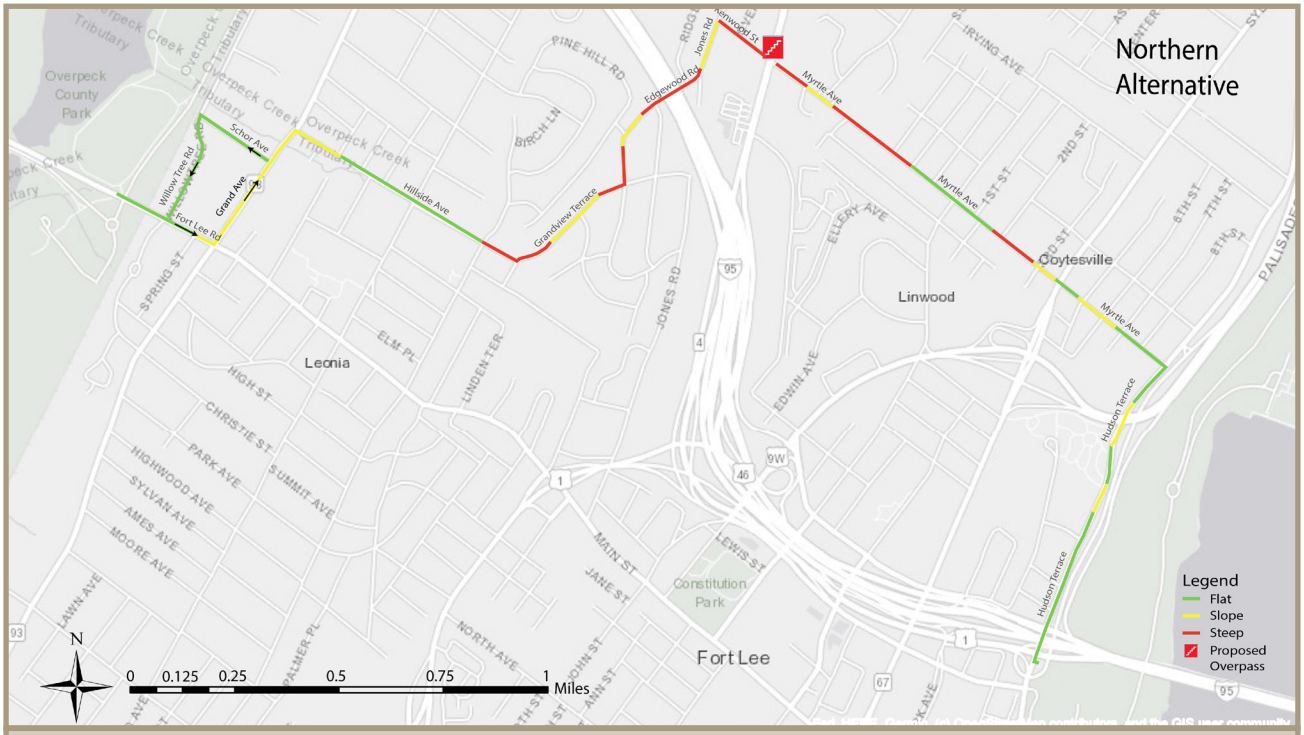


Figure 19. Map showing the Northern Alternative.

Route Description - Westbound

In the westbound direction, the route starts from the GWB and heads north on Hudson Terrace to cross under Interstate 95. The route continues for 0.64 miles on Hudson Terrace, which has a 35 mph speed limit but frequent bicycle shared lane signage (Figure 20). There are two bicycle shops on this road that attract cyclists riding through the area. The majority of this route is made up of flat topography with two short gentle slopes in the middle. North of I-95, Hudson Terrace has one lane in each direction with parking on both sides of the road. The route then turns left onto Myrtle Avenue, which is a long and straight road with low traffic volumes and a 25 mph speed limit. Myrtle Avenue is fronted mostly by residential properties. It is bidirectional, with no center line. Parking is allowed only on the west side (Figure 21).

Figure 20. Shared lane signage on Hudson Terrace.

The total length of this section is 0.88 miles. It starts with a combination of flat and gentle slopes for 0.31 miles before the first steep section of this route. From here onwards the section on Myrtle Avenue is a combination of steep and gentle slopes. The low traffic volumes allow bicyclists to easily pull over to rest if needed (Figure 22).

Figure 21. Looking northwest onto Myrtle Avenue, from Hudson Terrace.

Figure 22. Looking northwest from Myrtle Avenue, near the crest of the hill.

Myrtle Avenue terminates at the east side of Route 4, which runs north-south at this location. Currently, there is no way for a bicyclist or pedestrian to cross the highway without undertaking a 0.8-mile detour. Building a pedestrian bridge or tunnel at this location would make this route possible and also create a bicycle and pedestrian connection between two neighborhoods within Englewood (Figure 23).

West of Route 4, Kenwood Street continues for .12 miles with a steep slope to Jones Road (Figure 24). The roadway narrows from 30 feet to 18 feet as it approaches Jones Road. At Jones Road, the route turns left (south) to cross over I-95, where it changes names to Edgewood Road at the Leonia boundary. Both roads are 30 feet wide, bidirectional, and fronted by residential properties (Figure 25).

After crossing I-95, the route turns left onto Ridgeline Terrace and then right onto Grandview Terrace to continue to Hillside Avenue. The speed limit on these roads is 25 mph, and traffic volumes are low. On Hillside Avenue, the route has a consistent gentle slope. As with the previous roads, Hillside Avenue is primarily residential with a 25 mph speed limit and street parking on one side. It transitions from a width of 24 feet to 32 feet as it crosses Broad Avenue at a signal and continues to Grand Avenue (NJ Route 93) (Figure 26).

Figure 23. Kenwood Street, looking southeast across Route 4 to Myrtle Avenue.

Figure 24. Kenwood Street, looking northwest.

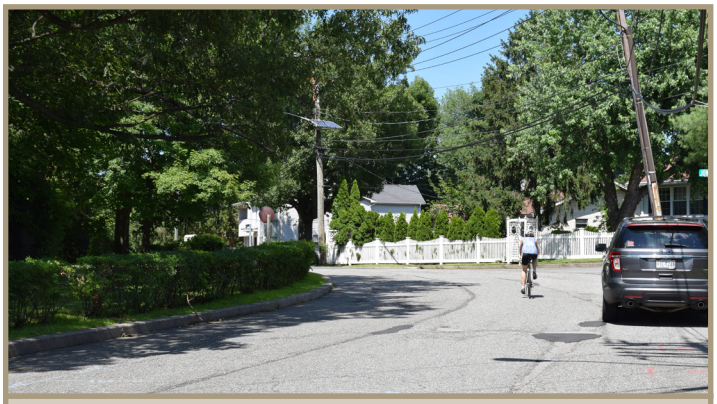


Figure 25. Bicyclist moving northeast on Edgewood Road.

Figure 26. Looking north on Hillside Avenue, at Broad Avenue.

Nearing downtown Leonia, the route turns left onto Grand Avenue, which has two lanes divided by a double yellow line, and shoulders on each side (Figure 27). The speed limit on Grand Avenue is 30 mph, and parking is prohibited. Bicyclists would only use Grand Avenue for 400-feet before turning onto Schor Avenue, a minor residential roadway that runs one-way towards Overpeck County Park. At the end of Schor Avenue, the route continues along Willow Tree Road to Fort Lee Road, which provides access to Overpeck County Park. Willow Tree Road is 30 feet wide, with one lane in each direction and no parking (Figure 28).

Figure 27. Looking southwest on Grand Avenue, from Hillside Avenue.

Figure 28. Looking south on Willow Tree Road, at the intersection with Schor Avenue.

Route Description - Eastbound

The eastbound route only varies from the westbound route near Overpeck County Park. From the park, the route follows Fort Lee Road until Grand Avenue, where bicyclists turn left. This is because Schor Avenue, used in the westbound direction, is not wide enough for two-way traffic. After a quarter of a mile on Grand Avenue, the route turns right onto Hillside Avenue. Hillside Avenue has a consistent upward slope, but the light traffic and low speed limit allow bicyclists to ride at a slower pace and to stop for rest when needed. The eastbound route encounters the same challenge at Route 4, where a new bridge is needed. Past Route 4, the route follows Myrtle Avenue to Hudson Terrace, where bicyclists turn right to reach the GWB access points.

Route Recommendations

The most significant recommendation for the Northern Alternative route is to develop a safe way for bicyclists to cross Route 4 at or near the intersection with Kenwood Street. Currently, the highway is a significant barrier to mobility in the area.

In terms of bicycle infrastructure, the majority of the roads along the route are 25 mph residential streets with an average width of 30 feet. One of the primary benefits of this route is it connects various neighborhoods. This unfortunately happens to also make it attractive to drivers. As such, Leonia has been challenged by cut-through traffic using these narrow residential streets as a way to avoid area highways. This report recommends "bicycle boulevard" treatments along the route, which encourages bicycle use, maintains vehicle access for local residents, but discourages speeding and makes the route less attractive for drivers who are not heading to local destinations. This is done by using traffic calming techniques that slow drivers to bicycle speeds. Details on the components of bicycle boulevard treatments can be found in the Additional Recommendations section of this report on Page 26.

Table 2, on the next page, summarizes the route with existing conditions and recommended treatments.

Table 2. Potential Bicycle Infrastructure Treatments, Northern Alternative.

Street Name	Distance (miles)	Total Lanes	Cartway Width (feet)	Speed Limit (mph)	Parking	Existing Bicycle Infrastructure	Potential Bicycle Infrastructure
Hudson Terrace	0.64	2-5	40 - 60	35	No Parking	Share the Road signs, some shoulders	Sharrows to supplement existing signs
Myrtle Avenue	0.88	2	26	25	One Side	None	Bicycle Boulevard
Route 4	N/A	5	80	50	No Parking	None	Overpass
Kenwood Street	0.12	2	18 - 30	25	One Side	None	Bicycle Boulevard
Jones Road	0.1	2	28	25	One Side	None	Bicycle Boulevard
Edgewood Road	0.14	2	30	25	One Side	None	Bicycle Boulevard
Ridgeland Terrace	0.13	2	30	25	One Side	None	Bicycle Boulevard
Grandview Terrace	0.3	2	30	25	One Side	None	Bicycle Boulevard
Hillside Avenue	0.59	2	24 - 32	25	One Side	None	Bicycle Boulevard
Grand Avenue	0.07 (westbound) 0.26 (eastbound)	2	32	30	No Parking	Shoulder	Bicycle Lane
Schor Avenue (westbound only)	0.15	1	23	25	One Side	None	Sharrows
Willow Tree Road (westbound only)	0.20	2	30	25	No Parking	None	Bicycle Lane

Central Alternative

Total Length - 2.0 miles

The Central Alternative route provides the shortest distance between the GWB and Overpeck County Park, primarily using Main Street in Fort Lee and Fort Lee Road in Leonia. Challenges include a continuous slope, high traffic volumes and right-of-way constraints on Fort Lee Road. Implementation of the route can be accomplished through the installation of a number of treatments, which vary street by street (Table 3).

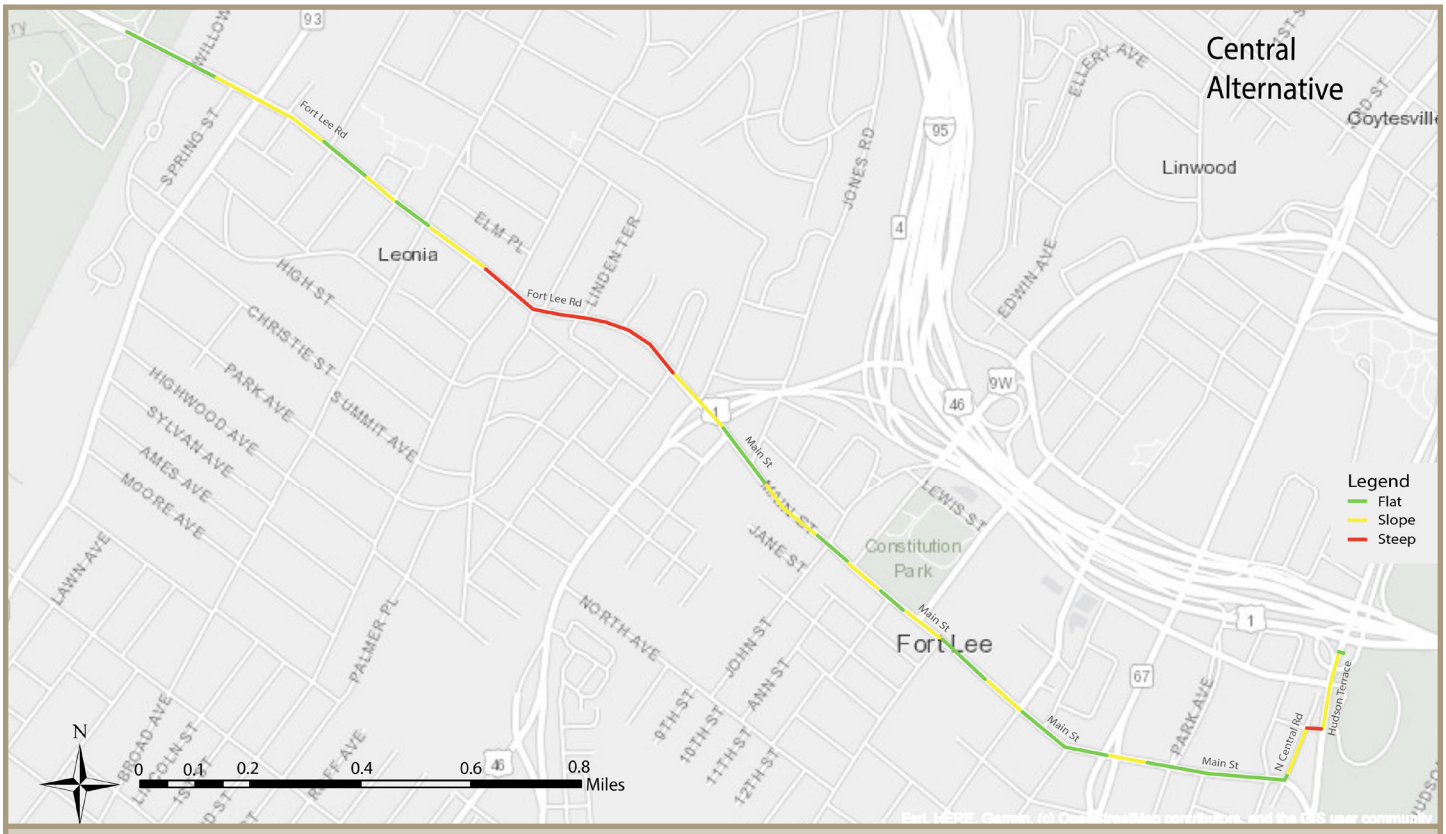


Figure 29. Map showing the Central Alternative.

Route Description - Westbound

In the westbound direction, this route starts at the GWB and goes 700 feet south to Hudson Terrace (County Road 505) before turning right onto Central Avenue. In this area, Hudson Terrace is 60 feet wide with four travel lanes and no parking. Along this first section, from the bridge entrance to Bruce Reynolds Boulevard, many bicyclists use the sidewalk (Figure 30). From Bruce Reynolds Boulevard to Central Avenue, there is an existing multi-use trail on the east side of the road.

This route turns right onto Central Avenue using the existing traffic signal, and then left onto North Central Road. Central Avenue has a single 16-foot northbound lane. North Central Road is 32 feet wide with parking on the west side. After 375 feet, the route turns right onto Main Street (Bergen County Route 56). The route then covers a mile-long stretch on Main Street that is made up of gentle slopes with short stretches of flat topography in between.

Figure 30. Hudson Terrace, looking south.

The width of Main Street varies throughout the route as turning lanes and parking are added or removed. At its eastern end, it widens to 55 feet and in some locations, it narrows to 24 feet. The most common width is 36 feet, which allows for one lane in each direction and parking on both sides (Figure 31).

Main Street crosses under North Bergen Boulevard where its name changes to Fort Lee Road but continues as Bergen County Route 12. On Fort Lee Road, the route starts with a quarter-mile steep slope followed by a series of gentle slopes before becoming steep again near Grand Avenue (Figure 32, Figure 33). As this section has two long steep slopes with shorter flat stretches it would require few break points as rest stops for bicyclists. Within Leonia, Fort Lee Road is primarily 28 feet wide, with one lane in each direction and one-foot shoulders. The exception is between Overpeck Park and Grand Avenue, where the road widens to four lanes.

Route Description - Eastbound

The eastbound route is identical to the westbound route, but requires the addition of a short (70 feet) contra-flow lane on Central Avenue. For one block, the 16-foot wide Central Avenue is one-way in the westbound direction (Figure 34). This is wide enough to add a 5-foot bicycle lane in the eastbound direction, allowing bidirectional bicycle traffic while maintaining one-way auto traffic.

Route Recommendations

The Central Alternative route differs from the Northern Alternative in that it primarily follows a single existing road: Main Street / Fort Lee Road. This road is already a favorite route among those who bicycle in the area for athletic training purposes, but it does not have any special accommodations for bicycle riding.

Evaluation of the feasibility to either widen the sidewalk on Hudson Terrace between the GWB and Bruce Reynolds Boulevard to create a multi-use path that accommodates bicyclists and pedestrians, or to install protected bike lanes in the road between the GWB and Central Avenue would be a first step toward implementation of an appropriate bicycle connection from the GWB.

Adding a short (70 feet) contra-flow bicycle lane on Central Avenue enables eastbound bicyclists to use this route, and to cross Hudson Terrace at the existing signalized intersection. Bigler Street could be improved with the addition of sharrows (shared lane markings) that assist both with wayfinding and with bicyclist positioning within the roadway.

Figure 31. Looking north on Main Street by Fletcher Avenue.

Figure 32. Looking southeast on Fort Lee Road, at Glenwood Avenue.

Figure 33. Looking northwest on Fort Lee Road, at Glenwood Avenue.

Figure 34. Looking east at the one-way section of Central Ave.

On Main Street, sharrows and "bicyclists may use full lane" signage would provide a reminder to motorists that bicyclists are expected on the roadway. For bicyclists, the sharrows act as a reminder to not ride too closely to parked cars.

Where Fort Lee Road is 28 feet wide, there is enough space on the roadway for two 11-foot travel lanes and one six-foot bicycle lane. A climbing bicycle lane, or a bicycle lane positioned on the uphill side, allows motorists to safely pass bicyclists who are struggling to make their way up the hill. On the downhill side, bicyclists are better able to keep up with traffic, and so they can comfortably share the lane (Figure 35). This configuration necessitates the removal of snow entirely from the roadway rather than plowing of snow to the side. High traffic volumes and right-way-constraints at intersections present significant engineering challenges.

Figure 35. A climbing bicycle lane on Van Ness Street NW, in Washington D.C.

Table 3. Potential Bicycle Infrastructure Treatments, Central Alternative

Street Name	Distance (miles)	Total Lanes	Cartway Width (feet)	Speed Limit (mph)	Parking	Existing Bicycle Infrastructure	Potential Bicycle Infrastructure
Hudson Terrace	0.13	4	60	35	No Parking	Sidewalk, Multi-use Trail	Multi-use Trail or Protected Bike Lanes
Central Ave	0.01	1	16	25	None	None	Eastbound contra-flow bicycle lane, westbound sharrows
North Central Road	0.07	2	32	25	One Side	None	Sharrows
Main Street	1	2 - 4	24 - 55	25	Both Sides	None	Sharrows
Fort Lee Road	0.9	2 - 4	28 - 45	25	No Parking	None	Eastbound climbing bicycle lane

Southern Alternative

Total Length – 2.88 miles

The Southern Alternative provides the flattest route between the GWB and Overpeck County Park. From the GWB, the route directs bicyclists south through Fort Lee, before turning northwest towards Leonia. An existing pedestrian bridge with stairs allows bicyclists on this route to cross New Jersey Route 4 if they are able to carry their bikes up and down the stairs, which is not a preferred scenario. Implementation of the route can be accomplished through the installation of a number of treatments, which vary street by street (Table 4)

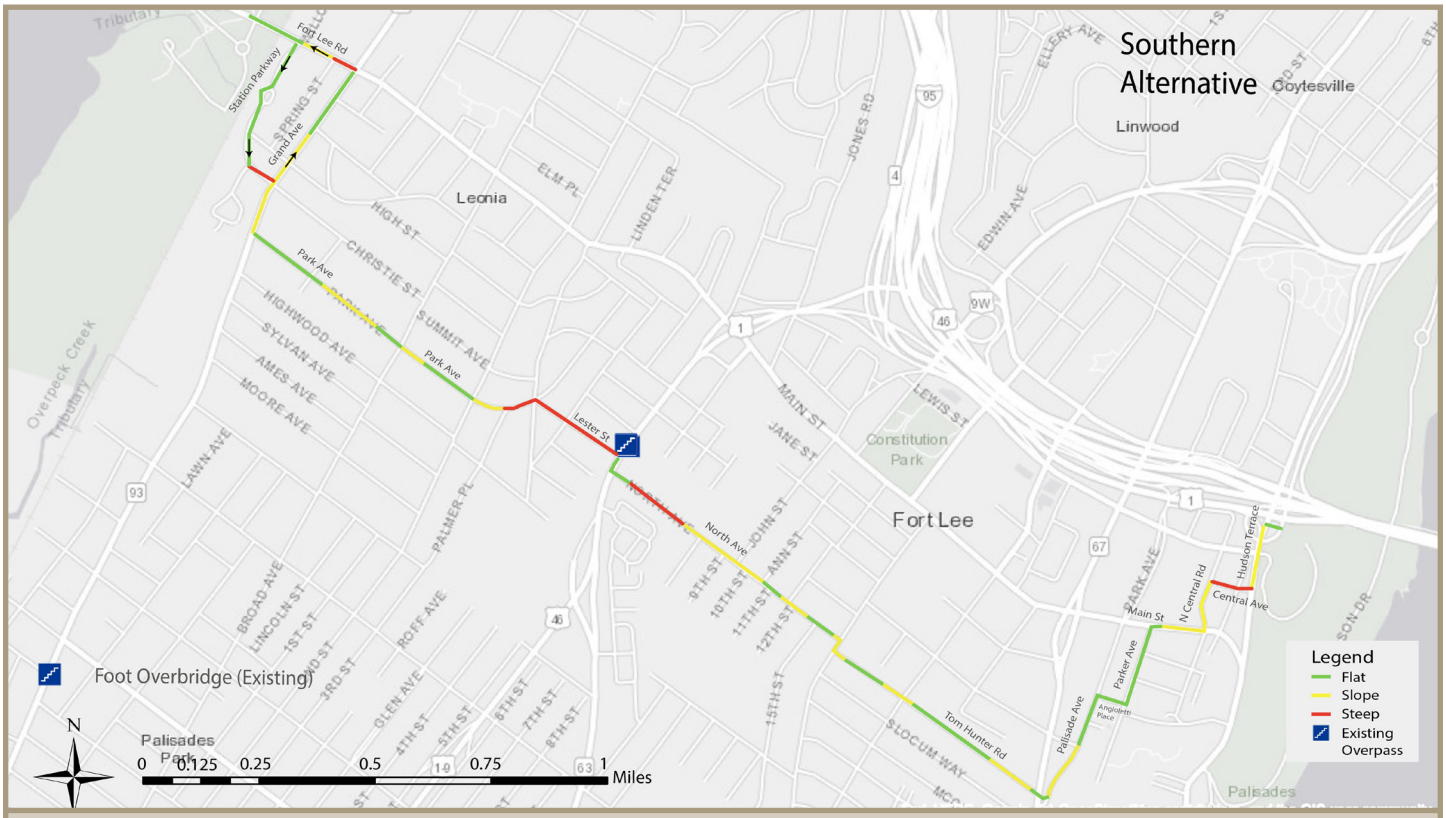


Figure 36. Map showing the Southern Alternative.

Route Description - Westbound

In the westbound direction, the Southern Alternative starts at the GWB and goes south along Hudson Terrace (County Road 505). As with the Central Alternative, the route goes 700 feet south on Hudson Terrace before turning right onto Central Avenue using the existing traffic signal and then left onto North Central Road. After 375 feet, the route turns right onto Main Street (Bergen County Route 56).

Figure 37. Looking south on Palisade Avenue.

The route diverges from the Central Alternative after just 580 feet on Main Street, when the route turns south onto Parker Avenue. Parker Avenue is 32 feet wide, and has parking on one side of the road. After 700 feet, the route turns right onto Angioletti Place for a short block, before turning left onto Palisade Avenue. Palisade Avenue is 40 feet wide with parking on both sides (Figure 37).

After a quarter of a mile on a flat section of Palisade Avenue, the route direct bicyclists northwest via Tom Hunter Road. Although it is just 25 feet wide, Tom Hunter Road is bidirectional, with parking along one side. Tom Hunter Road is bisected by a local bicycle trail 1,000 feet north of Palisade Avenue that connects two local parks (Figure 38).

Upon reaching Anderson Avenue, the route continues west on North Avenue, which is offset from Tom Hunter Road by 100 feet. North Avenue is 30 feet wide, with parking allowed on the south side. Bidirectional

traffic is separated by a double yellow line (Figure 39). On Tom Hunter Road and North Avenue, the route covers a mile on a combination of flat slopes with short gentle sloped sections in between.

North Avenue terminates at North Bergen Boulevard. Bicyclists, if they can carry their bikes up and down stairs, may cross the highway by using a pedestrian bridge located 240 feet to the north. The bridge is accessible with a sidewalk and a wide shoulder on the highway (Figure 40); however, it is not handicapped accessible and does not have ramps or elevators. On the south side of bridge, the route directs bicyclists along North Bergen Boulevard for 100 feet to reach Lester Street.

Lester Street is another 30-foot-wide residential road with parking on one side. At a five-way intersection, the route directs bicyclists onto Park Avenue for half a mile on a combination of flat and gentle slopes. Park Avenue varies from 22 to 28 feet wide with parking on one side (Figure 41). At Grand Avenue (NJ Route 28) the route turns right towards Fort Lee Road and continues 0.32 miles on the flat slope. Grand Avenue is 35 feet wide with two lanes and marked shoulders (Figure 42). At the signalized intersection with Fort Lee Road, the route turns left into Overpeck County Park.

Route Description - Eastbound

The eastbound route only varies from the westbound route near Overpeck County Park. From the park, the route follows Fort Lee Road briefly before turning right onto Station Parkway. Station Parkway is a bidirectional roadway that varies in width from 38 to 42 feet, with parking. Station Parkway ends at Grand Avenue with a mandatory right turn. The eastbound route turns onto Grand Avenue for 460 feet, before turning left onto Park Avenue. From Park Avenue, the eastbound route is identical to the westbound route, but requires the addition of a short (70 feet) contra-flow lane on Central Avenue, as with the Central Alternative.

Figure 38. Tom Hunter Road is bisected by a local trail (looking east)

Figure 39. Looking east on North Avenue.

Figure 40. Pedestrian bridge across North Bergen Boulevard, looking south.

Figure 41. Looking southeast on Park Avenue.

Figure 42. Looking south on Grand Avenue.

Route Recommendations

The Southern Alternative route is similar to the Northern Alternative in that it routes bicyclists through low-traffic residential roads whenever possible. However, there is an existing pedestrian bridge with stairs over New Jersey Route 4, which poses a barrier to bicyclists. In the short-term, adding a "wheeling ramp" on the side of the staircase can assist bicyclists using the bridge. Such a ramp allows users to push their bicycle up the stairs instead of carrying the bicycle (Figure 43). A long-term solution is to add either ramps or elevators to the bridge to make this route more generally accessible to bicyclists. It would also bring the bridge into compliance with the federal Americans with Disabilities Act (ADA). It is also recommended that the sidewalks along North Bergen Boulevard between the bridge and Lester Street and North Avenue be replaced with wider multi-use paths.

Figure 43. A wheeling ramp on the left side of the staircase. Photo: Oliver Dixon.

As with the Northern Alternative, most of the recommended improvements consist of upgrading streets to create bicycle boulevards. Doing so helps lower vehicle speeds, minimized cut-through traffic, and enhances safety for bicyclists. Not all roads are suitable candidates for bicycle boulevard treatments. In those cases, sharrows are recommended as a way-finding tool.

The westbound route does not use Station Parkway due to the difficult left turn from Grand Avenue. Christie Street, across from Station Parkway, has a mandatory right turn. The addition of a traffic signal at this intersection would allow bicyclists in both directions to use Station Parkway and avoid the busy intersection of Grand Avenue and Fort Lee Road.

Table 4. Potential Bicycle Infrastructure Treatments, Southern Alternative

Street Name	Distance (miles)	Total Lanes	Cartway Width (feet)	Speed Limit (mph)	Parking	Existing Bicycle Infrastructure	Potential Bicycle Infrastructure
Hudson Terrace	0.13	4	60	35	No Parking	Sidewalk, Multi-use Trail	Multi-Use Trail or Protected Bike Lanes
Central Ave	0.01	1	16	25	No Parking	None	Eastbound contra-flow bicycle lane, westbound sharrows
North Central Road	0.07	2	32	25	One Side	None	Sharrows
Main Street	0.09	2 - 3	48	25	No Parking	None	Sharrows
Parker Avenue	0.14	2	32	25	No Parking	None	Sharrows
Angioletti Place	0.04	2	35	25	Both Sides	None	Sharrows
Palisade Avenue	0.17	2	40	25	Both Side	None	Sharrows
Tom Hunter Road	0.4	2	25	25	One Side	None	Bicycle Boulevard
Anderson Avenue	0.02	2	40	25	Both Side	None	-
North Avenue	0.46	2	30	25	One Side	None	Bicycle Boulevard
North Bergen Boulevard	0.07	4	70	45	No Parking	None	Ramp or elevator access to existing pedestrian bridge, Multi-Use Trail.
Lester Street	0.15	2	30	25	One Side	None	Bicycle Boulevard
Park Avenue	0.5	2	22 - 28	25	One Side	None	Bicycle Boulevard
Grand Avenue	0.3 (westbound) 0.09 (eastbound)	2	35	30	No Parking	Shoulders	Bicycle Lanes
Station Parkway (eastbound only)	0.27	2	38-42	25	Both Sides	None	Sharrows, traffic signal at Grand Avenue

Additional Recommendations

During the kick-off meeting, the community expressed the desire to also encourage bicycling generally within Leonia, These recommendations contain additional strategies that the municipality may be interested in implementing.

1. Create Neighborhood Greenways / Bicycle Boulevards

Glenwood Avenue, Hillside Avenue, and Park Avenue are ideal candidates to be developed into low-speed multi-modal transportation corridors. This concept falls under a number of different names, including "neighborhood greenway," "quiet streets," or "bicycle boulevard." The only difference between the names is the benefit the local municipality is most interested in highlighting, such as traffic calming or bicycle access. The NJDOT uses bicycle boulevard as its preferred nomenclature, and classifies them as "linear corridors of interconnected, traffic-calmed streets where bicyclists are afforded an enhanced level of safety and comfort." The benefits extend beyond bicyclists, as implementation increases the safety and comfort for pedestrians and drivers as well. The 2017 New Jersey Complete Streets Design Guide states that bicycle boulevards are appropriate for roads with a traffic volume under 2,500 vehicles per day. Adopting this model can be effective in encouraging bicycling and walking while reducing vehicular speeds.

Bicycle boulevard treatments include signs, pavement markings, and other traffic-calming measures to discourage through-trips by motor vehicles, while accommodating local access. Essentially, a bicycle boulevard sends a message that pedestrians and bicyclists have priority along the corridor, and drivers need to be especially careful, or select an alternative route. The treatments deployed with a bicycle boulevard fit in with the residential character of the streets that have been identified, as they mostly contain single-family properties and plenty of greenery.

According to the National Association of City Transportation Officials (NACTO), the following components must be considered when creating a bicycle boulevard:

1. **Route Planning**: Direct access to destinations
2. **Signs and Pavement Markings**: Easy to find and to follow
3. **Speed Management**: Slow motor vehicle speeds
4. **Volume Management**: Low or reduced motor vehicle volumes
5. **Minor Street Crossings**: Minimal bicyclist delay
6. **Major Street Crossings**: Safe and convenient crossings
7. **Offset Crossings**: Clear and safe navigation
8. **Green Infrastructure**: Enhancing environments

Figure 44. Bicycle Boulevard signage in McKinley, Texas.

Figure 45. Curb extensions, high-visibility crosswalks, and turn restrictions calm traffic along a bicycle boulevard in Ocean City, NJ.

Route Planning

A challenge many communities face when designing a bicycle boulevard is that it can be difficult to convince people to use the planned route versus a shorter alternative. For Leonia, the most direct route is Fort Lee Road, which is challenging to all but the most experiences bicyclists due to its steep slope. As such, most riders will be happy to detour to the northern or southern alternatives that have less traffic and more manageable slopes, as long as they are aware that the option exists.

Signs and Pavement Marking

A bicycle boulevard is a new concept to most New Jersey residents. As such, it is important to communicate the purpose of the project to residents and visitors. According to NACTO, the bicycle boulevard "should also be actively marketed through events, activities, and maps to help reach its potential." This is important because education is essential to "improve public perception, build support for additional treatments, and provide confidence to new bicyclists."

Figure 46. Regulatory and educational signs along a bicycle boulevard in Portland, Oregon.

On the corridor itself, there are two forms of signs and pavement markings that need to be deployed: regulatory and educational/informational. Regulatory markings include speed limit signs, marked crosswalks, and instructions to drivers, bicyclists, and pedestrians where appropriate (Figure 46). This can include the "Bicycles May Use Full Lane" (R4-11) signs. Informational signage may include branding, wayfinding, and explanations of the project purpose (Figure 47).

Figure 47. Sign in Tucson, Arizona providing boulevard branding and wayfinding.

It is important that the branding be developed with community input. Pavement markings reinforce the message being delivered by the signs. Large shared-lane pavement markings advise bicyclists on where to position themselves, and remind drivers that bicyclists may use the center of the lane (Figure 48).

Speed Management

A low speed limit (15 or 20 mph) is key to a successful bicycle boulevard, but signage is not enough. Additional tools exist to help reduce vehicle speeds so that they are closer to the speed of a bicycle. Reducing speeds helps to prevent collisions, and also makes bicyclists and pedestrians feel more comfortable when sharing roads with motor vehicle traffic.

Traffic calming measures can include vertical deflection (e.g. speed humps or tables at intersections) or horizontal deflection (e.g. chicanes and traffic circles) (Figure 49). Traffic calming solutions can be combined with other measures to address other potential community goals, such as the addition of green infrastructure to a chicane (Figure 50).

Volume Management

Volume management is needed when the traffic volumes on the corridor exceed recommendations. This is especially true on residential streets being used as a cut-through. One common strategy to reduce traffic volumes is to prohibit cut-through traffic by forcing automobiles to turn off the boulevard every few blocks (Figure 51). For example, if drivers are using Glenwood Avenue as an alternative to Broad Avenue, a couple of mandatory turns would eliminate almost all cut-through behavior.

Effective speed management will also discourage cut-through traffic as drivers look for the path of least resistance. This is also true for drivers relying on apps such as Waze, which calculate total travel time when routing drivers.

Figure 48. Pavement markings in Ocean City, New Jersey.

Figure 49. A speed table with a marked crosswalk (a raised crosswalk).

Figure 50. Traffic calming chicanes with green infrastructure in Shoreline, WA.

Minor Street Crossings

A bicycle boulevard should have the right-of-way over minor streets. This is done to reduce delays for bicyclists and pedestrians, and to clarify that these modes have the right-of-way. In many cases, this can be done by simply switching which road has a stop sign, in the case of two-way stops. It is also important that existing deficiencies in the pedestrian network (especially ADA) be addressed. This includes new compliant curb ramps, and high-visibility crosswalks.

Figure 51. Diverters in San Luis Obispo, California, force automobile traffic to turn, while allowing bicyclists to continue straight.

Major Street Crossings

If bicyclists and pedestrians do not feel safe along the entire corridor, then they will shift to other modes of travel. Particular attention is needed when looking at major intersections, as they present the biggest barrier to an effective and successful bicycle boulevard. A comfortable intersection is one where crossing distances are minimized and visibility is maximized for boulevard users. This can be done with curb extensions, high-visibility crosswalks, advanced signage, and improved lighting .

Figure 52. "Crossbike" in Portland, OR. Photo: J. Maus/BikePortland

Offset Crossings

In many cases, a bicycle boulevard is actually the combination of multiple disjointed roads due to a broken street grid. For example, the Southern Alternative route requires users to navigate 100 feet of Anderson Avenue to continue from Tom Hunter Road to North Avenue. In these situations, wayfinding and turning solutions are required. In situations where the bicycle boulevard requires an offset crossing, additional treatments are required to facilitate turns. These treatments can include turn boxes for bicyclists, a bicycle lane in the middle of the roadway, or a protected cycle track.

Green Infrastructure

A bicycle boulevard can work hand-in-hand with the development of green infrastructure. Green infrastructure refers to projects that reduce flooding, add greenery, and address health concerns through the addition of vegetation. For example, a curb extension can be built as a rain garden to collect stormwater and add native plants.

Figure 53. Green infrastructure used to narrow the roadway and provide a shorter crossing distance for pedestrians.

Bicycle Parking

Bicyclists need safe and convenient bicycle parking at their destination, as fear of bicycle theft is a serious barrier to riding. The municipality should work with the school district to ensure that bicycle parking exists at the schools. Additional bicycle parking may be needed near municipal buildings and near downtown businesses. As many Leonia residents rely on buses to access New York City, bicycle parking near bus stops should also be considered.

2. Use of Demonstration Projects

Demonstration projects, also referred to as tactical urbanism, is an approach to neighborhood building that uses short-term, low-cost, scalable interventions to effect long-term change related to street safety and public space. This approach can draw attention to perceived shortcomings, widen public engagement, test interventions, and inspire action. Common examples include installing pop-up bike lanes, painting crosswalks and curb extensions to calm traffic, and streetscape enhancements like parklets and planters. A short-term trial can be paired with group rides to compare and contrast the experience with unmodified roadways. Many of the bicycle boulevard improvements can be tested quickly through a demonstration project.

Benefits of Demonstration Projects

Speed

These projects allow a municipality to quickly make necessary safety and livability improvements while the permanent improvements move through the various project design and funding steps.

Figure 54. New Brunswick, NJ, uses plastic bollards to prevent illegal parking near intersections. After a successful trial at one intersection, the city has added them throughout the city.

Flexibility

Demonstration projects are flexible because improvements can be temporary. Rather than debating the costs and benefits of a sidewalk extension, municipalities can paint one and observe the new dynamic between pedestrians and drivers without committing to a permanent change. This allows residents and policymakers to witness the improvement and determine its effects. It also allows for data to be collected, and the final permanent design to be modified based on what was learned during the temporary installation.

Affordability

These projects offer a "lighter, quicker, cheaper" implementation through which the municipality can test new concepts—like a new bicycle lane or pocket park—without breaking the bank. This means using low-cost materials such as paint and plastic bollards instead of concrete.

Figure 55. Curb extensions using plastic bollards and paint have been used in Seattle to realign confusing intersections, slow traffic, and add new pedestrian crossings.

Community Input

Demonstration projects are designed to spark a conversation about long-term change in the direction of complete streets. They solicit local ideas for planning challenges, taking the debate out of City Hall and placing it on the street where people can visualize and respond to the proposed project. These projects seek to spur conversation around neighborhood improvements, allowing residents to evaluate changes before permanent installation.

Economic Development

By creating a more welcoming environment for pedestrians and bicyclists, demonstration projects can spur economic development in commercial corridors that rely on local consumers. Tactical urbanism can also provide new outdoor space for restaurants by converting a single parking space into a protected seating area.

Resources

The "Tactical Urbanist's Guide to Materials and Design" (http://tacticalurbanismguide.com/guides/tactical-urbanists-guide-to-materials-and-design/) provides an excellent guide on what materials are appropriate to use for demonstrations, pilots, or semi-permanent installations.

Figure 56. In 2015, Jersey City created a new pedestrian plaza using planters, paint, tables and chairs. The plaza was successful and extended in 2018. Now the city is designing a permanent plaza with stone pavers, larger planters, benches, pedestrian safety bollards, and other public space features.

Figure 57. Tontine Crescent Tactical Plaza in Boston, MA. Photo: Ground Inc. A permanent design is in the works.

Figure 58. New York City has made extensive use of paint and plastic bollards to decrease turn radii at intersections throughout the city.

3. Use of Sharrows

Shared lane markings, or sharrows, are not dedicated bicycle infrastructure, but they can be a useful tool. According to NJDOT, "a shared-lane marking is not a facility type but can be used to assert the legitimacy of bicyclists on the roadway and offer directional and wayfinding guidance."

Sharrows are a quick and inexpensive way to indicate the preferred routes for bicyclists to take. On routes where bicyclists must turn frequently, sharrows can work together with signage to ensure that bicyclists do not get lost, or have to stop to check their phone.

On busier roads, sharrows help position bicyclists away from parked cars, into the safest position within the lane. For motorists, the sharrows provide a constant reminder that bicyclists are using the roads.

Figure 59. Sharrow installed in Asbury Park in May 2019, as part of their bicycle master plan implementation process.

4. Count Bicyclists

In 2014, the Port Authority of New York and New Jersey installed a bicycle counter on the George Washington Bridge in order to better understand existing demand. The counter showed that close to 2,000 bicyclists were crossing the bridge each day. Thanks to this data, the Port Authority was able to move forward with plans to improve bicycle access to the bridge.

In Leonia, accurate bicycle counts can support the introduction of new bicycle infrastructure within the municipality. Sometimes, local residents are skeptical of the need for new investments because they believe there is no demand for the improvements. With data in hand, it could become clear that improvements are justified. Additionally, before and after counts can show the impact that the new improvements have had.

Conclusion

Leonia residents and local officials are concerned about regional traffic cutting through the borough and the congestion and speeding it brings. The borough sought the services of the Complete Streets Technical Assistance Program to identify the best routes for bicyclists traveling between Overpeck County Park and the GWB.

The hilly topography and existing highway network pose significant challenges to bicycling in the area. The project team identified three potential bicycle route alternatives. The Northern Alternative uses low-volume residential streets that can be improved through the use of bicycle boulevard treatments; however, it requires construction of a bridge for bicyclists and pedestrians over New Jersey Route 4. The Central Alternative is the most direct route, but has a large change of grade and sees heavy motor vehicle traffic. A climbing bicycle lane along this route in the uphill direction may help bicyclists navigate this path. The Southern Alternative uses quiet residential streets; however, New Jersey Route 4 presents a barrier for this route as well, with an existing pedestrian bridge with stairs that is not a preferred option for bicyclists. The Southern Alternative also proposes bicycle boulevard treatments to enhance bicycle safety while also discouraging cut-through traffic.

Many of these improvements can be done quickly and at a low cost through demonstration projects or as part of the regular road maintenance program. Other aspects, such as education and marketing, must be done in partnership with local residents and stakeholders. This outreach is essential to ensure that the bicycle boulevard concept is adopted as an important facet of the community. Other recommendations, such as improvements to crossing New Jersey Route 4 and the climbing bicycle lane on Fort Lee Road, require approval, design and implementation by the state and county, which have jurisdiction over those roads.

Figure 60. Broad Avenue in downtown Leonia, looking south.

Appendix

A. StreetSmart Campaign Resources

B. Potential Funding Resources

C. Design Resources

STREET SMART

STREET SMART NJ FACT SHEET

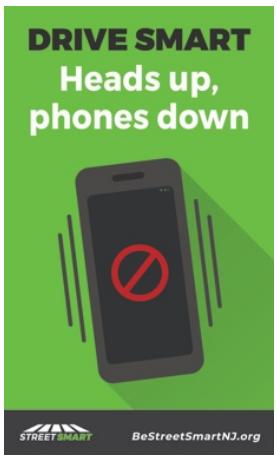
What is Street Smart NJ?

Street Smart NJ is a public education, awareness and behavioral change pedes- trian safety campaign created by the North Jersey Transportation Planning Authority (NJTPA). The campaign combines grassroots public awareness efforts with social media, public outreach efforts and law enforcement to address pedestrian safety.

There are a number of different ways communities can participate. Nearly all campaigns enlist the involvement of community leaders, businesses and organizations and ask police to step up enforcement of pedestrian safety laws. Some campaigns have an evaluation component, including pre- and post-campaign surveys and observations at crash prone locations. Smaller campaigns may be limited to handing out information at community events and dis- playing signage around town.

More than 80 communities have participated in Street Smart in some way since the program's inception in 2013. NJTPA's goal is to increase that number to 100 campaign partners. Communities everywhere are invited to use the strategies and materials on the Street Smart website, bestreetsmartnj.org, to create their own campaigns. The website includes a 'How To' guide, printable materials, social media posts and a sample press release among other resources.

NJTPA staff are available to sit down with interested towns to discuss how to bring Street Smart NJ to their community.



Why do we need Street Smart?

Part of the impetus behind Street Smart NJ was that the Federal Highway Administration identified New Jersey as a pedestrian "focus" state due to the high incidence of pedestrian injuries and fatalities. In 2018, 175 pedestrians died as a result of pedestrian-vehicle crashes in New Jersey. From 2014 to 2018, 870 pedestrians were killed and thousands were injured on New Jersey's roadways. That translates to one death every two days and 11 injuries daily.

Campaign Messages

The Street Smart NJ campaign urges pedestrians and motorists to keep safety in mind when traveling New Jersey's roads. The program's core message is "Walk Smart – Drive Smart – Be Street Smart" with specific messages including We look before crossing; Heads up, phones down; We slow down for safety; We stop for people – it's the law; We use crosswalks; We cross at corners; We cross at the light; and We wait for the walk. The NJTPA has developed pedestrian safety tip cards, in English and Spanish, for public distribution built around the messages. The messages are also printed on posters, banners, street signs, coasters, tent cards and coffee sleeves.

Police Enforcement

One of the keys to Street Smart NJ's success is law enforcement participation. Police officers engage and educate, rather than simply issue citations. In many communities that participate in Street Smart NJ police have issued warnings rather than citations and even rewarded good behavior with coupons, gift cards and free t-shirts. Street Smart NJ public awareness efforts are often conducted in conjunction with this increased enforcement.

Results

Evaluations of previous Street Smart NJ campaigns have shown positive results. There was a 28 percent reduction in pedestrians jaywalking or crossing against the signal and a 40 percent reduction in drivers failing to yield to crossing pedestrians or cyclists following campaigns the NJTPA managed in March 2016.

B. Potential Funding Resources

This appendix provides a list of common grant programs available to New Jersey communities for the advancement of complete streets initiatives, including both infrastructure and non-infrastructure projects, and programs to increase walking and bicycling. A table has been included that lists the most common grant sources for complete street related projects. Links to two online databases with additional funding sources has also been included. Grants listed are highly competitive and grant application requirements should be carefully reviewed before making the decision to apply. From the reviewers' perspective, application review is time-consuming and often applications will not be reviewed if all the required elements are not received by the published deadline. The most successful applications tell the story of the populations most in need of the proposed improvements, especially disadvantaged communities or vulnerable groups such as seniors. Applications should use compelling pictures, data and other documentation, and indicate how and why improvements are prioritized.

New Jersey Department of Transportation

The Division of Local Aid and Economic Development at the New Jersey Department of Transportation (NJDOT) provides funds to local public agencies such as municipal governments for construction projects to improve the state's transportation system. The state's Transportation Trust Fund and the federal Safe, Accountable, Flexible, Efficient Transportation Equity Act — A Legacy for Users (SAFETEA-LU) legislation provides the opportunity for funding assistance to local governments for road, bridge and other transportation projects. NJDOT and the three metropolitan planning organizations that cover the state administer federal aid programs. NJDOT administers state aid programs. Below are some options for funding infrastructure projects through NJDOT.

State Aid Infrastructure Grant Programs

Municipal Aid: This program assists municipalities in funding local transportation projects, and all municipalities in New Jersey are eligible to apply. NJDOT encourages applications for pedestrian safety improvements, bikeways, and streetscapes. Additionally, a common strategy to implement on-street bike lanes is to include bike lane striping within repaving projects that are funded through this program. Learn more here: https://www.state.nj.us/transportation/business/localaid/municaid.shtm

County Aid: County Aid funds are available for the improvement of public roads and bridges under county jurisdiction. Public transportation and other transportation projects are also included. Learn more here: https://www.state.nj.us/transportation/business/localaid/countyaid.shtm

Bikeways: This program funds bicycle projects that create new bike path mileage, working towards NJDOTs goal of 1,000 miles of dedicated bikeways in New Jersey. Special consideration will be given to bikeways physically separated from vehicle traffic, but on-road bike lanes or other bike routes are also eligible for funding. Learn more here: https://www.state.nj.us/transportation/business/localaid/bikewaysf.shtm

Safe Streets to Transit: This program encourages counties and municipalities to construct safe and accessible pedestrian linkages to all types of transit facilities and stations, in order to promote increased usage of transit by all segments of the population and decrease private vehicle use. Learn more here: https://www.state.nj.us/transportation/business/localaid/safe.shtm

Transit Village: This program awards grants for transportation projects that enhance walking, biking, and/or transit ridership within a ½ mile of the transit facility. Municipalities must already be designated as a Transit Village by the Commissioner of Transportation and the inter-agency Transit Village Task Force in order to be eligible to apply. Learn more here: https://www.state.nj.us/transportation/business/localaid/transitvillagef.shtm

Other NJDOT Assistance

Bicycle and Pedestrian Planning Assistance: NJDOT offers Local Technical Assistance (LTA) funding through the Office of Bicycle and Pedestrian Programs. Under this program, on-call consultants are paired with communities to complete a variety of projects including bicycle and pedestrian circulation and master plan studies, safety assessments, trail feasibility studies, bikeway plans, and improvement plans for traffic calming projects. For more information, please contact the state bicycle and pedestrian program coordinator at bikeped@dot.nj.gov

Federal Aid Infrastructure Grant Programs

Safe Routes to School: The Safe Routes to School Program provides federal funds for infrastructure projects that enable and encourage children in grades K-8, including those with disabilities, to safely walk and bicycle to school. Applicants can receive bonus points on the grant if they have School Travel Plans, a Complete Street Policy and Transit Village designation. Learn more here: https://www.state.nj.us/transportation/business/localaid/srts.shtm

Transportation Alternatives Program: The Transportation Alternatives Program provides federal funds for community based "non-traditional" transportation projects designed to strengthen the cultural, aesthetic and environmental aspects of the nation's intermodal system. Municipalities can receive bonus points on the grant if they have an adopted Complete Street Policy and are a designated Transit Village. Learn more here: https://www.state.nj.us/transportation/business/localaid/alternatives.shtm

New Jersey Department of Environmental Protection: The Recreational Trails Program administered by the NJDEP Green Acres Program provides federal funds for developing new trails and maintaining and restoring existing trails and trail facilities including trails for non-motorized, multi-use (including land and water) and motorized purposes. Learn more here: https://www.nj.gov/dep/greenacres/trails/index.html

Health and Environment Funding

Sustainable Jersey: The Sustainable Jersey Small Grants program provides capacity building awards to municipalities to support local green teams and their programs, and is not project specific. Learn more here: http://www.sustainablejersey.com/

Sustainable Jersey for Schools: Sustainable Jersey for Schools grants are intended to help districts and schools make progress toward Sustainable Jersey for Schools certification. Learn more here: http://www.sustainablejerseyschools.com

New Jersey Healthy Communities Network: The New Jersey Healthy Communities Network is a partnership of grantees, funders and advocate organizations who seek to have collective impact on community well-being to support healthy eating and active living. The Community Grant Program provides opportunities to develop healthy environments for people to live, work, learn and play by funding policies, projects and programs that support walking and bicycling. Learn more here: https://www.njhcn.org/

Funding from Other Sources

Various other funding sources exist that may help municipalities further complete streets projects. Both Sustainable Jersey and Together North Jersey have developed comprehensive online databases that catalog the many funding sources available. They can be found at the following locations:

Sustainable Jersey Grants Portal: http://www.sustainablejersey.com/grants-resources/grants-portal/

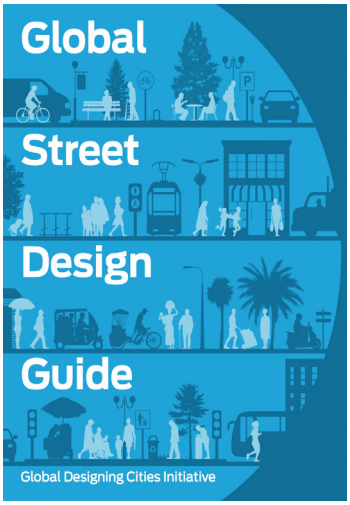
Together North Jersey Funding and Resources Database: https://togethernorthjersey.com/?page_id=25162

Federal Funding
1. US Department of Transportation (USDOT)
a. Better Utilizing Investments to Leverage Development (BUILD, replaced TIGER)
2. Federal Highway Administration (FHWA) Programs
a. Congestion Mitigation and Air Quality Improvement (CMAQ)
b. Surface Transportation Program (STP)
c. Highway Safety Improvement Program (HSIP)
d. National Highway Performance Program (NHPP)
e. Transportation Alternatives Program (TAP)
f. Safe Routes to School (SRTS)
g. Local Safety / High Risk Rural Roads Program (HRRR)
h. National Highway System (NHS)
i. Recreational Trails Program - Including hiking, bicycling, in-line skating, equestrian use, cross-country skiing, snowmobiling, off-road motorcycling, all-terrain vehicle riding, four-wheel driving, or using other off-road motorized vehicles.
j. Federal Lands Access Program (FLAP) - The Access Program supplements State and local resources for public roads, transit systems, and other transportation facilities, with an emphasis on high-use recreation sites and economic generators.
k. Emergency Relief - Repair or reconstruction after national disaster, can include bicycle and pedestrian facilities
3. National Highway Traffic Safety Association
a. NHTSA Section 402 State Highway Safety Program
b. NHTSA Section 405 Non-Motorized Safety Grants
4. Federal Transit Administration Programs
a. Urbanized Area Formula Program (UZA) - Public transit and bike routes to transit
b. Fixed Guideway Capital Investment Grants - Transit systems and bike parking
c. Bus and Bus Facilities Formula Grants - Includes bike parking facilities
d. Enhanced Mobility of Seniors and Individuals with Disabilities - Access to transit facilities for seniors
State Funding
5. Municipal Aid ($140m)
6. County Aid ($150m)
7. Local Bridges ($44m)
8. Safe Streets to Transit ($1m)
9. Transit Village ($1m)
10. Bikeways ($1m)
11. Local Aid Infrastructure Fund ($7.5m)
12. Safe Corridors Highway Safety Funds
13. Urban Aid ($10m)
14. New Jersey Trails Program (Department of Environmental Protection)
15. Other Funding Sources
16. Regional/Local CMAQ Initiatives Program (NJTPA)
17. NJ Division of Highway Traffic Safety
18. Open Space &Farmland Preservation
19. Homeland Security Transit Security Grant Program (TSGP)
Other Sources
20. County Capital Program
21. Municipal Capital Programs
22. Foundations

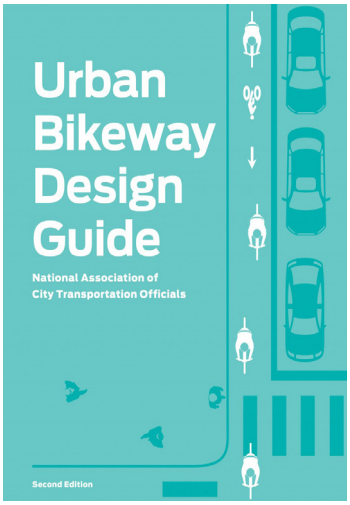
C. Design Resources

NACTO Guides

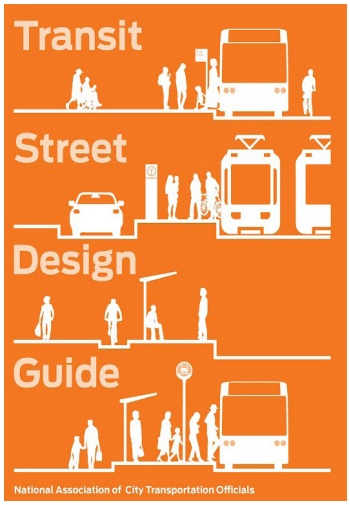
[Urban Street Design Guide]



[Global Street Design Guide]



[Urban Bikeway Design Guide]



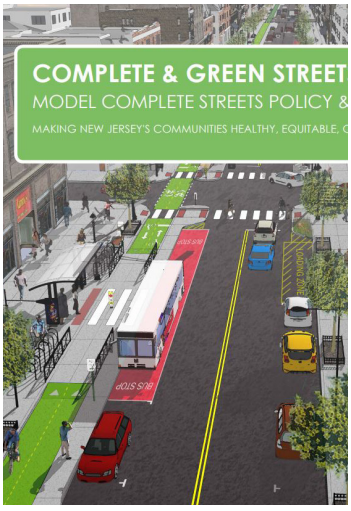
[Transit Street Design Guide]

[Blueprint for Autonomous Urbanism]

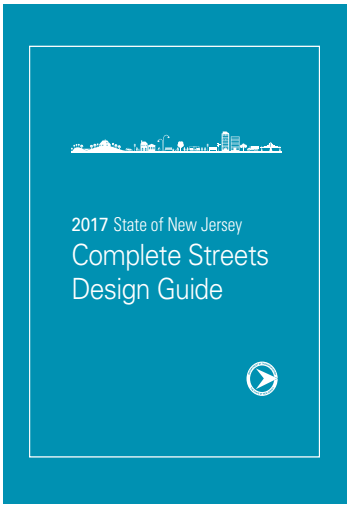
[Urban Street Stormwater Guide]

[Bike Share Station Siting Guide]

NJDOT Guides



[Complete & Green Streets for All: Model Policy and Guide]

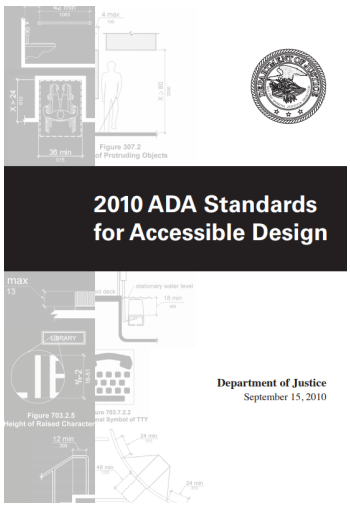


[2017 State of New Jersey Complete Streets Design Guide]

[A Guide to Policy Development]

[A Guide to Creating A Complete Streets Implementation Plan]

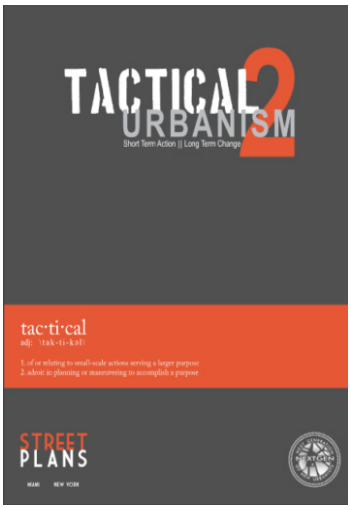
ADA Guidelines



[ADA Standards for Accessible Design]

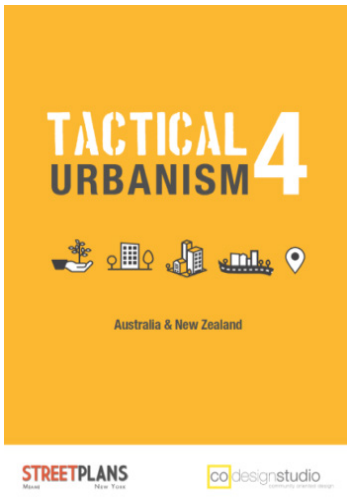
Tactical Urbanism Guides

Tactical Urbanism 1



Tactical Urbanism 2

Tactical Urbanism 3



Tactical Urbanism 4

Tactical Urbanism 5

Tactical Urbanism

Tactical Urbanist's Guide to Materials and Design Version 1.0

The Open Streets Guide

Mercado: Lessons from 20 Markets Across South America

Public Space Stewardship Guide