Columbus Drive

Complete Streets Implementation Plan

November 2019

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Introduction

1.1 What are Complete Streets?

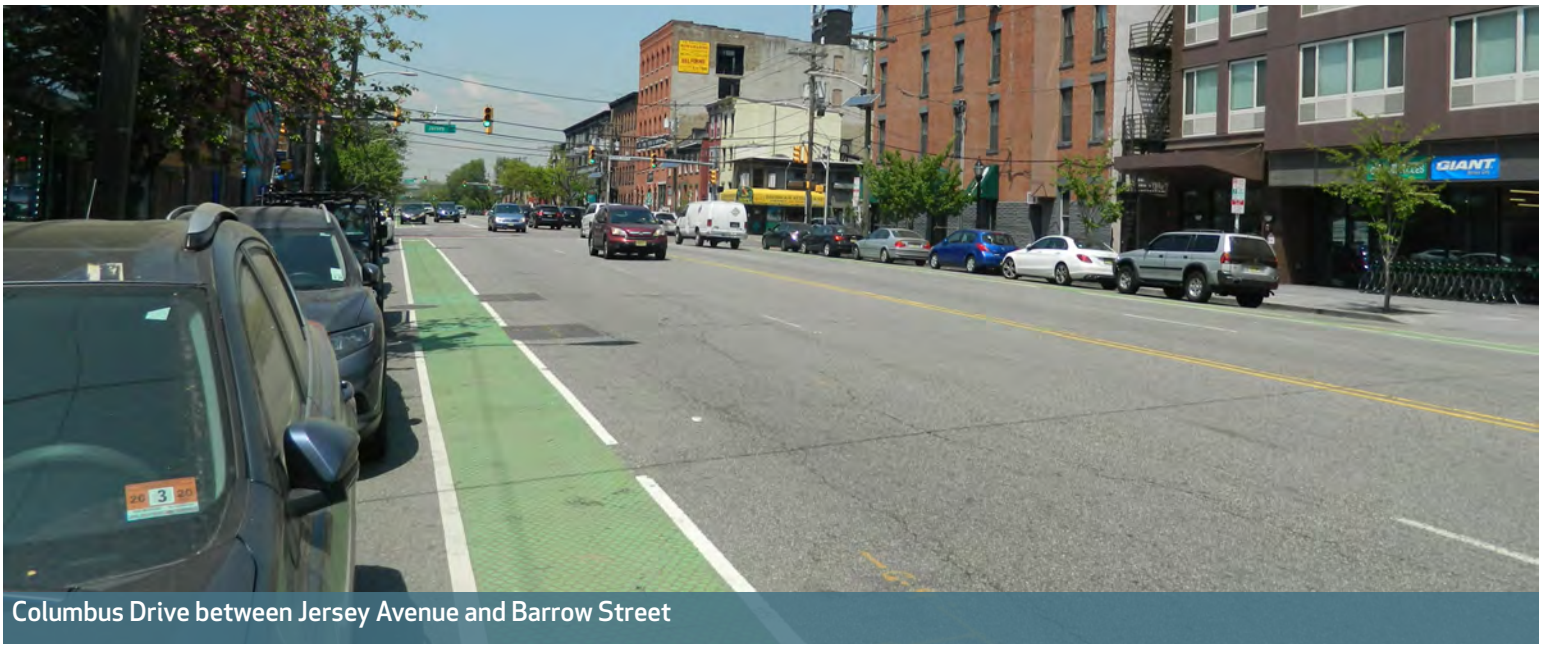
The Jersey City Complete Streets Policy, established on May 25, 2011, defines Complete Streets as roadways that enable safe and convenient access for all users, including children, persons with disabilities, bicyclists, motorists, seniors, movers of commercial goods, pedestrians, and users of public transportation. Complete Streets will include accommodations for all modes of transportation including sidewalks, bike lanes, and transit accessible features such as bus lanes and passenger amenities. Complete Streets make it easier to cross the street, walk to shops, bicycle to work, and drive motor vehicles in a safe way.

Complete Streets can be beneficial to individual's and community's health, safety, equity, economic vitality, transportation choices, environment, mobility, and livability. The New Jersey Department of Transportation (NJDOT) also has a Complete Streets policy that is implemented through the planning, design, construction, maintenance, and operation of new or rehabilitated transportation facilities within public rights-of-way that are federally or state funded, including projects undertaken or administered by NJDOT.

Along with a Complete Streets policy, Jersey City also adopted a Vision Zero policy that works towards zero fatalities and serious injuries in relation to road traffic.

1.2 Purpose of the Plan

The Columbus Drive Complete Streets Implementation Plan ("Implementation Plan," "Plan") assesses the street condition on Columbus Drive, recommends a comprehensive set of improvements based on existing safety and operational issues, sets priorities, assigns responsible parties for next steps, and identifies action items. Together, the Implementation Plan and the previously established Complete Streets Policy are tools for the community to discuss future improvements with community leaders, residents, and other agencies including the County and the State. Additionally, it assists in the application and selection process of funding opportunities. These funding opportunities can assist with infrastructure improvements as well as educational and enforcement programs for the community. As grant opportunities become available, the Implementation Plan provides a list of strategies which can be identified based on the type of funding. For instance, specific improvements that address safety concerns can be funded through the Highway Safety Improvement Program (HSIP). Similarly, improvements near schools can qualify for the Safe Routes to School (SRTS) grant program. As part of the scoring criteria, the SRTS grant program awards extra points for municipalities which have a Complete Streets Policy and extra credit for those municipalities which demonstrate past implementation of Complete Streets initiatives.



Columbus Drive between Jersey Avenue and Barrow Street

1.2 Scope of Work

As part of this study, Michael Baker performed the following tasks:

Data Collection
- Existing Resources (crash reports, Master Plans, GIS, AutoCAD or MicroStation files etc.)
- Field Inventory and Investigation
- Traffic Counts

Existing Conditions
- Sidewalk Inventory and Assessment
- Bicycle Compatibility Assessment
- Intersection Assessment
- Bicycle and Pedestrian Crash Review

Public Outreach
- Project Steering Committee
- Internet-Based Public Involvement
- Public Information Center

Develop Recommendations
- Quantitative Safety Analysis
- Sidewalk Priority Map
- Bicycle Compatibility Matrix and Map
- Identify Recommended Improvements
- Implementation Matrix

Implementation
- Coordination
- Enforcement
- Funding
- Phasing

Pedestrians cross Columbus Drive

Existing Conditions

2.1 Field Inventory

In May 2018, Michael Baker performed a field inventory of existing bicycle and pedestrian facilities at signalized intersections along the Columbus Drive study corridor.

Columbus Drive and Brunswick Street: The intersection of Columbus Drive and Brunswick Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and leading pedestrian intervals (LPIs) only for crossing Columbus Drive, and curb ramps with a Detectable Warning Surface (DWS). The crosswalks are outlined in white and covered in stamped brick. The crosswalks are in poor condition and show significant signs of wear. The brick pavers are completely worn away in some areas, revealing the asphalt below and the paint outlining the crosswalk is fading as well (Figure 1). Additionally, there is no sidewalk extending from the intersection along the secondary (westbound) direction of Columbus Drive (Figure 2).

The lighting at the intersection consists primarily of overhead streetlighting. There is pedestrian scale lighting along eastbound Columbus Drive.

There are no bicycle lanes at this intersection.

Figure 2: Missing sidewalk on westbound Columbus Drive

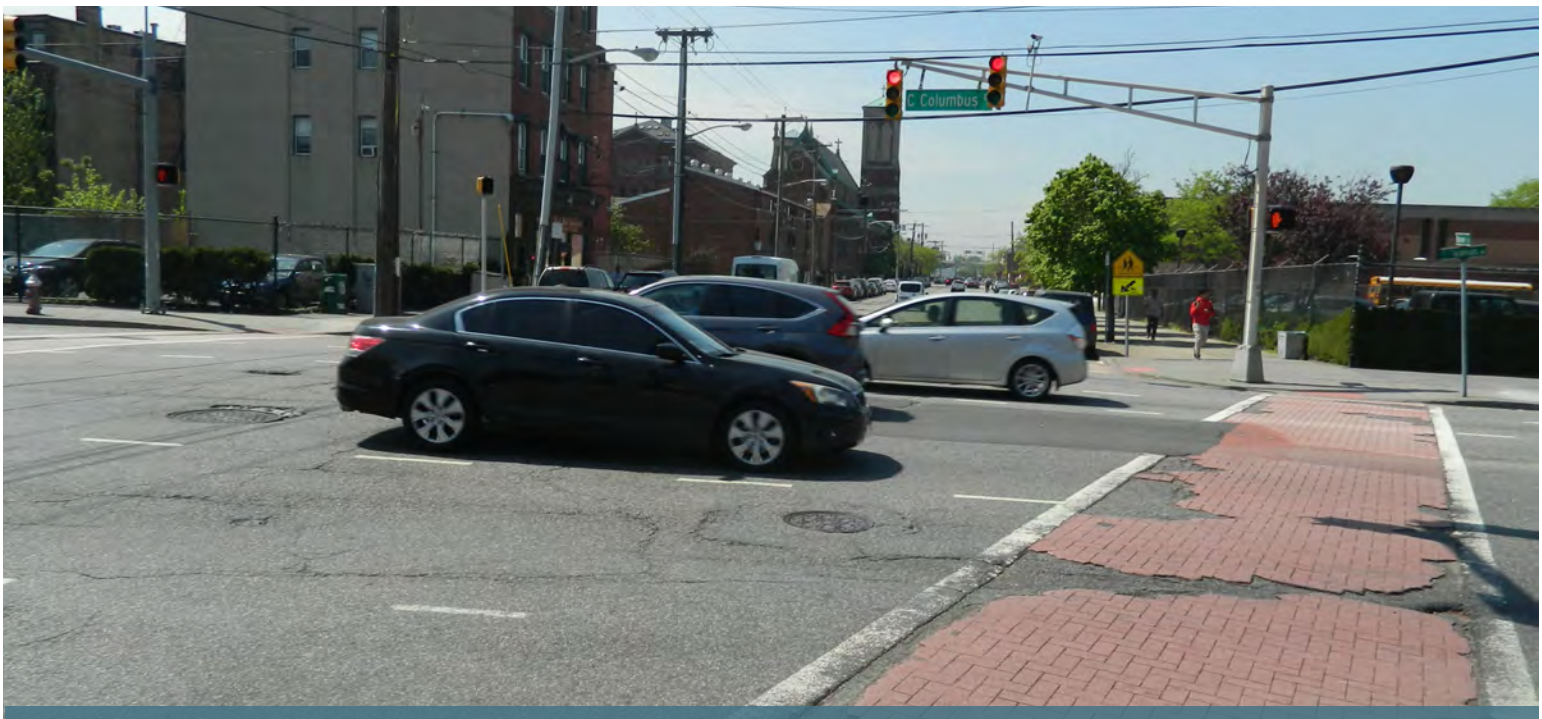


Figure 1: Faded crosswalk across Columbus Drive at the intersection of Brunswick Street

2.1 Field Inventory *(cont.)*

Columbus Drive and Monmouth Street: The intersection of Columbus Drive and Monmouth Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and LPIs (only for crossing Columbus Drive), and curb ramps with a DWS. The crosswalks are covered in stamped brick and are outlined in white paint. The crosswalks crossing the northbound, eastbound, and southbound approaches are in good condition. The crosswalk crossing the westbound approach of Columbus Drive is in fair condition showing signs of wear. There are cracks in the stamped brick surface and some of the asphalt below is exposed. Sidewalk is provided at all corners.

The lighting at the intersection consists primarily of overhead streetlighting. There is a single pedestrian scale light fixture on the southwest corner of the intersection.

There are marked bicycle lanes along Columbus Drive at this intersection. On the westbound side of the intersection the bicycle lanes are outlined. On the eastbound side of the intersection the bicycle lanes are outlined, painted green, bear bicycle lane pavement markings, and are endurablend lanes with a hexagon pattern, used to increase friction, minimize rainwater on surface, and to alert cars if they veer into the bicycle lane.

Figure 4: Intersection of Columbus Drive and Monmouth Street

Figure 3: Plastic bollards in place near the intersection of Columbus Drive and Monmouth Street

2.1 Field Inventory *(cont.)*

Columbus Drive and Varick Street(South of Columbus Drive)/Coles Street (North of Columbus Drive): The intersection of Columbus Drive and Varick Street/Coles Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and LPIs (only for crossing Columbus Drive), and curb ramps with a DWS. The intersection is connected to a sidewalk on all corners. The crosswalks are in fair condition. They are covered in stamped brick and outlined in white paint. The paint has faded on the eastbound and southbound crossings. There is a mixture of pedestrian scale and overhead streetlighting at the intersection. There are two pedestrian scale light fixtures on the eastern side of the intersection (one for each corner). Each corner has an overhead street light within 50 feet of the crosswalk.

There are marked bicycle lanes on all approaches to the intersection. Along Coles Street and Varick Street the bicycle lanes are outlined in white paint and bear a bicycle lane pavement marking. The paint is worn away on both Coles and Varick Street. Along Columbus Drive the bicycle lanes are outlined, filled in with green paint, bear a bicycle lane pavement marking, and are endurablend lanes with a hexagon pattern, used to increase friction, minimize rainwater on surface, and to alert cars if they veer into the bicycle lane.

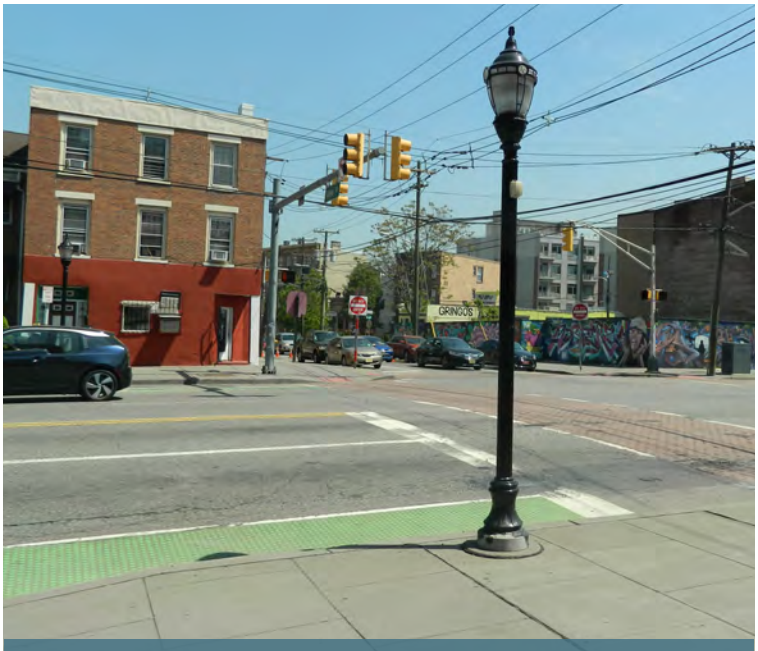


Figure 5: Bicycle lanes along Columbus Drive near Varick Street

Columbus Drive and Jersey Avenue: The intersection of Columbus Drive and Jersey Avenue has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and LPIs (only for crossing Columbus Drive), and curb ramps with a DWS. Sidewalk is provided at all corners. The crosswalks are in good condition. They are covered in stamped brick and outlined in white paint (Figure 6).

Lighting at the intersection consists of a single pedestrian scale light fixture (located on the southwest corner) and an overhead streetlight on each corner.

The bicycle lanes on Columbus Drive are outlined, painted green with white bicycle lane pavement markings, and are textured. There are no marked bicycle lanes on Jersey Avenue at the intersection.

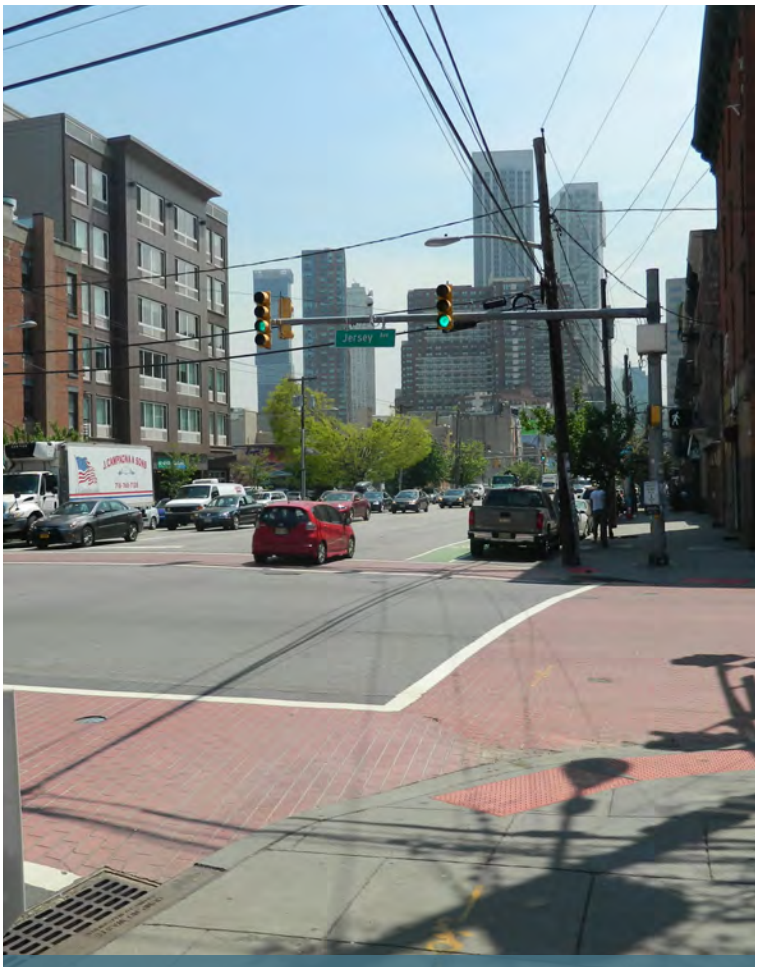


Figure 6: Intersection of Columbus Drive and Jersey Avenue

2.1 Field Inventory *(cont.)*

Columbus Drive and Barrow Street: The intersection of Columbus Drive and Barrow Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and LPIs (only for crossing Columbus Drive), curb ramps with a DWS, and a sidewalk is provided at each corner. The crosswalks are in fair condition. They are covered in stamped brick and outlined in white paint. The paint has faded on the eastbound, southbound, and westbound crossings. Lighting at the intersection consists of a single pedestrian scale light fixture, located on the northeast corner, and four overhead streetlights. The overhead streetlights are located on the northeast and southwest corners.

Bicycle lanes on Columbus Drive differ in their configuration. The bike lanes on the western side of the intersection and along eastbound Columbus Drive past the intersection are outlined, painted green with white bicycle lane pavement markings, and are textured. The westbound bicycle lane on Columbus Drive and northbound on Barrow Street are outlined in white paint. Barrow Street north of the intersection has no marked bicycle facilities. There is a marked bicycle lane on the northbound approach to the intersection.

Columbus Drive and Grove Street: The intersection of Columbus Drive and Grove Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons (for each crossing), LPIs (only for Columbus Drive), curb ramps with a DWS, and sidewalk is provided at each corner. The crosswalks crossing the eastbound and southbound approaches of the intersection are in fair condition. The marked crossing of the westbound and northbound approaches of the intersection are in good condition. The crosswalks are covered in a stamped brick pattern and outlined in white paint. The paint outlining the northern and western crossings is faded.

The lighting at the intersection consists of a mix of pedestrian scale and overhead fixtures. There are pedestrian scale fixtures on the northwest, northeast, and southeast corners. Overhead streetlights are present on the northeast, southeast, and southwest corners.

Bicycle lanes are present in both direction on Columbus Drive east of the intersection and on Grove Street south of the intersection. The eastbound bicycle lane on Columbus Drive is outlined in white, painted green, and is textured. The other bicycle lanes along Grove Street are only outlined in white.

This intersection is vital for access to the PATH station, Citibike station and bus station. It is a highly utilized intersection.

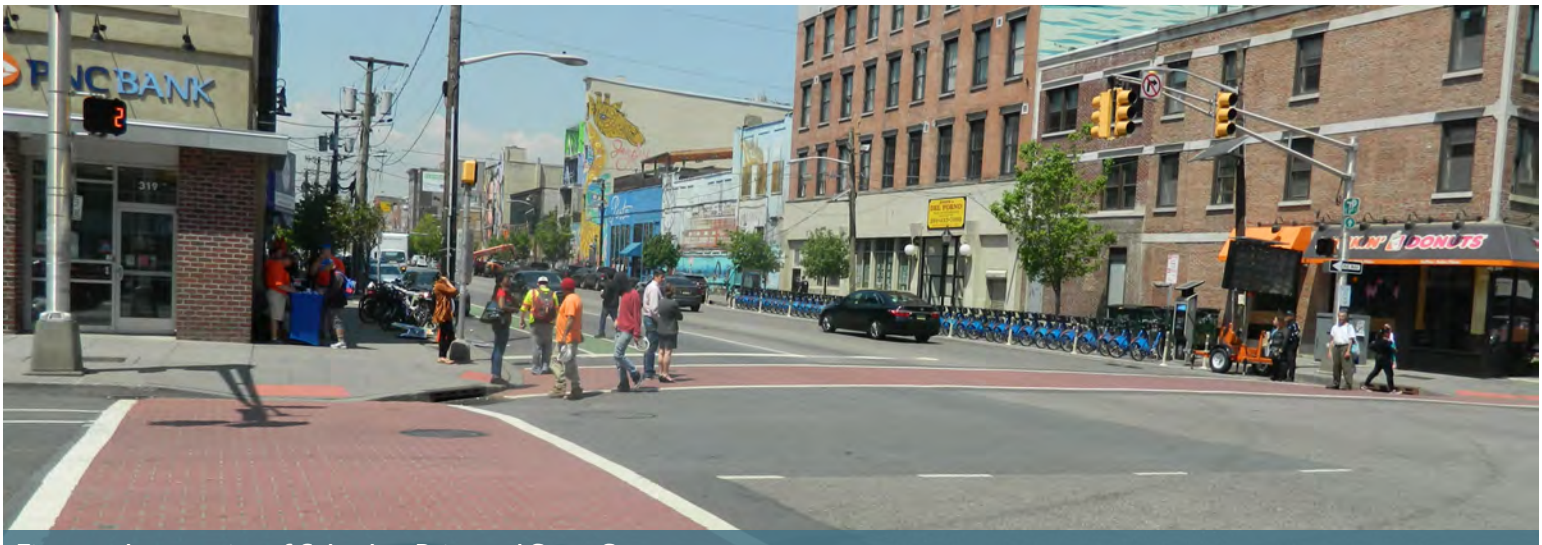


Figure 7: Intersection of Columbus Drive and Grove Street

2.1 Field Inventory *(cont.)*

Columbus Drive and Marin Boulevard: The intersection of Columbus Drive and Marin Boulevard has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons (for each crossing), LPIs (only for Columbus Drive), curb ramps with a DWS, and sidewalk is provided at each corner (Figure 8). There is a pedestrian island on the northbound Marin Boulevard approach. The crosswalks are in fair condition. They are covered in stamped brick and outlined in white paint.

Lighting at the intersection consists of pedestrian scale fixtures, which are present on each corner.

There are no marked bicycle lanes at this intersection.

Columbus Drive and Warren Street: The intersection of Columbus Drive and Warren Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and LPIs (for crossing Columbus Drive), curb ramps with a DWS, and sidewalk is provided at each corner. The crosswalks are in fair condition. They are covered in stamped brick and outlined in white paint.

The intersection is illuminated by pedestrian scale light fixtures, which are present on each corner.

There are no marked bicycle lanes at this intersection.

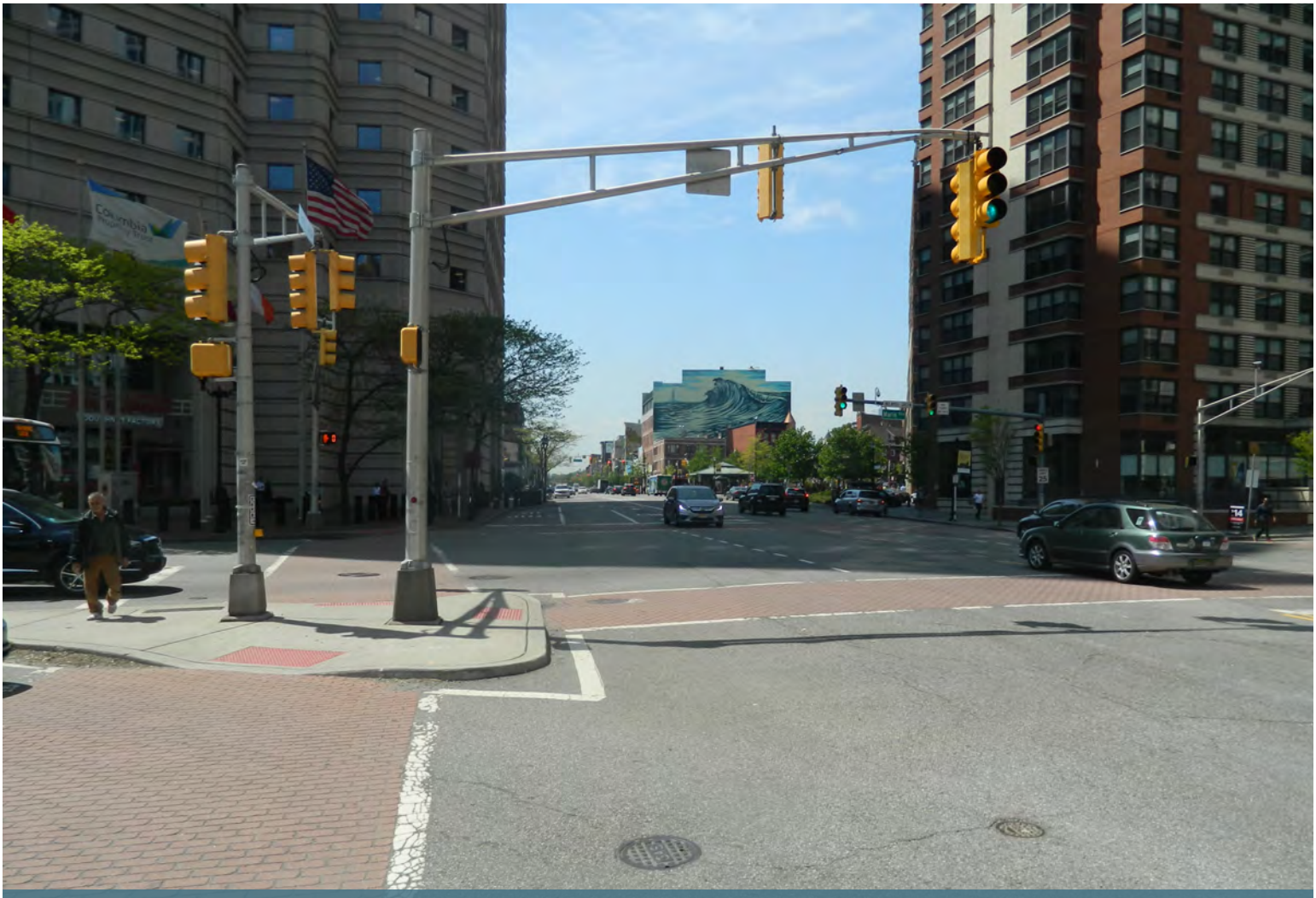


Figure 8: Intersection of Columbus Drive and Marin Boulevard

2.1 Field Inventory *(cont.)*

Columbus Drive and Washington Street: The intersection of Columbus Drive and Washington Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons and LPIs (only for crossing Columbus Drive), curb ramps, and sidewalk is provided at each corner (Figure 9). DWS are not present at the curb ramps. The crosswalks on the north, west, and southside of the intersection are in good condition. The marked crosswalk on the east side of the intersection is in fair condition, the paint outlining the crosswalk is faded. The northern crossing is a ladder-style painted crosswalk, while the western, southern, and eastern crosswalks are outlined.

There is a mixture of overhead streetlights and pedestrian scale light fixtures at this intersection. There are streetlights on the northwest and southeast corners of the intersection. Pedestrian scale fixtures are present on the northeast corner.

There are no marked bicycle lanes at this intersection.

Figure 9: Intersection of Columbus Drive and Washington Street

Columbus Drive and Greene Street: The intersection of Columbus Drive and Greene Street has marked crosswalks, pedestrian signal heads (for each crossing), pedestrian push buttons (for each crossing), LPIs (only for Columbus Drive), curb ramps, and sidewalk is provided at each corner. DWS are not present at the curb ramps. The crosswalks are in good condition at the intersection. The Columbus Drive crosswalks are ladder-style and the Greene Street crosswalks are outlined.

The southeast corner is illuminated by the overhead streetlight. All other corners have pedestrian scale light fixtures.

There are no marked bicycle lanes at this intersection.

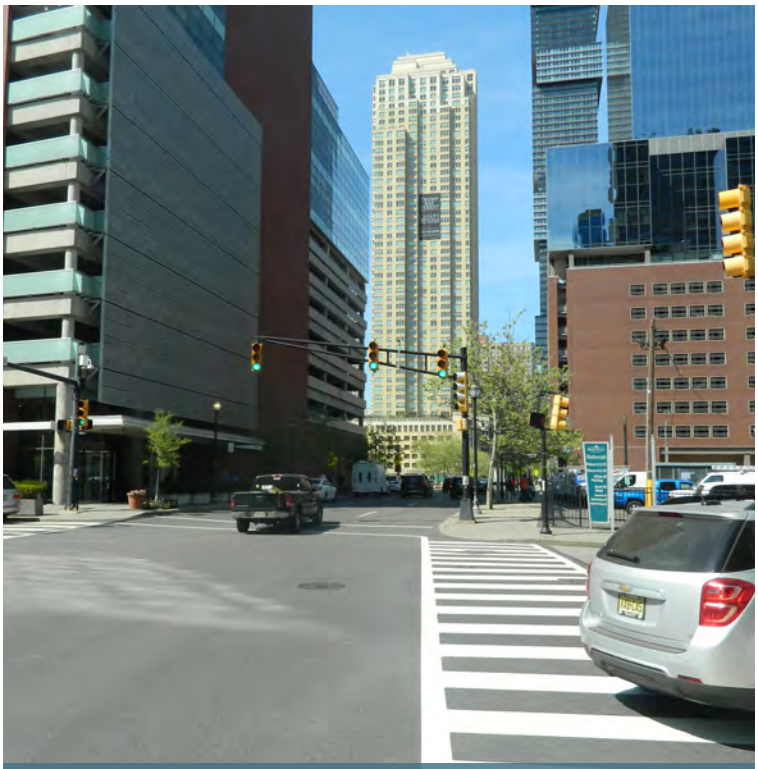


Figure 10: Intersection of Columbus Drive and Greene Street

2.1 Field Inventory *(cont.)*

Columbus Drive and Hudson Street (North Leg): The intersection of Columbus Drive and Hudson Street (North Leg) has marked crosswalks crossing the southbound Hudson Street approach, pedestrian signal heads and pedestrian push buttons for crossing Hudson Street (North Leg), LPIs for crossing Columbus Drive, and curb ramps at all corners. DWS are not provided at the curb ramps. Sidewalks are provided at each corner. Crossing Columbus Drive at the intersection is prohibited and pedestrians are directed to go to the intersection of Columbus Drive and Hudson Street (South Leg), where crossing is permitted. Because crossing is prohibited, there are no marked crosswalks on Columbus Drive (Figure 11). The marked crosswalks crossing southbound Hudson Street are outlined and in good condition.

There are overhead streetlights at the intersection.

There are no marked bicycle lanes at the intersection.

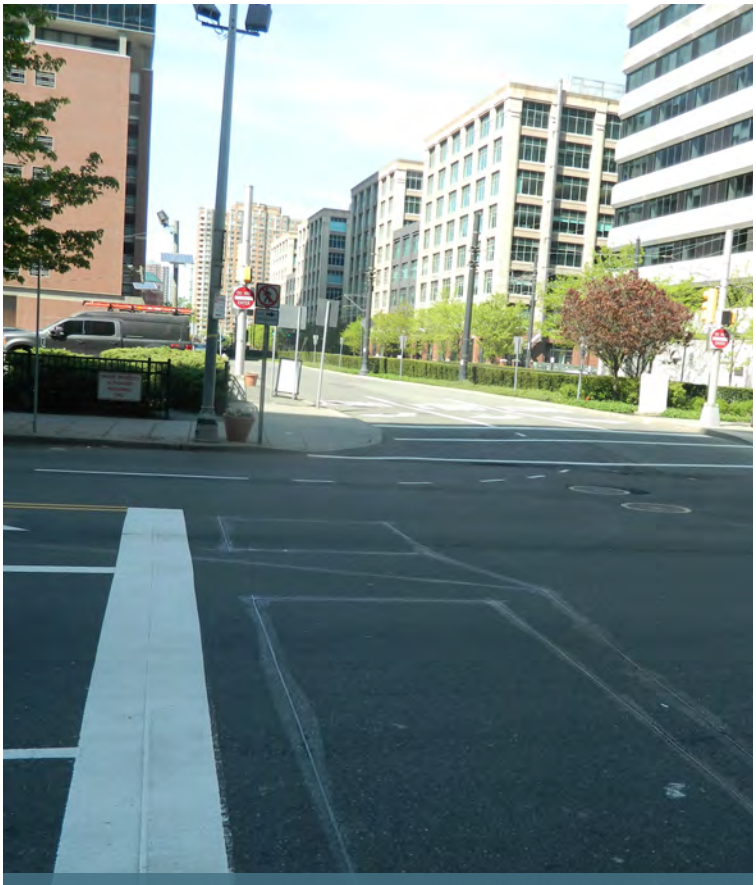


Figure 11: No crossing Columbus Drive at Husdon Street (North Leg)

Columbus Drive and Hudson Street (South Leg): The intersection of Columbus Drive and Hudson Street (South Leg) has marked crosswalks, pedestrian signal heads (for each marked crossing), pedestrian push buttons (for each marked crossing), curb ramps, LPIs for crossing Columbus Drive, and sidewalk is provided at each corner. DWS are not provided at the curb ramps. Pedestrians are permitted to cross Columbus Drive in the marked crosswalk on the westbound approach. The Columbus Drive crosswalk is in fair condition. The crosswalk across the southern leg of Hudson Street is in fair condition and has two sets of tracks for the Hudson-Bergen Light Rail line crossing at grade. The area where the tracks intersect the crosswalk is missing large sections of pavement (Figure 12). Both crosswalks have a distinct square pattern and are outlined in white striping.

There are pedestrian scale light fixtures along the southern side of this intersection. There is a single overhead street light on the southeast corner of this intersection.

There are no marked bicycle lanes at this intersection.

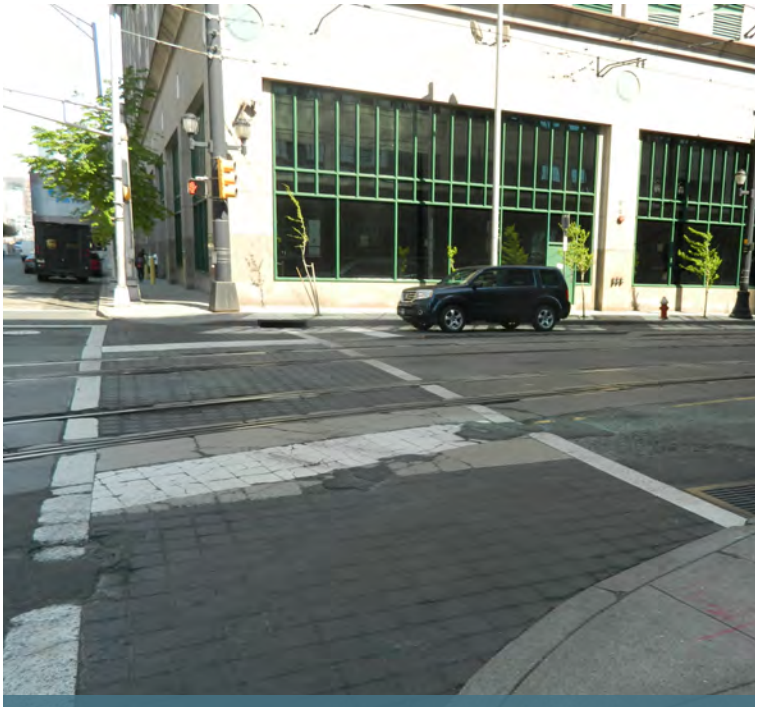


Figure 12: Crosswalk across Hudson Street (South Leg)

2.2 Roadway Characteristics

For the purpose of creating recommendations for the corridor, it is important to note roadway characteristics. Columbus Drive is relatively straight with a consistent grade, resulting in few geometry-based sight distance concerns along the corridor. For the purposes of this study, the corridor is organized into five segments. The segments are as follows;

- Eastern Project Limit to Greene Street
- Greene Street to Marin Boulevard
- Marin Boulevard to Grove Street
- Grove Street to Midblock between Monmouth Street and Brunswick Avenue
- Midblock between Monmouth Street and Brunswick Avenue to Western Project Limit

Characteristics of each are summarized in the table below.

Table 1: Roadway Segments

Segment Number	Segment (Milepost)	AADT	Posted Speed (MPH)	Configuration
1	Eastern Terminus to Greene Street (0.00-0.14)	5,298	25	Four 12' lanes, undivided
2	Greene Street to Marin Boulevard (0.14-0.47)	16,234	25	Four 12' lanes, undivided
3	Marin Boulevard to Grove Street (0.47-0.56)	16,234	25	Four 12' lanes, undivided
4	Grove Street to Midblock between Monmouth Street and Brunswick Avenue (0.56-0.98)	24,021	25	Four 12' lanes, undivided
5	Midblock between Monmouth Street and Brunswick Avenue to Western Project Limit (0.98-1.03+0.16)	24,021	25	Six 12' lanes, undivided

The existing study corridor consists of 11 signalized intersections, spaced relatively evenly with one approximately every 0.1 mile. These intersections are detailed in the table below.

Table 2: Intersections

Intersection #	Intersection (Milepost)	Major AADT	Minor AADT
1	Columbus Drive & Hudson Street (0.05)	4,321	2,899
2	Columbus Drive & Greene Street (0.14)	5,298	8,749
3	Columbus Drive & Washington Street (0.23)	16,234	9,074
4	Columbus Drive & Warren Street (0.32)	16,234	5,980
5	Columbus Drive & Marin Boulevard (0.47)	16,234	14,805
6	Columbus Drive & Grove Street (0.56)	24,021	6,890
7	Columbus Drive & Barrow Street (0.68)	24,021	4,706
8	Columbus Drive & Jersey Avenue (0.77)	24,021	8,650
9	Columbus Drive & Varick Street (0.85)	24,021	5,291
10	Columbus Drive & Monmouth Street (0.94)	24,021	12,233
11	Columbus Drive & Brunswick Avenue (1.03)	24,021	8,060

2.3 Crash History

A historical crash analysis was conducted to summarize crash data obtained from the NJDOT Bureau of Safety Programs. From 2015 to 2017, 207 crashes occurred along the study corridor, of which:

47 crashes resulted in:
58 people injured and **1 killed.**

The fatality occurred in 2017 at the Columbus Drive and Grove Street intersection.

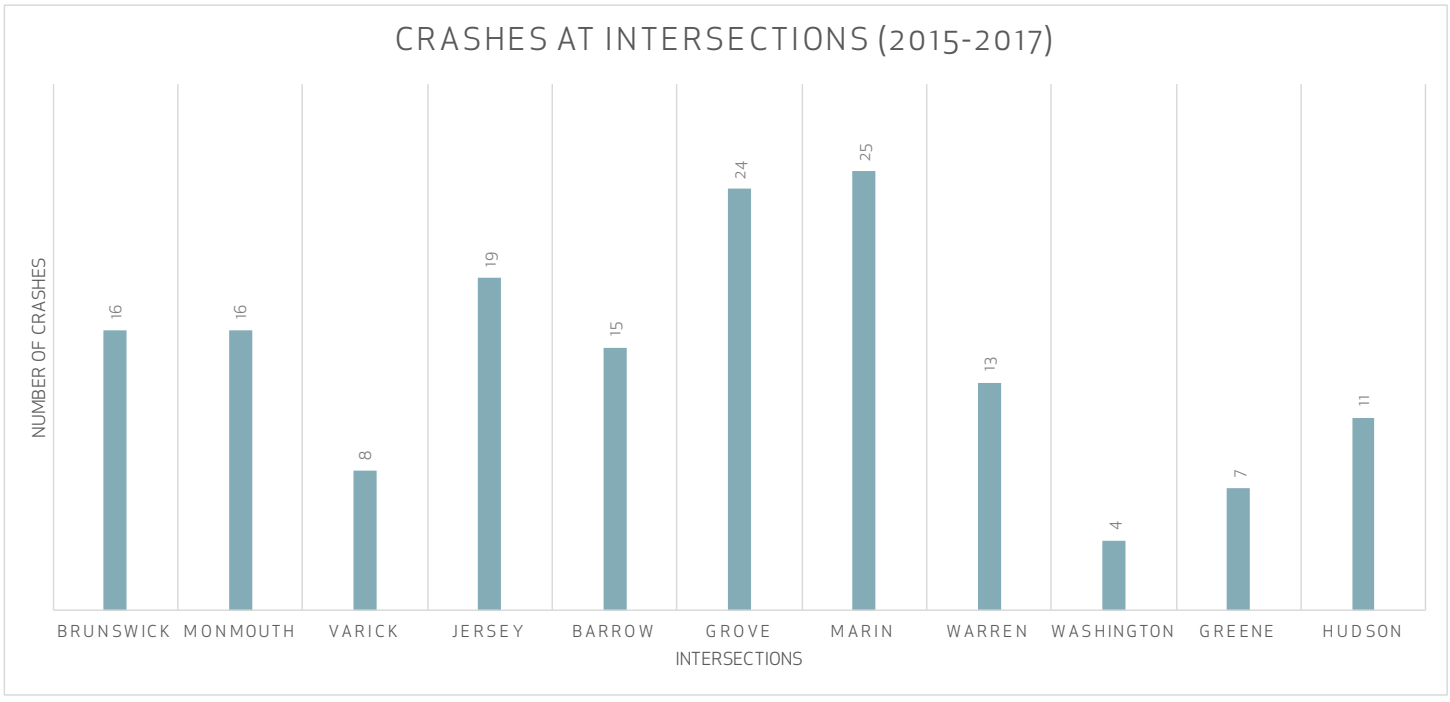
24 crashes involved a pedestrian or cyclist.

Approximately 75% of crashes occurred at signalized intersections. The top three crash locations were the Columbus Drive intersections at Marin Boulevard, Grove Street, and Jersey Avenue. The bar chart below shows the number of crashes at each intersection along the corridor. Of the crashes that occured at roadway segments, the roadway segment with the highest quantity of crashes was Segment 3, between Marin Boulevard and Grove Street (MP 0.47-0.56), with 17 crashes.

While not part of the analyzed data, crash history was collected for 2018. Data from 2018 was not included in the analysis because the completeness of data from 2018 could not be guaranteed. In 2018, crashes generally followed the same trends as the three previous years. There were 78 reported crashes within the project limits, of which 67 resulted in property damage only, 8 resulted in complaints of pain, and 3 resulted in moderate injuries. No fatalities or incapacitations were among the 2018 data collected. Additionally, 7 of the 78 crashes involved a pedestrian or cyclist. All seven of the pedestrian and cyclist crashes resulted in an injury, with two resulting in moderate injuries. The pedestrian crashes occurred at the following locations:

- Two crashes occurred at the Marin Boulevard intersection;
- Two crashes occurred at the Jersey Avenue intersection;
- One crash occurred at the Grove Street intersection;
- One crash occurred at the Varick Street intersection;
- One crash occurred at the Barrow Street intersection.

Figure 13: Crashes at Intersections



2.3 Crash History *(cont.)*

The Top three crash types represented 71% of all crashes, and the Top five represented 85.4%.
Twenty-four (11.6%) crashes were pedestrian or bicycle crashes.

Table 3: Number of Crashes by Crash Type

Crash Type	Number of Crashes
Same Direction (Side Swipe) Right Angle	81 (39.1%)
Same Direction (Rear End)	41 (19.8%)
Struck Parked Vehicle	25 (12.1%)
Pedestrian or Cyclist	24 (11.6%)
Right Angle	15 (7.2%)

Historical crashes were also utilized in comparing alternative configurations, countermeasures, and the resulting expected crash frequencies from the Predictive Analyses of the Highway Safety Manual (HSM). Crashes were extracted from NJDOT's online crash database, Safety Voyager, from 2015-2017 and assigned to signalized intersections and segments between those intersections, as they would be analyzed in the Predictive Analysis. Private property crashes were eliminated from the analysis.

Table 4: Annual Average Crash History (2015-2017) Segments

Segment Number	Segment (Milepost)	Average Multiple Vehicle Driveway (Crashes/Year)		Average Multiple Vehicle Non-driveway (Crashes/Year)		Average Single Vehicle (Crashes/Year)	
		Fatal and Injury Only	Property Damage Only	Fatal and Injury Only	Property Damage Only	Fatal and Injury Only	Property Damage Only
1	Eastern Terminus to Greene Street (0.00-0.14)	0	0	0	0.67	0	0
2	Greene Street to Marin Boulevard (0.14-0.47)	0	0	0.33	3	0	0.33
3	Marin Boulevard to Grove Street (0.47-0.56)	0	0	0	3.67	0.33	0
4	Grove Street to Midblock between Monmouth Street and Brunswick Avenue (0.56-0.98)	0	0.67	0.33	4.33	0	0.33
5	Midblock between Monmouth Street and Brunswick Avenue to Western Project Limit (0.98-1.03+0.16)	0	0.33	0	1.33	0	0.67

Table 5: Annual Average Crash History (2015-2017) Intersections

Intersection Number	Intersection (Milepost)	Average Multiple Vehicle (Crashes/Year)		Average Single Vehicle (Crashes/Year)	
		Fatal and Injury Only	Property Damage Only	Fatal and Injury Only	Property Damage Only
1	Columbus Drive & Hudson Street (0.05)	1	2.67	0	0
2	Columbus Drive & Greene Street (0.14)	0.33	2	0	0
3	Columbus Drive & Washington Street (0.23)	0	0.67	0.67	0
4	Columbus Drive & Warren Street (0.32)	0.33	3.33	0.33	0.33
5	Columbus Drive & Marin Boulevard (0.47)	1.33	6	0.67	0.33
6	Columbus Drive & Grove Street (0.56)	1	5.33	1.67	0
7	Columbus Drive & Barrow Street (0.68)	1	2.67	1.33	0
8	Columbus Drive & Jersey Avenue (0.77)	0	6.33	0	0
9	Columbus Drive & Varick Street (0.85)	0.33	1.33	1	0
10	Columbus Drive & Monmouth Street (0.94)	1.67	3.33	0	0.33
11	Columbus Drive & Brunswick Avenue (1.03)	1	3.33	1	0

2.4 Traffic Data

Traffic data was collected over the span of two years to inform the Implementation Plan of the Columbus Drive corridor. Peak period (7:00-9:00 AM and 2:30-6:30 PM) turning movement counts at each intersection were collected on five separate dates, summarized in Table 6. Turning movement counts performed prior to 2018 were grown to 2018 using Hudson County background growth rate values from the NJDOT Annual Background Growth Rate Table. To obtain Annual Average Daily Traffic (AADT) volumes, Automatic Traffic Recorder (ATR) counts were collected for seven consecutive days at two locations along the corridor: between Monmouth Street and Varick Street and between Marin Boulevard and Warren Street.

In addition to vehicle counts, pedestrian and bicycle counts were collected at the intersections counted in 2018 (Table 6). Pedestrian and bicycle counts were not performed at the intersections that were counted prior to 2018. At the intersections where pedestrian and bicycle counts were not performed, estimates were made by averaging the respective counts of adjacent intersections. Since counts were only performed during the peak period, the number of pedestrians counted during the peak periods was multiplied by a factor of 1.5, to produce a conservative estimate of the daily total of pedestrians at a given intersection. Count data can be found in Appendix D.

Table 6: Peak Period Turning Movement Counts - Date Performed

Intersection Number	Intersection (Milepost)	Date of Count
1	Columbus Drive & Hudson Street (0.05)	May 9th, 2018
2	Columbus Drive & Greene Street (0.14)	May 9th, 2017
3	Columbus Drive & Washington Street (0.23)	May 18th, 2017
4	Columbus Drive & Warren Street (0.32)	May 9th, 2018
5	Columbus Drive & Marin Boulevard (0.47)	November 16th, 2016
6	Columbus Drive & Grove Street (0.56)	May 9th, 2018
7	Columbus Drive & Barrow Street (0.68)	May 10th, 2018
8	Columbus Drive & Jersey Avenue (0.77)	May 10th, 2018
9	Columbus Drive & Varick Street (0.85)	May 10th, 2018
10	Columbus Drive & Monmouth Street (0.94)	May 24th, 2017
11	Columbus Drive & Brunswick Avenue (1.03)	May 10th, 2018

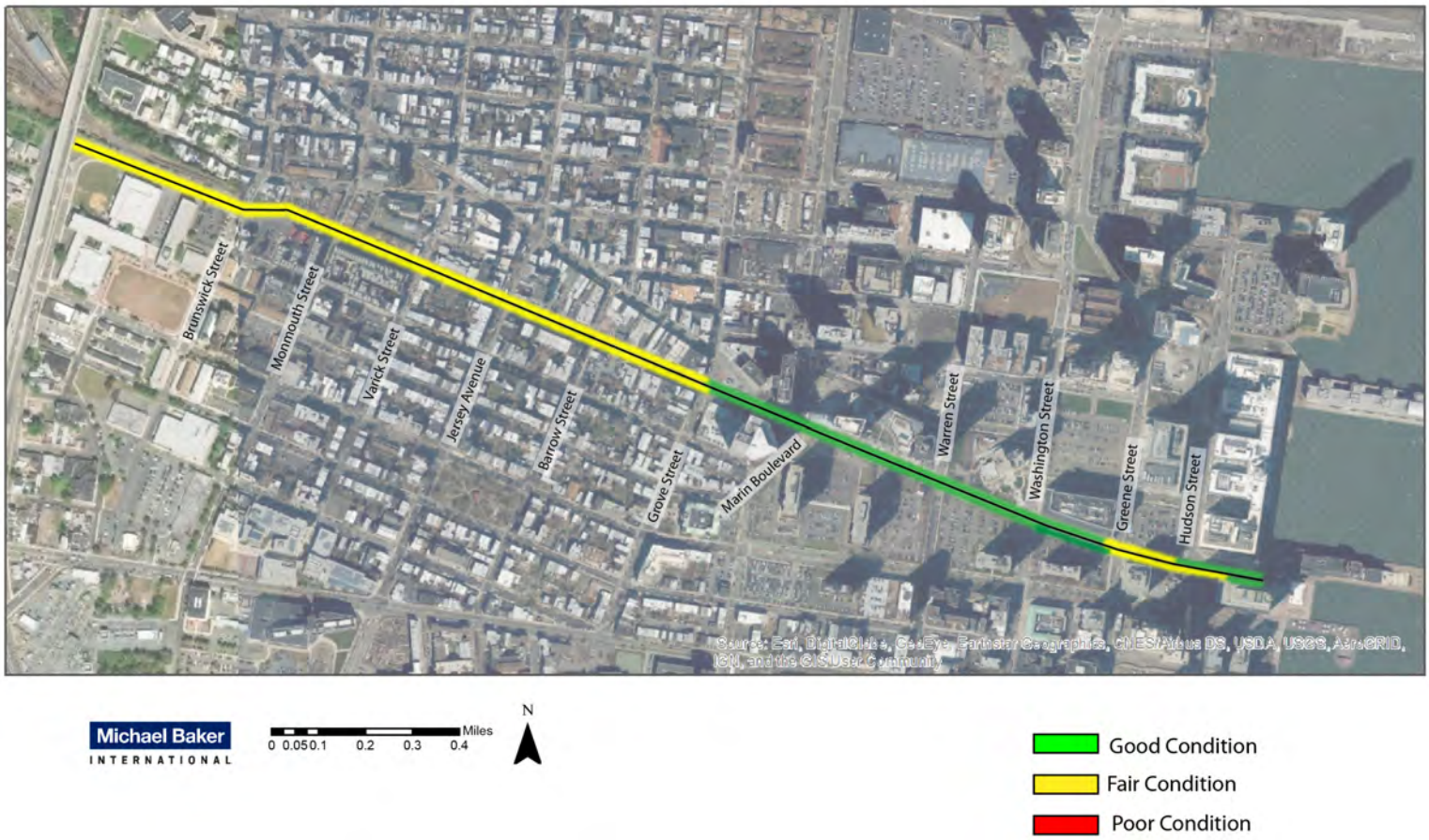
2.5 Sidewalk Inventory and Assessment

According to the NJDOT's Complete Streets Design Guide, sidewalks are considered an extension of the street system, and especially in a dense urban area like downtown Jersey City. They are the primary location of pedestrian travel and are fundamental to facilitating residential, commercial, and social activity in all communities. They are an integral part of streets.

An inventory of the existing sidewalks along the Columbus Drive corridor was conducted. The inventory identified sidewalk width and condition at locations where sidewalk is available as well as areas of missing sidewalk.

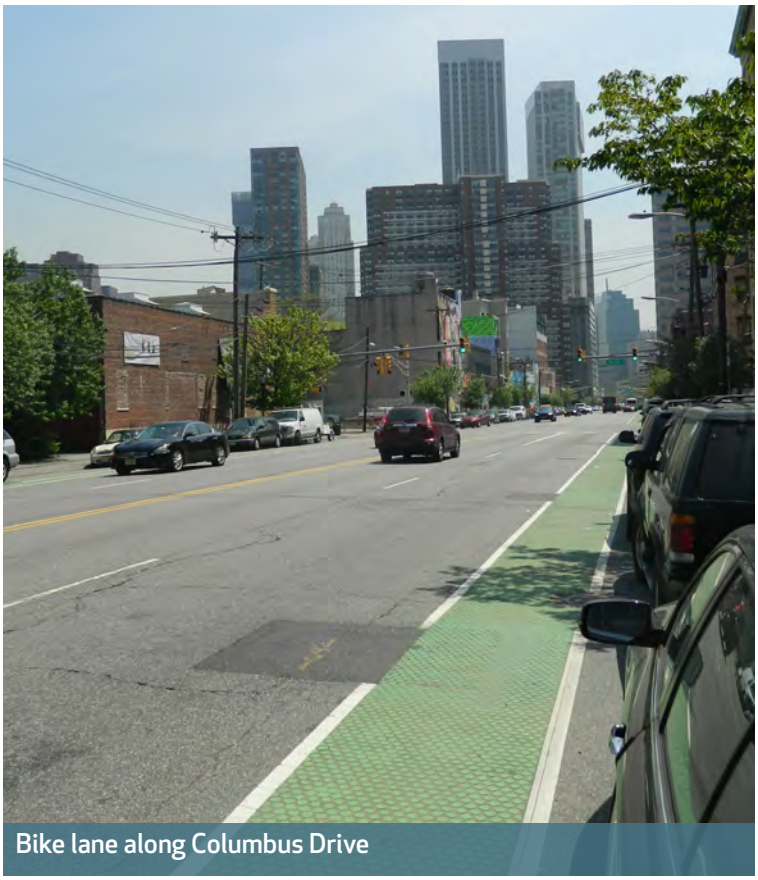
Based on the sidewalk inventory, the majority of Columbus Drive has a sidewalk with the exception of one section adjacent to westbound Columbus Drive between Center Street and Brunswick Street, which does not have a sidewalk. Additionally, several sections with sufficient sidewalk widths have obstacles that narrow the effective width of the sidewalk. Where these obstacles exist, the sidewalk narrows down to the minimum recommended width, however field investigation noted that the effective sidewalk widths remained above the NJDOT Complete Streets Design Guide's recommended width of four feet. An example of this is seen between Monmouth Street and Varick Street in Figure 14.

Figure 14: Sidewalk Inventory and Assessment



2.6 Bicycle Compatibility Assessment

Currently, the Columbus Drive Corridor has conventional (unprotected) bicycle lanes on both sides of the street. These bicycle facilities are substandard according to the NJDOT Complete Streets Design Guide, which recommends either Separated Bike Lanes or a Shared-use Path for Columbus Drive. The Bicycle Facility Table showing this recommendation can be seen below as Table 7.



Bike lane along Columbus Drive

Table 7: Bicycle Facility Table

	85TH PERCENTILE SPEED[1]						
ADT	≤ 20	25	30	35	40	45	≥50
≤ 2,500	ABCDEF	A[2]BCDEF	CDEF	CDEF	CDEF	DEF	F
2,500–5,000	BCDEF	BCDEF	CDEF	CDEF	DEF	DEF	F
5,000–10,000	B[3]CDEF	B[3]CDEF	CDEF	DEF	DEF	EF	F
10,000–15,000	DEF	DEF	DEF	DEF	EF	EF	F
≥15,000	DEF	DEF	DEF	EF	EF	F	F

A: Shared Street/Bicycle Boulevard **B:** Shared-lane Markings **C:** Bicycle Lane **D:** Buffered Bicycle Lane
E: Separated Bicycle Lane **F:** Shared-use Path

[1] If data not available, use posted speed
[2] Bicycle boulevards are preferred at speeds ≤25 mph
[3] Shared-lane markings are not a preferred treatment with truck percentages greater than 10%

2.7 Intersection Assessments

Each signalized intersection along the Columbus Drive corridor was assessed to determine if the existing traffic signal pedestrian and vehicle clearance intervals are in conformance with the latest editions of the NJDOT Roadway Design Manual, the MUTCD, and Institute of Transportation Engineers' (ITE) Manual on Traffic Signal Design. Signal timing directives were obtained from Jersey City. A field inventory was performed to gather more information on the condition of pedestrian facilities at each intersection within the corridor. There are 12 signalized intersections along Columbus Drive within the study corridor, listed from west to east:

- Brunswick Street
- Monmouth Street
- Varick Street/Coles Street
- Jersey Avenue
- Barrow Street
- Grove Street
- Marin Boulevard
- Warren Street
- Washington Street
- Greene Street
- Hudson Street (north leg)
- Hudson Street (south leg)

Intersection of Columbus Drive and Grove Street

2.7.1 Signal Timing Recommendations

Michael Baker performed pedestrian and vehicular clearance interval calculations based on existing intersection geometries and compared the results to the existing signal timing directives at each location. These calculations and analyses are included in Appendix E. Based on this analysis modifications to the Yellow Change Interval (YCI), Red Clearance Interval (RCI) and Flashing Don't Walk (FDW) were recommended.

Refuge island at intersection of Columbus Drive and Marin Boulevard

2.8 Highway Safety Manual Analysis

2.8.1 Methodology

The Highway Safety Manual (HSM) Predictive Analysis allows planners and engineers to compare the safety of existing and proposed facilities and the impact of safety countermeasures in a quantitative way. This analysis is used to identify site elements, segments, and intersections within a study area that have the most potential for safety improvement based on the element's crash frequency compared to peer sites with similar characteristics and traffic conditions.

The Predictive Method generates a predicted crash rate based on the Safety Performance Function, as determined by those site characteristics and conditions related to safety and potential for crashes. Types and severities of crashes are predicted using variables such as AADT, Roadway/Intersection class, historical crash data, geometric design, and roadway cross sectional elements. Regression-to-the-mean bias is accounted for by applying historical crash data to the predicted crash rate using the Empirical-Bayes methodology. Including the historical crash data in the analysis allows an expected crash rate to be generated, a weighted rate between the historical crash rate and the rate predicted by the Safety Performance Function.

Proposed improvements that have a proven effect on crash rate are included in the analysis through Crash Modification Factors (CMFs). CMFs are factors multiplied by the expected crash rate or the Safety Performance Function depending on the availability of historical crash data at specific sites. The product is an estimate of the expected crash rate following the implementation of those improvements.

The facility must be evaluated by individual sites, either homogeneous segments or intersections, when using the predictive method. Those individual pieces or elements can be found in Table 8. Segments are divided at points where the road geometry changes or a significant change in AADT occurred. Intersections are always an individual site, they are never combined with segments or other intersections. Dividing study corridors into individual sites allots evaluators to determine which elements of a project have the most potential for safety improvement and what the expected crash frequency of each of the proposed alternatives will be.

Pedestrian scale lighting along Columbus Drive

2.8.2 Analysis Method and Approach

Columbus Drive was analyzed using the methodology designed for urban and suburban arterials. Each site was analyzed individually for proposed alternatives at specific locations, as well as together for corridor wide improvements.

For multi-year analysis, 2023 was used as the construction year, and 2043 was used as the design year. 20-year analysis also allows evaluators to see the benefit of treatments or alternatives over the useful life of most infrastructure improvements. The assumption was made that traffic growth would increase 1.17% annually between 2018 and 2023. For post-construction years, it was assumed that the traffic growth would slow due to the fundamental change in the road's characteristics. Between 2023 and 2043 an annual growth rate of 0.71% was used. Both growth rates are based on the North Jersey Transportation Planning Authority's (NJTPA) Plan 2045 Forecasts.

2.8.3 HSM Input

Each project site must first be classified as either a Two-Lane Rural Road, Multi-Lane Rural Road, or Urban and Suburban Arterial. The data for the HSM analysis was analyzed as an urban/suburban arterial site-type. The input data necessary for calculating the predicted average crash frequency for this site-type are shown in Table 8.

Looking east along Columbus Drive at Brunswick Street Intersection

Table 8: HSM Input Data

Segments	Intersections
· Roadway Type/Configuration (e.g. 2-lane undivided)	· Intersection Type (3/4 Leg, Stop/Signal Controlled)
· Length of Segment	· AADT of Major Roadway
· AADT of Segment	· AADT of Minor Roadway
· Presence and Type of On-Street Parking	· Presence of Intersection Lighting
· Proportion of Curb Length with On-Street Parking	· Approaches with Left-Turn Lanes
· Presence and Width of Median	· Approaches with Right-Turn Lanes
· Presence of Lighting	· Left-Turn Phasing Type
· Presence of Automatic Speed Enforcement	· Approaches with Right-Turn on Red Prohibited
· Number and Type of Major/Minor Driveways	· Presence of Red Light Cameras
	· Sum of all Pedestrian Crossing Volumes
· Speed Category	· Number of Bus Stops within 1,000 feet
· Roadside Fixed Object Density	· Presence of Schools within 1,000 feet
· Offset to Roadside Fixed Objects	· Number of Alcohol Sales Establishments within 1,000 feet
· Calibration Factor	· Calibration Factor

2.8.4 HSM Output: Existing Conditions

A summary of the expected frequency of crashes per year under existing conditions in the base year (2018) is provided in Table 9.

Table 9: Expected Annual Crashes in the Existing Conditions (2018)

Site Number	Site (Milepost)	Expected Vehicle Crashes (per year)	Expected Pedestrian & Bike Crashes (per year)
Segments			
1	Eastern Terminus to Greene Street (0.00-0.14)	0.53	0.02
2	Greene Street to Marin Boulevard (0.14-0.47)	4.66	0.2
3	Marin Boulevard to Grove Street (0.47-0.56)	2.14	0.04
4	Grove Street to Midblock between Monmouth Street and Brunswick Avenue (0.56-0.98)	7.08	0.37
5	Midblock between Monmouth Street and Brunswick Avenue to Western Project Limit (0.98-1.03+0.16)	2.38	0.07
Intersections			
1	Columbus Drive & Hudson Street (0.05)	1.07	0.87
2	Columbus Drive & Greene Street (0.14)	1.54	1.2
3	Columbus Drive & Washington Street (0.23)	2.11	1.71
4	Columbus Drive & Warren Street (0.32)	3.86	1.57
5	Columbus Drive & Marin Boulevard (0.47)	5.89	2.13
6	Columbus Drive & Grove Street (0.56)	6.22	2.32
7	Columbus Drive & Barrow Street (0.68)	4.51	0.97
8	Columbus Drive & Jersey Avenue (0.77)	6.54	1.61
9	Columbus Drive & Varick Street (0.85)	3.19	0.56
10	Columbus Drive & Monmouth Street (0.94)	5.61	0.75
11	Columbus Drive & Brunswick Avenue (1.03)	5.15	0.77
Total		62.49	15.17

2.8.5 HSM Output: Design Year (2043)

A summary of the expected frequency of crashes per year in No Build and Proposed Design scenarios in the design year (2043) is provided in Table 10. The analysis performed predicts that in the design year, implementation of the proposed design could decrease the number of expected vehicle crashes by up to 40% (29.42 fewer crashes per year). Additionally, HSM analysis indicates that the proposed design could result in approximately 28% (4.97 fewer crashes per year) fewer bicycle and pedestrian crashes. The HSM Memorandum, which summarizes how this value was determined, can be found in Appendix E.

Table 10: Expected Crashes in the No Build Condition & Proposed Design (Design Year - 2043)

Site Number	Site (Milepost)	No Build Condition		Proposed Design	
		Expected Vehicle Crashes (per year)	Expected Pedestrian & Bike Crashes (per year)	Expected Vehicle Crashes (per year)	Expected Pedestrian & Bike Crashes (per year)
Segments					
1	Eastern Terminus to Greene Street (0.00-0.14)	0.75	0.02	0.55	0.03
2	Greene Street to Marin Boulevard (0.14-0.47)	5.19	0.31	4.13	0.38
3	Marin Boulevard to Grove Street (0.47-0.56)	2.81	0.05	1.58	0.06
4	Grove Street to Midblock between Monmouth Street and Brunswick Avenue (0.56-0.98)	7.57	0.57	5.94	0.73
5	Midblock between Monmouth Street and Brunswick Avenue to Western Project Limit (0.98-1.03+0.16)	3.42	0.12	2.36	0.11
Intersections					
1	Columbus Drive & Hudson Street (0.05)	1.8	1.01	0.94	0.74
2	Columbus Drive & Greene Street (0.14)	2.08	1.39	1.01	1.06
3	Columbus Drive & Washington Street (0.23)	2.54	1.98	1.39	1.46
4	Columbus Drive & Warren Street (0.32)	4.62	1.83	2.4	1.39
5	Columbus Drive & Marin Boulevard (0.47)	7.06	2.47	4.16	1.89
6	Columbus Drive & Grove Street (0.56)	7.2	2.7	4.05	1.05
7	Columbus Drive & Barrow Street (0.68)	5.23	1.15	2.88	0.86
8	Columbus Drive & Jersey Avenue (0.77)	7.42	1.89	4.01	1.48
9	Columbus Drive & Varick Street (0.85)	3.71	0.68	2.05	0.5
10	Columbus Drive & Monmouth Street (0.94)	6.39	0.91	3.58	0.67
11	Columbus Drive & Brunswick Avenue (1.03)	5.91	0.92	3.25	0.64
Total		**73.7**	**18.01**	**44.28**	**13.04**

Public Outreach

3.0 Public Outreach

Engaging with individuals who live, work, and visit the project area is essential to developing an understanding of community concerns, how people use and travel along the Columbus Drive corridor, and which improvements may be desirable.

Public Outreach for this project included:

- The organization of a Steering Committee
- Public Information Centers
- A project website
- An online crowdsourcing map
- A public survey

Each are described in the following sections.

Public Information Center attendees observing redesign concepts

3.1 Project Steering Committee

The Steering Committee was comprised of local, county, and state officials, as well as other stakeholders identified by Jersey City and the NJDOT Office of Bicycle and Pedestrian Programs (OBPP). The Steering Committee assisted with identifying deficiencies and opportunities for walking and biking accommodations along Columbus Drive and provided feedback on potential improvements. A list of Steering Committee members can be found in Appendix F.

After a project kick-off meeting, two Steering Committee meetings were held. The first Steering Committee meeting took place on June 20, 2018 to present key findings of data collected and assessed. The second meeting was held on December 11, 2018 to present draft conceptual improvements and bicycle and pedestrian facility recommendations. Comments and input received during these meetings guided the improvement alternatives. Summaries from both meetings are included in Appendix F.

3.2 Digital Public Involvement

3.2.1 Website

A project website was created to facilitate outreach and document sharing. The website URL was displayed on project handouts, surveys, the city's website, and at public events. The website was updated as materials and information were approved by Jersey City and NJDOT. As the study progressed, the website was updated with proposed recommendations and facility improvements, and at the conclusion of the study the final report was added.

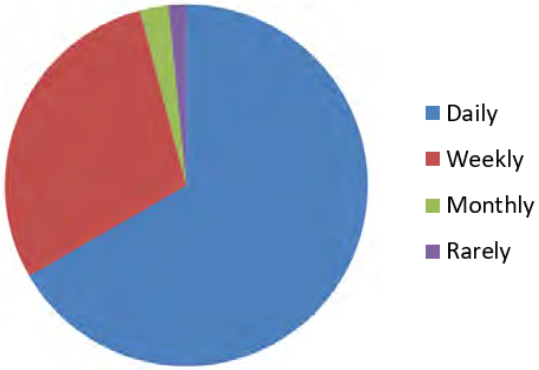
Multiple options were provided via the website for members of the public to leave comments or information, including an online survey, a crowdsource mapping tool, and a contact form to provide public input. The public provided feedback on general conditions, desired destinations, barriers to walking, locations where bicyclists feel unsafe while riding, and potential improvement strategies.

3.2.2 Online Survey

A public survey was launched in late May 2018 and remained open until July 20, 2018. 315 people responded to the survey. 98% of respondents were Jersey City residents and 87% of respondents live within walking distance to Columbus Drive, indicating that the survey effectively reached its targeted audience.

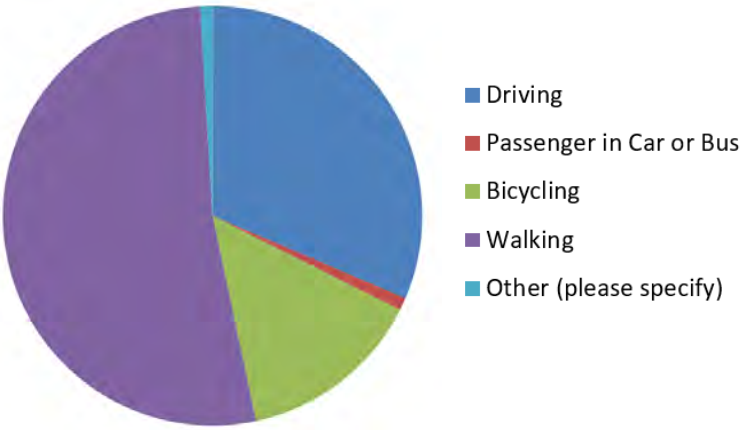
Survey Results Summary

Frequency of Travel: Approximately two-thirds of respondents (68%) travel to Columbus Drive on a daily basis, and an additional 29% use the corridor weekly.



Frequency of Travel

Mode of Transport: Over half of respondents (52%) cited walking as their primary mode of travel on Columbus Drive. Many respondents listed driving (31%) and bicycling (14%) as their primary mode of travel on Columbus Drive.



Mode of Transport

School Age Children & Travel: 16% of respondents have school age children who travel on Columbus Drive to get to school. The majority (58%) of those children walk to school. Among those who do not walk or bike to school, distance was the biggest factor (61%), along with lack of safe bike routes (33%).

Perceived Safety of Columbus Drive: When asked to rate the safety of Columbus Drive for various roadway users (1-5 scale, with 1 being very unsafe and 5 being very safe), respondents gave the following average answers: wheelchair users (1.6); cyclists (1.7); pedestrians (1.9); transit users (2.8); motorists (3.2).

Crashes: Nearly one in five respondents (19%) indicated that they or someone close to them have been involved in a crash on Columbus Drive. Two-thirds (67%) of respondents indicated that they or someone close to them have been involved in a near miss on Columbus Drive.

Vision Zero Awareness: The majority of respondents (78%) are aware of Jersey City's Vision Zero policy, and 90% of respondents feel that it is very important to improve roadway safety for all users.

Car Ownership & Use: Most respondents (76%) own a car. Among those, 42% use their car daily, and 50% use their car on a weekly basis.

Demographics: 43% of respondents are between ages 25 and 34; 36% are between ages 35 and 44; and 17% are between 45 and 59. Nearly all respondents (98%) are Jersey City residents, and 87% live within walking distance of the study area. One-third of respondents work in Jersey City.

Walking and Bicycling Trip Purpose: Walking is a common mode of travel for local shopping (66%), dining out (83%), social engagements (70%), and recreation (64%). Bicycling is most common for recreation and exercise (27%) and for purposes of commuting to work or school, 25% of respondents walk and 11% bicycle.

Survey Results Summary *(cont.)*

Biking and Walking to Local Businesses: 61% of respondents visit stores/businesses on Columbus Drive at least once a week, and the clear majority (79%) walk to these destinations. 9% of respondents bicycle to stores on Columbus Drive.

Barriers to Bicycling: A majority of respondents (71%) cited vehicle traffic or fear of a collision with a vehicle as preventing them from riding a bicycle more frequently. Many respondents also cited a lack of developed bike lanes (61%) and lack of secure bicycle parking at their destinations (33%) as barriers to cycling. In comments, respondents noted a lack of convenient access to a bicycle, poor driving behaviors, poor road conditions, and lack of secure bicycle parking where they live as additional barriers.

Safety Improvements for All Roadway Users: Just over two-thirds (68%) of respondents believe continuous bike lanes would improve safety for all Columbus Drive roadway users. Many respondents also feel that more visible crosswalks (67%), traffic-calming measures such as curb extensions or speed bumps (65%), consistent roadway configuration (59%), and longer pedestrian traffic signals (54%) would improve roadway safety. In comments, respondents mentioned greater policing of speeding and double-parked cars (12%) and protected/raised bike lanes (6%).

Safety Improvements for Biking & Walking: Most respondents (71%) indicated they would be more likely to walk or bike to businesses on Columbus Drive if traffic-calming measures were implemented. More than half of respondents would also like to see high visibility crosswalks (68%), continuous bike lanes (62%), more consistent roadway design (57%), and longer pedestrian crossing signals (53%). In comments, respondents mentioned protected bike lanes, wider sidewalks, and better policing of speeding and double-parked cars. 11% of respondents indicated they would not bike on Columbus Drive under any circumstances.

3.2.3 Crowdsourcing Map

An online crowdsourcing map was also used to solicit concerns, opportunities, and needs and desires of the community (Figure 14). The map gave the public the ability to point out specific locations of concern and comment on conditions. This helped the project team receive crucial input from those that live and work within the project area and spatially understand problem areas and associated concerns. This input was reviewed during the development of the conceptual design and helped shape the recommendations included within this report.

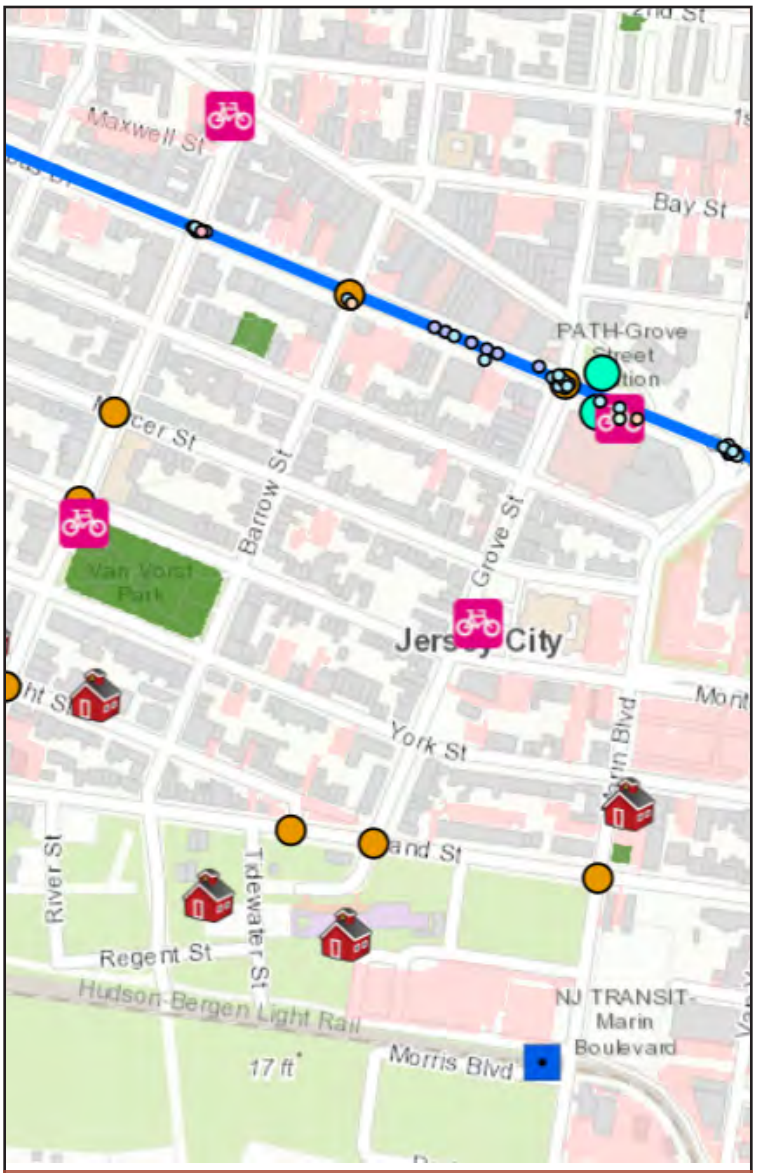


Figure 14: Screenshot of Response Locations in Crowdsource Map

Survey Results Summary *(cont.)*

In total, 64 responses were collected via the crowdsourcing map. When using the map, individuals could choose from several categories of response type. The categories included:

Safety concern (34 responses)

- "Rideshare drivers are always stopped in the rightmost eastbound lane"
- "The chronic illegal double parking is a huge hazard to all road users. We need protected bike lanes to help mitigate this behavior"

Barriers or obstacles for pedestrians (11 responses)

- "The exit from the Turnpike to Columbus avenue is a disaster. Very hazardous for pedestrians, filthy and no easy crossing without danger."
- "Lack of sidewalk on north side [of Columbus Drive, west of Brunswick Street]--pedestrians walk in street."
- "The intersection of Marin and Columbus is a study in poor design. All the traffic going to the Holland tunnel is funneled into this narrow street intersection. Access to the tunnel from downtown should also include Washington street or other wide blvds."

Barriers or obstacles for bicyclists (9 responses)

- "Location of the Citibike docks makes it difficult to reach legally when traveling east on Columbus, or north on Grove. I usually take Columbus, then cut across stopped traffic or wait for openings in the traffic."
- "Suggest switching the positions of the bike lane and parked cars all along Columbus Dr. so that the parked cars are between traffic and the bike lane"

Desired destination (4 responses)

- "Bus stop lane [on the eastbound approach to the Marin Boulevard intersection] is confusing and creates too many lanes - relocate bus stop from SW to SE corner. Bus lane can be eliminated to reduce distance for pedestrian crossing."

Facility conditions for bicyclists (4 responses)

- "The [Columbus Drive and Grove Street] intersection has no signal or markings which indicates that it is okay for bikes to proceed. The bike lane disappears traveling South on Grove St and then suddenly reappears after traveling through cars and crossing Columbus Dr."

Pedestrian route to school (1 response)

- "Ped volumes in the morning create crowding at the [northwest] corner [of the Christopher Columbus Drive and Montgomery Street intersection]. Students will be bunched up waiting to cross and will sometimes venture into the street if the curb becomes too crowded. Recommend a ped bump out to provide more protected curb space."

Facility conditions for pedestrians (1 response)

- "Prime locations for curb extensions / bump outs at Jersey and Barrow."

Bicycle route to school (0 responses)

A complete list of all comments received can be found in Appendix F.

3.3 Public Information Center

A Public Information Center (PIC) is a public meeting or event, held on its own or scheduled in conjunction with another public gathering, at which members of the public are given an opportunity to engage directly with the project team, voice opinions, and give feedback. Two PICs were held for this project.

The first was held at Ferris High School on September 25, 2018. Representatives from Michael Baker and Jersey City were in attendance to introduce the project, present preliminary findings, and gather feedback from the public. Maps of Jersey City were provided for the public to mark up with comments on perceived problem locations.

The second PIC was held at Grace Van Vorst Church on July 18, 2019. Representatives from Michael Baker, Jersey City, and NJDOT were in attendance to introduce the conceptual design for the Columbus Drive corridor to the public, outline project issues and goals, and field comments and questions. Comment cards were also made available to solicit written feedback. Feedback from the second PIC was primarily positive. A full meeting summary can be found in Appendix F.

PIC attendees sharing feedback on potential improvements


PIC attendees examining conceptual corridor design map

Recommendations

All data collected and analyzed, including feedback received from the public, were used to inform a holistic set of strategies designed. These strategies address specific concerns, improve mobility for all ages and abilities, and reduce crashes. Strategies are summarized by the following categories:

- Traffic Safety Improvements – These address motorized vehicle (cars, trucks, buses) travel.
- "Active" Transportation Improvements – These address walking and bicycling.
- Transit Improvements – These benefit passengers of the area's transit modes: Port Authority Trans-Hudson (PATH) trains, NJ TRANSIT buses, and the Hudson-Bergen Light Rail (HBLR).
- Community Improvements – These represent opportunities to further enhance the corridor with non-transportation features such as landscaping, green infrastructure, and signage.

4.1 Traffic Safety Improvements

Travel Lane Reduction

Removing a vehicular travel lane in either direction along the length of Columbus Drive is a key piece of the corridor's conceptual design. Also known as a Road Diet, lane removal is possible when one or more travel lanes on multilane roads are used as de facto turn lanes, clogging the road and limiting the use of all lanes. Road diets provide safety and operational benefits for all road users. According to the Federal Highway Administration (FHWA), the operational benefits of road diets include separating left turns from through lanes, reduced delay for side-street traffic crossings, and consistent traffic flow. These benefits are critical to maintaining the level of service for vehicles that travel along Columbus Drive. The space created from the lane removal can then be utilized for other uses and travel modes. Specifically, the removal of travel lanes allows for the introduction of protected bike lanes along the length of the corridor, a raised median, dedicated left turn lanes at intersections, reduced pedestrian crossing distances, and protected intersection features. Travel lane reductions are recommended along the length of the Columbus Drive project corridor.

Table 11: Dedicated Turn Lane Locations in Conceptual Design

	Approach			
Intersection (Milepost)	Eastbound	Westbound	Northbound	Southbound
Columbus Drive & Hudson Street (0.05)	Left Turn	Right Turn	None	Left & Right
Columbus Drive & Greene Street (0.14)	Left Turn	Left Turn	Right Turn	None
Columbus Drive & Washington Street (0.23)	None	Left Turn	None	None
Columbus Drive & Warren Street (0.32)	Left Turn	Left Turn	None	None
Columbus Drive & Marin Boulevard (0.47)	Left Turn	Left Turn	Left Turn	None
Columbus Drive & Grove Street (0.56)	None	Left Turn	None	Left Turn
Columbus Drive & Barrow Street (0.68)	Left Turn	None	None	None
Columbus Drive & Jersey Avenue (0.77)	Left Turn	Left Turn	None	None
Columbus Drive & Varick Street (0.85)	None	Left Turn	None	None
Columbus Drive & Monmouth Street (0.94)	Left Turn	None	Right Turn	None
Columbus Drive & Brunswick Avenue (1.03)	Right Turn	Left Turn	None	Right Turn

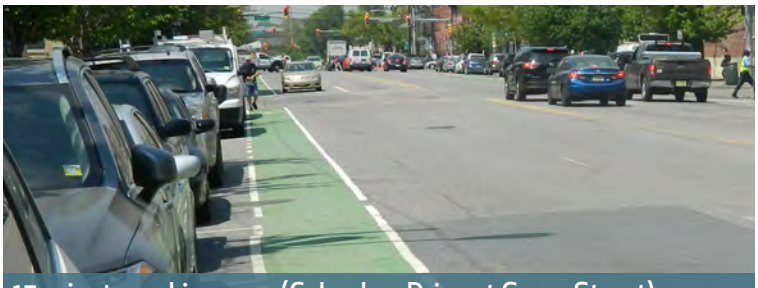
4.1 Traffic Safety Improvements *(cont.)*

Dedicated Turn Lanes

Dedicated turn lanes allow for turning vehicles to slow down in order to turn without affecting the flow of traffic going through an intersection. In the existing condition along Columbus Drive, lanes often act as a de facto turn lanes, as queued vehicles waiting to turn prohibit vehicles attempting to travel straight through the intersection from doing so. In most cases, dedicated turn lanes can reduce delay for vehicles by improving the flow of traffic in through lanes. Additionally, installing dedicated turn lanes can reduce rear-end and left turn crashes. The locations at which dedicated turn lanes are recommended are shown in Table 11. According to the National Highway Cooperative Research Program (NCHRP) Report 279, the addition of dedicated left turn lanes without a protected phase at signalized intersections can reduce all crashes experienced by 15%. Additionally, Report 279 states that the installation of dedicated left turn lanes with a dedicated signal phase can reduce all crashes by up to 33%.

Loading Zones

The proposed design provides dedicated zones between Barrow Street and Warren Street to be used flexibly throughout the day for quick stops, pick-ups, drop-offs, ride hailing services, and deliveries. These strategically-placed zones can be managed by time of day to, for example, allow for deliveries in the early morning, 15-minute parking during the day, and quick stops during the evening. The zones are also intended to alleviate double-parking and prevent the conflicts and delays that it can cause.



15-minute parking zone (Columbus Drive at Grove Street)

Traffic Signal Improvements

Several updates can be made to the traffic signals along Columbus Drive to improve safety for all road users. Recommendations in the conceptual design for the corridor focus on signal timing and signal visibility. Timing recommendations involve updating the signal timing plans to conform to current Manual on Uniform Traffic Control Devices (MUTCD) and Institute of Transportation Engineers (ITE) standards. Changes are recommended for the pedestrian phase lengths, yellow change interval lengths, and all red phase lengths. Specific changes to the signal timing plan are outlined in Section 3.6.1 Signal Timing Recommendations.

To improve signal visibility, it is recommended that retroreflective backplates be installed on all signal heads along the corridor and that all existing incandescent signal heads be replaced with LED bulbs. According to the FHWA, adding retroreflective backplates to signal heads can improve the visibility of the illuminated face of the signal in both daytime and nighttime conditions (Figure X). Replacing existing signal heads with LED lights will further improve signal visibility. These enhancements are intended to enhance motorist compliance with traffic signals, improving safety for all road users.

Street Parking

According to the New Jersey Complete Streets Design Guide, on-street parking can enhance a street by providing a physical buffer between vehicles and pedestrians. For streets with bicycle lanes, on-street parking can separate motorists from bicyclists, increasing safety. On-street parking also provides convenient access to adjacent land uses and offers a desirable parking option for visitors arriving by car since it offers the shortest possible time between parking and shopping. Parallel parking is the recommended arrangement for on-street parking along Columbus Drive because it requires the least amount of roadway space and is used in the existing condition. With the recommended parking there is no loss of parking availability.

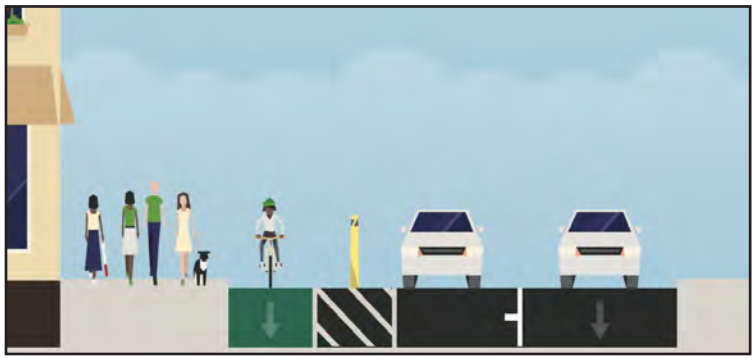
4.2 Active Transportation Improvements

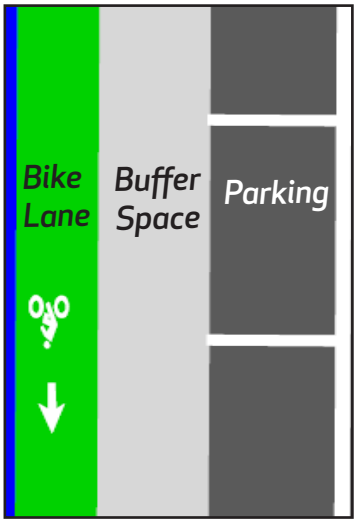
4.2.1 Bicycle Facilities

Protected Bicycle Lanes

According to the New Jersey Complete Streets Design Guide, bicycle lanes or "bike lanes" provide an exclusive space for bicyclists using pavement markings and signage. Current standards dictate that bike lanes be painted green or outlined in white. Bike lanes are designated for one-way travel and typically are located on both sides of two-way streets and one side of one-way streets. Bike lanes enable bicyclists to ride at their preferred speed, without interference from motorists.

To provide additional protection from vehicles, bike lanes can be separated from adjacent travel lanes or parking lanes using a marked buffer space. Buffers can consist of painted markings, delineators, bollards, curbing, landscaping, or other visual and/or physical features which decrease the risk of conflict between bikes and motor vehicles by creating space between vehicular and bicycle travel lanes. In the conceptual design for the Columbus Drive corridor all bike lanes are protected by a minimum 3' buffer space, marked with a delineator post. Protected bike lanes are recommended along the length of Columbus Drive. The bike lanes should be at least 5' wide and have a 3' buffer separating bicyclists from parked vehicles.





Conceptual Design Street Cross Section

Protected Bicycle Lane (Grove Street)

4.2.1 Bicycle Facilities *(cont.)*

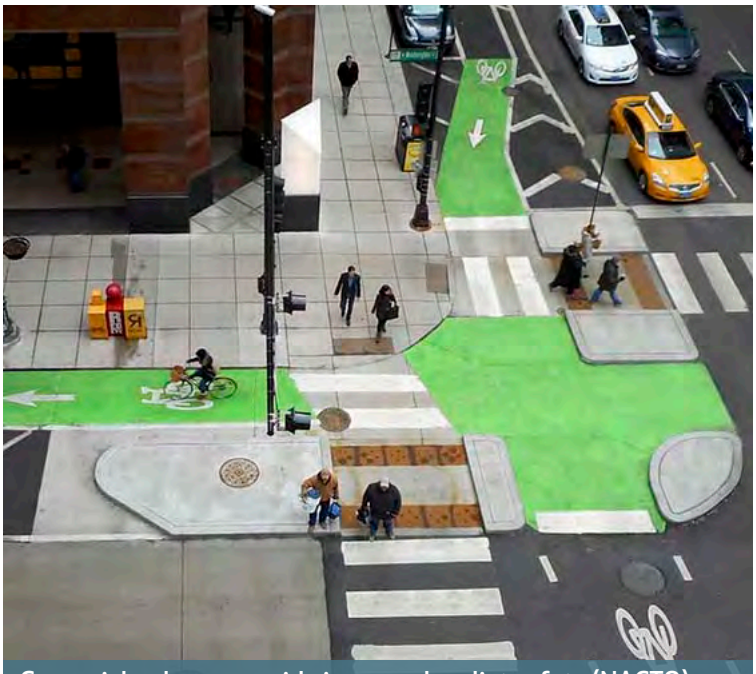
Protected Intersections

Protected intersections are an innovative type of intersection treatment that creates points of physical separation between vehicles and bicyclists. Many protected intersections use small concrete islands at or near corners to define bike lanes near the intersection and create dedicated queueing zones for cyclists at each corner, typically in front of queued vehicle traffic. These dedicated queueing zones reduce crossing distances, shorten the required pedestrian clearing phase lengths, and improve the visibility of bicyclists and pedestrians to turning vehicles. By providing separated facilities for bicyclists and pedestrians, a critical gap in traditional bicycle and pedestrian treatments at intersections is addressed. Other key components of protected intersections include:

- Setback: increases visibility of cyclists to turning motorists due to a separation of the motor vehicle lane and bicycle lane
- Corner Islands: extend the protected bike lane's separation as far into the intersection as possible, tighten turn radii at corners, reduce turning vehicle speeds, and improve the visibility of cyclists and pedestrians waiting to cross the street.
- Bike Queue Area: created by the corner islands, bike queue areas create space for people on bikes to wait.
- Waiting Zone: the setback also creates a waiting zone for turning cars, where drivers can yield to cyclists after starting to turn but before crossing the path of the oncoming cyclists. If large enough, this area allows turning drivers to wait clear of through-traffic, relieving pressure to turn quickly.
- Pedestrian Islands: protected intersections allow for shorter, safer crossings for people that are walking while providing more safe pedestrian spaces for those walking through an intersection.

In combination, the components of a protected intersection creates a safer design that prioritizes the safety of all road users can benefit from the reduced pedestrian crossing phase lengths, which often extend side street phases beyond what is necessary to serve the vehicles present on minor street approaches. Additionally, the provision of designated bike crossings can reduce delay from left-turning cyclists. These features provide increased flexibility in the signal timing plan by reducing constraints on phase lengths. This assessment is supported 2015 study performed by Fehr & Peers Transportation Consultants that found that protected intersections can improve intersection performance for motorists when standard signal phasing is used. The study found that when leading pedestrian intervals are employed, intersection performance is slightly reduced for vehicles.

The conceptual design for Columbus Drive includes protected intersections at each intersection except for Hudson Street.



Corner islands can provide improved cyclist safety (NACTO)

4.2.1 Bicycle Facilities *(cont.)*

Protected Intersections

No Stopping/No Standing Zone

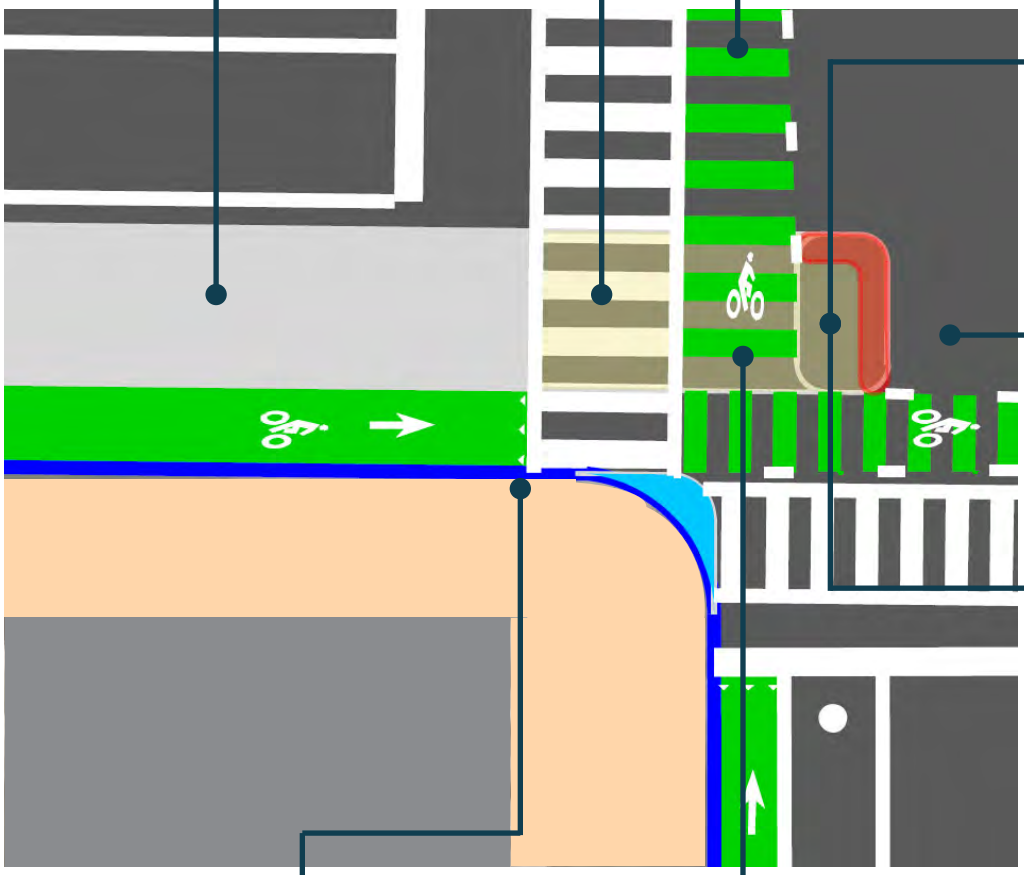
Parking and/or stopping of vehicles is prohibited at the approach of the intersection.

Pedestrian Islands

Reduces crossing distance and improves visibility.

Crossbikes/Intersection Crossing Markings

Markings provide directional guidance to bikes in the intersection.



Bikeway Setback

An area at which drivers may wait and yield. Provides better visibility and gives bicyclists time to react to turning vehicles

Motorist Waiting Zone

Space between the vehicle lane and crossbike allows for turning drivers to wait before crossing.

Corner Island

Separates bikes from vehicles to prevent encroachment on the bikeway. This corner island is mountable by large trucks or other vehicles when necessary.

Bike Yield Line

Bike Queue Area

A space for bicyclists to wait prior to the crosswalk for a green signal. Shortens crossing distance.

4.2.1 Bicycle Facilities *(cont.)*

"Cross-Bike" Bars

In areas of increased conflict, (intersections, driveways, bus stops, turning lanes, etc.) color may be applied in a dashed pattern within a bicycle lane to indicate merging areas. This dashed application of colored pavement mimics typical traffic striping layouts, where dashed markings indicate areas where merging maneuvers are permitted (Figure 15). The change in pattern draws attention to the conflict zone. Cross-bike bars are recommended at every location where bike lanes cross vehicular traffic, specifically at all intersections and driveways along Columbus Drive.

Figure 15: Cross bike bars

Cross bike bars in an urban area

Bike Lane "Bend-Outs"

Bicycle lane bend-outs are an intersection treatment that separates bicycle facilities by shifting the bicycle lane away from motorized traffic on the approach to an intersection (Figure 16). As the bike lane approaches the intersection it bends away from motor vehicle lanes and towards the sidewalk. The bend should end before the crosswalk to provide ample visibility for approaching pedestrians. The bike lane can also bend out after crossing the crosswalk and before crossing the motor vehicle lanes. This design can increase visibility by raising the angle that cars cross the bikeway. Increasing the distance between where bicycles and cars start at an intersection, can also provide room for turning cars to wait before making the turn. Bike lane bend-outs are included in the conceptual design for the corridor on the minor street approaches at the Varick Street and Barrow Street intersections.

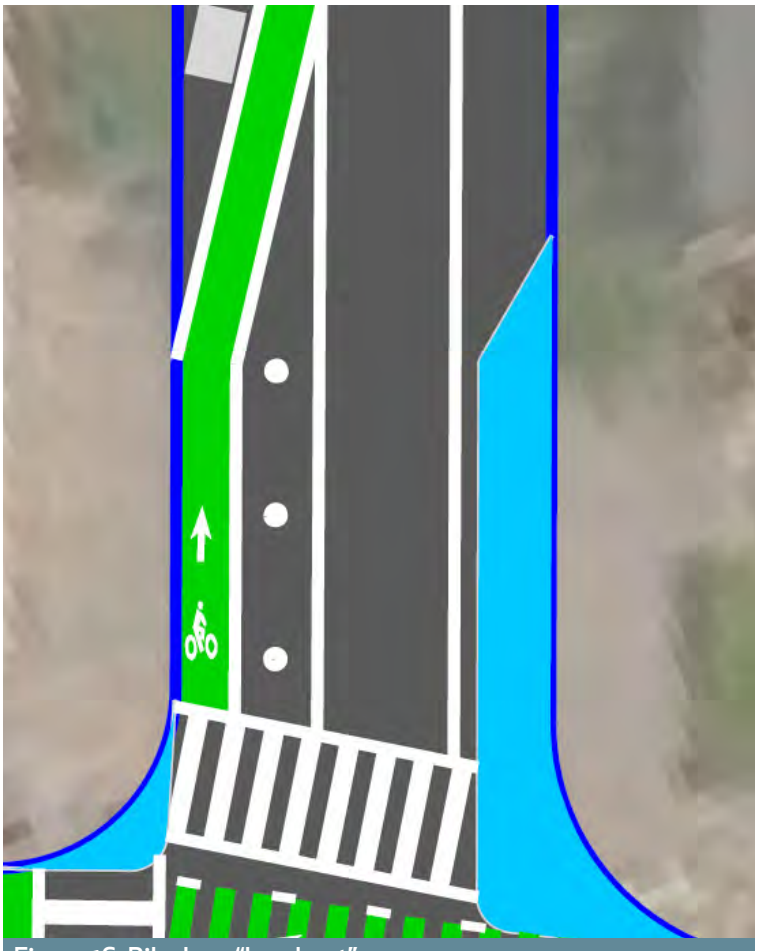


Figure 16: Bike lane "bend-out"

4.2.2 Pedestrian Facilities

Curb Extensions

Curb extensions, also referred to as bulb-outs or bump-outs, are an example of a traffic calming measure. A curb extension extends the curb line and sidewalk into the existing roadway, thereby expanding the available pedestrian space (Figure 17). Benefits of curb extensions include:

- Increased visibility for pedestrians and drivers
- Reduced pedestrian crossing distance
- Traffic Calming
- Shields on-street parking from intersection
- Expands pedestrian realm

Figure 17: Curb extension

Americans with Disabilities Act-Compliant Intersections

The Americans with Disabilities Act (ADA) is a federal civil rights law that prohibits discrimination against individuals with disabilities in all aspects public life. Within the context of the Columbus Drive corridor study, the ADA established guidelines require that all sidewalks, curb ramps, and pedestrian crossings are appropriately designed to accommodate people with disabilities, including those with physical or mental impairments. These guidelines require curb ramps at each pedestrian approach of the intersection to assist in providing a smooth transition from sidewalks to the street level and back again. In addition to curb ramps, ADA compliant intersections include Detectable Warning Surfaces (a tactile surface used to assist people with visual disabilities determine safe crossing locations), should also be included (Figure 18).

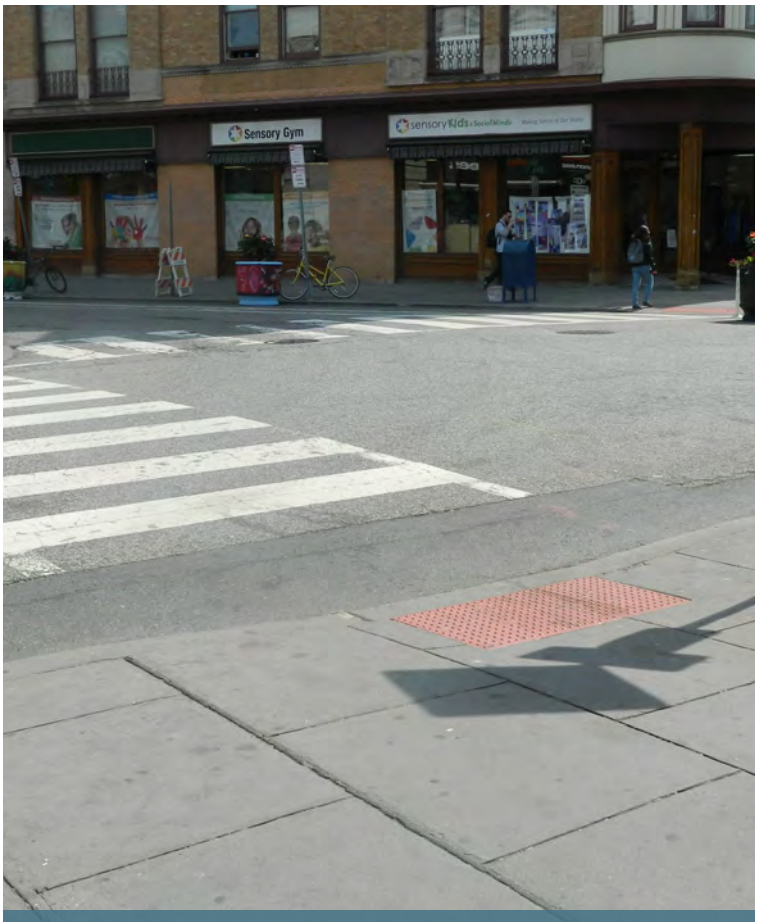


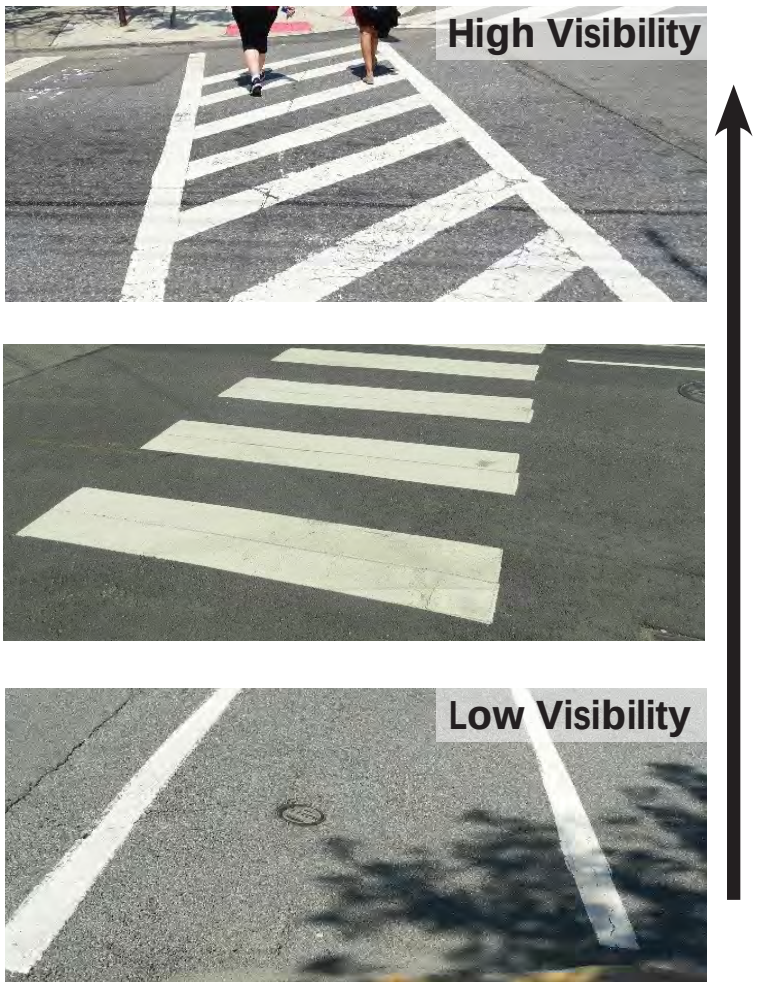
Figure 18: Detectable Warning Surface on a Curb Ramp

4.2.2 Pedestrian Facilities *(cont.)*

High Visibility Crosswalks

A crosswalk is a portion of a roadway designated for pedestrians to cross streets. The striping of crosswalks is critical to creating a high level of visual contrast with the surface of the roadway to draw both pedestrian and driver attention. Some striping styles are more visible than others. It is recommended that continental or ladder striping is used along the Columbus Drive corridor (Figure 19). These striping styles have been shown to be the most visible to drivers. Recommended materials for high visibility crosswalks are thermoplastic epoxy or tape which are more visible than traditional paint, inlaid pavers, stamped concrete, or other treatments. It is recommended that high-visibility ladder-style crosswalks be installed at all crossing points along Columbus Drive.

Figure 19: Crosswalk Striping



Pedestrian Scramble

A pedestrian scramble, also known as an all-pedestrian signal phase or "Barnes dance," is a type of traffic signal control that stops all vehicular traffic and allows pedestrians to cross the intersection in every direction, including diagonally, at the same time (Figure 20). The pedestrian scramble increases pedestrian visibility, reduces vehicle-ped conflict, reduces pedestrian crossing time and exposure, and reduces the buffer zone between vehicles and pedestrians. A pedestrian scramble is recommended at the Grove Street intersection during peak periods, during morning and evening commutes, when the greatest number of pedestrians are present. A pedestrian scramble phase is not necessary during other times of the day.

Figure 20: Pedestrian Scramble

4.3 Transit Improvements

"Floating" Bus Islands

"Floating" Bus Islands are bus stops separated from the sidewalk by a bicycle lane (Figure 21). These bus islands create dedicated space for bus passengers to wait, board, and exit buses and help to reduce conflict between buses, pedestrians, and cyclists by keeping buses out of bicycle lanes. Floating Bus Islands also help to reduce stop delays by keeping buses within or close to travel lanes. Floating Bus Islands are typically used on streets with moderate to high bus ridership, high bicycle volumes, and high pedestrian volumes. Floating bus islands are recommended at the bus stops in between Grove Street and Marin Boulevard along Columbus Drive.

Transit Signal Priority

Transit Signal Priority (TSP) technology modifies traffic signal timing or phasing when transit vehicles, such as buses, are present at an intersection. This modification can occur conditionally for late running transit or unconditionally for all arriving transit. TSP can improve both reliability and travel time for transit, especially on congested streets or streets with long signal cycles and distances between signals. TSP is recommended at the Grove Street and Marin Boulevard intersections to allow stopped buses to enter the intersection prior to conflicting vehicle movements. By implementing TSP at these locations, Jersey City can improve transit performance and establish a signal timing plan that prioritizes high-capacity buses over less efficient modes of transportation such as single-occupant passenger cars.

Figure 21: Floating Bus Island (Green Lane Project)

4.4 Community Improvements

Green Infrastructure

A city's stormwater management strategy is usually driven by federal regulatory requirements, existing sewer infrastructure, and the regional climate and ecology. Integrating green stormwater infrastructure into the right-of-way requires a coordinated approach and a holistic vision for sustainable urban design. Planning and implementing a stormwater network simultaneously with an active transportation network reveals new opportunities for cities and streets. Specific recommendations have not been made for the Columbus Drive Corridor, further analysis is needed to identify the correct treatments and placements. However, the following section contains recommendations for potential stormwater management treatments along Columbus Drive.

- Bioretention Basins: also known as Rain Gardens/ Stormwater Planters are landscaped excavations containing plants and soil that allow water to infiltrate into the ground. These systems filter stormwater runoff, removing some pollutants from the water before it enters the environment. In areas where infiltration does not occur, they can also function as short-term storage for stormwater, temporarily delaying the rate at which it enters the sewer system.

- Permeable Pavement: Permeable pavement is a layered system of porous asphalt and stone used to reduce the amount of water runoff into a municipal stormwater system by allowing rainwater to percolate through the pavement and enter the soil layer below. The stone layers provide pockets of space to store water while it seeps into the soil. Permeable pavement can be used to expand the capture areas of rain gardens, stormwater planters, and tree filter boxes.

- Tree Filter Boxes: Tree filter boxes consist of a small, contained area of soil with a tree (Figure 22). These boxes provide filtration for stormwater before the water enters the municipal stormwater system or infiltrates into the soil below.

For further information, please review the NJ Green Infrastructure Municipal Toolkit and the Green Infrastructure Guidance Manual for New Jersey.

Figure 22: Tree filter box

4.4 Community Improvements *(cont.)*

Wayfinding Signage

A comprehensive wayfinding system comprising clear, consistent informational and directional signage and/or pavement markings placed at key decision points can be used in four ways along the Columbus Drive corridor:

1. To guide bicyclists to their destinations via the new bicycle facilities. This can help less experienced bicyclists feel more comfortable in the environment and encourage these bicyclists to use the safest routes available.
2. To guide pedestrians to key destinations while also calling attention to the new bicycle facilities.
3. To increase awareness of the new facilities and create and reinforce a visual identity for the corridor.
4. To provide enhanced legibility of the downtown, particularly to visitors or those unfamiliar with the area.

Wayfinding systems are often planned, designed, and implemented formally by a municipality or business improvement district.

The Jersey City Bikeway Design Guide provides some design guidance for wayfinding:

- Wayfinding systems can be organized into three different categories: decision point signs, direction signs, and destination signs.
- Decision point signs should be placed in advance of the intersection of all major bikeways or decision points along bikeways and direct cyclists to key destinations.

- Direction signs tell cyclists that they need to turn to get to a destination. These signs can also tell bicyclists to continue straight as a way to reinforce that they are going in the correct direction if there has not been a decision point sign for a while.

- Destination signs may be used to let bicyclists know that they have arrived at a destination.

For further guidance please reference the Jersey City Bikeway Design Guide.

4.4 Community Improvements *(cont.)*

Streetscape Amenities

Pedestrian Scale Lighting: Pedestrian-scale lighting is an established pedestrian safety countermeasure commonly used at intersections and corridors to mitigate nighttime crashes. A primary difference between pedestrian-scale lighting and traditional street or highway lighting is the height at which luminaires are mounted. Typically, pedestrian-scale light fixtures are mounted between 10' and 14' (Figure 23). This lower height can improve the illumination of pedestrians as well as both vertical and horizontal objects and surfaces including sidewalks, crosswalks, curb ramps, push buttons, and other key pieces of pedestrian-oriented infrastructure. Despite these benefits, pedestrian-scale lighting may not be adequate for illuminating the overall roadway. On roads with more than two lanes, pedestrian-scale lighting should be used in conjunction with overhead street lights. The combination of these two lighting types can provide sufficient illumination for both pedestrians and motorists. According to the FHWA, pedestrian-scale lighting should have the following characteristics:

- Vertical illuminance of 20 lux
- A luminaire height of 10-14' above the sidewalk
- Close and even spacing of light fixtures

To improve pedestrian safety along Columbus Drive, it is recommended that pedestrian-scale lighting be installed along the length of the corridor where not already present.

Street Trees: According to the New Jersey Complete Streets Design Guide, trees, shrubs, and other landscape plantings play an important role in making a street "complete." Trees assist in defining the character of the street, provide shade, absorb stormwater, and act as a buffer from traffic. While already present in some locations along Columbus Drive, planting additional street trees could provide the following benefits according to the EPA :

- Reduce energy use in nearby buildings
- Improve air quality and lower greenhouse gas emissions
- Enhance stormwater management and water quality
- Improve quality of life

Street Furniture: According to the New Jersey Complete Streets Design Guide, street furniture encompasses a variety of amenities that can improve the aesthetics and functionality of the sidewalk environment. When well designed and placed, street furniture can make sidewalks more comfortable, convenient, inviting, and functional. Street furniture can attract people and facilitate gathering, provide a place for rest, or create an attractive spot to have lunch or coffee from a nearby business. In addition to street furniture, well distributed and maintained trash and recycling bins should be placed to help maintain clean streets.

Figure 23: Pedestrian Scale Lighting

Implementation

The recommendations outlined in this Implementation Plan create opportunities to enhance biking, walking, and transit use on Columbus Drive, improve safety, and accessibility for all road users. The following sections provide guidance on coordination, planning, education, and funding sources that can serve as a resource for advancing and implementing the proposed facilities throughout Columbus Drive and Jersey City.

5.1 Coordination

Coordination between Jersey City and key stakeholders should be initiated to advance improvements on Columbus Drive. Key stakeholders include: the NJTPA, NJDOT, Hudson County, Hudson Transportation Management Association (TMA), NJ TRANSIT, New Jersey Turnpike Authority, Port Authority of New York & New Jersey, and the Jersey City School District. A potential next step could be the formation of a working group to spearhead a public information campaign and pursue opportunities and resources to support the design and implementation of facilities. The working group would be led by a Complete Streets "champion" and could assist with prioritizing and advancing recommendations identified in this plan. The tasks around this project could also be implemented into the tasks of an existing group such as Sustainable Jersey City as an alternative to creating a new working group.

5.2 Promotional Activities

Hudson Transportation Management Association: Jersey City has a long history of encouraging and enhancing walking, bicycling, and public transit use. Hudson TMA is a division of the Hudson County Improvement Authority and offers Hudson County businesses, schools, employees, residents, and visitors resources to simplify travel, enhance daily commutes, improve business productivity, promote safety, and assist in lowering carbon emissions. Hudson TMA provides a robust array of programs and opportunities as a free service to help establish improved conditions for walking, bicycling, and transit in Jersey City. Relevant programs and services offered by the Hudson TMA include:

- **Safe Routes to School Programs in Jersey City School District:** Hudson TMA provides several educational and encouragement programs in Jersey City schools on an annual basis. Walk- and bike-to-school safety/education programs bring fun and fitness-promoting activities to students' daily school routines.

- **Stride & Ride – Countywide Bicycle Safety Day:** The annual Hudson TMA Stride & Ride program has two main goals:
  - Teach children who can ride to do so safely and with better ability
  - Teach children how to ride a bike who were previously on training wheels

- **Walk to School Safety Poster Contest (Grades K-8):** Children creating posters not only provides an opportunity to exercise their creative and artistic abilities, but to also think about various pedestrian safety rules and the importance of walking to school. Hudson TMA sponsors annual poster contests to provide teaching and learning opportunities and a chance to win prizes for the top three posters. All students who participate have their posters hung in their school which in turn exposed the other students to the positive messages.

- **Hudson BIKE SCHOOL:** Hudson BIKE SCHOOL is an evidence-based, on-bike skills class taught to students in grades 4 and 5 through a school's physical education program. Staff from Hudson TMA train school physical education teachers in the lesson plans, knowledge, and resources needed to implement a safety education program to youth. The curriculum covers bicycle-riding basics including helmet fit, bike fit, bike parts, and bike check along with on-bike skills including balancing, braking, scanning, and signaling. Upon completion of the training, PE teachers are eligible to receive a fleet of bikes which are loaned to the school for the children to use as part of their gym class.

- **Golden Sneaker Program:** The Golden Sneaker program is a walking mileage contest within a school between all classes in the 2nd and 3rd grades. During the Golden Sneaker competition, the children use

pedometers for one week to measure the distances they walked. The class with the greatest distance walked is awarded the Golden Sneaker trophy. During the week of competition, the program is incorporated into math and science classes as the children add and convert their numbers of steps and discuss the environmental impact. The award presentation includes an interactive program teaching children safety rules regarding crossing the street at the corner and within the crosswalk, understanding and following all signs and signals, being seen, listening as well as looking, and paying attention to the crossing guard.

- **Walk to School Program:** Hudson TMA's Walk to School Program encourages parents and children to walk to school rather than dropping off students by car. One of the ways Hudson TMA kicks-off this program at the beginning of the school year is to have staff accompanied by their mascot, Buster the Bus, lead a walking school bus with children and their parents, family members, and school staff. A walking school bus consists of a group of children walking to school with one or more adults, picking up more children at predetermined stops along the route. After the students arrive at school, the TMA staff run a fun, interactive, and educational presentation promoting both the benefits of walking and safety best practices to children in grades K to 3.

- **Youth Bicycle Safety Program:** The program provides bicycle safety questions, answers, and explanations through an interactive PowerPoint presentation in a Quiz Show format. Students participate by answering questions and demonstrating safe practices. Students who participate are also give bicycle safety activity books.

- **Bicycle Rehab Program:** Hudson TMA's Adult Bike Rehab program provides bikes, which were donated to and then rehabbed by the TMA, to qualified individuals who can use them as part of their commute to work. Bikes are available on a first-come, first-served basis. Bike donations sometimes include child sized bicycles which are then donated to children whose families may not be able to afford one.

- **Park(ing) Day:** Each year on the third Friday in September, the Hudson TMA participates in Park(ing) Day in downtown Jersey City. This is an annual international event where metered parking spaces are temporarily transformed into mini parks. The originators of Park(ing) Day conceived the event as a way for people to re-imagine our urban spaces. Hudson TMA uses the event as a fun way to get people to think about how much space cars occupy, how that space can be repurposed for people, and the impacts that our transportation systems have on our environment. The temporary parks created from the parking spaces attract passers-by, allowing TMA staff to engage them in a dialogue about using cars less often. The converted park is themed "Shakespeare in the Park(ing) Spot." On hand to provide the classical element is the Actor's Shakespeare Company. Between the dialogues and soliloquies, the actors promote the TMA's objectives and programs. A swordfight is also performed which centers around parking conflicts. TMA staff take advantage of the crowd of onlookers and ask individuals to pledge to reduce car trips.

- **Bike Driver's Ed Presentations:** As part of driver's education programs offered in county high schools, Hudson TMA provides a forty-minute interactive lecture on rules of the road for bicyclists and motorists, understanding the cyclists' perspective, and how to share the road safely between drivers and cyclists. This program is open to all high schools in Hudson County at no cost.

5.3 Enforcement

An important component of a safe and well-traveled transportation system is an enforcement program for traffic regulations as they apply to each type of roadway user: motorists, bicyclists, and pedestrians. Jersey City can improve travel habits and behavior through the creation of an enforcement program. This process should include reviewing current ordinances and traffic regulations to identify elements that may unnecessarily affect certain roadway users, such as bicyclists and pedestrians. As bicycle facilities are installed, it is recommended that local ordinances and regulations be developed or revised to clarify items such as: application of vehicle laws to bicyclists, permitted movements on and across bicycle facilities (e.g., permitted motor vehicle movements across bicycle lanes), bicycling on sidewalks, and bicycle parking requirements.

In addition, a review of enforcement regulations and practices may assist in identifying opportunities to partner with community, county, or state organizations to inform users about safe bicycle travel behavior, such as the N.J.S.A 39:4-10.1 which requires the use of helmets by bicyclists under the age of 17, N.J.S.A 39: 4-36 which requires motorists to stop for pedestrians in the crosswalk, or N.J.S.A 39:4-12.2 which requires bicyclists to ride in single file. For more information on bicycle regulations in New Jersey, visit:

http://www.state.nj.us/transportation/commuter/bike/regulations.shtm

Outreach and promotion through community channels and events is critical in reminding motorists, bicyclists, and pedestrians of applicable laws and recommended travel practices. The Street Smart Campaign is one resource that could be utilized to publicize new ordinances.

5.4 Capital Improvements Projects

Jersey City should review their Capital Improvements Projects to determine if the recommendations made within this report can be integrated. Recommendations outlined within this plan can be implemented as part of regular roadway resurfacing and/or restriping projects. When implemented as part of a larger maintenance or construction project, the added cost for roadway markings and signage may be lower due to the fixed costs of the larger project.

Intersection of Columbus Drive and Brunswick Street

5.5 Funding

There are several ways to fund infrastructure and non-infrastructure projects and programs that improve walking and bicycling facilities. The following is a list of common grant programs available to New Jersey communities. All grants listed are competitive. Applications can be time-consuming and will not be reviewed if all requirement materials are not submitted on time. The most effective applications tell a story about which populations are in most need of the improvement, detail the problems and concerns using compelling pictures, data, and other documentation, and indicate how and why improvements are prioritized.

5.5.1 North Jersey Transportation Planning Authority

Primarily funded through the Federal Highway Safety Improvement Program (HSIP), the NJTPA's Local Safety Program (LSP) provides financial support to a select number of safety improvement projects each fiscal year. Since 2005, the NJTPA has distributed more than $144.6 million of funding through its LSP. To be selected for funding, a subregion must demonstrate that the proposed project addresses safety issues through supportive crash data and an HSM analysis. Once a project is selected, funds can be used for engineering and design as well as construction. More information on the NJTPA's LSP can be found on their website:
http://www.njtpa.org/localsafety.aspx
To aid in the acquisition of funding for preliminary engineering, final design, and construction of the proposed design presented within this report, a draft application for the Local Safety Engineering Program FY 2020 was produced. The draft application can be found in Appendix G.

5.5.2 New Jersey Department of Transportation

The Division of Local Aid and Economic Development at 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 New Jersey Metropolitan Planning Organizations (MPOs) 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 specifically encourages applications for pedestrian safety improvements, bikeways, and streetscapes, encouraging at least 10% of all Municipal Aid funds for these projects specifically.

County Aid: funds are used for the improvement of public roads and bridges under county jurisdiction. Public transportation and other transportation projects are also included.

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.

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 to promote increased usage of transit by all segments of the population and decrease private vehicle use.

Transit Village: This program awards grants for transportation projects that enhance walking, biking, and/or transit ridership within ½ mile of the transit facility. To apply, municipalities must already be designated as Transit Villages by the Commissioner of Transportation and the inter-agency Transit Village Task Force.

5.5 Funding *(cont.)*

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.

5.5.3 Federal Aid Infrastructure Grant Programs

Safe Routes to School

Provides federal-aid highway funds for infrastructure projects that enable and encourage children in grades K-8, including those with disabilities, to safely walk and bicycle to school. Bonus points on the grant are given to applicants with School Travel Plans, a Complete Street Policy, and Transit Village Designation.

Transportation Alternatives Program (TAP)

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. Bonus points on the grant are given to municipalities that have an adopted Complete Street Policy and Transit Village Designation.

New Jersey Department of Environmental Protection Recreational Trails Grant Program

Administered by the NJDEP Green Acres Program with 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.

5.5.4 Health and Envrionmental Funding

Sustainable Jersey

Provides capacity building awards to municipalities to support local green teams and their programs and is not project specific.

Sustainable Jersey for Schools

Intended to help districts and schools make progress toward Sustainable Jersey for Schools Certification.

New Jersey Healthy Communities Network

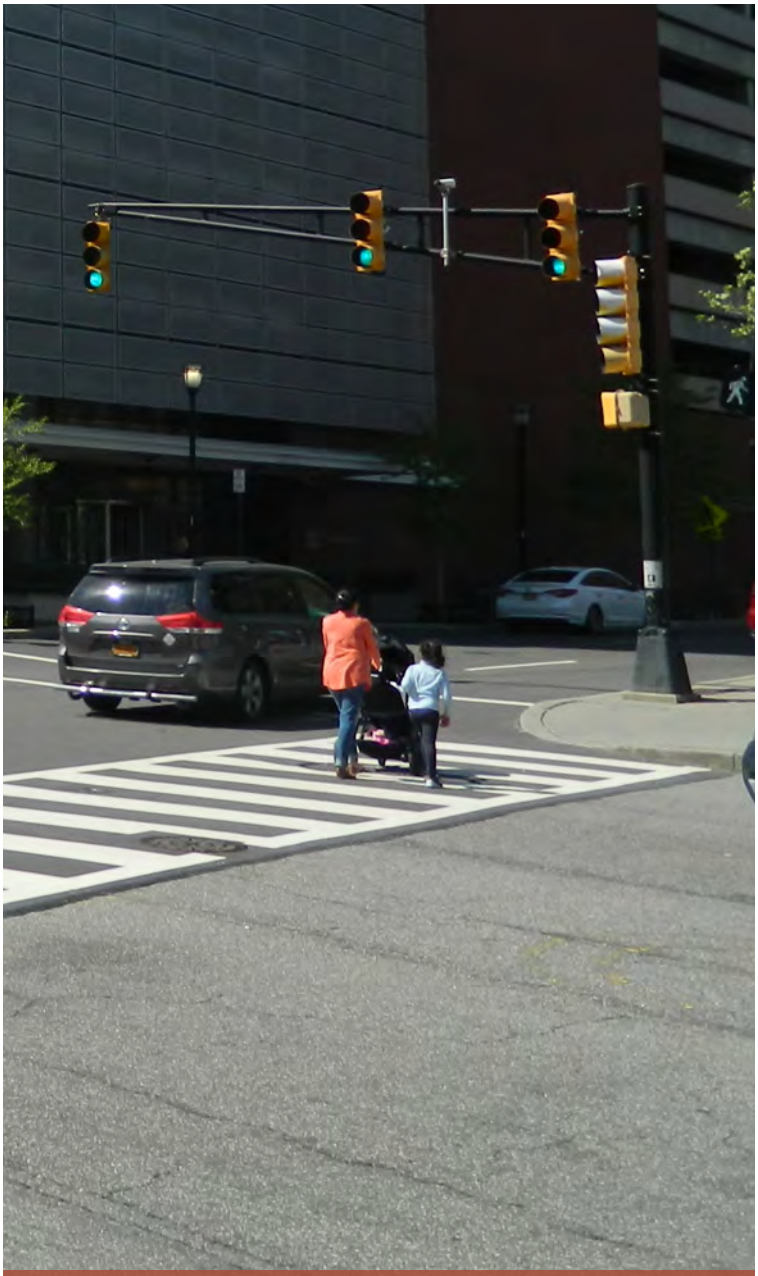
The New Jersey Healthy Communities Network is a partnership of grantees, funders, and advocacy organizations seeking to collectively impact community well-being and public health. The Community Grant Program provides opportunities to develop healthy environments for people to live, work, learn, and play by funding policies, projects, and programs that support walking and bicycling.

5.5.5 Transportation Infrastructure Bank

The New Jersey Transportation Infrastructure Bank (NJTIB) is the result of a unique partnership between the New Jersey Infrastructure Bank (I-Bank) and the NJDOT. With a mission of reducing the cost of financing for New Jersey counties and municipalities, the NJTIB was established by the New Jersey Infrastructure Trust Act N.J.S.A. 58:11B-1 et seq., to make low interest loans for local transportation infrastructure projects.

NJTIB loans are available for a variety of capital projects for public highways, bridges, approach roadways, and other necessary land-side improvements, ramps and grade crossings, signal systems, roadbeds, transit lanes, or rights-of- way, pedestrian walkways and bridges connecting to passenger stations and servicing facilities, bridge and grade crossings. Projects and programs designed to increase the movement of passengers and goods, and provide a safety and/or infrastructure preservation benefit with a goal of improving quality of life can also be funded through NJTIB.

The I-Bank has already been successfully used to fund green infrastructure in New Jersey. The City of Hoboken received an approximate $4.3 million construction loan in June 2018 with the NJ Water Bank to implement curb extensions with rain gardens to control stormwater inundation and frequent combined sewer overflows (CSOs) on streets located within the City's floodplain. While improving stormwater management, this project also improves pedestrian safety by extending the sidewalk and reducing crossing distances.



Looking north at the Columbus Drive and Green Street intersection

5.6 Phasing

There are several potential paths forward for the implementation of the proposed improvements outlined within this plan. Implementation of the proposed concept is predicated on the completion of four unique phases which include:

- Initial Improvements: In this phase, "quick build" improvements using low-cost, interim materials such as paint, planters, or temporary bollards are used to improve safety in the short-term and demonstrate future enhancements. During this phase, several components of the conceptual design such as protected bike lanes, high visibility crosswalks, traffic signal visibility improvements, and 10'-11' travel lanes could be implemented.
- Engineering and Design: An engineering review of the conceptual design for the Columbus Drive corridor is required prior to the installation of the more robust/ permanent treatments recommended within this plan.
- Corridor Enhancements: Additional, more advanced features of the conceptual design are implemented such as the travel lane reduction and protected intersections using more robust materials such as modular surface-mounted concrete islands.
- Final Construction: Features from the previous phases are permanently installed along the corridor. This phase requires the completion of a Final Design set of plans by an engineering firm.

Market St. Philadelphia (Philly Mag)

Temporary floating bus island, Oakland (@Transit Center)

5.6 Phasing *(cont.)*

Future Phases	Description*	Cost	Sample Timeline
Initial Improvements • **Low-cost interventions used to improve safety and demonstrate future enhancements**	• 10'-11' driving lane widths • Quick-build parking-protected bike lanes using paint and delineators • High-visibility crosswalks • Wet-reflective pavement markings • Traffic signal visibility enhancements • Longer crossing time for pedestrians • Street amenities: benches, potted plants, bike parking, trash cans, etc.	$	<1 year
Engineering & Design	Before implementing the concept proposed within this study, more-detailed engineering must be performed. This is often referred to as Preliminary Engineering (PE). During the PE phase, additional public outreach will be conducted to get feedback on the design as it evolves.	$$	1-2 years
Corridor Enhancements • **Street space reallocated and additional project features rolled out using more robust material**	• Two driving lanes (one in each direction) • Wider protected bike lanes • Modular concrete slabs and/or large planters added to painted bike lane buffers for enhanced protection • Modular concrete pedestrian refuge islands at street crossings • Protected intersections created with paint and modular concrete islands • Modular floating bus stops • Traffic signal retimings (as necessary)	$$	1-2 years
Final Construction	Features from previous phases are permanently installed including: • Poured concrete buffers, pedestrian refuge islands, street medians, and floating bus stops • Landscaping • Green stormwater infrastructure • ADA-compliant features	$$$$	1-2 years

5.7 Matrix

#	Issue and/or Deficiencies	Action to Investigate	Phase	Timeframe	Cost	Priority
1	**Vehicular Safety Issues / Opportunities** - Reduce vehicle speeds - 65% of survey respondents felt that measures needed to be taken to reduce vehicle speeds. - Reduce opportunities for double-parking - Conflicts between vehicles lead to aggressive and unpredictable driving behaviors	Narrow travel lane widths to 10'-11' on Columbus Drive.	N/A	Near	$	1
		Install wet-reflective thermoplastic pavement markings.	N/A	Near	$	1
		Install reflective backplates to improve traffic signal visibility.	N/A	Near	$	1
		Reduce number of travel lanes to one lane in each direction.	N/A	Mid	$$	2
		Provide dedicated left turn lanes to improve traffic flow at intersections.	N/A	Mid	$$	2
		Replace on-street parking at select corners with dedicated pick-up/drop-off/delivery zones.	N/A	Mid	$	2
		Dedicate space on corridor between Grove and Marin to pick-up/drop-off zones.	N/A	Mid	$	2
2	**Pedestrian Safety Issues / Opportunities** - Reduce pedestrian crossing distance. 54% of respondents would like to see longer time for pedestrian crossing. - 78% of survey respondents feel "very unsafe" or "moderately unsafe" when walking along the project corridor. - 67% of respondents requested traffic-calming measures such as curb extensions or speed bumps. - Improve visibility of crossing pedestrians - 68% of respondents requested high-visibility crosswalks. - Increase time for pedestrian crossing - 54% of respondents would like to see longer time for pedestrian crossing. 10 intersections provide insufficient yellow and red signal phase lengths based on NJDOT standards. - Sidewalks lack amenities and beautification.	Install curb extensions at each intersection to reduce crossing distances and enhance pedestrian visibility. Temporary/short-term material: paint/bollards/planters; Permanent material: concrete	Temporary	Near	$	1
			Final	Long	$$$	3
		Install wet-reflective, thermoplastic, ladder-type crosswalks at all locations.	N/A	Near	$	1
		Increase yellow and all-red signal timings to comply with NJDOT and ITE standards.	N/A	Mid	$	2
		Install planters, benches, trash cans, and other streetscape amenities wherever appropriate.	N/A	Near	$	1
		Install green infrastructure where space allows.	N/A	Long	$$$	3
3	**Bike Safety Issues / Opportunities** - 315 survey respondents indicate bike safety score of 1.7/10 where 1 is "very unsafe." - 89% of survey respondents feel "very unsafe" or "moderately unsafe" when biking along the project corridor. - 71% cited vehicle traffic or fear of a collision with vehicle as barrier to biking. - 71% indicated they would walk/bike on Columbus Drive if traffic-calming measures were implemented. - 61% cited lack of developed bike lanes. - 68% believe continuous bike lanes would improve safety for all road users. - Improve bicycle visibility at intersections.	Install 5' parking-protected bike lanes. Temporary/short-term material: paint/bollards/planters/modular curbing; Permanent material: concrete/landscaping	Temporary	Near	$	1
			Final	Mid	$$	2
		Install protected intersection features. Temporary/short-term material: paint/modular curbing; Permanent material: concrete	Temporary	Mid	$	2
			Final	Long	$$$	3
4	**Transit Safety Issues / Opportunities** - Improve bus-transit time through the corridor. - Reduce conflicts between buses and passenger vehicles. - Reduce conflicts between transit queuers and bike/peds.	Install bus islands for queuing passengers to expedite boarding between Grove and Marin in both travel directions.	N/A	Mid	$$	3

Timeframe:
Near: ~0-1 Year
Mid: ~1-3 Years, May require Engineering
Long: ~2-4 Years or longer, May require Full Engineering

Costs: (Including Engineering, and costs are cumulative for construction phases)
$: May be accomplished by maintenance crews.
$$: May require Engineering and/or Construction Contractor
$$$: Likely to require Engineering and a Construction Contractor

5.8 Cost Estimate

A cost estimate for the Columbus Drive conceptual design is shown in the table below. The cost estimate details the expected price of preliminary engineering, final design, construction, and post construction engineering.

Preliminary Quantities and Construction Cost Estimate					
ROADWAY					
SEQUENCE NO.	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
1	Mobilization	LS	1	$500,000	$500,000
2	Clearing Site	LS	1	$115,000	$115,000
3	Maintenance and Protection of Traffic	LS	1	$350,000	$350,000
4	Hot Mix Asphalt Pavement Repair (Spot)	SY	1,400	$79	$110,600
5	Hot Mix Asphalt Seal (for restriping)	SY	69,000	$10	$690,000
6	Protected Intersection (Truck-Mountable Features)	U	11	$4,000	$44,000
7	Side Street Bend-Outs (Paint, Delineators, Planter Box) - Brunswick, Monmouth, Varick, Jersey, Barrow, Warren, Washington, Greene)	U	8	$4,000	$32,000
8	Median Area (Concrete Island)	SY	1,600	$79	$126,400
9	Median Area (Concrete Curb, Pavement Repair)	LF	6,300	$124	$781,200
10	Curb Extension (w/ Curb, Pavement Repair, Drainage Reconst.)	SY	630	$330	$207,900
11	Longitudinal Sidewalk (w/ Curb, Pavement Repair, Drainage Reconst.)	SY	1,440	$345	$496,800
12	Curb Ramp (12 FT Wide)	U	88	$2,130	$187,440
13	Detectable Warning Surface (Unit = 4 FT x 2 FT)	U	275	$304	$83,600
14	Pedestrian Push Button	U	88	$1,564	$137,632
15	Inlet	U	10	$4,104	$41,040
16	Drainage Pipe	LF	220	$81	$17,820
17	Bicycle Safe Grate	U	30	$442	$13,260
18	Green Infrastructure (Marin Blvd.)	SF	300	$500	$150,000
19	Street Amenities	LS	1	$220,000	$220,000
20	Bike Lane Painting, ~5 Ft Wide	LF	13,000	$15.00	$195,000
21	Striping, 4", Epoxy	LF	50,000	$0.50	$24,761
22	Striping, Thermoplastic Markings (Lane and Bike Symbols, Etc.)	U	275	$300	$82,500
23	Reflective Signs	U	275	$259	$71,225
24	Bike Lane Delineator Posts	U	500	$50	$25,000
25	Bus Shelter & Bus Island	U	3	$32,200	$96,600
26	Soil Erosion and Sediment Control	LS	1	$75,000	$75,000
27	Traffic Signal Pole Relocation (Pole, Arm, JB, Conduit, TS Heads)	LS	7	$30,000	$210,000
28	LED Traffic Signal and Back Plate	U	80	$2,000	$160,000
29	Bicycle Signal (Brunswick, Monmouth)	LS	4	$20,000	$80,000
				Project Construction Subtotal	$5,324,778
				Utility Relocations (10%)	$532,500
				Pedestrian Streetlighting (10%)	$532,500
				Construction Cost	$6,389,778
				Contingencies (15%)	$798,717
				Engineering Cost (12%)	$639,000
				Construction Services (4%)	$210,000
				Post Construction Engineering Evaluation , per FHWA Guidance (2%)	$110,000
				Total Project Cost	$8,150,000

LS = Lump Sum U = Unit
SY = Square Yard LF = Linear Foot
SF = Square Foot