

Columbus Drive

Complete Streets Implementation Plan

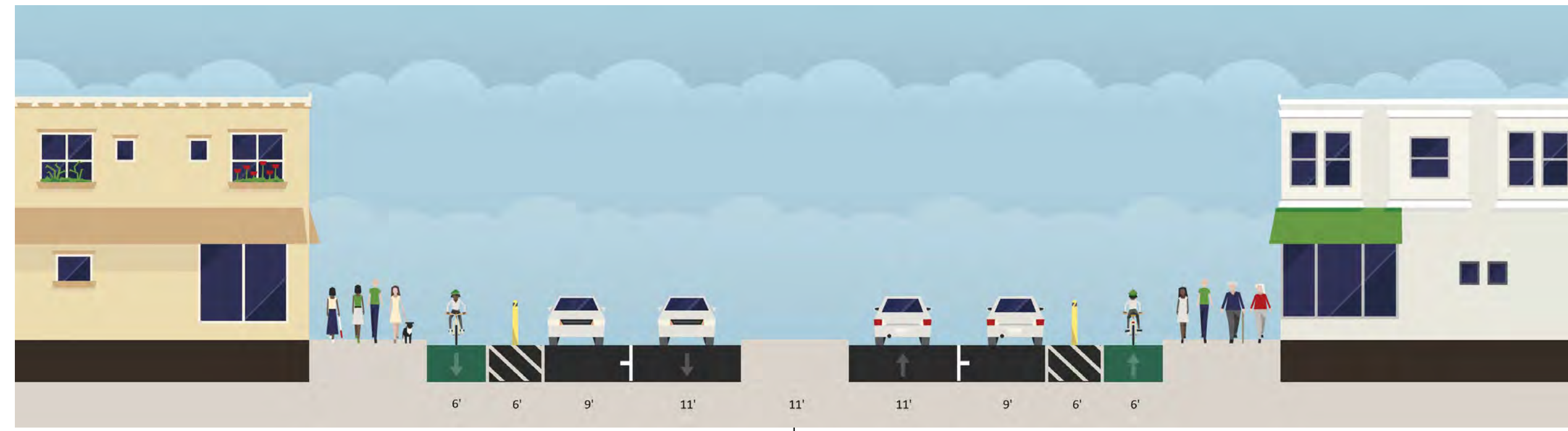
November 2019



Michael Baker
INTERNATIONAL

APPENDICES

APPENDIX A
PROPOSED CONCEPT PLAN



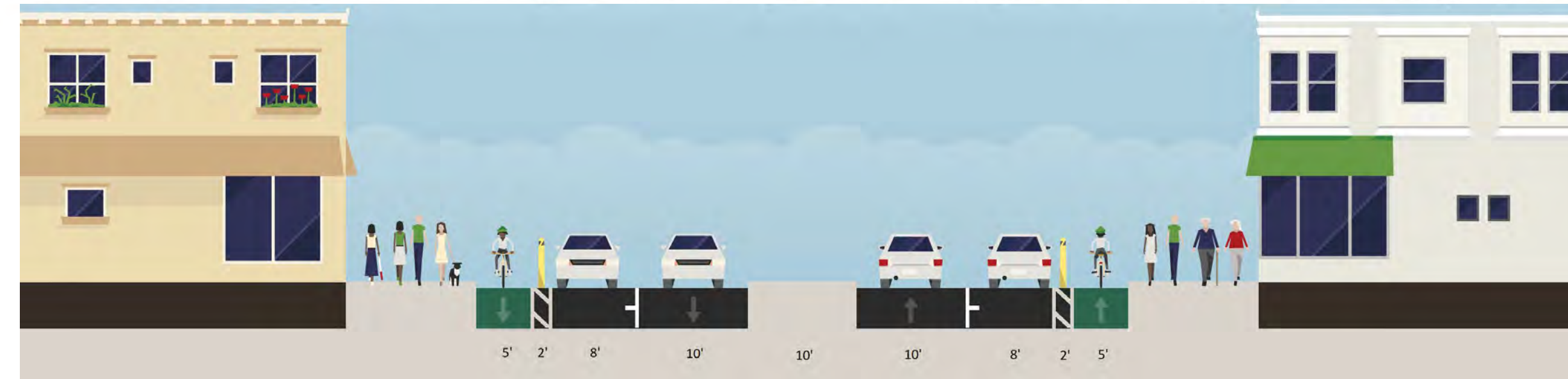
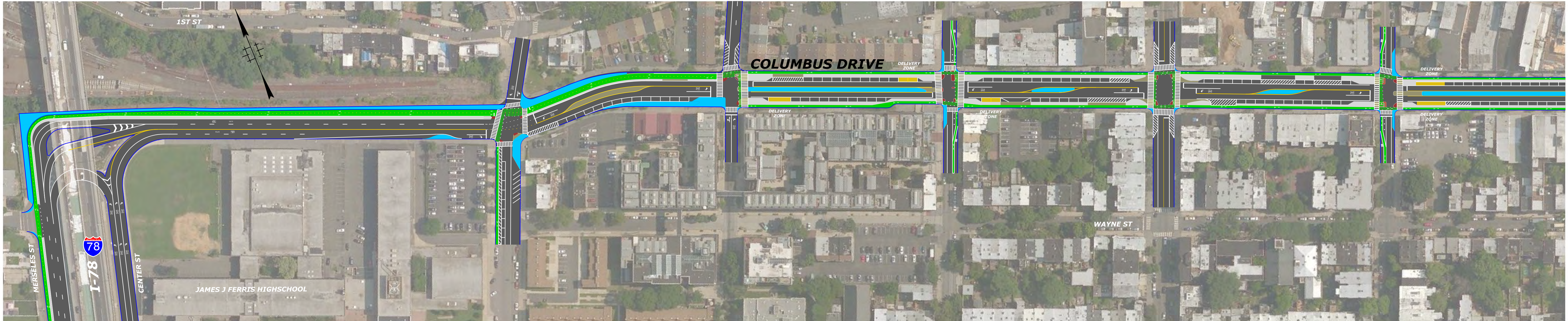
BRUNSWICK ST

MONMOUTH ST

VARICK ST

JERSEY AVE

BARROW ST



GROVE ST

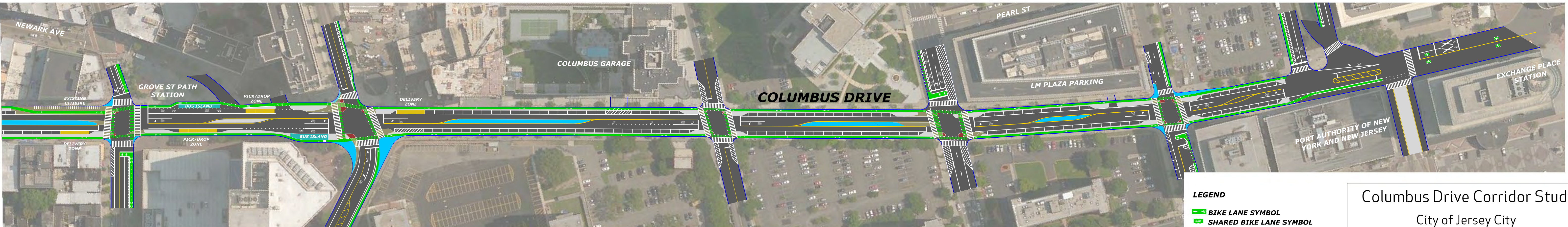
MARIN BLVD

WARREN ST

WASHINGTON ST

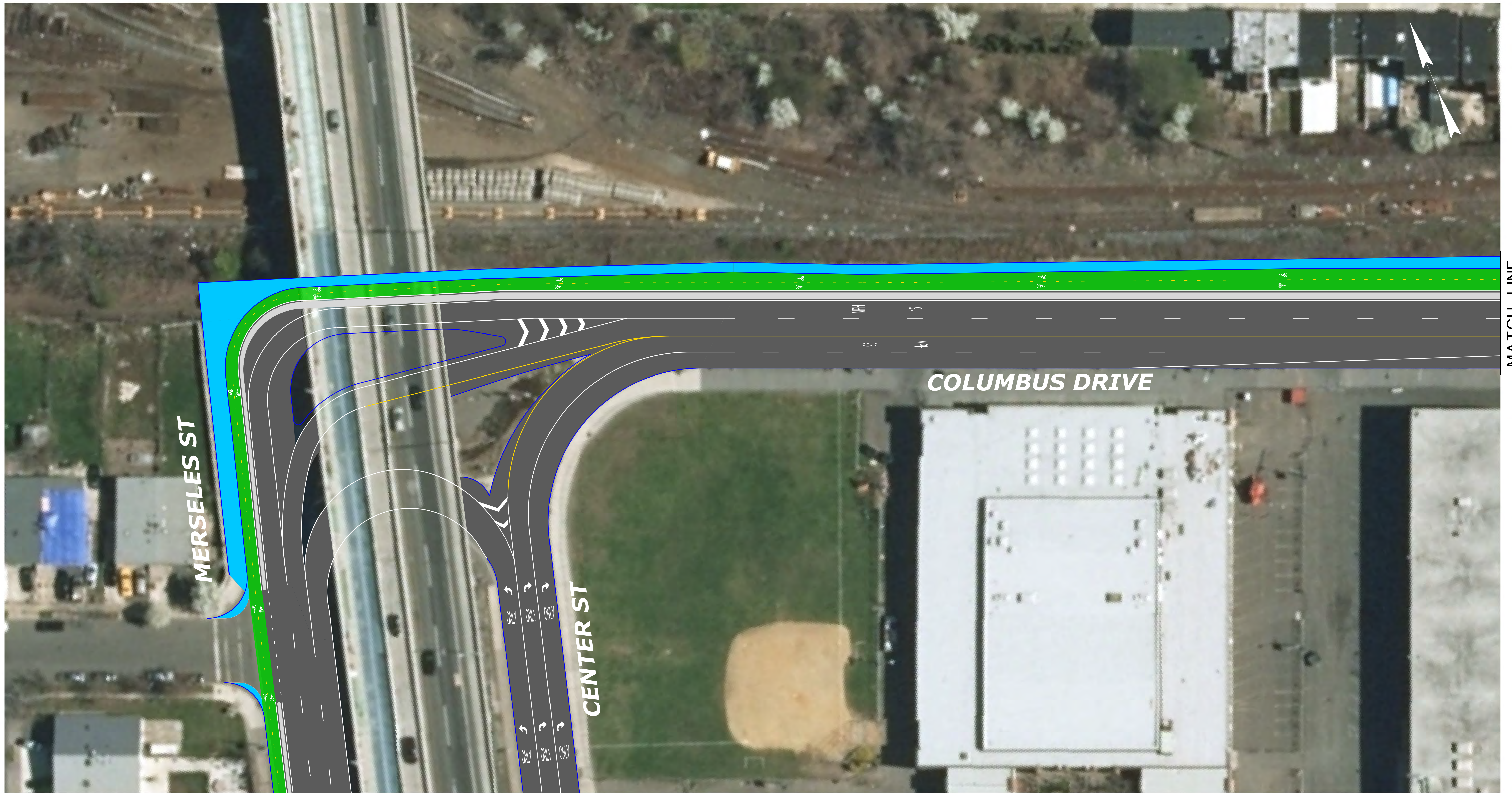
GREENE ST

HUDSON ST











- LEGEND**
- BIKE LANE SYMBOL
 - + SHARED BIKE LANE SYMBOL
 - BUS ISLAND
 - NEW SIDEWALK/MEDIAN AREA
 - DELINEATED BUFFER
 - PAINTED BUFFER
 - MOUNTABLE BUFFER
 - DELIVERY OR PICK/DROP ZONE

Columbus Drive Corridor Study
 City of Jersey City
 New Jersey Department of Transportation



MATCH LINE
SHEET C-2

LEGEND

- | | | | |
|---|--------------------------|---|----------------------------|
|  | BIKE LANE SYMBOL |  | DELINEATED BUFFER |
|  | SHARED BIKE LANE SYMBOL |  | PAINTED BUFFER |
|  | BUS ISLAND |  | MOUNTABLE BUFFER |
|  | NEW SIDEWALK/MEDIAN AREA |  | DELIVERY OR PICK/DROP ZONE |

C-1
C-7

Concept Alternatives

Columbus Drive Corridor Study
City of Jersey City

October 2019

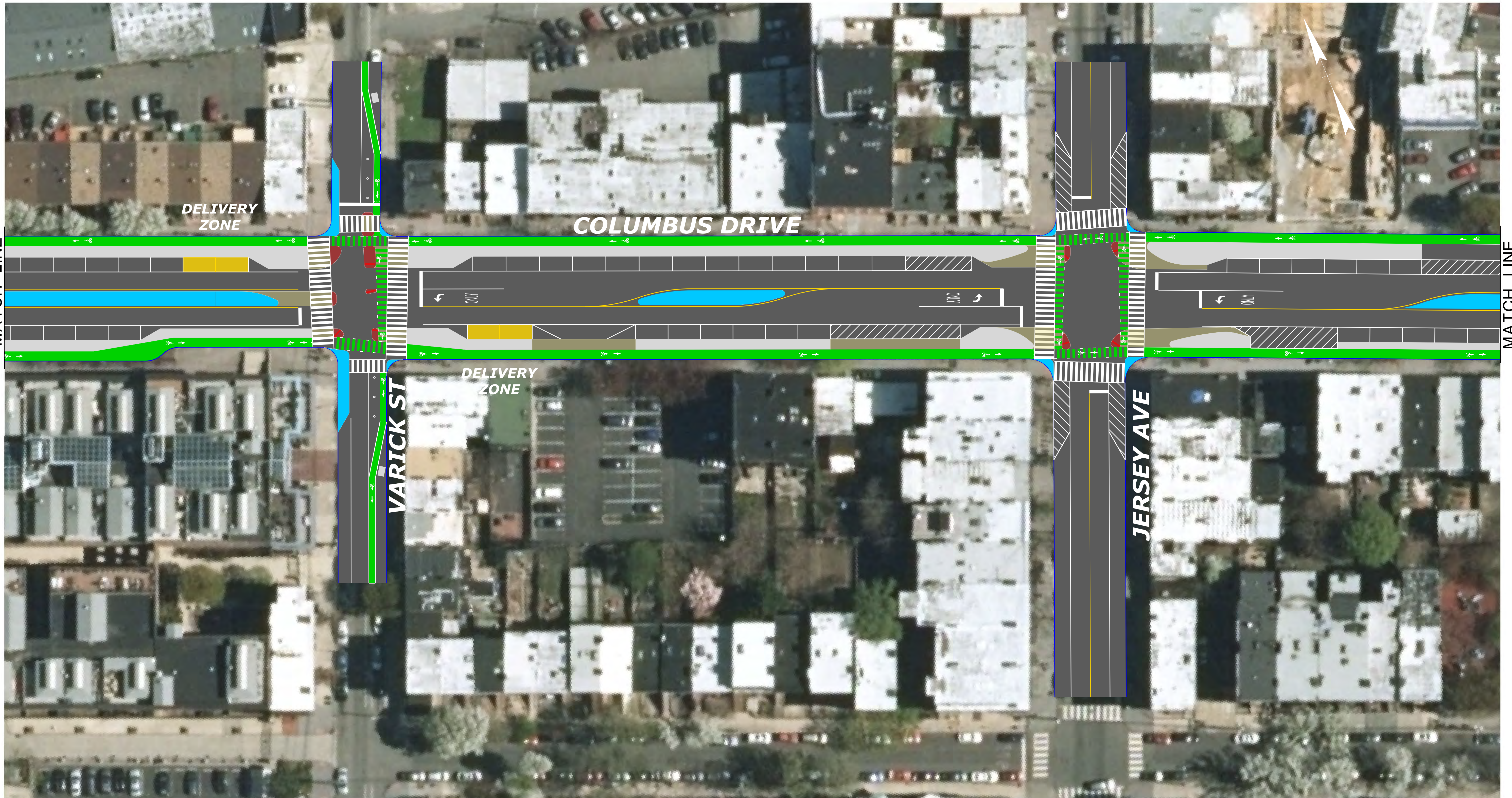


LEGEND









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| | BIKE LANE SYMBOL | | DELINEATED BUFFER |
| | SHARED BIKE LANE SYMBOL | | PAINTED BUFFER |
| | BUS ISLAND | | MOUNTABLE BUFFER |
| | NEW SIDEWALK/MEDIAN AREA | | DELIVERY OR PICK/DROP ZONE |

C-2
C-7

<p>Concept Alternatives Columbus Drive Corridor Study City of Jersey City</p>
<p>October 2019</p>



LEGEND

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|---|--------------------------|---|----------------------------|
|  | BIKE LANE SYMBOL |  | DELINEATED BUFFER |
|  | SHARED BIKE LANE SYMBOL |  | PAINTED BUFFER |
|  | BUS ISLAND |  | MOUNTABLE BUFFER |
|  | NEW SIDEWALK/MEDIAN AREA |  | DELIVERY OR PICK/DROP ZONE |

C-3
C-7

Concept Alternatives

Columbus Drive Corridor Study
City of Jersey City

October 2019



LEGEND

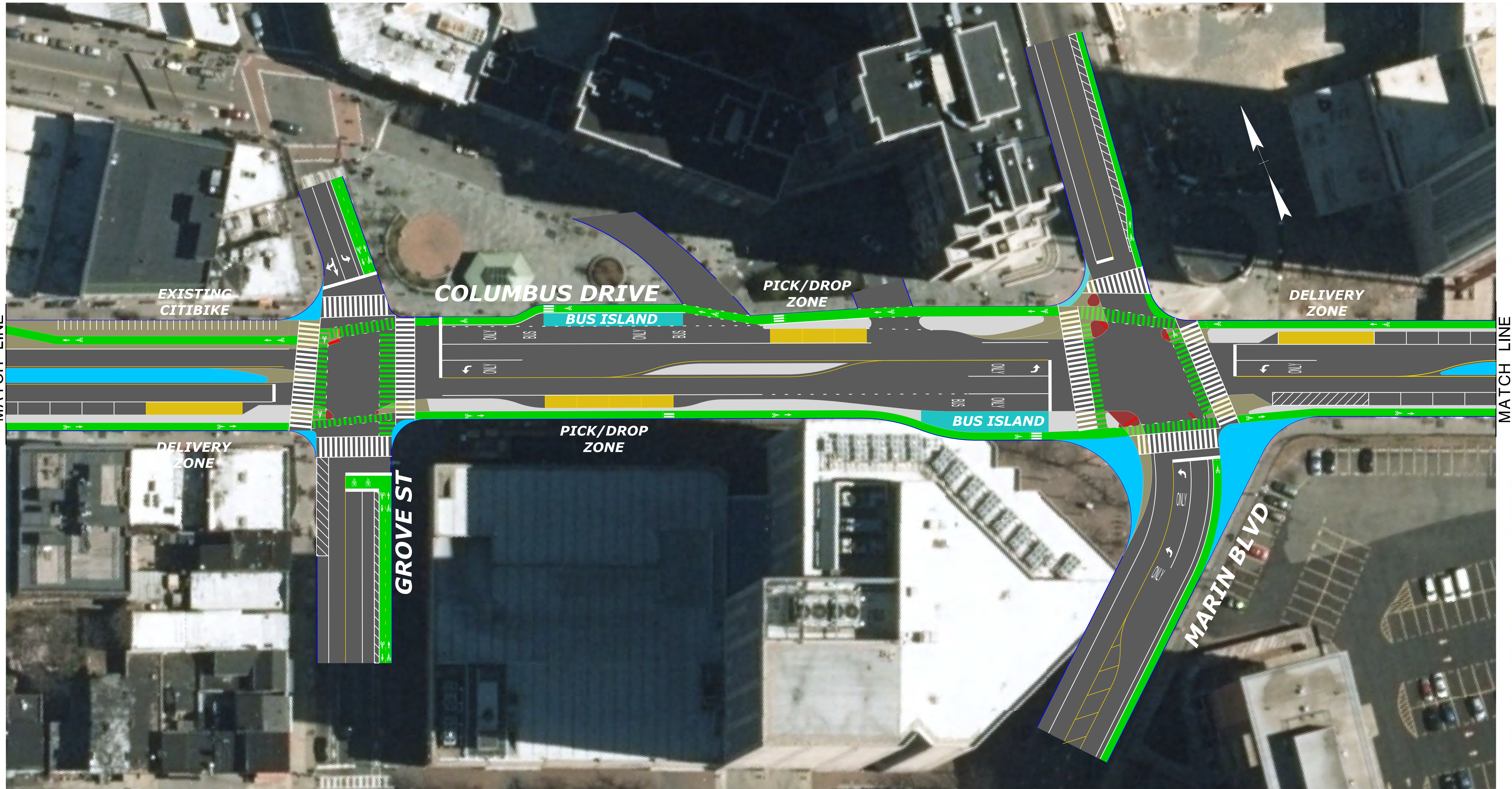
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| | SHARED BIKE LANE SYMBOL | | PAINTED BUFFER |
| | BUS ISLAND | | MOUNTABLE BUFFER |
| | NEW SIDEWALK/MEDIAN AREA | | DELIVERY OR PICK/DROP ZONE |

C-4
C-7









Concept Alternatives

Columbus Drive Corridor Study
City of Jersey City

October 2019

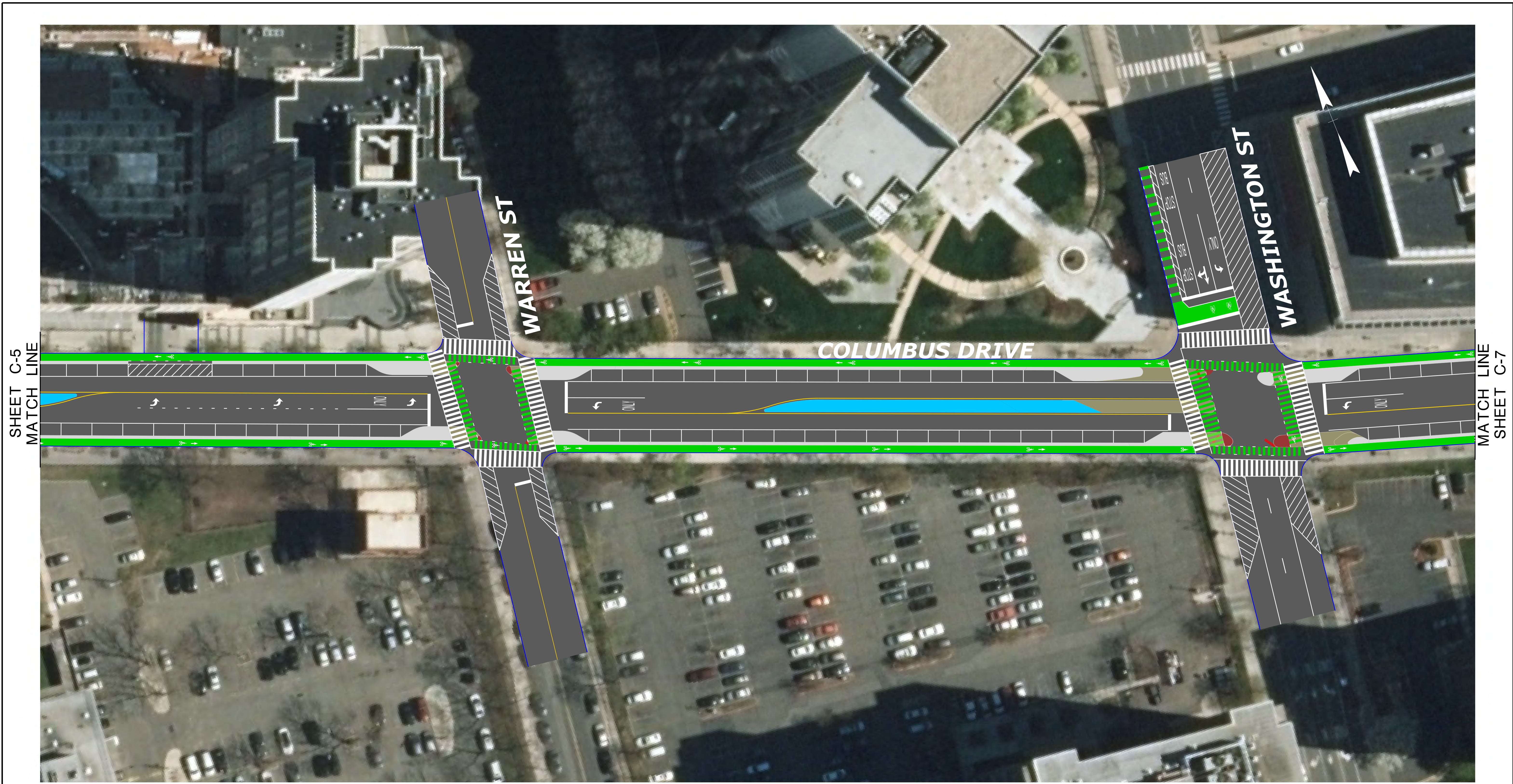


LEGEND

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|---|--------------------------|---|----------------------------|
|  | BIKE LANE SYMBOL |  | DELINEATED BUFFER |
|  | SHARED BIKE LANE SYMBOL |  | PAINTED BUFFER |
|  | BUS ISLAND |  | MOUNTABLE BUFFER |
|  | NEW SIDEWALK/MEDIAN AREA |  | DELIVERY OR PICK/DROP ZONE |

C-5
C-7

<p>Concept Alternatives Columbus Drive Corridor Study City of Jersey City</p>
<p>October 2019</p>



LEGEND

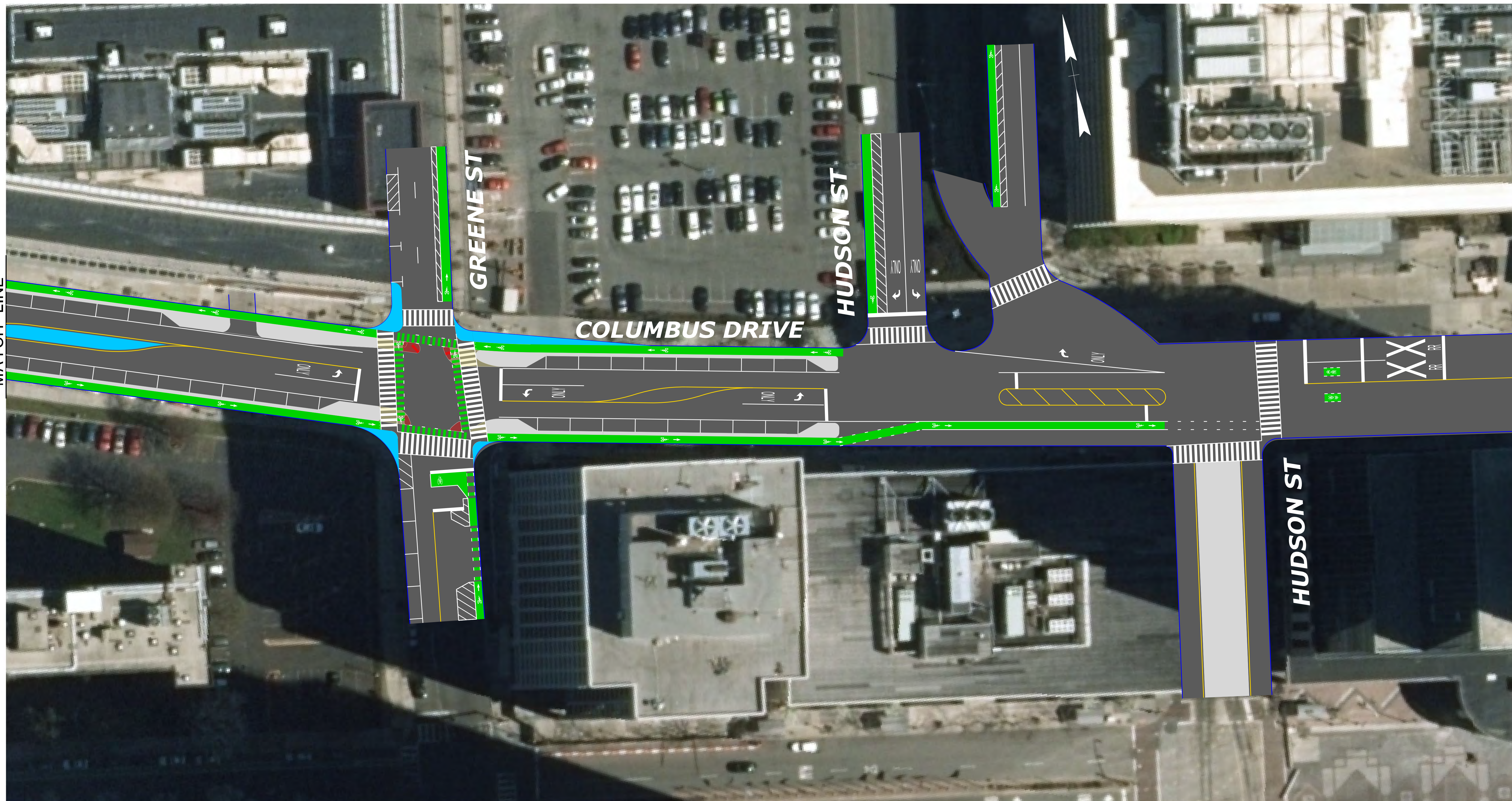
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|--|--------------------------|--|----------------------------|
| | BIKE LANE SYMBOL | | DELINEATED BUFFER |
| | SHARED BIKE LANE SYMBOL | | PAINTED BUFFER |
| | BUS ISLAND | | MOUNTABLE BUFFER |
| | NEW SIDEWALK/MEDIAN AREA | | DELIVERY OR PICK/DROP ZONE |

C-6
C-7









Concept Alternatives
Columbus Drive Corridor Study
City of Jersey City

October 2019

SHEET C-6
MATCH LINE



LEGEND

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|---|--------------------------|--|----------------------------|
|  | BIKE LANE SYMBOL |  | DELINEATED BUFFER |
|  | SHARED BIKE LANE SYMBOL |  | PAINTED BUFFER |
|  | BUS ISLAND |  | MOUNTABLE BUFFER |
|  | NEW SIDEWALK/MEDIAN AREA |  | DELIVERY OR PICK/DROP ZONE |

C-7
C-7

Concept Alternatives

Columbus Drive Corridor Study
City of Jersey City

October 2019

APPENDIX B
EXISTING PLANS AND ORDINANCE REVIEW

MEMO

TO: BARKHA PATEL
PROJECT MANAGER
JERSEY CITY DIVISION OF CITY PLANNING

FROM: MICHAEL BAKER INTERNATIONAL, INC.

SUBJECT: EXISTING PLAN AND STUDIES REVIEW

DATE: JULY 10TH, 2018

CC: NEW JERSEY DEPARTMENT OF TRANSPORTATION

The purpose of this memo is to provide a summary of initial findings related to the review of County and Municipal planning documents as well as any current studies, ordinances and/or initiatives.

PLANNING DOCUMENT REVIEW

HUDSON COUNTY

2002 HUDSON COUNTY MASTER PLAN

The 2002 Hudson County Master Plan briefly addresses the improvement of bicycle and pedestrian infrastructure when discussing the circulation objectives. The focus of the circulation section is on vehicular transportation as well as public transit options. The goals that are discussed in the 2002 Master Plan that impact bicycle and pedestrian infrastructure are as follows:

1. Encourage pedestrian/bike traffic by providing appropriate, safe and attractive facilities between population and employment centers.
2. Provide scenic walkways and bikeways along the Waterfront
3. Complete missing links in the Hudson River Waterfront Walkway and between major attractions
4. Coordinate the development and design of comprehensive and continuous walkway and bikeway facilities among the communities.

2008 HUDSON COUNTY REEXAMINATION

The Reexamination report serves as an addendum to the 2002 Hudson County Master Plan. Its main purpose is to address significant changes to assumptions, policies and objectives that formed the basis for the Master Plan in 2002. The main goals that have been established include; protecting the health, safety and welfare of residents, improvement of the overall quality of life in Hudson

County, and to preserve the character of existing well-established neighborhoods as well as other goals.

Circulation Plan Recommendations for Bicycle and Pedestrians include the following:

1. A county-wide bicycle and pedestrian study should be undertaken to identify bicycle and pedestrian improvements throughout the county.
2. Create and encourage provisions to provide secure bicycle racks at major employment centers and development nodes. Consideration should also be given to provide secure and/or indoor storage as well and shower and changing facilities for commercial and institutional uses.
3. Provide complete pedestrian and bicycle circulation throughout the site design and take into consideration of off-site generators of pedestrians and bicyclists.
4. Provide increase pedestrian visibility through lighting, improving sight lines, etc.
5. Mandate the installation of missing sidewalks and repair and widen existing sidewalks where access is necessary. Shade trees should also be included.
6. Provisions for the contribution to a sidewalk improvement fund should also be considered. Especially for those sites where off-tract improvements are needed. Shade trees should also be considered.
7. Work with NJTPA and municipalities to coordinate and educate public, planning, and zoning officials on maintaining and reestablishing strong urban design standards that incorporate reduced and shared parking requirements. Where appropriate, waivers from Residential Site improvement standards should be a permanent consideration, such as downtown and transit-oriented development districts.
8. Complete the Hudson River Waterfront Walkway
9. Complete the Hackensack River Greenway
10. Complete the Passaic River Greenway
11. Complete the Liberty-Watergap Trail
12. Complete East Cost Greenway

The reexamination report includes more goals surrounding bicycle and pedestrian planning than the original 2002 master plan. This shows the shift from vehicular traffic to a more altruistic view. The goals listed are also much more specific than those from the 2002 plan.

2016 HUDSON COUNTY MASTER PLAN RE-EXAMINATION

It was identified in the 2002 Master Plan that there were several physical barriers to bicycling throughout the county. These barriers included congested or narrow roadways, blocked routes, lack of storage areas and other issues. Since this issue was identified improvements have been made including the adoption of a county wide Complete Streets Policy in 2012 as well as new roadway design guidelines.

Updated and new goals that apply to this study include;

1. To provide a safe and efficient transportation system
 - a. Maintain the efficient movement of people with planning for safe and efficient pedestrian, bicycle, public transportation, and vehicular travel.
2. To promote alternate transportation modes including bicycling, telecommuting, transit and walking.
 - a. Continue to implement the Hudson County complete streets policy
 - b. Continue to encourage a regional bike share program

- c. Promote public access to the Hudson River waterfront walkway and pedestrian open space and circulation opportunities such as scenic walkways and bikeways along the county's waterfronts
- d. Improve pedestrian and bicyclist on-site circulation.
- e. To promote pedestrian-first approach in downtown areas

JERSEY CITY

JERSEY CITY MASTER PLAN 2000

The 2000 Master Plan has a focus on vehicular traffic and public transit, however, it does also discuss pedestrian and bicycle infrastructure. The goals surrounding this topic include, enhancement of the pedestrian environment and the encouragement of improvements that increase safety and facilitate pedestrian circulation and to promote the development and use of bicycle pathways and bike lanes on streets where possible throughout Jersey City.

In the section of the master plan focused on identifying the issues within the area it was mentioned that it is important to increase pedestrian safety in high traffic areas and frequent accident locations through traffic calming, improved signalization and speed restrictions.

At the time that this Master Plan was released Jersey City was in the process of preparing a Bicycle Plan. The plan was intended to identify key issues, address necessary improvements and provide a framework for the development of a safe and efficient bicycle and pedestrian network. The main goals of this document will be to encourage bicycle use in the city, reduce conflicts between bicycles, motor vehicles, and pedestrians and to encourage bicycle tourism. However, it appears as though this document was not completed. Below there will be information on the bicycle master plan that is currently being produced.

JERSEY CITY MASTER PLAN 2009

The circulation element of this Master plan prepares Jersey City for growth through 2050. In terms of pedestrian and bicycle related growth some of the goals listed in the circulation element include:

1. To Coordinate transportation and land use planning in a systematic and comprehensive manner
 - a. To develop and implement smart growth strategies that locate new residential development within walking distance of bus stops and passenger rail stations.
 - b. To support transit-dependent growth by creating street-level pedestrian friendly environments, providing frequent and reliable local bus service, and developing new transportation infrastructure.
2. Integrate and connect neighborhoods, and improve public access to and along waterfront areas.
 - a. Improve vehicular pedestrian and bicycle access within and between neighborhoods.
3. Create a city-wide pedestrian-friendly environment
 - a. Create a network of sidewalks, walkways and paths that allow pedestrians to walk between all neighborhoods and destinations in Jersey City.
 - b. Provide a safe and secure environment for pedestrians.

- c. Create a comfortable, aesthetically-pleasing, and visually-interesting environment for pedestrians.
- d. Support and reinforce the existing culture of walking in Jersey City
- e. Encourage walking to reduce carbon emissions and to increase public health
- f. Provide pedestrian linkages to all surrounding municipalities.

The actions listed to ensure that the goal is met include:

- 1. Adoption of a street regulating plan that regulates the form of all streets, bike lanes, where feasible, and sidewalks in accordance with the street typologies.
 - 2. Install traffic calming devices
 - 3. Installation of street trees
 - 4. Pruning of trees to remove low branches
 - 5. Increase of pedestrian safety by utilizing mechanisms, such as on-street parking, street trees, street furniture and bollards, to buffer pedestrians from moving vehicles
- 4. To create a city-wide bicycle-friendly environment
 - a. Provide a comprehensive city-wide network of dedicated bike lanes and vehicle/bike share lanes
 - b. Improve connectivity between neighborhoods for bicyclists.
 - c. Provide bicycle network linkages to all surrounding municipalities
 - d. Provide recreational bike routes through parks and open spaces, where appropriate.
 - e. Provide a robust set of bicycle system amenities to support bicycle usage.
 - f. Create a safe and secure bicycling environment
 - g. Encourage bicycling to reduce traffic congestions and carbon emissions and to improve public health.
 - 5. Create a safe and accessible environment for vehicles, pedestrians and bicyclists.

BICYCLE MASTER PLAN

The Jersey City Bicycle Master Plan is still in its planning process. Information about the steps being taken and how the public can get involved can be found on letsridejc.com. Over the next 11 months, the City of Jersey City and its consultant team will be evaluating how the City can better support biking for people of all ages and abilities.

PEDESTRIAN ENHANCEMENT PLAN

The Pedestrian Enhancement Plan Final Report Draft was released in May of 2018. This plan prioritizes the pedestrian experience through improvements to safety and aesthetics, and to promote placemaking. Recommendations that were made in this plan that are relevant to the Columbus drive study include:

- 1. No right turns on red
- 2. Crosswalk markings should be located at all signalized intersections and should be put on a maintenance schedule for regular inspection and touch-ups
- 3. Upgrading of all crossings to be ADA complaint should continue, and it is further recommended that regular inspections and maintenance be conducted.

4. Trash receptacles should be placed on each corner in any high-traffic pedestrian areas and elsewhere as determined by the city.
5. The development of a sidewalk maintenance program.
6. The development of a curbside management program and guidelines.
7. Implementation of street tree guidelines.

COMPLETE STREET INITIATIVE

Jersey City adopted an Complete Streets policy back in 2011. Prior to this policy's adoption Jersey City had no dedicated bike lanes. Since then the city has been working toward implementing it wherever possible. The policy calls for roadways that enable safe and convenient access for all users of the roadways.

GRAND STREET STUDY

Grand Street which runs parallel to Columbus Drive is undergoing a similar study. There are currently four alternatives being considered for redevelopment of this roadway. Throughout all four alternatives the pedestrian facilities improvements remain the same, 62 curb extensions with shorter crosswalks, lead pedestrian intervals, new signalized pedestrian crossing at the Hospital. The Bicycles Facilities change with each alternative.

ALTERNATIVE 1: BUFFERED DIRECTIONAL BIKE LANES

ALTERNATIVE 2: TWO-WAY CYCLE TRACK FOR THE WHOLE CORRIDOR

ALTERNATIVE 3: BUFFERED DIRECTIONAL LANES, EB LANE DIVERTED TO YORK ST.

ALTERNATIVE 4: SHARED-USE PATH ON WEST END. DIRECTIONAL BIKE LANES ON EAST END WITH EB LANE DIVERTED TO YORK ST.

Considering the development that may be occurring on street surround Columbus is important because it is preferable for the bike and pedestrian facilities developed to be cohesive.

MONTGOMERY STREET CORRIDOR

Montgomery Street Corridor, like Grand Street runs parallel to Columbus Drive and is undergoing a redevelopment study. The goal of the project is to more safely and efficiently accommodate all road users. Public meetings will be held through the Summer of 2018.

SCHOOL TRAVEL PLAN

The City of Jersey City is working with a consultant team to create a district-wide School Travel Plan. Some of the area involved with the School Travel plan may crossover with the project area for the Columbus Drive study. The main goal of this plan is to increase and improve pedestrian and bicycle travel to and from the area schools.

“VISION ZERO” INITIATIVE

The Mayor of Jersey City, Steven M. Fulop signed an executive order adopting the “Vision Zero” initiative. The guiding principle behind “Vision Zero” maintains that deaths and injuries caused by traffic crashes should be treated as a public health problem which can be eliminated through better planning practices.

APPENDIX C
CRASH DIAGRAMS



LEGEND

- | | | | | | |
|------|--------------------------------------|----|--------------|----|-----------------------|
| ←←← | SAME DIRECTION-REAR END | E← | ENCROACHMENT | A← | ANIMAL |
| ←←← | SAME DIRECTION-SIDE SWIPE | B← | PEDALCYCLIST | ☒← | NON-FIXED OBJECT |
| ↶↷ | LEFT TURN/U-TURN | □← | FIXED OBJECT | P← | PEDESTRIAN |
| ←↶↷ | OPPOSITE DIRECTION - SIDE SWIPE | ↶↷ | BACKING | ☐← | STRUCK PARKED VEHICLE |
| ↶↷↶↷ | OPPOSITE DIRECTION - HEAD ON/ANGULAR | ⊥ | RIGHT ANGLE | ○← | OTHER |



(X) NUMBER OF CRASHES

Source: NJDOT, Crash Records, 2015-2017

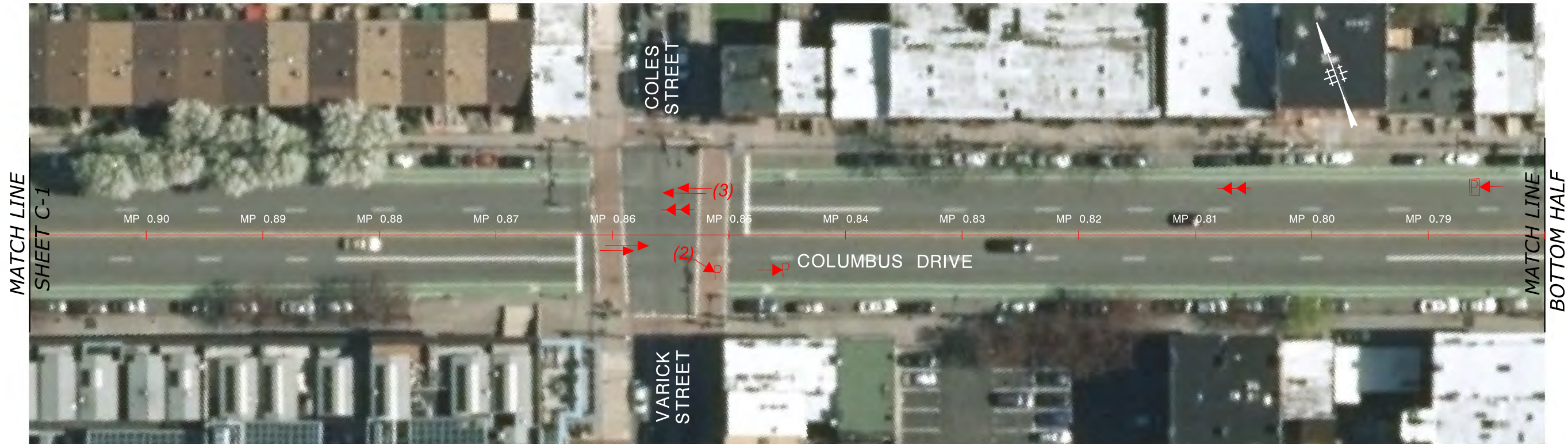
Crash Locations (2015-2017)

Columbus Drive Corridor Local Technical Assistance

Location	Columbus Drive, Jersey City, NJ
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	October 2019	
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C-1
C-5



LEGEND

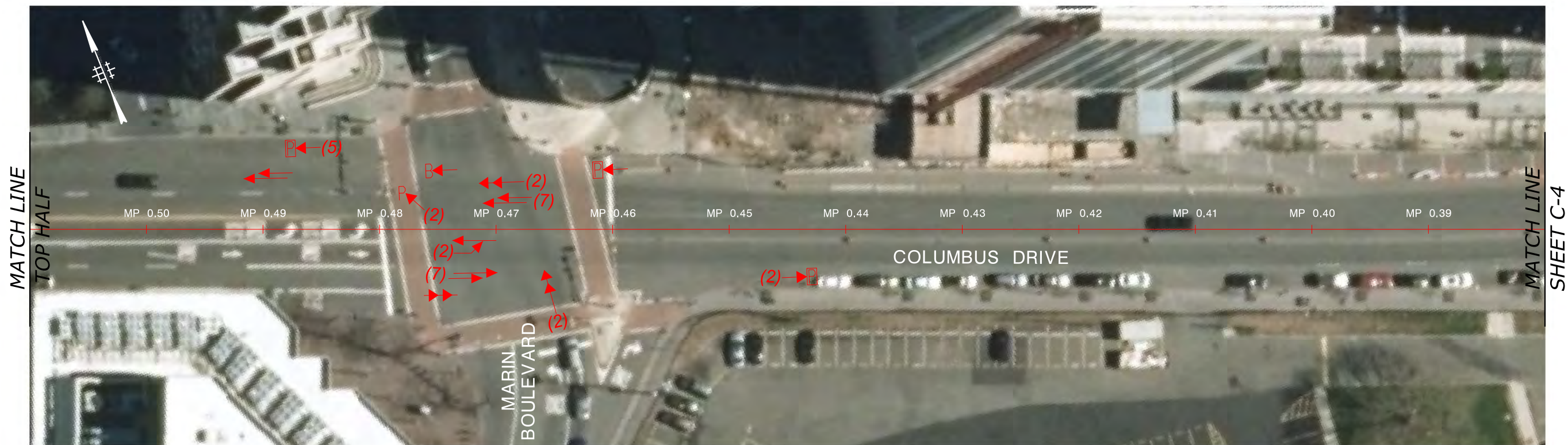
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|--|--------------------------------------|--|--------------|--|-----------------------|
| | SAME DIRECTION-REAR END | | ENCROACHMENT | | ANIMAL |
| | SAME DIRECTION-SIDE SWIPE | | PEDALCYCLIST | | NON-FIXED OBJECT |
| | LEFT TURN/U-TURN | | FIXED OBJECT | | PEDESTRIAN |
| | OPPOSITE DIRECTION - SIDE SWIPE | | BACKING | | STRUCK PARKED VEHICLE |
| | OPPOSITE DIRECTION - HEAD ON/ANGULAR | | RIGHT ANGLE | | OTHER |

(X) NUMBER OF CRASHES

Source: NJDOT, Crash Records, 2015-2017

C-2
C-5

Crash Locations (2015-2017)	
Columbus Drive Corridor Local Technical Assistance	
Location	Columbus Drive, Jersey City, NJ
	October 2019





LEGEND

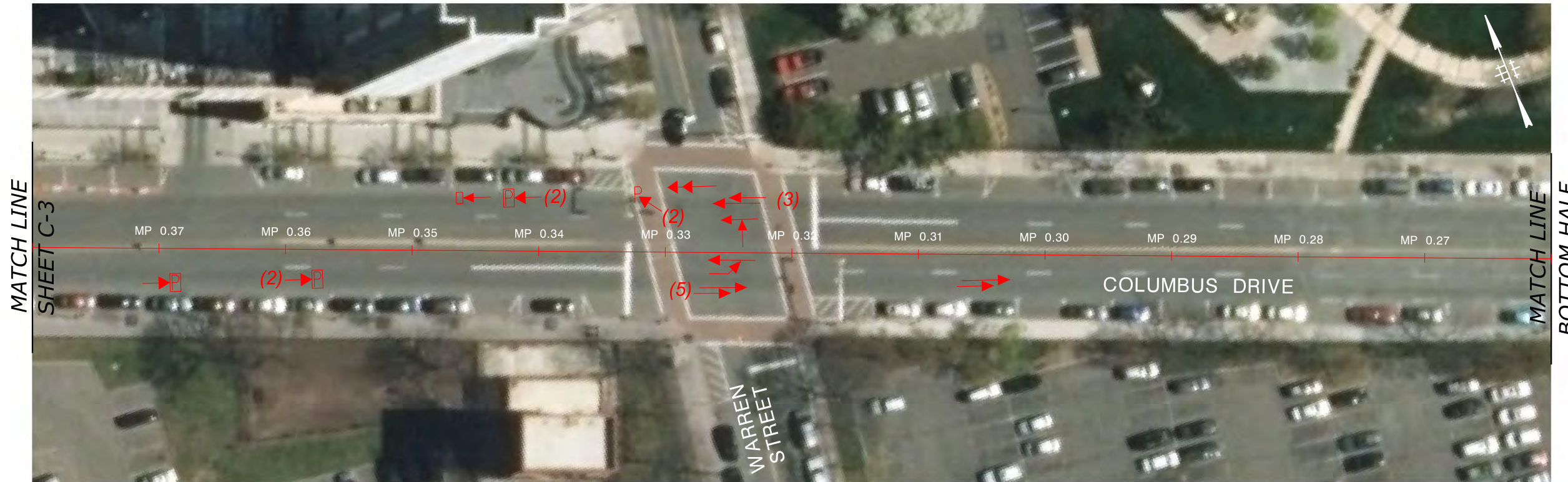
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|--------|--------------------------------------|-------|--------------|-------|-----------------------|
| ←← (2) | SAME DIRECTION-REAR END | ⊞ (2) | ENCROACHMENT | ⊠ (2) | ANIMAL |
| ←← (2) | SAME DIRECTION-SIDE SWIPE | ⊞ (2) | PEDALCYCLIST | ⊞ (2) | NON-FIXED OBJECT |
| ↔ (2) | LEFT TURN/U-TURN | ⊞ (2) | FIXED OBJECT | ⊞ (2) | PEDESTRIAN |
| ↔ (2) | OPPOSITE DIRECTION - SIDE SWIPE | ↔ (2) | BACKING | ⊞ (2) | STRUCK PARKED VEHICLE |
| ↔ (2) | OPPOSITE DIRECTION - HEAD ON/ANGULAR | ⊞ (2) | RIGHT ANGLE | ⊞ (2) | OTHER |

(X) NUMBER OF CRASHES

Source: NJDOT, Crash Records, 2015-2017

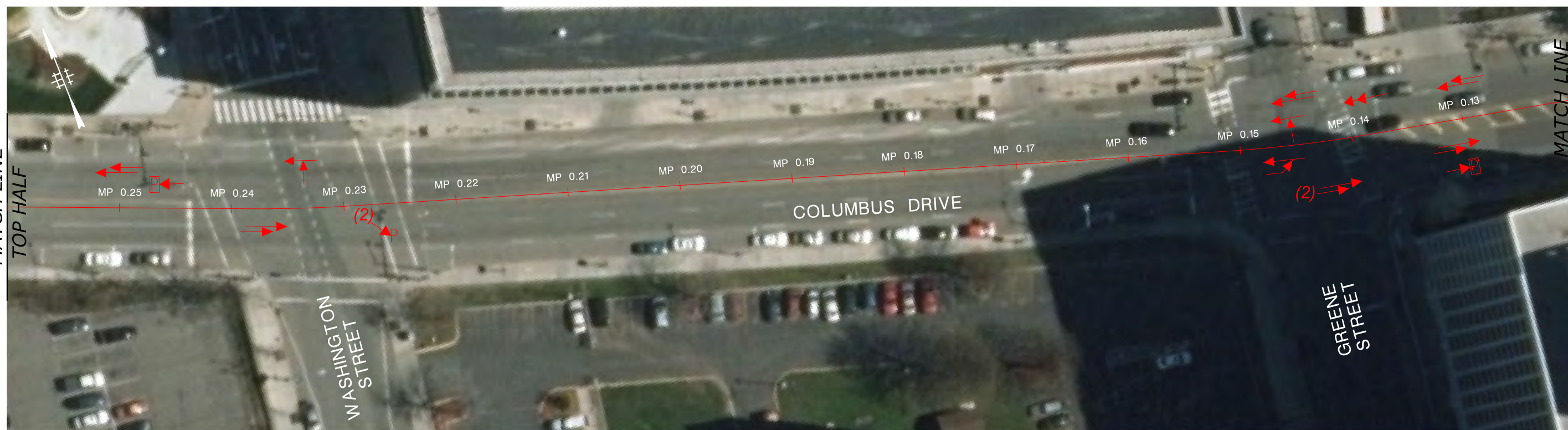
C-3
C-5

Crash Locations (2015-2017)	
Columbus Drive Corridor Local Technical Assistance	
Location	Columbus Drive, Jersey City, NJ
	October 2019 



MATCH LINE
SHEET C-3

MATCH LINE
BOTTOM HALF



MATCH LINE
TOP HALF

MATCH LINE
SHEET C-5

LEGEND

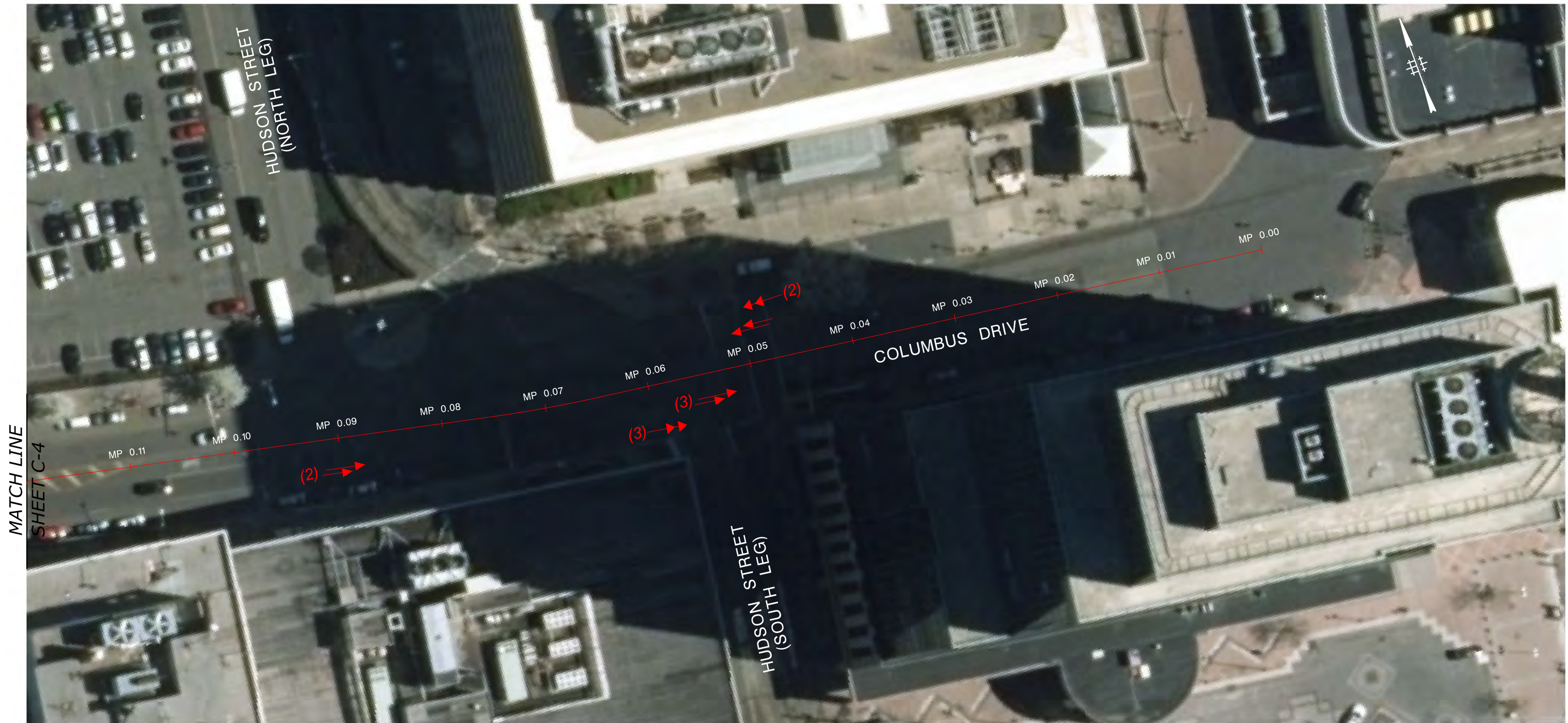
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| ←← | SAME DIRECTION-SIDE SWIPE | ⊞← | PEDALCYCLIST | ⊞← | NON-FIXED OBJECT |
| ↶↷ | LEFT TURN/U-TURN | ⊞← | FIXED OBJECT | ⊞← | PEDESTRIAN |
| ↶↷ | OPPOSITE DIRECTION - SIDE SWIPE | ↶↷ | BACKING | ⊞← | STRUCK PARKED VEHICLE |
| ↶↷ | OPPOSITE DIRECTION - HEAD ON/ANGULAR | ⊞↑ | RIGHT ANGLE | ⊞← | OTHER |

(X) NUMBER OF CRASHES

Source: NJDOT, Crash Records, 2015-2017

C-4
C-5

Crash Locations (2015-2017)	
Columbus Drive Corridor Local Technical Assistance	
Location	Columbus Drive, Jersey City, NJ
	October 2019



LEGEND

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|----|--------------------------------------|----|--------------|----|-----------------------|
| ←← | SAME DIRECTION-REAR END | ⊞← | ENCROACHMENT | ⊞← | ANIMAL |
| ←→ | SAME DIRECTION-SIDE SWIPE | ⊞← | PEDALCYCLIST | ⊞← | NON-FIXED OBJECT |
| ↶↷ | LEFT TURN/U-TURN | ⊞← | FIXED OBJECT | ⊞← | PEDESTRIAN |
| ↷↶ | OPPOSITE DIRECTION - SIDE SWIPE | ↶↷ | BACKING | ⊞← | STRUCK PARKED VEHICLE |
| ↘↙ | OPPOSITE DIRECTION - HEAD ON/ANGULAR | ⊞↑ | RIGHT ANGLE | ⊞← | OTHER |

(X) NUMBER OF CRASHES

Source: NJDOT, Crash Records, 2015-2017

C-5
C-5

Crash Locations (2015-2017)	
Columbus Drive Corridor Local Technical Assistance	
Location	Columbus Drive, Jersey City, NJ
	October 2019

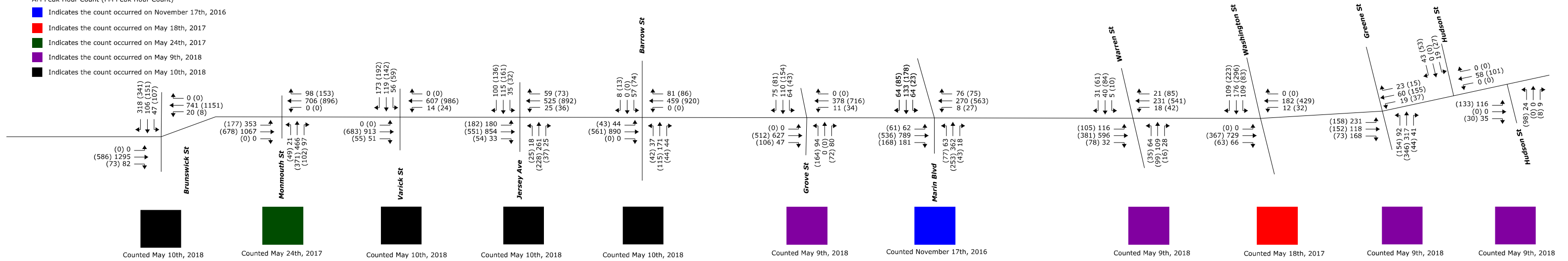
APPENDIX D
TRAFFIC COUNTS &
SIGNAL TIMING

Columbus Drive Turning Movement Counts

LEGEND

AM Peak Hour Count (PM Peak Hour Count)

- Indicates the count occurred on November 17th, 2016
- Indicates the count occurred on May 18th, 2017
- Indicates the count occurred on May 24th, 2017
- Indicates the count occurred on May 9th, 2018
- Indicates the count occurred on May 10th, 2018





Start Date: 5/10/2018
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	12	14	34	1	60	5	112	0	0	117	0	0	0	7	0	1	238	10	3	249
07:15 AM	21	38	53	1	112	6	147	1	5	154	0	0	0	2	0	0	312	20	3	332
07:30 AM	7	28	55	3	90	5	148	0	4	153	0	0	0	7	0	0	254	20	9	274
07:45 AM	8	34	81	0	123	3	166	0	3	169	0	0	0	6	0	0	289	20	33	309
08:00 AM	15	32	82	0	129	6	195	0	5	201	0	0	0	5	0	0	359	25	38	384
08:15 AM	9	22	74	1	105	9	200	0	11	209	0	0	0	7	0	0	318	21	106	339
08:30 AM	15	18	81	2	114	2	180	0	11	182	0	0	0	9	0	0	329	16	48	345
08:45 AM	11	14	40	1	65	4	131	0	3	135	0	0	0	0	0	0	323	25	20	348
02:30 PM	13	52	58	1	123	2	190	0	4	192	0	0	0	1	0	0	77	9	14	86
02:45 PM	8	45	95	0	148	3	229	0	0	232	0	0	0	2	0	0	74	9	32	83
03:00 PM	13	36	90	0	139	7	209	0	5	216	0	0	0	15	0	0	81	12	167	93
03:15 PM	14	52	92	0	158	7	282	0	2	289	0	0	0	3	0	0	103	10	37	113
03:30 PM	13	35	68	0	116	0	275	0	1	275	0	0	0	0	0	0	93	12	16	105
03:45 PM	26	32	72	1	130	6	209	0	6	215	0	0	0	1	0	0	97	9	8	106
04:00 PM	21	35	71	1	127	5	250	0	5	255	0	0	0	5	0	0	98	9	11	107
04:15 PM	20	35	71	0	126	3	275	0	7	278	0	0	0	2	0	0	101	6	13	107
04:30 PM	18	27	69	0	114	1	248	0	1	249	0	0	0	8	0	0	126	11	7	137
04:45 PM	16	54	79	2	149	0	352	0	12	352	0	0	1	4	1	0	177	9	3	186
05:00 PM	28	53	72	0	153	2	269	0	3	271	0	0	0	2	0	0	164	17	7	181
05:15 PM	28	32	115	1	175	0	345	0	1	345	0	0	0	0	0	0	152	24	9	176
05:30 PM	22	32	89	0	143	5	296	0	2	301	0	0	0	5	0	0	142	19	4	161
05:45 PM	29	34	65	0	128	1	241	0	3	242	0	0	0	0	0	0	128	13	8	141
06:00 PM	17	34	84	0	135	3	209	0	6	212	0	1	0	4	1	0	173	21	4	194
06:15 PM	21	32	54	0	107	3	175	0	5	178	0	0	0	2	0	0	188	18	7	206



Start Date: 5/24/2017
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	0	0	0	0	0	0	133	25	0	158	6	86	13	0	105	113	300	0	0	413
07:15 AM	0	0	0	0	0	0	145	15	0	160	7	99	22	0	128	108	264	0	0	372
07:30 AM	0	0	0	0	0	0	175	23	0	198	8	113	16	0	137	115	282	0	0	397
07:45 AM	0	0	0	0	0	0	185	22	0	207	4	112	28	0	144	109	270	0	0	379
08:00 AM	0	0	0	0	0	0	203	26	0	229	6	117	18	0	141	70	252	0	0	322
08:15 AM	0	0	0	0	0	0	155	26	0	181	5	113	24	0	142	95	288	0	0	383
08:30 AM	0	0	0	0	0	0	163	24	0	187	6	124	27	0	157	79	257	1	0	337
08:45 AM	0	0	0	0	0	0	132	20	0	152	4	117	38	0	159	90	224	0	0	314
04:00 PM	0	0	0	0	0	0	204	36	0	240	6	106	25	0	137	32	81	0	0	113
04:15 PM	0	0	0	0	0	0	197	30	0	227	9	111	22	0	142	50	82	0	0	132
04:30 PM	0	0	0	0	0	0	207	39	0	246	3	101	26	0	130	48	105	0	0	153
04:45 PM	0	0	0	0	0	0	209	49	0	258	5	105	22	0	132	44	114	0	0	158
05:00 PM	0	0	0	0	0	0	255	45	0	300	9	112	20	0	141	65	150	0	0	215
05:15 PM	0	0	0	0	0	0	243	42	0	285	11	74	21	0	106	36	191	0	0	227
05:30 PM	0	0	0	0	0	0	201	38	0	239	11	95	30	0	136	30	190	0	0	220
05:45 PM	0	0	0	0	0	0	197	28	0	225	18	90	31	0	139	46	147	0	0	193



Start Date: 5/10/2018
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	29	22	34	7	85	4	109	0	2	113	0	0	0	10	0	0	210	7	2	217
07:15 AM	13	20	35	2	68	1	120	0	7	121	0	0	0	10	0	0	265	5	1	270
07:30 AM	30	24	29	7	83	5	135	0	8	140	0	0	0	23	0	0	221	8	7	229
07:45 AM	17	29	37	2	83	5	164	0	6	169	0	0	0	22	0	4	221	12	4	237
08:00 AM	19	22	49	12	90	2	131	0	13	133	0	0	0	43	0	0	227	17	7	244
08:15 AM	8	32	51	10	91	2	150	0	25	152	0	0	0	25	0	0	223	15	11	238
08:30 AM	12	36	36	8	84	5	162	0	12	167	0	0	0	30	0	0	242	7	10	249
08:45 AM	20	35	47	15	102	3	108	0	12	111	0	0	0	29	0	0	254	10	10	264
02:30 PM	20	35	36	8	91	2	174	0	8	176	0	0	0	9	0	0	85	7	4	92
02:45 PM	14	28	37	3	79	5	191	0	49	196	0	0	0	15	0	0	100	9	11	109
03:00 PM	15	36	43	3	94	3	183	0	9	186	0	0	0	12	0	0	109	11	9	120
03:15 PM	12	29	52	6	93	2	201	0	15	203	0	0	0	26	0	0	96	9	11	105
03:30 PM	19	25	50	9	94	7	196	0	8	203	0	0	0	9	0	0	105	7	17	112
03:45 PM	11	34	44	5	89	2	175	0	14	177	0	0	0	11	0	0	105	12	4	117
04:00 PM	17	29	41	15	87	12	202	1	6	215	0	0	0	17	0	0	120	12	11	132
04:15 PM	11	29	41	6	81	3	228	0	14	231	0	0	0	18	0	0	158	14	12	172
04:30 PM	22	31	46	3	99	2	208	0	11	210	0	0	0	9	0	0	134	16	6	150
04:45 PM	16	40	48	7	104	7	208	0	10	215	0	0	0	9	0	0	154	13	7	167
05:00 PM	11	35	45	5	91	4	238	0	15	242	0	0	0	24	0	0	168	18	6	186
05:15 PM	17	37	46	10	100	8	261	0	10	269	0	0	0	21	0	0	164	14	9	178
05:30 PM	12	30	46	4	88	5	244	0	10	249	0	0	1	25	1	1	180	11	9	192
05:45 PM	19	40	55	5	114	7	243	1	18	251	0	0	2	41	2	1	171	12	10	184
06:00 PM	22	35	45	9	102	11	234	0	13	245	0	0	0	32	0	0	163	12	17	175
06:15 PM	17	34	37	20	88	8	244	0	16	252	0	0	0	40	0	0	200	11	23	211



Start Date: 5/10/2018
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	5	24	15	8	44	6	98	13	7	117	3	50	6	24	59	67	176	9	8	252
07:15 AM	7	24	18	18	49	6	101	15	14	122	6	64	5	29	75	58	215	3	19	276
07:30 AM	8	29	17	16	54	6	117	16	7	139	7	72	7	37	86	53	205	12	17	270
07:45 AM	7	30	24	9	61	4	128	16	16	148	2	61	5	47	68	42	213	11	12	266
08:00 AM	7	30	25	11	62	6	128	15	21	149	5	67	7	62	79	43	222	10	29	275
08:15 AM	11	29	26	25	66	8	126	8	28	142	3	69	5	70	77	42	205	8	39	255
08:30 AM	10	26	25	16	61	7	143	20	21	170	8	64	8	57	80	53	214	4	24	271
08:45 AM	8	27	17	26	52	4	92	15	32	111	0	56	11	54	67	48	225	9	28	282
02:30 PM	17	27	20	14	64	4	155	18	33	177	5	40	6	14	51	14	81	14	14	109
02:45 PM	9	29	31	20	69	7	149	17	42	173	5	54	11	16	70	13	99	11	51	123
03:00 PM	11	50	23	16	84	7	156	24	18	187	8	63	4	12	75	22	89	9	42	120
03:15 PM	7	40	31	13	78	7	167	24	39	198	6	47	11	33	64	23	80	10	40	113
03:30 PM	4	38	35	11	77	7	159	17	36	183	8	69	7	16	84	15	93	11	26	119
03:45 PM	5	35	26	14	66	11	150	17	33	178	6	61	9	18	76	17	90	11	17	118
04:00 PM	13	34	24	12	71	8	182	21	15	211	11	54	10	24	75	19	110	10	43	139
04:15 PM	5	31	35	12	71	9	195	23	27	227	7	60	10	21	77	39	122	10	17	171
04:30 PM	12	38	22	10	72	8	190	17	35	215	2	69	9	18	80	23	118	18	26	159
04:45 PM	10	47	21	17	78	7	191	19	33	217	8	62	10	15	80	45	121	18	25	184
05:00 PM	7	36	41	23	84	7	209	17	39	233	7	54	7	27	68	38	128	6	41	172
05:15 PM	8	46	34	13	88	12	233	17	45	262	5	56	10	33	71	52	145	12	22	209
05:30 PM	10	48	26	27	84	11	232	17	62	260	9	62	13	35	84	49	145	12	32	206
05:45 PM	7	31	35	15	73	6	218	22	51	246	4	56	7	40	67	43	133	24	23	200
06:00 PM	10	39	35	31	84	17	197	18	49	232	6	44	8	28	58	45	154	25	34	224
06:15 PM	9	34	30	31	73	12	206	22	57	240	6	50	13	53	69	46	169	14	50	229



Start Date:	5/10/2018
Start Time:	7:00:00 AM

Note: The cells highlighted in red were missing data. They were estimated by averaging the volumes in each of the previous 4 15-minute periods.

Start Time	From North					From East					From South					From West					
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	
07:00 AM	11	0	1	6	12	0	77	15	5	92	6	24	5	16	35	8	181	0	4	189	
07:15 AM	14	0	3	9	17	0	88	19	3	107	4	29	7	14	40	8	230	0	5	238	
07:30 AM	23	0	2	8	25	0	119	12	12	131	2	28	5	15	35	13	210	0	4	223	
07:45 AM	16	0	2	11	18	0	106	23	6	129	6	51	13	37	70	21	214	0	11	235	
08:00 AM	19	0	1	24	20	0	103	16	3	119	12	37	9	52	58	7	232	0	11	239	
08:15 AM	10	0	5	27	15	0	118	23	12	141	8	46	13	35	67	7	229	0	11	236	
08:30 AM	12	0	0	15	12	1	132	19	19	152	11	37	9	49	57	9	215	0	7	224	
08:45 AM	17	0	2	16	19	0	94	12	11	106	7	22	15	49	44	8	234	0	10	242	
02:30 PM	7	0	7	9	14	0	126	8	8	134	4	17	5	0	26	6	93	0	7	99	
02:45 PM	7	0	2	15	9	1	158	4	12	163	13	36	3	9	52	3	109	0	17	112	
03:00 PM	0	0	0	14	0	0	116	3	5	119	7	30	13	7	50	6	92	0	12	98	
03:15 PM	7	0	2	6	9	0	135	16	7	151	11	20	9	4	40	9	89	0	16	98	
03:30 PM	6	0	6	10	12	0	141	16	8	157	4	23	9	1	36	8	99	0	11	107	
03:45 PM	16	0	2	9	18	0	131	13	8	144	4	19	8	1	31	6	102	0	13	108	
04:00 PM	8	0	1	3	9	0	161	22	13	183	6	30	6	12	42	5	130	0	27	135	
04:15 PM	17	0	3	14	20	0	171	27	18	198	2	38	13	2	53	9	127	1	17	137	
04:30 PM	16	0	4	1	20	0	157	19	4	176	7	19	15	3	41	12	123	0	17	135	
04:45 PM	13	0	3	13	16	0	179	25	14	204	9	38	10	7	57	4	131	0	22	135	
05:00 PM	29	0	2	22	31	0	222	32	19	254	7	20	15	3	42	4	127	0	33	131	
05:15 PM	14	0	3	9	17	0	235	21	11	256	11	36	15	9	62	12	151	1	21	164	
05:30 PM	14	0	2	20	16	1	236	17	6	254	12	26	8	7	46	13	160	0	36	173	
05:45 PM	17	0	6	9	23	0	227	16	9	243	12	33	6	8	51	14	123	0	28	137	
06:00 PM	10	0	4	6	14	0	195	5	12	200	18	27	10	8	55	16	153	0	36	169	
6:15 PM	15	0	3	23	18		0.25	223.25	14.75	9.5	238.3	13.25	30.5	9.75	8	53.5	8	175	0	25	183



Start Date: 5/9/2018

Start Time: 7:00:00 AM

Note: The cells highlighted in red were missing data. They were estimated by averaging the volumes in each of the

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	13	24	11	51	48	2	89	0	36	91	21	0	15	69	36	0	171	7	45	178
07:15 AM	12	27	18	61	57	3	120	0	46	123	20	0	27	113	47	0	160	16	44	176
07:30 AM	16	42	17	68	75	4	89	0	60	93	20	0	17	91	37	0	173	9	42	182
07:45 AM	16	30	16	60	62	3	99	0	46	102	23	0	21	76	44	0	170	12	45	182
08:00 AM	13	28	14	86	55	3	98	0	56	101	23	0	11	175	34	0	150	9	40	159
08:15 AM	13	23	26	90	62	2	86	2	76	90	31	1	27	147	59	0	174	15	42	189
08:30 AM	22	29	19	77	70	3	95	0	36	98	17	0	21	126	38	0	133	11	51	144
08:45 AM	12	35	15	57	62	5	83	1	75	89	23	0	36	159	59	0	167	18	63	185
02:30 PM	12	42	26	35	80	7	122	0	70	129	26	0	20	38	46	0	66	12	73	78
02:45 PM	10	48	20	36	78	6	106	0	47	112	14	0	14	40	28	0	77	16	68	93
03:00 PM	13	42	24	36	79	7	141	0	67	148	29	0	18	39	47	0	60	17	75	77
03:15 PM	7	50	24	41	81	5	142	0	68	147	33	0	6	55	39	0	70	17	110	87
03:30 PM	7	39	21	43	67	4	132	0	44	136	20	0	31	43	51	0	85	21	75	106
03:45 PM	11	35	29	53	75	5	126	0	63	131	19	0	25	65	44	0	67	26	96	93
04:00 PM	10	41	22	35	73	2	167	1	66	170	41	0	8	78	49	0	84	19	75	103
04:15 PM	7	37	24	46	68	4	169	0	54	173	31	0	12	52	43	0	102	10	98	112
04:30 PM	8	38	17	51	63	5	173	0	50	178	30	0	18	44	48	0	122	20	67	142
04:45 PM	18	30	13	57	61	9	182	2	90	193	19	0	18	43	37	0	129	26	110	155
05:00 PM	11	48	18	55	77	6	189	0	90	195	39	0	17	62	56	0	87	36	84	123
05:15 PM	10	28	22	63	60	11	180	0	100	191	50	0	12	60	62	0	160	16	105	176
05:30 PM	15	30	24	51	69	10	174	0	118	184	40	0	19	86	59	0	161	22	100	183
05:45 PM	7	48	17	48	72	7	173	0	118	180	35	0	24	114	59	0	104	32	130	136
06:00 PM	8	38	14	68	60	2	206	1	151	209	27	0	14	82	41	0	122	40	106	162
06:15 PM	6	42	19	87	67	4	168	10	130	182	38	0	17.25	85.5	55.3	0	136.8	27.5	110.3	164.3



Start Date: 11/17/2016
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	9	26	17	0	52	2	70	1	0	73	15	109	9	0	133	19	199	34	0	252
07:15 AM	7	21	13	0	41	1	64	9	0	74	21	85	12	0	118	16	169	35	0	220
07:30 AM	10	26	25	0	61	2	70	11	0	83	13	89	5	0	107	16	202	48	0	266
07:45 AM	17	26	16	0	59	2	61	16	0	79	23	88	5	0	116	12	196	52	0	260
08:00 AM	13	33	9	0	55	1	76	16	0	93	19	88	1	0	108	19	179	51	0	249
08:15 AM	11	32	24	0	67	1	66	18	0	85	9	86	4	0	99	12	210	39	0	261
08:30 AM	23	42	15	0	80	4	67	26	0	97	12	100	8	0	120	19	204	39	0	262
08:45 AM	22	36	22	0	80	5	67	21	0	93	21	81	15	0	117	15	228	41	0	284
04:00 PM	4	45	32	0	81	4	111	36	0	151	15	89	9	0	113	7	90	25	0	122
04:15 PM	3	50	30	0	83	4	127	53	0	184	21	86	10	0	117	14	84	30	0	128
04:30 PM	11	50	31	0	92	7	139	35	0	181	15	84	11	0	110	21	98	30	0	149
04:45 PM	10	54	18	0	82	5	136	40	0	181	20	87	5	0	112	12	127	19	0	158
05:00 PM	9	35	29	0	73	5	139	19	0	163	24	70	7	0	101	7	135	42	0	184
05:15 PM	7	53	21	0	81	9	166	13	0	188	22	66	9	0	97	17	130	39	0	186
05:30 PM	4	46	17	0	67	6	129	21	0	156	14	47	12	0	73	21	132	43	0	196
05:45 PM	3	44	18	0	65	7	129	22	0	158	17	70	15	0	102	16	139	44	0	199



Start Date: 5/9/2018
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	0	5	4	27	9	1	58	4	4	63	9	19	6	9	34	25	122	8	43	155
07:15 AM	0	6	12	48	18	1	59	2	6	62	8	11	9	14	28	28	153	9	24	190
07:30 AM	2	5	4	45	11	0	51	1	6	52	15	15	11	13	41	22	144	8	37	174
07:45 AM	1	10	6	66	17	4	56	1	13	61	14	18	11	14	43	26	138	11	46	175
08:00 AM	1	15	7	67	23	9	61	7	12	77	17	23	6	28	46	33	143	4	86	180
08:15 AM	2	9	11	75	22	3	57	5	17	65	11	32	7	29	50	22	144	13	83	179
08:30 AM	1	6	7	85	14	2	57	8	17	67	22	36	4	33	62	35	171	4	80	210
08:45 AM	0	5	13	73	18	1	45	3	15	49	11	22	12	44	45	36	154	8	53	198
02:30 PM	2	13	14	40	29	3	92	4	17	99	9	11	3	18	23	12	72	8	23	92
02:45 PM	1	4	12	49	17	3	75	7	17	85	8	17	3	30	28	19	69	10	39	98
03:00 PM	0	17	13	57	30	5	87	9	12	101	13	27	4	12	44	22	63	9	51	94
03:15 PM	3	14	12	36	29	5	105	9	7	119	11	24	6	25	41	20	56	15	30	91
03:30 PM	1	10	14	69	25	0	76	7	16	83	8	24	1	17	33	20	80	12	29	112
03:45 PM	0	13	13	46	26	1	91	6	13	98	10	16	4	19	30	11	60	8	26	79
04:00 PM	3	20	10	59	33	2	120	10	19	132	10	22	2	16	34	22	65	9	24	96
04:15 PM	1	17	7	52	25	5	133	6	20	144	14	20	3	17	37	18	74	13	29	105
04:30 PM	1	14	19	63	34	2	161	14	21	177	19	23	2	16	44	23	87	16	19	126
04:45 PM	3	18	22	49	43	6	114	8	11	128	11	21	3	18	35	27	97	17	32	141
05:00 PM	0	13	12	95	25	12	150	23	9	185	7	25	4	31	36	16	89	17	29	122
05:15 PM	5	28	27	79	60	11	123	16	19	150	8	28	8	47	44	35	99	18	40	152
05:30 PM	3	26	14	115	43	11	140	20	19	171	9	27	2	39	38	25	100	25	48	150
05:45 PM	2	17	8	111	27	8	128	26	47	162	11	19	2	40	32	29	93	18	65	140
06:00 PM	7	22	9	114	38	4	124	12	30	140	8	25	4	32	37	30	94	23	53	147
06:15 PM	3	25	11	73	39	4	98	8	29	110	9	17	2	32	28	27	76	6	88	109



Start Date: 5/18/2017
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	15	23	18	0	56	0	31	0	0	31	0	1	0	0	1	0	129	12	0	141
07:15 AM	12	22	19	0	53	0	47	0	0	47	0	0	0	0	0	0	136	14	0	150
07:30 AM	17	30	21	0	68	3	35	0	0	38	0	0	0	0	0	0	153	12	0	165
07:45 AM	26	32	16	0	74	4	39	0	0	43	0	0	0	0	0	1	166	18	0	185
08:00 AM	18	54	42	0	114	0	47	0	0	47	0	0	0	0	0	0	169	17	0	186
08:15 AM	36	48	32	0	116	3	54	0	0	57	0	0	0	0	0	0	209	19	0	228
08:30 AM	29	42	19	0	90	5	42	0	0	47	0	0	0	0	0	0	185	12	0	197
08:45 AM	42	38	22	0	102	1	49	0	0	50	0	0	0	0	0	0	201	24	1	225
04:00 PM	21	44	43	0	108	4	97	0	0	101	0	2	0	0	2	0	57	14	0	71
04:15 PM	18	45	42	0	105	5	104	0	0	109	0	0	0	0	0	0	80	15	0	95
04:30 PM	24	57	44	0	125	9	112	0	0	121	0	0	0	0	0	1	75	10	0	86
04:45 PM	25	70	34	0	129	0	105	0	0	105	0	0	0	0	0	0	83	10	0	93
05:00 PM	22	71	59	0	152	11	125	0	0	136	0	0	0	0	0	0	77	20	0	97
05:15 PM	21	88	62	0	171	10	117	0	0	127	0	0	0	0	0	0	79	10	0	89
05:30 PM	20	69	49	0	138	5	96	0	0	101	0	0	0	0	0	0	117	17	0	134
05:45 PM	20	68	53	0	141	7	91	0	0	98	0	0	0	0	0	0	94	16	0	110



Start Date: 5/9/2018
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	0	0	0	13	0	5	21	2	27	28	19	70	16	15	105	47	29	41	11	117
07:15 AM	0	0	0	26	0	6	19	10	26	35	16	55	11	10	82	56	37	42	12	135
07:30 AM	0	0	0	17	0	6	10	10	28	26	17	65	12	14	94	50	27	52	23	129
07:45 AM	0	0	0	33	0	2	22	9	25	33	21	61	9	19	91	58	26	43	10	127
08:00 AM	0	0	0	42	0	5	10	2	23	17	25	70	5	14	100	45	30	38	19	113
08:15 AM	0	0	0	37	0	6	21	6	53	33	22	83	12	16	117	62	30	44	38	136
08:30 AM	0	0	0	74	0	6	7	6	18	19	24	103	15	30	142	66	32	43	34	141
08:45 AM	0	0	0	84	0	5	11	8	58	24	13	90	17	27	120	69	31	47	40	147
02:30 PM	4	1	1	37	6	5	13	6	34	24	26	70	5	7	101	19	33	22	19	74
02:45 PM	0	0	0	44	0	8	24	7	32	39	26	80	9	17	115	27	32	21	21	80
03:00 PM	0	0	0	29	0	6	28	7	36	41	35	91	15	19	141	28	27	16	29	71
03:15 PM	0	0	0	16	0	5	34	10	46	49	22	73	14	14	109	30	22	8	36	60
03:30 PM	0	0	0	32	0	3	25	8	24	36	30	79	15	11	124	26	33	12	21	71
03:45 PM	0	0	0	27	0	3	21	2	16	26	19	58	10	12	87	25	20	14	14	59
04:00 PM	0	0	0	34	0	5	9	1	23	15	42	104	9	12	155	25	25	15	21	65
04:15 PM	0	0	0	22	0	5	35	3	29	43	31	60	19	12	110	24	39	18	14	81
04:30 PM	0	0	0	49	0	10	37	3	31	50	43	88	14	22	145	21	31	20	31	72
04:45 PM	0	0	0	49	0	6	31	3	20	40	41	77	13	17	131	35	39	20	29	94
05:00 PM	0	0	0	56	0	9	42	6	25	57	48	91	9	28	148	29	37	18	45	84
05:15 PM	0	0	0	57	0	7	30	2	33	39	25	81	11	30	117	41	36	27	29	104
05:30 PM	0	0	0	62	0	12	46	2	41	60	37	91	12	25	140	44	39	17	37	100
05:45 PM	0	0	0	74	0	9	37	5	43	51	44	85	12	15	141	44	40	11	35	95
06:00 PM	3	0	0	56	3	8	37	12	18	57	31	91	12	23	134	39	34	18	28	91
06:15 PM	0	0	0	41	0	6	38	8	15	52	20	79	6	16	105	38	18	22	36	78



Start Date: 5/9/2018
Start Time: 7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	3	0	9	49	12	0	23	1	51	24	0	0	0	0	0	8	33	0	5	41
07:15 AM	3	0	3	51	6	0	27	1	50	28	0	0	0	0	0	8	34	0	5	42
07:30 AM	2	0	6	67	8	0	21	2	69	23	0	0	0	0	0	17	25	0	2	42
07:45 AM	11	0	9	68	20	0	25	2	69	27	0	0	0	0	0	10	25	0	8	35
08:00 AM	3	0	13	83	16	0	11	1	83	12	0	0	0	0	0	9	17	0	7	26
08:15 AM	5	0	9	69	14	0	36	2	70	38	0	0	0	0	0	14	38	0	5	52
08:30 AM	0	0	12	98	12	0	16	2	98	18	1	0	0	0	1	17	36	0	15	53
08:45 AM	3	0	11	85	14	0	22	3	84	25	0	0	0	0	0	23	26	0	7	49
02:30 PM	2	0	8	71	10	0	16	13	61	29	0	0	0	0	0	11	31	0	2	42
02:45 PM	3	0	10	52	13	0	27	1	52	28	0	0	0	0	0	9	30	0	3	39
03:00 PM	3	0	12	54	15	0	27	3	54	30	0	0	0	0	0	13	22	0	5	35
03:15 PM	2	0	8	33	10	0	31	3	33	34	0	0	0	0	0	8	31	0	4	39
03:30 PM	2	0	9	56	11	0	29	2	53	31	0	0	0	0	0	19	30	0	6	49
03:45 PM	5	0	10	53	15	0	28	3	53	31	0	0	0	0	0	9	22	0	6	31
04:00 PM	4	0	6	76	10	0	19	1	75	20	0	0	0	0	0	9	15	1	9	25
04:15 PM	6	0	8	91	14	0	53	2	85	55	0	0	0	0	0	16	46	0	6	62
04:30 PM	6	0	14	82	20	0	40	3	81	43	0	0	0	0	0	21	26	0	13	47
04:45 PM	9	0	9	97	18	0	34	2	100	36	0	0	0	0	0	16	40	0	8	56
05:00 PM	6	0	18	172	24	0	50	3	171	53	0	0	0	0	0	21	33	0	4	54
05:15 PM	13	0	5	81	18	0	41	3	81	44	0	0	0	0	0	17	31	0	2	48
05:30 PM	2	0	16	104	18	0	60	2	104	62	0	0	0	0	0	15	36	0	14	51
05:45 PM	6	0	14	75	20	0	47	2	75	49	0	0	0	0	0	19	33	0	10	52
06:00 PM	8	0	14	74	22	0	54	6	74	60	0	0	0	0	0	22	40	0	4	62
06:15 PM	2	0	10	26	12	0	43	3	37	46	0	0	0	0	0	18	20	0	2	38



Start Date:	5/9/2018
Start Time:	7:00:00 AM

Start Time	From North					From East					From South					From West				
	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total	Left	Thru	Right	Peds	Dir Total
07:00 AM	0	0	0	0	0	1	14	0	7	15	4	0	0	11	4	0	12	11	7	23
07:15 AM	0	0	0	0	0	0	21	0	17	21	5	0	0	38	5	0	22	15	2	37
07:30 AM	0	0	0	0	0	1	20	0	14	21	6	0	2	13	8	0	13	7	9	20
07:45 AM	0	0	0	0	0	2	15	0	24	17	5	0	3	33	8	0	18	11	2	29
08:00 AM	0	0	0	0	0	0	15	0	34	15	5	0	2	13	7	0	12	7	6	19
08:15 AM	0	0	0	0	0	0	16	1	42	17	9	0	1	37	10	0	11	17	3	28
08:30 AM	0	0	0	0	0	0	12	0	47	12	5	0	3	64	8	0	12	18	0	30
08:45 AM	0	0	0	0	0	1	17	0	26	18	4	0	4	24	8	0	14	10	8	24
02:30 PM	0	0	0	1	0	0	10	1	47	11	6	0	1	12	7	0	9	12	10	21
02:45 PM	0	0	0	0	0	0	17	0	23	17	5	0	1	6	6	0	14	13	5	27
03:00 PM	0	0	0	0	0	1	15	0	12	16	11	0	1	5	12	0	15	14	5	29
03:15 PM	0	0	0	0	0	1	15	0	9	16	8	0	0	2	8	0	18	9	1	27
03:30 PM	0	0	0	0	0	1	16	0	12	17	7	0	0	4	7	0	20	8	6	28
03:45 PM	0	0	0	0	0	0	20	0	7	20	5	0	1	4	6	0	12	6	8	18
04:00 PM	0	0	0	0	0	0	4	0	2	4	11	0	1	13	12	0	6	6	2	12
04:15 PM	0	0	0	0	0	1	12	1	10	14	13	0	0	15	13	0	18	17	17	35
04:30 PM	0	0	0	0	0	1	12	0	3	13	24	0	3	16	27	0	9	8	8	17
04:45 PM	0	0	0	0	0	0	16	0	17	16	15	1	1	23	17	0	17	10	5	27
05:00 PM	0	0	0	0	0	1	29	0	24	30	19	0	2	31	21	0	25	12	16	37
05:15 PM	0	0	0	0	0	0	21	0	23	21	20	0	2	47	22	0	17	11	11	28
05:30 PM	0	0	0	0	0	0	33	0	26	33	38	0	4	50	42	0	20	15	5	35
05:45 PM	0	0	0	0	0	0	18	0	10	18	21	0	0	27	21	0	14	10	11	24
06:00 PM	0	0	0	0	0	1	31	0	12	32	15	0	2	22	17	0	19	11	10	30
06:15 PM	0	0	0	0	0	0	12	0	13	12	24	0	2	25	26	0	10	6	3	16

Michael Baker INTERNATIONAL Traffic Signal Timing Recommendations

Project: Columbus Drive Corridor Study

Subject: Traffic Signal Timing Recommendations

To: Barkha Patel, Senior Transportation Planner, Division of City Planning, Jersey City

From: Michael Baker International, Inc.

Signalized Intersection Assessment

Each signalized intersection along the Columbus Drive corridor was assessed to determine if the existing traffic signal pedestrian and vehicular clearance intervals are in conformance with the latest editions of the NJDOT Roadway Design Manual, the Manual on Uniform Traffic Control Devices (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, they are:

- Columbus Drive and Brunswick Street,
- Columbus Drive and Monmouth Street,
- Columbus Drive and Varick Street/Coles Street,
- Columbus Drive and Jersey Avenue,
- Columbus Drive and Barrow Street,
- Columbus Drive and Grove Street,
- Columbus Drive and Marin Boulevard,
- Columbus Drive and Warren Street,
- Columbus Drive and Washington Street,
- Columbus Drive and Greene Street,
- Columbus Drive and Hudson Street (North Leg), and
- Columbus Drive and Hudson Street (South Leg).

Signal Timing Recommendations

Michael Baker performed pedestrian and vehicular clearance interval calculations based on existing intersection geometries and compared the results to the signal timing directives at each location. Traffic signal timing directives can be found in Appendix A. The calculations and analyses are included in Appendix B. Based on this analysis, the following modifications are recommended:

Columbus Drive and Brunswick Street

The Yellow Change Interval (YCI) for the eastbound and westbound Columbus Drive phases can be reduced from 4 seconds to 3 seconds. The Red Clearance Interval (RCI) for the Columbus Drive phases should be increased from 2.5 seconds to 3 seconds. Additionally, the RCI should be increased from 3 to 4 seconds for Brunswick Street's northbound and southbound phases.



Traffic Signal Timing Recommendations

Columbus Drive and Monmouth Street

The YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 3 seconds for the eastbound and westbound Columbus Drive phases. For the Monmouth Street phase, the RCI should be increased from 3 to 4 seconds and the YCI can be reduced from 4 to 3 seconds. The FDW interval for crossing Monmouth Street should be increased from 8 to 10 seconds. The pedestrian walk interval for crossing Monmouth Street can be decreased from 25 to 23 seconds to accommodate the increase in the length of the FDW interval. Additionally, the FDW interval for crossing Columbus Drive should be increased from 19 to 22 seconds.

Columbus Drive and Varick Street/Coles Street

The YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 3 seconds for the eastbound and westbound Columbus Drive phases. The RCI for southbound Coles Street should be increased from 3 to 4 seconds. The pedestrian walk interval for crossing Columbus Drive can be reduced from 14 to 13 seconds to accommodate the 1 second increase in the length of the RCI.

Columbus Drive and Jersey Avenue

For the eastbound and westbound Columbus Drive phases, the YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 3 seconds. Additionally, the RCI for the Jersey Avenue phases should be increased from 3 to 4 seconds. The Flashing Don't Walk (FDW) interval for crossing Jersey Avenue should be increased from 10 to 12 seconds. The FDW interval for crossing Columbus Drive should be increased from 20 to 23 seconds. The pedestrian walk interval for crossing Columbus Drive can be reduced from 14 to 11 seconds to accommodate the 3 second increase in the length of the FDW interval.

Columbus Drive and Barrow Street

For the eastbound and westbound Columbus Drive phases, the YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 3 seconds. Additionally, the RCI should be increased from 3 to 4 seconds for the Barrow Street phases. The FDW interval for crossing Barrow Street should be increased from 9 to 10 seconds. The pedestrian walk interval for crossing Columbus Drive can be reduced from 14 to 13 seconds to accommodate the 1 second increase in the length of the Barrow Street RCI.

Columbus Drive and Grove Street

For the Columbus Drive phases, the YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 3 seconds. The Grove Street YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 4 seconds. The FDW interval for crossing Grove Street can be reduced from 20 to 15 seconds.

Columbus Drive and Marin Boulevard

For the eastbound and westbound Columbus Drive phases, the YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 3 to 4 seconds. The Marin Boulevard YCI can be reduced from 4 to 3 seconds and its RCI should be increased from 2 to 5 seconds. The FDW interval for crossing Columbus Drive can be reduced from 28 to 27 seconds. The FDW interval for crossing Marin Boulevard can be reduced from 21 to 20 seconds.

Columbus Drive and Warren Street

The FDW interval for crossing Columbus Drive should be increased from 18 to 20 seconds. The pedestrian walk interval for crossing Columbus Drive can be reduced from 14 to 12 seconds to accommodate the increase of the FDW interval. The FDW interval for crossing Warren Street can be reduced from 16 to 14 seconds.

Columbus Drive and Washington Street

For the eastbound and westbound Columbus Drive phases, the YCI can be reduced from 4 to 3 seconds and the RCI should be increased from 2 to 4 seconds. The Washington Street RCI should be increased from 3 to 4 seconds. The FDW interval for crossing Washington Street should be increased from 16 to 17



Traffic Signal Timing Recommendations

seconds. The pedestrian walk interval for crossing Columbus Drive can be reduced from 14 to 13 seconds to account for the 1 second increase in length of the Washington Street RCI.

Columbus Drive and Greene Street

For the eastbound and westbound Columbus Drive phases, the RCI should be increased from 2 to 3 seconds. The Greene Street RCI should be increased from 3 to 4 seconds. The pedestrian walk interval for crossing Columbus Drive can be reduced from 14 to 13 seconds to account for the 1 second increase in the RCI. The FDW interval for crossing Greene Street should be increased from 12 to 16 seconds.

Columbus Drive and Hudson Street (North Leg)

Signal timing directives were not provided for the Columbus Drive and Hudson Street intersection.

Columbus Drive and Hudson Street (South Leg)

Signal timing directives were not provided for the Columbus Drive and Hudson Street intersection.



Appendix A



Intersection: Columbus + Brunswick
 Municipality: Jersey City
 Recording Technician: RAUL
 Recording Date: 3-15-2018
 Controller Make and Model: NAZTEC



631 Morris Ave. Springfield, NJ 07081
 Tel. 973.467.4901 Fax 973.467.4902

TIMING DATA

← Columbus EB Brunswick ← Columbus WB

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		40		7		40						
PASSAGE (GAP TIME)				2.0								
YELLOW		4.0		3.0		4.0						
CLEARANCE		2.5		3.0		2.5						
WALK		15		14		15						
PEDESTRIAN CLEARANCE		15		24		15						
MAX I		40		40		40						
MAX II												
MIN. RECALL												
MAX. RECALL		✓				✓						
PED. RECALL		✓				✓						
FLASH COLOR		Y		R								

PLAN 1

Cycle 1 Length:	100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds			55		45		55			
Coordinated Phases			✓							
Offset, seconds	0									
Time of Day		2300-0600			LPI 7s Phase 4					

PLAN 2

Cycle 2 Length:	100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds			55		45		55			
Coordinated Phases			✓							
Offset, seconds	0	↑ PED/MAX RECALL								
Time of Day		0600-2300			LPI 7s Phase 4					

Cycle 3 Length:		φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds										
Coordinated Phases										
Offset, seconds										
Time of Day										

Intersection: Columbus + Monmouth
 Municipality: Jersey City
 Recording Technician: RAUL
 Recording Date: 3-15-2018
 Controller Make and Model: NAZTEC



631 Morris Ave. Springfield, NJ 07081
 Tel. 973.467.4901 Fax 973.467.4902

TIMING DATA

PHASE/FUNCTION	#1	#2	#3	#4	#5	#6	#7	#8	OL/A	OL/B	OL/C	OL/D
INITIAL		25		7	8	25						
PASSAGE (GAP TIME)				2.0								
YELLOW		4.0		3.0	3.0	4.0						
CLEARANCE		2.0		3.0		2.0						
WALK		25		14		25						
PEDESTRIAN CLEARANCE		8		19		8						
MAX I		50		23	8	50						
MAX II												
MIN. RECALL												
MAX. RECALL		✓			✓	✓						
PED. RECALL		✓				✓						
FLASH COLOR		Y		R		Y						

PLAN 1

Cycle 1 Length: 100s	#1	#2	#3	#4	#5	#6	#7	#8	
Splits, seconds		60		40	19	46		40	
Coordinated Phases		✓							
Offset, seconds	⊖								
Time of Day	2300-0600				LPI 7s Phase 4				

PLAN 2

Cycle 2 Length: 100s	#1	#2	#3	#4	#5	#6	#7	#8	
Splits, seconds		60		40	19	46		40	
Coordinated Phases		✓							
Offset, seconds	⊖	* PED/MAX Recall							
Time of Day	0600-2300				LPI 7s Phase 4				

Cycle 3 Length:	#1	#2	#3	#4	#5	#6	#7	#8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

NEED TO ORDER

Intersection: Columbus & Varick / Coles
Municipality: Jersey city
Recording Technician: RAWL
Recording Date: 3-13-2018
Controller Make and Model: NAZTEC



631 Morris Ave Springfield, NJ 07081
 TEL: 973.467.4901 FAX: 973.467.4902

TIMING DATA

Columbus EB *Varick Coles* *Columbus WB*

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		25		7		25						
PASSAGE (GAP TIME)				2.0								
YELLOW		4.0		3.0		4.0						
CLEARANCE		2.0		3.0		2.0						
WALK		25		14		25						
PEDESTRIAN CLEARANCE		9		22		9						
MAX I		50		25		50						
MAX II												
MIN. RECALL												
MAX. RECALL		✓				✓						
PED. RECALL		✓				✓						
FLASH COLOR		Y		R		Y						

Cycle 1 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		58		42		58		42	
Coordinated Phases		✓							
Offset, seconds	⊖								
Time of Day	2300 - 0600				LPI 7s Phase 4				

Cycle 2 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		58		42		58		42	
Coordinated Phases		✓							
Offset, seconds	⊖								
Time of Day	0600 - 2300				LPI 7s Phase 4				

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Intersection: Columbus & Jersey

Municipality: Jersey city

Recording Technician: RAUL

Recording Date: 3-15-2018

Controller Make and Model: NAZTEC



631 Morris Ave. Springfield, NJ 07081

Tel 973.467.4901 Fax 973.467.4902

TIMING DATA

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		25		7	9	25		7				
PASSAGE (GAP TIME)				2.0								
YELLOW		4.0		3.0	3.0	4.0		3.0				
CLEARANCE		2.0		3.0		2.0		3.0				
WALK		10		14		10		14				
PEDESTRIAN CLEARANCE		10		20		10		20				
MAX I		52		34	9	52		34				
MAX II												
MIN. RECALL												
MAX. RECALL		✓				✓						
PED. RECALL		✓				✓						
FLASH COLOR		Y		R		Y		R				

PLAN 1

Cycle 1 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		59		41	15	44		41	
Coordinated Phases		✓							
Offset, seconds									
Time of Day	2300-0600				LPI 7s phase 4-8				

PLAN 2

Cycle 2 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		59		41	15	44		41	
Coordinated Phases		✓							
Offset, seconds	PED/MAX RECALL								
Time of Day	0600-2300				LPI 7s phase 4-8				

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Intersection: Columbus & Barrow
 Municipality: Jersey City
 Recording Technician: RAUL
 Recording Date: 3-15-2018
 Controller Make and Model: NAZTEC



681 Morris Ave. Springfield, NJ 07081
 Tel 978.467.4901 Fax 973.467.4902

TIMING DATA

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		20		7		20		7				
PASSAGE (GAP TIME)				2.0				2.0				
YELLOW		4.0		3.0		4.0		3.0				
CLEARANCE		2.0		3.0		2.0		3.0				
WALK		14		14		14		14				
PEDESTRIAN CLEARANCE		9		22		9		22				
MAX I		50		36		50		36				
MAX II												
MIN. REGALL												
MAX. REGALL		✓				✓						
PED. REGALL		✓				✓						
FLASH COLOR		Y		R		Y		R				

PLAN 1

Cycle 1 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		58		42		58		42	
Coordinated Phases		✓				✓			
Offset, seconds	0								
Time of Day	2300-0600				LPI 7s Phase 4-8				

PLAN 2

Cycle 2 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		58		42		58		42	
Coordinated Phases		✓				✓			
Offset, seconds	0								
Time of Day	0600-2300				LPI 7s Phase 4-8				

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Intersection: Columbus & Grove / Newark

Municipality: Jersey City

Recording Technician: RAUL

Recording Date: 6-28-2018

Controller Make and Model: NAZTEC



631 Morris Ave. Springfield, NJ 07081

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TIMING DATA

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		1.5		7		1.5		7				
PASSAGE (GAP TIME)				2.0				2.0				
YELLOW		4.0		4.0		4.0		4.0				
CLEARANCE		2.0		2.0		2.0		2.0				
WALK		7		18		7		18				
PEDESTRIAN CLEARANCE		20		21		20		21				
MAX I		37		25		37		25				
MAX II												
MIN. RECALL												
MAX. RECALL		✓				✓						
PED. RECALL		✓				✓						
FLASH COLOR		Y		R		Y		R	R	Y		

Cycle 1 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		55		45		55		45	
Coordinated Phases		✓							
Offset, seconds	⊖	^ PED/MAX Recall ^							
Time of Day	0600 - 2300				early PED (7s) for φ4 · φ8				

Cycle 2 Length: 100s	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		55		45		55		45	
Coordinated Phases		✓							
Offset, seconds	⊖								
Time of Day	2300 - 0600				0600 - 2300				

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Intersection: Columbus & Main
 Municipality: Jersey City
 Recording Technician: RAUL
 Recording Date: 4-16-2018
 Controller Make and Model: NAZTEC



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TIMING DATA

Columbus SB *Main NB* *Columbus NB* *Main SB* *4/17/18*

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		5		7		7		7				
PASSAGE (GAP TIME)				2.0				2.0				
YELLOW		4.0		4.0		4.0		4.0				
CLEARANCE		2.0		2.0		3.0		2.0				
WALK		14		7		14		7				
PEDESTRIAN CLEARANCE		21		28		21		28				
MAX I		24		41		24		41				
MAX II												
MIN. RECALL												
MAX. RECALL		✓		✓		✓		✓				
PED. RECALL		✓		✓		✓		✓				
FLASH COLOR		Y		R		Y		R				

Cycle 1 Length: <u>90s</u>	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		42		48		42		48	
Coordinated Phases		✓				✓			
Offset, seconds	\nwarrow 7 seconds EARLY PED \nearrow 5 seconds EARLY PED								
Time of Day	1 DAY PLAN								

Cycle 2 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Intersection: Columbus & Warren
 Municipality: JERSEY CITY
 Recording Technician: RAUL
 Recording Date: 6-28-2018
 Controller Make and Model: EDNOLITE



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TIMING DATA

Columbus EB
Warren WB
Warren SB
Columbus EB
Warren NB

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL	5	20		7		20		7				
PASSAGE (GAP TIME)				2.0				2.0				
YELLOW	3.0	3.0		3.0		3.0		3.0				
CLEARANCE		3.0		3.0		3.0		3.0				
WALK		10		14		10		14				
PEDESTRIAN CLEARANCE		16		18		16		18				
MAX I	12	30		32		30		32				
MAX II												
MIN. RECALL												
MAX. RECALL	✓	✓				✓						
PED. RECALL												
FLASH COLOR		Y		R		Y		R				

Cycle 1 Length:	1005	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		15	47		38		62		38	
Coordinated Phases			✓							
Offset, seconds	⊖	↑ PED/MAX recall ↑								
Time of Day		0600 - 2300				early PED (75) φ4-φ8				

Cycle 2 Length:	1005	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		15	47		38		62		38	
Coordinated Phases			✓							
Offset, seconds	⊖									
Time of Day		2300 - 0600								

Cycle 3 Length:		φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds										
Coordinated Phases										
Offset, seconds										
Time of Day										

Intersection: Columbus + Washington
 Municipality: Jersey City
 Recording Technician: RAUL
 Recording Date: 6-28-2018
 Controller Make and Model: econocite



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TIMING DATA

Columbus EB *washington SB* *Columbus WB* *washington EB*

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		5		7		5						
PASSAGE (GAP TIME)				2.0								
YELLOW		4.0		3.0		4.0						
CLEARANCE		2.0		3.0		2.0						
WALK		7		14		7						
PEDESTRIAN CLEARANCE		16		19		16						
MAX I		25		33		25						
MAX II												
MIN. RECALL												
MAX. RECALL		✓				✓						
PED. RECALL		✓				✓						
FLASH COLOR		Y		R		Y						

Cycle 1 Length: <u>100s</u>	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		61		39		61		39	
Coordinated Phases		✓							
Offset, seconds	⊖	↑ PED/MAX RECALL							
Time of Day	0600-2300			early PED (7s) φ4					

Cycle 2 Length: <u>100s</u>	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		61		39		61		39	
Coordinated Phases		✓							
Offset, seconds	⊖								
Time of Day	2300-0600								

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Intersection: Columbus & Greene

Municipality: JERSEY CITY

Recording Technician: RAUL

Recording Date: 6-28-2018

Controller Make and Model: MAZTEC



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Greene NB
Columbus EB
Columbus WB

Columbus EB

TIMING DATA

PHASE/FUNCTION	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	OL/A	OL/B	OL/C	OL/D
INITIAL		20	7	7			7	7				
PASSAGE (GAP TIME)				2.0				2.0				
YELLOW		3.0	3.0	3.0				3.0				
CLEARANCE		3.0		2.0				2.0				
WALK		14		7				7				
PEDESTRIAN CLEARANCE		21		12				12				
MAX I		35	11	24				24				
MAX II												
MIN. RECALL												
MAX. RECALL		✓						✓				
PED. RECALL		✓						✓				
FLASH COLOR		Y		R				R				

Cycle 1 Length: <u>90s</u>	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		46	14	30		46	14	30	
Coordinated Phases		✓							
Offset, seconds	<u>∅</u>								
Time of Day	<u>2300-0600</u>								

Cycle 2 Length: <u>90s</u>	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds		46	14	30		46	14	30	
Coordinated Phases		✓							
Offset, seconds	<u>15s</u>	↑ PED/MAX Recall ↑							
Time of Day	<u>0600-2300</u> early PED (7s) φ2								

Cycle 3 Length:	φ1	φ2	φ3	φ4	φ5	φ6	φ7	φ8	
Splits, seconds									
Coordinated Phases									
Offset, seconds									
Time of Day									

Appendix B



Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Brunswick Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations				
Phase A - Columbus Drive ROW			Notes	
Intersection Width (P) =	92 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	<i>Yellow Change Interval can be decreased to 3s</i> <i>Red Clearance Interval should be increased to 3s</i>	
Red Clearance Interval (R) =	$(W + L) / V =$	3.054 s		
Total Clearance Interval (VCI) =	$Y + R =$	5.888 s		
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s		
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	5.888 s		
Red Clearance Interval (R) =	$VCI - Y =$	2.888 s		
Existing Intervals:	Y = 4	R = 2.5		
Proposed Intervals:	Y = 3	R = 3		

Phase B - Brunswick Street ROW			Notes	
Intersection Width (P) =	120 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	<i>Yellow Change Interval as per NJDOT policy</i> <i>Red Clearance Interval should be increased to 4s</i>	
Red Clearance Interval (R) =	$(W + L) / V =$	3.817 s		
Total Clearance Interval (VCI) =	$Y + R =$	6.651 s		
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s		
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	6.651 s		
Red Clearance Interval (R) =	$VCI - Y =$	3.651 s		
Existing Intervals:	Y = 3	R = 3		
Proposed Intervals:	Y = 3	R = 4		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Brunswick Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Pedestrian Interval Calculations		Notes
Phase A - Crossing Brunswick Street		
<i>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:</i>		<i>No push button to cross minor roadway.</i>
CW Crossing Distance = 50 ft		
Walking Speed = 3.5 ft/s		
Pedestrian Clearance Time = Distance / Speed = 14.286 s		
<i>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:</i>		
PB-CW Distance = 6 ft		
Total Crossing Distance = 56 ft		
Walking Speed = 3 ft/s		
Total Crossing Time = Distance / Speed = 18.667 s		
<i>Existing Intervals:</i>	Pedestrian Walk = 15	
	Pedestrian Change (FDW) = 15	
	Buffer = 2.5	
<i>Proposed Intervals:</i>	Pedestrian Walk = 15	
	Pedestrian Change (FDW) = 15	
	Buffer = 3	

Phase B - Crossing Columbus Drive		Notes
<i>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:</i>		<i>Existing intervals are per NJDOT policy; however, red clearance interval should be increased to 4s Per vehicle clearance calc.</i>
CW Crossing Distance = 82 ft		
Walking Speed = 3.5 ft/s		
Pedestrian Clearance Time = Distance / Speed = 23.429 s		
<i>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:</i>		
PB-CW Distance = 12 ft		
Total Crossing Distance = 94 ft		
Walking Speed = 3 ft/s		
Total Crossing Time = Distance / Speed = 31.333 s		
<i>Existing Intervals:</i>	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 24	
	Buffer = 3	
<i>Proposed Intervals:</i>	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 24	
	Buffer = 4	

Project: Columbus Drive Major Road Name: Columbus Drive Minor Road Name(s): Monmouth Street Prepared By: ACL Date: September 10th, 2018 Checked By: JM Date: September 12th, 2018

Vehicular Interval Calculations				Notes
Phase A - Columbus Drive EB Lead				
Intersection Width (P) =	74 ft			<i>Protected-permissive LT operation</i>
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		2.563 s	
Total Clearance Interval (VCI) =	$Y + R =$		5.397 s	
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		5.397 s	
Red Clearance Interval (R) =	$VCI - Y =$		2.397 s	
Existing Intervals:	Y = 3	R = 0		<i>Existing intervals are per NJDOT policy</i>
Proposed Intervals:	Y = 3	R = 0		

Phase B - Columbus Drive ROW				Notes
Intersection Width (P) =	74 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		2.563 s	
Total Clearance Interval (VCI) =	$Y + R =$		5.397 s	
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		5.397 s	
Red Clearance Interval (R) =	$VCI - Y =$		2.397 s	
Existing Intervals:	Y = 4	R = 2		<i>Yellow Change Interval can be decreased to 3s Red Clearance Interval should be increased to 3s</i>
Proposed Intervals:	Y = 3	R = 3		

Project: Columbus Drive Major Road Name: Columbus Drive Minor Road Name(s): Monmouth Street Prepared By: ACL Date: September 10th, 2018 Checked By: JM Date: September 12th, 2018
--

Phase C - Monmouth Street ROW	Notes
Intersection Width (P) = 108 ft Approach Speed (V) = 25 mph or 36.675 ft/s Approach Grade (G) = 0.000 % Length of Vehicle (L) = 20 ft Perception-Reaction Time (t) = 1 s Deceleration Rate (a) = 10 ft/s ²	
Method 1, based on ITE's Manual on Traffic Signal Design: Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$ 2.834 s Red Clearance Interval (R) = $(W + L) / V =$ 3.490 s Total Clearance Interval (VCI) = $Y + R =$ 6.324 s	
Method 2, based on NJDOT's Roadway Design Manual: Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$ 3.000 s Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$ 6.324 s Red Clearance Interval (R) = $VCI - Y =$ 3.324 s	
Existing Intervals: Y = 4 R = 3	Yellow Change Interval can be decreased to 3s Red Clearance Interval should be increased to 4s
Proposed Intervals: Y = 3 R = 4	

Pedestrian Interval Calculations		Notes
Phase B - Crossing Monmouth Avenue		
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 32 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 9.143 s		
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 6 ft Total Crossing Distance = 38 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 12.667 s		No push button to cross minor roadway.
Existing Intervals:	Pedestrian Walk = 25	Walk Interval can be decreased to 23s to accommodate the increase in FDW FDW should be increased to 10s Buffer should be increased to 3s per vehicle clearance calcs
	Pedestrian Change (FDW) = 8	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 23	
	Pedestrian Change (FDW) = 10	
	Buffer = 3	

<p>Project: Columbus Drive Major Road Name: Columbus Drive Minor Road Name(s): Monmouth Street Prepared By: ACL Date: September 10th, 2018 Checked By: JM Date: September 12th, 2018</p>

Phase C - Crossing Columbus Drive		Notes
<p>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 74.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 21.286 s</p>		
<p>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 8 ft Total Crossing Distance = 82.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 27.500 s</p>		
Existing Intervals:	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 19	
	Buffer = 3	
Proposed Intervals:	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 22	
	Buffer = 4	

Existing walk interval doesn't need to be decreased because the initial for the Monmouth Street phase is long enough to accommodate the increase in FDW
FDW should be increased to 22s
Buffer should be increased to 4s per vehicle clearance calcs

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Varick Street/Coles Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations				Notes
Phase A - Columbus Drive ROW				
Intersection Width (P) =	71 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		2.481 s	
Total Clearance Interval (VCI) =	$Y + R =$		5.315 s	
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		5.315 s	
Red Clearance Interval (R) =	$VCI - Y =$		2.315 s	
Existing Intervals:	Y = 4	R = 2		<i>Yellow Change Interval can be decreased to 3s Red Clearance Interval should be increased to 3s</i>
Proposed Intervals:	Y = 3	R = 3		

Phase B - Varick Street & Coles Street ROW				Notes
Intersection Width (P) =	107 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		3.463 s	
Total Clearance Interval (VCI) =	$Y + R =$		6.297 s	
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		6.297 s	
Red Clearance Interval (R) =	$VCI - Y =$		3.297 s	
Existing Intervals:	Y = 3	R = 3		<i>Yellow Change Interval is per NJDOT policy Red Clearance Interval should be increased to 4s.</i>
Proposed Intervals:	Y = 3	R = 4		

<p>Project: Columbus Drive Major Road Name: Columbus Drive Minor Road Name(s): Varick Street/Coles Street Prepared By: ACL Date: September 10th, 2018 Checked By: JM Date: September 12th, 2018</p>
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Pedestrian Interval Calculations		Notes
Phase A - Crossing Varick Street & Coles Street		
<p><i>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:</i></p> <p>CW Crossing Distance = 31 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 8.857 s</p>		
<p><i>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:</i></p> <p>PB-CW Distance = 6 ft Total Crossing Distance = 37 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 12.333 s</p>		
Existing Intervals:	Pedestrian Walk = 25	<p><i>No push button to cross minor roadway.</i></p> <p><i>Existing walk interval doesn't need to be decreased because the initial for the Monmouth Street phase is long enough to accommodate the changes in FDW</i></p>
	Pedestrian Change (FDW) = 9	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 25	<p><i>Existing intervals are per NJDOT policy; however, red clearance interval should be increased to 3s. per vehicle clearance calcs</i></p>
	Pedestrian Change (FDW) = 9	
	Buffer = 3	

Phase B - Crossing Columbus Drive		Notes
<p><i>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:</i></p> <p>CW Crossing Distance = 76 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 21.714 s</p>		
<p><i>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:</i></p> <p>PB-CW Distance = 8 ft Total Crossing Distance = 84 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 28.000 s</p>		
Existing Intervals:	Pedestrian Walk = 14	<p><i>Walk Interval can be decreased to 13s to accommodate the increase in the length of the Buffer</i></p> <p><i>Existing FDW is per NJDOT policy</i></p> <p><i>Red clearance interval should be increased to 4s</i></p> <p><i>Per vehicle clearance calc.</i></p>
	Pedestrian Change (FDW) = 22	
	Buffer = 3	
Proposed Intervals:	Pedestrian Walk = 13	
	Pedestrian Change (FDW) = 22	
	Buffer = 4	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Jersey Avenue	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations

Phase A - Columbus Drive EB Lead		Notes	
Intersection Width (P) =	80 ft	<i>Protected-permissive LT operation</i>	
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s		
Red Clearance Interval (R) = $(W + L) / V =$	2.727 s		
Total Clearance Interval (VCI) = $Y + R =$	5.560 s		
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s		
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	5.560 s		
Red Clearance Interval (R) = $VCI - Y =$	2.560 s		
Existing Intervals:	Y = 3	R = 0	<i>Existing intervals are per NJDOT policy</i>
Proposed Intervals:	Y = 3	R = 0	

Phase B - Columbus Drive ROW		Notes	
Intersection Width (P) =	80 ft		
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s		
Red Clearance Interval (R) = $(W + L) / V =$	2.727 s		
Total Clearance Interval (VCI) = $Y + R =$	5.560 s		
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s		
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	5.560 s		
Red Clearance Interval (R) = $VCI - Y =$	2.560 s		
Existing Intervals:	Y = 4	R = 2	<i>Yellow Change Interval can be decreased to 3s Red Clearance Interval should be increased to 3s</i>
Proposed Intervals:	Y = 3	R = 3	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Jersey Avenue	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Phase C - Jersey Avenue ROW		Notes	
Intersection Width (P) =	120 ft		
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s		
Red Clearance Interval (R) = $(W + L) / V =$	3.817 s		
Total Clearance Interval (VCI) = $Y + R =$	6.651 s		
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s	Yellow Change Interval is per NJDOT policy	
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	6.651 s		
Red Clearance Interval (R) = $VCI - Y =$	3.651 s		
Existing Intervals:	Y = 3	R = 3	Red Clearance Interval should be increased to 4s
Proposed Intervals:	Y = 3	R = 4	

Pedestrian Interval Calculations		
Phase B - Crossing Jersey Avenue		Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:		
CW Crossing Distance =	42 ft	
Walking Speed =	3.5 ft/s	
Pedestrian Clearance Time = Distance / Speed =	12.000 s	
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:		
PB-CW Distance =	6 ft	No push button to cross minor roadway. Existing walk interval doesn't need to be decreased because the initial green time for the Jersey Avenue phase is long enough to accommodate the increase in FDW
Total Crossing Distance =	48 ft	
Walking Speed =	3 ft/s	
Total Crossing Time = Distance / Speed =	16.000 s	
Existing Intervals:	Pedestrian Walk =	10
	Pedestrian Change (FDW) =	10
	Buffer =	2
Proposed Intervals:	Pedestrian Walk =	10
	Pedestrian Change (FDW) =	12
	Buffer =	3

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Jersey Avenue	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Phase C - Crossing Columbus Drive		Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 78.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 22.429 s		
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 9 ft Total Crossing Distance = 87.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 29.167 s		
Existing Intervals:	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 20	
	Buffer = 3	
Proposed Intervals:	Pedestrian Walk = 11	
	Pedestrian Change (FDW) = 23	
	Buffer = 4	

Walk Interval can be decreased to 11s to accommodate the increase in FDW and the length of the Buffer FDW should be increased to 23s Buffer should be increased to 4s per vehicle clearance calcs

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Barrow Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations				Notes
Phase A - Columbus Drive ROW				
Intersection Width (P) =	93 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
<i>Method 1, based on ITE's Manual on Traffic Signal Design:</i>				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		3.081 s	
Total Clearance Interval (VCI) =	$Y + R =$		5.915 s	
<i>Method 2, based on NJDOT's Roadway Design Manual:</i>				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		5.915 s	<i>Yellow Change Interval can be decreased to 3s</i>
Red Clearance Interval (R) =	$VCI - Y =$		2.915 s	<i>Red Clearance Interval should be increased to 3s</i>
Existing Intervals:	Y = 4	R = 2		
Proposed Intervals:	Y = 3	R = 3		

Phase B - Barrow Street ROW				Notes
Intersection Width (P) =	109 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
<i>Method 1, based on ITE's Manual on Traffic Signal Design:</i>				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		3.517 s	
Total Clearance Interval (VCI) =	$Y + R =$		6.351 s	
<i>Method 2, based on NJDOT's Roadway Design Manual:</i>				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		6.351 s	<i>Yellow Change Interval is per NJDOT policy</i>
Red Clearance Interval (R) =	$VCI - Y =$		3.351 s	<i>Red Clearance Interval should be increased to 4s</i>
Existing Intervals:	Y = 3	R = 3		
Proposed Intervals:	Y = 3	R = 4		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Barrow Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Pedestrian Interval Calculations

Phase A - Crossing Barrow Street		Notes	
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 33.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 9.571 s		No push button to cross minor roadway. Existing walk interval doesn't need to be reduced because the initial green time for the Columbus Drive phase is long enough to accommodate the increase in FDW FDW should be increased to 10s Buffer should be increased to 3s per vehicle clearance calcs	
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 6 ft Total Crossing Distance = 39.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 13.167 s			
Existing Intervals:	Pedestrian Walk = 14		
	Pedestrian Change (FDW) = 9		
	Buffer = 2		
Proposed Intervals:	Pedestrian Walk = 14		
	Pedestrian Change (FDW) = 10		
	Buffer = 3		
Phase C - Crossing Columbus Drive			Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 74.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 21.286 s			Walk Interval can be decreased to 13s to accommodate the change in the length of the Buffer Existing FDW is per NJDOT policy Buffer should be increased to 4s per vehicle clearance calcs
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 10 ft Total Crossing Distance = 84.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 28.167 s			
Existing Intervals:	Pedestrian Walk = 14		
	Pedestrian Change (FDW) = 22		
	Buffer = 3		
Proposed Intervals:	Pedestrian Walk = 13		
	Pedestrian Change (FDW) = 22		
	Buffer = 4		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Grove Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations				Notes
Phase A - Columbus Drive ROW				
Intersection Width (P) =	93 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
<i>Method 1, based on ITE's Manual on Traffic Signal Design:</i>				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		3.081 s	
Total Clearance Interval (VCI) =	$Y + R =$		5.915 s	
<i>Method 2, based on NJDOT's Roadway Design Manual:</i>				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		5.915 s	<i>Yellow Change Interval can be decreased to 3s</i>
Red Clearance Interval (R) =	$VCI - Y =$		2.915 s	
Existing Intervals:	Y = 4	R = 2		<i>Red Clearance Interval should be increased to 3s</i>
Proposed Intervals:	Y = 3	R = 3		

Vehicular Interval Calculations				Notes
Phase B - Grove Street ROW				
Intersection Width (P) =	112 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
<i>Method 1, based on ITE's Manual on Traffic Signal Design:</i>				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$		2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$		3.599 s	
Total Clearance Interval (VCI) =	$Y + R =$		6.433 s	
<i>Method 2, based on NJDOT's Roadway Design Manual:</i>				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$		3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$		6.433 s	<i>Yellow Change Interval can be decreased to 3s</i>
Red Clearance Interval (R) =	$VCI - Y =$		3.433 s	
Existing Intervals:	Y = 4	R = 2		<i>Red Clearance Interval should be increased to 4s</i>
Proposed Intervals:	Y = 3	R = 4		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Grove Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Pedestrian Interval Calculations		Notes
Phase A - Crossing Grove Street		
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 51 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 14.571 s		No push button to cross minor roadway. Existing walk interval is per NJDOT policy. It should not be reduced due to the change in the buffer because it is already at the minimum <i>FDW can be decreased to 15s</i> <i>Buffer should be increased to 4s per vehicle clearance calcs</i>
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 6 ft Total Crossing Distance = 57 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 19.000 s		
Existing Intervals:	Pedestrian Walk = 7	
	Pedestrian Change (FDW) = 20	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 7	
	Pedestrian Change (FDW) = 15	
	Buffer = 4	

Phase B - Crossing Columbus Drive		Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 70.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 20.143 s		<i>Walk Interval can be decreased to 13s to accommodate the change in the length of the Buffer</i> <i>Existing FDW is per NJDOT policy</i> <i>Buffer should be increased to 4s per vehicle clearance calcs</i>
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 6 ft Total Crossing Distance = 76.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 25.500 s		
Existing Intervals:	Pedestrian Walk = 18	
	Pedestrian Change (FDW) = 21	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 17	
	Pedestrian Change (FDW) = 21	
	Buffer = 4	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Marin Boulevard	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations		Notes
Phase A - Columbus Drive ROW		<i>Phase 2 has a minimum initial of 5s. Phase 6 has a minimum initial of 7s. Otherwise the phases are exactly the same.</i> <i>Yellow Change Interval can be decreased to 3s</i> <i>Red Clearance Interval should be increased to 4s</i>
Intersection Width (P) =	102 ft	
Approach Speed (V) =	25 mph or 36.675 ft/s	
Approach Grade (G) =	0.000 %	
Length of Vehicle (L) =	20 ft	
Perception-Reaction Time (t) =	1 s	
Deceleration Rate (a) =	10 ft/s ²	
Method 1, based on ITE's Manual on Traffic Signal Design:		
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) = $(W + L) / V =$	3.327 s	
Total Clearance Interval (VCI) = $Y + R =$	6.160 s	
Method 2, based on NJDOT's Roadway Design Manual:		
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s	
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	6.160 s	
Red Clearance Interval (R) = $VCI - Y =$	3.160 s	
Existing Intervals:	Y = 4 R = 3	
Proposed Intervals:	Y = 3 R = 4	

Phase B - Marin Boulevard ROW		Notes
Intersection Width (P) = 135 ft		<i>Yellow Change Interval can be decreased to 3s</i> <i>Red Clearance Interval should be increased to 5s</i>
Approach Speed (V) = 25 mph or 36.675 ft/s		
Approach Grade (G) = 0.000 %		
Length of Vehicle (L) = 20 ft		
Perception-Reaction Time (t) = 1 s		
Deceleration Rate (a) = 10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:		
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) = $(W + L) / V =$	4.226 s	
Total Clearance Interval (VCI) = $Y + R =$	7.060 s	
Method 2, based on NJDOT's Roadway Design Manual:		
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s	
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	7.060 s	
Red Clearance Interval (R) = $VCI - Y =$	4.060 s	
Existing Intervals:	Y = 4 R = 2	
Proposed Intervals:	Y = 3 R = 5	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Marin Boulevard	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Pedestrian Interval Calculations		Notes
Phase A - Crossing Marin Boulevard		
<i>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:</i>		
CW Crossing Distance = 70 ft		
Walking Speed = 3.5 ft/s		
Pedestrian Clearance Time = Distance / Speed = 20.000 s		
<i>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:</i>		
PB-CW Distance = 7 ft		
Total Crossing Distance = 77 ft		
Walking Speed = 3 ft/s		
Total Crossing Time = Distance / Speed = 25.667 s		
Existing Intervals:	Pedestrian Walk = 14	Existing walk interval is per NJDOT policy.
	Pedestrian Change (FDW) = 21	
	Buffer = 3	
Proposed Intervals:	Pedestrian Walk = 14	FDW can be decreased to 20s Buffer should be increased to 4s per vehicle clearance calcs
	Pedestrian Change (FDW) = 20	
	Buffer = 4	

Phase B - Crossing Columbus Drive		Notes
<i>Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:</i>		
CW Crossing Distance = 94.5 ft		
Walking Speed = 3.5 ft/s		
Pedestrian Clearance Time = Distance / Speed = 27.000 s		
<i>Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:</i>		
PB-CW Distance = 6 ft		
Total Crossing Distance = 100.5 ft		
Walking Speed = 3 ft/s		
Total Crossing Time = Distance / Speed = 33.500 s		
Existing Intervals:	Pedestrian Walk = 7	Existing walk interval is per NJDOT policy. It should not be reduced due to the change in the buffer because it is already at the minimum
	Pedestrian Change (FDW) = 28	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 7	FDW can be decreased to 27s Buffer should be increased to 5s per vehicle clearance calcs
	Pedestrian Change (FDW) = 27	
	Buffer = 5	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Warren Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations			Notes
Phase A - Columbus Drive EB Lead			<i>Protected-permissive LT operation</i>
Intersection Width (P) =	75 ft		
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$	2.590 s	
Total Clearance Interval (VCI) =	$Y + R =$	5.424 s	
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	5.424 s	
Red Clearance Interval (R) =	$VCI - Y =$	2.424 s	
Existing Intervals:	Y = 3	R = 0	<i>Existing intervals are per NJDOT policy</i>
Proposed Intervals:	Y = 3	R = 0	

Phase B - Columbus Drive ROW			Notes
Intersection Width (P) =	76 ft		
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$	2.618 s	
Total Clearance Interval (VCI) =	$Y + R =$	5.451 s	
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	5.451 s	
Red Clearance Interval (R) =	$VCI - Y =$	2.451 s	
Existing Intervals:	Y = 3	R = 3	<i>Existing intervals are per NJDOT policy</i>
Proposed Intervals:	Y = 3	R = 3	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Warren Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Phase C - Warren Street ROW		Notes	
Intersection Width (P) =	95 ft		
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s	<i>Red Clearance Interval rounded down</i>	
Red Clearance Interval (R) = $(W + L) / V =$	3.136 s		
Total Clearance Interval (VCI) = $Y + R =$	5.969 s		
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s		
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	5.969 s		
Red Clearance Interval (R) = $VCI - Y =$	2.969 s		
Existing Intervals:	Y = 3	R = 3	<i>Existing intervals are per NJDOT policy</i>
Proposed Intervals:	Y = 3	R = 3	

Pedestrian Interval Calculations				
Phase B - Crossing Warren Street		Notes		
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:				
CW Crossing Distance =	48 ft			
Walking Speed =	3.5 ft/s			
Pedestrian Clearance Time = Distance / Speed =	13.714 s			
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:				
PB-CW Distance =	6 ft	<i>No push button to cross minor roadway.</i>		
Total Crossing Distance =	54 ft			
Walking Speed =	3 ft/s			
Total Crossing Time = Distance / Speed =	18.000 s			
<i>Existing Intervals:</i>	Pedestrian Walk =	10		
	Pedestrian Change (FDW) =	16		
	Buffer =	3		
<i>Proposed Intervals:</i>	Pedestrian Walk =	10		
	Pedestrian Change (FDW) =	14		<i>FDW can be decreased to 14s</i>
	Buffer =	3		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Warren Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Phase C - Crossing Columbus Drive		Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 70 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 20.000 s		
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 15 ft Total Crossing Distance = 85 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 28.333 s		
Existing Intervals:	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 18	
	Buffer = 3	
Proposed Intervals:	Pedestrian Walk = 12	
	Pedestrian Change (FDW) = 20	
	Buffer = 3	

Walk Interval can be decreased to 12s to accommodate the increase FDW
FDW should be increased to 20s
Existing Buffer is per NJDOT policy

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Washington Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations			
Phase A - Columbus Drive ROW			Notes
Intersection Width (P) =	103 ft		
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$	3.354 s	
Total Clearance Interval (VCI) =	$Y + R =$	6.188 s	
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s	<i>Yellow Change Interval can be decreased to 3s</i>
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	6.188 s	
Red Clearance Interval (R) =	$VCI - Y =$	3.188 s	
Existing Intervals:	Y = 4	R = 2	<i>Red Clearance Interval should be increased to 4s</i>
Proposed Intervals:	Y = 3	R = 4	

Phase B - Washington Street ROW				Notes
Intersection Width (P) =	111 ft			
Approach Speed (V) =	25 mph or 36.675 ft/s			
Approach Grade (G) =	0.000 %			
Length of Vehicle (L) =	20 ft			
Perception-Reaction Time (t) =	1 s			
Deceleration Rate (a) =	10 ft/s ²			
Method 1, based on ITE's Manual on Traffic Signal Design:				
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s		
Red Clearance Interval (R) =	$(W + L) / V =$	3.572 s		
Total Clearance Interval (VCI) =	$Y + R =$	6.406 s		
Method 2, based on NJDOT's Roadway Design Manual:				
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s	<i>Existing Yellow Change Interval is per NJDOT policy</i>	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	6.406 s		
Red Clearance Interval (R) =	$VCI - Y =$	3.406 s		
Existing Intervals:	Y = 3	R = 3	<i>Red Clearance Interval should be increased to 4s</i>	
Proposed Intervals:	Y = 3	R = 4		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Washington Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Pedestrian Interval Calculations		Notes
Phase A - Crossing Washington Street		
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 59.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 17.000 s		No push button to cross minor roadway. Existing walk interval is per NJDOT policy and should not be reduced due to the change in the length of the Buffer. <i>Buffer should be increased to 4s per vehicle clearance calcs</i>
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 6 ft Total Crossing Distance = 65.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 21.833 s		
Existing Intervals:	Pedestrian Walk = 7	
	Pedestrian Change (FDW) = 16	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 7	
	Pedestrian Change (FDW) = 17	
	Buffer = 4	

Phase B - Crossing Columbus Drive		Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 65 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 18.571 s		<i>Walk Interval can be decreased to 13s to accommodate the increase in the length of the Buffer</i> <i>Existing FDW is per NJDOT policy</i> <i>Buffer should be increased to 4s per vehicle clearance calcs</i>
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 10 ft Total Crossing Distance = 75 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 25.000 s		
Existing Intervals:	Pedestrian Walk = 14	
	Pedestrian Change (FDW) = 19	
	Buffer = 3	
Proposed Intervals:	Pedestrian Walk = 13	
	Pedestrian Change (FDW) = 19	
	Buffer = 4	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Greene Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Vehicular Interval Calculations			
Phase A - Greene Street ROW			Notes
Intersection Width (P) =	127 ft		<i>Greene Street is the major road at this intersection</i>
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	<i>Red Clearance Interval rounded down</i>
Red Clearance Interval (R) =	$(W + L) / V =$	4.008 s	
Total Clearance Interval (VCI) =	$Y + R =$	6.842 s	
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s	<i>Red Clearance Interval should be increased to 4s</i>
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	6.842 s	
Red Clearance Interval (R) =	$VCI - Y =$	3.842 s	
Existing Intervals:	Y = 3	R = 3	
Proposed Intervals:	Y = 3	R = 4	

Phase B - Columbus Drive EB Lead			Notes
Intersection Width (P) =	81 ft		<i>Protected-permissive LT operation</i>
Approach Speed (V) =	25 mph or 36.675 ft/s		
Approach Grade (G) =	0.000 %		
Length of Vehicle (L) =	20 ft		
Perception-Reaction Time (t) =	1 s		
Deceleration Rate (a) =	10 ft/s ²		
Method 1, based on ITE's Manual on Traffic Signal Design:			
Yellow Change Interval (Y) =	$t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) =	$(W + L) / V =$	2.754 s	
Total Clearance Interval (VCI) =	$Y + R =$	5.588 s	
Method 2, based on NJDOT's Roadway Design Manual:			
Yellow Change Interval (Y) =	$V \text{ (in mph)} / 10 =$	3.000 s	
Total Clearance Interval (VCI) =	$t + V/2a + (W + L)/V =$	5.588 s	
Red Clearance Interval (R) =	$VCI - Y =$	2.588 s	
Existing Intervals:	Y = 3	R = 0	<i>Existing intervals are per NJDOT policy</i>
Proposed Intervals:	Y = 3	R = 0	

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Greene Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Phase C - Columbus Drive ROW		Notes
Intersection Width (P) =	84 ft	
Approach Speed (V) =	25 mph or 36.675 ft/s	
Approach Grade (G) =	0.000 %	
Length of Vehicle (L) =	20 ft	
Perception-Reaction Time (t) =	1 s	
Deceleration Rate (a) =	10 ft/s ²	
Method 1, based on ITE's Manual on Traffic Signal Design:		
Yellow Change Interval (Y) = $t + V / (2a + 64.4G) =$	2.834 s	
Red Clearance Interval (R) = $(W + L) / V =$	2.836 s	
Total Clearance Interval (VCI) = $Y + R =$	5.669 s	
Method 2, based on NJDOT's Roadway Design Manual:		
Yellow Change Interval (Y) = $V \text{ (in mph)} / 10 =$	3.000 s	
Total Clearance Interval (VCI) = $t + V/2a + (W + L)/V =$	5.669 s	
Red Clearance Interval (R) = $VCI - Y =$	2.669 s	
Existing Intervals:	Y = 3 R = 2	<i>Red Clearance Interval should be increased to 4s</i>
Proposed Intervals:	Y = 3 R = 3	

Pedestrian Interval Calculations				
Phase A - Crossing Columbus Drive		Notes		
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7:				
CW Crossing Distance =	70.5 ft			
Walking Speed =	3.5 ft/s			
Pedestrian Clearance Time = $\text{Distance} / \text{Speed} =$	20.143 s			
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14:				
PB-CW Distance =	10 ft			
Total Crossing Distance =	80.5 ft			
Walking Speed =	3 ft/s			
Total Crossing Time = $\text{Distance} / \text{Speed} =$	26.833 s			
Existing Intervals:	Pedestrian Walk =	14	<i>Walk Interval can be decreased to 13s to accommodate the change in the length of the Buffer</i>	
	Pedestrian Change (FDW) =	21		
	Buffer =	3		
Proposed Intervals:	Pedestrian Walk =	13		<i>Existing FDW is per NJDOT policy Buffer should be increased to 4s per vehicle clearance calcs</i>
	Pedestrian Change (FDW) =	21		
	Buffer =	4		

Project: Columbus Drive	
Major Road Name: Columbus Drive	
Minor Road Name(s): Greene Street	
Prepared By: ACL	Date: September 10th, 2018
Checked By: JM	Date: September 12th, 2018

Phase C - Crossing Greene Street		Notes
Condition 1, based on 2009 MUTCD, Section 4E.06, Paragraph 7: CW Crossing Distance = 55.5 ft Walking Speed = 3.5 ft/s Pedestrian Clearance Time = Distance / Speed = 15.857 s		Existing walk interval is per NJDOT policy and should not be reduced due to the change in the length of the Buffer. FDW should be increased to 16s Buffer should be increased to 3s per vehicle clearance calcs
Condition 2, based on 2009 MUTCD, Section 4E.06, Paragraph 14: PB-CW Distance = 10 ft Total Crossing Distance = 65.5 ft Walking Speed = 3 ft/s Total Crossing Time = Distance / Speed = 21.833 s		
Existing Intervals:	Pedestrian Walk = 7	
	Pedestrian Change (FDW) = 12	
	Buffer = 2	
Proposed Intervals:	Pedestrian Walk = 7	
	Pedestrian Change (FDW) = 16	
	Buffer = 3	