

Bicyclists use of Leading Pedestrian Intervals: Pilot Program Results



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Introduction

Leading Pedestrian Intervals (LPIs) are a signal timing technique which provide people on foot a head start of at least seven seconds to cross the street at signalized intersections before drivers may proceed into the intersection or make turns through crosswalks. This treatment, an integral component of Vision Zero street engineering, has been proven to reduce serious injury and fatal pedestrian crashes^{1,2}.

Currently, people who are riding a bicycle must obey traffic signals and are not allowed to use the pedestrian signal head. In 2018, the New York City Department of Transportation (NYC DOT) conducted a seven-month pilot program to allow cyclists to follow LPIs at 50 designated intersections.

This pilot initiative from NYC DOT evaluates potential impacts of allowing bicyclists to also benefit from the conflict-free head start by installing temporary signage at 50 intersections that already have LPIs. The signs state that cyclists may use the pedestrian signal. NYC DOT believes that because bicyclists present a minimal risk to pedestrians, accounting for under half of a percent of pedestrian fatalities, and are still legally required to yield to pedestrians before turning across crosswalks, any potential increase in impacts on pedestrians would be minimal.

Expanding the legal use of LPIs to bicyclists is expected to further increase safety for cyclists who, like pedestrians, are particularly vulnerable to turning vehicles at intersections. This is supported by DOT's recent Safer Cycling study³ findings that 65 percent of bicyclist fatalities and 89 percent of bicyclists killed or seriously injured in vehicle crashes were struck by drivers at intersections.

The impetus for this pilot program stems from Council Member Menchaca, who in 2016 introduced legislation ([Int 1072-2016](#)) seeking to allow bicyclists to follow LPIs, stating at the start of this initiative:

"As a City, it is our duty to ensure we are doing our best to ensure the safety of pedestrians and bicyclists. This pilot program is a good step in the right direction and a long overdue victory for advocates and community residents from my district who worked tirelessly to ensure this initiative came to life. I am confident that the New York City Department of Transportation will gather enough data to conclude that Leading Pedestrian Intervals (LPIs) are as effective for bicyclists as they are for pedestrians. I look forward to hopefully having LPIs for bicyclists implemented permanently in New York City."

¹ New York City Department of Transportation. *Don't Cut Corners: Left Turn Pedestrian & Bicyclist Crash Study*, August 2016.

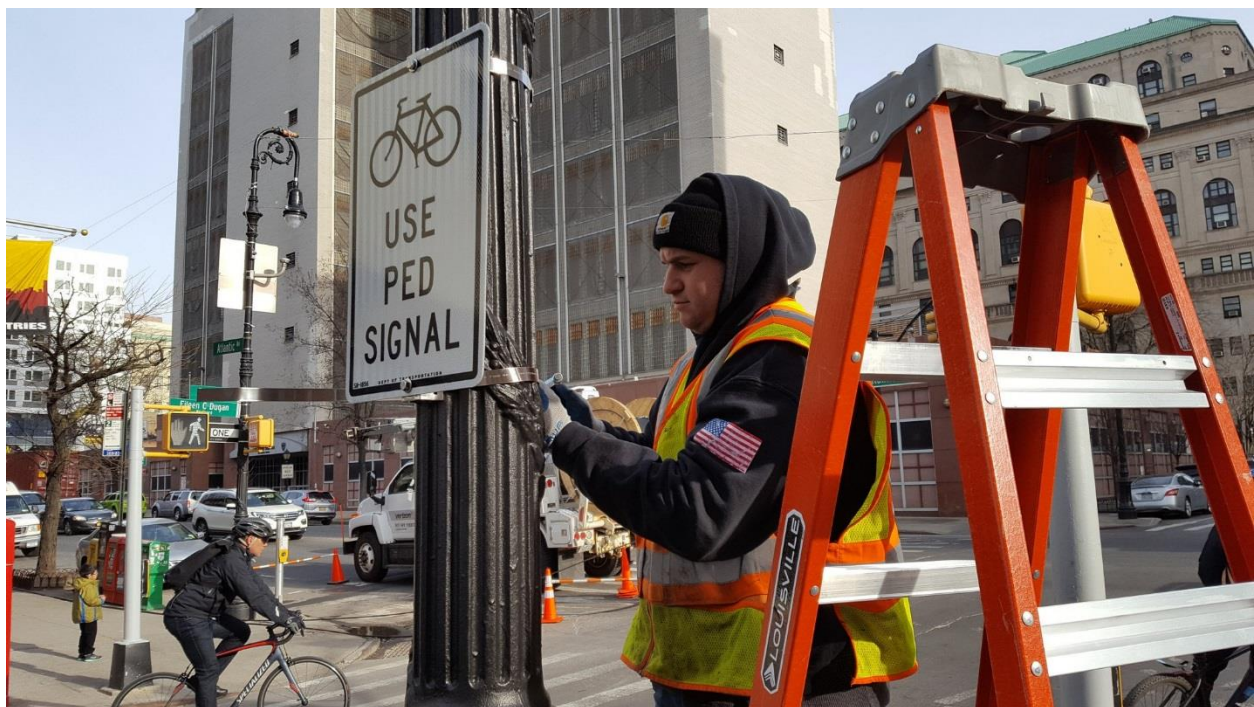
² Goughnour, E., Carter, D., Lyon, C., Persaud, B., Lan, B., Chun, P., Hamilton, I., and Signor, K. (2018). *Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety*, Report No. FHWA-HRT-18-044, Federal Highway Administration, Washington, DC.

³ Getman, A., Gordon-Koven, L., Hostetter, S., and Viola, R. *Safer Cycling: Bicycle Ridership and Safety in New York City*, New York City Department of Transportation, July 2017.

In addition to the safety benefits, allowing bicyclists to follow the LPI provides mobility benefits. Providing this time at the start of the signal cycle reduces travel time delay for bicyclists, giving this slower mode additional green time and moving them ahead of traffic. Due to being exposed to the elements, the perceived delay experienced by bicyclists when compared to those in motor vehicles is likely higher. Combined with bicyclists being as vulnerable as pedestrians to serious injury in a crash with motor vehicles, allowing bicyclists to also use the LPI will likely improve compliance with traffic signals. Providing street designs, traffic signals, and laws that are more intuitive and responsive for people who bike should make our streets more orderly and provide additional incentives that encourage bicycling.

Provided that no concerns on pedestrian, including low-vision and/or blind pedestrian, bicyclist and driver safety were raised by the pilot, the City will review the traffic rule change permitting cyclists to proceed on pedestrian signals. To determine the effect and next steps of this program, DOT carefully measured the various impacts of the pilot through:

1. An **observational study** of bicyclist behavior and conflicts at intersections with LPIs; and
2. A **crash comparison** between intersections with LPIs, which have a sign for the duration of the pilot allowing bicyclists to proceed on the pedestrian signal (Study Intersections), and similarly situated intersections with LPI and no other intervention (Control Intersections).



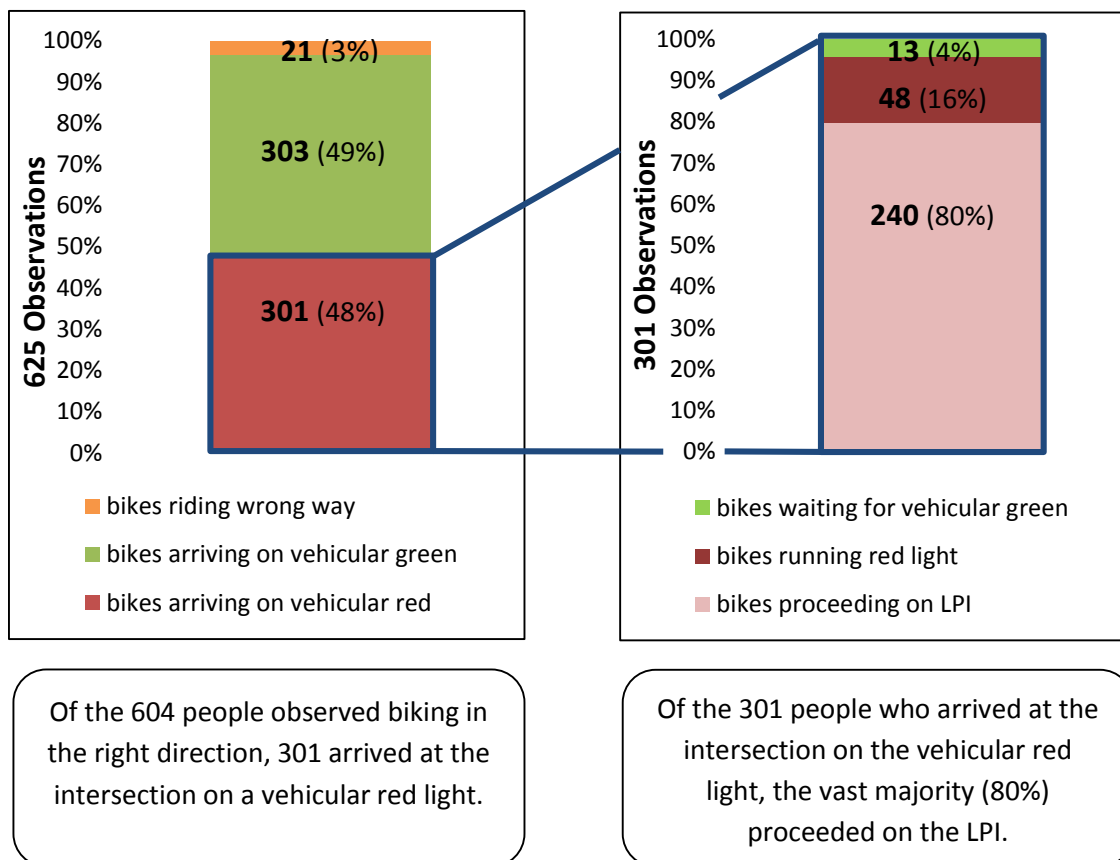
DOT staff installing a pilot study sign allowing bicyclists to use the LPI at an intersection

Results

The following section summarizes key study results, reference the Appendix for further study details.

Observational Study

Prior to this pilot, an observational study was conducted by DOT during peak morning and evening travel periods at six Manhattan and Brooklyn intersections with LPIs. Staff from DOT's Bicycle Program performed the observational study through direct observations at the study intersections. All observers used the same tally sheet that was developed specifically for this study. Observers recorded when in the signal cycle bicyclists arrived, when they departed, and if there were any conflicts. The results following 625 observations found that the **vast majority of people biking currently proceed on the LPI and no conflicts or near misses were observed**. These results indicate that the clear majority of cyclists prefer to utilize the extra green time and can do so safely, and helped to push the pilot program forward as a way to potentially formalize this behavior.



Crash Study

From April through October 2018, the pilot program was conducted at 50 designated intersections with LPIs in Manhattan, Brooklyn, and Queens. DOT installed signs at these intersections on the leg of the crossing that has the LPI phase stating that bicyclists may use the pedestrian signal.

To provide a comparison to the pilot intersections, 50 similar intersections with LPIs were selected to be control sites. These 100 intersections (study + control) were closely monitored throughout the seven month study period for differences in crashes.

Intersection Injuries by Type for the April - October 2018 Pilot Period

	Study		Control	
	All	Related to LPI*	All	Related to LPI*
Pedestrian Injury (all)	16	6	21	5
<i>Pedestrian Injury (with Bike)</i>	2	0	1	0
Bike Injury	12	0	9	1
Motor Vehicle Occupant Injury	27	-	42	-
Fatalities	0	0	0	0
Total	55	6	72	6

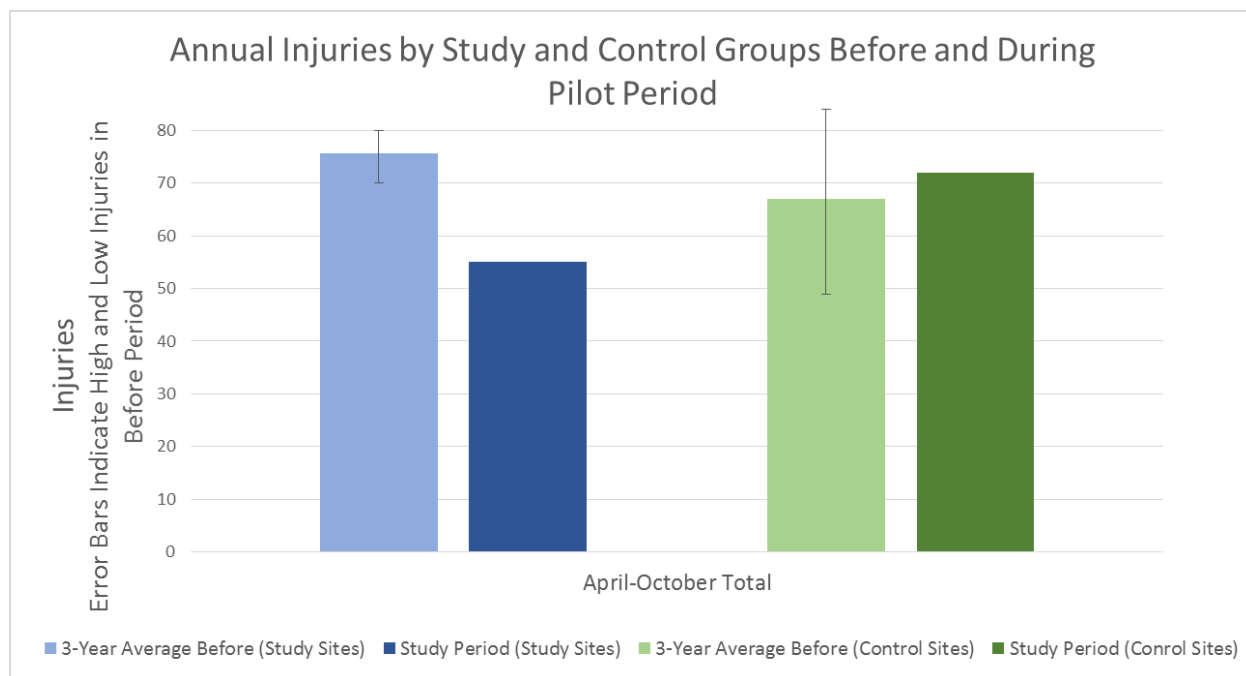
*A crash is considered related to the LPI when it occurred on the street leg approaching the LPI, even if it was not during the LPI signal phase, and the actions were movements related to intersection movements (e.g. turning or traveling through, not discharging passengers or parking)

All crashes are mapped to the nearest intersection, meaning that the crashes in these two groups will include some midblock crashes in addition to the crashes that occurred at the intersection. The majority of the crashes occurring at these intersections during the study period are unrelated to the LPI, typically due to them occurring on the intersecting street which does not have a LPI phase or because the crash occurred midblock.

A careful review of the narrative descriptions from the crash reports for the bicycle and pedestrian injury crashes reveals few crashes on the crossing with the LPI, nearly all of which are turning vehicles hitting pedestrians, an illegal movement which is not permitted during the LPI phase. The line *Pedestrian Injury (with Bike)* identifies the subset of pedestrian injury crashes that occurred due to a bike hitting them; 2 in the study sites, 1 in the control sites, none of which were related to the LPI.

The number of crashes in the crosswalks governed by the LPI between the two groups is both similar and low, with all of the pedestrian injuries related to drivers. None of the pedestrian/bike crashes in the study and control groups are related to the LPI; two of the crashes occurred when a pedestrian stepped into the bike lane against the traffic signal and one occurred when a bicyclist hit a pedestrian when the bicyclist came from a direction that does not have a LPI phase.

To provide additional context, the average injuries for April through October 2015-2017 (the same months of the study period in the preceding three years) are compared to the 2018 study period in the figure below. This demonstrates that both groups had a similar number of injuries in the before period. In the study period, the study sites had a lower total number of crashes than in any of the three prior years while the control sites maintained a similar number of crashes to the preceding period. **Note that these numbers include crashes on all approaches near the intersection, not only those related to the LPI.**



Recommendations

Due to conflicts with turning drivers, intersections are the most frequent place in the city for serious bicycle crashes to occur. Based on the experience of this pilot program, allowing bicyclists to also benefit from head start provided by the Leading Pedestrian Interval should improve safety for bicyclists and reduce stressful interactions at intersections without increasing the burden to any pedestrian. **Thus, it is recommended that cyclists be permitted to follow the pedestrian signal citywide with the following provisions:**

- Cyclists must continue to yield to all pedestrians
- NYCDOT can determine certain intersections where cyclists should not move with the pedestrian signal and prohibit that action with signage
- No signage is required other than at prohibited locations
- Presence of a LPI will continue to be used for prioritization of APS installation

Appendix

Appendix: Observational study

Dates and Locations

	Intersection	LPI crosses which street?	Borough	Date and time
All Ped Phase	1 Ave & 39 St	n/a	Manhattan	4/13/17, 5-6 PM
Conventional bike lane	6 Ave & 42 nd St	42 nd St	Manhattan	4/5/17, 8-9 AM
	Dean St & 4 Ave	4 Ave	Brooklyn	4/12/17, 5-6 PM
	Atlantic Ave & Smith St	Atlantic Ave	Brooklyn	4/5/2017, 9-10 AM
No bike facility	5 Ave & E 79 St	E 79 St	Manhattan	4/5/17, 8-9 AM
	2 Ave & E 19 St	2 Ave	Manhattan	4/11/17, 5-7 PM

Raw Data

Each person biking through the intersection was placed into one of six categories:

Behavior	Incidences
Proceed on pedestrian walk signal (during LPI) from stopped or almost stopped (approach on red)	160
Proceed on pedestrian walk signal (during at LPI) at speed (approach on LPI)	80
Proceed only on vehicular green from stopped or almost stopped (approach on red)	13
Proceed only on vehicular green at speed (approach on green)	303
Proceed through vehicular and pedestrian red	48
Riding the wrong way	21
TOTAL	625

Appendix: Treatment and Comparison Sites

As part of a pilot study, DOT installed signage to allow cyclists to follow pedestrian signals at 50 LPI locations from late March 2018 through October 2018. These study locations were compared to 50 'control' intersections with similar characteristics, including a LPI, but without the study signage.

Corridor	Street LPI is crossing	Cross-street (street with LPI)	Borough	Site Type
4 Ave (63 St - 18 St)	4 Avenue	18 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	19 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	21 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	29 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	30 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	35 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	36 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	37 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	38 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	40 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	41 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	42 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	43 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	46 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	59 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	60 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	62 Street	Brooklyn	Study
4 Ave (63 St - 18 St)	4 Avenue	63 Street	Brooklyn	Study
Atlantic Ave & Smith St	Atlantic Avenue	Smith Street	Brooklyn	Study
Marcus Garvey Blvd (Fulton St - Broadway)	Broadway	Marcus Garvey Blvd	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Fulton Street	Marcus Garvey Blvd	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Lafayette Avenue	Marcus Garvey Blvd	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Decatur Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Greene Avenue	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Halsey Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Hancock Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Hart Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Kosciuszko Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Lexington Avenue	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Macon Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Madison Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	McDonough Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Monroe Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Pulaski Street	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Putnam Avenue	Brooklyn	Control
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Quincy Street	Brooklyn	Control

Corridor	Street LPI is crossing	Cross-street (street with LPI)	Borough	Site Type
Marcus Garvey Blvd (Fulton St - Broadway)	Marcus Garvey Blvd	Van Buren Street	Brooklyn	Control
2 Ave & E 19 St	2 Avenue	E 19 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	E 20 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	E 21 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	E 22 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	E 32 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	E 33 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	East 30 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	East 49 Street	Manhattan	Study
2 Ave (20 St - 58 St)	2 Avenue	East 53 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 16 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 17 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 18 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 20 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 21 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 25 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 26 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 48 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 52 Street	Manhattan	Study
9 Ave (15 St - 57 St)	9 Avenue	West 55 Street	Manhattan	Study
1 Ave (20 St - 58 St)	1 Avenue	East 26 Street	Manhattan	Control
1 Ave (20 St - 58 St)	1 Avenue	East 29 Street	Manhattan	Control
1 Ave (20 St - 58 St)	1 Avenue	East 47 Street	Manhattan	Control
1 Ave (20 St - 58 St)	1 Avenue	East 54 Street	Manhattan	Control
1 Ave (20 St - 58 St)	1 Avenue	East 55 Street	Manhattan	Control
5 Ave & E 79 St	5 Avenue	East 79 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 15 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 17 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 18 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 20 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 21 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 25 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 28 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 51 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 52 Street	Manhattan	Control
8 Ave (15 St - 57 St)	8 Avenue	West 54 Street	Manhattan	Control
Dean St & 4 Ave	4 Avenue	Dean Street	Manhattan	Control
34 Ave (82 St - 73 St)	34 Avenue	81 Street	Queens	Study
34 Ave (82 St - 73 St)	34 Avenue	82 Street	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Ave	73rd St	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	72 Street	Queens	Study

Corridor	Street LPI is crossing	Cross-street (street with LPI)	Borough	Site Type
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	77 Street	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	78 Street	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	80 Street	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	82 Street	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	83 Street	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	Britton Ave	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	Case St	Queens	Study
Roosevelt Ave (72 St - Junction Blvd)	Roosevelt Avenue	Forley St	Queens	Study
Northern Blvd (82 St - 73 St)	Northern Boulevard	73 Street	Queens	Control
Northern Blvd (82 St - 73 St)	Northern Boulevard	74 Street	Queens	Control
Northern Blvd (82 St - 73 St)	Northern Boulevard	76 Street	Queens	Control
Northern Blvd (82 St - 73 St)	Northern Boulevard	77 Street	Queens	Control
Northern Blvd (82 St - 73 St)	Northern Boulevard	78 Street	Queens	Control
Northern Blvd (82 St - 73 St)	Northern Boulevard	80 Street	Queens	Control
Northern Blvd (82 St - 73 St)	Northern Boulevard	82 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	104 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	51 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	55 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	57 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	65 Place	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	98 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	99 Street	Queens	Control
Roosevelt Ave (98 St / Queens Blvd - 108 St / 69 St)	Roosevelt Avenue	Skillman Ave	Queens	Control

Appendix: Crash study

All crash data and analysis are derived from MV-104AN crash reports filled out by NYPD, provided to NYC DOT in database format.

This chart breaks down total study period injuries presented on Page 5 into monthly injuries for the study period to demonstrate the monthly variation in crashes. The monthly injuries for April through October 2015-2017 (the same months of the study period in the preceding three years) are compared to the 2018 study period in the figure. This shows that, for the most part, the injuries at the *control sites* during the study period remain within the same range as the preceding three years while the injuries at the *study sites* during the study period often drop below the range of injuries in the preceding three years. Note that these numbers include crashes on all approaches near the intersection, not only those related to the LPI.

