APPENDICES – DEVELOPING GUIDANCE ON LEADING PEDESTRIAN INTERVALS AND CURB EXTENSIONS TO IMPROVE PEDESTRIAN SAFETY AT SIGNALIZED INTERSECTIONS

Appendices

by

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SI* (Modern Metric) Conversion Factors
Approximate Conversions to SI Units

Physical Quantity	Symbol	When You Know	Multiply By	To Find	Symbol
Length	n	inches	25.4	millimeters	mm
Length	ft	feet	0.305	meters	m
Length	yd	yards	0.914	meters	m
Length	mi	miles	1.61	kilometers	km
Area	in2	square inches	645.2	square millimeters	mm2
Area	ft2	square feet	0.093	square meters	m2
Area	yd2	square yard	0.836	square meters	m2
Area	ac	acres	0.405	hectares	ha
Area	mi2	square miles	2.59	square kilometers	km2
Volume	fl oz	fluid ounces	29.57	milliliters	mL
Volume	gal	gallons	3.785	liters **	L
Volume	ft3	cubic feet	0.028	cubic meters	m3
Volume	yd3	cubic yards	0.765	cubic meters	m3
Mass	oz	ounces	28.35	grams	g
Mass	lb	pounds	0.454	kilograms	kg
Mass	T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
Temperature (exact degrees)	oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	oC
Illumination	fc	foot-candles	10.76	lux	lx
Illumination	fl	foot-Lamberts	3.426	candela/m2	cd/m2
Force and Pressure or Stress	lbf	poundforce	4.45	newtons	N
Force and Pressure or Stress	lbf/in2	poundforce per square inch	6.89	kilopascals	kPa

*SI is the symbol for the International System of Measurement
** Volumes greater than 1000 L shall be shown in m^3

SI* (Modern Metric) Conversion Factors
Approximate Conversions from SI Units

Physical Quantity	Symbol	When You Know	Multiply By	To Find	Symbol
Length	mm	millimeters	0.039	inches	in
Length	m	meters	3.28	feet	ft
Length	m	meters	1.09	yards	yd
Length	km	kilometers	0.621	miles	mi
Area	mm2	square millimeters	0.0016	square inches	in2
Area	m2	square meters	10.764	square feet	ft2
Area	m2	square meters	1.195	square yards	yd2
Area	ha	hectares	2.47	acres	ac
Area	km2	square kilometers	0.386	square miles	mi2
Volume	mL	milliliters	0.034	fluid ounces	fl oz
Volume	L	liters	0.264	gallons	gal
Volume	m3	cubic meters	35.314	cubic feet	ft3
Volume	m3	cubic meters	1.307	cubic yards	yd3
Mass	g	grams	0.035	ounces	oz
Mass	kg	kilograms	2.202	pounds	lb
Mass	Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
Temperature (exact degrees)	oC	Celsius	1.8C+32	Fahrenheit	oF
Illumination	lx	lux	0.0929	foot-candles	fc
Illumination	cd/m2	candela/m2	0.2919	foot-Lamberts	fl
Force and Pressure or Stress	N	newtons	0.225	poundforce	lbf
Force and Pressure or Stress	kPa	kilopascals	0.145	poundforce per square inch	lbf/in2

For More Information see: https://www.fhwa.dot.gov/publications/convtabl.cfm

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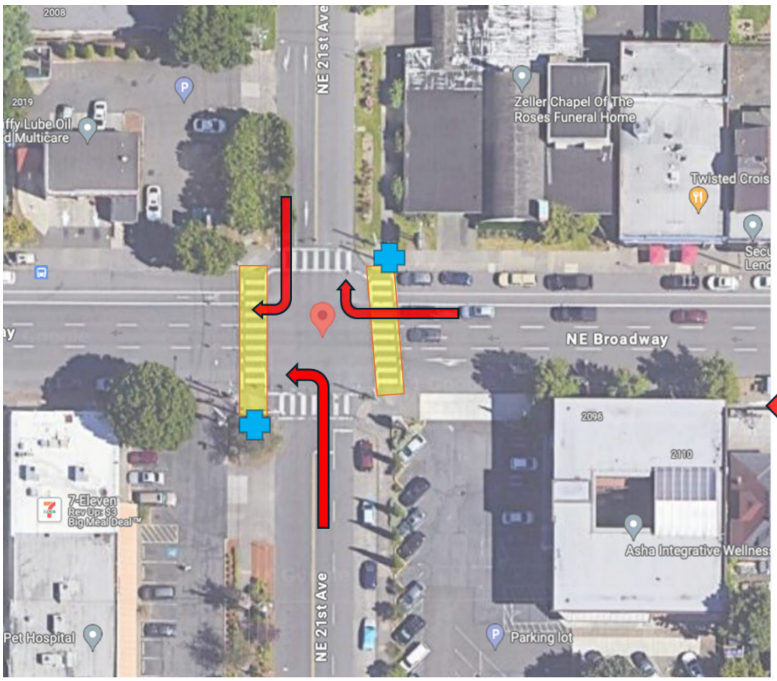


NE Broadway & 21st

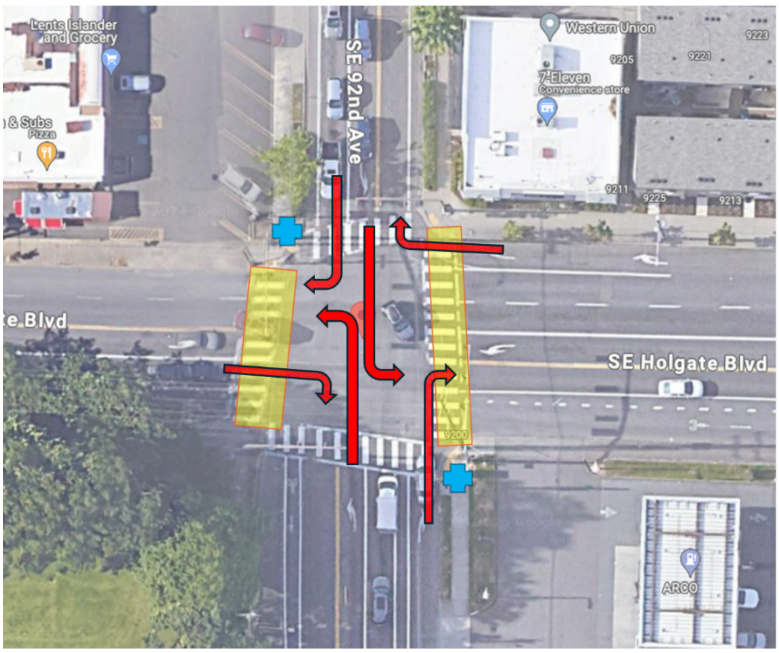
- Control

Crosswalks of Interest—both crosswalks that cross NE Broadway

Vehicle Movement of Interest—SB vehicles on 21st turning right onto Broadway, NB vehicles on 21st turning left onto Broadway, and WB vehicles turning right onto 21st from Broadway

Camera Placement—Utility poles at NE and SW corners

Figure A.1. Site 1 - NE Broadway & 21st Ave



SE Holgate Blvd& SE 92nd Ave

- Control

Crosswalks of Interest—both crosswalks that cross A Ave

Vehicle Movement of Interest—both right-turns and left-turns from 92nd St onto Holgate. Right-turns from Holgate onto 92nd

Camera Placement—Utility poles at NW and SE corners

Figure A.2. Site 2 – SE Holgate Blvd & SE 92nd Ave

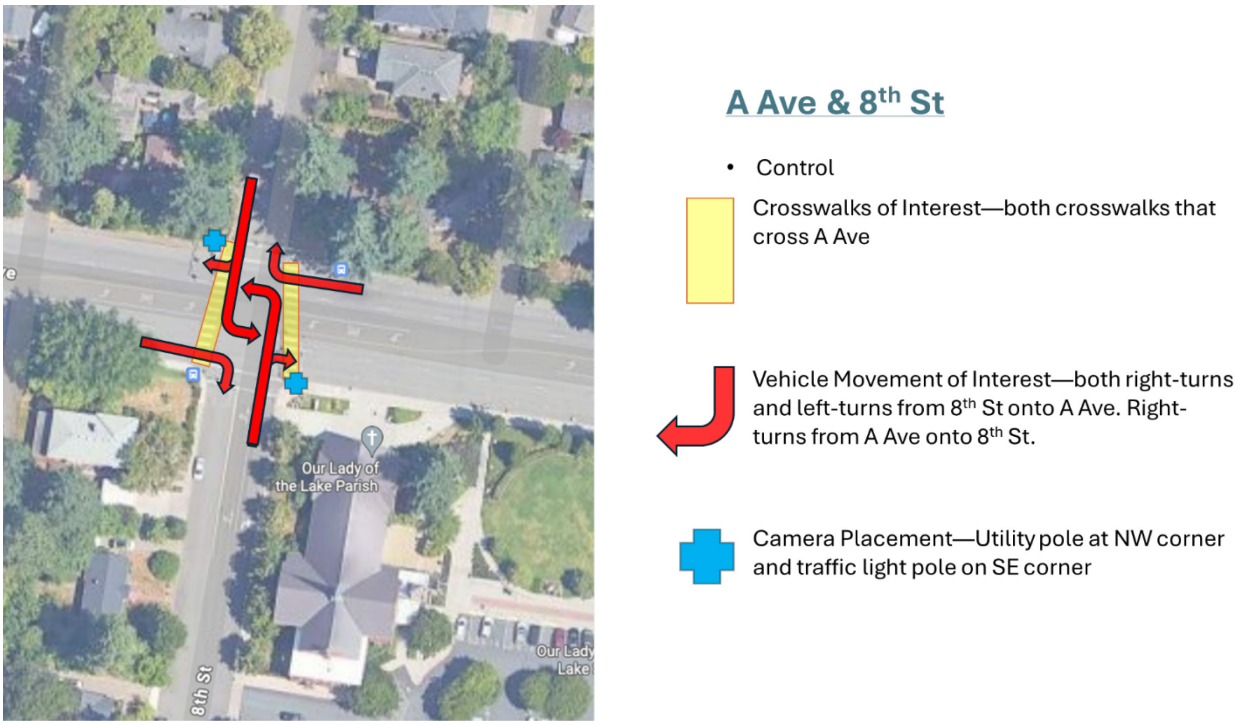


Figure A.3. Site 3 – A Ave & 8th St

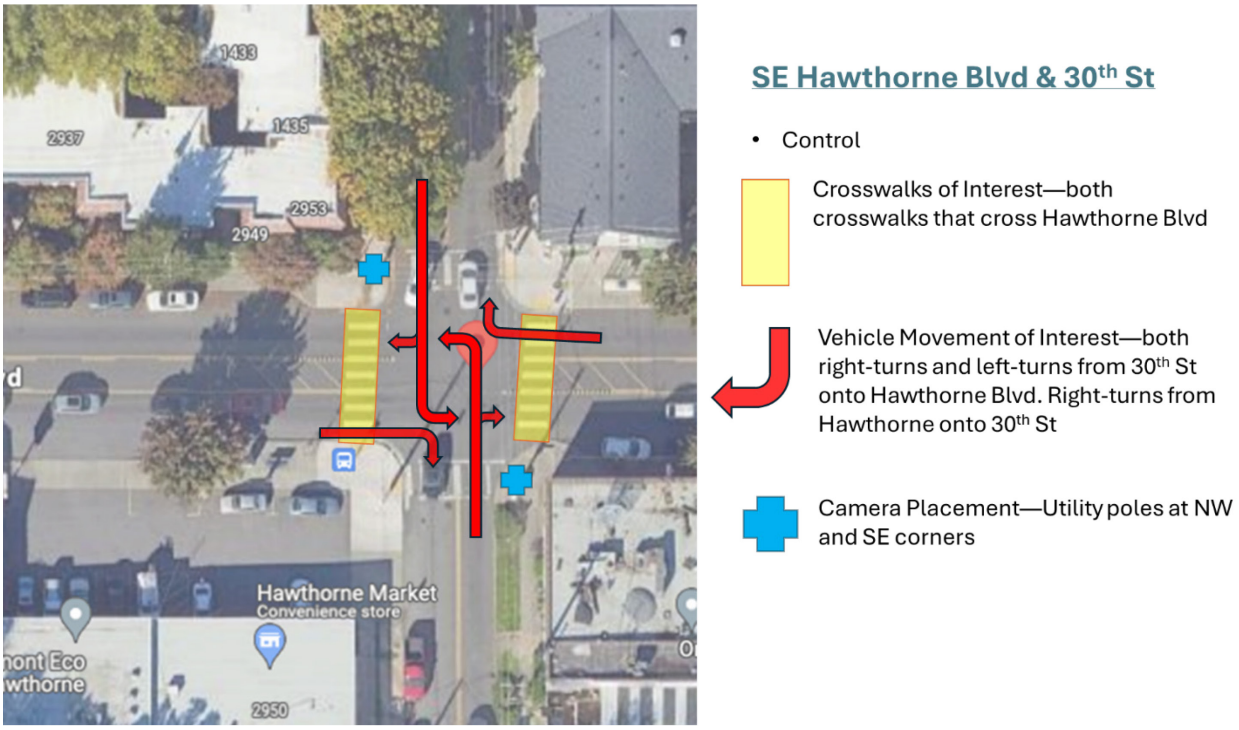


Figure A.4. Site 4 – SE Hawthorne Blvd & 30th St

NE Broadway & 14th

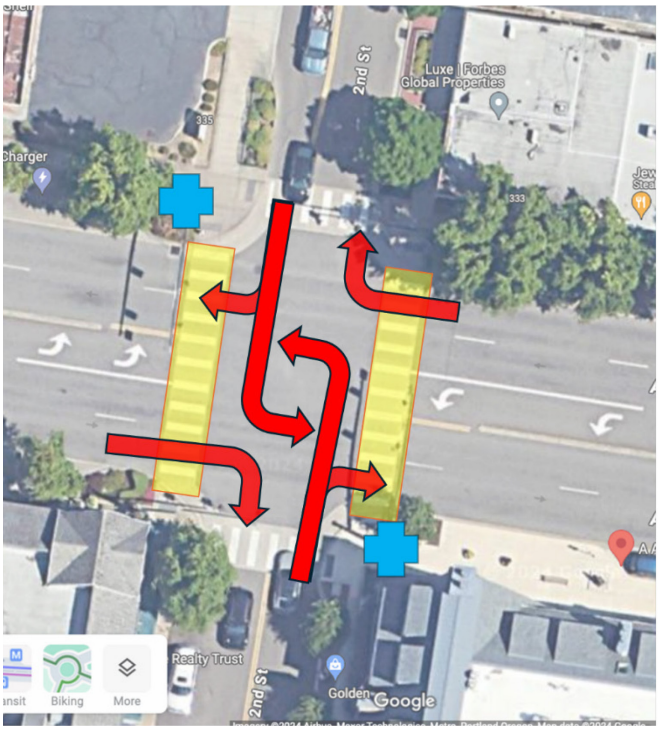
- ADT (Primary) - 15,121
- LPI used to cross Broadway (3 lanes)
- One-way
- Posted Speed – 30 mph
- Curb extensions on all crossings

Crosswalk of Interest—both crosswalks on Broadway

Vehicle Movement of Interest—SB vehicles on 14th turning right and NB vehicles on 14th turning left onto Broadway. WB vehicles turning right onto 14th.

Camera Placement—utility pole at SE corner on 14th sidewalk and light pole at NW corner

Figure A.5. Site 5 - NE Broadway & 14th Ave



A Ave & 2nd St

- ADT (Primary) - 14, 676
- LPI used to cross A Ave (5 lanes)
- Two-way
- Posted Speed – 30 mph
- Curb extensions on all crossings

Crosswalks of Interest—both crosswalks that cross A Ave

Vehicle Movement of Interest—both right-turns and left-turns from 2nd St onto A Ave. East and west bound right-turns from A Ave onto 2nd

Camera Placement—Traffic light poles at NW and SE corners

Figure A.6. Site 6 – A Ave & 2nd St

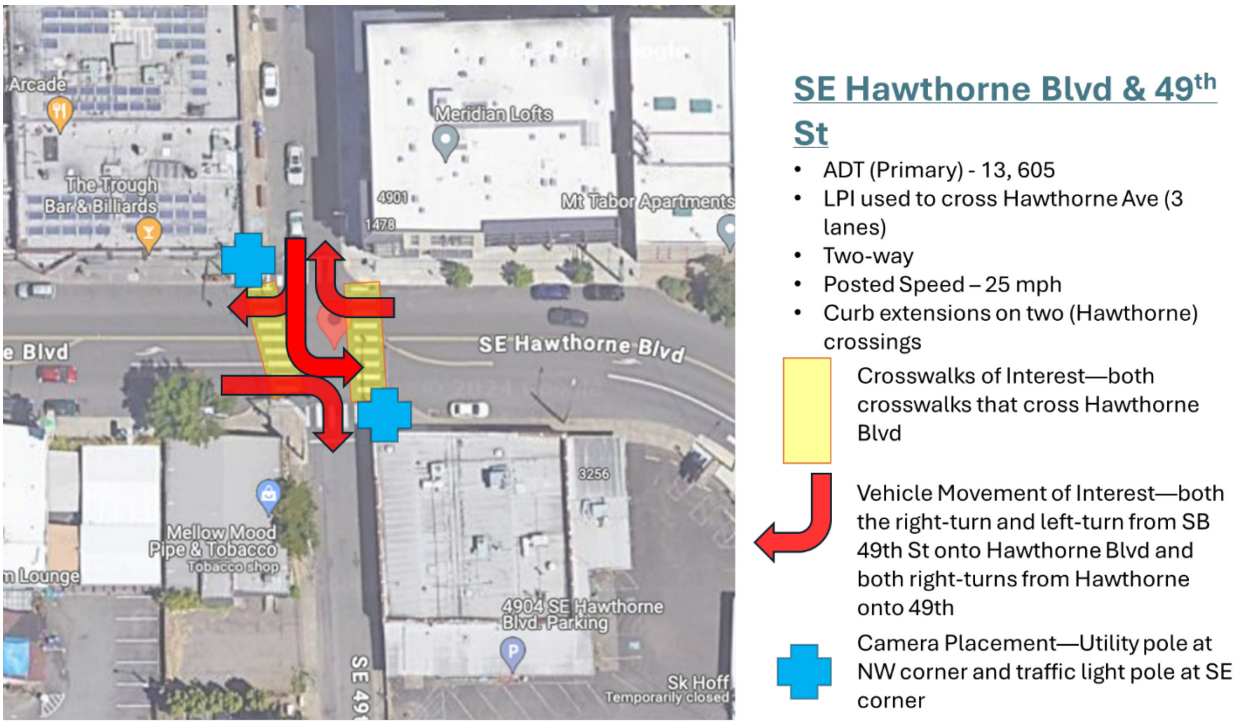


Figure A.7. Site 7 – SE Hawthorne Blvd & 49th Ave

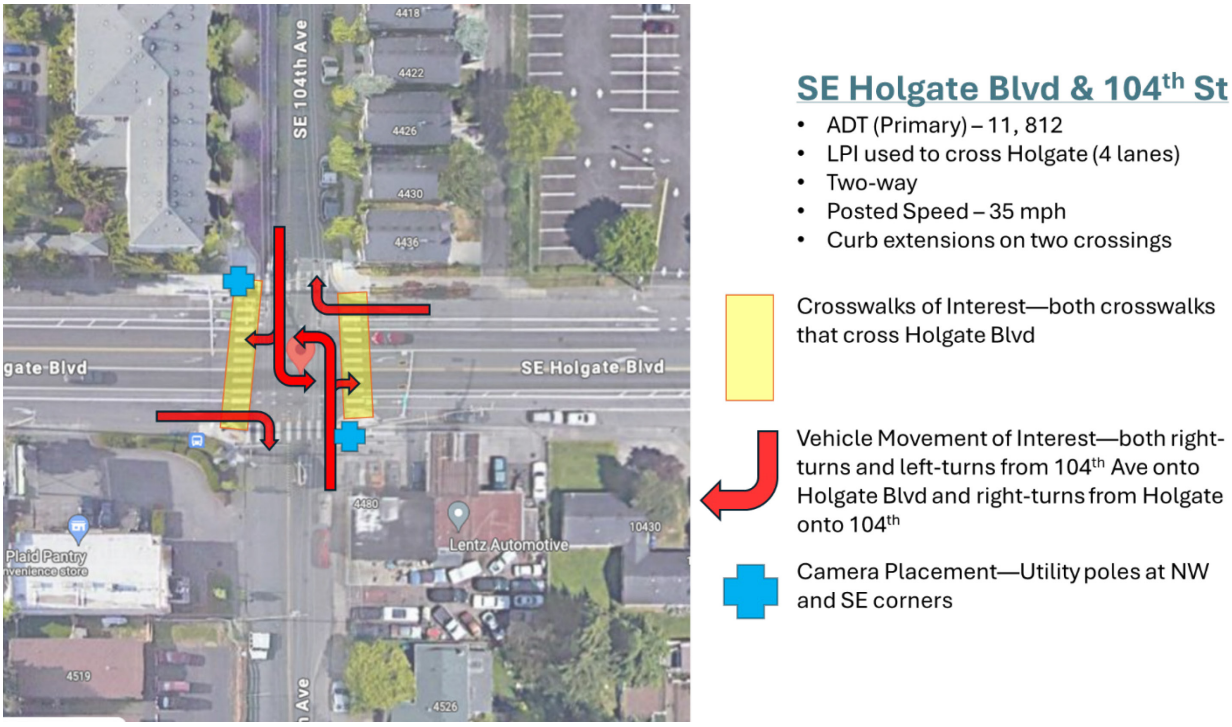


Figure A.8. Site 8 – SE Holgate Blvd & 104th St

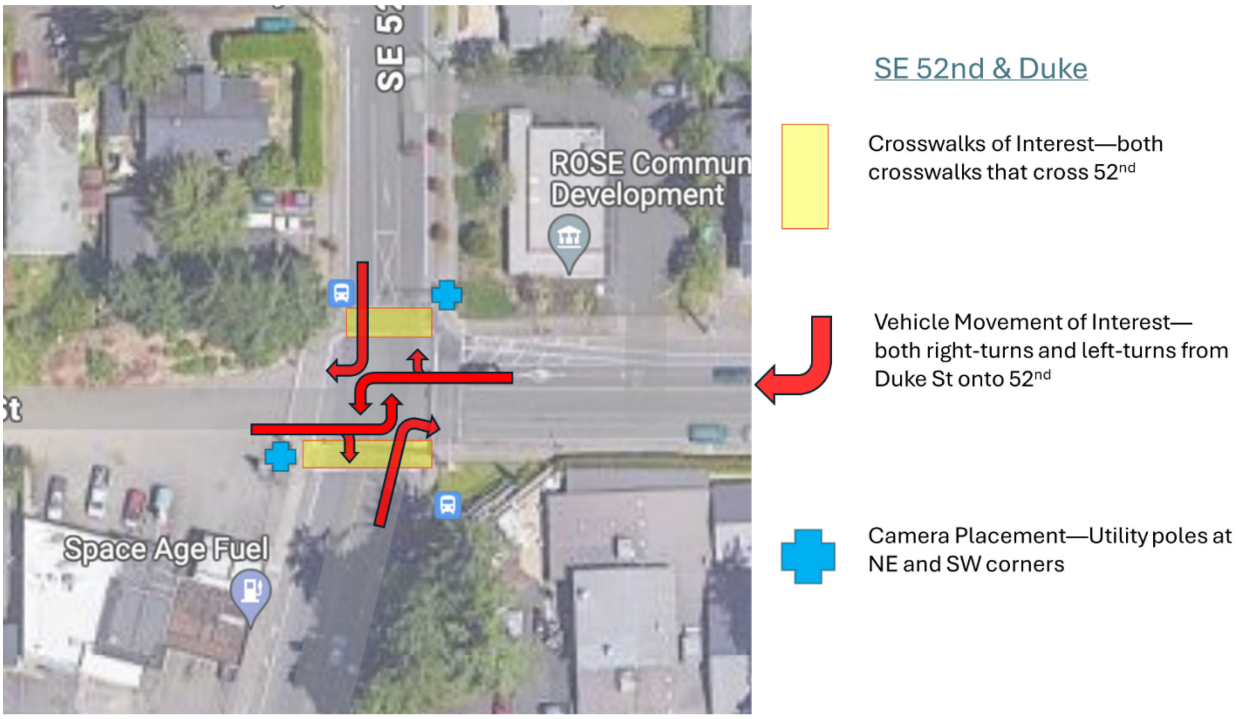


Figure A.9. Site 9 – SE 52nd & Duke St

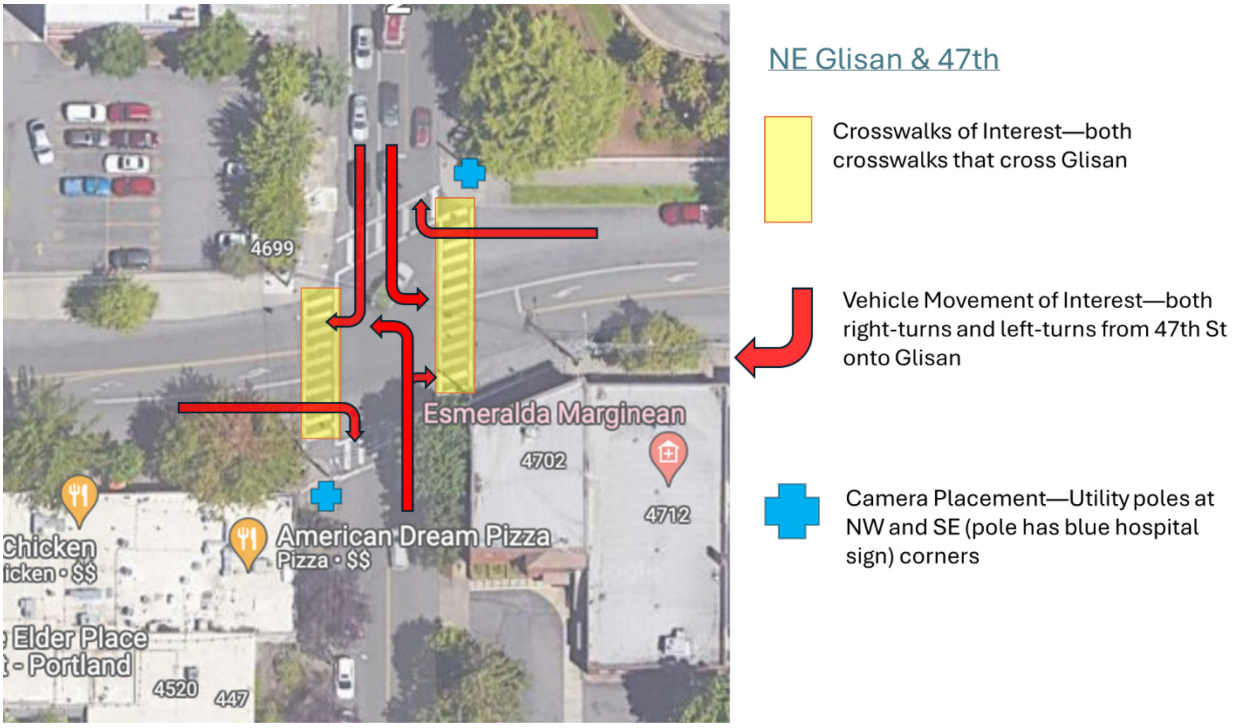


Figure A.10. Site 10 – SE Glisan St & 47th Ave

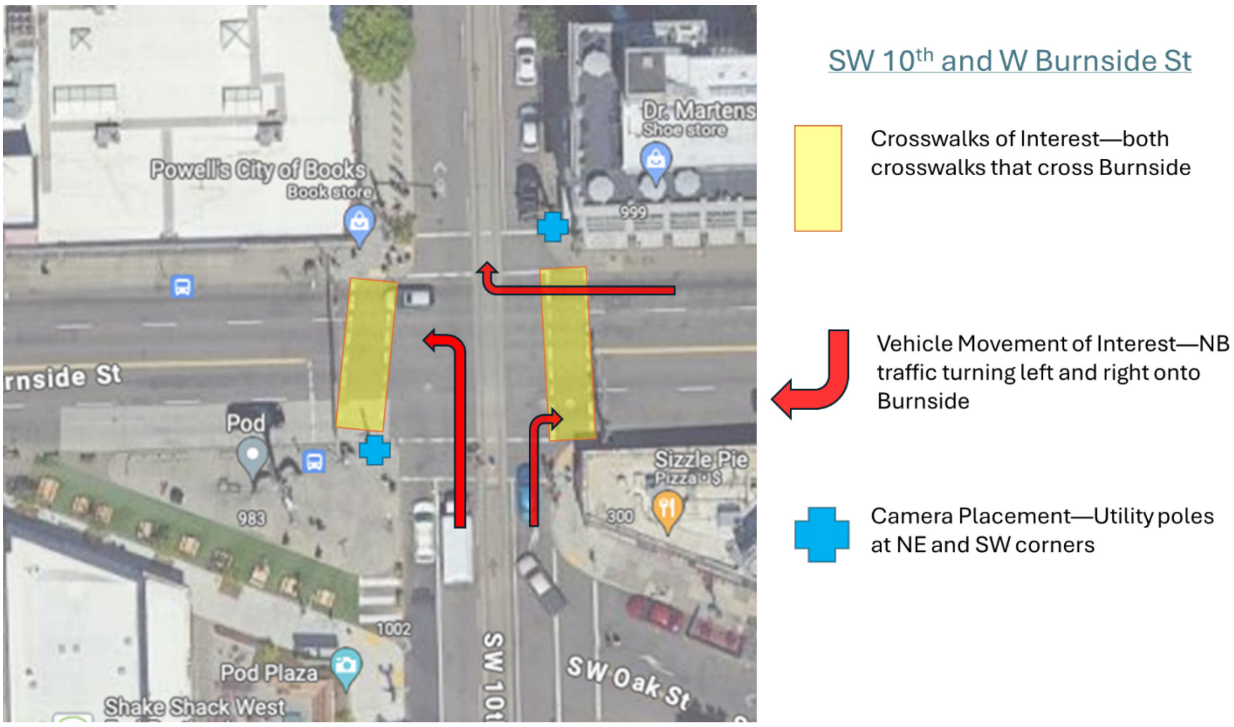


Figure A.11. Site 11 – SW 10th and W Burnside St

APPENDIX: B

Pedestrians in Multiple Conflicts by Intersection

Table B.1. Number & Percentage of Pedestrians in Multiple Conflicts by Intersection

Site	Treatment	Intersection	Crosswalk	Pedestrians in Multiple Conflicts
Single	Control	21st & Broadway	East	0 (0.0%)
			West	24 (7.9%)
		A & 8th	East	0 (0.0%)
			West	0 (0.0%)
		Holgate & 92nd	East	8 (9.5%)
			West	3 (4.7%)
	CE Only[1]	30th & Hawthorne	East	2 (2.2%)
			West	0 (0.0%)
	LPI Only	Holgate & 104th	West	1 (2.7%)
	LPI + Curb Extension	14th & Broadway	East	0 (7.1%)
			West	1 (1.5%)
		A & 2nd	East	0 (0.9%)
			West	0 (1.5%)
		49th & Hawthorne	East	2 (6.8%)
			West	0 (0.0%)
Before-After	Control	47th & Glisan - Before	East	4 (3.3%)
			West	1 (1.0%)
		52nd & Duke - Before	North	1 (4.6%)
			South	0 (1.8%)
		10th & Burnside - Before	East	21 (6.0%)
			West	38 (8.6%)
	LPI Only	47th & Glisan - After	East	7 (4.7%)
			West	1 (1.5%)
		52nd & Duke - After	North	1 (4.7%)
			South	3 (10.7%)
		10th & Burnside - After	East	7 (4.3%)
			West	28 (7.7%)

Pedestrian Group Size

Table B.2. Average Pedestrian Group Size by Intersection

Site	Treatment	Intersection	Pedestrian Group Size					
			n	Avg	Median	S.D.	Min	Max
Single	Control	21st & Broadway	316	1.18	1	0.47	1	4
		A & 8th	23	1.43	1	0.79	1	4
		Holgate & 92nd	159	1.16	1	0.43	1	3
	CE Only[1]	30th & Hawthorne	145	1.19	1	0.46	1	4
	LPI Only	Holgate & 104th	37	1.03	1	0.16	1	2
	LPI + Curb Extension	14th & Broadway	106	1.34	1	0.69	1	5
		A & 2nd	88	1.38	1	0.63	1	4
		49th & Hawthorne	68	1.35	1	0.77	1	5
Before-After	Control	47th & Glisan - Before	285	1.25	1	0.65	1	7
		52nd & Duke - Before	50	1.2	1	0.64	1	4
		10th & Burnside - Before	792	1.51	1	0.83	1	7
	LPI Only	47th & Glisan - After	260	1.24	1	0.82	1	12
		52nd & Duke - After	60	1.1	1	0.3	1	2
		10th & Burnside - After	527	1.31	1	0.67	1	5
All Sites			2916	1.32	1	0.7	1	12

Pedestrian Direction

Table B.3. Pedestrian Direction: All Pedestrians vs Pedestrians in Conflicts

Site	Treatment	Intersection	Crosswalk	All Ped Volumes		Conflict Ped Volumes	
				N-S or E-W	S-N or W-E	N-S or E-W	S-N or W-E
Single	Control	21st & Broadway	East	46.7%	53.3%	80.0%	20.0%
			West	50.0%	50.0%	61.7%	38.3%
		A & 8th	East	43.4%	56.6%	36.8%	63.2%
			West	63.9%	36.1%	50.0%	50.0%
		Holgate & 92nd	East	50.0%	48.6%	40.5%	59.5%
			West	41.8%	58.2%	45.3%	54.7%
	CE Only[1]	30th & Hawthorne	East	53.0%	47.0%	66.7%	33.3%
			West	57.8%	42.2%	43.6%	56.4%
	LPI Only	Holgate & 104th	West	43.2%	56.8%	24.3%	75.7%
	LPI + Curb Extension	14th & Broadway	East	43.2%	56.8%	100%	0%
			West	46.1%	53.9%	56.6%	43.4%
		A & 2nd	East	50.0%	50.0%	60.0%	40.0%
			West	63.7%	36.3%	75.8%	24.2%
		49th & Hawthorne	East	49.5%	50.5%	64.9%	35.1%
			West	45.5%	54.5%	19.4%	80.6%
Before-After	Control	47th & Glisan - Before	East	48.8%	51.2%	54.3%	45.7%
			West	54.4%	45.6%	43.5%	56.5%
		52nd & Duke - Before	North	64.90%	35.10%	54.50%	45.50%
			South	43.10%	56.90%	42.90%	57.10%
		10th & Burnside - Before	East	48.70%	51.30%	51.70%	48.30%
			West	45.50%	54.50%	47.70%	52.30%
	LPI Only	47th & Glisan - After	East	38.90%	61.10%	68.80%	31.20%
			West	56.60%	43.40%	44.00%	56.00%
		52nd & Duke - After	North	41.80%	58.20%	34.40%	65.60%
			South	41.80%	58.20%	57.10%	42.90%
		10th & Burnside - After	East	45.20%	54.80%	46.60%	53.40%
			West	43.20%	56.80%	42.90%	57.10%

Table B.4. Pedestrian Direction: Difference in Percentages between All Pedestrians & Pedestrians in Conflicts

Site	Treatment	Intersection	Crosswalk	Difference (All – Conflict)	
				N-S or E-W	S-N or W-E
Single	Control	21st & Broadway	East	-33.3%	33.3%
			West	-11.7%	11.7%
		A & 8th	East	6.6%	-6.6%
			West	13.9%	-13.9%
		Holgate & 92nd	East	9.5%	-10.9%
			West	-3.5%	3.5%
	CE Only[1]	30th & Hawthorne	East	-13.7%	13.7%
			West	14.2%	-14.2%
	LPI Only	Holgate & 104th	West	18.9%	-18.9%
	LPI + Curb Extension	14th & Broadway	East	-56.8%	56.8%
			West	-10.5%	10.5%
		A & 2nd	East	-10.0%	10.0%
			West	-12.1%	12.1%
		49th & Hawthorne	East	-15.4%	15.4%
			West	26.1%	-26.1%
Before-After	Control	47th & Glisan - Before	East	-5.5%	5.5%
			West	10.9%	-10.9%
	LPI Only	47th & Glisan - After	East	-29.9%	29.9%
			West	12.6%	-12.6%
	Control	52nd & Duke - Before	North	10.4%	-10.4%
			South	0.2%	-0.2%
	LPI Only	52nd & Duke - After	North	7.4%	-7.4%
			South	-15.3%	15.3%
	Control	10th & Burnside - Before	East	-3.0%	3.0%
			West	-2.2%	2.2%
	LPI Only	10th & Burnside - After	East	-1.4%	1.4%
			West	0.3%	-0.3%

Pedestrian Crossing Start

Table B.5. Average Crossing Start Phase by Intersection

Site	Treatment	Intersection	Walk	FDW	Stop Don't Walk		
					(Within 5 sec)	(Vehicle Green)	(Vehicle Red)
Single	Control	21st & Broadway	284 (89.9%)	31 (9.8%)	0 (0%)	0 (0%)	1 (0.3%)
		A & 8th	21 (91.3%)	1 (4.3%)	0 (0%)	1 (4.3%)	0 (0%)
		Holgate & 92nd	110 (69.2%)	15 (9.4%)	5 (3.1%)	24 (15.1%)	5 (3.1%)
	CE Only[1]	30th & Hawthorne	121 (83.4%)	19 (13.1%)	3 (2.1%)	0 (0.0%)	2 (1.4%)
	LPI Only	Holgate & 104th	29 (78.4%)	0 (0.0%)	1 (2.7%)	6 (16.2%)	1 (2.7%)
	LPI + Curb Extension	14th & Broadway	99 (93.4%)	6 (5.7%)	0 (0.0%)	0 (0.0%)	1 (0.9%)
		A & 2nd	77 (87.5%)	8 (9.1%)	1 (1.1%)	0 (0.0%)	2 (2.3%)
		49th & Hawthorne	58 (85.3%)	5 (7.4%)	0 (0.0%)	3 (4.4%)	2 (2.9%)
Before-After	Control	47th & Glisan - Before	253 (88.8%)	30 (10.5%)	0 (0.0%)	0 (0.0%)	2 (0.7%)
		52nd & Duke - Before	42 (84.0%)	2 (4.0%)	1 (2.0%)	5 (10.0%)	0 (0%)
		10th & Burnside - Before	674 (85.1%)	109 (13.8%)	4 (0.5%)	0 (0%)	5 (0.6%)
	LPI Only	47th & Glisan - After	204 (78.5%)	54 (20.8%)	0 (0.0%)	0 (0.0%)	2 (0.8%)
		52nd & Duke - After	39 (65.0%)	4 (6.7%)	0 (0.0%)	10 (16.7%)	7 (11.7%)
		10th & Burnside - After	449 (85.2%)	71 (13.5%)	5 (0.9%)	0 (0.0%)	2 (0.4%)

Pedestrian Dwell Time

Table B.6. Average Pedestrian Dwell Time by Intersection

Site	Treatment	Intersection	Pedestrian Dwell Time (seconds)					
			n	Avg	Median	S.D.	Min	Max
Single	Control	21st & Broadway	316	13.94	7.75	15.65	0	77.75
		A & 8th	23	49.52	19.5	132.54	0	651.5
		Holgate & 92nd	159	25.71	18.75	54.54	0	670
	CE Only[1]	30th & Hawthorne	145	16.89	12	17.78	0	77.5
	LPI Only	Holgate & 104th	37	32.59	21.5	38.78	0	215
	LPI + Curb Extension	14th & Broadway	106	11.5	0.5	16.46	0	96
		A & 2nd	88	25.63	20.88	23.65	0	108.75
		49th & Hawthorne	68	26.81	23.12	23	0	119.5
Before-After	Control	47th & Glisan - Before	285	17.49	13.25	17.44	0	73.5
		52nd & Duke - Before	50	24.73	19.25	19.06	2.25	89.75
		10th & Burnside - Before	792	16.01	5.25	22.19	0	208.75
	LPI Only	47th & Glisan - After	255	14.34	7.5	17.24	0	89.5
		52nd & Duke - After	60	18.75	9.75	23.4	0	122.5
		10th & Burnside - After	527	17.94	7	25.82	0	314
All			2911	17.77	10.0	27.29	0	670

Pedestrian Crossing Time

Table B.7. Pedestrian Crossing Time by Intersection

Site	Treatment	Intersection	Pedestrian Crossing Time (seconds)					
			n	Avg	Median	S.D.	Min	Max
Single	Control	21st & Broadway	316	11.36	11.75	2.66	3	26.25
		A & 8th	23	15.56	15.5	4.88	7.25	29.25
		Holgate & 92nd	159	11.54	11.5	3.21	4.25	20.75
	CE Only[1]	30th & Hawthorne	145	9.08	9	2.69	3.25	31
	LPI Only	Holgate & 104th	37	13.12	13	2.39	6	20.25
	LPI + Curb Extension	14th & Broadway	106	9	9	2.16	2.5	13.5
		A & 2nd	88	13.82	13.56	4.77	5.5	50
		49th & Hawthorne	68	10.58	10.38	2.5	4	18.75
Before-After	Control	47th & Glisan - Before	285	12.08	12.25	3.09	4.75	25
		52nd & Duke - Before	50	9.37	9.5	2.41	4.5	16
		10th & Burnside - Before	792	10.57	10.46	2.26	2.45	21.5
	LPI Only	47th & Glisan - After	260	12.08	12.49	3.51	3.75	27
		52nd & Duke - After	60	8.59	8.63	2.64	3.5	14.5
		10th & Burnside - After	527	10.09	9.75	2.12	4	26.75
All			2916	10.88	10.75	2.96	2.45	50.0

Conflict User Types

Table B.8. Percentage of Conflicts where Pedestrian Arrived First

Site	Treatment	Intersection	Pedestrian Arrived First
Single	Control	21st & Broadway	268 (84.8%)
		A & 8th	22 (95.7%)
		Holgate & 92nd	104 (65.4%)
	CE Only[1]	30th & Hawthorne	132 (91.0%)
	LPI Only	Holgate & 104th	31 (83.8%)
	LPI + Curb Extension	14th & Broadway	93 (87.7%)
		A & 2nd	77 (87.5%)
		49th & Hawthorne	65 (95.6%)
Before-After	Control	47th & Glisan - Before	264 (92.6%)
		52nd & Duke - Before	43 (86.0%)
		10th & Burnside – Before	668 (84.3%)
	LPI Only	47th & Glisan - After	234 (90.0%)
		52nd & Duke - After	48 (80.0%)
		10th & Burnside - After	476 (90.3%)

Pedestrian Types

Table B.9. Proportion of Pedestrian Types by Treatment

Intersection	Walking	Riding Bike	Walk Bike	Scooter/ Skateboard
Control	1533 (94.2%)	69 (4.2%)	19 (1.2%)	7 (0.4%)
Curb Extension Only	140 (96.6%)	2 (1.4%)	0 (0.0%)	3 (2.1%)
LPI Only	841 (95.1%)	32 (3.6%)	7 (0.8%)	4 (0.5%)
Curb Extension + LPI	248 (94.7%)	10 (3.8%)	2 (0.8%)	2 (0.8%)

Table B.10. Proportion of Pedestrian Types by Intersection

Site	Treatment	Intersection	Walking	Riding Bike	Walk Bike	Scooter/ Skateboard
Single	Control	21st & Broadway	301 (94.4%)	13 (4.1%)	3 (0.9%)	2 (0.6%)
		A & 8th	23 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Holgate & 92nd	131 (81.9%)	22 (13.8%)	5 (3.1%)	2 (1.2%)
	CE Only[1]	30th & Hawthorne	140 (96.6%)	2 (1.4%)	0 (0.0%)	3 (2.1%)
	LPI Only	Holgate & 104th	37 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	101 (94.4%)	6 (5.6%)	0 (0.0%)	0 (0.0%)
		A & 2nd	83 (95.4%)	2 (2.3%)	1 (1.1%)	1 (1.1%)
		49th & Hawthorne	64 (94.1%)	2 (2.9%)	1 (1.5%)	1 (1.5%)
Before-After	Control	47th & Glisan - Before	259 (90.9%)	19 (6.7%)	6 (2.1%)	1 (0.4%)
		52nd & Duke - Before	45 (90.0%)	4 (8.0%)	0 (0.0%)	1 (2.0%)
		10th & Burnside - Before	774 (97.9%)	11 (1.4%)	5 (0.6%)	1 (0.1%)
	LPI Only	47th & Glisan - After	232 (88.9%)	25 (9.6%)	3 (1.1%)	1 (0.4%)
		52nd & Duke - After	53 (88.3%)	5 (8.3%)	2 (3.3%)	0 (0.0%)
		10th & Burnside - After	519 (98.7%)	2 (0.4%)	2 (0.4%)	3 (0.6%)

Conflict Time After WALK Signal

Table B.11. Average Conflict Time after WALK Signal by Intersection

Site	Treatment	Intersection	Conflict Time After WALK Signal (seconds)					
			n	Avg	Median	S.D.	Min	Max
Single	Control	21st & Broadway	316	14.13	13.25	5.75	1.75	33.25
		A & 8th	22	13.28	12.25	5.54	6.5	24.5
		Holgate & 92nd	129	11.93	11.59	6.19	0.75	34.5
	CE Only[1]	30th & Hawthorne	144	12.53	11.75	4.38	0.25	25.25
	LPI Only	Holgate & 104th	30	14.9	15.25	4.3	3.25	22.5
	LPI + Curb Extension	14th & Broadway	106	14	13.5	4.87	1.74	25.43
		A & 2nd	87	14.93	14.5	5.37	3.75	32
		49th & Hawthorne	63	12.5	12.25	3.7	3.01	22
Before-After	Control	47th & Glisan - Before	285	14.52	14.5	6.03	-17	38.25
		52nd & Duke - Before	45	10.42	10.25	3.54	1.75	21.25
		10th & Burnside - Before	792	16.37	15.99	6.31	-19	53
	LPI Only	47th & Glisan - After	259	16.38	17	12.95	-161.4	35.75
		52nd & Duke - After	47	10.17	11.75	9.97	-35.25	28.37
		10th & Burnside - After	527	15.66	14.5	5.41	-1.75	36.24
All			2852	14.96	14.5	6.96	-161.4	53

Vehicle Type

Table B.12. Vehicle Type by Intersection

Site	Treatment	Intersection	Vehicle Type							
			Pass. Veh.	Truck	Bus	Ambulance	HV	Van	Motorcycle	Other
Single	Control	21st & Broadway	282 (89.2%)	19 (6.0%)	0 (0.0%)	0 (0.0%)	5 (1.6%)	7 (2.2%)	2 (0.6%)	1 (0.3%)
		A & 8th	23 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Holgate & 92nd	140 (88.1%)	15 (9.4%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	2 (1.3%)	0 (0.0%)	1 (0.6%)
	CE Only[1]	30th & Hawthorne	131 (90.3%)	12 (8.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (1.4%)	0 (0.0%)	0 (0.0%)
	LPI Only	Holgate & 104th	34 (91.9%)	3 (8.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	LPI + CE	14th & Broadway	98 (92.5%)	3 (2.8%)	0 (0.0%)	0 (0.0%)	1 (0.9%)	3 (2.8%)	1 (0.9%)	0 (0.0%)
		A & 2nd	78 (88.6%)	7 (8.0%)	2 (2.3%)	0 (0.0%)	0 (0.0%)	1 (1.1%)	0 (0.0%)	0 (0.0%)
		49th & Hawthorne	61 (89.7%)	6 (8.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.5%)	0 (0.0%)	0 (0.0%)
Before-After	Control	47th & Glisan - Before	238 (83.5%)	26 (9.1%)	3 (1.1%)	1 (0.4%)	4 (1.4%)	11 (3.9%)	2 (0.7%)	0 (0.0%)
		52nd & Duke - Before	42 (84.0%)	5 (10.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.0%)	1 (2.0%)	0 (0.0%)
		10^{th} & Burnside - Before	699 (88.3%)	47 (5.9%)	0 (0.0%)	0 (0.0%)	11 (1.4%)	30 (3.8%)	5 (0.6%)	0 (0.0%)
	LPI Only	47th & Glisan - After	229 (88.1%)	13 (5.0%)	3 (1.2%)	1 (0.4%)	7 (2.7%)	7 (2.7%)	0 (0.0%)	0 (0.0%)
		52nd & Duke - After	54 (90.0%)	6 (10.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		10^{th} & Burnside - After	472 (89.6%)	31 (5.9%)	0 (0.0%)	0 (0.0%)	6 (1.1%)	14 (2.7%)	4 (0.8%)	0 (0.0%)

Driver Evasive Action

Table B.13. Driver Evasive Action by Intersection

Site	Treatment	Intersection	Driver Evasive Action		
			None	Hard Braking	Other
Single	Control	21st & Broadway	311 (98.4%)	5 (1.6%)	0 (0.0%)
		A & 8th	21 (91.3%)	2 (8.7%)	0 (0.0%)
		Holgate & 92nd	153 (96.2%)	3 (1.9%)	3 (1.9%)
	CE Only[1]	30th & Hawthorne	144 (99.3%)	1 (0.7%)	0 (0.0%)
	LPI Only	Holgate & 104th	37 (100.0%)	0 (0.0%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	105 (99.1%)	1 (0.9%)	0 (0.0%)
		A & 2nd	88 (100.0%)	0 (0.0%)	0 (0.0%)
		49th & Hawthorne	66 (97.1%)	2 (2.9%)	0 (0.0%)
Before-After	Control	47th & Glisan - Before	277 (97.2%)	8 (2.8%)	0 (0.0%)
		52nd & Duke - Before	50 (100.0%)	0 (0.0%)	0 (0.0%)
		10th & Burnside - Before	777 (98.1%)	15 (1.9%)	0 (0.0%)
	LPI Only	47th & Glisan - After	252 (96.9%)	8 (3.1%)	0 (0.0%)
		52nd & Duke - After	60 (100.0%)	0 (0.0%)	0 (0.0%)
		10th & Burnside - After	527 (100.0%)	0 (0.0%)	0 (0.0%)

Pedestrian Evasive Action

Table B.14. Pedestrian Evasive Action by Intersection

Site	Treatment	Intersection	Pedestrian Evasive Action			
			None	Hard Stopping	Hard Swerving	Running
Single	Control	21st & Broadway	311 (98.4%)	3 (0.9%)	0 (0.0%)	2 (0.6%)
		A & 8th	23 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		Holgate & 92nd	155 (97.5%)	1 (0.6%)	0 (0.0%)	3 (1.9%)
	CE Only[1]	30th & Hawthorne	143 (98.6%)	0 (0.0%)	0 (0.0%)	2 (1.4%)
	LPI Only	Holgate & 104th	35 (94.6%)	0 (0.0%)	0 (0.0%)	2 (5.4%)
	LPI + Curb Extension	14th & Broadway	103 (97.2%)	2 (1.9%)	0 (0.0%)	1 (0.9%)
		A & 2nd	87 (98.9%)	0 (0.0%)	1 (1.1%)	0 (0.0%)
		49th & Hawthorne	66 (97.1%)	1 (1.5%)	0 (0.0%)	1 (1.5%)
Before-After	Control	47th & Glisan - Before	265 (93.0%)	3 (1.1%)	0 (0.0%)	17 (6.0%)
		52nd & Duke - Before	49 (98.0%)	1 (2.0%)	0 (0.0%)	0 (0.0%)
		10th & Burnside - Before	782 (98.7%)	6 (0.8%)	0 (0.0%)	4 (0.5%)
	LPI Only	47th & Glisan - After	256 (98.5%)	3 (1.2%)	1 (0.4%)	0 (0.0%)
		52nd & Duke - After	59 (98.3%)	1 (1.7%)	0 (0.0%)	0 (0.0%)
		10th & Burnside - After	524 (99.4%)	2 (0.4%)	0 (0.0%)	1 (0.2%)

Driver Stopping Zone

Table B.15. Driver Stopping Zone by Intersection

Site	Treatment	Intersection	Driver Stopping Zone				
			No Stop	Before First Crosswalk	In First Crosswalk	In Intersection	In Second Crosswalk
Single	Control	21st & Broadway	137 (43.4%)	124 (39.2%)	42 (13.3%)	13 (4.1%)	0 (0.0%)
		A & 8th	13 (56.5%)	5 (21.7%)	3 (13.0%)	2 (8.7%)	0 (0.0%)
		Holgate & 92nd	109 (68.6%)	30 (18.9%)	12 (7.5%)	8 (5.0%)	0 (0.0%)
	CE Only[1]	30th & Hawthorne	87 (60.0%)	43 (29.7%)	13 (9.0%)	2 (1.4%)	0 (0.0%)
	LPI Only	Holgate & 104th	15 (40.5%)	16 (43.2%)	5 (13.5%)	1 (2.7%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	38 (35.8%)	59 (55.7%)	7 (6.6%)	2 (1.9%)	0 (0.0%)
		A & 2nd	26 (29.5%)	48 (54.5%)	11 (12.5%)	3 (3.4%)	0 (0.0%)
		49th & Hawthorne	30 (44.1%)	36 (52.9%)	1 (1.5%)	1 (1.5%)	0 (0.0%)
Before-After	Control	47th & Glisan - Before	135 (47.4%)	84 (29.5%)	30 (10.5%)	36 (12.6%)	0 (0.0%)
		52nd & Duke - Before	19 (38.0%)	23 (46.0%)	5 (10.0%)	3 (6.0%)	0 (0.0%)
		10th & Burnside - Before	147 (18.6%)	429 (54.2%)	141 (17.8%)	74 (9.3%)	1 (0.1%)
	LPI Only	47th & Glisan - After	137 (52.7%)	91 (35.0%)	18 (6.9%)	13 (5.0%)	1 (0.4%)
		52nd & Duke - After	35 (58.3%)	21 (35.0%)	4 (6.7%)	0 (0.0%)	0 (0.0%)
		10th & Burnside - After	113 (21.4%)	372 (70.6%)	28 (5.3%)	14 (2.7%)	0 (0.0%)

Driver Stop Type

Table B.16. Driver Stop Type by Intersection

Site	Treatment	Intersection	Driver Evasive Action			
			Full Stop	Rolling	Partial	Starts from Stop
Single	Control	21st & Broadway	45 (14.2%)	136 (43.0%)	10 (3.2%)	125 (39.6%)
		A & 8th	5 (21.7%)	13 (56.5%)	0 (0.0%)	5 (21.7%)
		Holgate & 92nd	33 (20.8%)	109 (68.6%)	1 (0.6%)	16 (10.1%)
	CE Only[1]	30th & Hawthorne	9 (6.2%)	87 (60.0%)	1 (0.7%)	48 (33.1%)
	LPI Only	Holgate & 104th	10 (27.0%)	15 (40.5%)	1 (2.7%)	11 (29.7%)
	LPI + CE	14th & Broadway	4 (3.8%)	37 (34.9%)	5 (4.7%)	60 (56.6%)
		A & 2nd	11 (12.5%)	26 (29.5%)	0 (0.0%)	51 (58.0%)
		49th & Hawthorne	3 (4.4%)	30 (44.1%)	0 (0.0%)	35 (51.5%)
Before-After	Control	47th & Glisan - Before	53 (18.6%)	130 (45.6%)	25 (8.8%)	77 (27.0%)
		52nd & Duke - Before	11 (22.0%)	19 (38.0%)	1 (2.0%)	19 (38.0%)
		10th & Burnside - Before	192 (24.2%)	146 (18.4%)	11 (1.4%)	443 (55.9%)
	LPI Only	47th & Glisan - After	32 (12.3%)	135 (51.9%)	3 (1.2%)	90 (34.6%)
		52nd & Duke - After	8 (13.3%)	34 (56.7%)	0 (0.0%)	18 (30.0%)
		10th & Burnside - After	46 (8.7%)	110 (20.9%)	4 (0.8%)	367 (69.6%)

Pedestrian Distraction

Table B.17. Pedestrian Distraction by Intersection

Site	Treatment	Intersection	Pedestrian Distraction	
			None	Distraction
Single	Control	21st & Broadway	293 (92.7%)	23 (7.3%)
		A & 8th	23 (100.0%)	0 (0.0%)
		Holgate & 92nd	155 (97.5%)	4 (2.5%)
	CE Only[1]	30th & Hawthorne	136 (93.8%)	9 (6.2%)
	LPI Only	Holgate & 104th	35 (94.6%)	2 (5.4%)
	LPI + Curb Extension	14th & Broadway	102 (96.2%)	4 (3.8%)
		A & 2nd	78 (88.6%)	10 (11.4%)
		49th & Hawthorne	67 (98.5%)	1 (1.5%)
Before-After	Control	47th & Glisan - Before	262 (91.9%)	23 (8.1%)
		52nd & Duke - Before	47 (94.0%)	3 (6.0%)
		10th & Burnside - Before	749 (94.6%)	43 (5.4%)
	LPI Only	47th & Glisan - After	246 (94.6%)	14 (5.4%)
		52nd & Duke - After	56 (93.3%)	4 (6.7%)
		10th & Burnside - After	495 (93.9%)	32 (6.1%)

Pedestrian Age

Table B.18. Pedestrian Age by Intersection

Site	Treatment	Intersection	Pedestrian Age			
			Adult	Child / Teen	Older Adult	Unknown / Group
Single	Control	21st & Broadway	284 (89.9%)	8 (2.5%)	20 (6.3%)	3 (0.9%)
		A & 8th	17 (73.9%)	0 (0.0%)	2 (8.7%)	4 (17.4%)
		Holgate & 92nd	151 (95.0%)	2 (1.3%)	1 (0.6%)	5 (3.1%)
	CE Only[1]	30th & Hawthorne	137 (94.5%)	0 (0.0%)	6 (4.1%)	2 (1.4%)
	LPI Only	Holgate & 104th	37 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	93 (87.7%)	2 (1.9%)	10 (9.4%)	1 (0.9%)
		A & 2nd	76 (86.4%)	3 (3.4%)	5 (5.7%)	4 (4.5%)
		49th & Hawthorne	66 (97.1%)	0 (0.0%)	1 (1.5%)	1 (1.5%)
Before-After	Control	47th & Glisan - Before	227 (79.6%)	6 (2.1%)	37 (13.0%)	15 (5.3%)
		52nd & Duke - Before	47 (94.0%)	0 (0.0%)	1 (2.0%)	2 (4.0%)
		10th & Burnside - Before	727 (91.8%)	5 (0.6%)	17 (2.1%)	40 (5.1%)
	LPI Only	47th & Glisan - After	234 (90.0%)	1 (0.4%)	16 (6.2%)	9 (3.5%)
		52nd & Duke - After	56 (93.3%)	0 (0.0%)	2 (3.3%)	2 (3.3%)
		10th & Burnside - After	501 (95.1%)	3 (0.6%)	12 (2.3%)	9 (1.7%)

Child Present

Table B.19. Child Presence by Intersection

Site	Treatment	Intersection	Child Present	
			No	Yes
Single	Control	21st & Broadway	308 (97.5%)	7 (2.2%)
		A & 8th	17 (73.9%)	6 (26.1%)
		Holgate & 92nd	152 (95.6%)	7 (4.4%)
	CE Only[1]	30th & Hawthorne	143 (98.6%)	2 (1.4%)
	LPI Only	Holgate & 104th	37 (100.0%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	99 (93.4%)	7 (6.6%)
		A & 2nd	80 (90.9%)	8 (9.1%)
		49th & Hawthorne	64 (94.1%)	4 (5.9%)
Before-After	Control	47th & Glisan - Before	272 (95.4%)	13 (4.6%)
		52nd & Duke - Before	47 (94.0%)	3 (6.0%)
		10th & Burnside - Before	747 (94.3%)	41 (5.2%)
	LPI Only	47th & Glisan - After	247 (95.0%)	13 (5.0%)
		52nd & Duke - After	60 (100.0%)	0 (0.0%)
		10th & Burnside - After	517 (98.1%)	10 (1.9%)

Pedestrian Gender

Table B.20. Pedestrian Gender by Intersection

Site	Treatment	Intersection	Pedestrian Gender		
			Male	Female	Unknown/ Group
Single	Control	21st & Broadway	160 (50.6%)	120 (38.0%)	36 (11.4%)
		A & 8th	9 (39.1%)	6 (26.1%)	8 (34.8%)
		Holgate & 92nd	85 (53.5%)	41 (25.8%)	33 (20.8%)
	CE Only[1]	30th & Hawthorne	71 (49.0%)	50 (34.5%)	24 (16.6%)
	LPI Only	Holgate & 104th	15 (40.5%)	17 (45.9%)	5 (13.5%)
	LPI + Curb Extension	14th & Broadway	56 (52.8%)	27 (25.5%)	23 (21.7%)
		A & 2nd	28 (31.8%)	50 (56.8%)	10 (11.4%)
		49th & Hawthorne	24 (35.3%)	31 (45.6%)	13 (19.1%)
Before-After	Control	47th & Glisan - Before	128 (44.9%)	122 (42.8%)	35 (12.3%)
		52nd & Duke - Before	25 (50.0%)	16 (32.0%)	9 (18.0%)
		10th & Burnside - Before	330 (41.7%)	235 (29.7%)	222 (28.0%)
	LPI Only	47th & Glisan - After	105 (40.4%)	114 (43.8%)	41 (15.8%)
		52nd & Duke - After	39 (65.0%)	10 (16.7%)	11 (18.3%)
		10th & Burnside - After	218 (41.4%)	167 (31.7%)	142 (26.9%)

Mobility Device

Table B.21. Mobility Device by Intersection

Site	Treatment	Intersection	Mobility Device			
			None	Wheelchair / Walking Aid	Stroller	Other
Single	Control	21st & Broadway	311 (98.4%)	1 (0.3%)	3 (0.9%)	1 (0.3%)
		A & 8th	20 (87.0%)	0 (0.0%)	3 (13.0%)	0 (0.0%)
		Holgate & 92nd	153 (96.2%)	1 (0.6%)	4 (2.5%)	1 (0.6%)
	CE Only[1]	30th & Hawthorne	140 (96.6%)	3 (2.1%)	2 (1.4%)	0 (0.0%)
	LPI Only	Holgate & 104th	37 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	95 (89.6%)	9 (8.5%)	2 (1.9%)	0 (0.0%)
		A & 2nd	87 (98.9%)	0 (0.0%)	1 (1.1%)	0 (0.0%)
		49th & Hawthorne	65 (95.6%)	0 (0.0%)	3 (4.4%)	0 (0.0%)
Before-After	Control	47th & Glisan - Before	281 (98.6%)	3 (1.1%)	1 (0.4%)	0 (0.0%)
		52nd & Duke - Before	49 (98.0%)	0 (0.0%)	1 (2.0%)	0 (0.0%)
		10th & Burnside - Before	782 (98.7%)	6 (0.8%)	4 (0.5%)	0 (0.0%)
	LPI Only	47th & Glisan - After	255 (98.1%)	2 (0.8%)	3 (1.2%)	0 (0.0%)
		52nd & Duke - After	60 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
		10th & Burnside - After	520 (98.7%)	6 (1.1%)	1 (0.2%)	0 (0.0%)

Following Vehicle

Table B.22. Following Vehicle by Intersection

Site	Treatment	Intersection	Following Vehicle	
			No	Yes
Single	Control	21st & Broadway	228 (72.2%)	88 (27.8%)
		A & 8th	22 (95.7%)	1 (4.3%)
		Holgate & 92nd	80 (50.3%)	79 (49.7%)
	CE Only[1]	30th & Hawthorne	72 (49.7%)	73 (50.3%)
	LPI Only	Holgate & 104th	33 (89.2%)	4 (10.8%)
	LPI + Curb Extension	14th & Broadway	90 (84.9%)	16 (15.1%)
		A & 2nd	73 (83.0%)	15 (17.0%)
		49th & Hawthorne	48 (70.6%)	20 (29.4%)
Before-After	Control	47th & Glisan - Before	148 (51.9%)	137 (48.1%)
		52nd & Duke - Before	37 (74.0%)	13 (26.0%)
		10th & Burnside - Before	701 (88.5%)	91 (11.5%)
	LPI Only	47th & Glisan - After	126 (48.5%)	134 (51.5%)
		52nd & Duke - After	43 (71.7%)	17 (28.3%)
		10th & Burnside - After	469 (89.0%)	58 (11.0%)

LPI Activated

Table B.23. LPI Activated by Intersection

Site	Treatment	Intersection	LPI Activated	
			Yes	No
Single	Control	21st & Broadway	0 (0.0%)	316 (100.0%)
		A & 8th	0 (0.0%)	23 (100.0%)
		Holgate & 92nd	0 (0.0%)	159 (100.0%)
	CE Only[1]	30th & Hawthorne	0 (0.0%)	145 (100.0%)
	LPI Only	Holgate & 104th	30 (81.1%)	7 (18.9%)
	LPI + Curb Extension	14th & Broadway	105 (99.1%)	1 (0.9%)
		A & 2nd	85 (96.6%)	3 (3.4%)
		49th & Hawthorne	63 (92.6%)	5 (7.4%)
Before-After	Control	47th & Glisan - Before	0 (0.0%)	285 (100.0%)
		52nd & Duke - Before	0 (0.0%)	50 (100.0%)
		10th & Burnside - Before	0 (0.0%)	792 (100.0%)
	LPI Only	47th & Glisan - After	260 (100.0%)	0 (0.0%)
		52nd & Duke - After	35 (58.3%)	25 (41.7%)
		10th & Burnside - After	527 (100.0%)	0 (0.0%)

Darkness

Table B.24. Darkness by Intersection

Site	Treatment	Intersection	Darkness	
			Light	Dark
Single	Control	21st & Broadway	316 (100.0%)	0 (0.0%)
		A & 8th	23 (100.0%)	0 (0.0%)
		Holgate & 92nd	159 (100.0%)	0 (0.0%)
	CE Only[1]	30th & Hawthorne	145 (100.0%)	0 (0.0%)
	LPI Only	Holgate & 104th	37 (100.0%)	0 (0.0%)
	LPI + Curb Extension	14th & Broadway	106 (100.0%)	0 (0.0%)
		A & 2nd	88 (100.0%)	0 (0.0%)
		49th & Hawthorne	68 (100.0%)	0 (0.0%)
Before-After	Control	47th & Glisan - Before	285 (100.0%)	0 (0.0%)
		52nd & Duke - Before	50 (100.0%)	0 (0.0%)
		10th & Burnside - Before	792 (100.0%)	0 (0.0%)
	LPI Only	47th & Glisan - After	260 (100.0%)	0 (0.0%)
		52nd & Duke - After	53 (88.3%)	7 (11.7%)
		10th & Burnside - After	401 (76.1%)	126 (23.9%)

Crosswalk Violation

Table B.25. Crosswalk Violation by Intersection

Site	Treatment	Intersection	Crosswalk Violation	
			No	Yes
Single	Control	21st & Broadway	268 (84.8%)	48 (15.2%)
		A & 8th	14 (60.9%)	9 (39.1%)
		Holgate & 92nd	122 (76.7%)	37 (23.3%)
	CE Only[1]	30th & Hawthorne	127 (87.6%)	18 (12.4%)
	LPI Only	Holgate & 104th	22 (59.5%)	15 (40.5%)
	LPI + Curb Extension	14th & Broadway	100 (94.3%)	6 (5.7%)
		A & 2nd	85 (96.6%)	3 (3.4%)
		49th & Hawthorne	58 (85.3%)	10 (14.7%)
Before-After	Control	47th & Glisan - Before	256 (89.8%)	29 (10.2%)
		52nd & Duke - Before	45 (90.0%)	5 (10.0%)
		10th & Burnside - Before	725 (91.5%)	67 (8.5%)
	LPI Only	47th & Glisan - After	236 (90.8%)	24 (9.2%)
		52nd & Duke - After	55 (91.7%)	5 (8.3%)
		10th & Burnside - After	503 (95.4%)	24 (4.6%)

APPENDIX: C

BEFORE-AFTER INTERSECTIONS

Because the model indicated that LPIs were more strongly associated with reductions in conflict frequency than in conflict severity, the same modeling framework is applied to the three before-after treatment intersections: 10th & Burnside, 47th & Glisan, and 52nd & Duke. Restricting the sample to these before/after sites provides a more rigorous test of treatment effects, as each intersection serves as its own control. This restricted model helps verify whether the LPI-related trends observed in the all-intersections sample persist when analysis is limited to comparable before-after conditions, reducing the influence of geometric and contextual differences across the broader intersection set.

Model Development

The same model-building and selection procedures used for the all-intersection models were applied here. Because only three sites are included, several site-specific or data-collection covariates (e.g., month or day indicators) were excluded due to limited variability. The reduced pool of explanatory variables therefore included treatment presence (LPI), pedestrian and vehicle volumes, vehicle composition (e.g., left- and right-turn percentages, heavy-vehicle ratio), time-of-day, and intersection identifiers with corresponding interaction terms.

Model Selection

Table 8.26 presents the model dispersion parameters for the three different dependent variables, as well as the preferred model form. Model 1 (all conflicts) and 2 (high speed conflicts) show evidence of dispersion ($p < 0.05$) and thus are fit as negative binomial model. Model 3 has $p > 0.05$ and thus is retained as Poisson.

Table C.26 Before-After Conflict Frequency Model Dispersion

Mod.	Specification	Pearson χ^2	Dispersion (α)	Deg. Freedom	p-value	Preferred Model
1-BA	All Conflicts	225	1.23	183	0.018	NB
2-BA	High Speed Conflicts	227	1.21	187	0.025	NB
3-BA	High/ Medium Severity Conflicts	185	1.00	185	0.480	Poisson

Models

Treatment effects for the all-intersection and before/after intersection models are shown in Table 8.27. Table 8.28 presents the conflict frequency model options. Full results are shown in Table 8.29 to Table 8.34.

In this before–after subset, the only treatment term that remains significant is the LPI term in the all conflicts model, implying an estimated 14% reduction in all conflicts following LPI implementation (IRR ≈ 0.86). While the magnitude is smaller than the pooled LPI effect

(approximately 25%), it confirms that the treatment is present within the smaller, true before/after subset of intersections.

Table C.27 Treatment Variable Significance Comparison: Before/After Analysis

Mod.	Dependent Variable	Treatment Variable	Estimate	p-value	IRR
All Intersections	All Conflicts	LPI Presence	-0.285	< 0.001	0.752
	High Speed Conflicts	Curb Extension + LPI	-0.546	0.002	0.579
	High/Medium Severity Conflicts	Burnside x LPI Only	-0.458	0.003	0.632
Before/After Only	All Conflicts	LPI Presence	-0.150	0.035	0.861

Table C.28. Conflict Frequency Model Options: Before/After Analysis

Mod	DV	Selected Variables	BIC	Log Likelihood		R2 (MF[1])	Cross Validation				Holdout	
				Null	Conv.		R2[2]	*R2 S.D.*	CV RMSE	*RMSE S.D.*	R2	RMSE
1-BA	All Conflicts	LPI Presence, Pedestrian Volume (spline = 2), Vehicle Volume, Left Turn Percent, Intersection = 47th & Glisan, Intersection = 10th & Burnside	866	-604	-409	0.322	0.897	0.035	3.948	1.341	0.927	3.158
2-BA	High Speed Conflicts	Adjacent Right Turn Percent, Hour, Intersection = 10th & Burnside, Intersection = 47th & Glisan	597	-331	-282	0.147	0.126	0.301	1.559	0.477	0.365	1.584
3-BA	High/ Medium Severity Conflicts	Pedestrian Volume (spline = 2), Adjacent Right Turn Percent (spline = 2), Intersection = 47th & Glisan, Intersection = 10th & Burnside	551	-592	-257	0.566	0.765	0.095	1.635	0.611	0.769	1.654

[1]MF = McFadden

Table C.29. Conflicts: Before/After Only Model Coefficients

Variable	Estimate	Std. Error	z-value	*p*-value	IRR
Intercept	-0.464	0.153	-3.025	0.002	N/A
Volume					
Pedestrian Volume (Spline 1)	4.411	0.428	10.311	< 0.001	NA
Pedestrian Volume (Spline 2)	1.360	0.178	7.619	< 0.001	
Vehicle Volume	0.004	0.001	4.595	< 0.001	1.004
Left Turn Percent	0.005	0.001	4.804	< 0.001	1.005
Treatment					
LPI	-0.150	0.071	-2.111	0.035	0.861
Intersection Indicators					
Intersection = 52nd & Duke	*Reference*				
Intersection = 47th & Glisan	0.960	0.149	6.444	< 0.001	2.612
Intersection = 10th & Burnside	1.128	0.226	4.986	< 0.001	3.090

Table C.30. All Conflicts: Before/After Only Model Fit

Metric		Value
Number of Observations (Training Set)		192
Number of Observations (Testing Set)		48
Number of Parameters		7
Model Fit	BIC	866
	Log Likelihood (Null)	-604
	Log Likelihood (Convergence)	-409
	χ^2 (Log-Likelihood Ratio Test)	389
	χ^2 p -value	< 0.001
	McFadden R^2	0.322
Five-Fold Cross Validation	Cross-Validation R^2	0.897
	Cross-Validation R^2 S.D.	0.035
	Cross-Validation RMSE	3.948
	Cross-Validation RMSE S.D.	1.341
Holdout Validation	Holdout R^2	0.927
	Holdout RMSE	3.158

Table C.31. High Speed Conflicts: Before/After Only Model Coefficients

Variable	Estimate	Std. Error	z-value	*p*-value	IRR
Intercept	-1.831	0.333	-5.490	< 0.001	N/A
Volume					
Adjacent Right Turn Percent	0.015	0.004	4.175	0.000	1.015
Time					
Hour	0.055	0.020	2.772	0.006	1.057
Intersection Indicators					
Intersection = 52nd & Duke	*Reference*				
Intersection = 10th & Burnside	1.805	0.199	9.056	0.000	6.079
Intersection = 47th & Glisan	1.323	0.191	6.930	0.000	3.755

Table C.32. High Speed Conflicts: Before/After Only Model Fit

Metric		Value
Number of Observations (Training Set)		192
Number of Observations (Testing Set)		48
Number of Parameters		4
Model Fit	BIC	597
	Log Likelihood (Null)	-331
	Log Likelihood (Convergence)	-282
	χ^2 (Log-Likelihood Ratio Test)	179
	χ^2 p -value	< 0.001
	McFadden R^2	0.147
Five-Fold Cross Validation	Cross-Validation R^2	0.126
	Cross-Validation R^2 S.D.	0.301
	Cross-Validation RMSE	1.559
	Cross-Validation RMSE S.D.	0.477
Holdout Validation	Holdout R^2	0.365
	Holdout RMSE	1.584

Table C.33. High/Medium Severity Conflicts: Before/After Only Model Coefficients

Variable	Estimate	Std. Error	z-value	*p*-value	IRR
Intercept	-1.419	0.226	-6.289	< 0.001	N/A
Volume					
Pedestrian Volume (Spline 1)	5.347	0.651	8.217	< 0.001	NA
Pedestrian Volume (Spline 2)	1.779	0.244	7.282	< 0.001	
Adjacent Right Turn Percent (Spline 1)	0.048	0.250	0.193	0.847	1.050
Adjacent Right Turn Percent (Spline 2)	0.966	0.302	3.202	0.001	2.627
Intersection Indicators					
Intersection = 52nd & Duke	*Reference*				
Intersection = 47th & Glisan	1.464	0.250	5.862	< 0.001	4.322
Intersection = 10th & Burnside	0.865	0.370	2.338	0.019	2.376

Table C.34. High/Medium Severity Conflicts: Before/After Only Model Fit

Metric		Value
Number of Observations (Training Set)		192
Number of Observations (Testing Set)		48
Number of Parameters		6
Model Fit	BIC	551
	Log Likelihood (Null)	-592
	Log Likelihood (Convergence)	-257
	χ^2 (Log-Likelihood Ratio Test)	670
	χ^2 p -value	< 0.001
	McFadden R^2	0.567
Five-Fold Cross Validation	Cross-Validation R^2	0.765
	Cross-Validation R^2 S.D.	0.095
	Cross-Validation RMSE	1.635
	Cross-Validation RMSE S.D.	0.611
Holdout Validation	Holdout R^2	0.769
	Holdout RMSE	1.654

APPENDIX: D

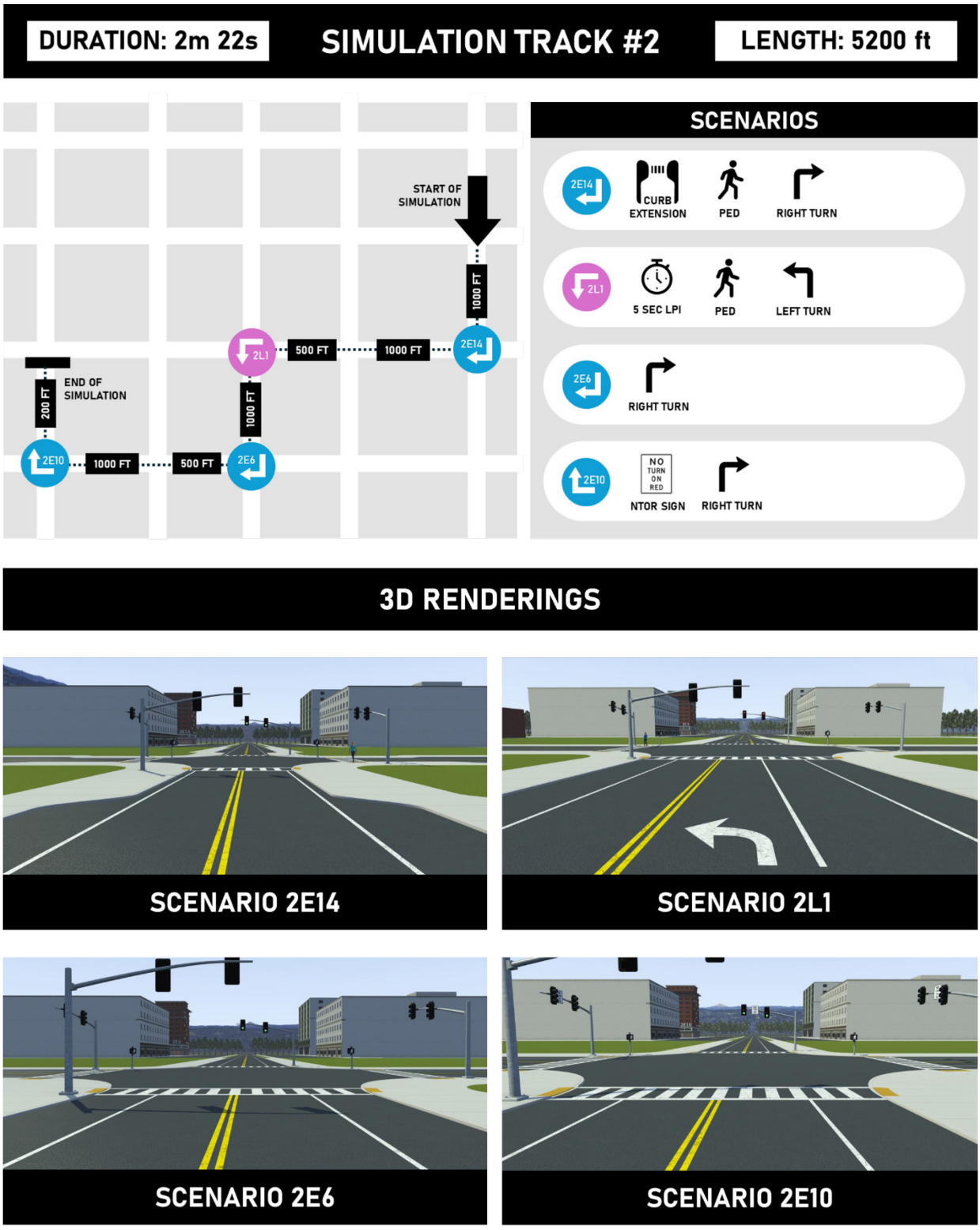


Figure D.12. Simulation Track #2

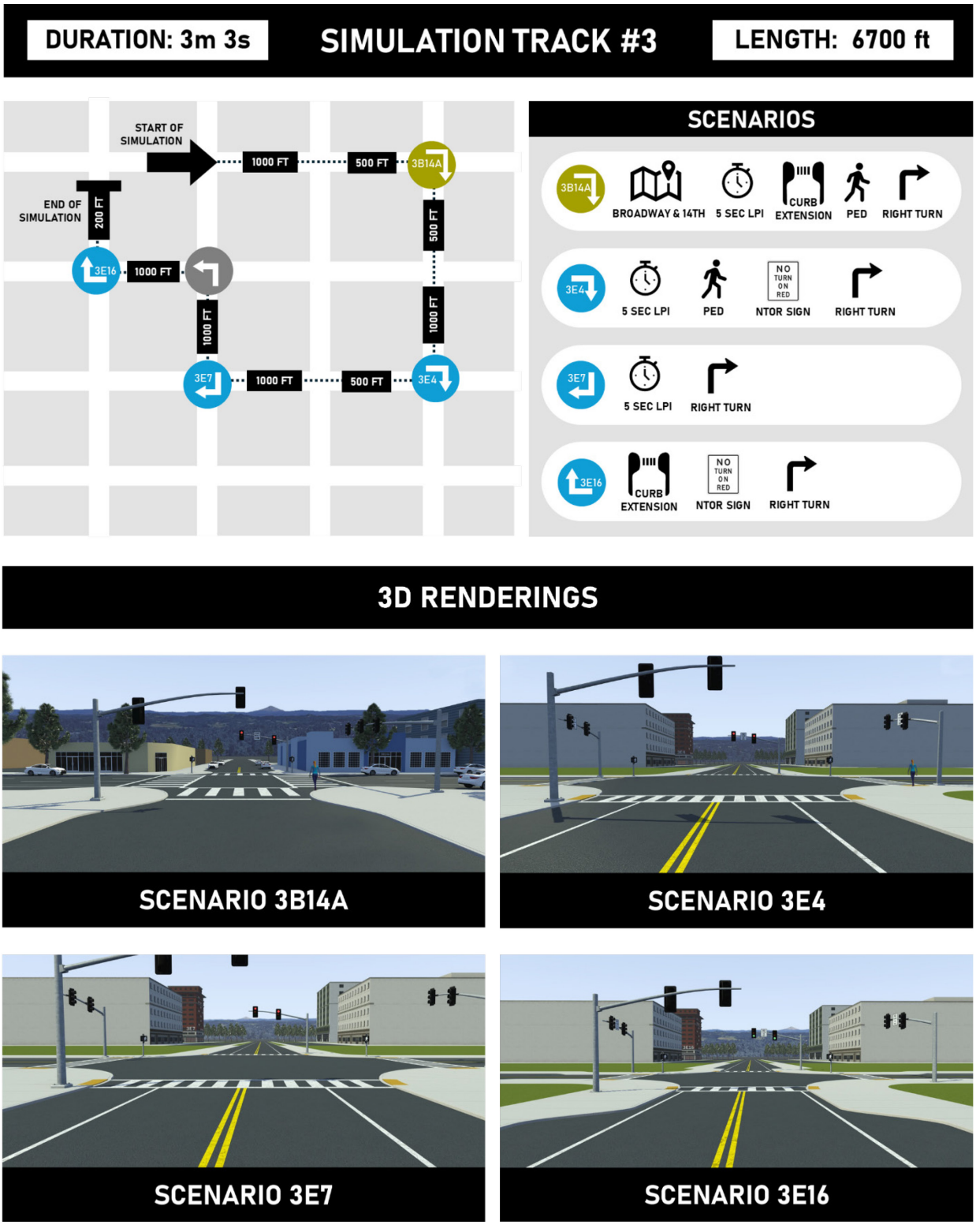


Figure D.13. Simulation Track #3

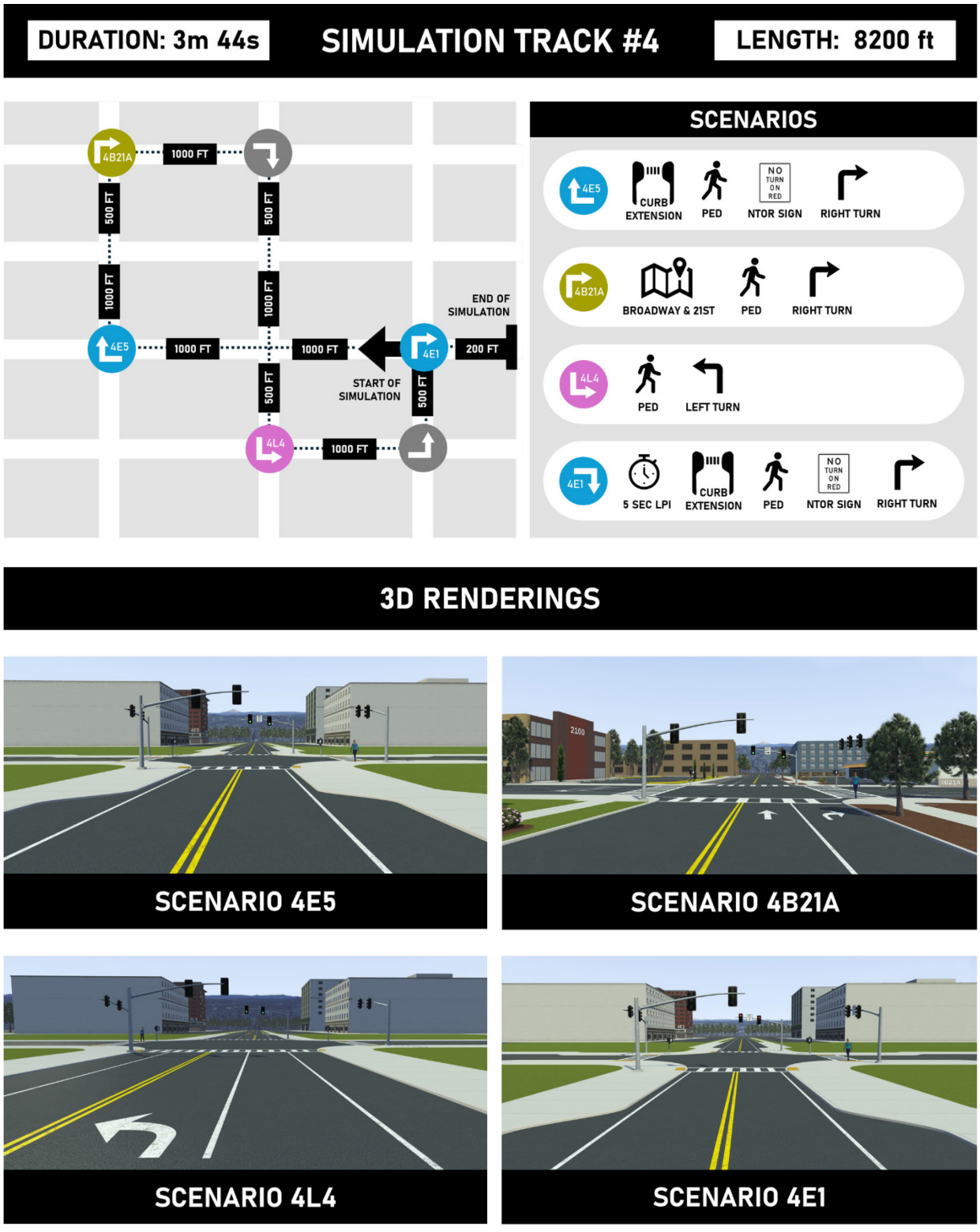


Figure D.14. Simulation Track #4

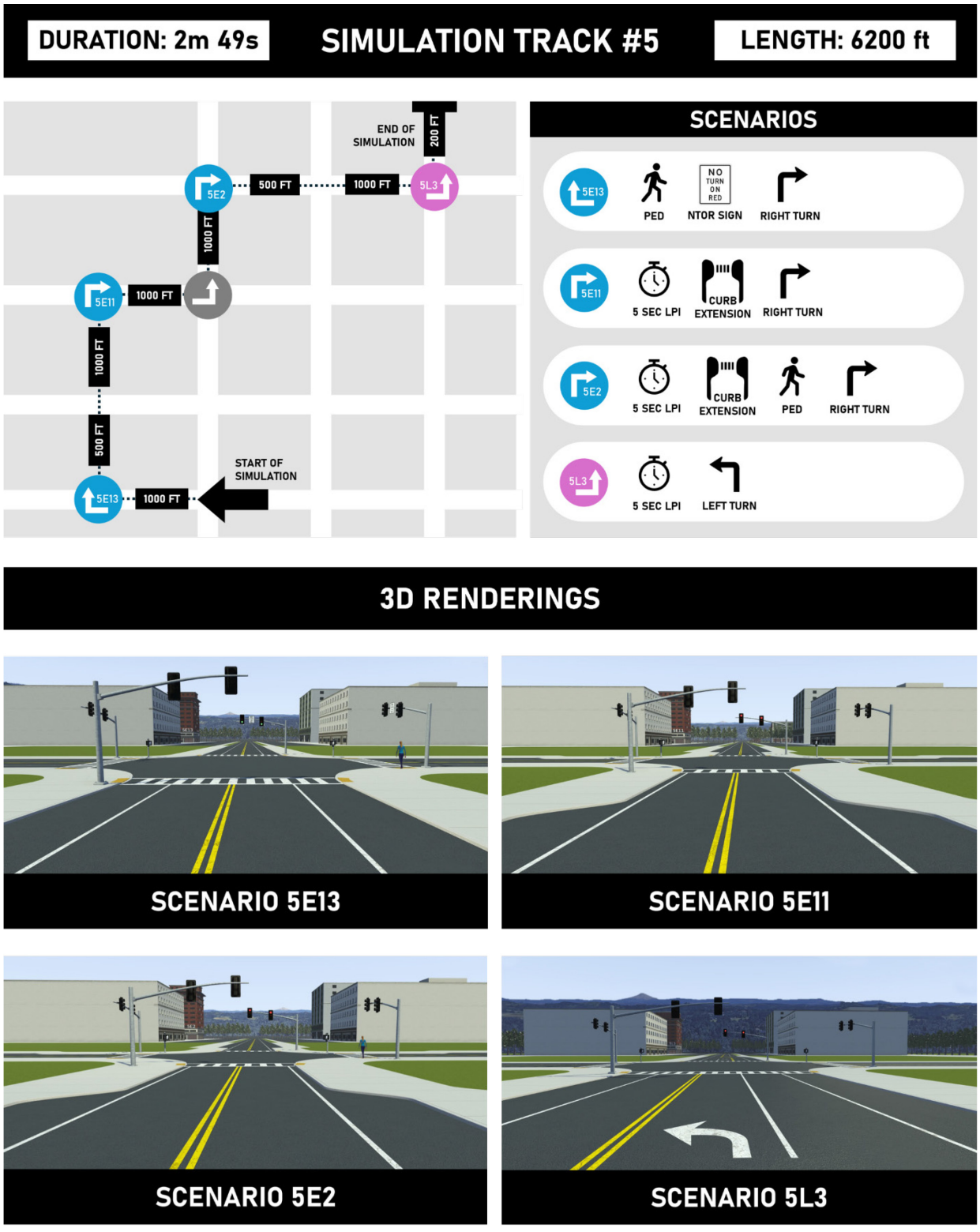


Figure D.15. Simulation Track #5

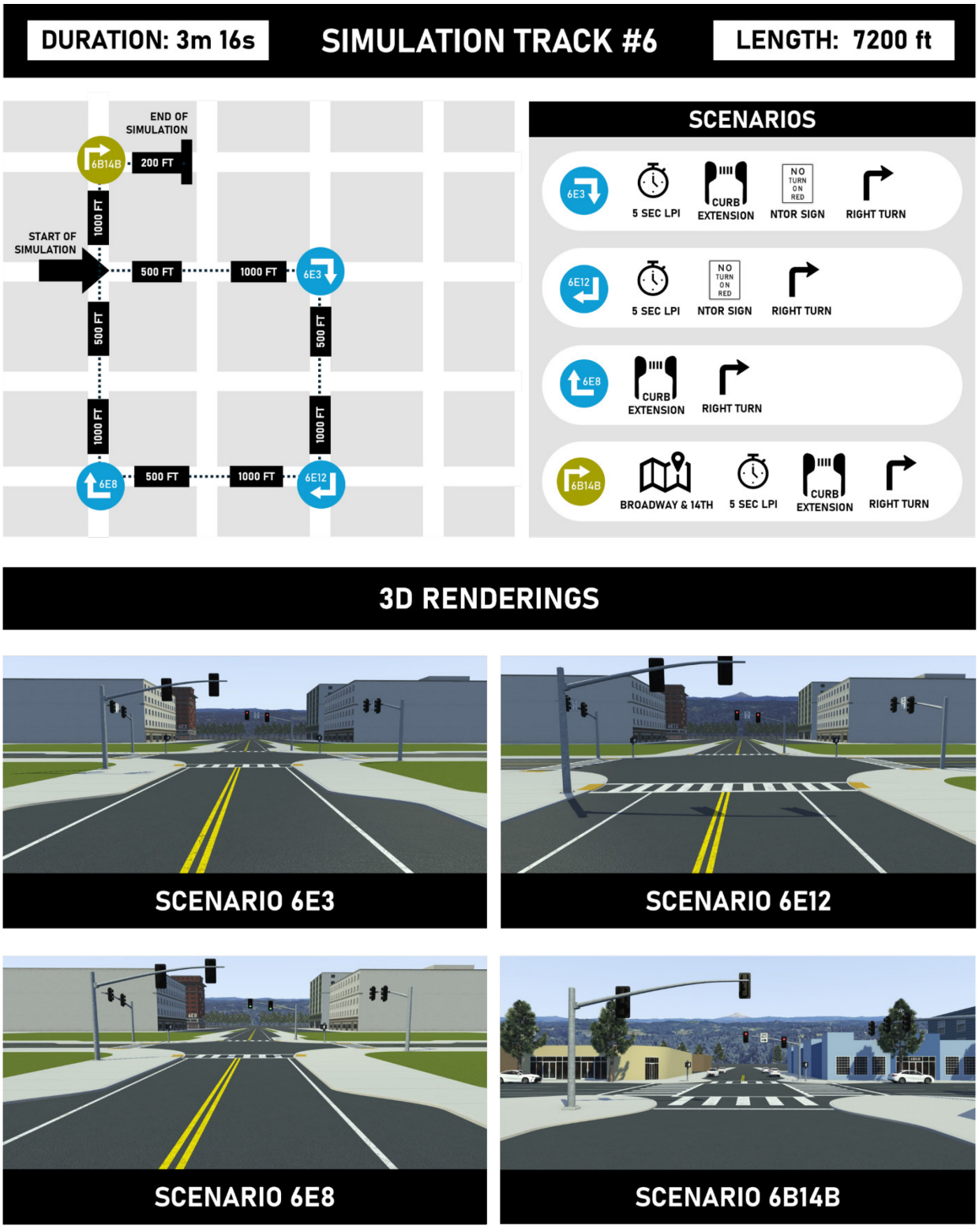


Figure D.16. Simulation Track #6

APPENDIX: E

Table E.35. LPI Suitability Assessment Tool Template (Part 1 - Intersection Level)

Factor	Score	Score Allocation	Your Assigned Score
 **Crash History**	0 to 60 points	How many crashes between pedestrians and turning vehicles have occurred in the last 5 years? • None = **0 points.** • 1 crash = **20 points.** • 2 crashes = **40 points.** • ≥ 3 crashes = **60 points.**	____ **points.** **Why Did You Pick This Score?**
 **Accessible Pedestrian Signal (APS)**	-30 to 60 points	Does the intersection have existing Accessible Pedestrian Signals (APS) at all 4 crosswalks? • No, there are no existing APS at all 4 crosswalks = **– 30 points.** • No, but planning to install APS at all 4 crosswalks before LPI implementation = **30 points.** • Yes, there are existing APS at all 4 crosswalks = **60 points.**	____ **points.** **Why Did You Pick This Score?**
 **Land Use Context**	0 to 30 points	How far away is the intersection from at least one land use type or facility that attracts vulnerable road users? (e.g. school, assisted-living, transit stop/station, shops, park, multifamily housing, healthcare facility, or any other land use type or facility not listed but deemed appropriate based on engineering judgement). • Greater than a 3000 ft radius = **0 points.** • Within a 2000 ft to 3000 ft radius = **10 points.** • Within a 500 ft to 2000 ft radius = **20 points.** • Within a 0 to 500 ft radius = **30 points.**	____ **points.** **Why Did You Pick This Score?**
 **Public Complaints**	0 to 30 points	How many public complaints regarding pedestrian safety has the intersection received in the last 5 years? • None = **0 points.** • 1 complaint = **10 points.** • 2 complaints = **20 points.** • ≥ 3 complaints = **30 points.**	____ **points.** **Why Did You Pick This Score?**
 **Unique Case**	-30 to 60 points	Based on engineering judgement, does the intersection have a unique case (something not already captured by the tool) that would influence the need for an LPI? Choose any score between **-30 to 60 points**, then identify and justify the unique case. Note: If no unique case is identified, enter **0 points.**	____ **points.** **What Is the Unique Case?** **Why Did You Pick This Score?**

Table E.36. LPI Suitability Assessment Tool Template (Part 2 - Crosswalk Level)

Factor	Score	Score Allocation	Your Assigned Scores
 **Pedestrian Volume**	10 to 20 points	For each crosswalk, how many pedestrians use the crosswalk (in both directions) within at least one peak hour (morning, midday, or evening) during any day? • ≤25 pedestrians = **10 points.** • ≥26 pedestrians = **20 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **Vehicle Volume**	0 to 20 points	For each crosswalk, how many right and left turning vehicles (if on a permissive phase) turn into the crosswalk during the same hour and day as the pedestrian volume? Note: If signal phasing separates right turning vehicles from peds, how many vehicles turn on red into the crosswalk? • Not applicable (e.g. no vehicles from parallel approach turning into the crosswalk / one-way) = **0 points.** • ≤50 turning vehicles = **10 points.** • ≥51 turning vehicles = **20 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **Speed Limit**	0 to 30 points	What is the posted speed limit for the approach parallel to the crosswalk under consideration? • Not applicable (e.g. no vehicles from parallel approach turning into the crosswalk / one-way) = **0 points.** • ≤25 mph = **10 points.** • 30 mph = **20 points.** • ≥35 mph = **30 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **Crosswalk Length**	10 to 30 points	How long (in feet) is the crosswalk under consideration? • ≤ 40 feet = **10 points.** • 41 to 79 feet = **20 points.** • ≥ 80 feet = **30 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**

Factor	Score	Score Allocation	Your Assigned Scores
 **Visibility Issues**	0 to 60 points	Does the approach parallel to the crosswalk under consideration have any of the features listed below that could affect pedestrian visibility for turning vehicles? **If more than one feature is present, add 10 points per feature (60 points max).** • 1. No Pedestrian Visibility Issues Identified = **0 points.** • 2. On-Street Parking at Corner with No Parking Restriction or Curb Extension = **10 points.** • 3. Physical Obstruction (e.g. Vegetation, Street Furniture, Utilities, etc.) = **10 points.** • 4. No Crosswalk Setback (i.e. crosswalk is very near the corner of the intersection) = **10 points.** • 5. Large Curb Radius (≥ 30 feet) = **10 points.** • 6. Skewed Angle (<75°) = **10 points.** • 7. Poor or No Lighting = **10 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **Turn Lane Configuration**	0 to 30 points	What is the right turn lane configuration for the approach parallel to the crosswalk under consideration? • Not applicable (e.g. no vehicles from parallel approach turning right into the crosswalk / one-way) = **0 points.** • Channelized Right-Turn Lane = **0 points.** • Shared Thru/Right Turn Lane = **10 points.** • Dedicated Right Turn Lane = **20 points.** • Dual Right Turn Lane = **30 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **RTOR Restriction**	0 to 20 points	Do the right turning vehicles turning into the crosswalk under consideration have a right-turn-on-red (RTOR) restriction? • No = **0 points.** • Yes = **20 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**

Factor	Score	Score Allocation	Your Assigned Scores
 **Right Turn Phasing**	0 to 30 points	What is the signal phasing for the right turn movement at the crosswalk under consideration? • Other (e.g. Protected, No Ped FYA, Split-Phasing, Protected / Permissive, N/A) = **0 points.** • Permissive = **30 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **Left Turn Phasing**	0 to 30 points	What is the signal phasing for the left turn movement at the crosswalk under consideration? • Other (e.g. Protected, No Ped FYA, Split-Phasing, Protected / Permissive, N/A) = **0 points.** • Permissive = **30 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **Why Did You Pick These Scores?**
 **Unique Case**	-30 to 30 points	Based on engineering judgement, does the crosswalk under consideration have a unique case (something not already captured by the tool) that would influence the need for an LPI? Choose any score between **-30 to 30 points** for each applicable crosswalk, then identify and justify the unique case. Note: If no unique case is identified, enter **0 points.**	**North:** ___ points. **South:** ___ points. **East:** ___ points. **West:** ___ points. **What Is the Unique Case for Each Applicable Crosswalk?** **Why Did You Pick That Score for Each Applicable Crosswalk?**

Table E.37. Combined Score Calculation (Template)

Assessment Scores	North Crosswalk	South Crosswalk	East Crosswalk	West Crosswalk
Intersection Score (Crash History + Accessible Pedestrian Signal (APS) + Land Use Context, Public Complaints, Unique Case).	_____ points	_____ points	_____ points	_____ points
Crosswalk Score (Pedestrian Volume + Vehicle Volume + Speed Limit + Crosswalk Length + Visibility Issues + Turn Lane Configuration + RTOR Restriction + Right Turn Phasing + Left Turn Phasing + Unique Case).	_____ points	_____ points	_____ points	_____ points
Combined Score **(Intersection Score + Crosswalk Score)**	**_____ points**	**_____ points**	**_____ points**	**_____ points**

Table E.38. LPI Suitability Matrix (Template)

Combined Score	North or East Crosswalk (0-180 points)	North or East Crosswalk (181-361points)	North or East Crosswalk (362-540 points)
South or West Crosswalk (0-180 points)	**Optional** (Low Expected Safety Benefit)	**Optional** (Low Expected Safety Benefit)	**Considered** (Moderate Expected Safety Benefit)
South or West Crosswalk (181-361 points)	**Optional** (Low Expected Safety Benefit)	**Considered** (Moderate Expected Safety Benefit)	**Recommended** (High Expected Safety Benefit)
South or West Crosswalk (362-540 points)	**Considered** (Moderate Expected Safety Benefit)	**Recommended** (High Expected Safety Benefit)	**Recommended** (High Expected Safety Benefit)

APPENDIX: F

Table F.39. LPI Suitability Assessment (Part 1 - Intersection Level), Broadway & 21st Avenue (Portland, Oregon)

Factor	Score	Score Allocation	Your Assigned Score
 **Crash History**	0 to 60 points	How many crashes between pedestrians and turning vehicles have occurred in the last 5 years? • None = **0 points.** • 1 crash = **20 points.** • 2 crashes = **40 points.** • ≥ 3 crashes = **60 points.**	**40 points.** **Why Did You Pick This Score?** 2 ped-vehicle crashes from 2019-2023 (ODOT TransGIS, 2025).
 **Accessible Pedestrian Signal (APS)**	-30 to 60 points	Does the intersection have existing Accessible Pedestrian Signals (APS) at all 4 crosswalks? • No, there are no existing APS at all 4 crosswalks = **– 30 points.** • No, but planning to install APS at all 4 crosswalks before LPI implementation = **30 points.** • Yes, there are existing APS at all 4 crosswalks = **60 points.**	**-30 points.** **Why Did You Pick This Score?** There is currently no APS at all 4 crosswalks.
 **Land Use Context**	0 to 30 points	How far away is the intersection from at least one land use type or facility that attracts vulnerable road users? (e.g. school, assisted-living, transit stop/station, shops, park, multifamily housing, healthcare facility, or any other land use type or facility not listed but deemed appropriate based on engineering judgement). • Greater than a 3000 ft radius = **0 points.** • Within a 2000 ft to 3000 ft radius = **10 points.** • Within a 500 ft to 2000 ft radius = **20 points.** • Within a 0 to 500 ft radius = **30 points.**	**30 points.** **Why Did You Pick This Score?** Multiple facilities that attract vulnerable road users are located within a 500 ft radius (e.g. bus stop, healthcare facility, shops, multifamily housing, etc).
 **Public Complaints**	0 to 30 points	How many public complaints regarding pedestrian safety has the intersection received in the last 5 years? • None = **0 points.** • 1 complaint = **10 points.** • 2 complaints = **20 points.** • ≥ 3 complaints = **30 points.**	**0 points.** **Why Did You Pick This Score?** Unknown.
 **Unique Case**	-30 to 60 points	Based on engineering judgement, does the intersection have a unique case (something not already captured by the tool) that would influence the need for an LPI? Choose any score between **-30 to 60 points**, then identify and justify the unique case. Note: If no unique case is identified, enter **0 points.**	**0 points.** **What Is the Unique Case?** No unique case identified. **Why Did You Pick This Score?** N/A.

Table F.40. LPI Suitability Assessment (Part 2 - Crosswalk Level), Broadway & 21st Avenue (Portland, Oregon)

Factor	Score	Score Allocation	Your Assigned Scores
 **Pedestrian Volume**	10 to 20 points	For each crosswalk, how many pedestrians use the crosswalk (in both directions) within at least one peak hour (morning, midday, or evening) during any day? • ≤25 pedestrians = **10 points.** • ≥26 pedestrians = **20 points.**	**North:** 10 points. **South:** 10 points. **East:** 10 points. **West:** 10 points. **Why Did You Pick These Scores?** **North:** ≤25 pedestrians. **South:** ≤25 pedestrians. **East:** ≤25 pedestrians. **West:** ≤25 pedestrians.
 **Vehicle Volume**	0 to 20 points	For each crosswalk, how many right and left turning vehicles (if on a permissive phase) turn into the crosswalk during the same hour and day as the pedestrian volume? Note: If signal phasing separates right turning vehicles from peds, how many vehicles turn on red into the crosswalk? • Not applicable (e.g. no vehicles from parallel approach turning into the crosswalk / one-way) = **0 points.** • ≤50 turning vehicles = **10 points.** • ≥51 turning vehicles = **20 points.**	**North:** 20 points. **South:** 20 points. **East:** 0 points. **West:** 20 points. **Why Did You Pick These Scores?** **North:** ≥51 turning vehicles. **South:** ≥51 turning vehicles. **East:** N/A (one-way). **West:** ≥51 turning vehicles.
 **Speed Limit**	0 to 30 points	What is the posted speed limit for the approach parallel to the crosswalk under consideration? • Not applicable (e.g. no vehicles from parallel approach turning into the crosswalk / one-way) = **0 points.** • ≤25 mph = **10 points.** • 30 mph = **20 points.** • ≥35 mph = **30 points.**	**North:** 20 points. **South:** 20 points. **East:** 0 points. **West:** 10 points. **Why Did You Pick These Scores?** **North:** 30 mph. **South:** 30 mph. **East:** N/A (one-way). **West:** 25 mph.
 **Crosswalk Length**	10 to 30 points	How long (in feet) is the crosswalk under consideration? • ≤ 40 feet = **10 points.** • 41 to 79 feet = **20 points.** • ≥ 80 feet = **30 points.**	**North:** 20 points. **South:** 20 points. **East:** 20 points. **West:** 20 points. **Why Did You Pick These Scores?** **North:** ~43 feet. **South:** ~41 feet. **East:** ~57 feet. **West:** ~57 feet.

Factor	Score	Score Allocation	Your Assigned Scores
 **Visibility Issues**	0 to 60 points	Does the approach parallel to the crosswalk under consideration have any of the features listed below that could affect pedestrian visibility for turning vehicles? **If more than one feature is present, add 10 points per feature (60 points max).** • 1. No Pedestrian Visibility Issues Identified = **0 points.** • 2. On-Street Parking at Corner with No Parking Restriction or Curb Extension = **10 points.** • 3. Physical Obstruction (e.g. Vegetation, Street Furniture, Utilities, etc.) = **10 points.** • 4. No Crosswalk Setback (i.e. crosswalk is very near the corner of the intersection) = **10 points.** • 5. Large Curb Radius (≥ 30 feet) = **10 points.** • 6. Skewed Angle (<75°) = **10 points.** • 7. Poor or No Lighting = **10 points.**	**North:** 40 points. **South:** 20 points. **East:** 0 points. **West:** 30 points. **Why Did You Pick These Scores?** Below are the features present at each crosswalk: • **North:** 2, 3, 4, 7 (4 total x 10 = 40 points). • **South:** 4, 7 (2 total x 10 = 20 points). • **East:** N/A (one-way) = 0 points. • **West:** 3, 4, 7 (3 total x 10 = 30 points).
 **Turn Lane Configuration**	0 to 30 points	What is the right turn lane configuration for the approach parallel to the crosswalk under consideration? • Not applicable (e.g. no vehicles from parallel approach turning right into the crosswalk / one-way) = **0 points.** • Channelized Right-Turn Lane = **0 points.** • Shared Thru/Right Turn Lane = **10 points.** • Dedicated Right Turn Lane = **20 points.** • Dual Right Turn Lane = **30 points.**	**North:** 10 points. **South:** 0 points. **East:** 0 points. **West:** 20 points. **Why Did You Pick These Scores?** **North:** Shared Thru/Right Turn Lane. **South:** N/A (one-way). **East:** N/A (one-way). **West:** Dedicated Right Turn Lane.
 **RTOR Restriction**	0 to 20 points	Do the right turning vehicles turning into the crosswalk under consideration have a right-turn-on-red (RTOR) restriction? • No = **0 points.** • Yes = **20 points.**	**North:** 0 points. **South:** 0 points. **East:** 0 points. **West:** 0 points. **Why Did You Pick These Scores?** No RTOR restriction at any crosswalk.

Factor	Score	Score Allocation	Your Assigned Scores
 **Right Turn Phasing**	0 to 30 points	What is the signal phasing for the right turn movement at the crosswalk under consideration? • Other (e.g. Protected, No Ped FYA, Split-Phasing, Protected / Permissive, N/A) = **0 points.** • Permissive = **30 points.**	**North:** 30 points. **South:** 0 points. **East:** 0 points. **West:** 30 points. **Why Did You Pick These Scores?** **North:** Permissive. **South:** N/A (one-way). **East:** N/A (one-way). **West:** Permissive.
 **Left Turn Phasing**	0 to 30 points	What is the signal phasing for the left turn movement at the crosswalk under consideration? • Other (e.g. Protected, No Ped FYA, Split-Phasing, Protected / Permissive, N/A) = **0 points.** • Permissive = **30 points.**	**North:** 0 points. **South:** 30 points. **East:** 0 points. **West:** 30 points. **Why Did You Pick These Scores?** **North:** N/A (one-way). **South:** Permissive. **East:** N/A (one-way). **West:** Permissive.
 **Unique Case**	-30 to 30 points	Based on engineering judgement, does the crosswalk under consideration have a unique case (something not already captured by the tool) that would influence the need for an LPI? Choose any score between **-30 to 30 points** for each applicable crosswalk, then identify and justify the unique case. Note: If no unique case is identified, enter **0 points.**	**North:** 0 points. **South:** 0 points. **East:** 0 points. **West:** 0 points. **What Is the Unique Case for Each Applicable Crosswalk?** No unique cases identified. **Why Did You Pick That Score for Each Applicable Crosswalk?** N/A.

Table F.41. Combined Score Calculation, Broadway & 21st Avenue (Portland, Oregon)

Assessment Scores	North Crosswalk	South Crosswalk	East Crosswalk	West Crosswalk
Intersection Score (Crash History + Accessible Pedestrian Signal (APS) + Land Use Context, Public Complaints, Unique Case).	40 points	40 points	40 points	40 points
Crosswalk Score (Pedestrian Volume + Vehicle Volume + Speed Limit + Crosswalk Length + Visibility Issues + Turn Lane Configuration + RTOR Restriction + Right Turn Phasing + Left Turn Phasing + Unique Case).	150 points	120 points	30 points	170 points
Combined Score (Intersection Score + Crosswalk Score)	**190 points**	**160 points**	**70 points**	**210 points**

Table F.42. LPI Suitability Matrix Decision for the North & South and East & West Crosswalk Pairs at Broadway & 21st Avenue (Portland, Oregon)

Combined Score	North or East Crosswalk (0-180 points)	North or East Crosswalk (181-361points)	North or East Crosswalk (362-540 points)
South or West Crosswalk (0-180 points)	**Optional** (Low Expected Safety Benefit)	**Optional** (Low Expected Safety Benefit)	**Considered** (Moderate Expected Safety Benefit)
South or West Crosswalk (181-361 points)	**Optional** (Low Expected Safety Benefit)	**Considered** (Moderate Expected Safety Benefit)	**Recommended** (High Expected Safety Benefit)
South or West Crosswalk (362-540 points)	**Considered** (Moderate Expected Safety Benefit)	**Recommended** (High Expected Safety Benefit)	**Recommended** (High Expected Safety Benefit)

In summary, an LPI is "Optional"
for both crosswalk pairs

(North & South and East & West)

Note: The tool provided this recommendation in response to the absence of APS within the intersection, among other factors.

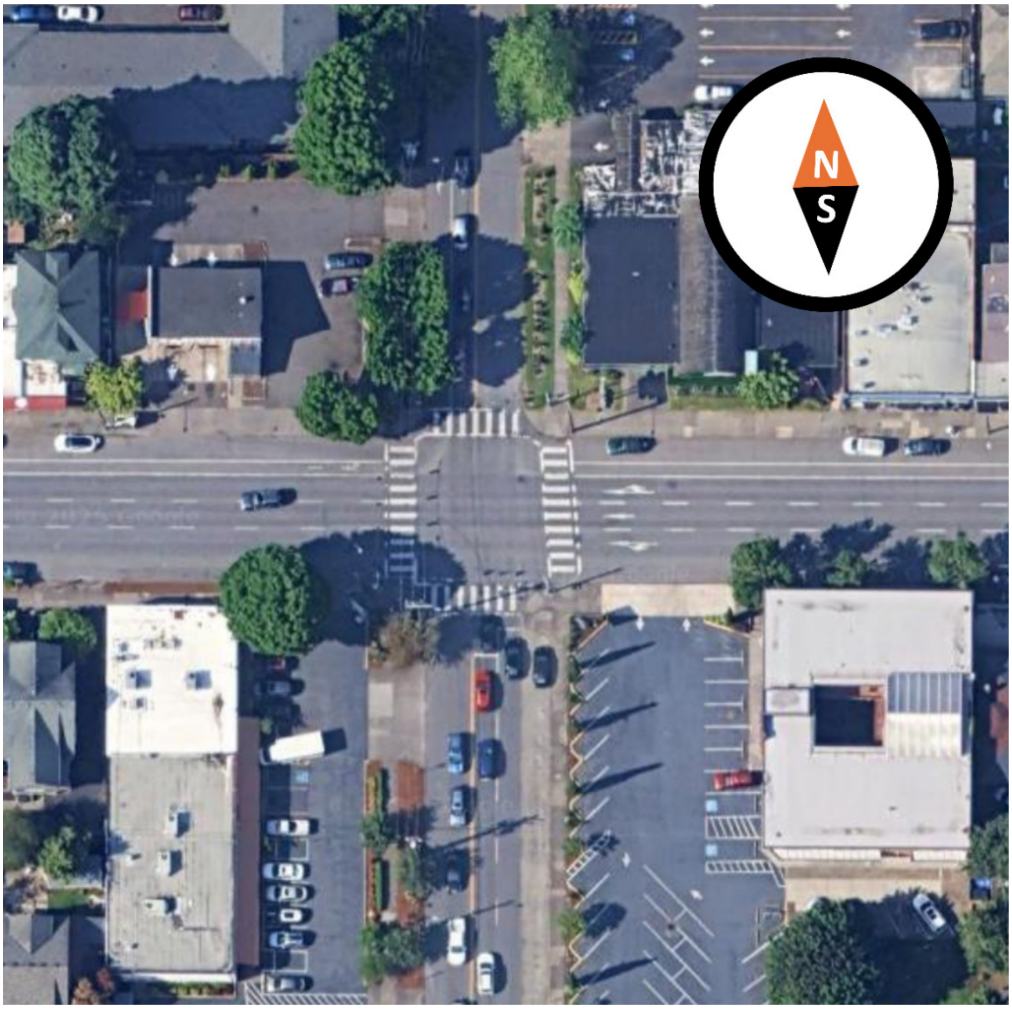


Figure 8.17. Broadway & 21st Avenue (Portland, Oregon)

APPENDIX: G

Intersection Level Assessment			
Factor	**Score**	**Score Allocation**	**Background**
Turning Vehicle -Pedestrian Crashes in recent 5 years	0 to 3	Three crashes or more = 3 Two crashes = 2 One crash = 1 None = 0	Through the literature, an LPI is shown to be effective in reducing this crash type.[a]
One Way Street	0 to 1	One or more approaches = 1 No approach = 0	Vehicles turning left on a one-way street do not need to wait for and yield to vehicles in the opposing direction.[a]
Intersection Distance from School	0 to 2	Less than 2800 ft. (853 m) = 2 More than 2800 ft. = 0	Intersections within 2,800 ft. of a school are found to have increased probability of turning vehicle-pedestrian crashes.[b, c, d]
Intersection Distance from Transit Stop	0 to 1	Less than 300 ft. (91.4 m) = 1 More than 300 ft. = 0	Intersections within 300 ft of transit stops are found to have increase probability of turning vehicle-pedestrian crashes.[b, c]
Travel Delay	-3 to 0	-1 for each degradation of an approach below LOS C. For example, LOS C to LOS D would be -1; LOS C to LOS E would be minus 2, etc. -1 for each degradation of intersection below LOS below C. For example, LOS C to LOS D would be -1; LOS C to LOS E would be minus 2, etc. Maximum of -3.	High level of travel delay can reduce LPI effectiveness by causing driver frustration and risky behavior. This should be calculated using a preferred analysis software, for the peak hour which the agency deems most critical.[a]
Crosswalk Level Assessment			
Factor	**Score**	**Score Allocation**	**Reason**
Pedestrian Volume (per hour)	0 to 3	More than 100 = 3 51 to 100= 2 6 to 50= 1 Less than 6 = 0	Higher pedestrian volumes increase the likelihood of pedestrian-vehicle interactions.[b]
Turning Vehicle Volume (vph)	0 to 3	More than 600 = 3 401 to 600= 2 101 to 400= 1 Less than 101 = 0	Higher volumes of turning vehicles increase the pedestri-an-vehicle interactions.[b]
T intersection	0 to 1	Crosswalk parallel with stalk of T intersection = 1 No = 0	In crosswalk parallel with the stalk of a T-intersection, all approaching vehicles turn left or right, with no need to wait for opposing traffic.[8a]
Sight Obstruction or Skewed Approach	0 to 1	Yes = 1 No = 0	A sight obstruction or skewed approach can make it more challenging for a vehicle to see a pedestrian on the corner.[a]
Highest Score	**15**		

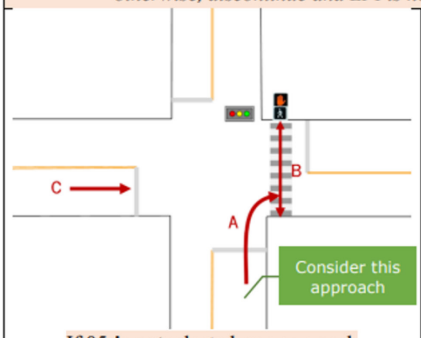
Figure G.18. Sample Tool by Eschen et al. (2025)

Factor	Values	Score	Score Allocation Guide	Justification	Notes
a. Is the pedestrian crossing at a T-intersection (crossing is parallel to a road that ends at the intersection) **and/or** **Is the pedestrian crossing parallel to a one-way road?**		0 to 2	Yes = 2 No = 0	High level of potential safety improvement with LPI at T-intersections compared with regular intersections because all vehicles approaching a T-intersection make a left or right turn and left-turning vehicles do not need to wait for and yield to vehicles in the opposing direction. Similarly, left turning vehicles traveling on a one-way road do not need to wait for and yield to vehicles in the opposing direction.	
b. Are there issues such as safety concerns verified by staff or visibility issues caused by features such as irregular intersection geometry, wide-turning radius, crosswalk placement, obstructions such as buildings or base of a bridge, blinding sun angle?		0 to 2	Yes (4 or more issues) = 2 Yes (between 1 to 3 issues) = 1 No = 0	High level of potential safety improvement.	
c. 8-h volume of pedestrians (*p*) crossing the leg being considered for LPI		0 to 2	2 if $p > 1{,}000$ 1 if $200 < p \le 1{,}000$ 0 if $p \le 200$	High level of benefit for the highest number of pedestrians.	
d. What is the overall total impact on vehicles using the intersection? **(*a*) What is the increase in intersection total or average delay (%)?** **(*b*) What is the through phase V/C ratio of the signal with LPI?** **(*c*) What is the total 8-h vehicular volume at intersection?**		0 to -6	Overall impact = $-1 \times \text{IMin}(A, B) \times CI$ where $A = \begin{cases} 0 & \text{if } a < 10\% \\ -1 & \text{if } 10\% < a \le 30\% \\ -2 & \text{if } a > 30\% \end{cases}$ $B = \begin{cases} 0 & \text{if } b < 0.9 \\ -1 & \text{if } b \ge 0.9 \end{cases}$ $C = \begin{cases} -1 & \text{if } c < 16{,}000 \\ -2 & \text{if } 16{,}000 \le c < 30{,}000 \\ -3 & \text{if } c \ge 30{,}000 \end{cases}$	High level of negative impact on traffic operations for a large number of drivers.	
e. What is the rate of annual collisions between pedestrians and left- or right-turning vehicles per 1,000 8-h pedestrian crossings at the specific crossing in the past 5 years?		0 to 2	None = 0 0–3 = 1 >3 = 2	High level of potential safety improvement.	
f. What is the rate of conflicts* (conflicts per 1,000 8-h observations) between pedestrians and left- or right-turning vehicles at the specific crossing during 8 h of observation during area-specific pedestrian peak and nonpeak periods?**		0 to 2	None = 0 0–3 = 1 >3 = 2		
g. How far is the location from the nearest elementary school?		0 to 2	<200 m = 2 >200 m and <850 m = 1 ≥850 m = 0	High level of benefit to smaller school children who are more negatively affected by visibility issues. Average distance of walk trips to school in Toronto is 850 m (Transportation Tomorrow Survey). 6% of walk trips to school are less than or equal to 200 m in distance (Transportation Tomorrow Survey).	
h. What is the elderly demand score (*e*) of the area where the intersection is located?		0 to 2	2 if $e = 5$ 1 if $4 \le e < 5$ 0 if $e < 4$	High level of benefit to slower walking pedestrians: elderly.	Look up score using this map.
Total score					

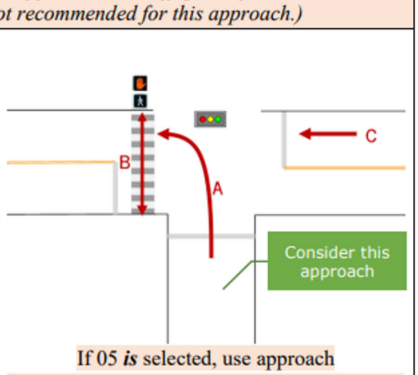
Figure G.19. Sample Tool by Saneinejad & Lo (2019)

Information needed: *a)* intersection location and geometry information, *b)* turning movement counts including pedestrian volume, and *c)* others (optional). Explanations for each item are included at the end of the guidelines table.

	Step I. Suitability Assessment at Intersection Level *(If signalized intersection meets at least one of criteria 01–05, go to Step II; otherwise, discontinue and do not consider LPI at this intersection.)*
01 ☐	**Average crash frequency** between turning vehicles on green and pedestrians legally crossing street on crosswalk with pedestrian "Walk" signal indication >=1 per year (in last 3 years).
02 ☐	**Reported visibility issue** blocking drivers' view of pedestrians due to obstructions or poor sight distance.
03 ☐	**Citizen complaints** about turning vehicles not yielding to pedestrians.
04 ☐	**Land use type** that attracts pedestrians (e.g., downtown core, marked school crossings) near intersection, but avoiding ineligible wide busy intersections.
05 ☐	**Intersection type** is T-intersection or intersection with one-way road (*see figure in Step II*).
	Step II. Suitability Assessment at Approach Level *(If approach meets one of criteria 06–10, LPI criteria are met for approach, go to Steps III and IV for recommended LPI duration and supplemental design for implementation; otherwise, discontinue and LPI is not recommended for this approach.)*



If 05 ***is not*** selected, use approach right-turn volume (movement A) for examining criteria 06–10



If 05 ***is*** selected, use approach left-turn volume (movement A) for examining criteria 06–10

06 ☐	***In 1 hour***, approach turning vehicle volume (movement A) >=100/hour, pedestrian volume at crosswalk (movement B) >=80/hour*, and through traffic volume of cross street (movement C) >=400/hour/lane (consider LPI for that one hour).
07 ☐	***In 4 consecutive hours***, approach turning vehicle volume (movement A) >=120/hour, pedestrian volume at crosswalk (movement B) >=70/hour*, and through traffic volume of cross street (movement C) >=400/hour/lane (consider LPI for those four hours).
08 ☐	***In 8 consecutive hours***, approach turning vehicle volume (movement A) >=125/hour, pedestrian volume at crosswalk (movement B) >=60/hour*, and through traffic volume of cross street (movement C) >=400/hour/lane (consider LPI for those eight hours).
09 ☐	***For marked school crossings***, approach turning vehicle volumes (movement A) >=50/hour (consider LPI for AM peak period -1 hour before and 30 mins after school start time, and PM peak period – 30 mins before and 1 hour after school end time).
10 ☐	Percentage of compromised pedestrians at onset of "Walk" signal at specific crosswalk >= 10% (usually for special needs; expensive to collect).
	Step III. LPI Duration Recommendations
11a	Interval should be minimum of 3 seconds in duration.
11b	Timing should allow pedestrians to clear half width of one lane in direction of moving traffic to increase visibility of pedestrians to turning traffic.
	Step IV. Supplemental Design Recommendations for LPI Implementation
12	Right-turn-on-red prohibitions – ""NO TURN ON RED"" sign or blank-out "NO TURN ON RED" sign.
13	Accessible pedestrian signals (APS).
14	Education about LPI.
Note: Count bicyclists as pedestrians if appropriate for crossing; users with slower crossing speeds can be weighted twice (children, older adults, persons with physical disabilities).	

Figure G.20. Sample Tool by Lin et al. (2017)