COUNTYWIDE REVIEW OF THE SUFFOLK COUNTY RED LIGHT CAMERA PROGRAM

Suffolk County Department of Public Works

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Executive Summary

Introduction

Since 1993, many states and local jurisdictions have adopted red light cameras as automated enforcement of red light ordinances. The use of cameras for red light violations is the most common example of automated enforcement programs that utilize cameras to enforce traffic safety laws. In red light camera programs, automated cameras take photographs and videos of vehicles entering intersections with traffic signals displaying a red light, and citations are sent to the vehicle's registered owner.

The Suffolk County Red Light Camera (RLC) program was authorized in 2009 under NYS Vehicle and Traffic Law, and is administered by the Suffolk County Traffic and Parking Violations Agency (TPVA). In May of 2009, New York State authorized the installation of red light cameras at fifty (50) locations in Suffolk County, and in June of 2010, the first cameras were activated. In June 2012, and additional fifty (50) cameras were authorized. In January 2013, the RLC program was transferred to TVPA. Between 2013 and 2014, the 50 additional cameras were installed, and 18 of the previously authorized locations were relocated. By October of 2014, 215 cameras were operating at 100 intersections, which is the current configuration of the program.

As with all RLC programs, the Suffolk County RLC program is intended to reduce red light running, and by extension, the occurrence of crashes associated with violations of this kind, widely considered to include right angle and left turn crashes, which are the crashes more likely to result in higher severity, including injury and fatality. Industry-wide research reviewed for the purposes of this study indicates that this pattern is not an uncommon occurrence at intersections where red light programs have been instituted. It also indicates an increase in the overall number of crashes could be expected.

For example, the results of a study conducted by the Federal Highway Administration (FHWA) based on 132 intersections in California concluded that red light camera programs increase total number of crashes, reduce right angle crashes, and provide generally positive safety and economic benefit. However, other studies indicate the contrary, including a study by the National Motorists Association that concluded that crashes increased with no discernable safety benefit due to red light camera enforcement. See Appendix A for additional information regarding these studies.

Therefore, in 2017, the Suffolk County Legislature directed the Suffolk County Department of Public Works (SCDPW) to engage an independent third party contractor to conduct a comprehensive review of the RLC program, to review the intersections in the RLC program, evaluate the efficacy of the program, and to serve as guidance as to the future conduct of the program.

This effort has been completed, and a report has been prepared documenting the procedures, methodologies, results and recommendations of the comprehensive review of the Suffolk County Red

Light Camera (RLC) program. The following sections of this Executive Summary provide a summary overview of the report.

Study Locations and Description

The study examines the entirety of the Suffolk County RLC program. At the time this writing, a total of 215 red light cameras were operating at 100 signalized intersections in Suffolk County. These intersection locations, which are referred to in this report as Active RLC locations, are identified in Table ES-1. Note that at a number of locations, more than one approach to the intersection is monitored, thus there are more cameras than intersections. Fifty-eight (58) of these intersections are under the jurisdiction of the New York State Department of Transportation, and the remaining forty-two (42) are at intersections under the jurisdiction of SCDPW. The crash experience at these 100 intersections for three years prior (2007 through 2009) to RLC enforcement and for three years during RLC enforcement (2015 through 2017) was examined in this study. For the purposes of this report, these periods are referred to as the Pre-Enforcement and Active-Enforcement periods.

In addition to the 100 Active RLC intersections in the program, eighteen (18) intersection locations are included in the study where red light cameras had previously been deployed, but were subsequently relocated to one of the above 100 intersections. Information regarding these intersections is provided in Table ES-2. These intersections are referred to as Deactivated RLC intersections in this report. The crash experience at these 18 Deactivated intersections prior to RLC enforcement (2007 through 2009), during RLC enforcement (variously between 2010 and 2013), and after the red light cameras were removed (2015 through 2017) was examined in this study. In addition to the study periods identified above for Active locations, the crash experience during the three years following removal of the cameras was examined. This study period is referred to as the Post-Enforcement period.

Table ES-1. 100 Active Intersection Locations

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
1	CR 4 (Commack Rd)	at	I495N	SB, WB	NYSDOT	East Half Hollow Hills
2	CR 112 (Johnson Ave)	at	NY27N	SB, WB	NYSDOT	Sayville
3	NY25	at	Pidgeon Hill Rd	EB, WB	NYSDOT	South Huntington
4	CR 93 (Ocean Ave)	at	I495S	NB, EB	NYSDOT	Ronkonkoma
5	Ronkonkoma Ave	at	I495N	SB, WB	NYSDOT	Ronkonkoma
6	NY25	at	Eastwood Blvd	EB, WB	NYSDOT	Centereach
7	Old Nichols Rd	at	I495N	SB, WB	NYSDOT	Ronkonkoma
8	NY111	at	I495S	NB, EB	NYSDOT	Hauppauge
9	CR 93 (Ocean Ave)	at	I495N	SB, WB	NYSDOT	Ronkonkoma
10	CR 67 (Motor Pkwy)	at	I495S (Exit 57)	NB, WB	NYSDOT	Islandia
11	CR 28 (New Hwy)	at	NY109	NB, EB, WB	NYSDOT	East Farmingdale
12	CR 83	at	NY25	NB, SB, EB, WB	NYSDOT	Selden
13	NY25	at	Holbrook Rd	EB, WB	NYSDOT	Centereach
14	NY110	at	CR 47 (Great Neck Rd)	NB, SB, WB	NYSDOT	Farmingdale
15	NY111	at	I495N	SB, WB	NYSDOT	Hauppauge
16	NY112	at	NY27N	SB, WB	NYSDOT	East Patchogue
17	CR 4 (Commack Rd)	at	NY25	NB, SB, EB, WB	NYSDOT	Commack

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
18	I495S	at	CR 4 (Commack Rd)	NB, EB	NYSDOT	Dix Hills
19	CR 2 (Straight Path)	at	NY27	NB, EB	NYSDOT	Lindenhurst
20	NY112	at	NY27S	NB, EB	NYSDOT	East Patchogue
21	NY25	at	Larkfield Rd	EB, WB	NYSDOT	Elwood
22	NY110	at	Conklin St	EB, SB	NYSDOT	Farmingdale
23	NY110	at	NY25	NB, EB, WB	NYSDOT	South Huntington
24	NY454	at	CR 100 (Suffolk Ave)	NB, SB	NYSDOT	Islandia
25	NY25	at	NY112	EB, WB	NYSDOT	Coram
26	NY25A	at	CR 21 (Rocky Point -Yaphank Rd)	EB, WB	NYSDOT	Rocky Point
27	NY112	at	CR 99 (Woodside Ave)	NB, SB, EB, WB	NYSDOT	South Medford
28	NY112	at	I495S	NB, EB	NYSDOT	Medford
29	NY112	at	I495N	SB, WB	NYSDOT	Medford
30	NY454	at	Broadway	EB, WB	NYSDOT	South Holbrook
31	NY347	at	Mark Tree Rd	EB, WB	NYSDOT	East Setauket
32	I495S	at	NY231 (Deer Park Ave)	EB	NYSDOT	Dix Hills
33	NY111, Joshua's Path	at	CR 67, Motor Pkwy	NB, SB, EB, WB	NYSDOT	Hauppauge
34	Hawkins Ave/Stony Brook Rd	at	NY25, Middle Country Rd	NB, SB, EB, WB	NYSDOT	Lake Grove
35	Mount Sinai Coram Rd	at	NY25, Middle Country Rd	SB, EB	NYSDOT	Coram
36	CR 47, Great Neck Rd	at	NY 27A	SB, WB	NYSDOT	Copiague
37	NY 112	at	Barton Ave	NB, SB	NYSDOT	East Patchogue
38	NY 25A	at	Mount Sinai Coram Road	EB, WB	NYSDOT	Mount Sinai
39	Miller Place Rd	at	NY 25A	NB, SN	NYSDOT	Miller Place
40	NY 454	at	Lincoln Ave	EB, WB	NYSDOT	Commack
41	CR 47, Great Neck Rd	at	CR 2, Dixon Ave	NB, SB, EB, WB	SCDPW	Copiague
42	CR 28, New Highway	at	Ralph Ave	SB	SCDPW	North Amityville
43	CR 47, Great Neck Rd	at	CR 12, Oak St	NB, SB	SCDPW	Copiague
44	CR 96, Great East Neck Rd	at	Raynor Ave	NB, SB	SCDPW	West Babylon
45	CR 96, Great East Neck Rd	at	Arnold Ave	NB, SB	SCDPW	West Babylon
46	NY 25	at	Redwood Lane	EB, WB	NYSDOT	Smithtown
47	NY 25/25A, E. Main Street	at	Landing Ave	EB, WB	NYSDOT	Smithtown
48	CR 14, Indian Head/ Harned Rd	at	NY 25	NB, SB, WB	NYSDOT	Commack
49	CR 3, Pinelawn Road	at	I-495, Express Drive North	SB, WB	NYSDOT	Melville
50	NY 231, Deer Park Ave	at	Nicolls Road	NB, SB	NYSDOT	Deer Park
51	NY 231, Deer Park Ave	at	CR 57, Bayshore Road	SB	NYSDOT	North Babylon
52	CR 10, Elwood Road	at	NY 25, Jericho Turnpike	SB, EB, WB	NYSDOT	Elwood
53	CR 17, Carleton Ave	at	NY 27A	NB, SB, EB	NYSDOT	East Islip
54	CR 13, Fifth Ave	at	CR 50, Union Blvd	NB, EB, WB	SCDPW	Bay Shore
55	CR 100, Suffolk Ave	at	Brentwood Road	EB, WB	SCDPW	Brentwood
56	CR 17, Carleton Ave	at	CR 100, Suffolk Ave	SB, EB, WB	SCDPW	Central Islip
57	CR 13, Fifth Ave	at	CR 57, Bay Shore Rd	NB, EB, WB	SCDPW	Bay Shore
59	CR 100, Suffolk Ave	at	2nd St/ Madison Ave	EB, WB	SCDPW	Bay Shore
60	CR 13, Fifth Ave	at	CR 100, Suffolk Ave	NB, SB, WB	SCDPW	Brentwood
61	CR 46, William Floyd Pkwy	at	Lawrence Rd/ Flintlock Dr	NB, SB	SCDPW	Shirley
62	CR 46, William Floyd Pkwy	at	Surrey Circle	NB, SB	SCDPW	Shirley
63	CR 83, Patchogue-Mt Sinai Rd	at	Old Town Rd	NB, SB	SCDPW	Coram

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
64	CR 80, Montauk Hwy	at	Garden Pl	EB, WB	SCDPW	Shirley
65	CR 101, Patchogue-Yaphank Rd	at	Station Rd	EB, WB	SCDPW	North Bellport
66	CR 80, Montauk Hwy	at	Phyllis Dr	EB, WB	SCDPW	East Patchogue
67	CR 46, William Floyd Pkwy	at	CR 80, Montauk Hwy	NB, SB, EB, WB	SCDPW	Shirley
68	Hawkins Ave	at	LIE, I-495 Express Dr South	NB, EB	NYSDOT	Lake Ronkonkoma
69	NYS 25	at	South Coleman Rd	EB, WB	NYSDOT	Centereach
70	NYS 110	at	LIE, I-495 Express Dr South	NB, EB	NYSDOT	Melville
71	CR 92, Oakwood Rd	at	NYS 25, Jericho	SB, WB	NYSDOT	Huntington Station
72	NYS 25	at	Dawn Dr	WB	NYSDOT	Centereach
73	CR 2, Straight Path	at	35th Street	NB	SCDPW	Copiague
74	CR 96, Great East Neck Rd	at	Railroad	NB	SCDPW	West Babylon
75	NYS 109	at	CR 96, Great East Neck Rd	SB	NYSDOT	West Babylon
76	CR 13A, N. Clinton Ave	at	CR 50, Union Blvd	SB, EB	SCDPW	Bay Shore
77	CR 13, Fifth Ave	at	Candlewood Rd	SB	SCDPW	North Bay Shore
78	CR 57, Bay Shore Rd	at	Howells Rd	EB	SCDPW	Baywood
79	CR 17, Wheeler Rd	at	CR 67, Motor Parkway	NB	SCDPW	Central Islip
80	CR 19, Waverly Ave	at	Gateway Plaza	NB	SCDPW	Yaphank
81	CR 99, Woodside Ave	at	Station Rd	WB	SCDPW	North Bellport
82	CR 16, Portion Rd	at	Ackerly Ln	EB, WB	SCDPW	Lake Ronkonkoma
83	CR 19, Waverly Ave	at	Furrows Rd	NB, SB	SCDPW	Holtsville
84	CR 4, Commack Rd	at	Dorothea St	NB, SB	SCDPW	Commack
85	CR 4, Commack Rd	at	Hauppauge Rd/ New Highway	SB	SCDPW	Commack
86	CR 16, Terry Rd	at	NYS 347	NB, SB, EB, WB	NYSDOT	Nesconset
87	CR 2, Straight Path	at	CR 3, Wellwood Ave	NB, SB	SCDPW	North Lindenhurst
88	CR 3, Pinelawn Rd	at	Half Hollow Road	NB, SB	SCDPW	Melville
89	CR 4, Commack Rd	at	Marcus Blvd/ Tanger Dwy	NB, SB	SCDPW	Deer Park
90	CR 83, North Ocean Ave	at	CR 16, Horseblock Rd	NB, SB	SCDPW	Farmingville
91	CR 19, Waverly Ave	at	NYS 27, SSR	NB, EB	SCDPW	North Patchogue
92	CR 19, Waverly Ave	at	NYS 27, NSR	WB	SCDPW	North Patchogue
93	CR 46, William Floyd Pkwy	at	Moriches Middle Island Rd	NB, SB	SCDPW	Shirley
94	CR 80, Montauk Hwy	at	Washington Ave/ Herkimer St	EB	SCDPW	Mastic
95	CR 111, Port Jeff-West Hampton	at	I-495, NSR	NB	SCDPW	Manorville
96	NY 109	at	CR 2, Straight Path	EB, WB	NYSDOT	West Babylon
97	NY 27A	at	CR 96, Great East Neck Rd/Bergen Ave	NB, SB	NYSDOT	West Babylon
98	NY 347	at	Arrowhead Ln	NB, EB, WB	NYSDOT	Setauket
99	CR 83, North Ocean Ave	at	I-495, Express Drive South	NB, EB	SCDPW	Holtsville
100	CR 35, Park Avenue	at	CR 11, Pulaski Road	NB, SB, EB, WB	SCDPW	Huntington Station

Table ES-2. 18 Deactivated Intersection Locations

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
101	CR 67 (Motor Parkway)	at	I495N (Exit 57)	SB, WB	NYSDOT	Islandia
102	CR 97 (Nicholls Rd)	at	NY347	NB, SB, EB, WB	NYSDOT	Lake Grove
103	NY25	at	Boyle Rd	EB, WB	NYSDOT	Selden
104	CR 93 (Lakeland)	at	NY27S NSR	SB	NYSDOT	Bohemia
105	NY25	at	Marshall Dr/Paula Blvd	EB, WB	NYSDOT	North Selden
106	CR 112 (Johnson Ave)	at	NY27S	NB, EB	NYSDOT	Sayville
107	NY454	at	CR 67 (Motor Pkwy)	NB, SB, EB, WB	NYSDOT	Islandia
108	NY112	at	CR 16 (Horseblock Rd)	NB, EB	NYSDOT	Medford
109	NY347	at	Old Town Rd	EB, WB	NYSDOT	Port Jefferson Station
110	NY454	at	Old Willets Path	EB	NYSDOT	Hauppauge
111	NY25	at	CR 97 (Nicholls Rd)	WB	NYSDOT	Centereach
112	NY454	at	CR 112 (Johnson Ave)	EB, WB	NYSDOT	Bohemia
113	NY347	at	NY25	SB,	NYSDOT	St. James
114	NY347	at	Stonybrook Rd	EB, WB	NYSDOT	South Stony Brook
115	NY27	at	N. Delaware Ave	EB	NYSDOT	North Lindenhurst
116	NY27	at	N. Monroe Ave	WB	NYSDOT	North Lindenhurst
117	NY231 (Deer Park Ave)	at	I495N	SB	NYSDOT	Dix Hills
118	NY231 (Deer Park Ave)	at	CR2 (Straight Path)	NB	NYSDOT	Dix Hills

Crash Data Reduction Procedure

To examine the crash experience, crash records were obtained from the NYSDOT's Accident Location Information System (ALIS), which is a Geographic Information Systems (GIS) based system. Crash reports were requested via the Freedom of Information Law (FOIL) process through NYSDOT. Crash records consisted of police accident reports, hereinafter referred to as MV-104A forms. These MV-104A reports are prepared by the responding police officer for each reportable crash, and submitted to DMV for recording in the database.

This data was subjected to a thorough and extensive preliminary review to ensure that each crash in fact occurred within the location and time parameters established for the study. It should be noted that, for the purposes of crash analyses, reports for crashes that occurred within 200 feet of the centerpoint of each study location were included, which ensured a comprehensive analysis of all intersection crashes. Each crash was categorized by crash type based on the descriptions in Table ES-3. In addition, the following information was entered into the project database for each crash:

Crash Information:

- Crash Date
- Crash Time
- Number of Vehicles
- Number Injured
- Number of Fatalities
- Cost exceeded $1,000

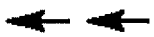
Crash Condition:

- Lighting Condition
- Roadway Surface Condition

Crash Location:

- Road name crash occurred on
- Nearest cross street name (where applicable)
- Distance from nearest cross street (where applicable)
- Cardinal direction from nearest cross street (where applicable)
- Each reviewer assigned the crash an approach code. During the evaluation process, the reviewer used a combination of the description and "Direction of Travel" boxes 23 and 24 from the MV-104A to determine the approach of the crash.

Table ES-3. Crash Code Description

Crash Code	Description	Diagram
Left Turn With	Collision of left turning vehicle into a vehicle in the same travel direction	
Rear End	Front to rear collision on same approach	
Overtaking	Side to side collision on same approach	
Left Turn Opposing	Collision of left turning vehicle into a vehicle in opposing travel directions	
Right Angle	Front to side collision from perpendicular approaches, also known as a T-Bone collision	
Right Turn With	Collision of right turning vehicle into a vehicle in the same travel direction	
Right Turn Opposing	Collision of right turning vehicle into a vehicle in the opposing travel direction	
Head On	Collision of vehicles front to front, usually opposite approaches	
Sideswipe	Collision of vehicles side to side traveling on opposite approaches	
Other	Other description could include multiple vehicles greater than two, pedestrian or bicycle accidents.	**Varies by Officer Sketch**

The increase of study area from the center of each intersection resulted in a total of 18,125 crash reports consisting of 33,503 pages were obtained, reviewed and entered into the data base developed for the purpose. Only those crashes found to have met the study parameters were then included in further analysis. Table ES-4 provides details of the crash data obtained, processed and included for analysis in the study.

Table ES-4. Total Records Processed

Provided by NYSDOT	Pages	Records	Within Study Area
Active Intersections			
2007-2009 (Pre-Enforcement)	8,625	4,935	3,515
2014-2017 (Active Enforcement)	13,716	8,729	6,808
100 Intersections Subtotal:	22,341	13,664	10,323
Deactivated Intersections			
2007-2009 (Pre-Enforcement)	6,030	1,175	722
2010-2013 (Active Enforcement)	1,879	1,284	821
2014-2017 (Post-Enforcement)	3,253	2,002	1,499
18 Intersections Subtotal:	11,162	4,461	3,042
Grand Total:	**33,503**	**18,125**	**13,365**

Projected Crashes Based On County-Wide Crash Rates

In order to evaluate the impact of the RLCs and to provide a more accurate evaluation, it was necessary to calculate the projected number of crashes that would have occurred at the 100 Active intersections if the intersections where red light cameras were installed followed the Countywide increase in crashes. Toward this end, growth rates were developed to estimate the number of crashes that would be expected during the Active-Enforcement period (2015-2017). The growth rates were determined using information obtained from the NYSDOT ALIS information on the actual number of total crashes in Suffolk County at signalized intersections from 2007-2017. To minimize the impact of the statistical regression to the mean, the three-year average number of crashes for each analysis period was used to form the basis of the projections. The NYSDOT data indicates that the total number of reportable crashes in Suffolk County at signalized intersections of all types rose from an average of 6,757 from 2007 to 2009 to an average of 7,574 from 2015 to 2017, an increase of 12.1%. These projected growth rates formed the basis for comparison between the two study periods. The following sections discuss the results of these comparisons.

Similarly, for the 18 Deactivated intersection locations, growth rates in crashes were developed based on the countywide data for the three study periods examined. For the Active-Enforcement years 2010-2013, the NYSDOT data indicates that the total number of reportable crashes in Suffolk County at signalized intersections of all types rose from an average of 6,757 from 2007 to 2009 to an average of 6,912 from 2010 to 2013, an increase of 2.3%. Thus, this growth rate was used to project crashes for the Active-Enforcement (2010-2013) period. From the Active-Enforcement (2010-2013) to Post-Enforcement (2015-

2017) periods, countywide crashes increased from an average of 6,912 per year to an average of 7,574 per year, an increase of 9.6%. This growth rate is used to project crashes for the Post-Enforcement (2015-2017) period and examine what happened after the cameras were removed.

Note that two analyses were conducted for the period following camera removal at the Deactivated locations. Analysis I compared the actual number of crashes at the 18 Deactivated intersection locations during the Post-Enforcement period (2015-2017) to the projected number of crashes during the Post-Enforcement period (2015-2017). Both crash severity and crash type were examined. The projections used in this analysis were based on the growth rate of 9.6% applied to the actual number of crashes during the Active-Enforcement 24 month period (2010-2013), and the analysis examines what took place after the cameras had been in place and were then removed.

The second analysis (Analysis II) also compares the actual number of crashes during the Post-Enforcement period (2015-2017) to the projected number of crashes during the Post-Enforcement period (2015-2017), but the projections are based on applying the 12.1% growth rate to the actual Pre-Enforcement period (2007-2009) crashes. Both crash severity and crash type were examined. In this manner, the analysis attempts to provide a comparison to the projections had the program not been implemented.

The following tables, Table ES-5 through Table ES-12, provide the results of the crash analyses conducted at all intersections for all study time periods.

Table ES-5. Comparison of Crashes by Crash Severity, Active-Enforcement Period (2015-2017) Projected Crashes* to Active – Enforcement (2015 – 2017) Actual Crashes, 100 Active Intersections

Crash Severity	Projected* Crashes Active Enforcement Period (2015-2017)		Actual Crashes Active Enforcement Period (2015-2017)		Difference - Actual to Projected Crashes		
	Projected No. of Crashes	Projected Annual Avg. No. of Crashes	Actual No. of Crashes	Annual Avg. No. of Crashes	No. of Crashes	Annual Avg. No. Crashes	Percent Change
Fatal	19	6.4	17	5.7	-2	-0.7	-10.5%
Injury	1,555	518.3	1,386	462.0	-169	-56.3	-10.9%
Combined Fatal + Injury	1,574	524.6	1,403	467.7	-171	-57.0	-10.9%
PDO	2,366	788.7	4,209	1,403.0	1,842	614.0	77.8%
Total Crashes	**3,940**	**1,313.3**	**5,612**	**1,870.67**	**1,671**	**557.0**	42.4%

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Table ES-6. Comparison of Crashes by Crash Type, Active- Enforcement Period (2015 – 2017) Projected Crashes* to Active-Enforcement (2015-2017) Actual Crashes, 100 Active Intersections

Location	Crash Type	Projected* Crashes Active-Enforcement Period (2015-2017)		Actual Crashes Active-Enforcement Period (2015-2017)		Difference - Actual to Projected Crashes		
		Projected No. of Crashes	Projected Average Annual No. of Crashes	No. of Crashes	Annual Avg. No. of Crashes	No. of Crashes	Annual Avg. No. of Crashes	Percent Difference
All Active Intersections	LEFT TURN WITH	89	29.7	95	31.7	6	2.0	6.7%
	REAR END	1453	484.3	2,702	900.7	1249	416.3	46.2%
	OVERTAKING	536	178.7	1,175	391.7	639	213.0	54.4%
	LEFT TURN OPPOSING	809	269.7	691	230.3	-118	-39.3	-17.1%
	RIGHT ANGLE	527	175.7	337	112.3	-190	-63.3	-56.4%
	RIGHT TURN WITH	152	50.7	144	48.0	-8	-2.7	-5.6%
	RIGHT TURN OPPOSING	40	13.3	58	19.3	18	6.0	31.0%
	HEAD ON	17	5.7	20	6.7	3	1.0	15.0%
	SIDESWIPE	36	12.0	45	15.0	9	3.0	20.0%
	OTHER	178	59.3	242	80.7	64	21.3	26.4%
	PEDESTRIAN	55	18.3	50	16.7	-5	-1.7	-10.0%
	BICYCLE	48	16.0	53	17.7	5	1.7	9.4%
All Active Intersections Total		**3,940**	**1,313.3**	**5,612**	**1,870.7**	**1,672**	**557.3**	**29.8%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017*

Table ES-7. Comparison of Crashes by Crash Severity, Active-Enforcement Period (2010 – 2013) Projected* Crashes to Active-Enforcement Period (2010-2013) Actual Crashes, 18 Deactivated Intersections

Crash Severity	Projected* Crashes Active Enforcement Period (2010-2013)	Actual Crashes Active Enforcement Period (2010-2013)	Difference Actual to Projected	
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Average No. Crashes	Percent Difference
Fatal	1.3	0.5	-0.8	-61.5%
Injury	99.9	97.5	-2.4	-2.5%
Combined Fatal + Injury	101.3	98.0	-3.3	-3.3%
Property Damage Only	145.0	144.5	-0.5	-0.3%
Total:	**246.2**	**242.5**	**-3.7**	**-1.5%**

**Projections are based on 2.3% growth in Countywide crashes at signalized intersections between 2007-2009 and 2010-2013.*

Table ES-8. Comparison of Crashes by Crash Type, Active-Enforcement Period (2010 – 2013) Projected* Crashes to Active Enforcement Period (2010-2013) Actual Crashes, 18 Deactivated Intersections

Int. No.	Crash Type	Projected* Crashes Active-Enforcement Period (2010 – 2013)	(Actual Crashes Active Enforcement Period (2010-2013)	Difference Actual to Projected	
		Annual Average No. of Crashes	Annual Average No. of Crashes	Annual Average No. Crashes	Percent Difference
All 18 Deactivated Intersections	LEFT TURN WITH	4.4	0.5	-3.9	-88.6%
	REAR END	128.9	144.5	15.6	12.1%
	OVERTAKING	26.3	38.5	12.2	46.4%
	LEFT TURN OPPOSING	38.9	32.0	-6.9	-17.7%
	RIGHT ANGLE	21.8	11.0	-10.8	-49.5%
	RIGHT TURN WITH	4.4	1.0	-3.4	-77.3%
	RIGHT TURN OPPOSING	3.1	1.0	-2.1	-67.4%
	HEAD ON	1.0	0.5	-0.5	-51.1%
	SIDESWIPE	2.0	1.0	-1.0	-51.1%
	OTHER	12.0	9.0	-3.0	-24.8%
	PEDESTRIAN	1.7	3.5	1.8	101.3%
	BICYCLE	1.7	0.0	-1.7	-100.0%
All 18 Deactivated Intersections Total:		**246.2**	**242.5**	**-3.7**	**-1.5%**

**Projections are based on 2.3% growth in Countywide crashes at signalized intersections between 2007-2009 and 2010-2013.*

Table ES-9. Comparison of Crashes by Crash Severity, Post-Enforcement Period (2015 – 2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis I

Crash Severity	Projected* Crashes Post-Enforcement Period (2015-2017)	Actual Crashes Post-Enforcement Period (2015-2017)	Difference Actual to Projected	
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Percent Difference
Fatal	0.5	0.3	-0.2	-40.0%
Injury	106.9	108.7	1.8	1.7%
Combined Fatal + Injury	107.4	109.0	1.6	1.5%
Property Damage Only	158.4	304.0	145.6	91.9%
Total:	**265.8**	**413.0**	**147.2**	**35.6%**

**Projections are based on 9.6% growth in Countywide crashes at signalized intersections between 2010-2013 and 2015-2017.*

Table ES-10. Comparison of Crashes by Crash Type, Post-Enforcement Period (2015 – 2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis I

Int. No.	Crash Type	Projected* Crashes Post-Enforcement Period (2015-2017)	Actual Crashes Active-Enforcement Period (2015-2017)	Difference Actual to Projected	
		Annual Average No. of Crashes	Annual Average No. of Crashes	Annual Average No. Crashes	Percent Difference
All 18 Deactivated Intersections	LEFT TURN WITH	0.5	2.0	1.5	400.0%
	REAR END	158.4	224.7	66.3	41.9%
	OVERTAKING	42.2	83.3	41.1	97.4%
	LEFT TURN OPPOSING	35.1	39.0	3.9	11.1%
	RIGHT ANGLE	12.1	24.3	12.2	100.8%
	RIGHT TURN WITH	1.1	10.0	8.9	809.1%
	RIGHT TURN OPPOSING	1.1	3.0	1.9	172.7%
	HEAD ON	0.5	0.7	0.2	40.0%
	SIDESWIPE	1.1	1.3	0.2	18.2%
	OTHER	9.9	19.0	9.1	91.9%
	PEDESTRIAN	3.8	2.0	-1.8	-47.4%
	BICYCLE	0.0	3.7	3.7	-
All 18 Deactivated Intersections Total:		**265.8**	**413.0**	**147.2**	**55.4%**

**Projections are based on 9.6% growth in Countywide crashes at signalized intersections between 2010-2013 and 2015-2017.*

Table ES-11. Comparison of Crashes by Crash Severity, Post-Enforcement Period (2015 – 2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis II

Crash Severity	Projected* Crashes Post-Enforcement Period (2015-2017)	Actual Crashes Post- Enforcement Period (2015-2017)	Difference Actual Crashes to Projected Crashes	
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Avg. No. Crashes	Percent Difference
Fatal	1.7	0.3	-1.3	-82.4%
Injury	109.7	108.7	-1.0	-0.9%
Combined Fatal + Injury	111.0	109.0	-2.0	-1.8%
Property Damage Only	159.0	304.0	145.0	91.2%
Total:	**270.0**	**413.0**	**143.0**	**52.9%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Table ES-12. Comparison of Crashes by Crash Type, Post-Enforcement Period (2015-2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis II

Int. No.	Crash Type	Projected* Crashes Post-Enforcement Period (2015 – 2017)	Actual Crashes Post-Enforcement Period (2015-2017)	Difference Actual to Projected	
		Annual Average No. of Crashes	Annual Average No. of Crashes	Annual Average No. Crashes	Percent Difference
All 18 Deactivated Intersections	LEFT TURN WITH	5.0	2.0	-3.0	-60.0%
	REAR END	141.3	224.7	83.4	59.0%
	OVERTAKING	28.7	83.3	54.6	190.7%
	LEFT TURN OPPOSING	42.7	39.0	-3.7	-8.6%
	RIGHT ANGLE	24.0	24.3	0.3	1.4%
	RIGHT TURN WITH	5.0	10.0	5.0	100.0%
	RIGHT TURN OPPOSING	3.3	3.0	-0.3	-10.0%
	HEAD ON	1.0	0.7	-0.3	-33.3%
	SIDESWIPE	2.3	1.3	-1.0	-42.9%
	OTHER	13.0	19.0	6.0	46.2%
	PEDESTRIAN	2.0	2.0	0.0	0.0%
	BICYCLE	2.0	3.7	1.7	83.3%
All 18 Deactivated Intersections Total:		**270.3**	**413.0**	**142.7**	**52.8%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Summary of Findings

The findings based on the results of this comprehensive, in-depth analysis of the crash experience at the signalized intersections included in the Suffolk County Red Light Camera Program are as follows:

1. The number of total crashes at the 100 Active RLC camera locations increased by 59.6%, from 3,515 to 5,612, between the two study periods examined in this study, 2007 – 2009 Pre-Enforcement and 2015 - 2017 Active-Enforcement.

2. The number of signalized intersections crashes Countywide increased by 12.1% between the two study periods examined in this study, Pre-Enforcement (2007 – 2009) and Active Enforcement (2015- 2017). Had the total number of crashes increased by the countywide rate, 3,940 total crashes could have been expected at the 100 RLC Active intersections during the three year period from 2015 to 2017. Therefore, 1,672 more crashes, a 42% increase, occurred at these locations than projected, or 557.3 more per year than projected.

3. The number of crashes that resulted in injury at the 100 Active intersection locations was lower than the number of crashes projected based on signalized intersection countywide crash rates. During the Active-Enforcement period (2015-2017), 1,403 such crashes occurred, while 1,574 were projected. Therefore, 171 fewer such crashes an average of 57.0 fewer crashes per year, occurred than had they increased at the countywide rate.

4. The total number of crashes that involved fatalities was unchanged between the Pre-Enforcement (2007- 2009) and Active-Enforcement (2015 – 2017) periods studied. Since fatal crashes are rare occurrences, statistical relationships and specific projections of increases or decreases in the number of fatal crashes are difficult to forecast. However, no increase in fatal crashes was noted.

5. The number of left turn and right angle crashes, generally considered to include a higher number of more severe crashes, and which are associated with red light running, was lower than the projected number of these crash types during the Active-Enforcement (2015 – 2017) period while the number of rear end and overtaking crashes was higher than projected.

6. The analyses confirm the trend identified in prior studies of RLC locations in other municipalities that concluded overall crashes increase but fatal and injury (F/I) crashes decrease with the implementation of RLC programs.

7. Overall, using standard NYSDOT crash reduction cost benefit methodology, the change in severity between the projected and actual crashes at these locations during the Active-Enforcement period (2015-2017)has resulted in a crash cost benefit of approximately $5.14M per year due to the reduction in anticipated fatal and injury (F/I) crashes, based on NYSDOT crash cost benefit methodology.

8. At fifteen (15) Active intersection locations, actual fatal and injury (F/I) crashes exceeded projected crashes by a notable amount (more than 2.0 crashes per year). These locations do not follow the program trend. Further investigations at these locations did not result in determination of any common factors that would explain these results.

9. Nineteen (19) Active intersection locations exhibited notably fewer (greater than 2.0 fewer) F/I crashes during the Active Enforcement period, seven (7) of which also experienced decreases in overall crashes. These locations exhibited better crash experience than the 100 Active intersections overall. Further investigations indicated that geometric improvements had been made at three (3) of these locations. As above, these locations did not exhibit any common factors that would explain these results.

10. The crash patterns at Deactivated locations exhibited patterns that were different from those at Active intersection locations. From Pre-Enforcement to Active Enforcement, the annual average number of total crashes was virtually unchanged, as was the number of injury crashes. Thus, both were slightly lower than the projected number of crashes.

11. At the Deactivated intersection locations, during the Active-Enforcement 24 month period (2020-2013), the number of fatal and injury and PDO crashes was lower than would have been expected, but the difference was so low as to be insignificant.

12. At the Deactivated intersection locations, left turn and right angle crashes were lower than projected during 24 Month Active-Enforcement period, and rear end and overtaking crashes were higher.

13. At the Deactivated intersection locations, following removal of the cameras, the following was noted:

    a. Crashes involving fatalities and injuries remained essentially unchanged, while property damage only crashes were nearly 100% higher than projected.

    b. Rear end, overtaking, right angle and left turn crashes were all higher than the projected annual average number of crashes based on countywide crash rates.

    c. Right angle crashes increased significantly more than would have been expected, doubling from approximately 12 to 24 crashes per year.

14. At the Deactivated intersection locations, an additional analysis of the Post-Enforcement period which examined what happened several years after the cameras had been removed, and attempted to compare crash history with that which may have prevailed had the RLC program not have been implemented, the following was observed:

    a. Combined fatal and injury crashes were essentially equal to the projected number of crashes, while property damage only crashes were 90% higher than projected.

    b. Total left turn decreased and right angle crashes increased slightly. Rear end and overtaking crashes increased at rates that might have been expected had the cameras remained in place.

15. At the 18 Deactivated intersection locations, contrary to trends at the 100 Active intersection locations and at other RLC programs, during the 24 Month Active-Enforcement period (2010-2013), seven (7) of the 18 Deactivated intersections exhibited an increase in average annual F/I crashes above the projected number, two of which showed a notable average annual increase in F/I crashes (greater than 2.0 crashes per year).

16. At the 18 Deactivated intersection locations, following removal of the cameras, during the Post-Enforcement period (2015-2017), eight (8) of the eighteen intersections showed increases in average annual F/I crashes beyond projected values, four (4) of which were notable and exceeded 2.0 F/I crashes per year. At four other locations, average annual F/I crashes decreased by 2.0 crashes.

17. At the 18 Deactivated intersection locations, seven (7) Deactivated intersections experienced increases of greater than 10.0 crashes per year following camera removal, with only one that had a corresponding decrease in F/I crashes.

18. At the 18 Deactivated intersection locations, it should be noted that due to the small sample size and short duration of active RLC monitoring at these locations, caution must be exercised when attempting to correlate crash patterns to the implementation of the RLC program.

Conclusions

1. There is a correlation between the RLC program and reduction of severity in the crash experience. There is no definitive way to prove causality.

2. At the Active 100 Intersections, the total number of crashes exceeded Countywide projections during Active Enforcement periods, but Fatal and Injury (F/I) crashes went down.

3. The reduced number of higher severity crashes has resulted in a crash cost reduction benefit of approximately $5.14M per year at the 100 Active Intersections.

4. At the 18 Deactivated locations, during the Active-Enforcements 24-month period (2010-2013) the RLC program had a similar impact on the crash experience as at Active locations.

5. At the 18 Deactivated locations, for all time periods examined, crash types exhibited patterns similar to those at the 100 Active locations, with rear end and overtaking crashes representing nearly the entirety of the total increase in crashes.

6. At the 18 Deactivated locations, termination of RLC monitoring correlated with an increase in crashes, including rear end, overtaking, left turn and right angle crashes without an associated increase in fatal and injury crashes.

7. There is no apparent residual benefit after cameras are removed, since fatal and injury, right angle and left turn crashes were approximately equal to the projected number of crashes at the Deactivated locations had the program not been implemented.

8. Although no studies in the public domain regarding crash experience following the termination of RLC enforcement could be located, and therefore care must be taken regarding the relationship of the RLC program and these crash results, based on the forgoing analysis and investigations.

Recommendations

1. The Suffolk County Red Light Camera program should be continued due to a reduction in crashes resulting in injury or fatality, and a corresponding reduction in left turn and right angle crashes.

2. At the following intersections where the number of Fatal and Injury (F/I) crashes were not reduced, the Red Light Camera program should be considered for either future study, monitoring or relocation to other signalized intersection locations:

Int.No	Description	Int.No	Description
8	NY111 at I495S	73	CR 2, Straight Path at 35th Street
10	CR 67 (Motor Pkwy) at I495S (Exit 57)	75	NYS 109 at CR 96, Great East Neck Rd
27	NY112 at CR 99 (Woodside Ave)	79	CR 17, Wheeler Rd at CR 67, Motor Parkway
35	Mount Sinai Coram Rd at NY25, Middle Country Rd	89	CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy
50	NY 231, Deer Park Ave at Nicolls Road	90	CR 83, North Ocean Ave at CR 16, Horseblock Rd
52	CR 10, Elwood Road at NY 25, Jericho Turnpike	97	NY 27A at CR 96, Great East Neck Rd/Bergen Ave
60	CR 13, Fifth Ave at CR 100, Suffolk Ave	98	NY 347 at Arrowhead Ln
62	CR 46, William Floyd Pkwy at Surrey Circle		

Section 1 Introduction and Study Methodology

1.1 Introduction

Since 1993, many states and local jurisdictions have adopted red light cameras as automated enforcement of red light ordinances. The use of cameras for red light violations is the most common example of automated enforcement programs that utilize cameras to enforce traffic safety laws. In red light camera programs, automated cameras take photographs of vehicles entering intersections with traffic signals on a red light, and citations are sent to the vehicle's registered owner.

The Suffolk County Red Light Camera (RLC) program was authorized in 2009 under NYS Vehicle and Traffic Law, and is administered by the Suffolk County Traffic and Parking Violations Agency (TPVA). In May of 2009, New York State authorized the installation of red light cameras at fifty (50) locations in Suffolk County, and in June of 2010, the first cameras were activated. In June 2012, and additional fifty (50) cameras were authorized. In January 2013, the RLC program was transferred to TVPA. Between 2013 and 2014, the 50 additional cameras were installed, and 18 of the previously authorized locations were relocated. By October of 2014, 215 cameras were operating at 100 intersections, which is the current configuration of the program.

In 2017, the Suffolk County Legislature directed the Suffolk County Department of Public Works (SCDPW) to engage an independent third party contractor to conduct a comprehensive review of the RLC program. The study was to review the crash experience at the intersections in the RLC program, evaluate the efficacy of the program, and to serve as guidance as to the future conduct of the program. This report presents the results of that study.

The study examines the entirety of the Suffolk County RLC program. At the time this writing, a total of 215 red light cameras were operating at 100 signalized intersections in Suffolk County. These intersection locations are referred to in this report as Active RLC locations. Note that at a number of locations, more than one approach to the intersection is monitored, thus there are more cameras than intersections. Fifty-eight (58) of these intersections are under the jurisdiction of the New York State Department of Transportation, and the remaining forty-two (42) are at intersections under the jurisdiction of SCDPW. The crash experience at these 100 intersections for three years prior (2007 through 2009) to RLC enforcement and for three years during RLC enforcement (2015 through 2017) was examined in this study. For the purposes of this report, these periods are referred to as the Pre-Enforcement and Active-Enforcement periods.

In addition to the 100 Active RLC intersections in the program, eighteen (18) intersection locations are included in the study where red light cameras had previously been deployed, but were subsequently relocated to one of the above 100 intersections These intersections are referred to as Deactivated RLC intersections in this report. The crash experience at these 18 Deactivated intersections prior to RLC enforcement (2007 through 2009), during RLC enforcement (variously between 2010 and 2013), and after

the red light cameras were removed (2015 through 2017) was examined in this study. In addition to the study periods identified above for Active locations, the crash experience during the three years following removal of the cameras was examined. This study period is referred to as the Post-Enforcement period.

This review also included confirmation of the signal operations at the program intersections, including signal timing and phasing, yellow and all red clearances, speed limits, grades, and field observations of traffic operating conditions. Available record plans for each intersection were obtained, and geometric and operational characteristics of the study intersections were verified in the field. In order to ensure that the traffic signals were operating as intended, each intersection was visited by study staff, and the geometry, phasing and timing of the signalized intersections were field verified.

To examine the crash experience, crash records were obtained from the NYSDOT's Accident Location Information System (ALIS). This data was subjected to a thorough and extensive preliminary review to ensure that each crash in fact occurred within the location and time parameters established for the study.

Trends and patterns in the accident experience prior to and since the installation of the RLC program have been thoroughly analyzed, and compared to statewide and countywide trends. At locations where an increase in accidents was identified, in-depth review was conducted to determine the underlying causation. At locations where RLC's had been previously installed but later relocated, crashes from before installation, during enforcement, and after removal were analyzed so as to provide an analysis of the crash experience since the cameras were removed.

The following sections provide a detailed description of the study methodology and results.

1.2 Study Methodology

1.2.1 Review of Prior Research

As part of this study, a review was conducted of previously written reports and studies regarding the impact of nationwide RLC programs on public safety. As with all RLC programs, the Suffolk County RLC program is intended to reduce red light running, and by extension, the occurrence of crashes associated with violations of this kind, widely considered to include right angle and left turn crashes, which are the crashes more likely to result in higher severity, including injury and fatality. Industry-wide research reviewed for the purposes of this study indicates that this pattern is not an uncommon occurrence at intersections where red light programs have been instituted.

For example, the results of a study conducted by the Federal Highway Administration (FHWA) based on 132 intersections in California concluded that red light camera programs increase total number of crashes, reduce right angle crashes, and provide generally positive safety and economic benefit. However, other studies indicate the contrary, including a study by the National Motorists Association, which concluded that crashes increased with no discernable safety benefit due to red light camera enforcement.

Table 1-1 provides a brief description and summary of findings of these studies, and a number of other studies that were reviewed for the purposes of this effort. Copies of relevant sections of these studies are provided in Appendix A.

Table 1-1. Summary of Reviewed Research – Red Light Camera Enforcement

Document Description	Summary of Findings
Automated Red-Light Enforcement Intervention Fact Sheets, Centers for Disease Control and Prevention, Compilation of studies conducted nationwide between (2001 – 2011), Last updated December 2015	More research is needed to shed light on spillover effects (positive or negative) of automated enforcement programs
Safety Evaluation of Red-Light Cameras, FHWA-HRT-05-048, Federal Highway Administration, April 2005, 132 intersections in El Cajon, San Diego, and San Francisco, CA; Howard County, Montgomery County, and Baltimore, MD; and Charlotte, NC.	RLC systems provide a modest aggregate crash-cost benefit ($39,000 - $50,000 per treated site year) by reducing the number of right angle crashes but increasing the number of rear end crashes. RLC systems provide the most benefits at intersections with a high number of right angle crashes and relatively few rear end crashes.
Evaluating the Impacts of Red Light Camera Deployment on Intersection Traffic Safety, June 2018, University of Maryland Department of Civil and Environmental Engineering	RLC enforcement can lead to a reduction in side impact crashes, variations of increases and/or decreases in rear-end collisions dependent on driver aggression, additionally a reduction in aggressive driving behavior at downstream intersections was observed, speed reduction during yellow phase, more drivers choose to stop on yellow phase, fewer red-light-running vehicles.
Red Light Running, Institute for Highway Safety Highway Loss Data Institute, April 2018, intersections in Oxnard, California; Fairfax, Virginia and Arlington Virginia.	Red light violations are reduced significantly with cameras, and the fatal red light running crash rate was reduced by 21 percent and the rate of all types of fatal crashes at signalized intersections was reduced by 14 percent.
Red Light Camera Studies, National Motorists Association, March 2018, a compilation of 20 different reports on the effectiveness of red light cameras in locations ranging from California to Virginia	"The preponderance of independent research (in other words, research that was not funded by ticket camera vendors or units of government interested in justifying camera-based traffic enforcement) has illustrated that ticket cameras typically increase, not decrease, the number of accidents at controlled intersections."

Document Description	Summary of Findings
Automated Enforcement for Speeding and Red Light Running, National Cooperative Highway Research Program, June 2014, A report summering the findings of NCHRP 729: Automated Enforcement for Speeding and Red Light Running, 2011 data from the National Highway Traffic Safety Administration and information from the Insurance Institute for Highway Safety.	"When used appropriately, automated enforcement can be a valuable tool to prevent speeding and red light running"
Analysis of Red Light Violation Data Collected from Intersections Equipped with Red Light Photo Enforcement Cameras, The National Highway Traffic Safety Administration, March 2006, Statistical analysis of about 47,000 red light violation records collected from 11 intersections in the City of Sacramento, California, by red light photo enforcement cameras between May 1999 and June 2003.	Provided general demographic statistics regarding red light running violations at intersections with photo enforcement. Study was reviewed and determined not applicable for this study.

As can be seen, the results of this review of prior research on RLC programs indicate that in most, but not all cases, RLC programs have a beneficial impact with the following trends:

- Increase total number of crashes
- Reduction of right angle crashes
- Reduction in crash severity
- Reduction in fatal crashes

The purpose of this effort is to determine whether the Suffolk County RLC program is having the desired results. The following sections describe the technical approach to this effort.

1.3 Data Collection

This section describes in detail the process utilized to assemble the required operational, location and crash data for use in the review of the Suffolk County Red Light Camera Program. Subsections provide a detailed account of the effort associated with each task.

As stated in the Introduction, there are 100 intersections with active red light cameras. Fifty eight (58) are maintained and operated by the New York Department of Transportation (NYSDOT) and 42 are maintained by the Towns and operated by the Suffolk County Department of Public Works (SCDPW). These intersections are variously referred to as "active enforcement" or "currently monitored" intersections in this report.

In addition, the 18 intersections that previously had red light cameras that have been relocated are maintained and operated by NYSDOT. These intersections are variously referred to as "post-enforcement" or "deactivated" intersections in this report.

1.4 Active and Deactivated Camera Intersection Locations

A list of the Active and Deactivated camera intersection locations is presented Table 1-1 and Table 1-2, respectively. For ease of reference, an intersection number was assigned to each intersection for identification purposes within this study. The tables provide location details of each including; intersection number, the roadway names, which approach(es) is monitored, jurisdiction (either NYSDOT or SCDPW), and the Hamlet location of each intersection. Table 1-3 identifies the camera installation and removal date for each intersection.

Table 1-4, Figure 1-1 through Figure 1-5 present the location of each RLC intersection broken down by Township of location. Intersections are identified as either the "Active" or "Deactivated" designation.

Table 1-1. 100 Active Intersection Locations

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
1	CR 4 (Commack Rd)	at	I495N	SB, WB	NYSDOT	East Half Hollow Hills
2	CR 112 (Johnson Ave)	at	NY27N	SB, WB	NYSDOT	Sayville
3	NY25	at	Pidgeon Hill Rd	EB, WB	NYSDOT	South Huntington
4	CR 93 (Ocean Ave)	at	I495S	NB, EB	NYSDOT	Ronkonkoma
5	Ronkonkoma Ave	at	I495N	SB, WB	NYSDOT	Ronkonkoma
6	NY25	at	Eastwood Blvd	EB, WB	NYSDOT	Centereach
7	Old Nichols Rd	at	I495N	SB, WB	NYSDOT	Ronkonkoma
8	NY111	at	I495S	NB, EB	NYSDOT	Hauppauge
9	CR 93 (Ocean Ave)	at	I495N	SB, WB	NYSDOT	Ronkonkoma
10	CR 67 (Motor Pkwy)	at	I495S (Exit 57)	NB, WB	NYSDOT	Islandia
11	CR 28 (New Hwy)	at	NY109	NB, EB, WB	NYSDOT	East Farmingdale
12	CR 83	at	NY25	NB, SB, EB, WB	NYSDOT	Selden
13	NY25	at	Holbrook Rd	EB, WB	NYSDOT	Centereach
14	NY110	at	CR 47 (Great Neck Rd)	NB, SB, WB	NYSDOT	Farmingdale
15	NY111	at	I495N	SB, WB	NYSDOT	Hauppauge
16	NY112	at	NY27N	SB, WB	NYSDOT	East Patchogue
17	CR 4 (Commack Rd)	at	NY25	NB, SB, EB, WB	NYSDOT	Commack
18	I495S	at	CR 4 (Commack Rd)	NB, EB	NYSDOT	Dix Hills
19	CR 2 (Straight Path)	at	NY27	NB, EB	NYSDOT	Lindenhurst
20	NY112	at	NY27S	NB, EB	NYSDOT	East Patchogue
21	NY25	at	Larkfield Rd	EB, WB	NYSDOT	Elwood
22	NY110	at	Conklin St	EB, SB	NYSDOT	Farmingdale
23	NY110	at	NY25	NB, EB, WB	NYSDOT	South Huntington
24	NY454	at	CR 100 (Suffolk Ave)	NB, SB	NYSDOT	Islandia
25	NY25	at	NY112	EB, WB	NYSDOT	Coram
26	NY25A	at	CR 21 (Rocky Point -Yaphank Rd)	EB, WB	NYSDOT	Rocky Point
27	NY112	at	CR 99 (Woodside Ave)	NB, SB, EB, WB	NYSDOT	South Medford
28	NY112	at	I495S	NB, EB	NYSDOT	Medford
29	NY112	at	I495N	SB, WB	NYSDOT	Medford
30	NY454	at	Broadway	EB, WB	NYSDOT	South Holbrook
31	NY347	at	Mark Tree Rd	EB, WB	NYSDOT	East Setauket
32	I495S	at	NY231 (Deer Park Ave)	EB	NYSDOT	Dix Hills
33	NY111, Joshua's Path	at	CR 67, Motor Pkwy	NB, SB, EB, WB	NYSDOT	Hauppauge
34	Hawkins Ave/Stony Brook Rd	at	NY25, Middle Country Rd	NB, SB, EB, WB	NYSDOT	Lake Grove
35	Mount Sinai Coram Rd	at	NY25, Middle Country Rd	SB, EB	NYSDOT	Coram
36	CR 47, Great Neck Rd	at	NY 27A	SB, WB	NYSDOT	Copiague
37	NY 112	at	Barton Ave	NB, SB	NYSDOT	East Patchogue
38	NY 25A	at	Mount Sinai Coram Road	EB, WB	NYSDOT	Mount Sinai
39	Miller Place Rd	at	NY 25A	NB, SN	NYSDOT	Miller Place
40	NY 454	at	Lincoln Ave	EB, WB	NYSDOT	Commack
41	CR 47, Great Neck Rd	at	CR 2, Dixon Ave	NB, SB, EB, WB	SCDPW	Copiague
42	CR 28, New Highway	at	Ralph Ave	SB	SCDPW	North Amityville
43	CR 47, Great Neck Rd	at	CR 12, Oak St	NB, SB	SCDPW	Copiague
44	CR 96, Great East Neck Rd	at	Raynor Ave	NB, SB	SCDPW	West Babylon
45	CR 96, Great East Neck Rd	at	Arnold Ave	NB, SB	SCDPW	West Babylon
46	NY 25	at	Redwood Lane	EB, WB	NYSDOT	Smithtown

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
47	NY 25/25A, E. Main Street	at	Landing Ave	EB, WB	NYSDOT	Smithtown
48	CR 14, Indian Head/ Harned Rd	at	NY 25	NB, SB, WB	NYSDOT	Commack
49	CR 3, Pinelawn Road	at	I-495, Express Drive North	SB, WB	NYSDOT	Melville
50	NY 231, Deer Park Ave	at	Nicolls Road	NB, SB	NYSDOT	Deer Park
51	NY 231, Deer Park Ave	at	CR 57, Bayshore Road	SB	NYSDOT	North Babylon
52	CR 10, Elwood Road	at	NY 25, Jericho Turnpike	SB, EB, WB	NYSDOT	Elwood
53	CR 17, Carleton Ave	at	NY 27A	NB, SB, EB	NYSDOT	East Islip
54	CR 13, Fifth Ave	at	CR 50, Union Blvd	NB, EB, WB	SCDPW	Bay Shore
55	CR 100, Suffolk Ave	at	Brentwood Road	EB, WB	SCDPW	Brentwood
56	CR 17, Carleton Ave	at	CR 100, Suffolk Ave	SB, EB, WB	SCDPW	Central Islip
57	CR 13, Fifth Ave	at	CR 57, Bay Shore Rd	NB, EB, WB	SCDPW	Bay Shore
59	CR 100, Suffolk Ave	at	2nd St/ Madison Ave	EB, WB	SCDPW	Bay Shore
60	CR 13, Fifth Ave	at	CR 100, Suffolk Ave	NB, SB, WB	SCDPW	Brentwood
61	CR 46, William Floyd Pkwy	at	Lawrence Rd/ Flintlock Dr	NB, SB	SCDPW	Shirley
62	CR 46, William Floyd Pkwy	at	Surrey Circle	NB, SB	SCDPW	Shirley
63	CR 83, Patchogue-Mt Sinai Rd	at	Old Town Rd	NB, SB	SCDPW	Coram
64	CR 80, Montauk Hwy	at	Garden Pl	EB, WB	SCDPW	Shirley
65	CR 101, Patchogue-Yaphank Rd	at	Station Rd	EB, WB	SCDPW	North Bellport
66	CR 80, Montauk Hwy	at	Phyllis Dr	EB, WB	SCDPW	East Patchogue
67	CR 46, William Floyd Pkwy	at	CR 80, Montauk Hwy	NB, SB, EB, WB	SCDPW	Shirley
68	Hawkins Ave	at	LIE, I-495 Express Dr South	NB, EB	NYSDOT	Lake Ronkonkoma
69	NYS 25	at	South Coleman Rd	EB, WB	NYSDOT	Centereach
70	NYS 110	at	LIE, I-495 Express Dr South	NB, EB	NYSDOT	Melville
71	CR 92, Oakwood Rd	at	NYS 25, Jericho	SB, WB	NYSDOT	Huntington Station
72	NYS 25	at	Dawn Dr	WB	NYSDOT	Centereach
73	CR 2, Straight Path	at	35th Street	NB	SCDPW	Copiague
74	CR 96, Great East Neck Rd	at	Railroad	NB	SCDPW	West Babylon
75	NYS 109	at	CR 96, Great East Neck Rd	SB	NYSDOT	West Babylon
76	CR 13A, N. Clinton Ave	at	CR 50, Union Blvd	SB, EB	SCDPW	Bay Shore
77	CR 13, Fifth Ave	at	Candlewood Rd	SB	SCDPW	North Bay Shore
78	CR 57, Bay Shore Rd	at	Howells Rd	EB	SCDPW	Baywood
79	CR 17, Wheeler Rd	at	CR 67, Motor Parkway	NB	SCDPW	Central Islip
80	CR 19, Waverly Ave	at	Gateway Plaza	NB	SCDPW	Yaphank
81	CR 99, Woodside Ave	at	Station Rd	WB	SCDPW	North Bellport
82	CR 16, Portion Rd	at	Ackerly Ln	EB, WB	SCDPW	Lake Ronkonkoma
83	CR 19, Waverly Ave	at	Furrows Rd	NB, SB	SCDPW	Holtsville
84	CR 4, Commack Rd	at	Dorothea St	NB, SB	SCDPW	Commack
85	CR 4, Commack Rd	at	Hauppauge Rd/ New Highway	SB	SCDPW	Commack
86	CR 16, Terry Rd	at	NYS 347	NB, SB, EB, WB	NYSDOT	Nesconset
87	CR 2, Straight Path	at	CR 3, Wellwood Ave	NB, SB	SCDPW	North Lindenhurst
88	CR 3, Pinelawn Rd	at	Half Hollow Road	NB, SB	SCDPW	Melville
89	CR 4, Commack Rd	at	Marcus Blvd/ Tanger Dwy	NB, SB	SCDPW	Deer Park
90	CR 83, North Ocean Ave	at	CR 16, Horseblock Rd	NB, SB	SCDPW	Farmingville

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
91	CR 19, Waverly Ave	at	NYS 27, SSR	NB, EB	SCDPW	North Patchogue
92	CR 19, Waverly Ave	at	NYS 27, NSR	WB	SCDPW	North Patchogue
93	CR 46, William Floyd Pkwy	at	Moriches Middle Island Rd	NB, SB	SCDPW	Shirley
94	CR 80, Montauk Hwy	at	Washington Ave/ Herkimer St	EB	SCDPW	Mastic
95	CR 111, Port Jeff-West Hampton	at	I-495, NSR	NB	SCDPW	Manorville
96	NY 109	at	CR 2, Straight Path	EB, WB	NYSDOT	West Babylon
97	NY 27A	at	CR 96, Great East Neck Rd/Bergen Ave	NB, SB	NYSDOT	West Babylon
98	NY 347	at	Arrowhead Ln	NB, EB, WB	NYSDOT	Setauket
99	CR 83, North Ocean Ave	at	I-495, Express Drive South	NB, EB	SCDPW	Holtsville
100	CR 35, Park Avenue	at	CR 11, Pulaski Road	NB, SB, EB, WB	SCDPW	Huntington Station

Table 1-2. 18 Deactivated Intersection Locations

Int. No.	Roadway 1		Roadway 2	Enforced Approach	Jurisdiction	Hamlet
101	CR 67 (Motor Parkway)	at	I495N (Exit 57)	SB, WB	NYSDOT	Islandia
102	CR 97 (Nicholls Rd)	at	NY347	NB, SB, EB, WB	NYSDOT	Lake Grove
103	NY25	at	Boyle Rd	EB, WB	NYSDOT	Selden
104	CR 93 (Lakeland)	at	NY27S NSR	SB	NYSDOT	Bohemia
105	NY25	at	Marshall Dr/Paula Blvd	EB, WB	NYSDOT	North Selden
106	CR 112 (Johnson Ave)	at	NY27S	NB, EB	NYSDOT	Sayville
107	NY454	at	CR 67 (Motor Pkwy)	NB, SB, EB, WB	NYSDOT	Islandia
108	NY112	at	CR 16 (Horseblock Rd)	NB, EB	NYSDOT	Medford
109	NY347	at	Old Town Rd	EB, WB	NYSDOT	Port Jefferson Station
110	NY454	at	Old Willets Path	EB	NYSDOT	Hauppauge
111	NY25	at	CR 97 (Nicholls Rd)	WB	NYSDOT	Centereach
112	NY454	at	CR 112 (Johnson Ave)	EB, WB	NYSDOT	Bohemia
113	NY347	at	NY25	SB,	NYSDOT	St. James
114	NY347	at	Stonybrook Rd	EB, WB	NYSDOT	South Stony Brook
115	NY27	at	N. Delaware Ave	EB	NYSDOT	North Lindenhurst
116	NY27	at	N. Monroe Ave	WB	NYSDOT	North Lindenhurst
117	NY231 (Deer Park Ave)	at	I495N	SB	NYSDOT	Dix Hills
118	NY231 (Deer Park Ave)	at	CR2 (Straight Path)	NB	NYSDOT	Dix Hills

Table 1-3. Camera Installation and Removal Dates – All Intersections

Int. No.	Roadway 1		Roadway 2	Activation Date	Deactivation Date
1	CR 4 (Commack Rd)	at	I495N	10/22/10	
2	CR 112 (Johnson Ave)	at	NY27N	10/12/10	
3	NY25	at	Pidgeon Hill Rd	10/22/10	
4	CR 93 (Ocean Ave)	at	I495S	6/21/10	
5	Ronkonkoma Ave	at	I495N	8/18/10	
6	NY25	at	Eastwood Blvd	10/22/10	
7	Old Nichols Rd	at	I495N	10/19/10	
8	NY111	at	I495S	9/25/10	
9	CR 93 (Ocean Ave)	at	I495N	12/19/10	
10	CR 67 (Motor Pkwy)	at	I495S (Exit 57)	11/5/10	
11	CR 28 (New Hwy)	at	NY109	12/22/10	
12	CR 83	at	NY25	12/7/10	
13	NY25	at	Holbrook Rd	10/18/10	
14	NY110	at	CR 47 (Great Neck Rd)	11/24/10	
15	NY111	at	I495N	3/18/11	
16	NY112	at	NY27N	10/1/10	
17	CR 4 (Commack Rd)	at	NY25	1/25/11	
18	I495S	at	CR 4 (Commack Rd)	4/5/11	
19	CR 2 (Straight Path)	at	NY27	4/8/11	
20	NY112	at	NY27S	2/11/11	
21	NY25	at	Larkfield Rd	2/4/11	
22	NY110	at	Conklin St	4/10/11	
23	NY110	at	NY25	2/24/11	
24	NY454	at	CR 100 (Suffolk Ave)	8/17/10	
25	NY25	at	NY112	6/24/11	
26	NY25A	at	CR 21 (Rocky Point -Yaphank Rd)	2/18/11	
27	NY112	at	CR 99 (Woodside Ave)	2/24/11	
28	NY112	at	I495S	12/16/10	
29	NY112	at	I495N	12/1/10	
30	NY454	at	Broadway	3/8/11	
31	NY347	at	Mark Tree Rd	1/13/11	
32	I495S	at	NY231 (Deer Park Ave)	3/18/11	
33	NY111, Joshua's Path	at	CR 67, Motor Pkwy	5/6/13	
34	Hawkins Ave/Stony Brook Rd	at	NY25, Middle Country Rd	4/30/13	
35	Mount Sinai Coram Rd	at	NY25, Middle Country Rd	4/22/13	
36	CR 47, Great Neck Rd	at	NY 27A	6/26/13	
37	NY 112	at	Barton Ave	6/20/13	
38	NY 25A	at	Mount Sinai Coram Road	8/8/13	
39	Miller Place Rd	at	NY 25A	8/22/13	
40	NY 454	at	Lincoln Ave	8/14/13	
41	CR 47, Great Neck Rd	at	CR 2, Dixon Ave	7/22/13	
42	CR 28, New Highway	at	Ralph Ave	8/2/13	
43	CR 47, Great Neck Rd	at	CR 12, Oak St	7/3/13	
44	CR 96, Great East Neck Rd	at	Raynor Ave	7/16/13	
45	CR 96, Great East Neck Rd	at	Arnold Ave	7/24/13	
46	NY 25	at	Redwood Lane	2/11/14	
47	NY 25/25A, E. Main Street	at	Landing Ave	4/9/14	
48	CR 14, Indian Head/ Harned Rd	at	NY 25	1/28/14	
49	CR 3, Pinelawn Road	at	I-495, Express Drive North	2/11/14	
50	NY 231, Deer Park Ave	at	Nicolls Road	12/26/13	
51	NY 231, Deer Park Ave	at	CR 57, Bayshore Road	3/1/14	

Int. No.	Roadway 1		Roadway 2	Activation Date	Deactivation Date
52	CR 10, Elwood Road	at	NY 25, Jericho Turnpike	2/27/14	
53	CR 17, Carleton Ave	at	NY 27A	7/10/14	
54	CR 13, Fifth Ave	at	CR 50, Union Blvd	9/18/13	
55	CR 100, Suffolk Ave	at	Brentwood Road	9/13/13	
56	CR 17, Carleton Ave	at	CR 100, Suffolk Ave	8/28/13	
57	CR 13, Fifth Ave	at	CR 57, Bay Shore Rd	12/1/13	
59	CR 100, Suffolk Ave	at	2nd St/ Madison Ave	9/9/13	
60	CR 13, Fifth Ave	at	CR 100, Suffolk Ave	9/9/13	
61	CR 46, William Floyd Pkwy	at	Lawrence Rd/ Flintlock Dr	10/16/13	
62	CR 46, William Floyd Pkwy	at	Surrey Circle	10/8/13	
63	CR 83, Patchogue-Mt Sinai Rd	at	Old Town Rd	10/2/13	
64	CR 80, Montauk Hwy	at	Garden Pl	12/6/13	
65	CR 101, Patchogue-Yaphank Rd	at	Station Rd	11/13/13	
66	CR 80, Montauk Hwy	at	Phyllis Dr	11/26/13	
67	CR 46, William Floyd Pkwy	at	CR 80, Montauk Hwy	10/29/13	
68	Hawkins Ave	at	LIE, I-495 Express Dr South	11/18/13	
69	NYS 25	at	South Coleman Rd	10/8/14	
70	NYS 110	at	LIE, I-495 Express Dr South	4/14/14	
71	CR 92, Oakwood Rd	at	NYS 25, Jericho	9/16/14	
72	NYS 25	at	Dawn Dr	9/25/14	
73	CR 2, Straight Path	at	35th Street	7/25/14	
74	CR 96, Great East Neck Rd	at	Railroad	12/26/13	
75	NYS 109	at	CR 96, Great East Neck Rd	12/15/13	
76	CR 13A, N. Clinton Ave	at	CR 50, Union Blvd	10/1/14	
77	CR 13, Fifth Ave	at	Candlewood Rd	12/13/13	
78	CR 57, Bay Shore Rd	at	Howells Rd	12/10/13	
79	CR 17, Wheeler Rd	at	CR 67, Motor Parkway	12/26/13	
80	CR 19, Waverly Ave	at	Gateway Plaza	12/6/13	
81	CR 99, Woodside Ave	at	Station Rd	4/7/14	
82	CR 16, Portion Rd	at	Ackerly Ln	12/26/13	
83	CR 19, Waverly Ave	at	Furrows Rd	12/26/13	
84	CR 4, Commack Rd	at	Dorothea St	12/17/13	
85	CR 4, Commack Rd	at	Hauppauge Rd/ New Highway	12/12/13	
86	CR 16, Terry Rd	at	NYS 347	2/4/14	July 2015**
87	CR 2, Straight Path	at	CR 3, Wellwood Ave	9/9/14	
88	CR 3, Pinelawn Rd	at	Half Hollow Road	12/19/13	
89	CR 4, Commack Rd	at	Marcus Blvd/ Tanger Dwy	12/6/13	
90	CR 83, North Ocean Ave	at	CR 16, Horseblock Rd	12/12/13	
91	CR 19, Waverly Ave	at	NYS 27, SSR	12/12/13	
92	CR 19, Waverly Ave	at	NYS 27, NSR	12/15/13	
93	CR 46, William Floyd Pkwy	at	Moriches Middle Island Rd	12/15/13	
94	CR 80, Montauk Hwy	at	Washington Ave/ Herkimer St	1/22/14	
95	CR 111, Port Jeff-West Hampton	at	I-495, NSR	12/19/13	
96	NY 109	at	CR 2, Straight Path	12/26/13	
97	NY 27A	at	CR 96, Great East Neck Rd/Bergen Ave	10/25/13	
98	NY 347	at	Arrowhead Ln	10/16/13	
99	CR 83, North Ocean Ave	at	I-495, Express Drive South	10/9/13	
100	CR 35, Park Avenue	at	CR 11, Pulaski Road	10/2/13	

Int. No.	Roadway 1		Roadway 2	Activation Date	Deactivation Date
Deactivated Locations					
101	CR 67 (Motor Parkway)	at	I495N (Exit 57)	10/19/10	10/28/13
102	CR 97 (Nicholls Rd)	at	NY347	11/16/10	4/29/13
103	NY25	at	Boyle Rd	12/8/10	10/16/13
104	CR 93 (Lakeland)	at	NY27S NSR	3/22/11	9/25/13
105	NY25	at	Marshall Dr/Paula Blvd	12/6/10	10/9/13
106	CR 112 (Johnson Ave)	at	NY27S	10/19/10	10/2/13
107	NY454	at	CR 67 (Motor Pkwy)	8/23/10	4/22/13
108	NY112	at	CR 16 (Horseblock Rd)	2/6/11	10/16/13
109	NY347	at	Old Town Rd	1/26/11	4/15/13
110	NY454	at	Old Willets Path	3/18/11	10/9/13
111	NY25	at	CR 97 (Nicholls Rd)	4/6/11	9/25/13
112	NY454	at	CR 112 (Johnson Ave)	1/26/11	9/9/13
113	NY347	at	NY25	12/21/10	10/28/13
114	NY347	at	Stonybrook Rd	1/12/11	9/11/13
115	NY27	at	N. Delaware Ave	4/9/11	9/30/13
116	NY27	at	N. Monroe Ave	4/18/11	9/30/13
117	NY231 (Deer Park Ave)	at	I495N	3/30/11	9/25/13
118	NY231 (Deer Park Ave)	at	CR2 (Straight Path)	3/18/11	9/11/13

*** It should be noted that Intersection 86, CR 16, Terry Rd at NYS 347, was under construction during the analysis period and the camera was temporarily removed. The camera at the time of this study has not been reinstalled.*

Table 1-4. Intersections Location by Town

Intersection ID		
Int. No.	**Name**	**Hamlet**
	Town of Babylon	
11	CR 28 (New Hwy) at NY109	East Farmingdale
14	NY110 at CR 47 (Great Neck Rd)	Farmindgale
19	CR 2 (Straight Path) at NY27	Lindenhurst
22	NY110 at Conklin St	Farmindgale
36	CR 47, Great Neck Rd at NY 27A	Copiague
41	CR 47, Great Neck Rd at CR 2, Dixon Ave	Copiague
42	CR 28, New Highway at Ralph Ave	North Amityville
43	CR 47, Great Neck Rd at CR 12, Oak St	Copiague
44	CR 96, Great East Neck Rd at Raynor Ave	West Babylon
45	CR 96, Great East Neck Rd at Arnold Ave	West Babylon
50	NY 231, Deer Park Ave at Nicolls Road	Deer Park
51	NY 231, Deer Park Ave at CR 57, Bayshore Road	North Babylon
73	CR 2, Straight Path at 35th Street	Copiague
74	CR 96, Great East Neck Rd at Railroad	West Babylon
75	NYS 109 at CR 96, Great East Neck Rd	West Babylon
87	CR 2, Straight Path at CR 3, Wellwood Ave	North Lindenhurst
89	CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy	Deer Park
96	NY 109 at CR 2, Straight Path	West Babylon
97	NY 27A at CR 96, Great East Neck Rd/Bergen Ave	West Babylon
115	NY27 at N. Delaware Ave	North Lindenhurst
116	NY27 at N. Monroe Ave	North Lindenhurst
	Town of Brookhaven	
5	Ronkonkoma Ave at I495N	Ronkonkoma
6	NY25 at Eastwood Blvd	Centereach
12	CR 83 at NY25	Selden
13	NY25 at Holbrook Rd	Centereach
16	NY112 at NY27N	East Patchogue
20	NY112 at NY27S	East Patchogue
25	NY25 at NY112	Coram
26	NY25A at CR 21 (Rocky Point -Yaphank Rd)	Rocky Point
27	NY112 at CR 99 (Woodside Ave)	South Medford
28	NY112 at I495S	Medford
29	NY112 at I495N	Medford
31	NY347 at Mark Tree Rd	East Setauket
34	Hawkins Ave/Stony Brook Rd at NY25, Middle Country Rd	Lake Grove
35	Mount Sinai Coram Rd at NY25, Middle Country Rd	Coram
37	NY 112 at Barton Ave	East Patchogue
38	NY 25A at Mount Sinai Coram Road	Mount Sinai
39	Miller Place Rd at NY 25A	Miller Place
61	CR 46, William Floyd Pkwy at Lawrence Rd/ Flintlock Dr	Shirley
62	CR 46, William Floyd Pkwy at Surrey Circle	Shirley
63	CR 83, Patchogue-Mt Sinai Rd at Old Town Rd	Coram
64	CR 80, Montauk Hwy at Garden Pl	Shirley
65	CR 101, Patchogue-Yaphank Rd at Station Rd	North Bellport
66	CR 80, Montauk Hwy at Phyllis Dr	East Patchogue
67	CR 46, William Floyd Pkwy at CR 80, Montauk Hwy	Shirley
68	Hawkins Ave at LIE, I-495 Express Dr South	Lake Ronkonkoma
69	NYS 25 at South Coleman Rd	Centereach
72	NYS 25 at Dawn Dr	Centereach
80	CR 19, Waverly Ave at Gateway Plaza	Yaphank

Intersection ID		
Int. No.	**Name**	**Hamlet**
81	CR 99, Woodside Ave at Station Rd	North Bellport
82	CR 16, Portion Rd at Ackerly Ln	Lake Ronkonkoma
90	CR 83, North Ocean Ave at CR 16, Horseblock Rd	Farmingville
91	CR 19, Waverly Ave at NYS 27, SSR	North Patchogue
92	CR 19, Waverly Ave at NYS 27, NSR	North Patchogue
93	CR 46, William Floyd Pkwy at Moriches Middle Island Rd	Shirley
94	CR 80, Montauk Hwy at Washington Ave/ Herkimer St	Mastic
95	CR 111, Port Jeff-West Hampt at I-495, NSR	Manorville
98	NY 347 at Arrowhead Ln	Setauket
99	CR 83, North Ocean Ave at I-495, Express Drive South	Holtsville
102	CR 97 (Nicholls Rd) at NY347	Lake Grove
103	NY25 at Boyle Rd	Selden
105	NY25 at Marshall Dr/Paula Blvd	North Selden
108	NY112 at CR 16 (Horseblock Rd)	Medford
109	NY347 at Old Town Rd	Port Jefferson Station
111	NY25 at CR 97 (Nicholls Rd)	Centereach
114	NY347 at Stonybrook Rd	South Stonybrook
Town of Huntington		
1	CR 4 (Commack Rd) at I495N	East Half Hollow Hills
3	NY25 at Pidgeon Hill Rd	South Huntington
17	CR 4 (Commack Rd) at NY25	Commack
18	I495S at CR 4 (Commack Rd)	Dix Hills
21	NY 25 at Larkfield Rd	Elwood
23	NY110 at NY25	South Huntington
32	I495S at NY231 (Deer Park Ave)	Dix Hills
49	CR 3, Pinelawn Road at I-495, Express Drive North	Melville
52	CR 10, Elwood Road at NY 25, Jericho Turnpike	Elwood
70	NYS 110 at LIE, I-495 Express Dr South	Melville
71	CR 92, Oakwood Rd at NYS 25, Jericho	Huntington Station
84	CR 4, Commack Rd at Dorothea St	Commack
85	CR 4, Commack Rd at Hauppauge Rd/ New Highway	Commack
88	CR 3, Pinelawn Rd at Half Hollow Road	Melville
100	CR 35, Park Avenue at CR 11, Pulaski Road	Huntington Station
117	NY231 (Deer Park Ave) at I495N	Dix Hills
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	Dix Hills
Town of Islip		
2	CR 112 (Johnson Ave) at NY27N	Sayville
4	CR 93 (Ocean Ave) at I495S	Ronkonkoma
7	Old Nichols Rd at I495N	Ronkonkoma
8	NY111 at I495S	Hauppauge
9	CR 93 (Ocean Ave) at I495N	Ronkonkoma
10	CR 67 (Motor Pkwy) at I495S (Exit 57)	Islandia
15	NY111 at I495N	Hauppauge
24	NY454 at CR 100 (Suffolk Ave)	Islandia
30	NY454 at Broadway	South Holbrook
33	NY111, Joshua's Path at CR 67, Motor Pkwy	Hauppauge
40	NY 454 at Lincoln Ave	Commack
53	CR 17, Carleton Ave at NY 27A	East Islip
54	CR 13, Fifth Ave at CR 50, Union Blvd	Bay Shore
55	CR 100, Suffolk Ave at Brentwood Road	Brentwood
56	CR 17, Carleton Ave at CR 100, Suffolk Ave	Central Islip
57	CR 13, Fifth Ave at CR 57, Bay Shore Rd	Bay Shore
58	CR 50, Union Blvd at Brentwood Road	Bay Shore

Intersection ID		
Int. No.	**Name**	**Hamlet**
59	CR 100, Suffolk Ave at 2nd St/ Madison Ave	Bay Shore
60	CR 13, Fifth Ave at CR 100, Suffolk Ave	Brentwood
76	CR 13A, N. Clinton Ave at CR 50, Union Blvd	Bay Shore
77	CR 13, Fifth Ave at Candlewood Rd	North Bay Shore
78	CR 57, Bay Shore Rd at Howells Rd	Baywood
79	CR 17, Wheeler Rd at CR 67, Motor Parkway	Central Islip
83	CR 19, Waverly Ave at Furrows Rd	Holtsville
101	CR 67 (Motor Parkway) at I495N (Exit 57)	Islandia
104	CR 93 (Lakeland) at NY27S NSR	Bohemia
106	CR 112 (Johnson Ave) at NY27S	Sayville
107	NY454 at CR 67 (Motor Pkwy)	Islandia
112	NY454 at CR 112 (Johnson Ave)	Bohemia
Town of Smithtown		
46	NY 25 at Redwood Lane	Smithtown
47	NY 25/25A, E. Main Street at Landing Ave	Smithtown
48	CR 14, Indian Head/ Harned Rd at NY 25	Commack
86	CR 16, Terry Rd at NYS 347	Nesconset
110	NY454 at Old Willets Path	Hauppauge
113	NY347 at NY25	St. James

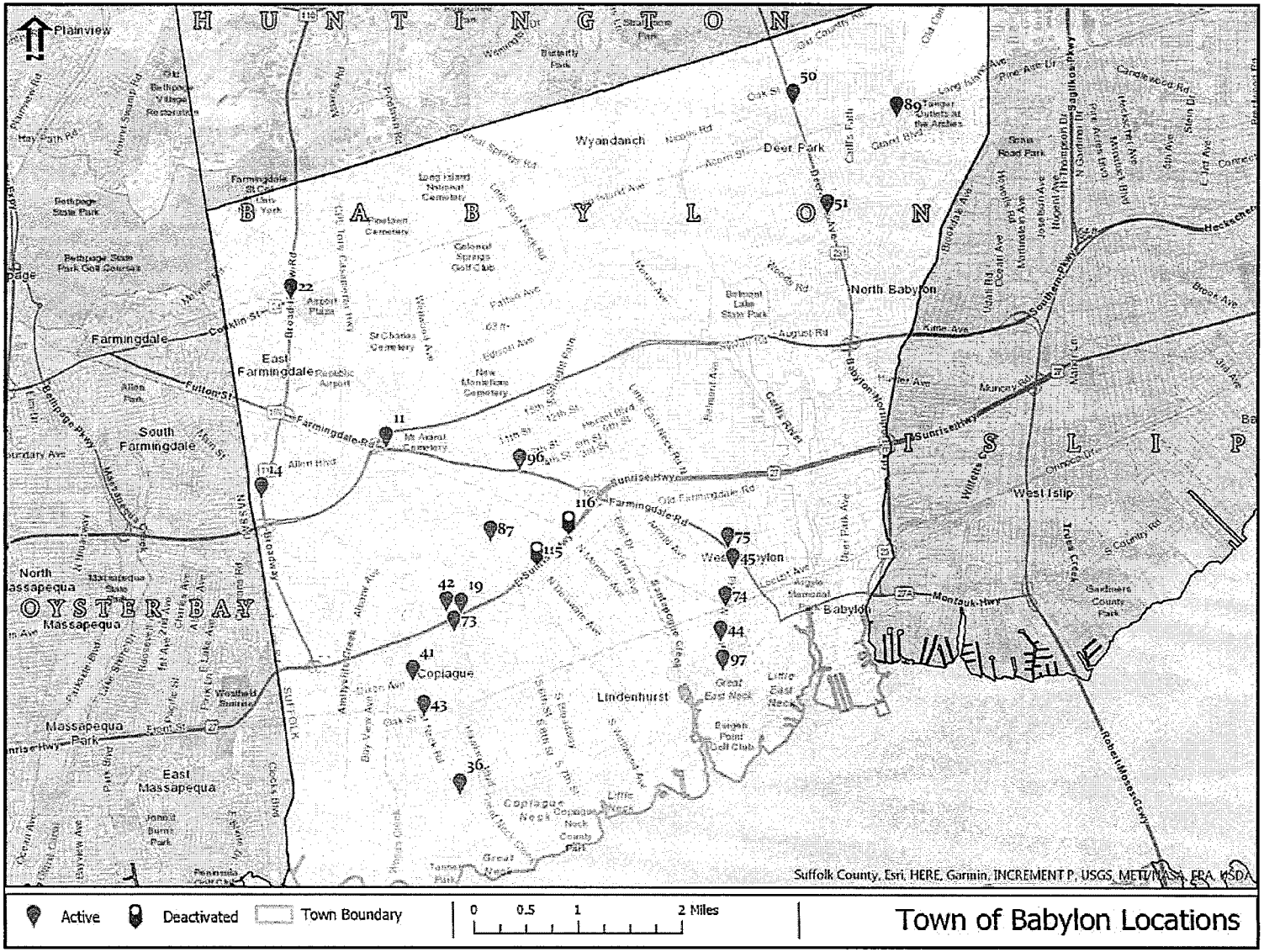


Figure 1-1. Town of Babylon RLC Locations

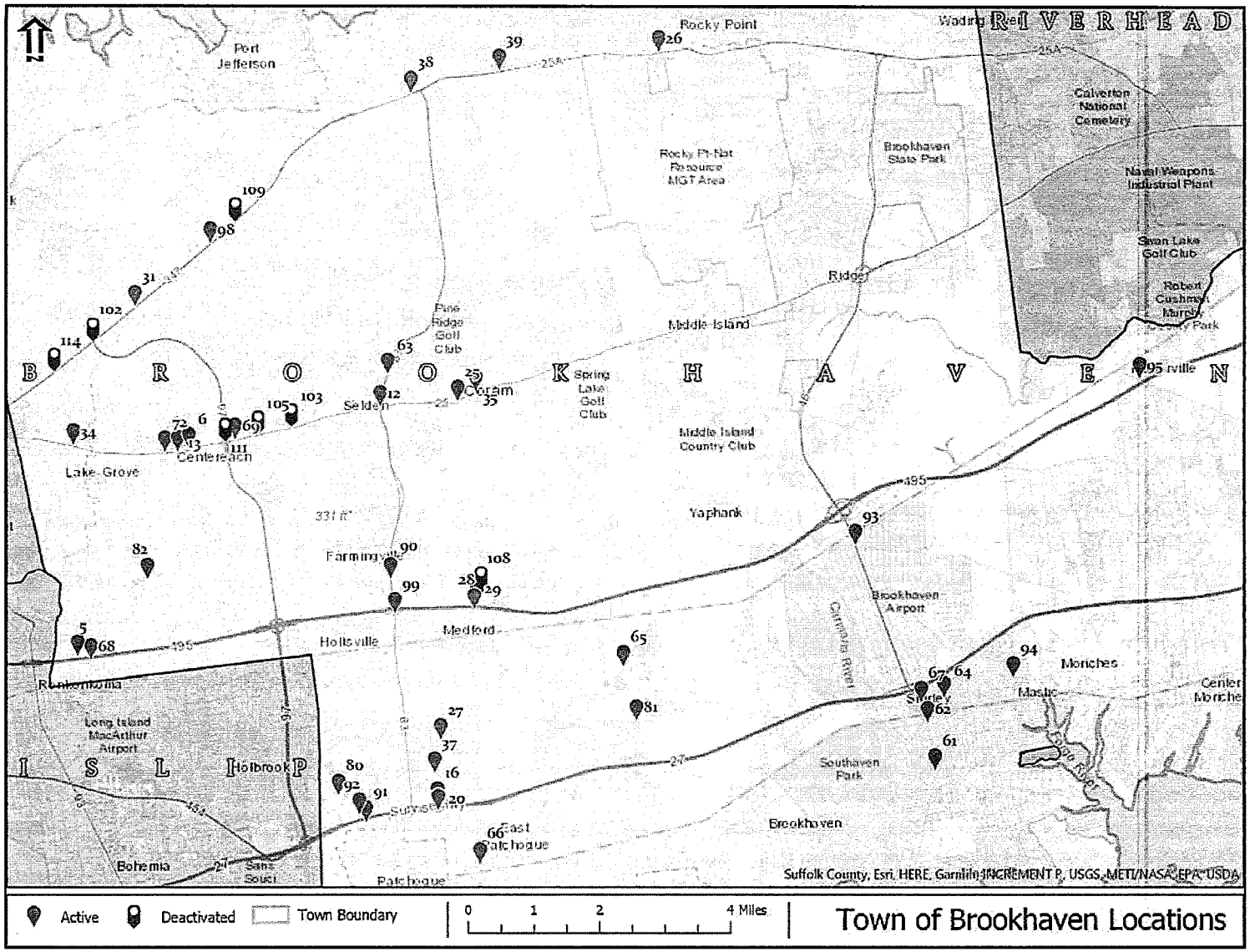


Figure 1-2. Town of Brookhaven RLC Locations

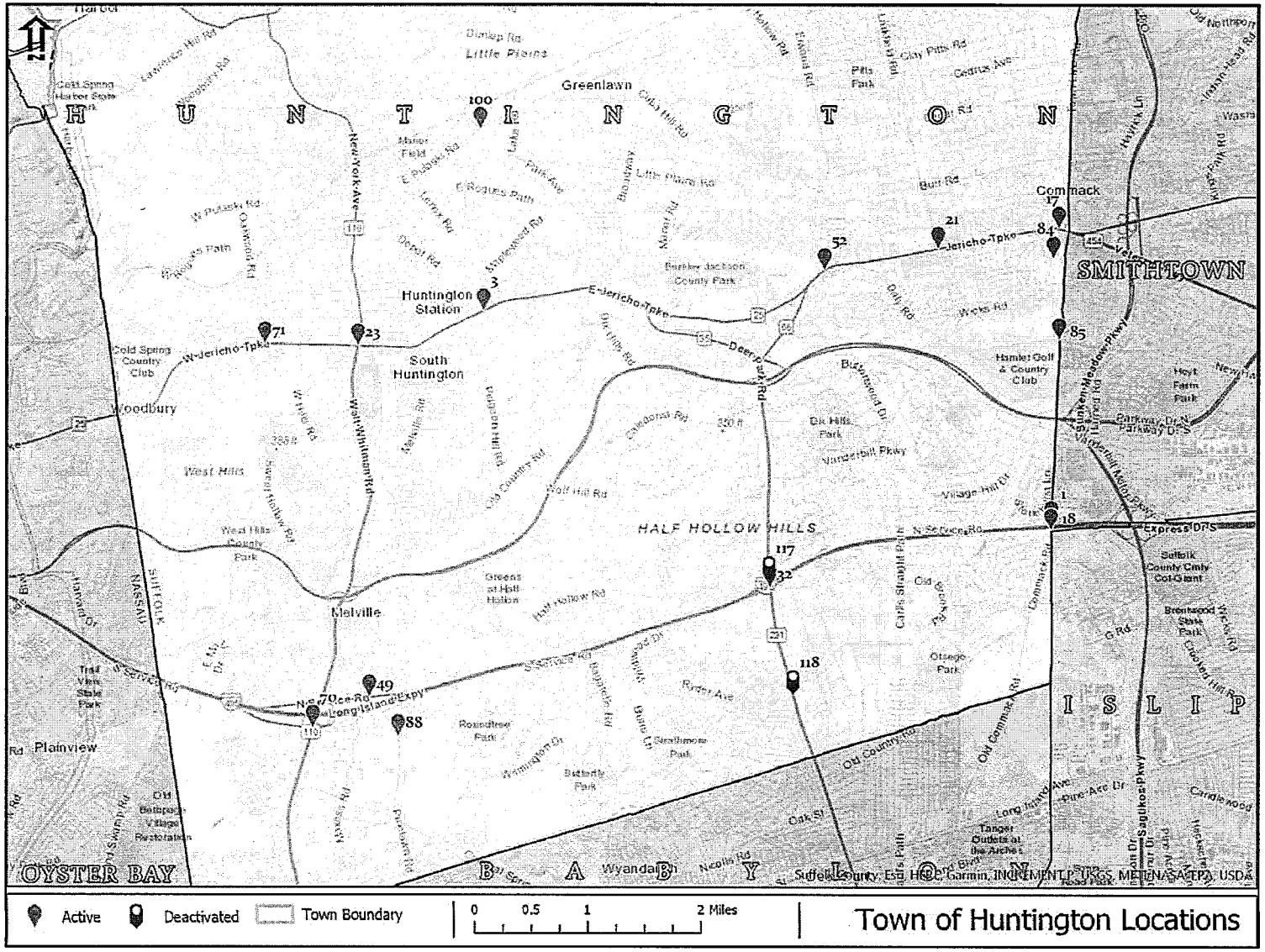


Figure 1-3. Town of Huntington RLC Locations

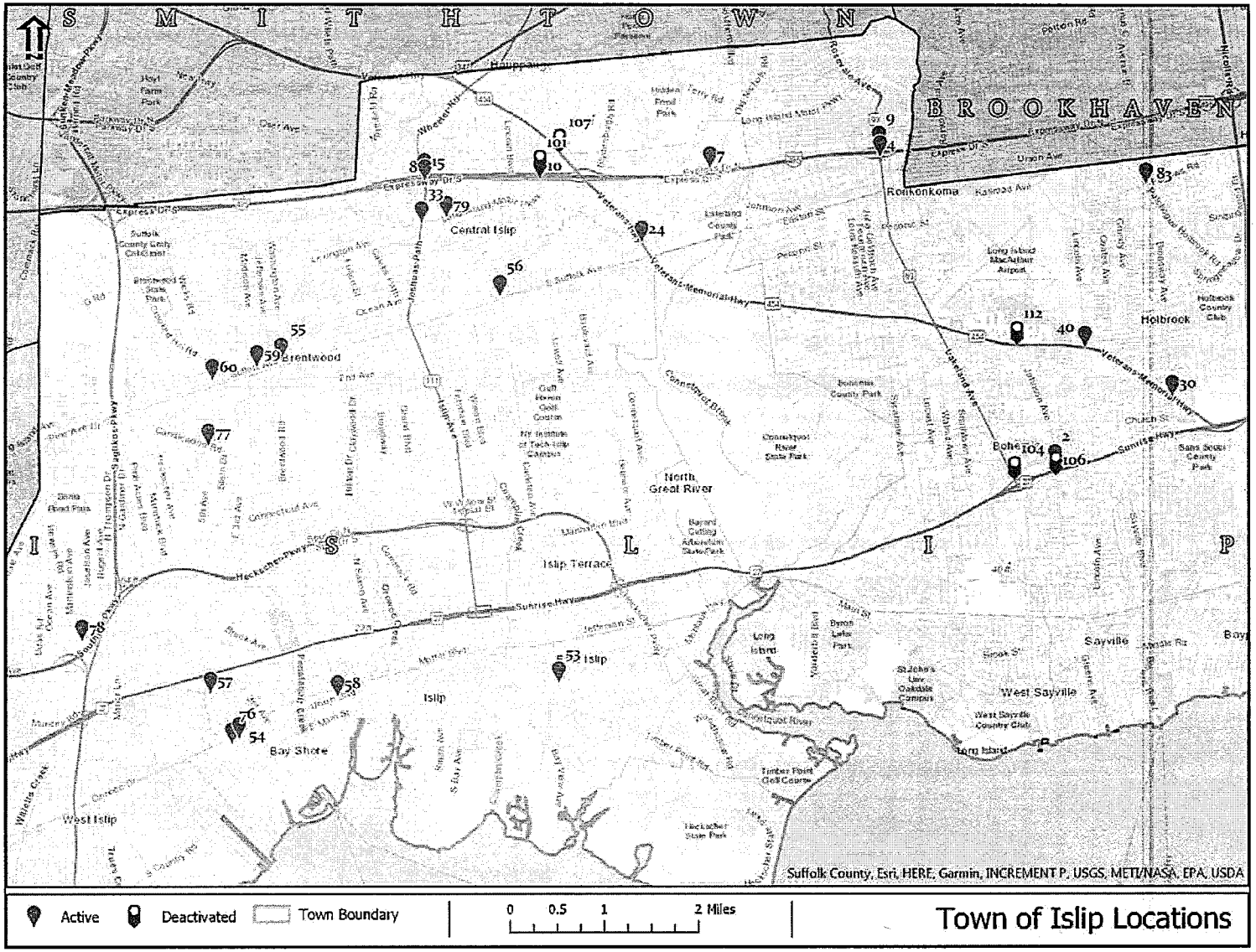


Figure 1-4. Town of Islip RLC Locations

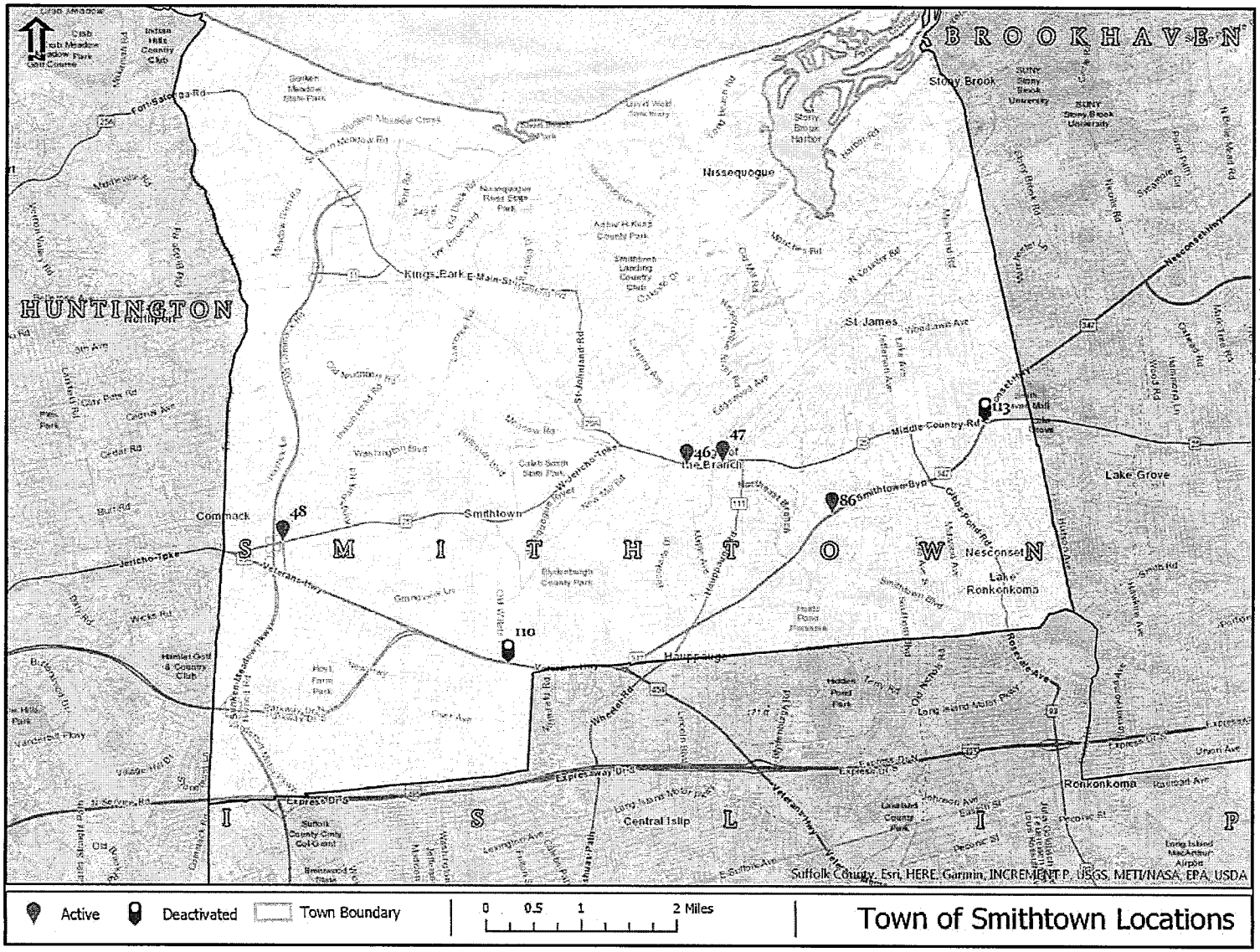


Figure 1-5. Town of Smithtown RLC Locations

1.5 Traffic Signal Plans and Signal Timing Sheets

As previously stated, the purpose of the RLC program is to improve safety conditions at the monitored signalized intersections by reducing red light running, and ideally by extension, the crash types typically associated with that activity. This reduction is intended to change driver behavior through the issuance of citations for violations of the red light ordinances. In order to ensure that the program is not resulting in an inordinate or inappropriate number of red light citations, it is important that the signalized intersections are operating in the intended fashion, and that the signals are providing motorists with conditions that are consistent with driver experience and expectations.

All study intersections are under the jurisdiction of either the Suffolk County Department of Public Works or the New York State Department of Transportation. In order to verify that the traffic signals were operating in the intended manner, and to identify potential underlying conditions that might influence the crash experience, traffic signal design, phasing and timing plans were obtained for each intersection from the relevant jurisdiction (NYSDOT or SCDPW).

In simplest terms, traffic signals are traffic control devices that assign right of way to vehicles, pedestrians and bicyclists entering an intersection of two or more streets on conflicting approaches. Modern traffic signals are controlled by electronic devices that provide green light indications for users with the right of way at a given time, and red indications for all others. The right of way assignment progresses from one group of users on the intersection approaches to the next in an orderly fashion that has been developed by transportation engineering professionals over the course of decades, and is relatively consistent nation and even worldwide. Road users are thus provided with operating conditions that are consistent with their expectations.

SCDPW provided all traffic signal plans and signal timing sheets for the 42 signals under their jurisdiction. For intersections under the jurisdiction of NYSDOT, relevant documents were obtained through Freedom of Information Law (FOIL) requests on behalf of SCDPW submitted to NYSDOT on May 17, 2018 and July 18, 2018. Copies of relevant correspondence with NYSDOT are provided in Appendix B.

The FOIL request was also used to obtain NYSDOT signal timing sheets. The signal plans were reviewed by traffic engineers and used to identify signal phasing and correlated with the traffic signal timing sheets. Note that in a small number of cases, timing plans were not available for NYSDOT signals. Therefore, field observations and review of available aerial photography was utilized to verify existing conditions. In this manner, current prevailing geometric and operational conditions were available for use in the crash review, analyses and investigations described later in this report.

1.6 Verification of Intersection Operating Conditions

Each intersection was visited by study staff, and the geometry, phasing and timing of the signalized intersections were field verified. In addition, at SCDPW locations, the signal timing and phasing was compared to the programmed information provided by SCDPW by accessing the controller cabinet and observing the operation in real time. Where available, copies of current traffic signal plans were obtained for both Active and Deactivated intersections including any available historical plans from the appropriate public agency.

Note that access to controller cabinets was not granted by NYSDOT at locations under their jurisdiction. Therefore, at the NYSDOT locations, field observations were conducted to ensure operations were in conformance with the intent of the signal timing plans provided. In addition, at other locations, a small number of phasing and timing plans were unavailable, so field sketches were prepared for those locations.

Thus, while the precise programmed duration of each interval on the NYSDOT signals could not be verified, and a small number of other locations lacked record plans, this information is not critical to the evaluation of the crash experience, and has no bearing on the study outcome.

Of significant relevance to red light camera enforcement programs the concept of is the expectation that a red indication would follow a yellow indication after a reasonable interval that allowed users ample time to stop outside the intersection before the onset of red, or to clear the intersection before a conflicting approach is assigned a green indication, should the user already have entered the intersection.

These intervals are known as the Yellow Change and Red Clearance intervals. The Yellow Change interval warns users that the assignment of the right of way to their approach is about to end, and the Red Clearance interval (also referred to as the all-red interval) provides a short lag between the end of one assignment and the beginning of the next. Determination of the provision and duration of the intervals is founded in research and analyses by transportation engineering professionals and local officials, while compliance with the right of way assignments, including the change and clearance intervals, has been long codified into local vehicle and traffic laws. For the purposes of this study, the an evaluation of the yellow change and red clearance intervals, including a review of prevailing research regarding these parameters, was conducted, and is provided in Appendix D.

1.7 Crash Data Request

The crash data for the study analysis periods, hereinafter referred to as the Pre-Enforcement, Active Enforcement and Post-Enforcement periods, were analyzed by reviewing crash data supplied by NYSDOT. The process included requesting the crash data for each applicable condition at each of the 100 Active intersections and 18 Deactivated intersections with the process detailed below. Since crashes are random events that naturally fluctuate over time at any given site, it is important that more than one year of data be used for the analysis. Multiple years of data are also preferable to avoid the regression to the mean phenomenon, a statistical phenomenon that describes a situation in which crash rates are artificially high during the before period and would have been reduced even were no other changes made. In the transportation-engineering field, typically a minimum of three years of crash data is used for analysis, and, with the exception of the Active-Enforcement period at Deactivated intersections, the analysis periods chosen for this study included three full years of crash data. At the Deactivated locations, which were among the first intersections to have cameras installed, the Active-enforcement period was defined as the continuous two-year period following installation of the cameras at each individual location. The two-year period was chosen because the installations took place on various dates, and the cameras were subsequently removed and redeployed at other locations, again on various dates. (See Table 1-3 for the camera installation dates for all intersections, and the removal dates at the Deactivated locations). Based on a review of the installation and relocation dates, it can be seen that at only one of these locations were the cameras deployed for a continuous three-year period. Therefore, in order to avoid introducing variables in the analysis data that might influence the outcomes, the two-year period was selected. In this manner the data sets are consistent with one another with respect to the months and seasons included, and month to month and season to season factors that have been shown to influence crash data, including weather, length of daylight and seasonal precipitation is not over or under-represented.

1.7.1 NYSDOT Accident Location Information System (ALIS)

Crash location information and crash statistics are retrieved by the Department of Transportation (DOT) using the Accident Location Information System (ALIS)[1]. The ALIS application uses crash data stored in the Safety Information Management System (SIMS) database in conjunction with location information produced by location coders at the Department of Motor Vehicles (DMV). These applications provide the ability to query all public roads in New York State and can produce both tabular and graphical reports. The application can be queried using data ranges in conjunction with location information and is how the crash data request was structured.

1.7.2 ALIS Data Request and Collection

In New York State, the default definition of an intersection crash is any crash occurring within 10 meters, or approximately 33 feet, of the center point of an intersection. Given the geometry of

[1] https://www.dot.ny.gov/divisions/operating/osss/highway/accident-analysis-toolbox

the intersections included within this study, using the center point of the intersection and including crash data radially within 33 feet from the center point would not be guaranteed to return data on all crashes that might be relevant to this study. Crashes occurring on the approaches of the intersection and outside of the intersection would not be captured in the data such as a rear-end crash occurring 50 feet from the intersection. Crashes occurring outside of the intersection have relevance to this investigation and should be included. For this study, the crash data was requested at 200 feet from the center point of the intersection to fully capture all crashes that occur at the intersection in addition to those that occur in the intersection.

On May 17, 2018, the initial FOIL request to NYSDOT was made under a non-disclosure agreement to request un-redacted MV-104A crash data. Crucial to the data reduction process, the exact manner in which NYSDOT delivered the crash data be identified before requesting data for all intersections. The FOIL included five intersections selected at random as a beta test and requested both the crash event report in MS Excel format and the MV-104A Police Accident Reports.

The NYSDOT response dated, May 25, 2018, included data for each of the five requested intersections. For each intersection, NYSDOT provided two pdf files, one pdf including the years 2007-2009 and one pdf for the years 2014-2017. Both files included the MV-104A police report and if available a MV-104 (DMV's driver-reported crash form). Each intersection was also provided with an MS Excel file for the years 2007-2009 and separate MS Excel file for the years 2014-2017. A subsequent FOIL was made on May 25, 2018 requesting the same crash data for the remaining 113 intersections. The FOIL included tables and maps of each intersection location, a sample of which is shown in Figure 1-6. Section 1.8 discusses the steps taken to reduce and process the crash data received from NYSDOT.

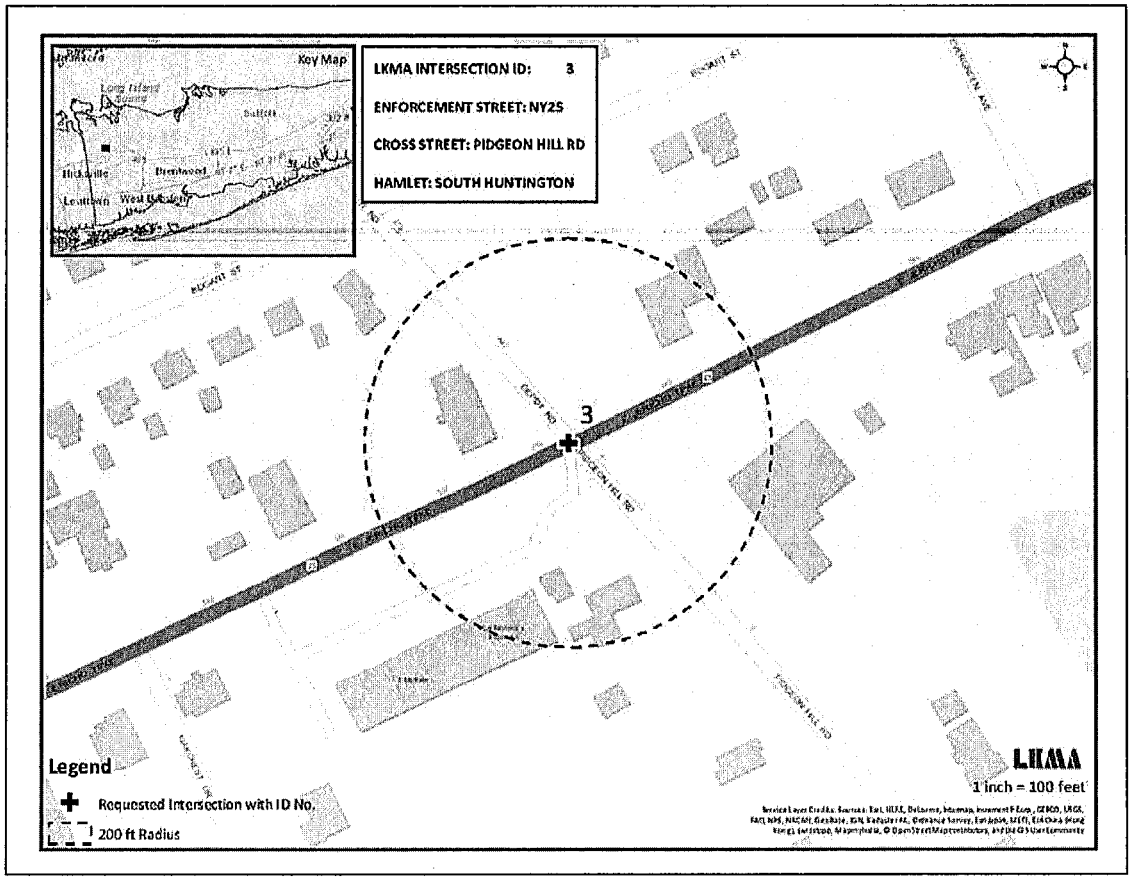


Figure 1-6. Sample Intersection FOIL Map

1.8 Crash Data Processing and Review

The following section gives an in-depth description of the process used to evaluate each MV-104A provided by NYSDOT. Note that MV-104 reports were not utilized in the analysis, since these documents are prepared by members of the public as supplements to the official record. Thus, this study relied on documentation prepared solely by responding police officers. The NYSDOT data was used only to identify the NYSDOT case number and the intersection location. Additionally, during processing, the crash location was verified. Thus, an independent analysis of each crash report was conducted.

1.8.1 Pre-Processing the MV-104A Data

Unlike the previously provided data for the five sample locations, the data provided by NYSDOT for the 113 remaining intersections was provided in single files based on years and intersection activation status and required pre-processing prior to evaluation. NYSDOT provided case numbers for each crash, and included a column with the intersection number associated with each case to identify its associated location. However, the NYSDOT numbering system did not correspond with the intersection numbers provided in the FOIL requests, which necessitated an additional

processing step for project continuity. Toward this end, a list of NYSDOT cases numbers by intersection ID number was generated and used to process the PDF files with the MV-104A crash data. An automated process using the list of NYSDOT Case numbers by intersection was used to extract all pages from the collective PDF into a single discrete PDF for each intersection. The process to generate PDFs was completed for both the Active and Deactivated intersections. Note this did not apply to the five beta intersections as the data had already been separated by NYSDOT. In this manner, it was ensured that all crash data was assigned to the appropriate intersection location without relying exclusively on the results of processing by NYSDOT's ALIS system.

1.8.2 Customized Application

A customized multi-user application (RLC Application) was developed to input the MV-104A crash data. The custom RLC Application included a graphic user interface (GUI) that included a sequenced workflow allowing the reviewer to work through the MV-104A from top to bottom. The application was pre-programmed with dropdowns maintaining consistency within the data parameters entered while minimizing potential keying errors. The RLC Application was programmed to only allow one DOT case number to be entered in once, eliminating duplicate entries. The list generated in Section 1.8.1 was used to prepopulate the RLC Application with the DOT case number by intersection id. The RLC Application grouped all DOT crashes by the intersection id numbers as shown in number Table 1-1 and Table 1-2. All reviewers were assigned a custom login to the RLC Application to prevent any misuse.

1.8.3 Reference Data Creation

Prior to evaluating the crash data, reference data was created to assist the reviewer. Mapping software was used to create the center point of every intersection and a ring extending radially from the center point outwards of 200 feet. The ring determined the study area for each intersection.

Each intersection also included a separate point on each approach indicating its "approach code". These codes were later used to separate those crashes occurring inside the intersection versus those crashes occurring on each of the approaches. The codes used were:

0 - Intersection – Crashes occurring inside the intersection (I)
1 - Northbound approach (NB)
2 - Southbound approach (SB)
3 - Eastbound approach (EB)
4 - Westbound approach (WB)
99 - Unknown – Undetermined (U)

**Note that not all intersections follow a NB/SB/EB/WB pattern. Each intersection was reviewed prior to evaluation and assigned approach number codes as close as possible to the directions listed above.*

1.8.4 Review of Crash Data

Each MV-104A includes the DOT assigned case number printed at the top of the crash report. Each reviewer used the prepopulated DOT case numbers from the RLC Application to locate the DOT case number within the PDF created in Section 1.8.1. Once the case was located within the PDF, the reviewer determined if the crash occurred within the 200 foot study area ring. Using the crash location information such as the coordinates, NYSDOT reference marker or the verbal description, the crash data field "Within Parameters" was marked as "Yes" for being within the study area or "No" if it fell outside the study area. Note that corresponding driver-reported crashes, the MV-104, were not used in the analysis as they are often inconsistent and/or not submitted by the driver.

During the review of the crash data, a reviewer was assigned only one intersection at a time. The reviewer was also instructed to review each intersection's geometry, surrounding street names and the historical aerial imagery for the year of the crash data using Google Earth Pro©. This was done to familiarize themselves with the intersection being reviewed as the crash descriptions and all MV-104A were revaluated. Revaluating the crash code description against the police assigned code resulted in the following actions:

- Included in the RLC Application is a space for the crash description if necessary (see below)
- Crash could be marked for review if necessary by the lead engineer
- Crash description could be indicated as illegible in the case of "10 – Unknown Crashes"

If the crash was determined to be within the study area, the RLC Application was populated the following information from the MV-104A:

Crash Information:

- Crash Date
- Crash Time
- Number of Vehicles
- Number Injured
- Number of Fatalities
- Cost exceeded $1,000

Crash Condition:

- Lighting Condition
- Roadway Surface Condition

Crash Location:

- Road name crash occurred on
- Nearest cross street name (where applicable)
- Distance from nearest cross street (where applicable)
- Cardinal direction from nearest cross street (where applicable)

- Each reviewer assigned the crash an approach code. During the evaluation process, the reviewer used a combination of the description and "Direction of Travel" boxes 23 and 24 from the MV-104A to determine the approach of the crash.

Each reviewer verified or adjusted the crash code based on the description during the reduction process. Table 1-5 provides the crash code types and descriptions used from the MV-104A (2011). All crashes were coded to match Table 1-5.

Table 1-5. Crash Code Description

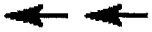
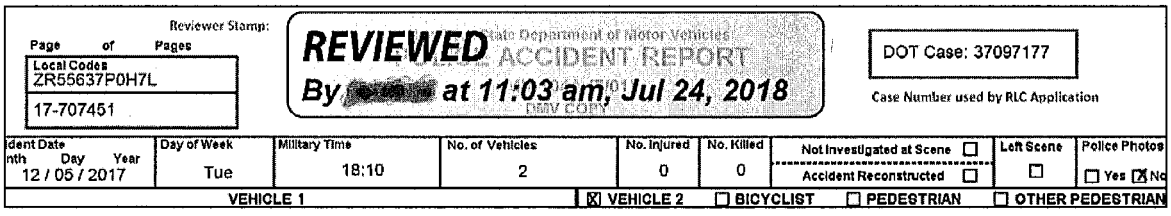
Crash Code	Description	Diagram
Left Turn With	Collision of left turning vehicle into a vehicle in the same travel direction	
Rear End	Front to rear collision on same approach	
Overtaking	Side to side collision on same approach	
Left Turn Opposing	Collision of left turning vehicle into a vehicle in opposing travel directions	
Right Angle	Front to side collision from perpendicular approaches, also known as a T-Bone collision	
Right Turn With	Collision of right turning vehicle into a vehicle in the same travel direction	
Right Turn Opposing	Collision of right turning vehicle into a vehicle in the opposing travel direction	
Head On	Collision of vehicles front to front, usually opposite approaches	
Sideswipe	Collision of vehicles side to side traveling on opposite approaches	
Other	Other description could include multiple vehicles greater than two, pedestrian or bicycle accidents.	**Varies by Officer Sketch**

Table 1-6 provides a description of scenarios encountered during data reduction, and the methodologies by which each scenario was resolved. In this manner, analyses conducted for the purposes of this study were based on a database consistent across all crashes and intersections.

Table 1-6. Data Reduction Scenarios

Scenario	Resolution
Crash location outside of 200 foot study area	Not included in database
Crash occurred in parking lot, but within 200 feet	Not included in database
Crash occurred in a driveway but within 200 feet	Not included in database
NYSDOT provided MV-104, but no MV-104A	Not included in database, not official police report
Crash code and description on the MV-104A didn't match	Crash code revised as appropriate based on parameters available
MV-104A crash data occurred outside of the study time range	Not included in database
Crash occurred within 200 feet on another roadway (typically found at service road intersection pairs, where only one intersection is monitored)	Not included in database
Crash description indicated the crash occurred on the opposite service road	Crash coded to correct intersection based on crash parameters
Crash occurred at another intersection location	Scenario A: If the crash location is included in the study, crash coded to correct intersection based on crash parameters Scenario B: If the location is not included in the study, not included in database

Once the review of the MV-104A was complete, the reviewer indicated that MV-104A as reviewed using the "Stamp" tool in the PDF document. The stamp included the user name, date and time at which the review occurred (as shown below). A detailed tracking list of intersections review status was maintained throughout the review process.



1.8.5 Records Processed

After processing, the crashes that were determined to be relevant to the study were included in subsequent analyses. The total number of records processed into the RLC Application is presented in Table 1-7 along with the total number of crashes.

Table 1-7. Total Records Processed

Provided by NYSDOT	Pages	Records	Within Study Area
Active Intersections			
2007-2009 (Pre-Enforcement)	8,625	4,935	3,515
2014-2017 (Active Enforcement)	13,716	8,729	6,808
100 Intersections Subtotal:	22,341	13,664	10,323
Deactivated Intersections			
2007-2009 (Pre-Enforcement)	6,030	1,175	722
2010-2013 (Active Enforcement)	1,879	1,284	821
2014-2017 (Post-Enforcement)	3,253	2,002	1,499
18 Intersections Subtotal:	11,162	4,461	3,042
Grand Total:	**33,503**	**18,125**	**13,365**

As can be seen, 13,365 total crashes were identified for analysis during the study period at the 118 locations included in the study. All the information described above was input into the database, and processed for use in the analyses conducted to examine the crash experience at each of the study locations for the time periods before cameras were installed (Pre-Enforcement), while the cameras were installed and issuing citations (Active Enforcement) and following removal of cameras to alternate locations (Post-Enforcement). For Active camera locations camera locations, the Pre-Enforcement period included the full calendar years 2007, 2008 and 2009, and the Active Enforcement period included the calendar years 2014, 2015, 2016 and 2017. For Deactivated camera locations, the Pre-Enforcement period included the full calendar years 2007, 2008 and 2009, and the post-enforcement period (following camera removal) included the calendar years 2014, 2015, 2016 and 2017. Note that the red light cameras were not in place at nearly all of the Deactivated locations for any three-year period, and that the dates of installation and removal varied from intersection to intersection. Therefore, the Active Enforcement period for Deactivated intersection locations was chosen for each intersection where the cameras were in operation for a continuous 24-month (2-year) period (See Section 2, Table 2-10). In this manner, analyses conducted for each deactivated intersection location considered a consistent time frame in terms of seasonality, day length, etc.

The following sections provide a comprehensive description of the efforts associated with and the results of these in depth analyses utilizing the methodologies and database discussed above.

Section 2 Crash Data Analyses and Identification of Patterns and Trends

2.1 Introduction

The data obtained from NYSDOT and the processing and analysis tools previously described in Section 1 of this report was used to define the crash experience at the study locations. The gross number of crashes that occurred for all time periods examined in this study has been identified, based on the location and time of occurrence parameters established at the outset of the study and defined in Section 1. The data was disaggregated by intersection and time period to identify the number of crashes by three severity categories, that is, crashes that involved fatalities, crashes that involved personal injury, and crashes that resulted in property damage only, the standard severity definitions utilized in safety analyses in the transportation engineering field. Note that the combined fatal and injury (F/I) number of crashes is used for the purposes of analyses in this study as is typical of studies based on crash statistics, and is therefore also presented in tables in this report. Information on crash type is also provided, based on the ten crash type categories used in police reporting and is identified in Section 1.

This data was utilized to examine the crash experience at the 100 Active camera intersections during the Pre-Enforcement and Active Enforcement periods and at the 18 Deactivated intersection locations during the Pre-Enforcement, Active Enforcement and Post-Enforcement periods. Analyses have been conducted to identify and investigate trends and patterns in the crash experience, including total number of crashes, crash severity, and crash type for each intersection and enforcement period. Investigations were conducted to determine changes in the crash patterns, both program-wide and, where appropriate, on an individual intersection basis, and to investigate whether the changes in patterns can be associated with RLC operations.

Analyses have been performed on the study locations utilizing the data on crashes that was obtained from NYSDOT and processed as described, to identify and investigate trends and patterns in the crash experience, including total number of crashes, crash severity, and crash type for each intersection and enforcement period. Investigations were conducted to determine changes in the trends and patterns, both program-wide and, where appropriate, on an individual intersection basis, and to investigate whether the changes can be associated with RLC operations.

The crash experience at the study intersections prior to the installation of the cameras has also been compared to countywide crash data. The data summaries and comparisons are presented in this section for relevant time periods and conditions. Trends, patterns and the possible relationship between the public safety and the Red Light Camera program are examined and discussed. Complete crash data is provided in Appendix E.

The following sections summarize the results of this effort.

2.2 Active Intersection Locations

2.2.1 Number of Crashes - Pre-Enforcement to Active-Enforcement – 100 Active RLC Intersections

Table 2-1 and Table 2-2 present the number of total crashes for the 100 Active RLC locations during each year for the Pre-Enforcement and Active-Enforcement study periods, respectively, including the annual average number of crashes for each period. As can be seen in Table 2-1, during the Pre-Enforcement period, the annual number of crashes of all kinds increased from 996 crashes in 2007 to 1,292 crashes in 2009, an increase of 296 crashes. This represents an increase of 29.7% over the three-year study period, or 9.9% per year. As shown in Table 2-2, between 2015 and 2017, the number of crashes of all kinds rose from 1,440 to 2,171, an increase of 16.9% per year.

Table 2-1. Total Crashes Annually - Pre-Enforcement Period (2007-2009), 100 Active Intersections

Pre-Enforcement Period				
2007	2008	2009	Total Crashes	Annual Average Number Crashes
996	1,227	1,292	3,515	1171.7

Table 2-2. Total Crashes Annually, Active Enforcement Period (2015-2017), 100 Active Intersections)

Active Enforcement Period				
2015	2016	2017	Total Crashes	Annual Average Number Crashes
1,440	2,001	2,171	5,612	1870.7

Thus, both the number of crashes and rate of growth in crashes at the 100 Active RLC camera locations have increased between 2007 and 2017. The total number of crashes at each intersection from the Pre-Enforcement period (2007-2009) to the Active Enforcement period (2015-2017) is presented in Table 2-3.

Table 2-3. Number of Crashes Pre-Enforcement (2007-2009) to Active Enforcement (2015-2017), 100 Active Intersections

Intersection ID		Pre-Enforcement Period (2007-2009)		Active Enforcement Period (2015 - 2017)	
Int. #	Name	Total No. Crashes	Annual Avg. No. Crashes	Total No. Crashes	Annual Avg. No. Crashes
1	CR 4 (Commack Rd) at I495N	95	31.7	150	50.0
2	CR 112 (Johnson Ave) at NY27N	15	5.0	17	5.7
3	NY25 at Pidgeon Hill Rd	46	15.3	51	17.0
4	CR 93 (Ocean Ave) at I495S	26	8.7	69	23.0
5	Ronkonkoma Ave at I495N	16	5.3	40	13.3
6	NY25 at Eastwood Blvd	53	17.7	66	22.0
7	Old Nichols Rd at I495N	26	8.7	58	19.3
8	NY111 at I495S	28	9.3	72	24.0
9	CR 93 (Ocean Ave) at I495N	22	7.3	37	12.3
10	CR 67 (Motor Pkwy) at I495S (Exit 57)	10	3.3	50	16.7
11	CR 28 (New Hwy) at NY109	62	20.7	68	22.7
12	CR 83 at NY25	72	24.0	136	45.3
13	NY25 at Holbrook Rd	58	19.3	58	19.3
14	NY110 at CR 47 (Great Neck Rd)	55	18.3	86	28.7
15	NY111 at I495N	34	11.3	63	21.0
16	NY112 at NY27N	26	8.7	32	10.7
17	CR 4 (Commack Rd) at NY25	54	18.0	105	35.0
18	I495S at CR 4 (Commack Rd)	58	19.3	107	35.7
19	CR 2 (Straight Path) at NY27	95	31.7	108	36.0
20	NY112 at NY27S	10	3.3	35	11.7
21	NY 25 at Larkfield Rd	49	16.3	73	24.3
22	NY110 at Conklin St	59	19.7	99	33.0
23	NY110 at NY25	59	19.7	59	19.7
24	NY454 at CR 100 (Suffolk Ave)	47	15.7	102	34.0
25	NY25 at NY112	47	15.7	62	20.7
26	NY25A at CR21 (Rocky Pt -Yaphank Rd)	48	16.0	67	22.3
27	NY112 at CR 99 (Woodside Ave)	28	9.3	64	21.3
28	NY112 at I495S	15	5.0	55	18.3
29	NY112 at I495N	13	4.3	40	13.3
30	NY454 at Broadway	31	10.3	34	11.3
31	NY347 at Mark Tree Rd	43	14.3	71	23.7
32	I495S at NY231 (Deer Park Ave)	35	11.7	55	18.3
33	NY111 Joshua's Path at CR67, Motor Pky	36	12.0	48	16.0
34	Hawkins Ave/Stony Brook Rd at NY25	56	18.7	94	31.3
35	Mount Sinai Coram Rd at NY25	48	16.0	80	26.7
36	CR 47, Great Neck Rd at NY 27A	16	5.3	28	9.3
37	NY 112 at Barton Ave	21	7.0	20	6.7
38	NY 25A at Mount Sinai Coram Road	35	11.7	49	16.3
39	Miller Place Rd at NY 25A	86	28.7	104	34.7
40	NY 454 at Lincoln Ave	16	5.3	46	15.3
41	CR 47, Great Neck Rd at CR 2, Dixon Ave	52	17.3	43	14.3
42	CR 28, New Highway at Ralph Ave	14	4.7	10	3.3
43	CR 47, Great Neck Rd at CR 12, Oak St	33	11.0	46	15.3
44	CR 96, Great East Neck Rd at Raynor Ave	10	3.3	8	2.7
45	CR 96, Great East Neck Rd at Arnold Ave	11	3.7	18	6.0
46	NY 25 at Redwood Lane	17	5.7	13	4.3
47	NY 25/25A, E Main Street at Landing Ave	27	9.0	37	12.3
48	CR 14, Indian Head/ Harned Rd at NY 25	43	14.3	111	37.0

Intersection ID		Pre-Enforcement Period (2007-2009)		Active Enforcement Period (2015 - 2017)	
Int. #	Name	Total No. Crashes	Annual Avg. No. Crashes	Total No. Crashes	Annual Avg. No. Crashes
49	CR3, Pinelawn Rd at I-495, Express Dr N	24	8.0	51	17.0
50	NY 231, Deer Park Ave at Nicolls Road	15	5.0	44	14.7
51	NY231, Deer Pk Ave at CR57, Bayshore Rd	44	14.7	74	24.7
52	CR10 Elwood Road at NY25, Jericho Tpke	38	12.7	66	22.0
53	CR 17, Carleton Ave at NY 27A	24	8.0	30	10.0
54	CR 13, Fifth Ave at CR 50, Union Blvd	45	15.0	30	10.0
55	CR 100, Suffolk Ave at Brentwood Road	94	31.3	95	31.7
56	CR17 Carleton Ave at CR 100, Suffolk Ave	51	17.0	95	31.7
57	CR 13, Fifth Ave at CR 57, Bay Shore Rd	48	16.0	48	16.0
58	CR 50, Union Blvd at Brentwood Road	30	10.0	33	11.0
59	CR100 Suffolk Ave at 2nd St/Madison Av	43	14.3	36	12.0
60	CR 13, Fifth Ave at CR 100, Suffolk Ave	67	22.3	99	33.0
61	CR 46, Wm Floyd Pky at Lawrence Rd	32	10.7	55	18.3
62	CR46 William Floyd Pkwy at Surrey Circle	36	12.0	88	29.3
63	CR83 Patchogue-Mt Sinai Rd at Old Town Rd	52	17.3	83	27.7
64	CR 80, Montauk Hwy at Garden Pl	21	7.0	62	20.7
65	CR 101, Patchogue-Yaphank Rd at Station Rd	16	5.3	42	14.0
66	CR 80, Montauk Hwy at Phyllis Dr	22	7.3	28	9.3
67	CR 46, William Floyd Pkwy at CR 80, Montauk Hwy	50	16.7	125	41.7
68	Hawkins Ave at LIE, I-495 Express Dr South	16	5.3	26	8.7
69	NYS 25 at South Coleman Rd	13	4.3	35	11.7
70	NYS 110 at LIE, I-495 Express Dr South	39	13.0	71	23.7
71	CR 92, Oakwood Rd at NYS 25, Jericho	42	14.0	54	18.0
72	NYS 25 at Dawn Dr	37	12.3	36	12.0
73	CR 2, Straight Path at 35th Street	16	5.3	35	11.7
74	CR 96, Great East Neck Rd at Railroad	14	4.7	15	5.0
75	NYS 109 at CR 96, Great East Neck Rd	43	14.3	90	30.0
76	CR 13A, N. Clinton Ave at CR 50, Union Blvd	23	7.7	13	4.3
77	CR 13, Fifth Ave at Candlewood Rd	55	18.3	44	14.7
78	CR 57, Bay Shore Rd at Howells Rd	11	3.7	16	5.3
79	CR 17, Wheeler Rd at CR 67, Motor Parkway	32	10.7	64	21.3
80	CR 19, Waverly Ave at Gateway Plaza	16	5.3	32	10.7
81	CR 99, Woodside Ave at Station Rd	39	13.0	25	8.3
82	CR 16, Portion Rd at Ackerly Ln	17	5.7	20	6.7
83	CR 19, Waverly Ave at Furrows Rd	26	8.7	28	9.3
84	CR 4, Commack Rd at Dorothea St	16	5.3	15	5.0
85	CR 4, Commack Rd at Hauppauge Rd/ New Highway	33	11.0	27	9.0
86	CR 16, Terry Rd at NYS 347	46	15.3	12	4.0
87	CR 2, Straight Path at CR 3, Wellwood Ave	29	9.7	42	14.0
88	CR 3, Pinelawn Rd at Half Hollow Road	5	1.7	16	5.3
89	CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy	16	5.3	41	13.7
90	CR 83, North Ocean Ave at CR 16, Horseblock Rd	46	15.3	122	40.7
91	CR 19, Waverly Ave at NYS 27, SSR	18	6.0	60	20.0
92	CR 19, Waverly Ave at NYS 27, NSR	24	8.0	43	14.3
93	CR 46, William Floyd Pkwy at Moriches Middle Island Rd	61	20.3	113	37.7
94	CR 80, Montauk Hwy at Washington Ave/ Herkimer St	13	4.3	25	8.3
95	CR 111, Port Jeff-West Hampton Road at I-495 NSR	2	0.7	11	3.7
96	NY 109 at CR 2, Straight Path	53	17.7	86	28.7
97	NY 27A at CR 96, Great East Neck Rd/Bergen Ave	26	8.7	42	14.0
98	NY 347 at Arrowhead Ln	31	10.3	65	21.7

Intersection ID		Pre-Enforcement Period (2007-2009)		Active Enforcement Period (2015 - 2017)	
Int. #	Name	Total No. Crashes	Annual Avg. No. Crashes	Total No. Crashes	Annual Avg. No. Crashes
99	CR 83, North Ocean Ave at I-495, Express Drive South	27	9.0	96	32.0
100	CR 35, Park Avenue at CR 11, Pulaski Road	26	8.7	64	21.3
	All Active Intersections Total :	**3,515**	**1,171.7**	**5,612**	**1,870.7**

2.2.2 Projected Crashes Based On County-Wide Crash Rates

In order to evaluate the impact of the RLCs and to provide a more accurate evaluation, it was necessary to calculate the projected number of crashes that would have occurred at the 100 Active intersections if the intersections where red light cameras were installed followed the Countywide increase in crashes. Toward this end, growth rates were developed to estimate the number of crashes that would be expected during the Active-Enforcement period (2015-2017). The growth rates were determined using information obtained from the NYSDOT ALIS information on the actual number of total crashes in Suffolk County at signalized intersections from 2007-2017. To minimize the impact of the statistical regression to the mean, the three-year average number of crashes for each analysis period was used to form the basis of the projections. The NYSDOT data indicates that the total number of reportable crashes in Suffolk County at signalized intersections of all types rose from an average of 6,757 from 2007 to 2009 to an average of 7,574 from 2015 to 2017, an increase over the nine-year period of 12.1%. These projected growth rates formed the basis for comparison between the two study periods. The following sections discuss the results of these comparisons.

2.2.3 Crash Severity Analysis for the Active-Enforcement Period (2015 - 2017) – 100 Active RLC Intersections

Table 2-4 presents the number of crashes by severity that occurred during the Pre-Enforcement study period at the 100 Active RLC locations. Also presented in the annual average number of crashes for the study period. As is typical of studies based on crash statistics the combined fatal and injury (F/I) number of crashes is used for the purposes of analyses in this study. Also provided in Table 2-4 is the number of crashes projected. Projected crashes are calculated by applying the 12.1% growth rate previously calculated to the Pre-Enforcement period crash numbers. As can be seen, 3,940 crashes are projected for the Active-Enforcement period (2015 – 2017).

Table 2-4. Crash Severity Projection, Pre-Enforcement Period (2007 – 2009) Actual Crashes to Active-Enforcement Period (2015-2017) Projected Crashes*, 100 Active Intersections

Crash Severity	Actual Crashes Pre-Enforcement Period (2007-2009)		Projected* Crashes Active-Enforcement Period (2015-2017)	
	Actual No. of Crashes	Annual Avg. No. of Crashes	Projected No. of Crashes	Projected Annual Avg. No. of Crashes
Fatal	17	5.7	19	6.4
Injury	1,387	462.3	1,555	518.3
Combined Fatal + Injury	1,404	468.0	1,574	524.6
PDO	2,111	703.7	2,366	788.7
Total Crashes	**3,515**	**1,171.7**	**3,940**	**1,313.3**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

For the purposes of comparison, Table 2-5 presents the actual number of crashes by severity that actually occurred at the Active intersections during the Active-Enforcement period (2015 to 2017) and compares this to the projected number of crashes calculated above.

Table 2-5. Comparison of Crashes by Crash Severity, Active-Enforcement Period (2015-2017) Projected Crashes* to Active – Enforcement (2015 – 2017) Actual Crashes, 100 Active Intersections

Crash Severity	Projected* Crashes Active-Enforcement Period (2015-2017)		Actual Crashes Active-Enforcement Period (2015-2017)		Difference - Actual to Projected Crashes		
	Projected No. of Crashes	Projected Annual Avg. No. of Crashes	Actual No. of Crashes	Annual Avg. No. of Crashes	No. of Crashes	Annual Avg. No. Crashes	Percent Change
Fatal	19	6.4	17	5.7	-2	-0.7	-10.5%
Injury	1,555	518.3	1,386	462.0	-169	-56.3	-10.9%
Combined Fatal + Injury	1,574	524.6	1,403	467.7	-171	-57.0	-10.9%
PDO	2,366	788.7	4,209	1,403.0	1,842	614.0	77.8%
Total Crashes	**3,940**	**1,313.3**	**5,612**	**1,870.67**	**1,671**	**557.0**	**42.4%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

As can be seen, the actual total number of crashes for the 100 Active intersections during the Active-Enforcement period (2015-2017) was higher than the projected number by 1,671 crashes. However, the number of crashes that involved injury or fatality was 171 fewer than projected, or 57.0 fewer F/I crashes per year. Thus, a trend was identified wherein the total number of crashes increased but the number of fatal and injury crashes decreased at the 100 Active intersections, which matches trends in many of the studies at other RLC programs reviewed for the purposes of this effort as previously discussed in this report.

2.2.4 Crash Type Analysis for the Active-Enforcement Period (2015-2017) – 100 Active RLC Intersections

In similar fashion, Table 2-6 presents the number of crashes by crash type that occurred during the Pre-Enforcement period (2007-2009) at the 100 Active RLC locations, based on the previously defined crash types. Also provided is the projected number of crashes by crash type calculated using the 12.1% growth rate. As previously discussed and as is common at signalized intersections, rear end and overtaking crashes are the most frequently occurring crash types, followed by left turn and right angle crashes. The projected crashes for Active-Enforcement period (2015 -2017) show that rear end and overtaking crashes should represent 50.5% of total crashes, and left turn and right angle crashes should represent 36.2% of total crashes, at the 100 Active intersection locations.

Table 2-6. Crash Type Projection, Pre-Enforcement Period (2007 – 2009) Actual Crashes to Active-Enforcement Period (2015-2017) Projected Crashes*, 100 Active Intersections

Location	Crash Type	Actual Crashes Pre-Enforcement Period (2007 – 2009)		Projected* Crashes Active-Enforcement Period (2015-2017)	
		Actual No. of Crashes	Annual Avg. No. of Crashes	Projected No. of Crashes	Annual Avg. No. of Crashes
All Active Intersections	LEFT TURN WITH	79	26.3	89	29.7
	REAR END	1,296	432.9	1,453	484.3
	OVERTAKING	478	159.3	536	178.7
	LEFT TURN OPPOSING	722	240.7	809	269.7
	RIGHT ANGLE	470	156.7	527	175.7
	RIGHT TURN WITH	136	45.3	152	50.7
	RIGHT TURN OPPOSING	36	12.0	40	13.3
	HEAD ON	15	5.0	17	5.7
	SIDESWIPE	32	10.7	36	12.0
	OTHER	159	53.0	178	59.3
	PEDESTRIAN	49	16.3	55	18.3
	BICYCLE	43	14.3	48	16.0
All Active Intersections Total		**3,515**	**1,171.7**	**3,940**	**1,313.3**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Table 2-7. Comparison of Crashes by Crash Type, Active- Enforcement Period (2015 – 2017) Projected Crashes* to Active-Enforcement (2015-2017) Actual Crashes, 100 Active Intersections

Location	Crash Type	Projected* Crashes Active-Enforcement Period (2015-2017)		Actual Crashes Active-Enforcement Period (2015-2017)		Difference - Actual to Projected Crashes		
		Projected No. of Crashes	Projected Average Annual No. of Crashes	No. of Crashes	Annual Avg. No. of Crashes	No. of Crashes	Annual Avg. No. of Crashes	Percent Difference
All Active Intersections	LEFT TURN WITH	89	29.7	95	31.7	6	2.0	6.7%
	REAR END	1453	484.3	2,702	900.7	1249	416.3	46.2%
	OVERTAKING	536	178.7	1,175	391.7	639	213.0	54.4%
	LEFT TURN OPPOSING	809	269.7	691	230.3	-118	-39.3	-17.1%
	RIGHT ANGLE	527	175.7	337	112.3	-190	-63.3	-56.4%
	RIGHT TURN WITH	152	50.7	144	48.0	-8	-2.7	-5.6%
	RIGHT TURN OPPOSING	40	13.3	58	19.3	18	6.0	31.0%
	HEAD ON	17	5.7	20	6.7	3	1.0	15.0%
	SIDESWIPE	36	12.0	45	15.0	9	3.0	20.0%
	OTHER	178	59.3	242	80.7	64	21.3	26.4%
	PEDESTRIAN	55	18.3	50	16.7	-5	-1.7	-10.0%
	BICYCLE	48	16.0	53	17.7	5	1.7	9.4%
All Active Intersections Total		**3,940**	**1,313.3**	**5,612**	**1,870.7**	**1,672**	**557.3**	**29.8%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Again, for the purposes of comparison, Table 2-7 presents the actual number of crashes by crash type that occurred at the 100 Active intersections during the Active-Enforcement period (2015-2017). As can be seen, rear end and overtaking crashes represented 69.1% of total crashes, and left turn and right angle crashes represent 20.0% of total crashes at the 100 Active intersection locations. An average of 100.7 fewer right angle and left turn crashes were recorded annually (37.3 fewer left turn and 63.3 right angle crashes and 629.3 more rear end and overtaking crashes per year occurred than projected using countywide rates (416.3 more rear end crashes and 213.0 more overtaking crashes).

Thus, the number of crashes generally considered to result in higher number of fatalities and injuries was lower than projected during Active-Enforcement period (2015-2017), and the number of crashes generally considered to result in fewer fatalities and injuries was higher than projected. This is in keeping with the trend identified in Section 2.2.3 and with those at other RLC programs discussed earlier in this report.

2.2.5 Crash Cost Comparison Pre-Enforcement to Active-Enforcement – Active RLC Intersections

Utilizing NYSDOT's Safety Benefits Evaluation Procedure, crash costs were determined for the Active-Enforcement period (2015-2017). The procedure is a standard NYSDOT safety benefit calculation utilized in cost benefit analyses when evaluating projects for potential implementation. The methodology seeks to assign a dollar cost value to the change in crash experience due to the implementation of proposed crash reduction measures. In this manner, a dollar cost basis of comparison can be developed for each proposed improvement. Toward this end, costs were computed for the Active-Enforcement period (2015 – 2017) projected crashes using the Countywide accident growth of 12.1%, calculated based on the average crash costs in NYSDOT's Safety Information Management System. The NYSDOT cost per crash are estimates of the societal costs calculated based on methodologies developed by the National Highway Traffic Safety Administration. These methodologies consider productivity losses, property damage, medical costs, rehabilitation costs, congestion costs, legal and court costs, emergency services such as medical, police, and fire services, insurance administration costs, and the costs to employers. They are widely used by agencies, although input parameters vary from region to region. The values used in this study are those provided by NYSDOT for use in projects in New York State.

This represents the crash costs had the number of crashes by crash type grown at the same rate as the Countywide rate at signalized intersections. A comparison of these crash costs to the actual Active Enforcement crash data was then made. The results, provided Table 2-8, indicate an annual crash cost benefit of $5.14 Million. This benefit is reflective of the fact that while the total number of crashes increased significantly, the number of injury crashes essentially remained constant; therefore, the increase in crashes was entirely related to an increase in property damage crashes. Since property damage crashes have a significantly lower crash cost than injury crashes, the annual crash cost for the Active Enforcement Period was significantly lower than that for the Pre-Enforcement Period. Were this to be utilized in a cost-benefit comparison, costs for the RLC system would include installation and maintenance, while benefits would include the societal crash cost benefit as well as the possibly the revenue generated through enforcement.

Table 2-8. Crash Cost Benefit – 100 Active Intersections

Crash Condition	Crash Cost 2015-2017	Annual Average Crash Cost
Projected Crashes*	$217,254,700	$72,418,000
Actual	$201,846,000	$67,282,000
	Annual Benefit	**$5,136,000**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

2.2.6 Summary and Conclusions of Crash Analysis for the 100 Active RLC Intersections

Based on the forgoing analysis and investigations, the following can be concluded regarding the crash experience at the 100 Active RLC locations from the Pre-Enforcement period (2007-2009) to the Active-Enforcement periods (2015-2017):

1. **Both the number of crashes and rate of growth in crashes at the 100 Active RLC camera locations increased between the Pre-Enforcement (2007-2009) and the Active-Enforcement (2015-2017) study periods.**
2. **The total number of crashes during Active-Enforcement period (2015-2017) exceeds the projected number of crashes for the period based on Countywide growth rates of 12.1%. There were 1,671 more crashes than projected.**
3. **The actual number of crashes that involved a combination of injury and fatality was 171 fewer than projected, or an annual average of 57.0 per year during the Active-Enforcement period (2015-2017).**
4. **The actual number of right angle and left turn crashes, which are generally considered to result in higher number of fatalities and injuries, was lower than projected in the Active-Enforcement period (2015-2017).**
5. **These results have identified the following trends:**
    a. **There has been an overall increase in the number of crashes, but more importantly there has been a reduction in fatalities and injuries.**
    b. **There has been a reduction in the crash types associated with red-light running and higher severity results, these types being right angle and left turn crashes, which correlates with the reduction in fatalities and injuries.**
    c. **These trends are in keeping with those identified in studies at many other RLC programs.**
6. **The reduction in actual F/I crashes compared to projected crashes during the Active–Enforcement period (2015-2017) has resulted in a crash cost benefit which is sufficient to offset the cost of the increased number of overall crashes.**

2.3 18 Deactivated Intersection Locations

At the 18 intersections identified as Deactivated Red Light Camera locations for this study, the Pre-Enforcement period is defined the same as that for the 100 Active intersection locations, that is, the three-year period prior to the installation of any red light cameras at any locations in Suffolk County, and includes calendar years 2007 through 2009. Table 2-9 presents the crash experience at these 18 intersection locations. As with the 100 Active intersection locations discussed previously, the number of crashes of all types that were included in the study data base is presented for each intersection for each year during that time period. The total number of crashes of all types that occurred during the full three-year analysis period is also presented.

Table 2-9. Pre-Enforcement Period (2007-2009) Total Crashes by Intersection – 18 Deactivated Intersections, All Crash Types

Intersection ID		Pre-Enforcement Period			Pre-Enforcement Total (2007-2009)
Int. #	Name	2007	2008	2009	Total No. Crashes
101	CR 67 (Motor Parkway) at I495N (Exit 57)	5	1	1	7
102	CR 97 (Nicholls Rd) at NY347	27	33	34	94
103	NY25 at Boyle Rd	17	27	20	64
104	CR 93 (Lakeland) at NY27S NSR	3	2	12	17
105	NY25 at Marshall Dr/Paula Blvd	12	15	21	48
106	CR 112 (Johnson Ave) at NY27S	1	1	1	3
107	NY454 at CR 67 (Motor Pkwy)	9	12	13	34
108	NY112 at CR 16 (Horseblock Rd)	19	24	29	72
109	NY347 at Old Town Rd	18	15	19	52
110	NY454 at Old Willets Path	8	12	11	31
111	NY25 at CR 97 (Nicholls Rd)	11	38	35	84
112	NY454 at CR 112 (Johnson Ave)	12	14	13	39
113	NY347 at NY25	7	19	18	44
114	NY347 at Stonybrook Rd	24	15	20	59
115	NY27 at N. Delaware Ave	1	9	3	13
116	NY27 at N. Monroe Ave	1	10	12	23
117	NY231 (Deer Park Ave) at I495N	6	17	10	33
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	1	2	2	5
All Deactivated Intersections Total:		**182**	**266**	**274**	**722**

2.3.1 Total Crashes – Active-Enforcement Period

At the 18 intersection locations identified as Deactivated Red Light Camera locations for this study, the Active-enforcement period is defined differently than that for the 100 Active intersection locations. These locations were among the first intersections to have cameras installed, and the installations took place on various dates. The cameras at all of these locations were subsequently removed and redeployed at other locations, again on various dates, and the new locations are now among the 100 Active intersection locations previously described. (See Table 1-3 for the camera installation dates for all intersections, and the removal dates at the Deactivated locations). Based on a review of the installation and relocation dates, it can be seen that at only one of these locations were the cameras deployed for a continuous three-year period. Therefore, in order to avoid introducing variables in the analysis data that might influence the outcomes, the Active-enforcement period for these locations was defined as the continuous two-year period following installation of the cameras at each individual location. In this manner the data sets are consistent with one another with respect to the months and seasons included, and month to month and season to season factors that have been shown to influence crash data, including weather, length of daylight and seasonal precipitation is not over or under-represented. Table 2-10 presents the two-year Active-enforcement time periods for the Deactivated intersection locations.

Table 2-10. Active Enforcement - 24-month period between 2010 and 2013 – Deactivated Intersections

Int. #	Active Enforcement Time Period	
	Start of	End of
101	November 2010	October 2012
102	December 2010	November 2012
103	January 2011	December 2012
104	April 2011	March 2013
105	January 2011	December 2012
106	November 2010	October 2012
107	September 2010	August 2012
108	March 2011	February 2013
109	February 2011	January 2013
110	April 2011	March 2013
111	May 2011	April 2013
112	February 2011	January 2013
113	January 2011	December 2012
114	February 2011	January 2013
115	May 2011	April 2013
116	May 2011	April 2013
117	April 2011	March 2013
118	April 2011	March 2013

Based on the dates in Table 2-10, Table 2-11 presents the crash experience at these 18 intersection locations for the Active-Enforcement period. The number of crashes of all types that were included in the study data base is presented for each intersection for each year during that time period, along with the total number of crashes of all types that occurred during the full two-year analysis period.

Table 2-11. Active Enforcement 24-Month Period (2010-2013) Total Crashes by Intersection – 18 Deactivated Intersections, All Crash Types

Intersection ID		Active-Enforcement Period (2010-2013) *(Note 1)*			
Int. No.	**Name**	**Year 1**	**Year 2**	**Total No. Crashes**	**Annual Average No. Crashes**
101	CR 67 (Motor Parkway) at I495N (Exit 57)	2	1	3	1.5
102	CR 97 (Nicholls Rd) at NY347	35	40	75	37.5
103	NY25 at Boyle Rd	15	13	28	14
104	CR 93 (Lakeland) at NY27S NSR	4	3	7	3.5
105	NY25 at Marshall Dr/Paula Blvd	18	7	25	12.5
106	CR 112 (Johnson Ave) at NY27S	0	0	0	0
107	NY454 at CR 67 (Motor Pkwy)	4	22	26	13
108	NY112 at CR 16 (Horseblock Rd)	29	27	56	28
109	NY347 at Old Town Rd	26	17	43	21.5
110	NY454 at Old Willets Path	7	12	19	9.5
111	NY25 at CR 97 (Nicholls Rd)	17	14	31	15.5
112	NY454 at CR 112 (Johnson Ave)	10	9	19	9.5
113	NY347 at NY25	5	15	20	10
114	NY347 at Stonybrook Rd	35	21	56	28
115	NY27 at N. Delaware Ave	15	11	26	13
116	NY27 at N. Monroe Ave	5	10	15	7.5
117	NY231 (Deer Park Ave) at I495N	14	17	31	15.5
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	4	1	5	2.5
All Deactivated Intersections Total:		**245**	**240**	**485**	**242.5**

Note 1: Includes crashes for continuous 24 month period between 2010 and 2013 at each intersection when enforcement was active. Exact period varies by intersection (see Table 2-10).

2.3.2 Total Crashes - Comparison of Pre-Enforcement Period (2007-2009) to Active-Enforcement 24-Month Period (2010-2013)

Table 2-12 provides a comparison of the total crash experience at the 18 Deactivated RLC locations between the Pre-Enforcement period (2007 - 2009) and Active-Enforcement period (continuous 24 month period between 2010 and 2013) periods. The annual average number of crashes for each intersection is presented. The change (increase or decrease) in the annual average number of crashes of all types is also presented for each intersection. Only the annual average is presented because, at these 18 Deactivated intersection locations, the Active-Enforcement period is only two years, while the Pre-Enforcement and Post-Enforcement periods were each three years in duration. Therefore, the relevant parameter in using this data for analyses purposes is the average number of crashes, as opposed to the total number of crashes

As can be seen in Table 2-12, the average annual number of crashes remained relatively constant between the Pre-Enforcement period (2007-2009) and the 24-month Active-Enforcement period (2010-2013), increasing by less than 2.0 crashes per year across all 18 intersections. Ten (10) of the intersections show a decrease between the two periods, and the remaining 8 intersections showed an increase between the two time periods.

Once again, all data was cross checked to ensure proper coding and no anomalies were detected in the database. Therefore, the information in the tables accurately reflects the number of crashes for which data was provided by NYSDOT for each location and time period analyzed.

Table 2-12. Pre-Enforcement Period (2007-2009) to Active-Enforcement Period (2010-2013) Comparison of Total Crashes by Intersection – 18 Deactivated Intersections, All Crash Types

Intersection ID		Pre-Enforcement Period (2007 - 2009)	Active-Enforcement Period (24 Months) (2010 -2013) *(Note 1)*	Change in Crash Experience From Pre-Enforcement to Active-Enforcement Periods
Int. No.	Name	Annual Average No. of Crashes	Annual Average No. of Crashes	Annual Average No. of Crashes
101	CR 67 (Motor Parkway) at I495N (Exit 57)	2.3	1.5	-0.8
102	CR 97 (Nicholls Rd) at NY347	31.3	37.5	6.2
103	NY25 at Boyle Rd	21.3	14.0	-7.3
104	CR 93 (Lakeland) at NY27S NSR	5.7	3.5	-2.2
105	NY25 at Marshall Dr/Paula Blvd	16.0	12.5	-3.5
106	CR 112 (Johnson Ave) at NY27S	1.0	0.0	-1.0
107	NY454 at CR 67 (Motor Pkwy)	11.3	13.0	1.7
108	NY112 at CR 16 (Horseblock Rd)	24.0	28.0	4.0
109	NY347 at Old Town Rd	17.3	21.5	4.2
110	NY454 at Old Willets Path	10.3	9.5	-0.8
111	NY25 at CR 97 (Nicholls Rd)	28.0	15.5	-12.5
112	NY454 at CR 112 (Johnson Ave)	13.0	9.5	-3.5
113	NY347 at NY25	14.7	10.0	-4.7
114	NY347 at Stonybrook Rd	19.7	28.0	8.3
115	NY27 at N. Delaware Ave	4.3	13.0	8.7
116	NY27 at N. Monroe Ave	7.7	7.5	-0.2
117	NY231 (Deer Park Ave) at I495N	11.0	15.5	4.5
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	1.7	2.5	0.8
All Deactivated Intersections Total:		**240.7**	**242.5**	**1.8**

Note 1: Includes crashes for continuous 24 month period between 2010 and 2013 at each intersection when enforcement was active. Exact period varies by intersection (see Table 2-10)

2.3.3 Total Crashes – Post-Enforcement Period (2015-2017)

At the 18 Deactivated Red Light Camera locations for this study, the Post-Enforcement period is defined as the three year period of calendar years 2015 through 2017. All red light cameras had been removed at these locations for several years by this time. Table 2-13 presents the crash experience at these 18 intersection locations. The number of crashes of all types that were included in the study data base is presented for each intersection for each year during that time period. The total number of crashes of all types that occurred during the full three-year analysis period is also presented.

Table 2-13. Post-Enforcement Period (2015-2017) Total Crashes by Intersection, 18 Deactivated Intersections, All Crash Types

Intersection ID		Post-Enforcement Year			Post-Enforcement Total	
Int. #	Name	2015	2016	2017	Total No. Crashes	Annual Average No. Crashes
101	CR 67 (Motor Parkway) at I495N (Exit 57)	21	25	20	66	22.0
102	CR 97 (Nicholls Rd) at NY347	60	63	63	186	62.0
103	NY25 at Boyle Rd	19	24	22	65	21.7
104	CR 93 (Lakeland) at NY27S NSR	2	16	17	35	11.7
105	NY25 at Marshall Dr/Paula Blvd	13	27	18	58	19.3
106	CR 112 (Johnson Ave) at NY27S	2	0	2	4	1.3
107	NY454 at CR 67 (Motor Pkwy)	10	18	23	51	17.0
108	NY112 at CR 16 (Horseblock Rd)	31	56	43	130	43.3
109	NY347 at Old Town Rd	40	34	34	108	36.0
110	NY454 at Old Willets Path	16	16	37	69	23.0
111	NY25 at CR 97 (Nicholls Rd)	17	17	16	50	16.7
112	NY454 at CR 112 (Johnson Ave)	13	25	22	60	20.0
113	NY347 at NY25	18	24	24	66	22.0
114	NY347 at Stonybrook Rd	27	19	37	83	27.7
115	NY27 at N. Delaware Ave	6	10	34	50	16.7
116	NY27 at N. Monroe Ave	12	11	21	44	14.7
117	NY231 (Deer Park Ave) at I495N	22	34	24	80	26.7
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	10	13	11	34	11.3
All Deactivated Intersections Total:		**339**	**432**	**468**	**1,239.0**	**413.1**

2.3.4 Projected Crashes Based on Countywide Crash Rates

As at the 100 Active RLC locations, analyses have been conducted at these eighteen (18) intersections. In addition, two comparisons following the relocation of the cameras have also been analyzed. Both are referred to as the Post-Enforcement period. For the purposes of these analyses, and similar to the analysis conducted for the 100 Active intersection locations, growth rates were calculated in order to project the crash numbers expected during the periods analyzed. The growth rates were determined using information obtained from the NYSDOT ALIS information on the actual number of total crashes in Suffolk County at signalized intersections from 2007-2017. These growth rates will be used to calculate the projected crash numbers for the 24-month Active-Enforcement period (2010-2013) and the Post-Enforcement period of three years for 2015 to 2017.

The NYSDOT data indicates that the total number of reportable crashes in Suffolk County at signalized intersections of all types rose from an average of 6,757 from 2007 to 2009 to an average of 6,912 from 2010 to 2013, an increase of 2.3%. Thus, this growth rate was used to project crashes for the Active-Enforcement (2010-2013) period.

Similarly, from the Active-Enforcement (2010-2013) to Post-Enforcement (2015-2017) periods, countywide crashes increased from an average of 6,912 per year to an average of 7,574 per year, an increase of 9.6%. This growth rate is used to project crashes for the Post-Enforcement (2015-2017) period and examine what happened after the cameras were removed.

Finally, the previously discussed growth rate of 12.1% was utilized to project crashes from the actual Pre-Enforcement period (2007-2009) to the projected Post-Enforcement period (2015-2017) at the 18 Deactivated intersections.

2.3.5 Total Crashes Pre-Enforcement Period (2007-2009) to Post-Enforcement Period (2015-2017) – 18 Deactivated RLC Intersections

Table 2-14 presents the number of total crashes for the 18 Deactivated intersection locations during each year for the Pre-Enforcement, Active-Enforcement and Post-Enforcement study periods. Note that as explained previously the Active-Enforcement period examined at these locations included only two (2) years crash data, while all other study periods were three years long. Therefore, for the purposes of this section of the study, comparisons will consider only the annual average number of crashes, as opposed to the total number of crashes. In this manner, the reduced duration of the Active-Enforcement study period will not influence the comparisons.

Table 2-14. Total Actual Crashes Annually Pre-Enforcement Period (2007-2009), Active-Enforcement Period 24 Months (2010-2013) and Post-Enforcement Period (2015-2017), 18 Deactivated Intersections

Pre-Enforcement Period (2007-2009)					Active Enforcement Period (2010-2013) *Note 1**				Post-Enforcement Period (2015-2017)				
2007	2008	2009	Total Crashes	Annual Average	Year 1	Year 2	Total Crashes*	Annual Average	2015	2016	2017	Total Crashes	Annual Average
182	266	274	722	240.7	245	240	485	242.5	339	432	468	1,239	413.0
Note 1: Includes crashes for continuous 24 month period between 2010 and 2013 at each intersection when enforcement was active. Exact period varies by intersection (see Table 2-10). * Two –year total only.													

As shown, the annual average number of crashes did not increase between the Pre-Enforcement (2007-2009) and the Active-Enforcement (2010-2013) periods, as might have been expected based on the results and trends seen previously for the 100 Active intersection locations, and on the findings of prior RLC studies. It can also be seen that the annual average number of crashes did increase between the Active-Enforcement and Post-Enforcement periods. The following sections provide a discussion of analyses conducted to examine the trends and patterns in crashes at these 18 Deactivated locations.

2.3.6 Crash Severity Analysis for the Active-Enforcement 24 Month Period (2010– 2013) – 18 Deactivated RLC Intersections

Table 2-15 presents the actual annual average number of crashes at the 18 Deactivated locations during the Pre-Enforcement (2007 – 2009) period by severity, that is, fatal crashes, injury crashes, combined fatal and injury (F/I) crashes, property damage only (PDO) crashes, and total crashes. Table 2-15 also presents the projected annual average number of crashes for the Active-Enforcement (2010-2013) period based on the discussion above.

For the purposes of comparison, Table 2-16 presents the actual annual average number of crashes by severity that occurred at the 18 Deactivated intersections during the two-year Active-Enforcement (2010-2013) study period.

Table 2-15. Crash Severity Projection, Pre-Enforcement Period (2007-2009) Actual Crashes to Active-Enforcement Period (2010-2013) Projected* Crashes, 18 Deactivated Intersections

Crash Severity	Actual Crashes Pre-Enforcement Period (2007-2009)	Projected* Crashes Active-Enforcement Period (24 Months) (2010-2013)
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes
Fatal	1.3	1.3
Injury	97.7	99.9
Combined Fatal + Injury	99.0	101.3
Property Damage Only	141.7	145.0
Total:	**240.7**	**246.2**
**Projections based on 2.3% growth in Countywide crashes at signalized intersections between 2007-2009 and 2010-2013.*		

Table 2-16. Comparison of Crashes by Crash Severity, Active-Enforcement Period (2010 – 2013) Projected* Crashes to Active-Enforcement Period (2010-2013) Actual Crashes, 18 Deactivated Intersections

Crash Severity	Projected* Crashes Active-Enforcement Period (2010-2013)	Actual Crashes Active-Enforcement Period (2010-2013)	Difference Actual Crashes to Projected Crashes	
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Average No. Crashes	Percent Difference
Fatal	1.3	0.5	-0.8	-61.5%
Injury	99.9	97.5	-2.4	-2.5%
Combined Fatal + Injury	101.3	98.0	-3.3	-3.3%
Property Damage Only	145.0	144.5	-0.5	-0.3%
Total:	**246.2**	**242.5**	**-3.7**	**-1.5%**

**Projections based on 2.3% growth in Countywide crashes at signalized intersections between 2007-2009 and 2010-2013.*

As can be seen, an average of 3.3 fewer F/I crashes were recorded than projected. However, as can also be seen, the average annual number of overall crashes and PDO crashes remained essentially unchanged between the Pre-Enforcement and Active-Enforcement period.

Therefore, the annual average number of F/I crashes was slightly less than that projected at these locations. While this in keeping with the trend at the 100 Active intersections during the Active-Enforcement period, it is so small as to possibly be statistically insignificant. The annual average number of PDO crashes also was lower than the projected number, which does not correspond to the trend at 100 Active intersections, nor is it in keeping with the patterns identified in many studies at other RLC programs in the United States. Based on this data, no conclusions can be drawn as to the impact that the RLC program was having on the occurrence of F/I crashes, since the differences were small. It is noted that these locations were among the first to receive RLC enforcement. Therefore, RLC enforcement may have not yet manifested its full influence on driver behavior, due to the short period of time that enforcement was active.

2.3.7 Crash Type Analysis for the Active-Enforcement 24 Month Period (2010-2013) – 18 Deactivated RLC Intersections

Table 2-17 provides the annual average number of crashes by crash type that occurred at the 18 Deactivated intersection locations during the Pre-Enforcement period (2007-2009), and the annual average number of projected crashes for the Active-Enforcement 24 month period (2010-2103) calculated using the growth rate of 2.3% applied to the Pre-Enforcement actual crashes.

Table 2-17. Crash Type Projection, Pre-Enforcement Period (2007-2009) Actual Crashes to Active-Enforcement Period (2010-2013) Projected*Crashes, 18 Deactivated Intersections

Int. No.	Crash Type	Actual Crashes Pre-Enforcement Period (2007 - 2009)	Projected* Crashes Active-Enforcement Period (24 Months) (2010 – 2013)
		Annual Average No. of Crashes	Annual Average No. of Crashes
All 18 Deactivated Intersections	LEFT TURN WITH	4.3	4.4
	REAR END	126.0	128.9
	OVERTAKING	25.7	26.3
	LEFT TURN OPPOSING	38.0	38.9
	RIGHT ANGLE	21.3	21.8
	RIGHT TURN WITH	4.3	4.4
	RIGHT TURN OPPOSING	3.0	3.1
	HEAD ON	1.0	1.0
	SIDESWIPE	2.0	2.0
	OTHER	11.7	12.0
	PEDESTRIAN	1.7	1.7
	BICYCLE	1.7	1.7
All 18 Deactivated Intersections Total:		**240.7**	**246.2**

**Projections based on 2.3% growth in Countywide crashes at signalized intersections between 2007-2009 and 2010-2013.*

Table 2-18. Comparison of Crashes by Crash Type, Active-Enforcement Period (2010 – 2013) Projected* Crashes to Active Enforcement Period (2010-2013) Actual Crashes, 18 Deactivated Intersections

Int. No.	Crash Type	Projected* Crashes Active-Enforcement Period (2010 – 2013)	Actual Crashes Active-Enforcement Period (2010-2013)	Difference Actual Cashes to Projected Crashes	
		Annual Average No. of Crashes	Annual Average No. of Crashes	Annual Average No. Crashes	Percent Difference
All 18 Deactivated Intersections	LEFT TURN WITH	4.4	0.5	-3.9	-88.6%
	REAR END	128.9	144.5	15.6	12.1%
	OVERTAKING	26.3	38.5	12.2	46.4%
	LEFT TURN OPPOSING	38.9	32.0	-6.9	-17.7%
	RIGHT ANGLE	21.8	11.0	-10.8	-49.5%
	RIGHT TURN WITH	4.4	1.0	-3.4	-77.3%
	RIGHT TURN OPPOSING	3.1	1.0	-2.1	-67.4%
	HEAD ON	1.0	0.5	-0.5	-51.1%
	SIDESWIPE	2.0	1.0	-1.0	-51.1%
	OTHER	12.0	9.0	-3.0	-24.8%
	PEDESTRIAN	1.7	3.5	1.8	101.3%
	BICYCLE	1.7	0.0	-1.7	-100.0%
All 18 Deactivated Intersections Total:		**246.2**	**242.5**	**-3.7**	**-1.5%**

**Projections based on 2.3% growth in Countywide crashes at signalized intersections between 2007-2009 and 2010-2013.*

As can be seen, with respect to individual crash types, the actual annual average number of right angle and left turn crashes was lower than the projected number and the actual annual average number of rear end and overtaking crashes was higher than the projected number. Therefore, the RLC program appeared to be having the anticipated impact on crash type, wherein the number of left turn and right angle crashes which are generally associated with higher crash severity decreased. Rear end and overtaking crashes also rose as a percentage of total crashes. This is in keeping with the trend at the 100 Active intersection

locations, and conforms to the studies at other RLC programs that concluded that RLC programs have the effect of reducing left turn and right angle crashes, and increasing rear end and overtaking crashes.

2.3.8 Analysis of the Post-Enforcement Period (2015-2017) – 18 Deactivated Locations

Two separate analyses of the Post-Enforcement period (2015-2017) were conducted utilizing the previously developed growth rates for the study periods examined. The derivation of these growth rates is discussed in detail in Section 2.3.4.

The first (Analysis I) compared the actual number of crashes at the 18 Deactivated intersection locations during the Post-Enforcement period (2015-2017) to the projected number of crashes during the Post-Enforcement period (2015-2017). Both crash severity and crash type were examined. The projections used in this analysis were based on the growth rate of 9.6% applied to the actual number of crashes during the Active-Enforcement 24 month period (2010-2013), and the analysis examines what took place after the cameras had been in place and were then removed.

The second analysis (Analysis II) also compares the actual number of crashes during the Post-Enforcement period (2015-2017) to the projected number of crashes during the Post-Enforcement period (2015-2017), but the projections are based on applying the 12.1% growth rate to the actual Pre-Enforcement period (2007-2009) crashes. Both crash severity and crash type were examined. In this manner, the analysis attempts to provide a comparison to the projections had the program not been implemented. The following sections provide a discussion of the results of these two analyses.

2.3.8.1 Crash Severity Analysis for the Post-Enforcement Period (2015-2017) - 18 Deactivated RLC Intersections – Analysis I

Table 2-19 presents the actual annual average crashes by severity at the 18 Deactivated locations during the Active-Enforcement 24 month period (2010-2013). These numbers were used to project the annual average Post-Enforcement period (2015-2017) crashes, calculated using a growth rate of 9.6%, which was based on average countywide increases in crashes at signalized intersections between 2010-2013 and 2015-2017.

Table 2-20 presents actual annual average crashes by severity for the Post-Enforcement period (2015-2017) period, following the removal of the cameras from the 18 Deactivated locations. This comparison identifies what happened to the crash severity during enforcement, after the cameras were removed from these 18 locations.

Table 2-19. Crash Severity Projection, Active-Enforcement Period (2010-2013) Actual Crashes to Post-Enforcement Period (2015-2017) Projected* Crashes, 18 Deactivated Intersections, Analysis I

Crash Severity	Actual Crashes Active-Enforcement Period (2010-2013)	Projected* Crashes Post-Enforcement Period (2015-2017)
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes
Fatal	0.5	0.5
Injury	97.5	106.9
Combined Fatal + Injury	98.0	107.4
Property Damage Only	144.5	158.4
Total:	**242.5**	**265.8**

**Projections based on 9.6% growth in Countywide crashes at signalized intersections between 2010-2013 and 2015-2017.*

Table 2-20. Comparison of Crashes by Crash Severity, Post-Enforcement Period (2015 – 2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis I

Crash Severity	Projected* Crashes Post-Enforcement Period (2015-2017)	Actual Crashes Post-Enforcement Period (2015-2017)	Difference Actual to Projected	
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Percent Difference
Fatal	0.5	0.3	-0.2	-40.0%
Injury	106.9	108.7	1.8	1.7%
Combined Fatal + Injury	107.4	109.0	1.6	1.5%
Property Damage Only	158.4	304.0	145.6	91.9%
Total:	**265.8**	**413.0**	**147.2**	**35.6%**

**Projections based on 9.6% growth in Countywide crashes at signalized intersections between 2010-2013 and 2015-2017.*

As can be seen, following the removal of the cameras, the actual F/I crashes were 1.5% higher than the projected annual average number of F/I crashes based on countywide crash rates, once again is not statistically significant. Note however that PDO crashes nearly double following the camera removal, when compared to the crash severity that prevailed during enforcement.

2.3.8.2 Crash Type Analysis for the Post-Enforcement Period (2015-2017) - 18 Deactivated RLC Intersections – Analysis I

Table 2-21 presents the actual annual average crashes by crash type at the 18 Deactivated locations during the Active-Enforcement 24 month period (2010-2013). These numbers were used to project the annual average Post-Enforcement period (2015-2017) crashes, calculated using a growth rate of 9.6%, which was based on average countywide increases in crashes at signalized intersections between 2010-2013 and 2015-2017.

Table 2-21. Crash Type Projection, 2010-2013 Actual Crashes to 2015-2017 Projected Crashes*, 18 Deactivated Intersections, Analysis I

Int. No.	Crash Type	Actual Crashes Active-Enforcement Period (2010-2013)	Projected* Crashes Post-Enforcement Period (2015 – 2017)
		Annual Avg. No. of Crashes	Annual Avg. No. of Crashes
All 18 Deactivated Intersections	LEFT TURN WITH	0.5	0.5
	REAR END	144.5	158.4
	OVERTAKING	38.5	42.2
	LEFT TURN OPPOSING	32.0	35.1
	RIGHT ANGLE	11.0	12.1
	RIGHT TURN WITH	1.0	1.1
	RIGHT TURN OPPOSING	1.0	1.1
	HEAD ON	0.5	0.5
	SIDESWIPE	1.0	1.1
	OTHER	9.0	9.9
	PEDESTRIAN	3.5	3.8
	BICYCLE	0.0	0.0
All 18 Deactivated Intersections Total:		**242.5**	**265.8**

**Projections based on 9.6% growth in Countywide crashes at signalized intersections between 2010-2013 and 2015-2017.*

Table 2-22. Comparison of Crashes by Crash Type, Post-Enforcement Period (2015 – 2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis I

Int. No.	Crash Type	Projected* Crashes Post-Enforcement Period (2015-2017)	Actual Crashes Post-Enforcement Period (2015-2017)	Difference Actual to Projected	
		Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Average No. Crashes	Percent Difference
All 18 Deactivated Intersections	LEFT TURN WITH	0.5	2.0	1.5	400.0%
	REAR END	158.4	224.7	66.3	41.9%
	OVERTAKING	42.2	83.3	41.1	97.4%
	LEFT TURN OPPOSING	35.1	39.0	3.9	11.1%
	RIGHT ANGLE	12.1	24.3	12.2	100.8%
	RIGHT TURN WITH	1.1	10.0	8.9	809.1%
	RIGHT TURN OPPOSING	1.1	3.0	1.9	172.7%
	HEAD ON	0.5	0.7	0.2	40.0%
	SIDESWIPE	1.1	1.3	0.2	18.2%
	OTHER	9.9	19.0	9.1	91.9%
	PEDESTRIAN	3.8	2.0	-1.8	-47.4%
	BICYCLE	0.0	3.7	3.7	-
All 18 Deactivated Intersections Total:		**265.8**	**413.0**	**147.2**	**55.4%**

**Projections based on 9.6% growth in Countywide crashes at signalized intersections between 2010-2013 and 2015-2017.*

Table 2-22 presents actual annual average crashes by crash type for the Post-Enforcement period (2015-2017) period, following the removal of the cameras from the 18 Deactivated locations. This comparison identifies what happened to the crash severity during enforcement, after the cameras were removed from these 18 locations. As can be seen, following the removal of the cameras, rear end, overtaking, right angle and left turn crashes were all higher than the projected annual average number of crashes based on countywide crash rates during this time. Note that right angle crashes increased significantly, doubling

from approximately 12 to 24 crashes per year. However, as discussed in Section 2.3.7, right angle crashes had decreased significantly during RLC enforcement, and this increase represents a return in the number of right angle crashes to the pre-enforcement level. This is discussed further in Section 2.3.8.4 below. Note that the total number of left turning crashes increased by approximately 15%, when all left turn crashes are considered.

2.3.8.3 Crash Severity Analysis for the Post-Enforcement Period (2015-2017) - 18 Deactivated RLC Intersections – Analysis II

This analysis compares the projected crash severity based on crashes from prior to the installation of the RLC program to the crash rates that prevailed several years after removal of the system. In this manner, the analysis attempts to provide a comparison to the projections had the program not been implemented. The projected crash numbers are presented in Table 2-23. They are calculated by applying the growth rate of 12.1% to the pre-enforcement crash numbers. Table 2-24 compares the actual Post-Enforcement crash numbers to the projected numbers.

Table 2-23. Crash Severity Projection, Pre-Enforcement Period (2007-2009) Actual Crashes to Post-Enforcement Period (2015-2017) Projected* Crashes, 18 Deactivated Intersections, Analysis II

Crash Severity	Actual Crashes Pre-Enforcement Period (2007 - 2009)	Projected* Crashes Post-Enforcement Period (2015-2017)
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes
Fatal	1.3	1.7
Injury	97.7	109.7
Combined Fatal + Injury	99	111.0
Property Damage Only	141.7	159.0
Total:	**240.7**	**270.0**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Table 2-24. Comparison of Crashes by Crash Severity, Post-Enforcement Period (2015 – 2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis II

Crash Severity	Projected* Crashes Post-Enforcement Period (2015-2017)	Actual Crashes Post- Enforcement Period (2015-2017)	Difference Actual Crashes to Projected Crashes	
	Annual Avg. No. of Crashes	Annual Avg. No. of Crashes	Annual Avg. No. Crashes	Percent Difference
Fatal	1.7	0.3	-1.3	-82.4%
Injury	109.7	108.7	-1.0	-0.9%
Combined Fatal + Injury	111.0	109.0	-2.0	-1.8%
Property Damage Only	159.0	304.0	145.0	91.2%
Total:	**270.0**	**413.0**	**143.0**	**52.9%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

As can be seen, while F/I crashes were slightly lower, the difference is so small as to be insignificant, and are therefore approximately equal to the projected average, PDO crashes were nearly 100% higher than the projected numbers.

2.3.8.4 Crash Type Analysis for the Post-Enforcement Period (2015-2017) - 18 Deactivated RLC Intersections – Analysis II

In order to identify the potential effect RLC may have on a location it is necessary to project the pre-enforcement crash numbers to out to the period of time after the cameras have been removed (post-enforcement), and then compare these numbers to the actual crash numbers for that same period. The projected crash numbers are presented in Table 2-25. They are calculated by applying the growth rate of 12.1% to the pre-enforcement crash numbers. Table 2-26 compares the actual Post-Enforcement crash numbers to the projected numbers.

Table 2-25. Comparison of Crashes by Crash Type, Pre-Enforcement Period (2007-2009) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis II

Int. No.	Crash Type	Actual Crashes Pre-Enforcement Period (2007 - 2009)	Projected* Crashes Post-Enforcement Period (2015 – 2017)
		Annual Avg. No. of Crashes	Annual Avg No. of Crashes
All 18 Deactivated Intersections	LEFT TURN WITH	4.3	5.0
	REAR END	126	141.3
	OVERTAKING	25.7	28.7
	LEFT TURN OPPOSING	38.0	42.7
	RIGHT ANGLE	21.3	24.0
	RIGHT TURN WITH	4.3	5.0
	RIGHT TURN OPPOSING	3.0	3.3
	HEAD ON	1.0	1.0
	SIDESWIPE	2.0	2.3
	OTHER	11.7	13.0
	PEDESTRIAN	1.7	2.0
	BICYCLE	1.7	2.0
All 18 Deactivated Intersections Total:		**240.7**	**270.3**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Table 2-26.Comparison of Crashes by Crash Type, Post-Enforcement Period (2015-2017) Projected* Crashes to Post-Enforcement Period (2015-2017) Actual Crashes, 18 Deactivated Intersections, Analysis II

Int. No.	Crash Type	Projected* Crashes Post-Enforcement Period (2015 – 2017)	Actual Crashes Post-Enforcement Period (2015-2017)	Difference Actual to Projected	
		Annual Average No. of Crashes	Annual Average No. of Crashes	Annual Average No. Crashes	Percent Difference
All 18 Deactivated Intersections	LEFT TURN WITH	5.0	2.0	-3.0	-60.0%
	REAR END	141.3	224.7	83.4	59.0%
	OVERTAKING	28.7	83.3	54.6	190.7%
	LEFT TURN OPPOSING	42.7	39.0	-3.7	-8.6%
	RIGHT ANGLE	24.0	24.3	0.3	1.4%
	RIGHT TURN WITH	5.0	10.0	5.0	100.0%
	RIGHT TURN OPPOSING	3.3	3.0	-0.3	-10.0%
	HEAD ON	1.0	0.7	-0.3	-33.3%
	SIDESWIPE	2.3	1.3	-1.0	-42.9%
	OTHER	13.0	19.0	6.0	46.2%
	PEDESTRIAN	2.0	2.0	0.0	0.0%
	BICYCLE	2.0	3.7	1.7	83.3%
All 18 Deactivated Intersections Total:		**270.3**	**413.0**	**142.7**	**52.8%**

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

The annual average number of left turn crashes is slightly lower than would have been expected, and the number of right angle crashes is higher. Note that right angle crashes, which had been shown to decrease notably during the Active-Enforcement 24 month period (2010-2013), had returned to very close to the projected number following removal of the cameras. Rear end and overtaking crashes are shown to be considerably higher than would have been expected had the program not been in place.

2.3.9 Conclusions of Post-Enforcement Analysis – 18 Deactivated RLC Intersections

Note that since the Deactivated location sample size of 18 intersections is small, and the duration of the Active-Enforcement period was limited to 24 months between 2010 and 2013, care must be taken in drawing definitive conclusions regarding the impact of the RLC program on the crash experience at these locations. However, based on the forgoing analyses, the following can be stated:

1. **Based on the results of Analysis I, which examined what happened after the RLC cameras had been in place, and had been remove for several years, the following was observed:**
    a) **Crashes involving fatalities and injuries remained essentially unchanged, while property damage only crashes were nearly 100% higher than projected.**
    b) **Rear end, overtaking, right angle and left turn crashes were all higher than the projected annual average number of crashes based on countywide crash rates.**
    c) **Right angle crashes increased significantly more than would have been expected, doubling from approximately 12 to 24 crashes per year.**

2. Based on the results of Analysis II, which examined what happened several years after the cameras had been removed, and attempted to compare crash history with that which may have prevailed had the RLC program not have been implemented, the following was observed:
    a) Combined fatal and injury crashes were essentially equal to the projected number of crashes, while property damage only crashes were 90% higher than projected.
    b) Total left turn decreased and right angle crashes increased slightly. Rear end and overtaking crashes increased at rates that might have been expected had the cameras remained in place.

2.3.10 Summary and Conclusions of Crash Analysis for 18 Deactivated RLC Intersections

Since the Deactivated location sample size of 18 intersections is small, and the duration of the Active-Enforcement period was limited to 24 months between 2010 and 2013, care must be taken in drawing definitive conclusions regarding the impact of the RLC program on the crash experience at these locations. The following findings are noted regarding the crash experience at the 18 Deactivated RLC locations during the Pre-Enforcement (2007-2009), Active-Enforcement (2010-2013) and Post-Enforcement (2015-2017) study periods:

1. During the Active-Enforcement 24 month period (2020-2013), the number of fatal and injury and PDO crashes was lower than would have been expected, but the difference was so low as to be insignificant.
2. Left turn and right angle crashes were lower than projected during 24 Month Active-Enforcement period, and rear end and overtaking crashes were higher.
3. These locations were among the first to receive RLC enforcement. Therefore, the influence of RLC enforcement on driver behavior may not have yet fully manifested itself due to the short period of time that enforcement was active.
4. Based on the results of Analysis I, which examined what happened after the RLC cameras had been in place, and had been removed for several years, the following was observed:
    c) Crashes involving fatalities and injuries remained essentially unchanged, while property damage only crashes were nearly 100% higher than projected.
    d) Rear end, overtaking, right angle and left turn crashes were all higher than the projected annual average number of crashes based on countywide crash rates.
    e) Right angle crashes increased significantly more than would have been expected, doubling from approximately 12 to 24 crashes per year.
5. Based on the results of Analysis II, which examined what happened several years after the cameras had been removed, and attempted to compare crash history with that which may have prevailed had the RLC program not have been implemented, the following was observed:
    a) Combined fatal and injury crashes were essentially equal to the projected number of crashes, while property damage only crashes were 90% higher than projected.
    b) Total left turn and right angle crashes decreased slightly and rear end and overtaking crashes increased at rates that might have been expected had the cameras remained in place.

Although no studies in the public domain regarding crash experience following the termination of RLC enforcement could be located, and therefore care must be taken regarding the relationship of the RLC program and these crash results, based on the forgoing analysis and investigations.

Conclusions

The following conclusions are made:

1. **For all time periods examined, crash types exhibited patterns similar to those at the 100 Active locations, with rear end and overtaking crashes representing nearly the entirety of the total increase in crashes.**
2. **Analysis I shows that termination of RLC monitoring correlates with an increase in crashes, including rear end, overtaking, left turn and right angle crashes without an associated increase in fatal and injury crashes.**
3. **Analysis II indicates that there is no apparent residual benefit after cameras are removed, since fatal and injury, right angle and left turn crashes were approximately equal to the projected number of crashes had the program not been implemented.**

Section 3 Detailed Intersection Investigation

3.1 Introduction

This section provides the results of analyses conducted at intersections that exhibited crash experience that differed from the general crash experience patterns identified in Section 2. These analyses were conducted for both the 100 Active and 18 Deactivated intersections. The following sections provide a discussion of the results of these efforts.

3.1 Analysis of Individual Intersections – 100 Active RLC Intersections

One of the trends identified in Section 2 indicate that the number of crashes at the 100 Active intersection locations was higher during the Active – Enforcement period than during the Pre-Enforcement period, and had increased faster than would have been expected countywide during that time.

However, during the Active-Enforcement period, the number of combined Fatal and Injury (F/I) crashes was reduced, as 171 fewer F/I crashes occurred than projected. Thus, the overall crash experience at Active program locations is shown to have followed another trend of this program, in keeping with what was found for other RLC programs for which studies were reviewed.

However, not all intersections in either enforcement scenario conformed to these trends. Since it is the purpose of the program to evaluate the effectiveness of RLC enforcement in improving safety at the enforced locations, additional analyses were performed to identify intersections that did not conform to the trends. Of particular importance are intersections that showed a notable increase in the number of F/I crashes, which could indicate that RLC enforcement at these locations was not resulting in the expected reduction in higher severity crashes. Additional analysis has been conducted to identify these locations and investigate potential underlying reasons that they have not followed the reduction in F/I crash trend.

Also of note are intersections where the severity reduction was noted to have been most pronounced, since these trends could be indicative of locations where the RLC program was particularly effective. These intersections have also been identified and investigated for underlying causation.

The following sections describe the results of investigation of these locations.

3.1.1 Individual Intersections with Higher F/I Crashes – 100 Active RLC Intersections

Table 3-1 presents details regarding the crash experience at fifteen (15) intersections where the number of F/I crashes was noted to have increased during the Active-Enforcement period (2015-2017) in comparison to the projected number of F/I crashes calculated using the countywide growth rate. As this contradicts the overall trend of reduced F/I crashes at the 100 Active locations, these intersections were selected for additional analysis. As can be seen, the number of F/I crashes at these locations was notably higher than projected, with the annual average number of F/I crashes exceeding the projected number by between 2.0 and 5.7 F/I crashes per year. Note that the information in Table 3-1 is presented in ascending order of F/I crash increase.

Table 3-1. Intersection Locations with Actual F/I Crashes Higher Than Projected* F/I Crashes, 100 Active Intersections

Intersection ID		Projected* Crashes Active-Enforcement Period (2015 – 2017)		Actual Crashes Active-Enforcement Period (2015-2017)		Difference Actual to Projected	
#	Name	Combined F/I	Annual Average No. Crashes - Combined F/I	Combined F/I	Annual Avg. No Crashes Combined F/I	Change in F/I Crashes	Annual Avg. Number of Crashes
90	CR 83, North Ocean Ave at CR 16, Horseblock Rd	18	6.0	24	8.0	6	2.0
98	NY 347 at Arrowhead Ln	15	5.0	21	7.0	6	2.0
52	CR 10, Elwood Road at NY 25, Jericho Turnpike	4	1.3	11	3.7	7	2.4
60	CR 13, Fifth Ave at CR 100, Suffolk Ave	22	7.3	29	9.7	7	2.4
10	CR 67 (Motor Pkwy) at I495S (Exit 57)	8	2.7	16	5.3	8	2.6
35	Mount Sinai Coram Rd at NY25, Middle Country Rd	19	6.3	28	9.3	9	3.0
79	CR 17, Wheeler Rd at CR 67, Motor Parkway	8	2.7	17	5.7	9	3.0
62	CR 46, William Floyd Pkwy at Surrey Circle	12	4.0	22	7.3	10	3.3
89	CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy	4	1.3	14	4.7	10	3.4
73	CR 2, Straight Path at 35th Street	7	2.3	18	6.0	11	3.7
75	NYS 109 at CR 96, Great East Neck Rd	11	3.7	22	7.3	11	3.6
8	NY111 at I495S	21	7.0	33	11.0	12	4.0
97	NY 27A at CR 96, Great East Neck Rd/Bergen Ave	9	3.0	22	7.3	13	4.3
27	NY112 at CR 99 (Woodside Ave)	7	2.3	24	8.0	17	5.7
50	NY 231, Deer Park Ave at Nicolls Road	4	1.3	21	7.0	17	5.7

**Projections are based on 12.1% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2015 - 2017.*

Because these intersections did not follow the trend where F/I crashes were lower during the Active-Enforcement period (2015-2017), each of these intersections was evaluated separately. Information regarding operational and geometric parameters at this group of intersections was reviewed, and is presented in Table 3-2. As can be seen, most are four-leg intersections, speed limits vary from 30mph to 45mph, signal operations are of varying complexity, and cycle lengths range from a low of 80 seconds to a high of 160 seconds, and the number of monitored approaches ranges from one to four. Of 15 intersections where the number of crashes increased but the severity percentage did not decrease, 12 are four-leg intersections, 2 are three-leg intersection and one is an unconventional five-leg intersection. The Average Annual Daily Traffic (AADT) of these roadways ranged from 6,808 to 60,268vpd. The following sections provide a detailed discussion of each intersection. Table 3-2 is presented in order by intersection number, which correlates to the order in which the discussion of each intersection is presented.

Table 3-2. Operational Parameters of Active Intersections with Increased F/I Crashes

Int. No	Name	Activation Date	Number of Approaches	Number of Monitored Approaches	North/South Street Speed Limit	East/West Street Speed Limit	Number of Phases	Cycle Length
8	NY111 at I-495 SSR	9/25/2010, 11/18/2010	3	2	40 mph	30 mph	3	100
10	CR67 Motor Parkway at I-495 S	11/5/2010, 12/16/2010	3	3	45 mph	40 mph	3	120
27	NY112 at CR 99 (Woodside Ave)	2/24/2011, 6/20/2013	4	4	40 mph	45 mph	4	160
35	Mt Sinai Coram Road at NY 25	4/22/2013	4	2	30 mph	40 mph	3	145
50	NY 231, Deer Park Ave at Nicolls Road	12/26/2013	4	2	40 mph	30 mph	3	115
52	CR 10, Elwood Road at NY 25, Jericho Turnpike	2/27/2014, 3/3/2014, 3/24/2014	4	3	40 mph	40 mph	3	120
60	CR13 Fifth Ave at CR100 Suffolk Ave	9/13/2013, 10/16/2013	4	3	40 mph	30 mph	4	100
62	CR46 Wm Floyd Pky at Surrey Circle	10/2/2013	4	2	45 mph	30 mph	3	95
73	CR 2, Straight Path at 35th Street	12/26/2013	4	1	35 mph	30 mph	3	80
75	NYS 109 at CR 96, Great East Neck Rd	10/1/2014	5	1	40 mph	50 mph	5	155
79	CR 17, Wheeler Rd at CR 67, Motor Parkway	12/6/2013	4	1	30 mph	45 mph	4	100
89	CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy	12/12/2013	4	2	40 mph	30 mph	3	120
90	CR83 N. Ocean at CR16 Horseblock Rd	12/12/2013	4	2	45 mph	35 mph	4	100
98	NY347 at Arrowhead Ln.	10/9/2013, 10/16/2013	4	3	30 mph	55 mph	4	165
97	NY 27A at CR 96, Great East Neck Rd/Bergen Ave	10/16/2013, 11/27/2013	4	2	30 mph	40 mph	3	100

3.1.1.1 Intersection 8, NY111 (Wheeler Road) at I-495S (Exit 56)

This is a three-leg intersection of NY111 Wheeler Road and I-495 Long Island Expressway South Service Road in Hauppauge, NY located at exit 56 off the (I-495) Long Island Expressway. NY111 is a north-south roadway under the jurisdiction of NYSDOT that provides three through lanes and right turn lane in the northbound direction and two through lanes and a left turn lane in the southbound direction. NY111 is classified as an Urban Principal Arterial (Other), with an estimated Average Annual Daily Traffic (AADT) of 11809vpd in 2016. I-495 South Service Road is an eastbound NYSDOT roadway with a left turn lane, a shared left through lane, a through lane and right turn lane. The South Service Road is classified as an Urban Principal Arterial (Other), with an estimated Average Annual Daily Traffic (AADT) of 13300vpd in 2016. There are red light cameras on the northbound and eastbound approaches.

During the Pre-Enforcement period, 28 total crashes occurred at this location, including 19 injury crashes and no fatal crashes. During the Active-Enforcement period, 72 total crashes occurred, including 32 injury crashes and 1 fatal crash. Left turn opposing and right angle crashes increased, which is contrary to the trend, but is in keeping with the increase in severity trend. Rear end and overtaking crashes also increased, which is in keeping with the trend. No geometric improvements to the intersection have been implemented since 2007 and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall program trends.

3.1.1.2 Intersection 10, CR 67 (Motor Pkwy) at I495S (Exit 57)

This is a three-leg intersection of CR 67, Motor Parkway and the South Service Road of the Long Island Expressway in Islandia, NY located at exit 57 off the (I-495) Long Island Expressway west of NY454. CR 67, Motor Parkway is a major north-south highway under the jurisdiction of SCDPW. There are two through lanes and one right turn lane northbound and two through lanes and one left turn lane southbound. CR 67 is classified as an Urban Minor Arterial with an estimated Average Annual Daily Traffic (AADT) of 12,831vpd in 2016. The South Service Road of the Long Island Expressway is an eastbound NYS roadway that has one left turn lane, one through and shared through-right turn lane. The service road is classified as an Urban Principal Arterial (Other) with an estimated Average Annual Daily Traffic (AADT) of 15,469vpd in 2016. There are red light cameras on the northbound and eastbound approaches.

During the Pre-Enforcement period, 10 total crashes occurred at this location, including 7 injury crashes and no fatal crashes. During the Active-Enforcement period, 50 total crashes occurred, including 16 injury crashes and no fatal crashes. Left turn opposing and right angle crashes increased, which is contrary to the trend, but is in keeping with the increase in severity. Rear end and overtaking crashes also increased, in keeping with the trend. No geometric improvements to the intersection have been implemented since 2007, and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall crash trends.

3.1.1.3 Intersection 27, NY112 (Medford Ave) at CR 99 (Woodside Ave)

This is a four-leg intersection of NY112, Medford Avenue and CR 99, Woodside Avenue in South Medford, NY. NY112 is a north-south roadway under the jurisdiction of NYSDOT that has two through lanes, one left turn lane and right turn lane northbound and two through lanes, one left turn lane and right turn lane southbound. NY112 is classified as an Urban Principal Arterial (Other), with an estimated Average Annual Daily Traffic (AADT) of 25082vpd in 2016. CR 99, Woodside Avenue is an east-west Suffolk County roadway that provides two through lanes, one left turn and one right turn lane in both directions. CR 99, Woodside Avenue, is classified as an Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 27601vpd in 2016. There are red light cameras on the northbound, southbound, eastbound and westbound approaches.

During the Pre-Enforcement period, 28 total crashes occurred at this location, including 6 injury crashes and no fatal crashes. During the Active-Enforcement period, 64 total crashes occurred, including 24 injury crashes and no fatal crashes. Left turn opposing crashes increased, contrary to the trend and there was no change in right angle crashes between the Pre-Enforcement period and the Active-Enforcement period, also contrary to the trend, as there was no reduction, but in keeping with the increase in severity. Rear end and overtaking crashes increased, in keeping with the trend. No geometric improvements to the intersection have been implemented since 2007 and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.4 Intersection 35, Mount Sinai Coram Rd at NY25, Middle Country Rd

This is a four-leg intersection of Mount Sinai Coram Road and NY 25, Middle Country Road in Coram, NY. Mount Sinai Coram Road is a major north-south roadway under the jurisdiction of the Town of Brookhaven. The northbound approach extends from a shopping center with one through, one right and one left turn lane. The southbound approach has one shared through left and one right turn lane. Mount Sinai Coram Road is classified as Urban Minor Arterial; there is no AADT data available. NY 25, Middle Country Road is an east-west NYS roadway with two through lanes and one left turn lane on the westbound approach. The eastbound approach has one left turn lane, one through and right turn lane. NY 25 is classified as an Urban Principal Arterial (Other) with an estimated Average Annual Daily Traffic (AADT) of 21,266vpd in 2016. There are red light cameras on the southbound and eastbound approaches.

During the Pre-Enforcement period, 48 total crashes occurred at this location, including 17 injury crashes and no fatal crashes. During the Active-Enforcement period, 80 total crashes occurred, including 28 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased, while right angle crashes decreased. In contrast to the trend, left turn opposing crashes increased, in keeping with the severity increase. No geometric improvements to the intersection have been implemented since 2007, and there have been no significant changes to the surround land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.5 Intersection 50, NY 231, Deer Park Ave at Nicolls Road

This is a four-leg intersection of NY 231 and Nicolls Road in Deer Park, NY. NY 231 is a north-south roadway under the jurisdiction of NYSDOT with identical configurations on both approaches of two through lanes and left turn lanes. NY 231 is classified as an Urban Principal Arterial (Other), with an estimated Average Annual Daily Traffic (AADT) of 33555vpd in 2016. Nicolls Road is an east-west Town of Babylon roadway also with identical configurations at both approaches of one shared through right lane and one left turn lane. Nicolls Road, is classified as Urban Major Collector, with an estimated Average Annual Daily Traffic (AADT) of 6807vpd in 2016. There are red light cameras on the northbound and southbound approaches.

During the Pre-Enforcement period, 15 total crashes occurred at this location, including 4 injury crashes and no fatal crashes. During the Active-Enforcement period, 44 total crashes occurred, including 21 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased, while right angle crashes decreased marginally by 1 crash. In contrast to the trend, left turn opposing crashes increased. No geometric improvements to intersection have been implemented since 2007 and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.6 Intersection 52, CR 10, Elwood Road at NY 25, Jericho Turnpike

This is a four-leg intersection of CR 10, Elwood Road and NY 25, Jericho Turnpike in Elwood, NY. NY 25, Jericho Turnpike is a major east-west highway under the jurisdiction of NYSDOT that has three through lanes and one left turn lane in the westbound direction and two through lanes and one left turn lane in the eastbound direction. NY 25 is classified as an Urban Principal Arterial (Other) with an estimated Average Annual Daily Traffic (AADT) of 22,821vpd in 2016. CR 10, Elwood Road is a north-south Suffolk County roadway. The northbound approach extends from a shopping center with one left turn lane and one shared through-right lane. The southbound direction has a right turn lane, a shared through-right lane and one left turn lane. Elwood Road is classified as an Urban Minor Arterial with an estimated Average Annual Daily Traffic (AADT) of 22,095vpd in 2016. There are red light cameras on the southbound, westbound and eastbound approaches.

During the Pre-Enforcement period, 38 total crashes occurred at this location, including 4 injury crashes and no fatal crashes. During the Active-Enforcement period, 66 total crashes occurred, including 11 injury crashes and no fatal crashes, in keeping with the trend. Rear end and overtaking crashes increased and left turn opposing crashes decreased marginally by 1 crash. Contrary to the trend, right angle crashes remaining unchanged at this intersection. No geometric improvements to intersection have been implemented since 2007, but the northwest quadrant of the intersection is currently undergoing modifications. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.7 Intersection 60, CR 13, Fifth Ave at CR 100, Suffolk Ave

This is a four-leg intersection of CR 13, Fifth Avenue and CR 100, Suffolk Avenue in Brentwood. CR 13, Fifth Avenue is a major north-south highway under the jurisdiction of SCDPW. The southbound approach has two through lanes and one left turn lane. The northbound approach has one left turn lane, two through lanes and one right turn lane. CR 13 is classified as an Urban Minor Arterial with an estimated Average Annual Daily Traffic (AADT) of 27,834vpd in 2016. CR 100, Suffolk Avenue is an east-west Suffolk County roadway. Both the east and westbound approaches have one left turn lane, one through lane and one right turn lane. CR 100 is classified as an Urban Minor Arterial with an estimated Average Annual Daily Traffic (AADT) of 21,887vpd in 2016. There are red light cameras on the northbound, southbound and westbound approaches.

During the Pre-Enforcement period, 67 total crashes occurred at this location, including 20 injury crashes and no fatal crashes. During the Active-Enforcement period, 99 total crashes occurred, including 29 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased, while right angle crashes decreased marginally by 1 crash. Left turn opposing crashes increased, contrary to the trend but in keeping with the crash severity. No geometric improvements to intersection have been implemented since 2007, and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.8 Intersection 62, CR 46, William Floyd Pkwy at Surrey Circle

This is a four-leg intersection of CR 46, William Floyd Parkway and Surrey Circle in Shirley, NY. CR 46 is a north-south highway under the jurisdiction of SCDPW. The northbound approach has three through lanes and one left turn lane. The southbound approach has three through lanes and two left turn lanes. CR 46 is classified as Urban Principal Arterial (Other), with an estimated Average Annual Daily Traffic (AADT) of 52,682vpd in 2016. Surrey Circle is an east-west Town of Brookhaven roadway. The westbound approach has on left turn lane and a shared through-right lane while the eastbound approach has a shared through-left and a right turn lane. Surrey Circle is classified as an Urban Local Road with no available data on AADT. There are red light cameras on the northbound and southbound approaches.

During the Pre-Enforcement period, 36 total crashes occurred at this location, including 10 injury crashes and 1 fatal crash. During the Active-Enforcement period, 88 total crashes occurred, including 22 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased and right angle crashes decreased. Contrary to the trend, left turn opposing crashes remained unchanged. These crash changes do not support the severity increase seen.

An additional left turn lane was added to the southbound approach in 2012 and an additional dedicated right turn lane was added to the westbound approach in 2012. It should be noted that bank

construction at the northwest quadrant of the intersection in 2008 should have no impact on crashes included in the analysis of this intersection as bank access is well beyond the study area. The carwash located in the southeast quadrant of the intersection experienced site plan and pavement marking modifications, but no changes to driveway access were made and therefore should have no impact on traffic patterns that might influence crash patterns. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.9 Intersection 73, CR 2, Straight Path at 35th Street

This is a four-leg intersection of CR 2, Straight Path and 35th Street in Copiague, NY. CR 2 is a north-south roadway under the jurisdiction of SCDPW. The northbound approach has two through lanes and one left turn lane. The southbound approach has two through lanes and one left turn lane. CR 2 is classified as an Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 22244vpd in 2016. 35th Street is an east-west Town of Babylon roadway. The westbound approach has a right turn lane and a shared through-left lane. The eastbound approach has one lane for all movements. 35th Street is classified as an Urban Major Collector; there is no available AADT data. There is a red light camera on the northbound approach.

During the Pre-Enforcement period, 16 total crashes occurred at this location, including 6 injury crashes and no fatal crashes. During the Active-Enforcement period, 35 total crashes occurred, including 18 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased. Contrary to the trend, left turn opposing and right angle crashes increased, in keeping with the increase in severity. No geometric improvements to the intersection have been implemented since 2007, and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.10 Intersection 75, NYS 109 at CR 96, Great East Neck Rd

This is an unconventional five-leg intersection of NYS 109 and CR 96, Great East Neck Road in West Babylon, NY. The intersection is southwest of NY 27, Sunrise Highway. NYS 109 is a north-south roadway under the jurisdiction of NYSDOT. The northbound approach has one through lane, a shared through right lane, and one right turn only lane. The southbound approach has one through lane and one shared through-right lane. NYS 109 is classified as an Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 21909vpd in 2016. CR 96. The westbound approach has one left turn lane, one through lane and small channelized right turn lane. The eastbound approach (Little East Neck Road) has one through lane and one left turn lane. CR 96 is classified as an Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 19067vpd in 2016. There is a red light camera on the southbound approach.

During the Pre-Enforcement period, 43 total crashes occurred at this location, including 9 injury crashes and 1 fatal crash. During the Active-Enforcement period, 90 total crashes occurred, including 22 injury crashes and no fatal crashes. In keeping with the trend, rear end crashes increased. Contrary to the trend, overtake crashes decreased. Left turn opposing crashes increased, contrary to the trend,

but right angle crashes decreased, which does not support the increase in severity. No geometric improvements to the intersection have been implemented since 2007. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.11 Intersection 79, CR 17, Wheeler Rd at CR 67, Motor Parkway

This is a four-leg intersection of CR 17, Wheeler Road and CR 67, Motor Parkway in Central Islip, NY. The intersection is east of the NY Route 111. CR 17 is a north-south roadway under the jurisdiction of SCDPW. Both the north and southbound approaches have a left turn lane and a shared through-right turn lane. Wheeler Road is classified as a Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 18,081vpd in 2016. CR 67, Motor Parkway is an east-west Suffolk County. Both the east and westbound approaches have one right turn lane, one through lane and one left turn lane. CR 67 is classified as an Urban Minor Arterial with an estimated Average Annual Daily Traffic (AADT) of 12,972vpd in 2016. There is a red light camera on the northbound approach.

During the Pre-Enforcement period (2007-2009), 32 total crashes occurred at this location, including 7 injury crashes and no fatal crashes. During the Active-Enforcement period, 64 total crashes occurred, including 17 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased. Left turn opposing crashes increased, and right angle crashes increased marginally by 1 crash, contrary to the trend, but in keeping with the increase in severity. No geometric improvements to intersection have been implemented since 2007, and there have been no significant changes to the surround land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.12 Intersection 89, CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy

This is a four-leg intersection of CR 4, Commack Road and Marcus Boulevard/Tanger Driveway in Deer Park, NY. The Tanger Outlet Center, a major shopping destination, opened in late 2008, and during the Pre-Enforcement period. The intersection is south of Long Island Avenue. CR 4 is a north-south roadway under the jurisdiction of SCDPW. Both the south and northbound approach have two through lanes, one right turn and one left turn lane. CR 4 is classified as an Urban Minor Arterial with an Average Annual Daily Traffic (AADT) of 22,464vpd in 2016. Marcus Boulevard is an east-west Town of Babylon roadway. The westbound approach has one through lane, one left turn lane and one channelized right turn lane exiting the Tanger driveway. The eastbound approach has one shared through left lane and one shared through-right turn lane. Marcus Boulevard is classified as an Urban Local Road with an Average Annual Daily Traffic (AADT) of 13,323vpd in 2016. There are red light cameras on the northbound and southbound approaches.

During the Pre-Enforcement period, 16 total crashes occurred at this location, including 4 injury crashes and no fatal crashes. During the Active-Enforcement period, 41 total crashes occurred, including 14 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtaking crashes increased, and left turn opposing crashes decreased marginally by 1 crash. Right angle crashes increased, contrary to the trend but in keeping with the severity experience. The Tanger Outlet Center

was opened in 2008 and has expanded since the opening. In 2010, an additional southbound left turn lane was added and the eastbound approach channelized right turn lane was reconfigured to a shared through-right turn lane. Due to the influence of the Tanger Outlet Center on traffic volumes and turning movements at this location and the potential crash experience brought on by this large development, it is not possible to determine with any degree of certainty any possible impact the RLC program or the expansion of Tanger may have on the crash experience at this location. Further evaluation and monitoring on this intersection is recommended.

3.1.1.13 Intersection 90, CR 83, North Ocean Ave at CR 16, Horseblock Rd

This is a four-leg intersection of CR 83, North Ocean Road and CR 16 Horseblock Road in Farmingville, NY. The intersection is north of the I-495 Long Island Expressway and west of NYS 112, Medford Avenue. CR 83, North Ocean Road is a major north-south highway under the jurisdiction of SCDPW. The northbound approach has three through lanes and one left turn lane. The southbound approach has two through lanes, one right turn lane and one left turn lane. CR 83 is classified as an Urban Principal Arterial (Other) with an estimated Average Annual Daily Traffic (AADT) of 60268vpd in 2016. CR 16 is an east-west Suffolk County roadway that has identical configurations of two through lanes, one left turn lane and one right turn lane on both the east and westbound approaches. CR 16 is an Urban Minor arterial with an estimated AADT of 14868vpd in 2016. There are red light cameras on the northbound and southbound approaches.

During the Pre-Enforcement period, 46 total crashes occurred at this location, including 16 injury crashes and no fatal crashes. During the Active-Enforcement period, 122 total crashes occurred, including 23 injury crashes and 1 fatal crash. In keeping with the trend, rear end and overtake crashes increased, while left turn opposing and right angle crashes decreased. This does not correlate with the increase in severity. The northeast quadrant of the intersection was redeveloped in 2013 with a gas station, but is not likely to account of the full increase in crashes as the access points from the original development to the gas station are identical.

3.1.1.14 Intersection 97, NY 27A at CR 96, Great East Neck Rd/Bergen Ave

This is a four-leg intersection of NYS Route 27A/Montauk Hwy and CR 96, Great East Neck Road in West Babylon, NY. The intersection is west of NYS 109, Little East Neck Road South. NYS 27A/Montauk Hwy is an east-west roadway under the jurisdiction of NYSDOT. The west and east bound approach have two through lanes and one left turn lane. NYS 27A, is classified as an Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 24975vpd in 2016. CR 96, Great East Neck Road is a north-south Suffolk County roadway. The northbound approach has one through lane, one right turn lane and one left turn lane. The southbound approach has two through lanes and one left turn lane. CR 96, Great East Neck Road, is classified as an Urban Minor Arterial, with an estimated Average Annual Daily Traffic (AADT) of 15034vpd in 2016. There are red light cameras on the northbound and southbound approaches.

During the Pre-Enforcement period, 26 total crashes occurred at this location, including 8 injury crashes and no fatal crashes. During the Active-Enforcement period, 42 total crashes occurred, including 22 injury crashes and no fatal crashes. In keeping with the trend, rear end and overtake crashes increased. In contrast to the trend left turn opposing and right angle crashes increased, with does not correlate with the increased severity. No geometric improvements to the intersection have been implemented since 2007 and there have been no significant changes to the surrounding land uses. Thus, no underlying reason is apparent to explain this departure from the overall trend.

3.1.1.15 Intersection 98, NY 347 at Arrowhead Ln

This is a four-leg intersection of NY 347 and Arrowhead Lane in Setauket, NY. The intersection is southwest of Old Town Road. NY 347 is a major east-west highway under the jurisdiction of NYSDOT. The eastbound approach has two left turn lanes, two through lanes and one right turn lane. The westbound approach has two through lanes, one right turn lane and one left turn lane. NY 347 is classified as an Urban Principal Arterial (Other) with an estimated Average Annual Daily Traffic (AADT) of 48971vpd in 2016. Arrowhead Lane is a north-south Town of Brookhaven roadway. The northbound approach has one left turn lane, one through lane and a shared through-right turn lane. The southbound approach has two left turn lanes, one through lane and one right turn lane. Arrowhead Lane is classified as an Urban Local Road with no AADT data currently available. There are red light cameras on the northbound, westbound and eastbound approaches.

During the Pre-Enforcement period (2007-2009), 31 total crashes occurred at this location, including 13 injury crashes and no fatal crashes. During the Active-Enforcement period, 65 total crashes occurred, including 21 injury crashes and no fatal crashes. In contrast to the trend, left turn opposing crashes increased and there was no change in right angle crashes but in keeping with the severity experience. In keeping with the trend, rear end and overtaking crashes increased. An additional northbound through lane and an additional left turn southbound lane were added in 2010. Thus, it could have been expected that crashes decreased.

3.1.2 Individual Intersections with Reduced Number of Crashes – 100 Active Intersections

Nineteen (19) Active intersections exhibited notably fewer (greater than 2.0 fewer) F/I crashes during the Active Enforcement period, seven (7) of which also experienced decreases in overall crashes. The data for these intersections are provided in Table 3-3. Further investigation indicated that geometric improvements had been made at three (3) of these locations, which may have contributed to the reduction in F/I crashes and overall crashes. These three locations are:

- Intersection 11, CR28 (New Highway) at NY108
- Intersection 38, NY25A at Mt. Sinai Coram Road
- Intersection 51, NY231 Deer Park Avenue at CR57, Bay Shore Road.

At one additional intersection, Intersection 39, NY25A at Miller Place Road, pavement markings have been upgraded, and signal phasing modifications and additional pedestrian equipment installed. This intersection is discussed in detail in Section 5.

Details of the operational and geometric parameters of these intersections were also investigated to identify potential similarities among these intersections that could identify intersections with characteristics where RLC enforcement would be most effective. However, no set of unifying operational or geometric features can be identified among these locations. These parameters are in Table 3-4.

Based on this analysis, these locations are experiencing improvements in crash experience that is more pronounced than the overall trend, especially those that had reduced overall crashes. Additional monitoring of these locations is recommended to ascertain whether this trend in crash experience at these locations persists.

Table 3-3. 100 Active Intersections with Decreased Annual Average of Fatal and Injury Crashes by 2.0 or more

Intersection ID		Actual Crashes Pre-Enforcement Period (2007 - 2009)			Projected* Crashes Active-Enforcement Period (2015 – 2017)			Actual Crashes Active-Enforcement Period (2015-2017)			Difference Actual to Projected		
Int. No	Name	Combined F/I Crashes	Annual Avg. No. Combined F/I Crashes	Total Crashes	Combined F/I Crashes	Annual Avg. No. Combined F/I Crashes	Total Crashes	Combined F/I Crashes	Annual Avg. No Combined F/I Crashes	Total Crashes	Change in F/I Crashes	Annual Avg. Number of Crashes	Change in Total Crashes
19	CR 2 (Straight Path) at NY27	37	12.3	95	41	13.7	106	35	11.6	108	-6.0	-2.0	2
22	NY110 at Conklin St	22	7.3	22	25	8.3	66	19	6.3	99	-6.0	-2.0	33
23	NY110 at NY25	15	5	59	17	5.7	66	11	3.7	59	-6.0	-2.0	-7
36	CR 47, Great Neck Rd at NY 27A	9	3	16	10	3.3	18	4	1.3	28	-6.0	-2.0	10
51	NY 231, Deer Park Ave at CR 57, Bayshore Road	22	7.3	44	25	8.3	49	19	6.3	74	-6.0	-2.0	25
30	NY454 at Broadway	11	3.3	31	12	4.0	35	6	1.7	34	-7.0	-2.3	-1
49	CR 3, Pinelawn Road at I-495, Express Drive North	18	6	24	20	6.7	27	13	4.3	51	-7.0	-2.3	24
76	CR 13A, N. Clinton Ave at CR 50, Union Blvd	8	2.7	23	9	3.0	26	2	0.7	13	-7.0	-2.3	-13
9	CR 93 (Ocean Ave) at I495N	13	4.3	22	15	5.0	25	7	2.3	37	-8.0	-2.7	12
92	CR 19, Waverly Ave at NYS 27, NSR	13	4.3	24	15	5.0	27	6	2	43	-9.0	-3.0	16
16	NY112 at NY27N	15	5	26	17	5.7	29	7	2.3	32	-10.0	-3.3	3
3	NY25 at Pidgeon Hill Rd	23	7.3	46	26	8.7	52	15	5	51	-11.0	-3.7	-1
85	CR 4, Commack Rd at Hauppauge Rd/ New Highway	15	5	33	17	5.7	37	6	2	27	-11.0	-3.7	-10
11	CR 28 (New Hwy) at NY109	27	9	62	30	10.0	70	17	5.7	68	-13.0	-4.3	-2
38	NY 25A at Mount Sinai Coram Road	24	8	35	27	9.0	39	13	4.3	49	-14.0	-4.7	10
39	Miller Place Rd at NY 25A	35	11.7	86	39	13.0	96	25	8.3	104	-14.0	-4.7	8
57	CR 13, Fifth Ave at CR 57, Bay Shore Rd	24	8	48	27	9	54	13	4.3	48	-14.0	-4.7	-6
54	CR 13, Fifth Ave at CR 50, Union Blvd	18	6	45	20	6.7	50	5	1.7	30	-15.0	-5.0	-20
1	CR 4 (Commack Rd) at I495N	43	14	95	48	16.0	106	25	8	150	-23.0	-7.7	44

Table 3-4. Operational Parameters of Active Intersections with Decreased F/I and Total Crashes

Int. No	Name	Number of Approaches	Number of Monitored Approaches	North/South Street Speed Limit	East/West Street Speed Limit	Number of Phases	Cycle Length
1	CR 4 (Commack Rd) at I495N	3	2	40	40	3	100
3	NY 25 at Pigeon Hill Rd	4	2	30	40	4	120
9	CR 93 (Ocean Ave) at I495N	3	2	40	40	3	120
11	CR 28 (New Hwy) at NY 109	5	3	40	50	5	185
16	NY 112 at NY 27N	3	2	40	35	3	120
19	CR 2 (Straight Path) at NY27	4	2	45	35	4	190
22	NY 110 at Conklin St	4	2	55	40	4	140
23	NY 110 at NY 25	4	3	40	40	4	120
30	NY454 at Broadway	4	2	30	55	4	170
36	CR 47, Great Neck Rd at NY 27A	4	2	30	40	4	115
38	NY 25A at Mount Sinai Coram Road	4	2	35	45	4	140
39	Miller Place Rod at NY 25A	4	2	30	45	4	145
49	CR 3, Pinelawn Road at I495 Express Drive North	3	2	40	40	3	115
51	NY 231, Deer Park Ave at CR 57, Bayshore Road	4	2	40	30	3	120
54	CR 13, Fifth Ave at CR 50, Union Blvd	3	3	30	35	3	85
57	CR 13, Fifth Ave at CR 57, Bay Shore Rd	4	3	40	30	4	90
76	CR 13A, N. Clinton Ave at CR 50, Union Blvd	3	2	30	35	2	85
85	CR 4, Commack Road at Hauppauge Rd/ New Highway	4	1	40	30	4	100
92	CR 19, Waverly Ave at NYS 27, NSR	3	2	30	35	3	90

3.1.3 Summary of Individual Intersection Investigations –100 Active RLC Intersections

Based on the foregoing, it can be seen that while the RLC program exhibits the trend that the total number of crashes was higher and the number of fatal and injury (F/I) crashes was lower at the 100 Active intersections than the projected number of crashes, not all the intersections exhibited this pattern. Individual intersections that did not follow the trends were identified for additional analyses, and the following observations are made in this regard:

1. **Fifteen (15) locations where the annual average number of F/I crashes increased notably by more than 2.0 crashes per year were identified. At these intersections, 153 more F/I crashes occurred than projected. Had these locations followed the overall trend, additional reduction in the number of F/I crashes programwide would have occurred.**
2. **These locations were examined closely for operational and geometric similarities that might help identify factors related to this outcome, but none were immediately apparent.**
3. **Changes in roadway geometry or additional development on properties adjacent to the intersections were investigated, which in some cases may have impacted crash experience.**
4. **At nineteen (19) Active intersections F/I crashes went down notably by more than 2.0 annual average crashes. These intersections accounted for 167 fewer F/I crashes overall.**
5. **These locations were also examined closely for operational and geometric similarities that might help identify intersections that would benefit most from RLC enforcement. Again, none was apparent.**

3.2 Analysis of Individual Intersections – 18 Deactivated RLC Intersections

The crash patterns at the 18 Deactivated locations exhibited trends that were different from those at the 100 Active intersection locations, and different from the trends anticipated based on the results of studies of other RLC programs and this report at the 100 Active intersections. From Pre-Enforcement to Active Enforcement, the annual average number of total crashes was virtually unchanged, as was the annual average number of F/I crashes, and were therefore slightly below the projected number of crashes. From Active-Enforcement to Post-Enforcement, the annual average number of total crashes did increase, as did the annual average number of F/I crashes, although by a negligible amount. Table 3-5 provides a comparison of the actual crashes that occurred during the Active-Enforcement 24 month period (2010-2013) and the projected crashes that would have been expected to occur during this time period. The projected crashes were calculated by applying the growth rates previously discussed in this report.

Table 3-5. Active-Enforcement Period (2010-2013) Actual vs Projected* Crash Experience, 18 Deactivated Intersections

Intersection ID		Projected* Crashes Active-Enforcement Period (24 Month) (2010-2013)		Actual Crashes Active-Enforcement Period (24 month) (2010 -2013)		Difference Actual Crashes Active-Enforcement Period (2010-2013) to Projected* Crashes Active Enforcement Period (2010-2013)	
#	Name	Projected* Annual Avg. Combined F/I Crashes	Projected* Annual Avg. Total Crashes	Annual Avg. No. Combined F/I Crashes	Annual Avg. Total Crashes	Change in Annual Avg. Combined F/I Crashes	Change in Annual Avg. Total Crashes
101	CR 67 (Motor Parkway) at I495N (Exit 57)	1.4	2.4	1.5	1.5	0.1	-0.9
102	CR 97 (Nicholls Rd) at NY347	13.3	32.1	12.5	37.5	-0.8	5.4
103	NY25 at Boyle Rd	10.6	21.8	7.0	14.0	-3.6	-7.8
104	CR 93 (Lakeland) at NY27S NSR	2.4	5.8	0.5	3.5	-1.9	-2.3
105	NY25 at Marshall Dr/Paula Blvd	7.2	16.4	5.5	12.5	-1.7	-3.9
106	CR 112 (Johnson Ave) at NY27S	0.0	1.0	0.0	0.0	0.0	-1.0
107	NY454 at CR 67 (Motor Pkwy)	6.1	11.6	6.0	13.0	-0.1	1.4
108	NY112 at CR 16 (Horseblock Rd)	12.3	24.6	11.5	28.0	-0.8	3.4
109	NY347 at Old Town Rd	7.5	17.7	7.5	21.5	0.0	3.8
110	NY454 at Old Willets Path	4.8	10.6	6.0	9.5	1.2	-1.1
111	NY25 at CR 97 (Nicholls Rd)	8.9	28.6	5.5	15.5	-3.4	-13.1
112	NY454 at CR 112 (Johnson Ave)	4.1	13.3	5.0	9.5	0.9	-3.8
113	NY347 at NY25	5.8	15.0	4.0	10.0	-1.8	-5.0
114	NY347 at Stonybrook Rd	7.5	20.1	10.5	28.0	3.0	7.9
115	NY27 at N. Delaware Ave	2.4	4.4	6.5	13.0	4.1	8.6
116	NY27 at N. Monroe Ave	3.8	7.8	3.0	7.5	-0.8	-0.3
117	NY231 (Deer Park Ave) at I495N	3.8	11.3	4.5	15.5	0.7	4.2
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	0.7	1.7	1.0	2.5	0.3	0.8
	Totals:	**102.3**	**246.2**	**98.0**	**242.5**	**-4.3**	**-3.7**

**Projections are based on 2.3% growth in Countywide crashes at signalized intersections from 2007- 2009 to 2010 - 2013.*

Table 3-6. Post-Enforcement Period (2015-2017) Actual vs Projected* Crash Experience, 18 Deactivated Intersections

Intersection ID		Projected* Crashes Post-Enforcement Period (2015-2017)		Actual Crashes Post-Enforcement Period (2015-2017)		Difference to Actual Crashes Post-Enforcement Period to Projected* Crashes Post-Enforcement Period	
#	Name	Projected Annual Avg. No. Comb. F/I	Projected Annual Avg. Total Crashes	Annual Avg. No. Combined F/I	Avg. Annual Crashes	Change in Average Annual F/I Crashes	Change in Avg. Annual Crashes
101	CR 67 (Motor Parkway) at I495N (Exit 57)	1.5	2.6	9.3	22.0	7.8	19.4
102	CR 97 (Nicholls Rd) at NY347	14.6	35.1	16.7	62.0	2.1	26.9
103	NY25 at Boyle Rd	11.6	23.9	7.0	21.7	-4.6	-2.2
104	CR 93 (Lakeland) at NY27S NSR	2.6	6.4	2.0	11.7	-0.6	5.3
105	NY25 at Marshall Dr/Paula Blvd	7.8	17.9	5.7	19.3	-2.2	1.4
106	CR 112 (Johnson Ave) at NY27S	0.0	1.1	0.3	1.3	0.3	0.2
107	NY454 at CR 67 (Motor Pkwy)	6.7	12.7	4.3	17.0	-2.4	4.3
108	NY112 at CR 16 (Horseblock Rd)	13.5	26.9	10.0	43.3	-3.5	16.4
109	NY347 at Old Town Rd	8.2	19.4	9.3	36.0	1.1	16.6
110	NY454 at Old Willets Path	5.2	11.6	4.0	23.0	-1.2	11.4
111	NY25 at CR 97 (Nicholls Rd)	9.7	31.4	4.3	16.7	-5.4	-14.7
112	NY454 at CR 112 (Johnson Ave)	4.5	14.6	8.0	20.0	3.5	5.4
113	NY347 at NY25	6.4	16.4	5.3	22.0	-1.0	5.6
114	NY347 at Stonybrook Rd	8.2	22.0	5.3	27.7	-2.9	5.6
115	NY27 at N. Delaware Ave	2.6	4.9	5.0	16.7	2.4	11.8
116	NY27 at N. Monroe Ave	4.1	8.6	5.7	14.7	1.6	6.1
117	NY231 (Deer Park Ave) at I495N	4.1	12.3	4.0	26.7	-0.1	14.3
118	NY231 (Deer Park Ave) at CR2 (Straight Path)	0.7	1.9	2.7	11.3	1.9	9.5
	Totals:	**112.1**	**269.8**	**109.0**	**413.0**	**-3.1**	**143.2**

**Projections are based on 9.6% growth in Countywide crashes at signalized intersections from 2010- 2013 to 2015 - 2017*

Regarding the crash experience following removal of the cameras, Table 3-6 provides a comparison of the actual crashes that occurred after removal of the cameras and the projected number of crashes, again based on the growth rates previously discussed. As can be seen, as was the case with the 100 Active intersection locations, not all Deactivated intersections followed the overall trends. The following sections provide a discussion of the crash experience at the individual Deactivated intersections that exhibited crash experience notably different from that noted at RLC locations in general.

3.2.1 Analysis of Crash Severity at Individual Intersections- 18 Deactivated RLC Intersections

As can be seen in Table 3-5, during the 24 Month Active-Enforcement period (2010-2013), seven (7) of the 18 Deactivated intersections exhibited an increase in average annual F/I crashes above the projected number, two of which showed a notable average annual increase in F/I crashes (greater than 2.0 crashes per year). Thus, these locations did not follow the trend noted in the crash experience at the 100 Active locations. All remaining Deactivated locations exhibited annual average F/I crashes lower than the projected number, although only two (2) of those Deactivated intersections showed decreases greater than 2.0 annual average F/I crashes. Since RLC enforcement has already been terminated at these 18 locations, additional analyses are not warranted. However, the early installation date and its potential impact on the effect of the RLC program on driver behavior at these locations, as discussed earlier, is noted.

As can be seen in table 3-6, following removal of the cameras, during the Post-Enforcement period (2015-2017), eight (8) of the eighteen intersections showed increases in average annual F/I crashes beyond projected values, four (4) of which were notable and exceeded 2.0 F/I crashes per year. At four other locations, average annual F/I crashes decreased by 2.0 crashes. These changes are not considered statistically significant. Due to the small sample size, no conclusions can be drawn regarding the impact of crash experience of the removal of the RLC program from these locations.

3.2.2 Analysis of Changes in Total Crashes at Individual Intersections - 18 Deactivated RLC Intersections

Eight (8) intersections experienced increases in total crashes in excess of Active-Enforcement period projected crashes. Several of these locations also exhibited decreases in F/I crashes which would be consistent with expectations at the 100 Active intersection locations, and at other RLC programs examined for this study. Once again, these changes are too small to be of significance regarding the effects of the RLC program.

However, per table 3-6, after camera removal and when comparing actual to projected crashes during the Post-Enforcement period (2015-2017), a number of the Deactivated intersection locations experienced an increase in the annual average number of crashes above that projected. Seven (7) of these intersections experienced increases of greater than 10.0 crashes per year, with only one that had a corresponding decrease in F/I crashes. Again, this is not in keeping with the results noted at the Active intersections.

Examination of the geometric and operational attributes of these locations do not indicate any significant similarities or differences that would be expected to influence the crash experience, such as high speed limits, long cycle lengths, or complex signal timing.

It should be noted that due to the small sample size and short duration of active RLC monitoring at these locations, caution must be exercised when attempting to correlate crash patterns to the implementation of the RLC program.

3.2.3 Summary of Individual Intersection Investigations- 18 Deactivated Intersections

1. **The number of annual average total crashes remained essentially unchanged between the Pre-Enforcement period (2007-2009) and Active Enforcement 24 month period (2010-2013) at the 18 Deactivated locations.**
2. **Contrary to trends at the 100 Active intersection locations and at other RLC programs, during the 24 Month Active-Enforcement period (2010-2013), seven (7) of the 18 Deactivated intersections exhibited an increase in average annual F/I crashes above the projected number, two of which showed a notable average annual increase in F/I crashes (greater than 2.0 crashes per year).**
3. **Eight (8) intersections experienced increases in total crashes in excess of Active-Enforcement period projected crashes. Two (2) of these locations also exhibited a notable annual average decreases in F/I crashes of more than 2.0 which would be consistent with expectations at the 100 Active intersection locations, and at other RLC programs examined for this study.**
4. **Following removal of the cameras, during the Post-Enforcement period (2015-2017), eight (8) of the eighteen intersections showed increases in average annual F/I crashes beyond projected values, four (4) of which were notable and exceeded 2.0 F/I crashes per year. At four other locations, average annual F/I crashes decreased by 2.0 crashes.**
5. **Seven (7) Deactivated intersections experienced increases of greater than 10.0 crashes per year following camera removal, with only one that had a corresponding decrease in F/I crashes.**
6. **It should be noted that due to the small sample size and short duration of active RLC monitoring at these locations, caution must be exercised when attempting to correlate crash patterns to the implementation of the RLC program.**

Section 4 Fatal Crash Review – 100 Active Intersections

4.1 Introduction

A review was conducted of all crashes that involved fatalities during the study periods at the 100 Active intersection locations. During the Pre-Enforcement period, seventeen (17) fatal crashes occurred, and during the Active-Enforcement period, seventeen (17) fatal crashes also occurred. Table 4-1 and Table 4-2 present the location and date of each fatal crash for the Pre-Enforcement and Active Enforcement periods respectively and are shown in Figure 4-1 and Figure 4-2.

Table 4-1. Fatal Crash Locations Pre-Enforcement Period (2007-2009), 100 Active Intersections

Intersection ID		Pre-Enforcement (2007 – 2009)	
Intersection ID	Name	Number of Fatal Crashes	Date (s) of Fatal Crashes
3	NY25 at Pidgeon Hill Rd	1	8/16/2008
12	CR 83 at NY25	1	12/15/2008
13	NY25 at Holbrook Rd	1	8/31/2009
18	I495S at CR 4 (Commack Rd)	1	12/19/2008
19	CR 2 (Straight Path) at NY27	2	11/22/2007, 4/12/2008
25	NY25 at NY112	1	10/20/2007
30	NY454 at Broadway	1	8/25/2009
31	NY347 at Mark Tree Rd	1	9/2/2007
32	I495S at NY231 (Deer Park Ave)	1	6/17/2007
33	NY111, Joshua's Path at CR 67, Motor Pkwy	1	9/1/2007
41	CR 47, Great Neck Rd at CR 2, Dixon Ave	1	11/22/2007
62	CR 46, William Floyd Pkwy at Surrey Circle	1	4/9/2008
75	NYS 109 at CR 96, Great East Neck Rd	1	1/30/2008
85	CR 4, Commack Rd at Hauppauge Rd/ New Highway	1	3/18/2009
86	CR 16, Terry Rd at NYS 347	1	11/25/2009
96	NY 109 at CR 2, Straight Path	1	8/4/2008
	Total	**17**	

Table 4-2. Fatal Crash Locations Active Enforcement Period (2015-2017), 100 Active Intersections

Intersection ID		Active-Enforcement (2015 – 2017)	
Intersection ID	Name	Number of Fatal Crashes	Date (s) of Fatal Crashes
1	CR 4 (Commack Rd) at I495N	1	5/28/2017
8	NY111 at I495S	1	11/27/2017
19	CR 2 (Straight Path) at NY27	2	8/28/2015, 12/4/2015
23	NY110 at NY25	1	6/26/2016
25	NY25 at NY112	1	2/11/2015
26	NY25A at CR 21 (Rocky Point -Yaphank Rd)	1	9/22/2016
39	Miller Place Rd at NY 25A	2	5/5/2015, 2/24/2017
40	NY 454 at Lincoln Ave	1	1/30/2015
41	CR 47, Great Neck Rd at CR 2, Dixon Ave	1	10/7/2016
56	CR 17, Carleton Ave at CR 100, Suffolk Ave	1	9/16/2016
64	CR 80, Montauk Hwy at Garden Pl	1	12/30/2015
67	CR 46, William Floyd Pkwy at CR 80, Montauk Hwy	1	8/11/2015
72	NYS 25 at Dawn Dr	1	4/21/2015
90	CR 83, North Ocean Ave at CR 16, Horseblock Rd	1	6/20/2015
94	CR 80, Montauk Hwy at Washington Ave/ Herkimer St	1	7/20/2017
	Total	**17**	

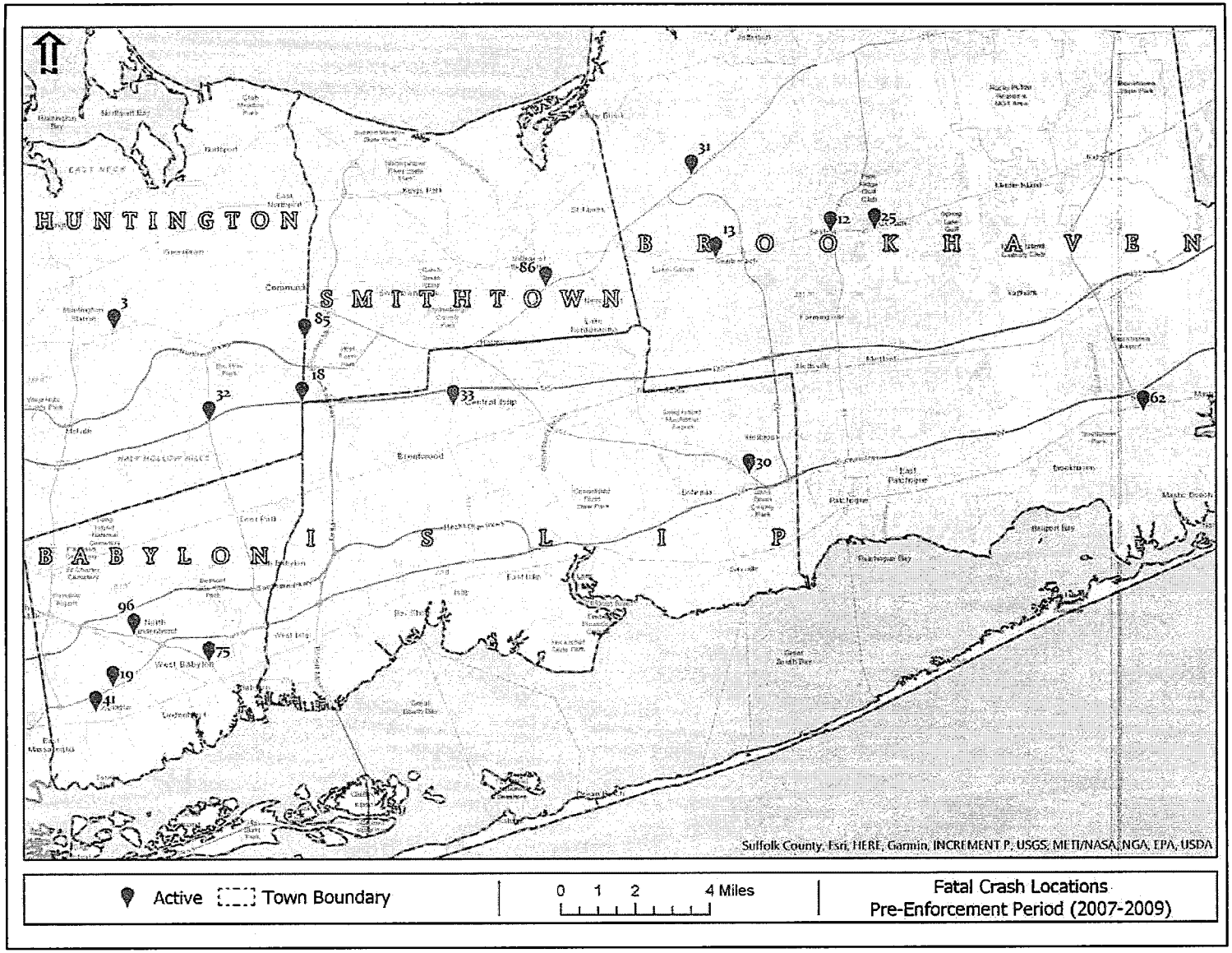


Figure 4-1. Fatal Crash Locations – Pre-Enforcement Period (2007-2009)

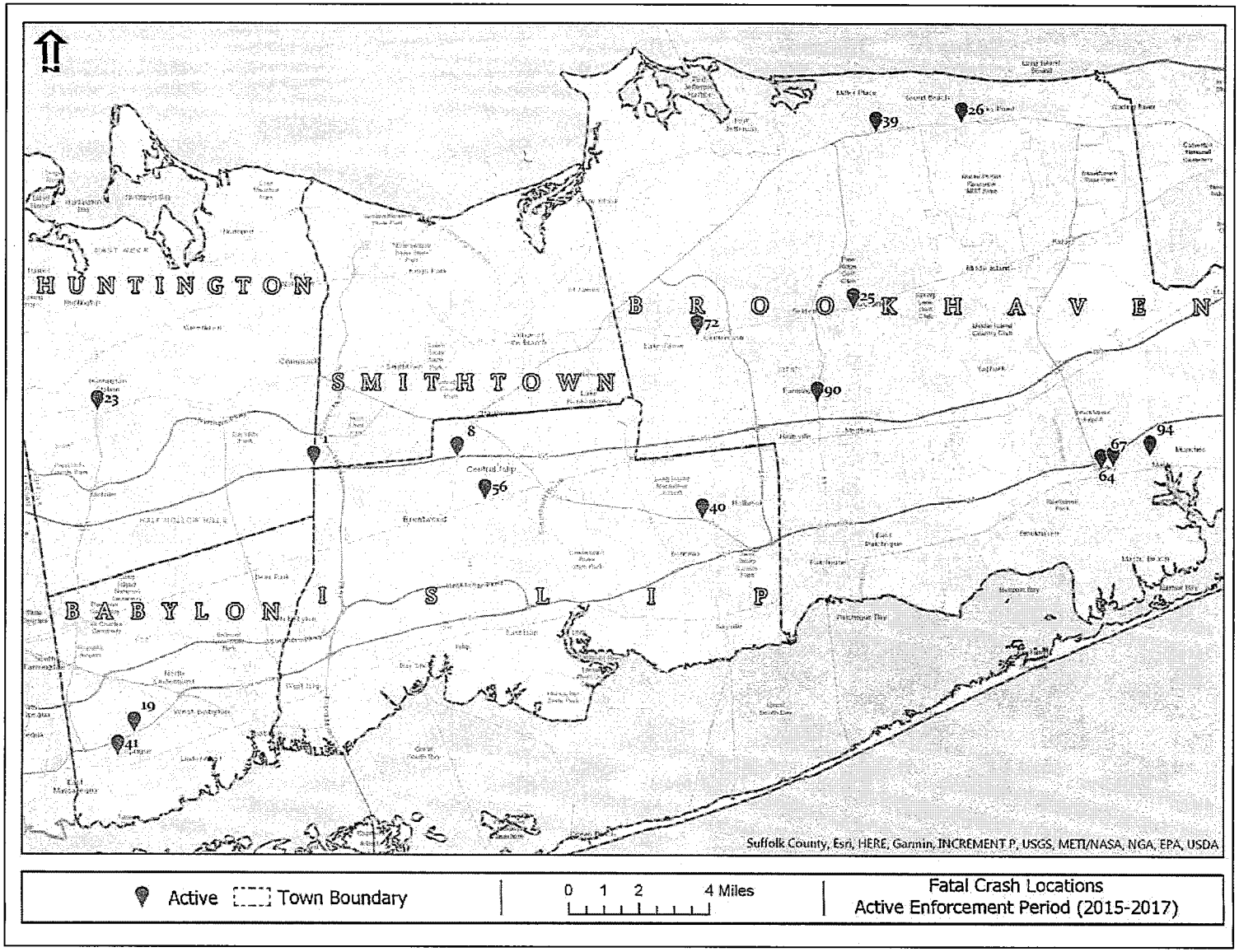


Figure 4-2. Fatal Crash Locations – Active Enforcement Period (2015-2017)

4.2 Findings

Note that although the overall number of fatal crashes was unchanged, had fatal crashes grown at countywide rates for crashes in general, a slight increase in fatal crashes would be expected. Note also that the number of fatal crashes declined from nine (9) in 2015 to four in 2016, and four also occurred in 2017. However fatal crashes are rare occurrences, and a single crash has the potential to influence any attempt at assigning trends to rates of fatal crash occurrence of any but the most general kind. For example, 14 of the seventeen locations that experienced fatal crashes during Pre-Enforcement saw none during Active-Enforcement. It is noted that eight of the seventeen crashes that occurred during the Pre-Enforcement period were left turn or right angle crashes that involved vehicles that were reported to have ignored a red signal, while only three during the Active-Enforcement period were noted as crashes where one involved vehicle was reported to have run a red light.

Further review of the tables indicates that only three locations experienced fatal crashes during both Pre-Enforcement and Active Enforcement. Of particular concern is Intersection 19, CR2 Straight Path at NY27 Sunrise Highway. Two fatal crashes occurred at this location during both the Pre-Enforcement and Active Enforcement periods. The MV-104A's for these crashes have been examined. These documents indicate that none of the crashes were of the type that might be influenced by RLC enforcement. The driver in one of the crashes that occurred during the Pre-Enforcement period suffered from a medical emergency and lost control of the vehicle at high speed, ultimately resulting in the death of two passengers in the vehicle. The second fatal crash during that period involved a bicyclist riding in the left lane of NY27 and had no relationship to the traffic signal operation.

Regarding the fatal crashes that occurred during the Active-Enforcement period, both crashes occurred in 2015, one involving a pedestrian and the other involving a bicyclist. No red light violations were reported on the MV-104A for either crash.

Section 5 Locations of Legislator Concern

5.1 Introduction

Due to inquiries from members of the Suffolk County Legislature, three intersections were identified for additional examination. These intersections are:

- Intersection 39, NY25A at Miller Place Road
- Intersection 48, NY25 at CR14 Indian Head / Harned Road
- Intersection 84, CR4 Commack Road at Dorothea Street

Table 5-1 provides information on crash type and Table 5-2 provides information on crash severity during the Pre-Enforcement and Active-Enforcement periods at these locations. The following sections provide a discussion of the results of the investigations conducted into these three locations.

Table 5-1. Crash Type at Intersections of Concern to Legislators

Intersection ID		Crash Type	Pre-Enforcement Period (2007 - 2009)		Active Enforcement Period (2015 -2017)		Change in Crash Experience	
Number	Name		Total Number of Crashes	Annual Average Number of Crashes	Total Number of Crashes	Annual Average Number of Crashes	Total Number of Crashes	Annual Average Number of Crashes
39	Miller Place Rd at NY 25A	LEFT TURN WITH	1	0.3	5	1.7	4	1.4
		REAR END	27	9.0	54	18.0	27	9.0
		OVERTAKING	9	3.0	8	2.7	-1	-0.3
		LEFT TURN OPPOSING	26	8.7	17	5.7	-9	-3.0
		RIGHT ANGLE	9	3.0	2	0.7	-7	-2.3
		RIGHT TURN WITH	3	1.0	6	2.0	3	1.0
		RIGHT TURN OPPOSING	1	0.3	1	0.3	0	0.0
		HEAD ON	1	0.3	0	0.0	-1	-0.3
		SIDESWIPE	0	0.0	0	0.0	0	0.0
		OTHER	4	1.3	8	2.7	4	1.4
		PEDESTRIAN	2	0.7	1	0.3	-1	-0.4
		BICYCLE	3	1.0	2	0.7	-1	-0.3
		Intersection Total	**86**	**28.7**	**104**	**34.7**	**18**	**6.0**
48	CR 14, Indian Head/ Harned Rd at NY 25	LEFT TURN WITH	2	0.7	1	0.3	-1	-0.4
		REAR END	15	5.0	47	15.7	32	10.7
		OVERTAKING	1	0.3	27	9.0	26	8.7
		LEFT TURN OPPOSING	15	5.0	24	8.0	9	3.0
		RIGHT ANGLE	1	0.3	2	0.7	1	0.4
		RIGHT TURN WITH	3	1.0	3	1.0	0	0.0
		RIGHT TURN OPPOSING	2	0.7	3	1.0	1	0.3
		HEAD ON	0	0.0	0	0.0	0	0.0
		SIDESWIPE	1	0.3	1	0.3	0	0.0
		OTHER	2	0.7	3	1.0	1	0.3
		PEDESTRIAN	0	0.0	0	0.0	0	0.0
		BICYCLE	1	0.3	0	0.0	-1	-0.3
		Intersection Total	**43**	**14.3**	**111**	**37.0**	**68**	**22.7**
84	CR 4, Commack Rd at Dorothea St	LEFT TURN WITH	0	0.0	0	0.0	0	0.0
		REAR END	6	2.0	3	1.0	-3	-1.0
		OVERTAKING	2	0.7	1	0.3	-1	-0.4
		LEFT TURN OPPOSING	5	1.7	7	2.3	2	0.6
		RIGHT ANGLE	1	0.3	0	0.0	-1	-0.3
		RIGHT TURN WITH	1	0.3	0	0.0	-1	-0.3
		RIGHT TURN OPPOSING	1	0.3	0	0.0	-1	-0.3
		HEAD ON	0	0.0	0	0.0	0	0.0
		SIDESWIPE	0	0.0	1	0.3	1	0.3
		OTHER	0	0.0	2	0.7	2	0.7
		PEDESTRIAN	0	0.0	0	0.0	0	0.0
		BICYCLE	0	0.0	1	0.3	1	0.3
		Intersection Total	**16**	**5.3**	**15**	**5.0**	**-1**	**-0.3**

Table 5-2. Crash Severity at Intersections of Concern to Legislators

Intersection ID		Pre-Enforcement Period (2007 - 2009)					Active-Enforcement Period (2015 -2017)					Change in Crash Experience			
#	Name	Fatal Crashes	Injury Crashes	Total Crashes	Annual Average No. Crashes - Fatal	Annual Average No. Crashes - Injury	Fatal Crashes	Injury Crashes	Total Crashes	Annual Average No. Crashes - Fatal	Annual Average No. Crashes - Injury	Change in Fatal Crashes	Annual Avg. Number of Crashes	Change in Injury Crashes	Annual Average Number of Crashes
39	Miller Place Rd at NY 25A	0	35	86	0.0	11.7	2	23	104	0.7	7.7	2	0.7	-16	-5.3
48	CR 14, Indian Head/ Harned Rd at NY 25	0	17	43	0.0	5.7	0	22	111	0.0	7.3	0	0.0	3	1.0
84	CR 4, Commack Rd at Dorothea St	0	4	16	0.0	1.3	0	5	15	0.0	1.7	0	0.0	1	0.3

5.2 Intersection 39, NY25A at Miller Place Road

This is a four-leg intersection of NYS Route 25A and Miller Place Road, in Miller Place, NY. NYS Route 25A is a major east west NYS highway that provides two lanes in each directions, with separate left and right turn lanes at the intersection. NYS Route 25A is classified as an Urban Principal arterial with an estimated Average Annual Daily Traffic (AADT) of 25113 vehicles per day (vpd) in 2016. Miller Place Road is a north south Town of Brookhaven roadway that provides one lane in each direction, with left and right turn lanes at the intersection. Miller Place Road is classified as an Urban major collector with an estimated AADT of 13376vpd in 2016. There are red light cameras on the northbound and southbound approaches of Miller Place Road.

During the Pre-Enforcement period (2007-2009), 28.7 crashes per year occurred at this location, including 11.7 injury crashes and no fatal crashes. During the Active-Enforcement period (2015-2017), 34.7 total crashes occurred, including 8.0 injury crashes and two fatal crashes. Thus, the overall number of annual crashes increased while the number of F/I crashes decreased, in keeping with the overall trend at Active intersection locations. Total left turn and right angle crashes decreased, while total rear end and overtaking crashes increased, also in keeping with noted overall trends at Active RLC intersections.

The first fatal crash occurred on May 5, 2015 at 11:30 PM, when a vehicle traveling westbound on Miller Place Road struck a pedestrian crossing NY 25A. The MV-104A indicates that the operator stated that the pedestrian was in the middle of the intersection and that the signal was green for westbound traffic. The MV104 indicates that the pedestrian was in the middle of the intersection. RLC enforcement was therefore not active on the intersection approach that the vehicle was traveling on at the time of the crash. At the time of the crash, pedestrian crosswalks were provided for all for intersection approaches, as were pedestrian signals to cross NY25A.

The second fatal crash occurred on February 24 2017 at 5:04PM, when a northbound vehicle turning left onto westbound NY25A struck a bicyclist crossing NY 25A from south to north. The bicycle was in the crosswalk on the west side of the intersection where pedestrian activity is expected. RLC enforcement was therefore active on the intersection approach that the vehicle was traveling on at the time of the crash. Since the time of the crash, pavement markings have been upgraded, and signal phasing modifications and additional pedestrian equipment installed.

5.3 Intersection 48, NY25 at CR14 Indian Head / Harned Road

This is a five-leg intersection of NYS Route 25 and CR14 Indian Head / Harned Road in Commack, NY. The intersection is just east of the Sunken Meadow Parkway, and the northbound exit ramp from the parkway to NY25 forms the northeast bound fifth approach to the intersection in the southwest quadrant. NYS Route 25 is a major east west NYS highway that provides two lanes in each direction, with separate left and right turn lanes at the intersection. NYS Route 25 is classified as an Urban Principal arterial with an estimated Average Annual Daily Traffic (AADT) of 22457vpd in 2016. CR14 is a north south Suffolk County roadway that provides one lane in each direction, with left and right turn lanes at the intersection. CR14 is an Urban Minor arterial with an estimated AADT of 17376vpd in 2016. There are red light cameras on the northbound, southbound and westbound approaches.

During the Pre-Enforcement period, 14.3 total crashes occurred annually at this location, including 5.7 injury crashes and no fatal crashes. During the Active-Enforcement period, 37.0 total crashes occurred annually including 7.3 annual injury crashes and no fatal crashes. Thus, the number of total crashes increased while the number of F/I crashes failed to decrease. In addition, left turn and right angle crashes also increased as did rear end and overtaking crashes (see Table 5-2). This is not in keeping with the overall trend at Active intersection locations. No geometric improvements to intersection have been implemented since 2009. However, the southeast quadrant of the intersection was redeveloped in 2014 with a gas station and convenience store, which may have contributed to the increase in the number of crashes.

5.4 Intersection 84, CR4, Commack Road at Dorothea Street

This is a four-leg intersection of CR4, Commack Road at Dorothea Street in Commack, NY. Commack Road is a north south Suffolk County highway that provides two lanes in each direction, with separate left turn lanes at the intersection. Commack Road is classified as an Urban Minor arterial with AADT of 42698vpd in 2016. Dorothea Street is an east west Town of Huntington local roadway that provides one lane in each direction, with no turn lanes at the intersection. No AADT information is available for Dorothea Street. A commercial driveway forms the westbound leg of the intersection. There are red light cameras on the northbound and southbound CR4 approaches.

During the Pre-Enforcement period, 5.3 total crashes occurred annually at this location, including 1.3 injury crashes and no fatal crashes. During the Active-Enforcement period, 5.0 total crashes occurred annually, including 1.7 annual injury crashes and no fatal crashes. Total crashes were therefore reduced, and F/I crashes were essentially the same. Crash types also remained basically unchanged. Thus, the number, severity and type of crashes was essentially unchanged. Although F/I crashes failed to decrease, no increase was noted, and the slight increase in total crashes was fewer than projected based on countywide crash statistics. While this does not mirror precisely the overall trend, the intersection nonetheless exhibits fewer F/I crashes than projected during RLC enforcement. No geometric improvements to the intersection have been implemented since 2009.

Section 6 Findings, Conclusions and Recommendations

6.1 Summary of Findings

The findings based on the results of this comprehensive, in-depth analysis of the crash experience at the signalized intersections included in the Suffolk County Red Light Camera Program are as follows:

1. The number of total crashes at the 100 Active RLC camera locations increased by 59.6%, from 3,515 to 5,612, between the two study periods examined in this study, 2007 – 2009 Pre-Enforcement and 2015 - 2017 Active-Enforcement.

2. The number of signalized intersections crashes Countywide increased by 12.1% between the two study periods examined in this study, Pre-Enforcement (2007 – 2009) and Active Enforcement (2015- 2017). Had the total number of crashes increased by the countywide rate, 3,940 total crashes could have been expected at the 100 RLC Active intersections during the three year period from 2015 to 2017. Therefore, 1,672 more crashes, a 42% increase, occurred at these locations than projected, or 557.3 more per year than projected.

3. The number of crashes that resulted in injury at the 100 Active intersection locations was lower than the number of crashes projected based on signalized intersection countywide crash rates. During the Active-Enforcement period (2015-2017), 1,403 such crashes occurred, while 1,574 were projected. Therefore, 171 fewer such crashes an average of 57.0 fewer crashes per year, occurred than had they increased at the countywide rate.

4. The total number of crashes that involved fatalities was unchanged between the Pre-Enforcement (2007- 2009) and Active-Enforcement (2015 – 2017) periods studied. Since fatal crashes are rare occurrences, statistical relationships and specific projections of increases or decreases in the number of fatal crashes are difficult to forecast. However, no increase in fatal crashes was noted.

5. The number of left turn and right angle crashes, generally considered to include a higher number of more severe crashes, and which are associated with red light running, was lower than the projected number of these crash types during the Active-Enforcement (2015 – 2017) period while the number of rear end and overtaking crashes was higher than projected.

6. The analyses confirm the trend identified in prior studies of RLC locations in other municipalities that concluded overall crashes increase but fatal and injury (F/I) crashes decrease with the implementation of RLC programs.

7. Overall, using standard NYSDOT crash reduction cost benefit methodology, the change in severity between the projected and actual crashes at these locations during the Active-Enforcement

period (2015-2017)has resulted in a crash cost benefit of approximately $5.14M per year due to the reduction in anticipated fatal and injury (F/I) crashes, based on NYSDOT crash cost benefit methodology.

8. At fifteen (15) Active intersection locations, actual fatal and injury (F/I) crashes exceeded projected crashes by a notable amount (more than 2.0 crashes per year). These locations do not follow the program trend. Further investigations at these locations did not result in determination of any common factors that would explain these results.

9. Nineteen (19) Active intersection locations exhibited notably fewer (greater than 2.0 fewer) F/I crashes during the Active Enforcement period, seven (7) of which also experienced decreases in overall crashes. These locations exhibited better crash experience than the 100 Active intersections overall. Further investigations indicated that geometric improvements had been made at three (3) of these locations. As above, these locations did not exhibit any common factors that would explain these results.

10. The crash patterns at Deactivated locations exhibited patterns that were different from those at Active intersection locations. From Pre-Enforcement to Active Enforcement, the annual average number of total crashes was virtually unchanged, as was the number of injury crashes. Thus, both were slightly lower than the projected number of crashes.

11. At the Deactivated intersection locations, during the Active-Enforcement 24 month period (2020-2013), the number of fatal and injury and PDO crashes was lower than would have been expected, but the difference was so low as to be insignificant.

12. At the Deactivated intersection locations, left turn and right angle crashes were lower than projected during 24 Month Active-Enforcement period, and rear end and overtaking crashes were higher.

13. At the Deactivated intersection locations, following removal of the cameras, the following was noted:

    a. Crashes involving fatalities and injuries remained essentially unchanged, while property damage only crashes were nearly 100% higher than projected.

    b. Rear end, overtaking, right angle and left turn crashes were all higher than the projected annual average number of crashes based on countywide crash rates.

    c. Right angle crashes increased significantly more than would have been expected, doubling from approximately 12 to 24 crashes per year.

14. At the Deactivated intersection locations, an additional analysis of the Post-Enforcement period which examined what happened several years after the cameras had been removed, and attempted to compare crash history with that which may have prevailed had the RLC program not have been implemented, the following was observed:

    a. Combined fatal and injury crashes were essentially equal to the projected number of crashes, while property damage only crashes were 90% higher than projected.

    b. Total left turn decreased and right angle crashes increased slightly. Rear end and overtaking crashes increased at rates that might have been expected had the cameras remained in place.

15. At the 18 Deactivated intersection locations, contrary to trends at the 100 Active intersection locations and at other RLC programs, during the 24 Month Active-Enforcement period (2010-2013), seven (7) of the 18 Deactivated intersections exhibited an increase in average annual F/I crashes above the projected number, two of which showed a notable average annual increase in F/I crashes (greater than 2.0 crashes per year).

16. At the 18 Deactivated intersection locations, following removal of the cameras, during the Post-Enforcement period (2015-2017), eight (8) of the eighteen intersections showed increases in average annual F/I crashes beyond projected values, four (4) of which were notable and exceeded 2.0 F/I crashes per year. At four other locations, average annual F/I crashes decreased by 2.0 crashes.

17. At the 18 Deactivated intersection locations, seven (7) Deactivated intersections experienced increases of greater than 10.0 crashes per year following camera removal, with only one that had a corresponding decrease in F/I crashes.

18. At the 18 Deactivated intersection locations, it should be noted that due to the small sample size and short duration of active RLC monitoring at these locations, caution must be exercised when attempting to correlate crash patterns to the implementation of the RLC program.

6.2 Conclusions

1. There is a correlation between the RLC program and reduction of severity in the crash experience. There is no definitive way to prove causality.

2. At the Active 100 Intersections, the total number of crashes exceeded Countywide projections during Active Enforcement periods, but Fatal and Injury (F/I) crashes went down.

3. The reduced number of higher severity crashes has resulted in a crash cost reduction benefit of approximately $5.14M per year at the 100 Active Intersections.

4. At the 18 Deactivated locations, during the Active-Enforcements 24-month period (2010-2013) the RLC program had a similar impact on the crash experience as at Active locations.

5. At the 18 Deactivated locations, for all time periods examined, crash types exhibited patterns similar to those at the 100 Active locations, with rear end and overtaking crashes representing nearly the entirety of the total increase in crashes.

6. At the 18 Deactivated locations, termination of RLC monitoring correlated with an increase in crashes, including rear end, overtaking, left turn and right angle crashes without an associated increase in fatal and injury crashes.

7. There is no apparent residual benefit after cameras are removed, since fatal and injury, right angle and left turn crashes were approximately equal to the projected number of crashes at the Deactivated locations had the program not been implemented.

8. Although no studies in the public domain regarding crash experience following the termination of RLC enforcement could be located, and therefore care must be taken regarding the relationship of the RLC program and these crash results, based on the forgoing analysis and investigations.

6.3 Recommendations

1. The Suffolk County Red Light Camera program should be continued due to a reduction in crashes resulting in injury or fatality, and a corresponding reduction in left turn and right angle crashes.

2. At the following intersections where the number of Fatal and Injury (F/I) crashes were not reduced, the Red Light Camera program should be considered for either future study, monitoring or relocation to other signalized intersection locations:

Int.No	Description	Int.No	Description
8	NY111 at I495S	73	CR 2, Straight Path at 35th Street
10	CR 67 (Motor Pkwy) at I495S (Exit 57)	75	NYS 109 at CR 96, Great East Neck Rd
27	NY112 at CR 99 (Woodside Ave)	79	CR 17, Wheeler Rd at CR 67, Motor Parkway
35	Mount Sinai Coram Rd at NY25, Middle Country Rd	89	CR 4, Commack Rd at Marcus Blvd/ Tanger Dwy
50	NY 231, Deer Park Ave at Nicolls Road	90	CR 83, North Ocean Ave at CR 16, Horseblock Rd
52	CR 10, Elwood Road at NY 25, Jericho Turnpike	97	NY 27A at CR 96, Great East Neck Rd/Bergen Ave
60	CR 13, Fifth Ave at CR 100, Suffolk Ave	98	NY 347 at Arrowhead Ln
62	CR 46, William Floyd Pkwy at Surrey Circle		