Supplementary Analysis of the Red Light Camera Program in Garden Grove, CA

By Jay Beeber, Executive Director, Safer Streets L.A., Member ITE
Contact: [redacted] Jay@saferstreetsla.org

The following is our follow-up report on the Red Light Camera (RLC) Program in Garden Grove, California. This report provides independently collected data as well as offering commentary on the Staff Report dated October 27, 2015 in reference to Agenda Item 17b..

Background

At the city council meeting on August 25th Safer Streets L.A. presented an analysis of the Garden Grove Red Light Camera Program which provided evidence that the red light camera program did not improve safety overall at photo enforced intersections and may have decreased safety due to an increase in rear end collisions that occurred at most locations. Our report included an analysis of whether the trade-off of a few less red light running collisions was worth the increase in rear end collisions. City officials requested that staff review our analysis and report back to council.

General Comments

We had hoped that after our report and presentation in August, the city would have reached out to us to discuss the methodology of their analysis and work with us on a new analysis of the data. Unfortunately, this did not occur and we just recently became aware that a new staff report on this item has been drafted. We have reviewed the new staff report and conducted a new analysis of the collision and violation data which we present below. As we stated in our previous correspondence, our goal in forwarding you the following information is not to criticize the elected officials, staff, or city of Garden Grove. In fact, we commend the city for going to great lengths to study this issue and make an informed decision. We hope that this supplemental report proves useful in your deliberations as to whether or not to continue the red light camera program.

In reviewing the staff report and conducting our own further analysis, we find that:

1. Staff did not conduct a proper analysis of the change in the severity of collisions before and after the red light cameras were installed. The staff report only includes an analysis of the change in severity due to red light running collisions but does not include the change in collision severity due to the increase in rear end collisions. Staff's original contention from their August report was that since red light running collisions are expected to be more serious than rear end collisions, the trade-off of fewer red light running collisions with a large increase in rear end collisions still provided a safety benefit. We challenged that assumption and provided our own analysis showing that this was not necessarily correct. **The new staff report does not shed any new light on this question since staff did not include an analysis of the potential overall increase in collision severity due to the substantial increase in rear end collisions that occurred at almost every red light camera enforced intersection.** Our new report will provide this analysis.

Furthermore, the analysis of collision severity within the single category of red light running collisions provided by staff likely overestimates any reduction in collision severity that may have occurred at red light camera locations. As older cars are replaced by newer cars employing better safety technology including side impact airbags, stronger materials, improved engineering of crumple zones, and collision avoidance systems, it would be expected that the number as well as the severity of red light running collisions would decrease over more than a decade and a half, whether or not red light cameras were present. Staff's failure to control for this factor (as well as others) renders their results unreliable.

2. Our analysis will show that even after giving more weight to more serious collisions, there was still an overall increase in the severity of collisions at red light camera intersections. **At intersections where RLR collisions decreased and rear end collisions increased, there was an overall 95.5% increase in collision severity.** Across all red light camera intersections, there was an overall 15% increase in collision severity. Further, for the reasons discussed above, this analysis likely underestimates the negative safety impact of red light cameras as it would be expected that collision severity of all types of collisions would decrease over the long study period absent any external intervention.

3. As stated in our previous report, since the yellow interval was increased at red light camera intersections by 0.5 second in January 2015, there has been more than a 60% decrease in violations at RLC intersections, with some locations seeing a 95% decrease. Fewer violations increase safety, but also decrease revenue to pay for the program. **We estimate that when all revenue and expenses are tabulated for FY 2014-2015, the city could lose up to $143,000 on the program. We further estimate that in FY 2015-2016, the city will lose over $370,000 once the full impact of the reduction in citations is reflected in the revenue returned from the Court.** In fact, in FY 2015-2016, the revenue returned by the red light camera program will likely not even cover payments due to Redflex and certainly won't cover the two police officer's salaries. While the program may have covered its costs in previous years, starting this most recent fiscal year and going forward, that is no longer true.

4. The question that elected officials may wish to ask themselves is not whether the red light cameras have improved safety (we contend that they likely did not), but rather what alternative countermeasures the city can employ to improve safety other than issuing $500 tickets mostly for slow rolling right turns. We have shown that increasing the yellow signal interval by a mere 0.5 second has drastically reduced red light running in Garden Grove. Where red light running violations are still higher than desired, the city can further increase the yellow interval and/or employ other proven engineering countermeasures to reduce red light running and improve safety. There are alternatives to a program that is not improving safety (at least, with certainty, not as much as engineering improvements), will cost the city over $370,000 per year, and which burdens residents and visitors with $500 tickets for mostly minor violations. Rather than continue this program, city officials should explore those other options.

COLLISION ANALYSIS

Safer Streets L.A. conducted an analysis of Red Light Related (RLR) collisions and rear end collisions occurring at seven intersections with red light camera enforcement in Garden Grove. We were unable to conduct an analysis for the intersection of Brookhurst & Westminster due to the fact that collision data from the SWITRS database only goes back as far as January 2001. Since the red light cameras were first installed at this location in July 1999, we do not have the necessary data for the “before period” to conduct our analysis. However, there is no reason to believe that the results of such an analysis would prove different than the results found at the other seven enforced locations.

METHODOLOGY

As the staff report indicates, there are differences in methodology between our analysis and staff analysis. Certainly, reasonable persons can disagree on their methodology. However, for reasons we will explain within, we believe our methodology is more robust and provides a better indication of whether or not red light cameras provided a safety benefit where they were employed. It is also important to remember that even if one concludes that collisions changed by a significant amount, either up or down, it would be difficult to ascribe those changes to only one cause as numerous factors can affect whether a collision occurs or how severe it is.

Rear End Collisions

While it is not unreasonable to include rear end collisions occurring up to 150 feet from the intersection within the analysis, we do not believe that this is the best approach. Including collisions up to 150' does make it less likely that some relevant collision might be missed, but it also makes it more likely that irrelevant collisions might be included. If the presence of red light cameras causes drivers to over-react and slam on their brakes causing a rear end collision, this effect is most likely to occur the closer one gets to the intersection. It is certainly more likely that driver will attempt to emergency brake when they are close to the intersection rather than when they are 150' away, a distance that would give them the opportunity to brake in a more leisurely manner. In other words, drivers who see the light change when they are 150' away from the intersection are unlikely to slam on their brakes at that distance in order to stop, but are much more likely to do so if they see the light change when they are closer on their approach.

The physical laws inherent in stopping a motor vehicle also bear this out. Emergency or "panic" braking is generally considered to be a deceleration rate of about 24 fps^2. A vehicle traveling at 40 mph (59 fps) will stop in about 72 feet if the driver panic brakes at 24 fps^2. If the driver panic brakes at 150', they will come to a stop 78 feet before the intersection. While this could happen, it is unlikely and is certainly much less likely than a driver slamming on their brakes so they can stop from around 70 feet away. Further, any collision that occurs from this action will not occur immediate upon the driver hitting their brakes as both the braking vehicle and the following vehicle will continue moving forward until the car behind overtakes the car in front, resulting in a rear end collision.

For these reasons, including rear end collisions occurring up to 150' from the intersection in the analysis is likely to skew the results as the collisions further away will "water down" the data and mask the effect the cameras may have on causing rear end collisions. While it is likely that rear end collisions caused by drivers slamming on their brakes in the presence of red light cameras occurs on a continuum, and drawing the line at 50' is somewhat arbitrary, we believe it is within this distance that we are most likely to find rear end collisions caused by the presence of the cameras. We therefore maintain our original methodology of analyzing only rear end collisions up to 50' from the intersection as we believe this provides the most accurate results.

Broadside Collisions vs Red Light Running Violations (Vehicle Code Section 21453)

For this supplemental report, we did not analyze broadside collisions as they are not the proper criteria to use when studying the effects of red light cameras, especially where the data specifically includes information on whether or not a collision was caused by someone running a red light. As staff correctly points out, broadside collisions can be caused by many factors beyond someone running a red light, such as, "drivers entering traffic from nearby driveways". Further, just because a broadside collision occurs within the intersection, we have no greater evidence that it was caused by a red light

runner. We therefore reiterate that the best data to use in the analysis are collisions coded as a violation of CVC 21453 (a) and 21453 (c) which are the violation factors of a driver failing to stop at a circular red light or red arrow.

Staff makes the claim that, "by limiting our study to red light running violations, our analysis would not have captured all broadside and rear end collisions required by the study". This statement is somewhat confusing as the database specifically codes rear end collisions with that designation. In order to count rear end collisions, one need only look for collisions coded as such. And if one wishes to count collisions caused by red light running, one need only look for collisions with a primary collision factor violation of CVC 21453 (a) or 21453 (c). Certainly, any particular collision might be mis-coded, but including broadside collisions in order to try to account for these random errors introduces a much greater possibility of skewed results.

To highlight this, we looked at collisions at the intersection of Harbor and Trask from 2001 through 2014. We found a total of 22 broadside collisions occurring within the intersection. Of those 22, only 8 were designated as red light running collisions (primary collision factor violation of CVC 21453 (a) or 21453 (c)). On the other hand, there were a total of 10 collisions designated as red light running but only 8 were broadside collisions. Had we done an analysis of broadside collisions at this intersection using the criteria suggested in the staff report, we would have include 14 collisions that were not due to red light running and missed 2 collisions that were.

We, therefore, stand by our assertion that the best and most accurate analysis of whether red light cameras prevented drivers from running the red light and causing a collision will necessarily include only collisions designated as red light running within the database. Additionally, an analysis of whether red light cameras contributed to rear end collisions from drivers over-reacting and slamming on their brakes would include only those collisions designated as rear-end collisions within the database. These are two separate data sets which can be extracted from the database with relative ease.

Severity Index

We concur that our original severity before-after analysis based on a "1-5 index" scale might be less robust than an analysis using an index where more severe injuries and fatalities are more heavily weighted. Staff suggests using the TIMS Benefit-Cost Analysis Index to weight the collisions. We find a few problems with this approach. First, our review of the TIMS website could not produce the scale listed in the staff report and we therefore cannot check it for accuracy. Further, the scale weights fatalities and severe injuries equally. We do not know if this is an error introduced as staff was writing the report or if it is reflective of the actual TIMS index, but logic dictates that a fatal collision should be weighted much more heavily than a severe injury.

Since we could not find the TIMS index on the website, we searched for other valid collision cost indexes. We found two sources, one from the FHWA[1] and the other within the 2005 report entitled "Safety Evaluation of Red Light Cameras"[2] referenced within the staff report. We reproduce the two sets of data we found below with the addition of a calculated index to use as a multiplying factor within the analysis.

We found that the index from the FHWA most closely matched the TIMS index with the exception that

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1Available at http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec4.cfm
2Available at
http://www.cmfclearinghouse.org/collateral/Safety_Evaluation_of_Red_Light_Cameras.PDF

fatalities were more heavily weighted as we believe they should be and severe collisions we not as heavily weighted. In comparison, the index from the 2005 study did not seem to give sufficient weight to the collisions, with the exception of fatal collisions.

For our analysis, we decided to use a blend of all three indexes. For PDO, Complaint of Pain, Visible Injuries and Severe Injuries, we used the TIMS/ FHWA index numbers. For Fatalities, we used the 2005 study index number because it was more conservative than the FHWA index number.

From FHWA		
Injury Severity Level	Comprehensive Crash Cost	Index
Fatality (K)	$4,008,900.00	541.74
Disabling Injury (A)	$216,000.00	29.19
Evident Injury (B)	$79,000.00	10.68
Possible Injury (C)	$44,900.00	6.07
PDO (O)	$7,400.00	1

From "Safety Evaluation of Red Light Cameras"				
Crash severity level	Right-angle crash cost	Index	Rear end crash cost	Index
K	$4,090,042.00	471.58	$3,781,989.00	329.93
A	$120,810.00	13.93	$84,820.00	7.40
B	$103,468.00	11.93	$27,043.00	2.36
C	$34,690.00	4.00	$49,746.00	4.34
O	$8,673.00	1	$11,463.00	1.00

Severity Index – Additional Notes

The staff report acknowledges that, "It is often the case that with the installation of red light cameras, there is a reduction in broadside collisions and an increase in rear end collisions, the latter relating to motorists 'panic breaking'", and goes on to suggest that it is necessary to "quantify this trade off and its effect on public safety". However, it should be pointed out that the staff report does not actually provide this analysis. Instead, the staff report only includes an analysis of the change in severity due to red light running collisions and does not include the change in collision severity due to the increase in rear end collisions. The entire purpose of creating a severity index and applying it to crashes within the database is to be able to quantify the trade off of a reduction in red light running collisions with an increase in rear end collisions. Since staff did not do this analysis, the staff report does not shed any light on this question.

Crashes with Multiple Injuries

Our original analysis and the current staff analysis are further limited due to the fact that collision severity was only quantified for the crash as a whole, even where there were multiple injuries. For example, a collision with injuries to two parties, both of whom are severely injured, would only be counted as one severe injury. We believe this under-counts the severity of collisions with multiple injuries. A more accurate analysis would count all injuries and assign each the appropriate injury index factor. This is the approach we take in our analysis as it better quantifies how severe a collision actually is.

Differences in Red Light Running Collisions Chosen for Analysis

Based on our review of the staff analysis, it appears that staff only included collisions coded as red light running collisions if the occurred within the intersection and excluded collisions occurring even within a few feet of the intersection. We can find no justification for this decision. Either a collision was caused by a motorist running the red signal at a particular intersection or it was not. It makes no difference whether the actual impact occurred 5, 10, 15, or even 20 feet from the intersection proper. We included in our analysis all red light running collisions that occurred at or near an intersection so long as we were confident that the collision was attributable to a driver violating that traffic signal.

INTERSECTION ANALYSIS

The following is a summary of the results of our analysis followed by the intersection by intersection data.

Summary of Results

At intersections where RLR collisions decreased and rear end collisions increased, there was an overall **95.5% increase in collision severity. This indicates that where the city traded off a reduction in red light running collisions for an increase in rear end collisions, public safety was compromised as the severity of injuries almost doubled.** Across all red light camera intersections, there was an overall 15% increase in collision severity.

Summary of Results Ranked Highest to Lowest Percentage Collision Severity Increase			
	RLR Collisions	Rear End Collisions	Severity of Collisions
Valley View & Chapman	Increase from 0	771.79%	4346.15%
Brookhurst & Chapman	-40.91%	54.55%	274.18%
Valley View & Lampson	-39.39%	16.36%	38.18%
Brookhurst & Trask	-18.18%	183.64%	8.25%
Brookhurst & Orangewood	89.47%	73.68%	5.61%
Magnolia & Trask	-55.68%	190.91%	-5.30%
Harbor & Trask	-82.95%	-21.39%	-68.50%
All Intersections			**15.11%**
Intersections With Decrease in RLR Collisions and Increase in Rear End Collisions			**95.51%**

At two intersections, red light running actually increased. At one location **red light running increased by 89%.** At the other location, there had been no red light running collisions in the years immediately preceding the installation of the cameras so we cannot calculate a percent increase.

Rear end collisions increased at all but one intersection, with the highest increase being a **772% increase at Valley View & Chapman**.

The severity of collisions increased at all but two intersections with the highest **increase of 4346% occurring again at Valley View & Chapman**. The next worse performing intersection was **Brookhurst & Chapman** where the **severity of collisions increased by 274%**.

Overall it appears that the red light camera program did not improve safety in Garden Grove and may have reduced public safety due to an increase in collisions and collision severity.

Statistical Significance

As previously, we conducted a statistical significance test (P-Value T-Test) on both the changes in red light running collisions and rear end collisions. We found a statistically significant decrease in red light running at only one intersection, Harbor & Trask and a statistically significant increase in rear end collisions at two intersections, Brookhurst & Trask (184% increase in collisions) and Valley View & Chapman (772% increase in collisions).

The staff report correctly points out that, “small sample sizes... often do not yield statistical significance”. But this does not relieve the researcher from the obligation of determining statistical significance. Where significance is not found, whether due to small sample sizes or randomness, intellectual honesty dictates that one declare the theory being tested, in this case whether red light cameras reduced collisions, not proven.

Valley View & Chapman - Enforcement start date April 2005									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	0	0	0	0	0	0	0		
2002	0	1	0	0	0	0	1		
2003	0	0	0	0	0	0	0		
2004	0	0	0	0	0	0	0		
Jan – Mar 2005	0	0	0	0	0	0	0		
Apr – Dec 2005	1	4	0	0	0	1	4		
2006	0	3	0	0	0	3	1		
2007	2	4	0	0	1	3	2		
2008	1	0	0	0	0	2	0		
2009	0	1	0	0	0	0	1		
2010	0	1	0	0	0	0	1		
2011	0	1	0	0	1	1	0		
2012	0	1	0	0	0	0	1		
2013	0	3	0	0	0	1	2		
2014	0	2	0	0	0	0	2		
Ave 2001 – Mar 2005	0.00	0.24	472	29	11	6	1		Severity Index FHWA
Ave Apr 2005 – 2014	0.41	2.05	0.00	0.00	0.00	0.00	0.24		Ave 2001 – Mar 2005
% Change	**#DIV/0!**	**771.79%**	0.00	0.00	0.21	1.13	1.44		Ave Apr 2005 – 2014
P-value T-test	0.231	0.017	0.00	0.00	0.00	0.00	0.24	0.24	Severity Before
Statistically Significant?	No	Yes	0.00	0.00	2.26	6.77	1.44	10.46	Severity After
								4346.15%	**% Change**

Brookhurst & Chapman Enforcement start date Jan 2014									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	1	2	0	0	1	1	1		
2002	3	3	0	0	0	3	3		
2003	2	4	0	0	0	3	3		
2004	4	9	0	0	2	13	5		
2005	1	8	0	0	3	3	5		
2006	3	7	0	0	1	2	8		
2007	0	7	0	0	0	4	3		
2008	1	2	0	0	0	1	2		
2009	0	5	0	0	0	0	5		
2010	1	3	0	0	2	0	2		
2011	1	2	0	0	0	2	1		
2012	1	5	1	0	1	0	5		
2013	1	1	0	0	0	1	1		
2014	0	2	0	0	1	0	1		
Ave 2001 – 2003	2.00	3.00	472	29	11	6	1		Severity Index FHWA
Ave 2004 – 2014	1.18	4.64	0.00	0.00	0.33	2.33	2.33		Ave 2001 – 2003
% Change	**-40.91%**	**54.55%**	0.10	0.00	0.91	2.36	3.45		Ave 2004 – 2014
P-value T-test	0.321	0.351	0.00	0.00	3.67	14.00	2.33	20.00	Severity Before
Statistically Significant?	No	No	47.20	0.00	10.00	14.18	3.45	74.84	Severity After
								274.18%	**% Change**

Valley View & Lampson - Enforcement start date Oct 2004									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	1	0	0	0	1	0	0		
2002	0	2	0	0	0	1	1		
2003	1	2	0	0	0	0	3		
Jan – Sept 2004	1	1	0	0	1	0	1		
Oct. - Dec. 2004	0	0	0	0	0	0	0		
2005	0	0	0	0	0	0	0		
2006	0	2	0	0	1	1	1		
2007	0	4	0	0	0	3	1		
2008	1	1	0	0	1	2	0		
2009	2	1	0	0	0	1	2		
2010	1	1	0	0	0	2	0		
2011	0	1	0	0	0	0	2		
2012	0	1	0	0	0	1	0		
2013	0	2	0	0	0	2	0		
2014	1	3	0	0	0	2	2		
Ave 2001 – 2004	0.75	1.25	472	29	11	6	1		Severity Index FHWA
Ave 2005 – 2014	0.45	1.45	0.00	0.00	0.50	0.25	1.25		Ave 2001 – 2004
% Change	**-39.39%**	**16.36%**	0.00	0.00	0.20	1.40	0.80		Ave 2005 – 2014
P-value T-test	0.450	0.767	0.00	0.00	5.50	1.50	1.25	8.25	Severity Before
Statistically Significant?	No	No	0.00	0.00	2.20	8.40	0.80	11.40	Severity After
								38.18%	**% Change**

Brookhurst & Trask - Enforcement start date Jan 2014									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	0	2	0	0	0	0	2		
2002	4	0	0	0	1	3	2		
2003	1	3	0	0	0	5	2		
2004	0	3	0	0	0	0	3		
2005	4	7	0	0	2	4	7		
2006	3	8	0	0	0	4	7		
2007	0	8	0	0	0	2	6		
2008	2	8	0	0	0	5	7		
2009	0	5	0	0	0	0	5		
2010	0	4	0	0	0	2	3		
2011	2	1	0	0	3	1	2		
2012	1	4	0	0	0	5	3		
2013	1	2	0	0	0	2	1		
2014	2	2	0	0	0	1	3		
Ave 2001 – 2003	1.67	1.67	472	29	11	6	1		Severity Index FHWA
Ave 2004 – 2014	1.36	4.73	0.00	0.00	0.33	2.67	2.00		Ave 2001 – 2003
% Change	**-18.18%**	**183.64%**	0.00	0.00	0.45	2.36	4.27		Ave 2004 – 2014
P-value T-test	0.381	0.042	0.00	0.00	3.67	16.00	2.00	21.67	Severity Before
Statistically Significant?	No	Yes	0.00	0.00	5.00	14.18	4.27	23.45	Severity After
								8.25%	**% Change**

Brookhurst & Orangewood - Enforcement start date July 2005									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	1	0	0	0	0	5	0		
2002	1	0	0	0	0	1	0		
2003	1	2	0	0	0	4	0		
2004	0	0	0	0	0	0	0		
Jan – June 2005	0	1	0	0	0	0	1		
July – Dec 2005	0	1	0	0	0	0	1		
2006	2	2	0	0	2	3	1		
2007	1	1	0	0	1	1	0		
2008	1	1	0	0	0	1	1		
2009	1	1	0	0	0	2	0		
2010	1	1	0	0	1	1	0		
2011	3	0	0	0	0	0	3		
2012	0	0	0	0	0	0	0		
2013	0	2	0	0	0	0	2		
2014	3	2	0	0	1	4	1		
Ave 2001 – June 2005	0.67	0.67	472	29	11	6	1		Severity Index FHWA
Ave July 2005 – 2014	1.26	1.16	0.00	0.00	0.00	2.22	0.22		Ave 2001 – June 2005
% Change	**89.47%**	**73.68%**	0.00	0.00	0.53	1.26	0.95		Ave July 2005 – 2014
P-value T-test	0.290	0.268	0.00	0.00	0.00	13.33	0.22	13.56	Severity Before
Statistically Significant?	No	No	0.00	0.00	5.79	7.58	0.95	14.32	Severity After
								5.61%	**% Change**

Magnolia & Trask – Enforcement start date Jan 2014									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	1	0	0	0	0	0	1		
2002	4	0	0	0	0	2	2		
2003	3	3	0	0	1	1	4		
2004	2	8	0	0	1	6	7		
2005	0	0	0	0	0	0	0		
2006	1	1	0	0	0	1	1		
2007	0	7	0	0	0	2	6		
2008	2	2	0	0	0	2	3		
2009	0	3	0	0	0	0	3		
2010	1	3	0	0	0	0	3		
2011	2	2	0	0	0	0	3		
2012	3	1	0	0	1	0	0		
2013	0	3	0	0	0	1	3		
2014	2	2	0	0	0	0	2		
Ave 2001 – 2003	2.67	1.00	472	29	11	6	1		Severity Index FHWA
Ave 2004 – 2014	1.18	2.91	0.00	0.00	0.33	1.00	2.33		Ave 2001 – 2003
% Change	**-55.68%**	**190.91%**	0.00	0.00	0.18	1.09	2.82		Ave 2004 – 2014
P-value T-test	0.074	0.119	0.00	0.00	3.67	6.00	2.33	12.00	Severity Before
Statistically Significant?	No	No	0.00	0.00	2.00	6.55	2.82	11.36	Severity After
								-5.30%	**% Change**

Harbor & Trask - Enforcement start date Feb 2004									
Number of Collisions			Total 21453 & Rear End Injury Severity						
Year	21543	Rear End 50'	Fatal=1	Inj Severe=2	Inj Other=3	Inj Pain=4	PDO=0		
2001	3	2	0	1	1	3	2		
2002	3	4	0	1	0	2	4		
2003	2	11	0	0	1	9	4		
2004	1	9	0	0	0	3	7		
2005	0	4	0	0	0	6	2		
2006	0	3	0	0	0	1	2		
2007	0	4	0	0	0	1	3		
2008	0	4	0	0	0	1	3		
2009	0	4	0	0	0	2	3		
2010	0	5	0	0	0	2	3		
2011	1	9	0	0	0	5	7		
2012	0	2	0	0	0	2	0		
2013	1	2	0	0	0	2	1		
2014	2	3	0	0	1	1	3		
Ave 2001 – 2003	2.67	5.67	472	29	11	6	1		Severity Index FHWA
Ave 2004 – 2014	0.45	4.45	0.00	0.67	0.67	4.67	3.33		Ave 2001 – 2003
% Change	**-82.95%**	**-21.39%**	0.00	0.00	0.09	2.36	3.09		Ave 2004 – 2014
P-value T-test	0.0003	0.5380	0.00	19.33	7.33	28.00	3.33	58.00	Severity Before
Statistically Significant?	Yes	No	0.00	0.00	1.00	14.18	3.09	18.27	Severity After
								-68.50%	**% Change**

VIOLATION ANALYSIS & FINANCIAL IMPACT

Reduction in Violations

As we showed in our previous report, the city has achieve a very significant reduction in red light running violations by increasing the yellow signal interval by 0.5 second beginning in January 2015. The result has been an overall 61% decrease in red light running violations with some locations achieving almost a 95% decrease. At many locations, the number of red light running incidents has been reduced to single digits where they previously were in the double and triple digits.

This indicates that significant safety improvements can be made through the proper application of engineering countermeasures. It also shows that it is possible to virtually eliminate red light running without the use of photo enforcement. Note, however, that a few locations still have relatively high numbers of red light violations. Since the driving population is the same at all intersections within the city, it is logical to assume that the differences seen between the intersections with low numbers and those with high numbers must be due to differences in engineering at those locations rather than differences in driver behavior. It is possible, therefore, to evaluate the intersections that still have higher numbers of violations to see which additional countermeasures, including a further increase in yellow timing, might be appropriate to employ.

Red Light Running Violations Before and After ½ Second Increase in Yellow Interval							
	BRCH 01	BROR 01	BRWE 01	BRWE 03	CHBR 01	**HATR 01**	MATR 01
Jun14	130	231	164	123	14	118	77
Jul14	145	215	139	76	21	208	64
Aug14	147	212	170	84	16	328	126
Sep14	170	185	170	72	22	325	118
Oct14	148	188	176	90	15	388	38
Nov14	168	244	133	82	14	341	54
Dec14	109	112	115	84	14	180	31
Average	145.29	198.14	152.43	87.29	16.57	269.71	72.57
Jan15	35	47	73	41	4	54	18
Feb15	0	0	70	39	6	129	28
Mar15	1	0	91	41	3	144	30
Apr15	1	38	80	50	3	131	23
May15	1	31	87	62	10	126	50
June15	8	56			10	122	45
Jul15	5	43	89	41	15	137	45
Aug15	16	54			21	118	41
Average	8	34	82	46	9	120	35
% Change	-94.24%	-83.03%	-46.42%	-47.68%	-45.69%	-55.46%	-51.77%

TRBR 01	TRBR 03	**TRHA 01**	TRMA 01	VACH 01	VACH 03	VVLA01	Total
7	25	431	23	100	107	194	1744
17	25	391	16	133	102	250	1802
9	26	452	21	114	136	265	2106
14	22	404	60	117	132	283	2094
11	19	411	46	104	125	285	2044
5	18	344	43	106	98	233	1883
4	8	338	27	37	67	188	1314
9.57	20.43	395.86	33.71	101.57	109.57	242.57	1,855.29
1	2	266	9	21	7	66	644
4	7	245	15	10	6	66	625
5	8	307	18	14	12	50	724
5	6	237	31	18	15	55	694
3	6	300	17	9	14	46	762
2	2	381	23	19	12	24	
9	5	344	26	33	16	57	865
4	8	277	13	16	13	62	
4	6	295	19	18	12	53	719
-56.90%	-73.08%	-25.57%	-43.64%	-82.77%	-89.16%	-78.05%	-61.25%

Financial Impact

Fewer violations increase safety, but also decrease revenue to pay for the program. Based on the 60% reduction in violations we can estimate the approximate amount of fine revenue the city should expect to receive from the program going forward.

Reviewing the financial data provided in the staff report of August 25, 2012, we see that estimated revenue for FY 2014-2015 is $763,000 and expenses are $676,000. However, the revenue estimate is likely based on the volume of citations issued prior to the yellow timing increase in January 2012 and does not take into account the reduced number of citations being issued since the change. This is partially due to the delay between the issuance of a citation and fine revenue received back to the city which averages 3 - 6 months. The city should expect to have seen some reduction in revenue beginning around April, but a significant reduction might not be seen until the beginning of the new fiscal year which began in July.

Applying half the 60% reduction to the revenue expected in the final quarter of FY 2014-2015 yields an estimated reduction in fine revenue of $57,000. Applying the full 60% reduction to the fourth quarter yields an estimated reduction in fine revenue of $114,450. Since staff estimated that the program would net approximately $87,000 after expenses, it is likely that the city might barely break even when all revenue and expenses are tabulated for FY 2014-2015. However, the possibility exists that the city could experience an overall loss.

Going forward, however, the total effect of the reduced ticketing will eventually have it's full financial impact. Applying the entire 60% reduction to the revenue estimate of $763,000 produces an expected annual revenue return of approximately $305,000, which is less than the annual cost of the Redflex contract of $382,800. If staff costs remain at or close to FY 2014-2015 levels, the city can expect to lose about $370,000 annually.

Staff has indicated that the revenue from the program pays the cost of one full time and one part time police officer. Beginning with the new fiscal year, this will likely no longer be possible. Therefore, regardless of whether the city cancels the red light camera contract, those salaries will now have to be paid for out of the general fund.

While the program may have covered its costs in previous years, going forward, that will no longer true.

CONCLUSION

The question that elected officials may wish to ask themselves is not whether the red light cameras have improved safety (we contend that they likely did not), but rather what alternative countermeasures the city can employ to improve safety other than issuing $500 tickets mostly for slow rolling right turns. We have shown that increasing the yellow signal interval by a mere 0.5 second has drastically reduced red light running in Garden Grove. Where red light running violations are still higher than desired, the city can further increase the yellow interval and/or employ other proven engineering countermeasures to reduce red light running and improve safety. There are alternatives to a program that is not improving safety (at least, with certainty, not as much as engineering improvements), will cost the city over $370,000 per year, and which burdens residents and visitors with $500 tickets for mostly minor violations. Rather than continue this program, city officials should explore those other options.