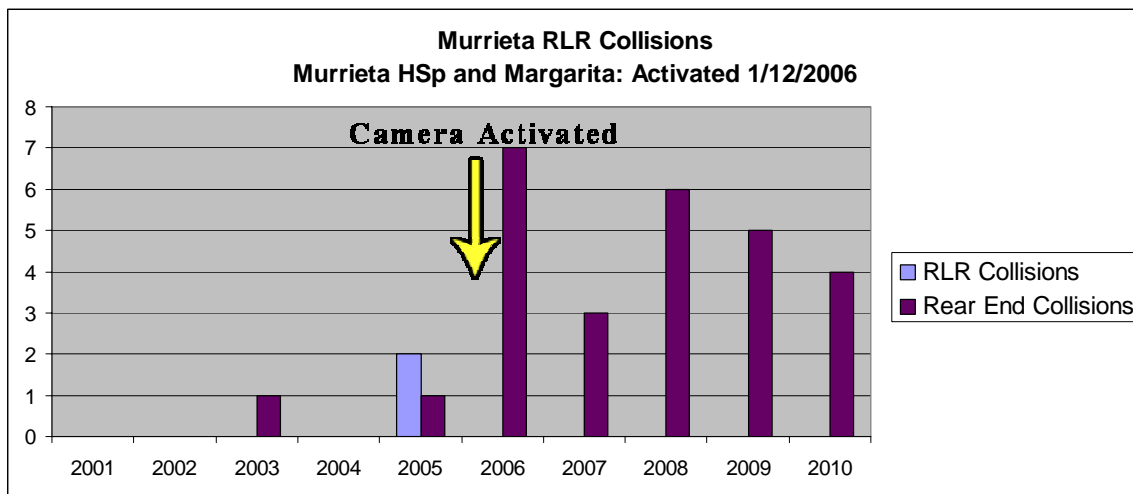


## A DETAILED ANALYSIS OF THE IMPACT OF RED LIGHT CAMERAS ON INTERSECTION SAFETY IN MURRIETA, CA

### Collision History at Photo Enforced Intersections

As can be seen from the following analysis, both red light related collisions and rear end collisions increased at intersections with red light cameras in the period after the cameras were installed as compared to a similar time period before camera installation. This trend is also apparent after adjustments are made for increases in population. Also, considering the relatively small number of red light related collisions that occurred at the three photo enforced intersections in the years leading up to installation of the red light cameras, the implementation of photo enforcement at these locations cannot be justified for safety reasons.

#### Murrieta Hot Springs and Margarita - Activated 1/12/2006



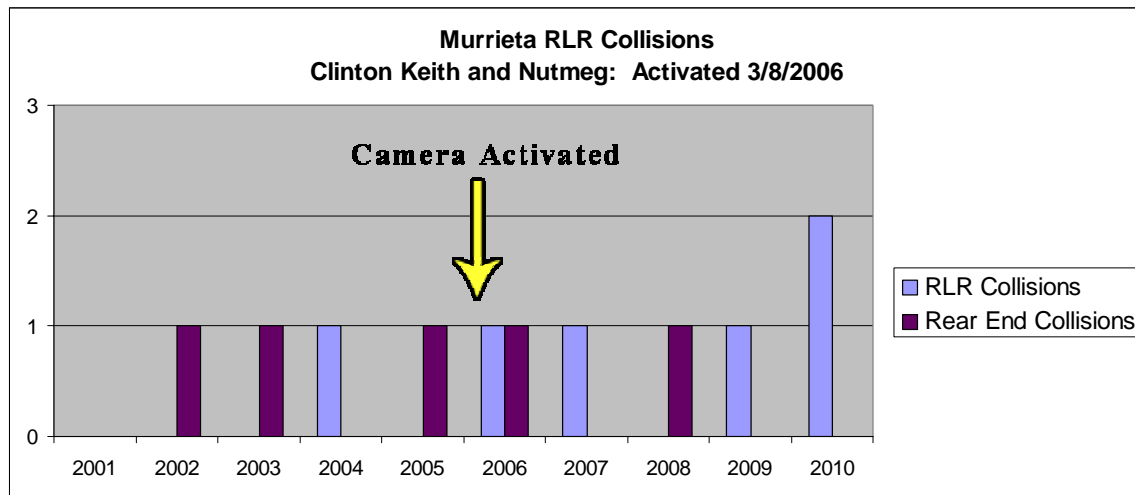
The intersection of Murrieta Hot Springs and Margarita experienced only two red light related collisions (represented by the blue bar on the graph above) in the five years prior to installation of the red light cameras in January of 2006. Both collisions occurred in late 2005 with no collisions occurring in the years 2001 through 2004. Furthermore, since staff reports submitted to the City Council in October 2005 indicate that this intersection was being considered for photo enforcement prior to the occurrence of the collisions in 2005, it appears that no red light related collisions had taken place at this location prior to it being targeted as a candidate for red light camera enforcement. Since red light related collisions rarely occurred at this intersection, it could not be categorized as having a red light running collision problem and photo enforcement cannot be justified for safety purposes.

Likewise, rear end collisions (represented by the maroon bar on the graph above) were also relatively rare at this intersection in the five years prior to installation of the red light cameras with only two such collisions occurring during that period, one in 2003 and one in 2005. However, after installation of the red light cameras, rear end collisions spiked with seven such collisions occurring in the first year of photo enforcement alone. In the

full five year period after installation of the cameras, a total of 25 rear end collisions occurred at this location, representing a staggering 1150% increase.

The presence of red light cameras at this intersection appears to have resulted in a decrease in public safety.

Clinton Keith and Nutmeg - Activated 3/8/2006

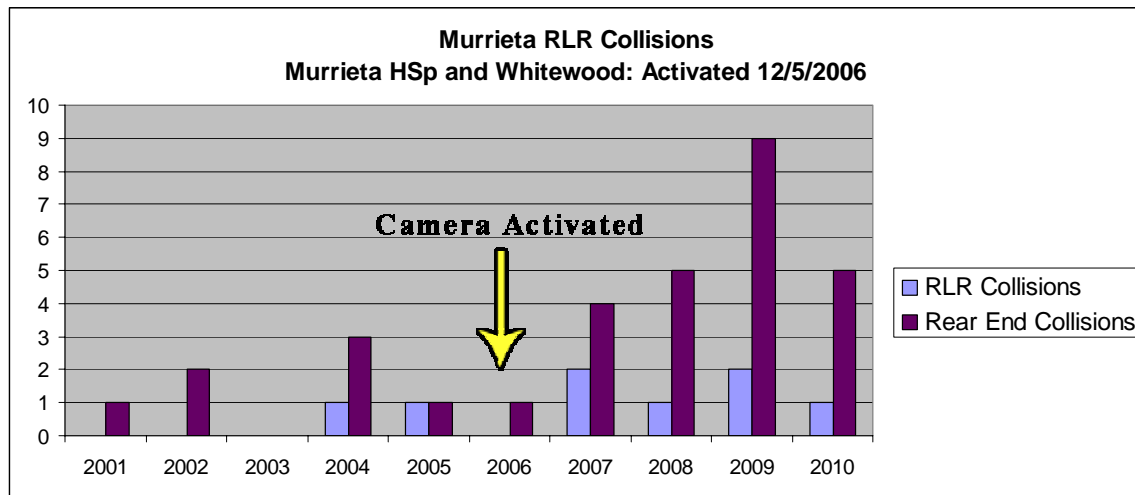


The intersection of Clinton Keith and Nutmeg experienced only one red light related collision in the five years prior to installation of the red light cameras in March of 2006. In the five year period after installation of the cameras, the intersection experienced five red light related collisions, a 400% increase.

In the five year period prior to installation of the red light cameras, there were three rear end collisions at this location, one each occurring in 2002, 2003, and 2005. In the five year period after installation of the red light cameras, there were two rear end collisions, one in 2006 and one in 2008. It appears that, at this location, photo enforcement did not result in an increase in rear end collisions.

Since red light related collisions were virtually non-existent at this intersection prior to implementation of photo enforcement, it could not be categorized as a location having a red light running collision problem and therefore the use of red light cameras cannot be justified for safety purposes. Furthermore, the 400% increase in red light related collisions that occurred after the cameras were installed clearly indicates that these devices neither maintained nor improved safety at this location.

## Murrieta Hot Springs and Whitewood Rd - Activated 12/5/2006



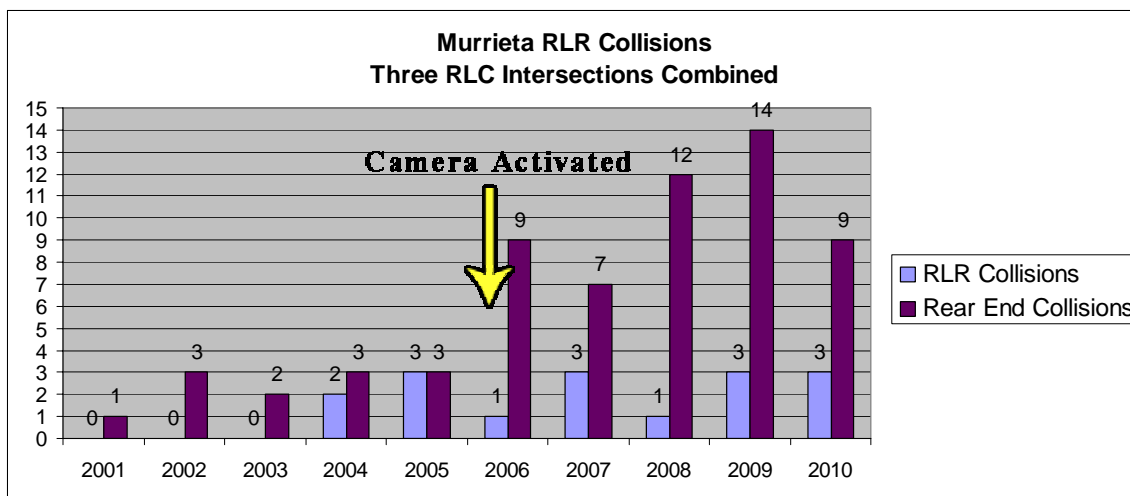
The intersection of Murrieta Hot Springs and Whitewood Rd. experienced only two red light related collisions in the five years prior to installation of the red light cameras in December of 2006. In the five year period after installation of the cameras, the intersection experienced six red light related collisions, a 200% increase.

In the five year period prior to installation of the red light cameras, there were seven rear end collisions at this location. In the five year period after installation of the red light cameras, there were twenty four rear end collisions, a 243% increase.

Since red light related collisions were rare at this intersection prior to implementation of photo enforcement, it could not be categorized as a location having a red light running collision problem and therefore the use of red light cameras cannot be justified for safety purposes. Furthermore, the 200% increase in red light related collisions and 243% increase in rear end collisions that occurred after the cameras were installed clearly demonstrates that not only did the red light cameras not improve safety at this location, they appear to have had the opposite effect.

### Combined Data for All Three Photo Enforced Intersections

When the data set consists of relatively few collisions in the before or after period (or both) as it does at the three photo enforced intersections in Murrieta, small changes in results can be magnified, skewing the results. Therefore, it is often useful to combine the data in order to get a more balanced picture of what has occurred. The results of this exercise are shown in the graph and table below.



	Prior to Camera Installation	After Camera Installation <sup>1</sup>	Change	% Change
RLR	5	11	6	+120%
Rear End	12	51	39	+325%

As can be seen in the above figures, in the five years prior to installation of the red light cameras, the three photo enforced intersections experienced a total of five red light related collisions. In the period after the cameras were installed<sup>1</sup>, these same three photo enforced intersections experienced a total of eleven red light related collisions, an increase of 120%.

In the five years prior to installation of the red light cameras, the three photo enforced intersections experienced a total of twelve rear end collisions. In the period after the cameras were installed<sup>1</sup>, these same three photo enforced intersections experienced a total of fifty one rear end collisions, an increase of 325%.

From the data above, it is apparent that the installation of red light cameras at these three intersections did not improve safety by preventing red light related collisions. Additionally, the data also strongly suggests that intersection safety has decreased due to and increase in rear end collisions as drivers overreact to the presence of the cameras.

<sup>1</sup> Note: The cameras were installed at the three different locations at various times throughout 2006 with the final system at Murrieta Hot Springs and Whitewood coming on line in December (warning period in November). The after period in the combined data therefore represents approximately 5 years at two of the intersections and 4 years at the third. Therefore, this analysis may slightly underestimate the number of collisions in the period after the cameras were installed since only four years of data is included in the after period for one of the intersections. However, since all the collisions occurring in 2006 occurred after the cameras were operational, for simplicity we refer to one after period which can be thought of as occurring from 2006 to 2010.

Adjustment for Population Growth

Red light camera supporters have suggested that the increase in collisions seen at the three photo enforced intersections may be due to a population increase in the city over the ten year study period. This theory is not without merit as Murrieta experienced an 88% increase in population between 2001 and 2010 and increased population could conceivably result in higher traffic volumes and an increase in collision rates absent any other factors. However, after adjusting the collision data to account for changes in population, we find that population growth alone does not account for the increase in collisions seen at photo enforced intersections after red light cameras were installed.

We obtained population statistics from the US Census Bureau as compiled by the IDcide Local Information Data Server. As the chart below shows, while the population of Murrieta did increase significantly between 2001 and 2010, the vast majority of the population increase occurred in the years prior to installation of the cameras in 2006. We used these figures to adjust the collision data for population growth.

Murrieta Population by Year*		Change Rate
2000	51,018	N/A
2001	54,964	7.73%
2002	60,436	9.96%
2003	66,297	9.70%
2004	74,260	12.01%
2005	84,418	13.68%
2006	93,997	11.35%
2007	97,543	3.77%
2008	97,935	0.40%
2009	97,881	-0.06%
2010	103,466	5.71%

\*Source: <http://www.idcide.com/citydata/ca/murrieta.htm> & US Census Bureau

As can be seen in the table below, after adjusting for population growth, the results still show a 78% increase in the collision rate for red light related collisions and a 199% increase in the collision rate for rear end collisions in the period after the cameras were installed as compared to the before period.

Before and After Comparison of Collision Rates at Photo Enforced Intersections in Murrieta (Per 100,000 Population)				
	Prior to Camera Installation	After Camera Installation <sup>1</sup>	Change	% Change
RLR	6.24	11.13	4.89	+78%
Rear End	17.39	52	34.61	+199%

This analysis shows that while adjusting for population growth does reduce the magnitude of the increase in collision rates for the period after the cameras were installed, the conclusion that red light cameras failed to reduce red light related collisions

while increasing rear end collisions, thereby resulting in a decrease in safety, remains valid.

Comparison to Other Signalized Intersections in Murrieta

Red light camera supporters have also claimed that although red light related collisions may have increased at photo enforced intersections, there was a greater increase at three nearby non-photo enforced intersections on Murrieta Hot Springs Road. However, not only could we find no evidence in the data to support this claim, the exact opposite appears to be true and this assertion is clearly invalid.

As with the three photo enforced intersections, we counted the number of red light related collisions at the three non-photo enforced intersections claimed to have higher numbers of collisions: Murrieta Hot Springs & Alta Murrieta (MHSP & AM), Murrieta Hot Springs & Hancock (MHSP & HK), and Murrieta Hot Springs & Madison (MHSP & Mad). We then adjusted for population. The results appear in the table below.

<b>RLR Collision Rate at Three Nearby Non-Photo Enforced Intersections</b>						
	MHSP & AM	MHSP & HK	MHSP & Mad	Total	Population	RLR Rate
2001	3	3	1	7	54,964	12.74
2002	1	4	0	5	60,436	8.27
2003	0	1	0	1	66,297	1.51
2004	1	0	3	4	74,260	5.39
2005	1	0	3	4	84,418	4.74
Total Before Period						32.64
<b>2006</b>	4	0	0	4	93,997	4.26
2007	2	1	1	4	97,543	4.10
2008	2	2	0	4	97,935	4.08
2009	0	1	3	4	97,881	4.09
2010	0	0	0	0	103,466	0.00
Total After Period						16.52715

We then compared the changes in the red light related collision rate at photo enforced intersections to the collision rate at non-photo enforced intersections.

<b>Before and After Comparison of Collision Rates at Photo Enforced Intersections vs. Three Nearby Non-Photo Enforced Intersections (Per 100,000 Population)</b>				
	Prior to Camera Installation	After Camera Installation	Change	% Change
Photo Enforced Intersections	6.24	11.13	4.89	+78%
Non-Photo Enforced Intersections	32.64	16.53	-16.11	-49%

As the comparison clearly shows, the three nearby non-photo enforced intersections experienced a 49% reduction in red light related collisions while the photo enforced intersections experienced a 78% increase.

In order to avoid selection bias, we also compared the changes in the red light related collision rate at photo enforced intersections to the collision rate at a number of other non-photo enforced intersections throughout Murrieta as well as for the city as a whole. The results appear in the table below.

<b>Before and After Comparison of Collision Rates at Photo Enforced Intersections vs. Non-Photo Enforced Intersections (Per 100,000 Population)</b>				
	Prior to Camera Installation	After Camera Installation	Change	% Change
Photo Enforced Intersections	6.24	11.13	4.89	+78%
Los Alamos & Hancock	2.53	3.06	0.53	+21%
Kalmia & Jefferson	4.04	1.99	-2.05	-51%
Clinton Keith & Cal Oaks	7.52	1.02	-6.5	-86%
Cal Oaks & Jackson	10.84	6.18	-4.66	-43%
Torrey Pines & Margarita	11.23	5.16	-6.07	-54%
MHSP & Rt 79	16.62	9.04	-7.58	-46%
Cal Oaks & Monroe	23.31	4.02	-19.29	-83%
Cal Oaks & Cal Oaks Plaza	25.74	10.04	-15.7	-61%
All Non-Photo Enforced Intersections	318	231.96	-86.04	-27%

As can be seen from the above analysis, while the photo enforced intersections experienced a cumulative 78% increase in the rate of red light related collisions after the cameras were installed, every other major intersection we surveyed, as well as the city as whole, showed a reduction in the rate of red light related collisions during the same period. The non-photo enforced intersection that did show an increase, showed a significantly smaller increase than at photo enforced intersections.