

Philadelphia Parking Authority Red Light Photo Enforcement Analysis

September 17, 2007






NESTEL

CONSULTING

In October 2006, the Philadelphia Parking Authority contracted Nestel Consulting (Philadelphia, PA) to conduct an analysis of vehicle crashes occurring at Cottman Avenue and Roosevelt Boulevard. The goal of this analysis was to evaluate whether red light photo enforcement affects the level of safety at that intersection. In late July 2007, the Philadelphia Police Department delivered to the Philadelphia Parking Authority the data discovery request necessary to complete this analysis. The analysis was completed and submitted in draft format within six weeks from the date that the consultant received the requested data. This product is the property of the Philadelphia Parking Authority.

Thomas J. Nestel, III is a 4th generation Philadelphia police officer who presently serves as a Staff Inspector commanding the department's intelligence functions. He has earned a Bachelor of Science (magna cum laude) in Criminal Justice from Chestnut Hill College, a Master of Science (magna cum laude) in Public Safety from Saint Joseph's University, a Master of Arts in National Security Studies from the United States Naval Postgraduate School, a Master of Science in Criminology from the University of Pennsylvania, and is pursuing a Doctoral degree in Criminology at the University of Pennsylvania.

September 17, 2007



Thomas J. Nestel, III

Table of Contents

<i>Executive Summary</i>	i
Introduction	1
Map of analysis area	1
Review parameters	2
Description of comparisons	2
Identifying crashes at Cottman	3
Identifying crashes at Tyson	4
Total crashes	6
Crashes resulting in injury	8
Crashes resulting in towing	10
Broadside crashes	12
Rear end crashes	14
Red light violation timeline	15
Conclusion	16

Executive Summary

On 25 August 2005, Red Light Photo Enforcement (RLPE) was installed at Cottman Avenue and Roosevelt Boulevard. In order to study the system's effectiveness at making the intersection safer, a private researcher conducted a comparison study using data from Cottman Avenue and Roosevelt Boulevard and a control intersection without the technology. By comparing the data from the two intersections, assertions can be made regarding whether RLPE influences risk of collision and injury at Cottman Avenue and Roosevelt Boulevard. The following information was gleaned from this evaluation:

- When crashes increased at the two intersections, the percentage increase at Cottman Avenue and Roosevelt Boulevard was less than the percentage increase at Tyson Avenue and Roosevelt Boulevard
- When crashes decreased at the two intersections, the percentage decrease at Cottman Avenue and Roosevelt Boulevard was greater than the percentage decrease at Tyson Avenue and Roosevelt Boulevard
- When crashes resulting in injury decreased at Cottman Avenue and Roosevelt Boulevard, crashes resulting in injury dramatically increased at Tyson Avenue and Roosevelt Boulevard
- When crashes resulting in towing increased at the two intersections, the percentage increase at Cottman Avenue and Roosevelt Boulevard was less than the percentage increase at Tyson Avenue and Roosevelt Boulevard
- When crashes resulting in towing increased during RLPE's Year One at the two intersections, the percentage increase at Cottman Avenue and Roosevelt Boulevard was nearly half of the percentage increase at Tyson Avenue and Roosevelt Boulevard
- When the percentage of crashes resulting in towing during RLPE's Year Two decreased from 9% to 2.3% at Cottman Avenue and Roosevelt Boulevard, crashes resulting in towing at Tyson Avenue and Roosevelt Boulevard increased from 4.4% to 7.9%

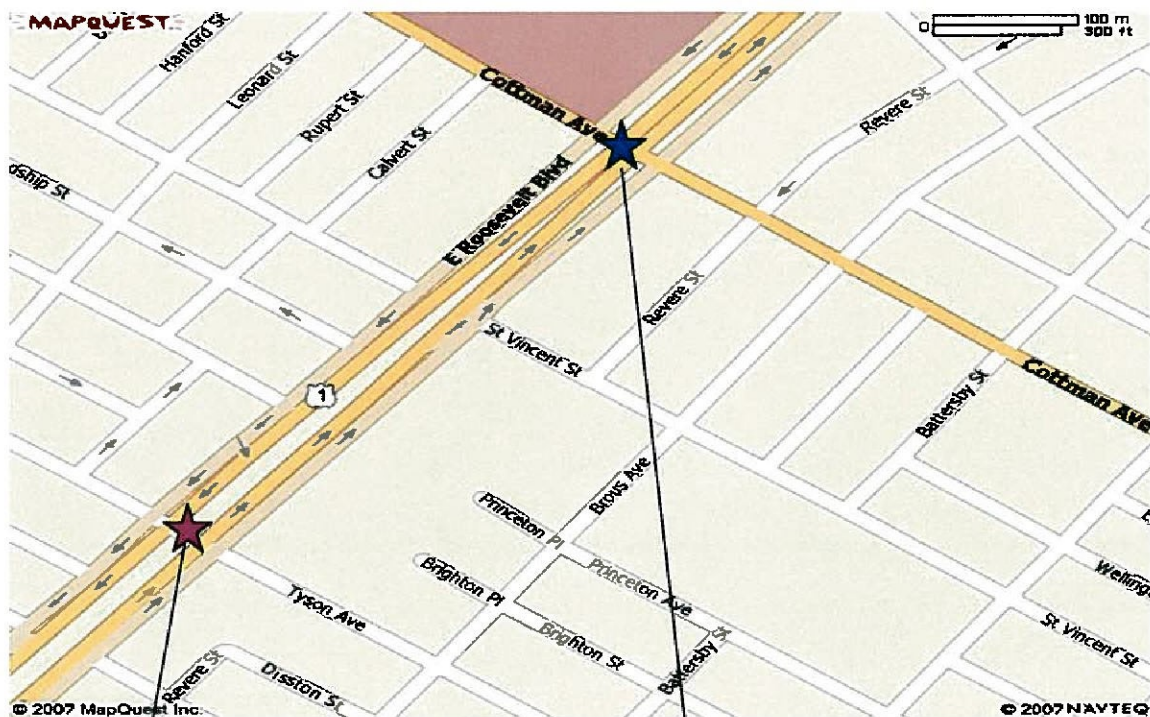
- When crashes categorized as broadside incidents decreased at Cottman Avenue and Roosevelt Boulevard, crashes categorized as broadside incidents dramatically increased at Tyson Avenue and Roosevelt Boulevard
- By Year Two of RLPE, crashes categorized as rear end incidents at Cottman Avenue and Roosevelt Boulevard were lower than during the pre-RLPE period.
- The difference between Year One and Year Two of the RLPE program at Cottman Avenue and Roosevelt Boulevard netted a reduction of nine-hundred three (903) red light violations

Introduction

On 25 August 2005, the City of Philadelphia activated red light photo enforcement at the intersection of Cottman Avenue and Roosevelt Boulevard. Red light violators received warnings during the grace period that terminated on 22 December 2005. After that date, \$100 tickets were issued to the registered owners of vehicles disregarding traffic signals captured by the automated red light photo enforcement.

The Philadelphia Parking Authority contracted an independent researcher to gauge the program's effectiveness in reducing crashes, injuries and property damage.

Map of Analysis Area



Tyson Avenue and Roosevelt Boulevard

Cottman Avenue and Roosevelt Boulevard

Review Parameters

In order to accurately evaluate the effectiveness of red light photo enforcement, an analysis was conducted during which crash data from a technology equipped intersection (target) was compared to a non-technology equipped intersection (control). Cottman Avenue and Roosevelt Boulevard served as the target intersection, and for the purposes of this report it will be known as Cottman. Tyson Avenue and Roosevelt Boulevard serves as the control intersection, and for the purposes of this report it will be known as Tyson. The distance between the two intersections is less than ½ mile. No engineering or environmental changes have been made to the area that would independently affect the probability of crashes occurring at either intersection.

<i>Cottman Avenue and Roosevelt Boulevard</i>	=	<i>Cottman</i>
<i>Tyson Avenue and Roosevelt Boulevard</i>	=	<i>Tyson</i>

Description of Comparisons

The following comparisons were conducted:

- Pre-photo enforcement period (25 August 2004 to 24 August 2005) crashes at Cottman compared to post-photo enforcement period (25 August 2005 to 24 August 2007) crashes at Cottman
- Pre-photo enforcement period (25 August 2004 to 24 August 2005) crashes at Tyson compared to post-photo enforcement period (25 August 2005 to 24 August 2007) crashes at Tyson
- Percentage increase/decrease in crashes at Cottman compared to Tyson

Identifying Crashes at Cottman

The Philadelphia Police Department's incident reporting system provided the data identifying the total number of crashes. When a citizen contacts 9-1-1 to report a vehicle crash, a police unit is dispatched to the location. Upon the arrival of the police officer, the incident is either coded as "Founded" or "Unfounded." A founded designation indicates that the crash did occur and that the involved parties request a police report. An unfounded designation indicates that the involved parties have either left the location without speaking to the police officer or that they do not wish to have a police report prepared.

Ideally, reports documenting crashes at Cottman would note "Cottman Avenue and Roosevelt Boulevard" in the *location of occurrence* block. Unfortunately, the system of reporting and entering data by the Philadelphia Police Department could also include the following designations for Cottman :

- 2700 Cottman Avenue
- 2701 Cottman Avenue
- 2800 Cottman Avenue
- 2801 Cottman Avenue
- 7200 Roosevelt Boulevard
- 7201 Roosevelt Boulevard
- 7300 Roosevelt Boulevard
- 7301 Roosevelt Boulevard



Reports identifying the place of occurrence for the crash as being “Cottman Avenue and Roosevelt Boulevard” accounts for eighty-eight (88) of the one hundred seventy-two (172) crashes that actually occurred at Cottman between 25 August 2004 and 24 August 2007. Every crash designated as having occurred at the above noted locations was reviewed to determine if the crash was related to Cottman. If the crash was found to have occurred at the intersection or due to traffic control measures at the intersection, it was included in this study.

Identifying Crashes at Tyson

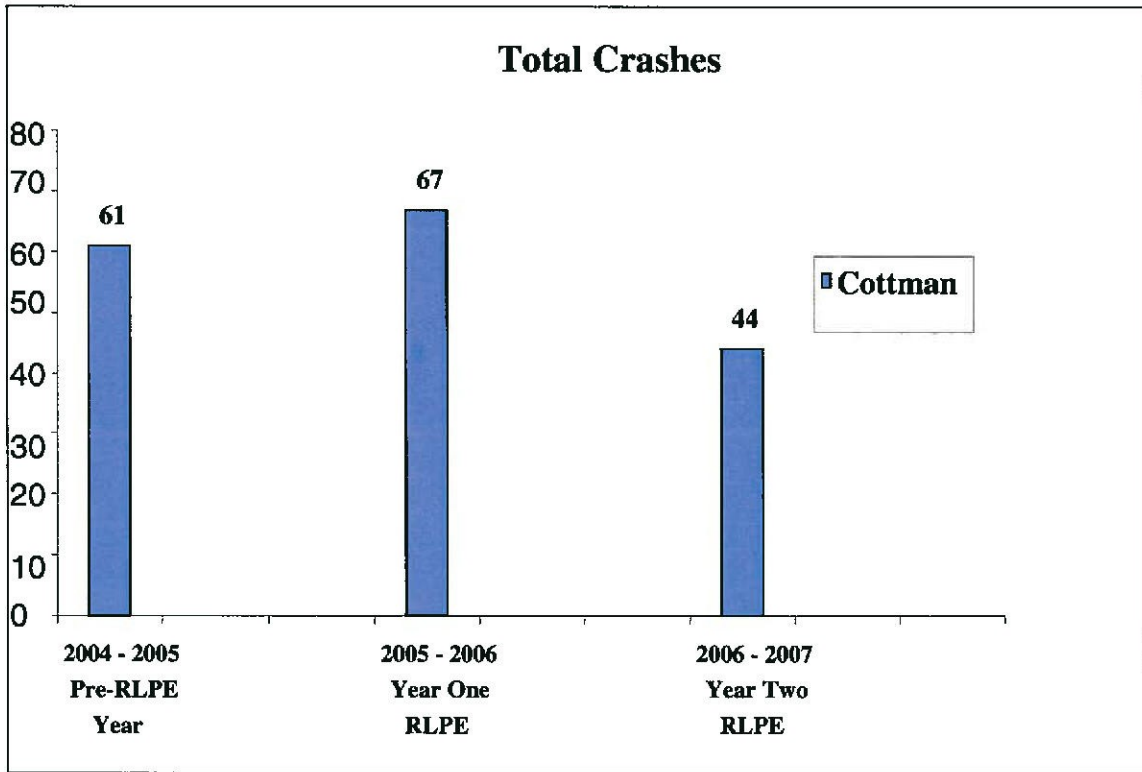
Ideally, reports documenting crashes at Tyson would note “Tyson Avenue and Roosevelt Boulevard” in the *location of occurrence* block. Unfortunately, the system of reporting and entering data by the Philadelphia Police Department could also include the following designations for Tyson:

- 2200 Tyson Avenue
- 2201 Tyson Avenue
- 2800 Tyson Avenue
- 2801 Tyson Avenue
- 6900 Roosevelt Boulevard
- 6901 Roosevelt Boulevard
- 7000 Roosevelt Boulevard
- 7001 Roosevelt Boulevard

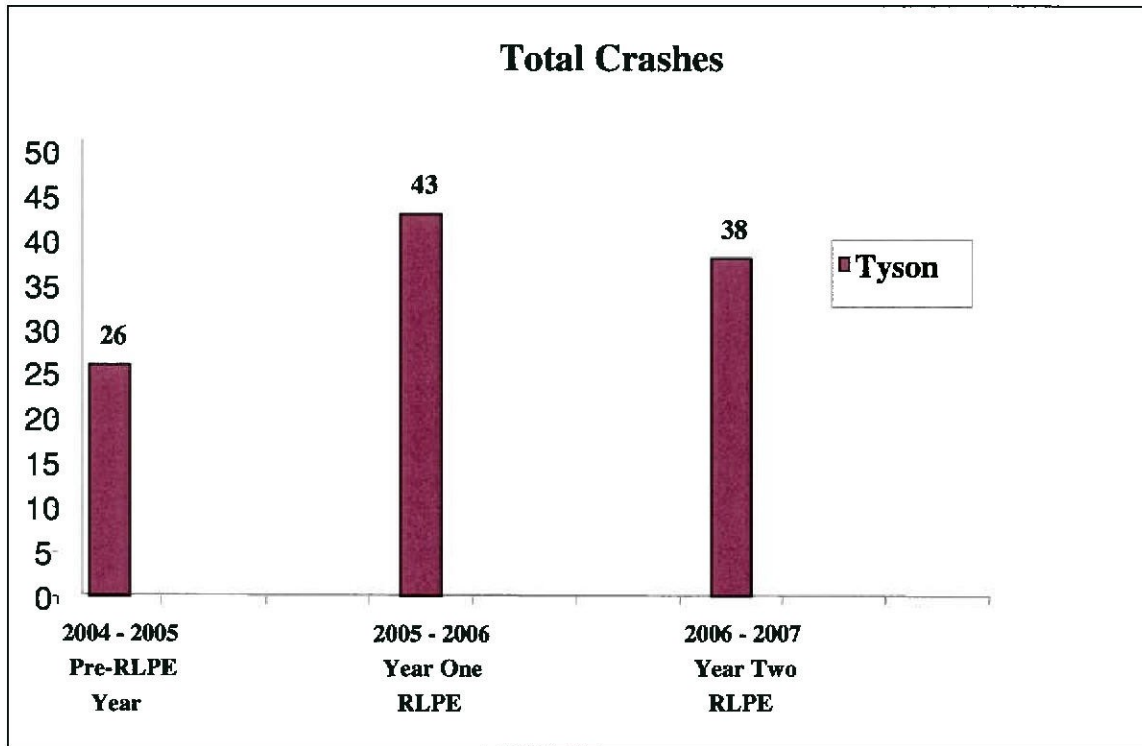


Reports identifying the place of occurrence for the crash as being “Tyson Avenue and Roosevelt Boulevard” accounts for twenty-eight (28) of the one hundred seven (107) crashes that actually occurred at Tyson between 25 August 2004 to 24 August 2007. Every crash designated as having occurred at the above noted locations was reviewed to determine if the crash was related to Tyson. If the crash was found to have occurred at the intersection or due to traffic control measures at the intersection, it was included in this study.

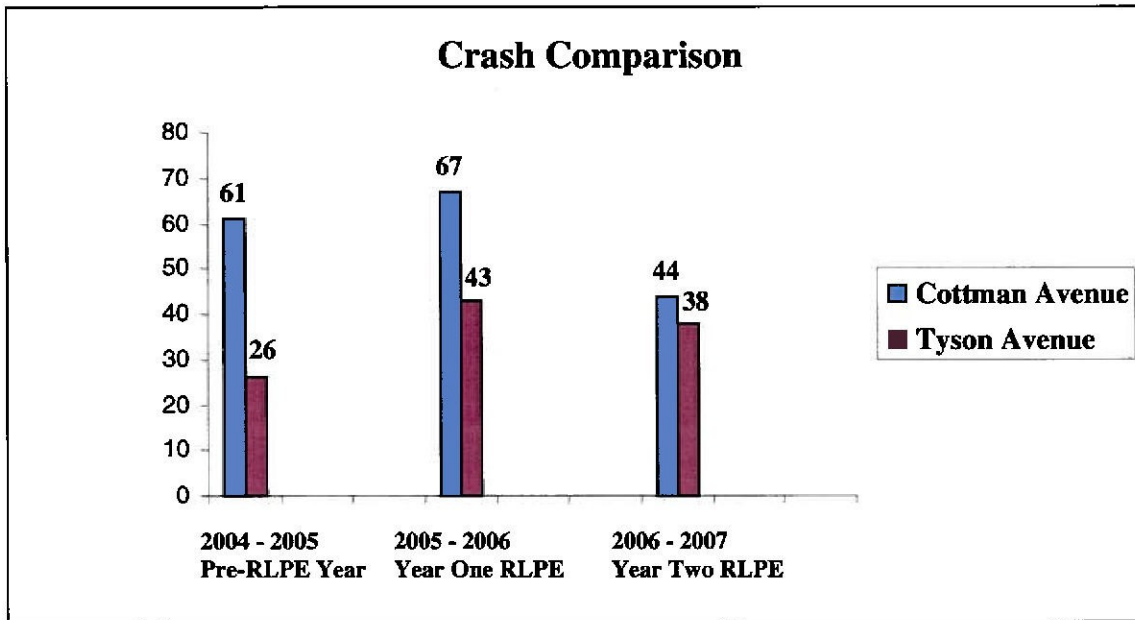
Total Crashes - Cottman



Total Crashes - Tyson



Comparison of Cottman crash totals to Tyson crash totals

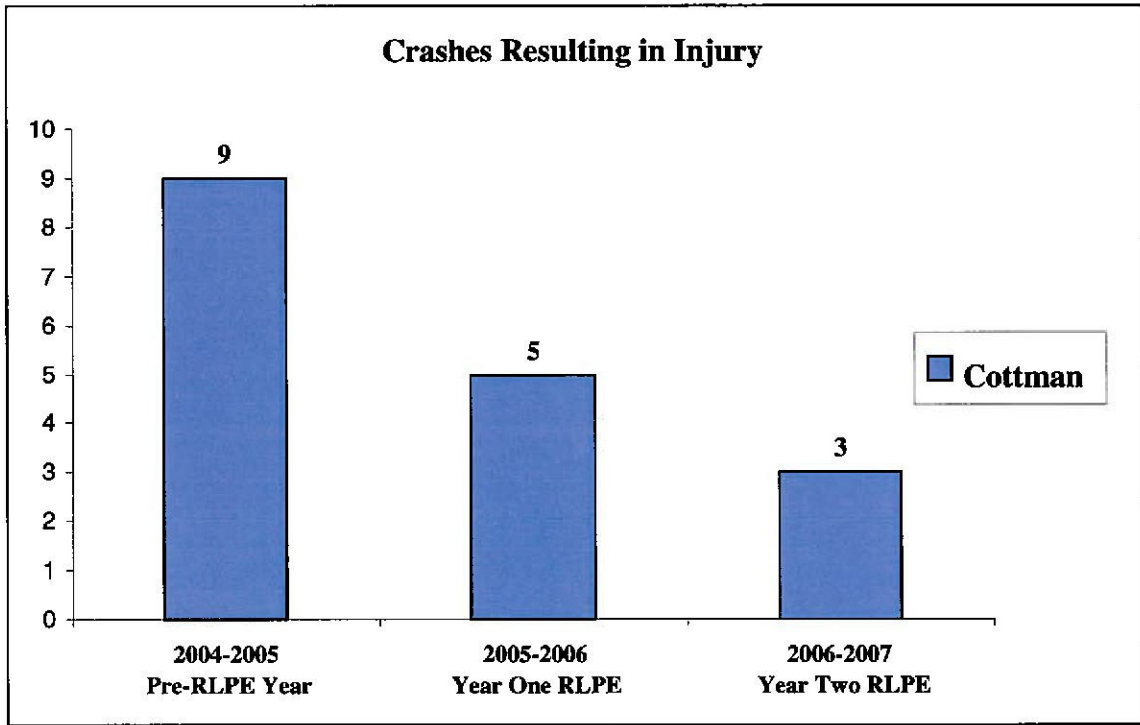


Evaluation of crash comparison

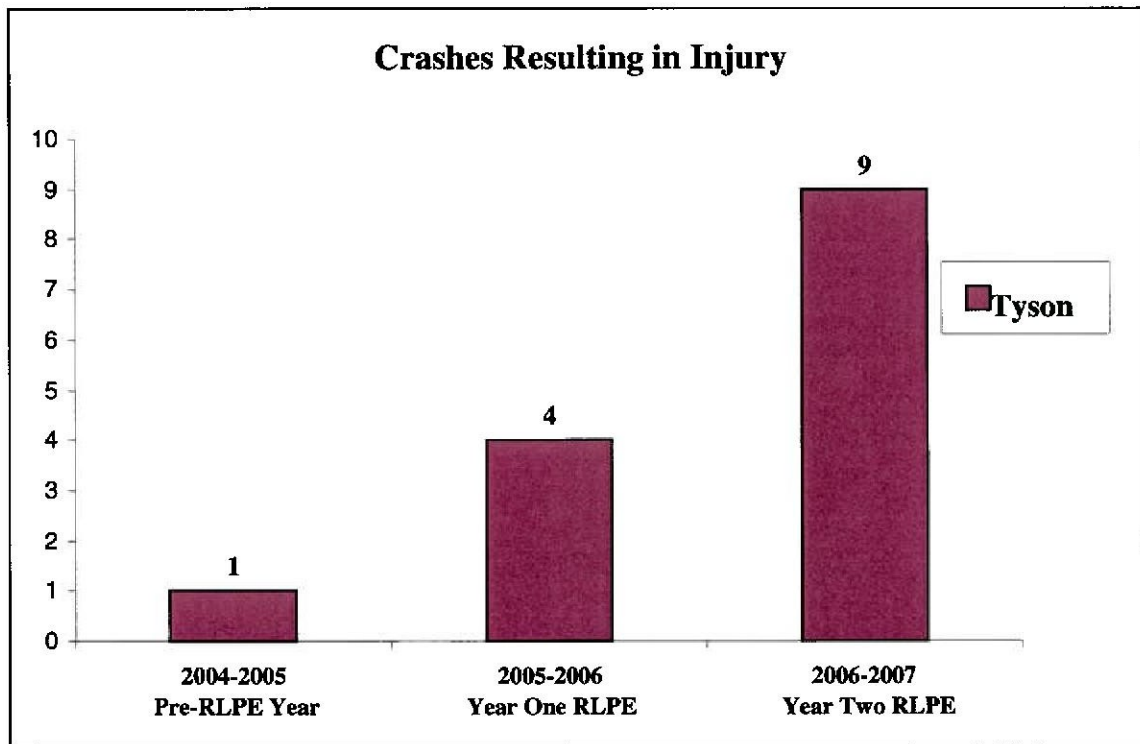
In order to properly evaluate the effectiveness of RLPE, the intersection monitored by the technology must be compared to a non-equipped intersection that lies in close geographic proximity to the treated intersection. In the included graphs, the rise and fall of crash totals demonstrates that the technology equipped intersection succeeded in netting a dramatic decrease in crashes after the implementation of RLPE.

Both intersections suffered from an increase in crashes during the first year of RLPE. However, Cottman had a significantly smaller spike of +9% or six (6) additional crashes. Tyson posted +39% or seventeen (17) additional crashes. At the completion of the second year of RLPE, Cottman exhibited -34% or twenty-three (23) fewer crashes. Although Tyson also had a decrease in crashes, it was a smaller total of -12% or five (5) crashes. *Comparing the year long period prior to the implementation of RLPE, Cottman benefited 28% fewer crashes while Tyson had a 32% increase.*

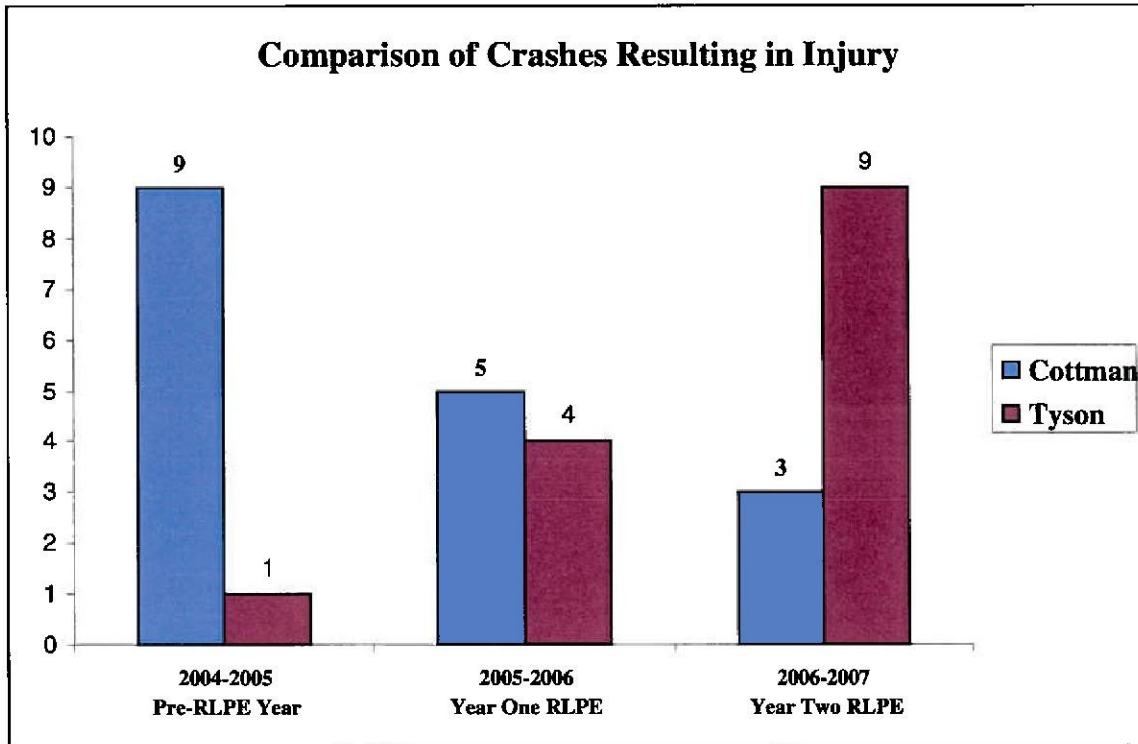
Total crashes resulting in injury - Cottman



Total crashes resulting in injury - Tyson



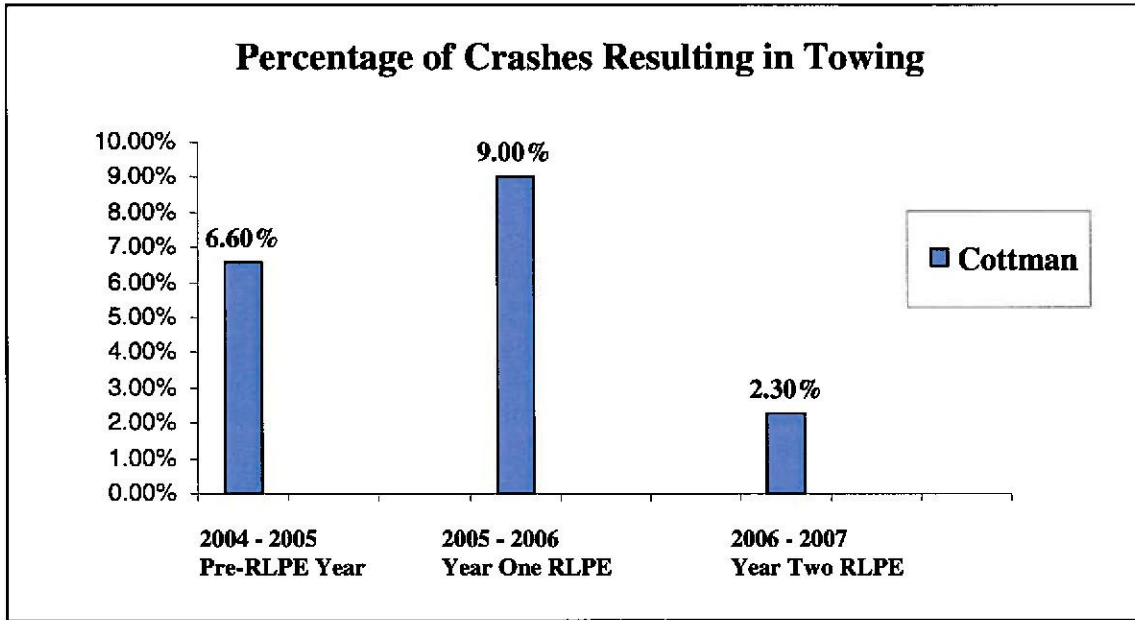
Comparison of Cottman injury totals to Tyson injury totals



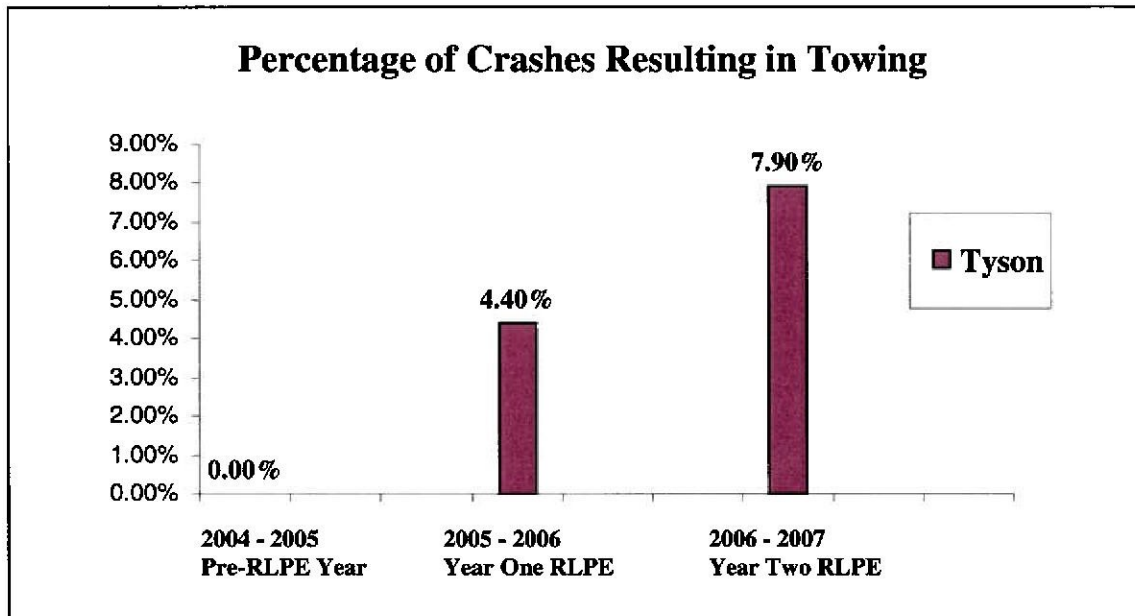
Evaluation of injury comparison

Injuries documented by the investigating police officer range from a mere complaint of pain to death. The involved person's statement determines whether the officer designates the report as a crash with resulting injuries. With the exception of a crash-related fatality, no scale exists that differentiates the severity of injury. During the three-year period examined for this review, one fatality occurred at Cottman, and that incident occurred prior to the introduction of RLPE. The injury comparison exhibited a directly converse effect. While injuries at Cottman decreased by 66%, injuries at Tyson multiplied by nine times from the pre-RLPE period.

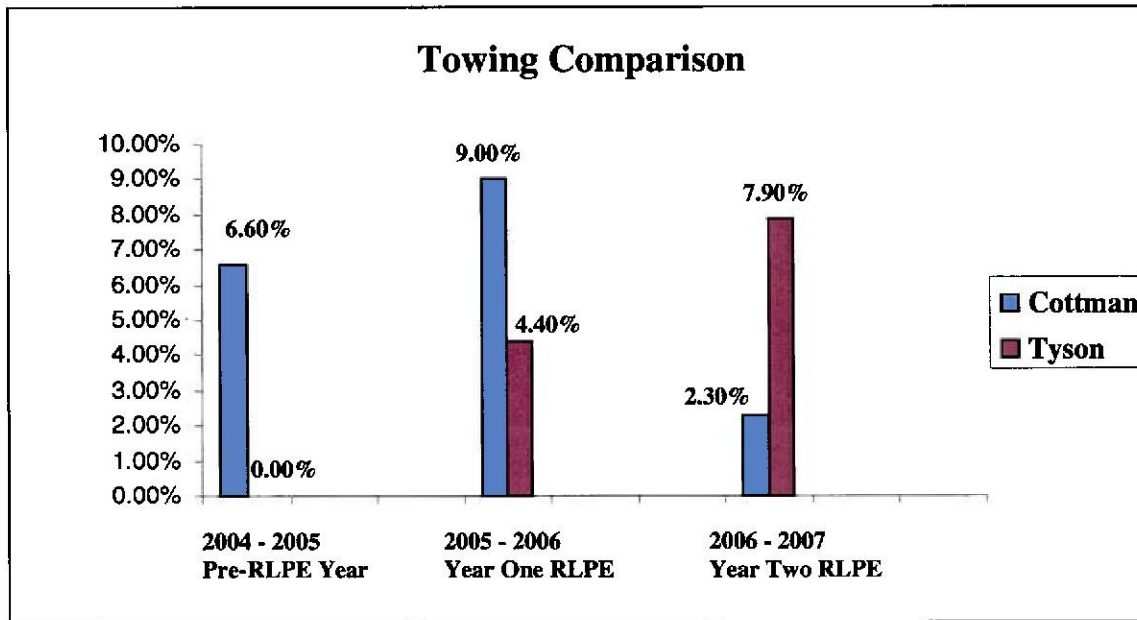
Percentage of crashes resulting in towing - Cottman



Percentage of crashes resulting in towing - Tyson



Comparison of Cottman towing percentages to Tyson towing percentages

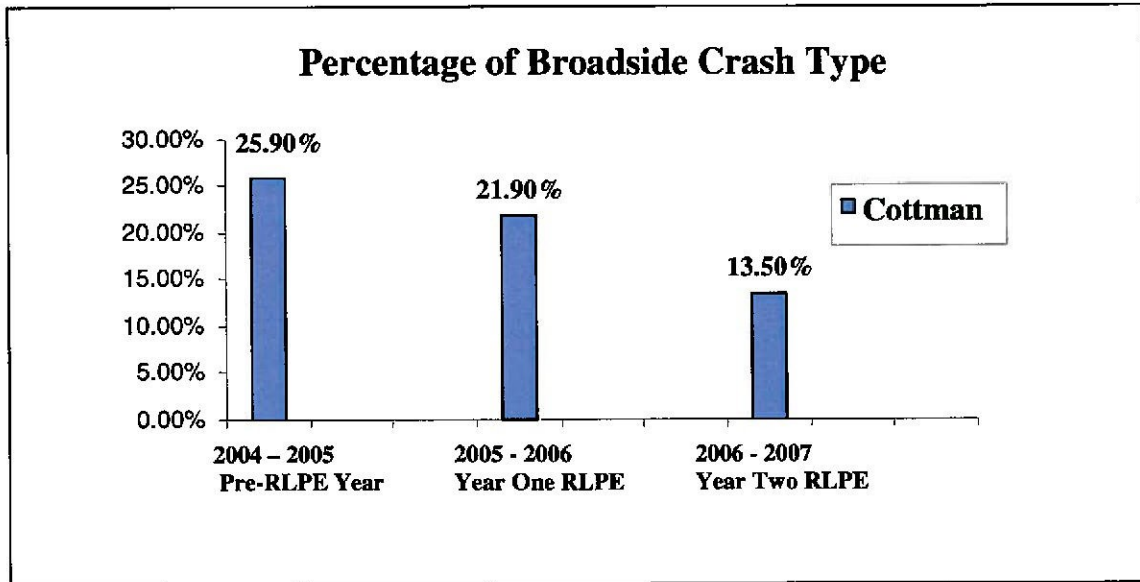


Evaluation of towing comparison

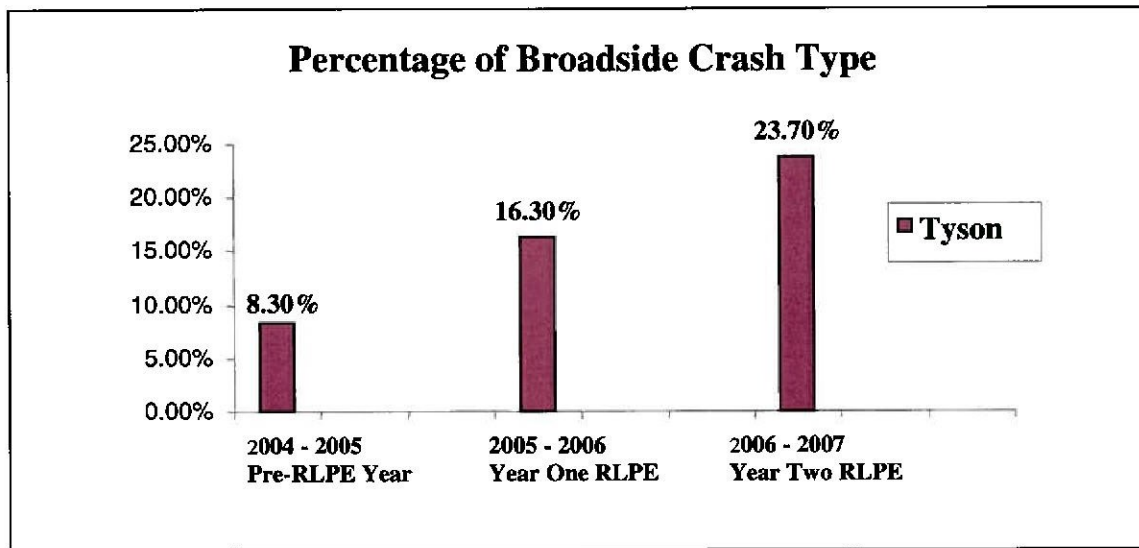
Unlike injury reporting during a crash investigation, the towing designation is not left up to the involved persons. The investigating officer determines whether the crashed vehicle can be driven from the scene. If the damage to the vehicle interferes with the driver's ability to operate normally and requires towing, then the crash receives a special designation. Vehicles that sustain minor damage, but whose operators request towing for reasons other than inoperability, are not classified as crashes requiring towing.

During the year leading up to the introduction of RLPE, Cottman had a dramatically higher percentage than Tyson of crashes that resulted in towing. By the end of Year Two for RLPE, Cottman posted an overwhelmingly smaller percentage than Tyson of crashes resulting in towing. Additionally, Tyson suffered from a continuing increase in towing incidents while Cottman reduced crashes requiring towing to 2.3%.

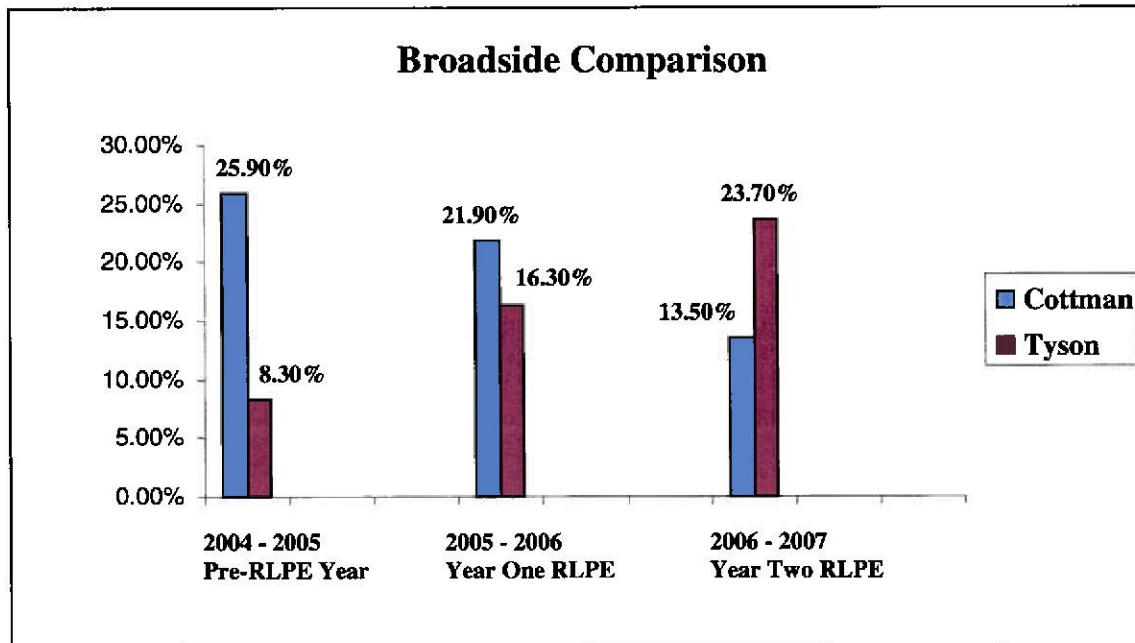
Percentage of broadside crashes - Cottman



Percentage of broadside crashes - Tyson



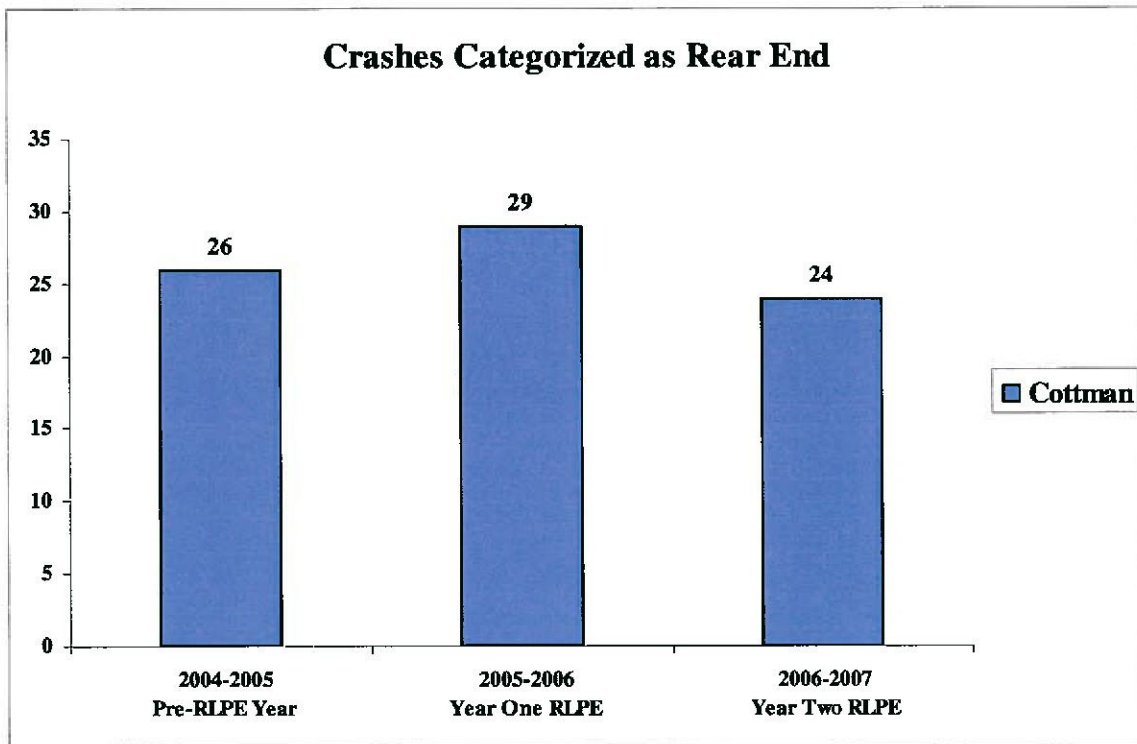
Comparison of Cottman broadside percentages to Tyson broadside percentages



Evaluation of broadside crashes

For this review, broadside crashes were those incidents in which the point of contact was front end of vehicle #1 to the side of vehicle #2. The broadside type of crash provides the clearest indication of adherence to an intersection's traffic signal. In the year leading up to RLPE, nearly 26% of crashes at Cottman were broadside crashes, while Tyson had a total of less than 9%. As RLPE was introduced, the number of broadside crashes at Cottman continuously declined while Tyson had a steady increase. By the end of RLPE's second year, Tyson had peaked at nearly 24% of the intersection's crashes being designated as broadside type incidents.

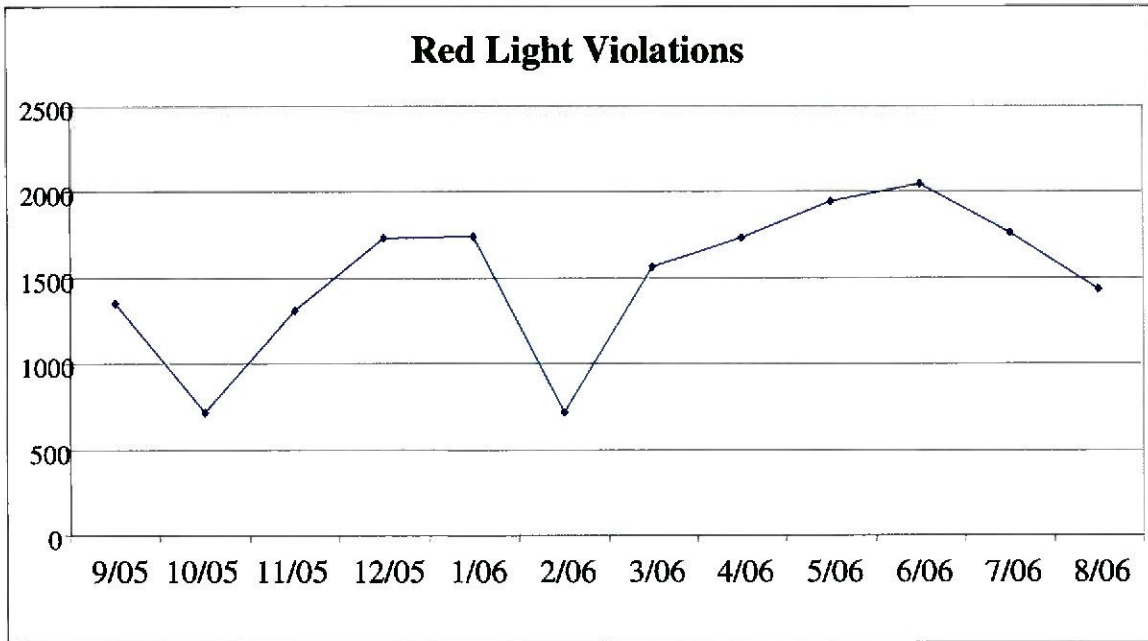
Total crashes categorized as rear-end



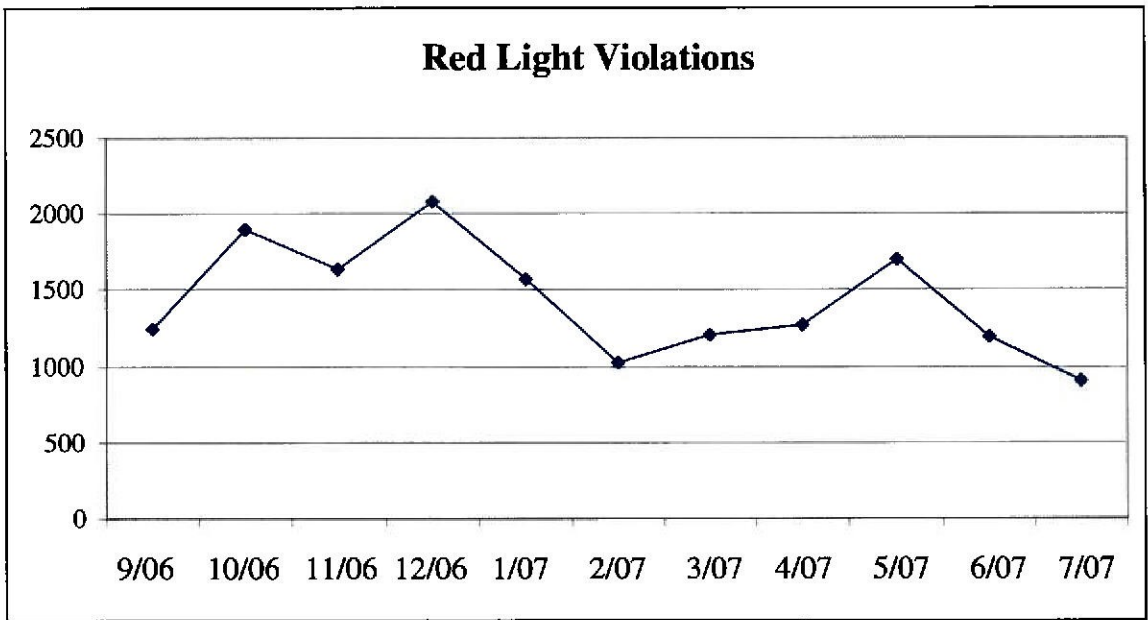
Evaluation of rear end crashes

Rear end crashes are considered to be a common side effect of RLPE. The intersection of Cottman Avenue and Roosevelt Boulevard posted an unusual finding. A review of crashes categorized as rear end shows that by the end of RLPE's Year Two, the number of rear end crashes was less than during the Pre-RLPE Year. Continued observation of this phenomenon should occur in order to determine if Year Two was merely an anomaly.

Red Light Violation Timeline



YEAR ONE



YEAR TWO

Evaluation of red light violations

The differences are subtle when comparing the graphs for Year One and Year Two. The peaks and valleys of Year One and Year Two are nearly reflective. The slopes of the lines in Year Two are slightly less than the slope of the lines in Year One. At this particular point in time, Year Two seems to be accumulating fewer violations than Year One at a rate of approximately 500 fewer per month. Year Two had nine-hundred three (903) fewer violations than issued at Cottman in Year One.

Conclusion

If the goal of technology-enhanced intersections is to reduce crashes, injuries, property damage and red light violations, it would seem that Cottman Avenue and Roosevelt Boulevard serves as a success story. It is recommended that further monitoring and evaluation of this intersection occur to determine if the improvements can be sustained.