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7. Author(s) Susan Herbel, Cambridge Systematics Richard Retting, Sam Schwartz Engineering Elizabeth Wemple, P.E., Cambridge Systematics	8. Performing Organization Report No. 8527-001	
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16. Abstract

The objectives of the Automated Enforcement and Highway Safety Research study were to conduct a literature review of national research related to the effectiveness of Red Light Camera (RLC) programs in changing crash frequency, crash severity, crash costs, and violations; to identify red light running program noteworthy practices, strengths, weaknesses, opportunities, and barriers; establish a record of current RLC applications in Louisiana communities and the observed safety impact of the programs; conduct a survey to understand public perception of RLC programs in Louisiana; review the existing statewide RLC policy, compare it to noteworthy practices, and identify potential improvements; and develop a guidebook for implementing red light camera programs. The research led to recommendations to modify state policy to improve public support for RLC. Potential modifications include enhanced public education programs, additional signage and clarification on the determination of right turn on red violations at signalized intersections with red light cameras. The research also includes recommendations to maximize local agency involvement in site selection.

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Project Review Committee

LTRC appreciates the dedication of the following Project Review Committee Members in guiding this research study to fruition.

LTRC Administrator/Manager

Kirk Zeringue, P.E.

Members

Peter Allain, P.E., PTOE, Louisiana Department of Transportation and Development

Robert Canfield, P.E., Consultant

Dan Magri, P.E., Louisiana Department of Transportation and Development

Tony Tramel, P.E., PTOE, Lafayette Consolidated Government

Marie Walsh, Ph.D., LTAP/LTRC

Directorate Implementation Sponsor

Richard Savoie, P.E.

DOTD Chief Engineer

LTRC Automated Enforcement and Highway Safety

by

Susan Herbel, Cambridge Systematics, Inc.
Richard Retting, Sam Schwartz Engineering
Elizabeth Wemple, P.E., Cambridge Systematics, Inc.

Cambridge Systematics, Inc.
4800 Hampden Lane, Suite 800
Bethesda, MD 20814

LTRC Project No. 10-3SS
State Project No. 30000203

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ABSTRACT

The objectives of the Automated Enforcement and Highway Safety Research study were to conduct a literature review of national research related to the effectiveness of Red Light Camera (RLC) programs in changing crash frequency, crash severity, crash costs, and violations; identify red light running program noteworthy practices, strengths, weaknesses, opportunities, and barriers; establish a record of current RLC applications in Louisiana communities and the observed safety impact of the programs; conduct a survey to understand public perception of RLC programs in Louisiana; review the existing statewide RLC policy, compare it to noteworthy practices, identify potential improvements; and develop a guidebook for implementing red light camera programs. The research led to recommendations to modify state policy to improve public support for red light cameras. Potential modifications include enhanced public education programs, additional signage, and clarification on right-turn-on-red violations at signalized intersections with red light cameras. The research also includes recommendations to maximize local agency involvement in site selection.

IMPLEMENTATION STATEMENT

This study was conducted to summarize currently understood research about the effectiveness of red light cameras at signalized intersections and to understand public perceptions about red light cameras at signalized intersections. The research led to recommendations to modify state policy to improve public support for red light cameras and development of a public education guidebook for communities considering implementing red light cameras.

The potential outcomes from implementing the results of this research project and distributing the project guidebook include improved public support for red light cameras in Louisiana, implementation of red light cameras in more communities in Louisiana, and reduced frequency and severity of angle crashes at signalized intersections in Louisiana.

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INTRODUCTION

In 2009, 7043 people were killed in intersection-related crashes in the United States (NHTSA, 2010) including 676 fatalities and nearly 113,000 injuries that involved red light running (RLR). According to the Insurance Institute of Highway Safety (IIHS), about half of the deaths in RLR crashes are pedestrians, bicyclists, and occupants in vehicles hit by the red light runners (IIHS, 2013).

Research shows the key contributing factors to RLR and/or crashes at signalized intersections are vehicle characteristics, intersection design and operation, and driver behavior (FHWA & NHTSA, 2003). For example, vehicles carrying heavy loads require additional time to stop. Failure to consider vehicle weight can result in RLR. Faulty braking and other defects may also contribute to RLR. Inadequate design and configuration of signalized intersections may contribute to RLR because it may be difficult for motorists to appropriately perceive and react to hazards. Finally, behavioral considerations, such as accelerating near an intersection to travel through during the yellow phase, in-vehicle driver distractions, and exceeding the posted speed limit also contribute to RLR.

Public opinion surveys indicate drivers who run red lights are perceived by 97 percent of survey respondents to be a major safety threat (NHTSA, 2004). A third of respondents claim they know someone who was injured or killed in an intersection crash because of RLR; however, public opinion on red light camera (RLC) programs is divided. Opponents of automated enforcement of RLR may perceive that the programs are designed to generate revenue rather than to improve road safety.

The Louisiana Transportation Research Center (LTRC) funded this project to evaluate the advantages and disadvantages of automated enforcement at intersections, identify strategies to enhance public opinion related to automated enforcement, develop policy guidance for statewide implementation, and develop a guidebook for local jurisdictions considering implementing automated enforcement at signalized intersections. In the remainder of this document, the terms “automated enforcement at intersections” and “RLCs” are used interchangeably.

The project tasks included conducting a literature review of RLCs, surveying Louisiana residents to understand their perceptions of red light cameras, and developing recommendations and a guidebook for implementing RLCs in Louisiana.

OBJECTIVES

This report documents the results of research conducted to evaluate the advantages and disadvantages of automated enforcement at intersections, identify strategies to enhance public opinion related to automated enforcement, develop policy guidance for statewide implementation of automated enforcement, and develop a guidebook for local jurisdictions considering implementing automated enforcement at signalized intersections. The guidebook for RLC implementation in Louisiana was provided separately to LTRC.

The following bullets show the five major project tasks and the objectives of each:

Literature review – study the national research related to the effectiveness of RLC programs in changing crash frequency, crash severity, crash costs, and violations; and identify red light running program noteworthy practices, strengths, weaknesses, opportunities, and barriers.

Data collection – establish a record of current RLC applications in Louisiana communities and the observed safety impact of the programs. The information collected for each community included: how the need for the RLC program was established; how the programs were implemented; information about public opinion of automated enforcement, if available; and crash and citation data before and after RLC installation.

Public opinion survey – understand public perception of RLC programs in Louisiana. The evaluation of perceptions provided information for developing the guidelines for implementing RLC programs in Louisiana communities.

Identify and evaluate potential implementation strategies – review the existing statewide RLC policy, compare it to noteworthy practices, and identify potential improvements to enhance the likelihood of successful RLC program implementation.

Integrate recommended strategies and policies into a guidebook – target local practitioners considering implementing and evaluating the effectiveness of RLC camera programs.

SCOPE

The literature review, public opinion survey, and alternatives development and evaluation conducted for this project focused on identifying opportunities to enhance the Louisiana Department of Transportation and Development (DOTD) RLC program and providing guidance to jurisdictions considering a program.

The literature review provided national level information about the effectiveness and public perceptions of RLC programs. Noteworthy practices to improve or expand implementation of RLC programs in Louisiana were identified.

Existing RLC programs in Louisiana were evaluated by conducting interviews with representatives from the City of Baton Rouge/East Baton Rouge Parish (Baton Rouge) and Lafayette Consolidated Government (Lafayette). Jefferson Parish and Orleans Parish initiated programs, but at the time of this project both were currently under investigation and the programs were inactive. Automated *speed* enforcement programs have been implemented in other Louisiana communities. However this project was focused on red light running at intersections, so automated *speed* enforcement was not evaluated in this project.

The project public opinion survey focused on understanding the public perception of red light running cameras and identifying the measures that might enhance public approval of red light camera programs. Two types of surveys were conducted. A Tier 1 survey was an intercept survey conducted in three Louisiana communities – two with active RLC programs (Baton Rouge and Lafayette) and one without (Alexandria). The Tier 1 survey also included an internet-based survey released through the DOTD web site. A Tier 2 survey involved conducting follow-up interviews with respondents from the Tier 1 surveys who volunteered to participate in more detailed conversations.

The research team also reviewed the existing state automated enforcement policy. Findings from the literature review and the public opinion survey were considered to identify noteworthy practices and potential changes in the policy. The recommendations focus on enhancing public opinion and support for RLC programs. The policy changes were evaluated for ease of implementation, consistency with existing Louisiana practices, effectiveness, and potential impacts on public perception.

Finally, a guidebook targeted at local practitioners considering implementing a RLC for their jurisdictions was developed and provided separately to LTRC. The guidebook provides tools and strategies for implementing and enhancing public understanding support for RLC programs.

METHODOLOGY

Literature and Program Review

The literature review scanned domestic and international documentation related to the effectiveness of RLC programs and RLC implementation policies. It used the National Transportation Library online Transportation Research International Documentation and Research in Progress (RIP) databases. Google Scholar was also searched to identify additional documents and cross verify references. The project team also incorporated the expertise and resources of team member Richard Retting of Sam Schwartz Engineering to confirm critical concepts and resources had not been overlooked. The results of the literature review were organized according to the topics researched, and the references considered for each section are listed at the end of this document.

The review of existing RLC programs in Louisiana was conducted by identifying communities with RLC programs. Representatives from each community were contacted to understand the status of existing programs. Baton Rouge and Lafayette were selected based on this evaluation. Subsequently, detailed interviews were conducted with each RLC program manager to develop a detailed understanding of the program.

Survey Implementation and Evaluation

Two types of surveys were developed and implemented for this project. Two methods were used to implement the Tier 1 survey: in-person intercept interviews and a web-based survey. The Tier 1 survey included a question to solicit volunteers for a follow up interview (Tier 2). The Tier 2 survey was a telephone interview with the volunteers.

Tier 1 Survey

The objective of the Tier 1 survey was to understand public opinion of the RLC programs. Broadly, the questions related to whether a RLC program exists where participants live or work; the participants' opinion of whether RLR running is a problem; whether the participants favor or oppose RLCs and why; and if the participant opposes RLCs, what information or actions would change their opinions about RLC use. The Tier 1 survey can be found in Appendix A.

Team members conducted the Tier 1 intercept surveys at the Office of Motor Vehicles (OMV) branches in Baton Rouge (7701 Independence Boulevard; Monday, December 5, 2011), Lafayette (3241 N.W. Evangeline Thruway; Tuesday, December 6, 2011), and Alexandria (5602 Coliseum Boulevard; Wednesday, December 7, 2011) during the hours of 8:00 a.m. to 4:30 p.m. At the Baton Rouge and Lafayette locations, the public was invited to

participate in a survey regarding the RLC program upon entering the OMV. Team members also approached persons seated and waiting for their turn. At the Alexandria location, all persons were approached while seated and waiting.

An internet version of the Tier 1 survey was also conducted to gather public opinion at the statewide level. DOTD posted the survey on the DOTD web site and distributed an e-mail statewide announcing the survey. The e-mail recipients had at sometime in the past signed up to receive notifications from the DOTD outreach program. Registrants on the DOTD site include the general public, legislators, local leaders, media, and businesses throughout the state. The internet-based survey was available December 14, 2011 to January 6, 2012. The results from the intercept and internet-based surveys were coded into a spreadsheet for analysis.

The Tier 1 survey (both intercept and internet-based) also asked participants if they would be willing to participate in an in-depth follow-up telephone interview. The names of the willing participants were compiled into a spreadsheet. Fifty people were randomly selected from this list for follow up interviews. This follow up interview is called the Tier 2 survey.

Tier 2 Survey Implementation Methodology

The Tier 2 follow-up survey is included in Appendix B. Broadly, this detailed telephone survey focused on participants' overall opinion of RLCs; perceived effectiveness of RLCs to improve intersection safety; opinion on the likelihood of getting caught running a red light; opinion on how RLC revenues should be used; and whether participants or someone they know have received a citation for running a red light.

The Tier 2 survey participants included respondents of both the intercept and internet-based surveys and were from communities throughout the state. The Tier 2 telephone interviews were conducted on weekdays between February 15, 2012 and February 26, 2012 between 8:30 a.m. and 4:30 p.m. until a total of 50 respondents were interviewed. These results were also coded into a spreadsheet for analysis.

Survey Error Rate

The *intercept* survey produced 176 responses (46 in Baton Rouge, 91 in Lafayette, 39 in Alexandria) and 1,058 persons responded to the Tier 1 *Internet* survey. To increase the sample size and decrease the error rate of the Tier 1 intercept survey results, responses from the appropriate internet survey respondents were added to the intercept survey responses. In all, 312 responses from the Alexandria, Baton Rouge, and Lafayette regions were extracted from the Tier 1 *Internet* survey and added to the corresponding Tier 1 *intercept* survey responses. Respondents were added based on the location identified as the residential zip code. Adding the internet responses does not introduce bias because both the internet

response and people arriving at the OMV locations were random. Moreover, the same questionnaire was used in both efforts. The total number of responses analyzed for each community is called "combined respondents." Table 1 summarizes the number of survey respondents and estimated error rate based on the entire population for each community and statewide for the internet survey. An error rate was not calculated for any subsets of the population evaluated in this report.

Table 1
Summary of the number of survey respondents and estimated error rates

Location	Original Number of Respondents	Number of Respondents Added From Internet Survey	Combined Respondents Analyzed	Estimated Error Rate (Plus or Minus)
Baton Rouge	46	243	289	6%
Lafayette	91	59	150	8%
Alexandria	39	10	49	14%
Statewide Internet Survey	1,058	Not applicable	1,058	3%
Overall Tier 1 Survey	**1,234**	**Not applicable**	**--**	**3%**

The volunteers were randomly contacted until 50 responses were collected for the Tier 2 survey. These results are being used anecdotally because an error rate could not be estimated.

Analysis of Tier 1 and Tier 2 Surveys

The Tier 1 intercept survey responses were analyzed in the following ways:

- Individually for each region (Baton Rouge, Lafayette, and Alexandria) using the combined results;
- At a statewide level using the internet survey only; and
- Comparing regions with RLC programs (Baton Rouge, Lafayette, and New Orleans) to regions without RLC programs (remainder of state).

The Tier 2 survey responses were analyzed in one group only.

Alternative Development and Evaluation

Finally, based on the literature review and the survey results, alternative policies and programs were identified for possible implementation in Louisiana. The research team developed and evaluated policy recommendations to the existing state-automated

enforcement policy and created a guidebook for local agencies considering RLCs. The current state policy is included in Appendix C.

Policy changes to the existing state-automated enforcement policy and guidance were evaluated according to the following qualitative criteria:

- **Implementation** – Who would be responsible to implement the change and is the recommendation likely to be relatively easy or relatively difficult to implement?

- **Consistency with Louisiana practices –** How consistent is the recommendation with existing Louisiana practices? Consistency with existing practices facilitates adaptation to change.

- **Effectiveness –** How effective is the recommendation likely to be in changing public opinion about RLCs? Is making the recommended change likely to yield a large or small change in public perception of RLCs?

- **Benefits to public perception –** Would making the recommended change have a positive or negative impact on public opinion about RLCs? At a qualitative level, what is the anticipated magnitude of the impact on public perception?

DISCUSSION OF RESULTS

Literature Review

The literature review addressed research results in terms of crash type, severity, and cost, behavior change due to RLCs, public opinion about RLCs, and RLC program implementation guidance.

Crash Type and Severity Associated with RLC Programs

Based on a summary of the research literature on RLC impacts, a synthesis report conducted for the National Cooperative Highway Research Program (NCHRP) concluded the preponderance of evidence indicates red light running camera systems improve the overall safety of intersections. Angle crashes are usually reduced and rear-end crashes increase, but to a lesser extent. Some "spillover" effect occurs at other signalized intersections. Automated enforcement of red light running can be an effective safety countermeasure. However, the report admits the findings are inconclusive because not enough empirical evidence based on a statistically rigorous experimental design are available to report the findings conclusively (NCHRP 310, 2003).

The peer-reviewed literature provides mixed findings on the type and severity of crashes affected with RLC programs. Installing RLC generally yields a reduction in right angle crashes and injury crashes. Many studies report increases in rear-end crashes although the findings are not universal. Many studies also show reductions in crash severity. Council, et al. (2005) found reductions in injury-related crashes. Examples from specific locations include:

- The city of Dallas (2009) reported a decline in RLR crashes and overall crashes within two years of implementation.

- After 10 years of implementation, Howard County, Maryland (2007), reported a decline of up to 57 percent in angle crashes and up to 18 percent in all crashes. Rear-end crashes in the same jurisdiction had a short-term incremental increase, but a long-term reduction.

- Evaluation of San Francisco RLC intersections (1992 - 2001) before and after crash data showed nearly a 50 percent decrease in fatal crashes and a nine percent decrease in injury crashes.

- Phoenix and Scottsdale (Washington and Shin, 2005) reported a systematic decline in angle and left-turn crashes. Overall crashes remained unchanged for Phoenix area sites, but decreased for Scottsdale. Rear-end crashes increased for both jurisdictions.

An analysis of 586 annualized crashes at 56 intersections across Texas showed a reduction in overall annualized crash frequency and angle crashes as well as a small increase in rear-end crashes (Walden, 2008). The researchers concluded RLC programs have a positive impact on crash frequency at intersections in Texas, although the results were not statistically significant.

Red Light Running Violations

Most studies show implementing RLC yields a decrease in the number of red light running violations at the treatment sites. Retting et al. (1999) reported approximately 40 percent reduction in violations in Fairfax, VA, and Oxnard, CA. The communities also witnessed a decline in red light running violations at *non-treatment* sites, indicating an overall change in driver behavior. Other specific findings include:

- Virginia Beach, VA, experienced 78 percent reduction violations (Martinez and Porter 2006).

- In Philadelphia, PA, yellow time extensions at two suspect intersections resulted in a 36 percent reduction in violations. After implementing RLCs, the violations decreased by an additional 62 percent (Retting et al., 2008).

- Howard County also reported a 67 percent decline in RLR citations (Frangos, undated).

- RLR violations decreased by 68 percent in San Francisco, following RLC program implementation.

Table 2 summarizes the observed changes in crashes, violations, and citations reported by jurisdictions across the country with RLC programs in place. An up arrow (↑) indicates an increase and a down arrow (↓) shows a decline of crashes or violations. Status quo is represented by "↔."

Table 2
Red light camera programs data summary

Jurisdiction	Study Year	RLR Crashes	Total Crashes	Angle Crashes	Rear-End Crashes	Violations
Phoenix, AZ	2005		↔	↓	↑	
Scottsdale, AZ	2005		↓	↓	↑	
Calgary, CA	2009			↓	↓	
Oxnard, CA	1998		↓	↓	↑	↓
San Diego, CA	2002	↓	↑	↓	↑	↓
Baltimore County, MD	2003	↓	↓			
Howard County, MD	undated		↓	↓		↓
Charlotte, NC	2001		↔	↓	↑	↓
Raleigh, NC	2003	↓	↓	↓	↓	
Dallas, TX	2009		↓		↓	
Garland, TX	2009	↓	↓		↑	↓
Irving, TX	2009		↓	↓	↑	
Seattle, WA	2008		↓	↔		↓

Crash Costs

Council et al. (2005) report an aggregate crash cost benefit of RLC programs. The economic benefits due to reduction in angle crashes outweigh the additional cost incurred with the increase of rear-end crashes. They further suggest RLC programs should be considered at locations with a high ratio of angle crashes to rear-end crashes, high proportion of entering ADT at the major road, short cycle lengths, and one or more protected left-turn phases. Washington and Shin (2005) reported a net benefit of $4,504 per approach per year for Phoenix and $684,134 per approach per year for Scottsdale, which benefited more because of the greater decrease in fatal and injury crashes.

Effectiveness in Louisiana

RLCs were installed at six intersections in Lafayette between December 2007 and March 2008 (Schneider, 2010). The observational before after study by Schneider identified 127 crashes in the 12-month period before the installation and 111 crashes in the 12-month after period indicating a decline of 12.6 percent. Angle crashes decreased by 33.3 percent; whereas, rear-end and other types of crashes remained relatively unchanged. The research by Schneider indicated no statistically significant change in overall crashes per month. Only angle crashes registered a statistically significant decline. A cost benefit analysis estimates a net savings of $693,926 per year.

Public Opinion Surveys

Retting et al. (1999) conducted one of the first public opinion studies on RLCs in Fairfax, VA, and Oxnard, CA. In Oxnard, a majority of the residents were aware of the RLC program, and 79 percent supported it. Support for the program was lower among males and young respondents (16-29 years old). In Fairfax, VA, 84 percent of the respondents supported the program after one year of enforcement.

In another study, Retting and Williams (2000) surveyed respondents from 10 cities in the US, five with RLCs and five without. Overall, a majority of the respondents supported the programs. A notable finding is 80 percent of the respondents in cities with RLC programs supported the programs, and 76 percent of the respondents in the cities without RLCs supported RLR automated enforcement. RLC programs had a higher approval among respondents 35 years and older. Garber et al. (2005) indicated 66 percent of the respondents in Virginia communities with or without RLCs supported the program. A 2002 nationwide survey by the Gallop Organization reported 75 percent of drivers favor the RLCs.

Retting and Williams (2000) found respondents in cities with RLC programs perceive a greater risk of being cited. Sixty-one percent of the respondents in cities with RLC programs believe red light runners will receive a citation, compared with 46 percent in non-RLC cities.

The same document reported more than half of the respondents in Fresno, CA, mistakenly believed the city had implemented RLC programs. Media coverage about such programs and the actual implementation in other cities in California may have contributed to the misperception among Fresno residents.

Red Light Camera Program Implementation

In 2003, FHWA and NHTSA published "Guidance for Using Red Light Cameras." The document demonstrates situations in which it is best to install RLCs and provides critical information for State and local agencies on consistent and proper implementation and operation of RLCs.

Initially, a systematic investigation of intersection crash data and red light running violations should be conducted to identify potential locations for RLC implementation. Potential sites are those with high incidence of red light running. However, caution should be exercised in using the number of violations as the only diagnostic tool because it does not always translate to a red light running crash problem.

In addition, a comprehensive review of crash data and field conditions should be undertaken. The crash data should be considered to understand crash location and type, time of day, speed, weather, direction of travel, and vehicle type. Further, field observations by traffic engineers and video surveillance may provide additional insight to driver behavior.

Intersection geometry, traffic volumes, and signal time data may provide clues to frequency of red light running crashes. Complaints from road users and the public should also be taken into account.

Following problem identification and a thorough engineering study, engineering, educational, and conventional enforcement countermeasures should be tried and proven unsuccessful before RLC programs are installed. RLCs should be installed only when authorized by law. Thirteen states and the District of Columbia have laws granting statewide authority for camera enforcement.

FHWA and NHTSA identify the following steps for a proper RLC program implementation:

- Early planning and set up;
- System planning;
- Engineering design consideration of RLC systems;
- RLC system installation;
- Operation and maintenance; and
- Public information and education.

Early planning includes establishing a stakeholder oversight committee responsible for clearly articulating program objectives. Typical program concerns vary but include privacy issues, distribution of RLC citations, and penalties. All of these should be thoroughly addressed and resolved before RLC system installation.

It is important to implement a comprehensive public awareness and information campaign before the RLC program. Outreach efforts can target schools, media, driver education programs, and local community programs. Quick response to telephone and email inquires and correspondence should be a priority. In the early stages of the RLC program, warning citations could be issued to potential violators as an additional form of public education. Subsequently, the public should be advised of the end of warning citation period and the start of the actual enforcement.

Authorities are advised to explore all system procurement alternatives available to the state and local agencies. If agencies elect to outsource the functions and operations of the RLC programs to private contractors, they should establish necessary procedures for oversight and supervision. Responsible agencies should clearly establish procedures for site selection, violation processing, warning sign placement, system selection, technologies, vehicle

detection and communications apparatus, and methods for documenting yellow/clearance change interval signal timing according to the Manual on Uniform Traffic Control Devices (MUTCD) guidelines.

RLC Implementation in Louisiana

Louisiana laws allow for local authorities to evaluate and make the decision to implement an automated enforcement program. Once an application is made to the state, DOTD will issue appropriate permits to local governments or designated agents for installing and operating photo enforcement equipment when such locations are proposed on state highways. The local authorities are required to provide documentation on the existence of a legal instrument authorizing the use of electronic enforcement in the jurisdiction. The permit application should include a public education plan with a 30-day warning period, issuance of a public information notice, an annual announcement of enforcement locations, and number of violations issued. The permit application must also include installation plans and appropriate signage for each site. Monitored intersection selection should be primarily based on vehicle/pedestrian crashes.

Data Collection and Analysis

The Baton Rouge and Lafayette programs were studied. The City of Baton Rouge/East Baton Rouge Parish Department of Public Works (DPW) in cooperation with the Police Department oversees the Red Light Safety Program in Baton Rouge. The program was developed in 2007 and initiated in early 2008. It is currently managed by Sarah Paul-Edel, P.E. (sedel@brgov.com, 225.389.2167) who was also responsible for the site selection methodology described below. The program was based on data from DOTD and was initiated by the Mayor's office as a possible solution to Baton Rouge's high crash problem.

Lafayette Parish's automated red light running program is called the SafeLight/SafeSpeed Program. It encompasses both RLC and automated speeding enforcement. The SafeLight red light program was studied for this data collection effort. The SafeLight/SafeSpeed program began in 1998 when Tony Tramel, P.E., became director of Lafayette's Department of Traffic and Transportation (DTT). At the time, increased emphasis on red light running crashes was occurring throughout the nation. In 2000, FHWA reported 106,000 RLR crashes nationwide, including 89,000 injuries and 1,036 fatalities. DTT staff perceived an increasing RLR trend and educated the members of the City Parish Council during a series of briefings and presentations, and provided information about alternative programs.

In 2004-05, Lafayette Consolidated Government (LCG) DTT received a safety grant from DOTD to study red light running enforcement issues and practices of other communities. This effort included validating all of the yellow/signal change intervals for all traffic signals,

identifying problem sites, reviewing technologies, and identifying challenges in other communities with RLR enforcement. A member of the City Council; members of local, parish, and state law enforcement officers; and the local prosecuting attorney conducted field visits to eight communities in North Carolina and Arizona and two companies who provide red light enforcement equipment and services. Staff also supervised a public opinion poll where the community identified red light running as a problem. Several members of the LCG Council were educated on this safety issue and were exposed to the automated enforcement in Charlotte, North Carolina, during a National League of City's Conference in 2006. The same year, the Council passed an ordinance allowing automated enforcement. The DTT director is identified in the Code of Ordinances as responsible for electronic enforcement provisions. Travis Smith, P.E. (tsmith@lafayettela.gov, 337.291.8506) works with the director to manage the program.

The following summary provides specific information about the Baton Rouge and Lafayette Parish programs.

Baton Rouge Implementation

The Department of Public Works (DPW) chose a network approach to select RLC locations, using crash data from red light intersections and narrowing down the selection based on correctable crash locations (right angle) with relatively lower numbers of rear-end collisions. Selected locations were presented to a committee comprised of representatives of the Baton Rouge City Police, the Mayor's office, and the DPW Chief Traffic Engineer. The list was narrowed further based on recommendations from the committee, which factored in numbers of violations at intersections and the desire to distribute the locations throughout the city, in an effort to avoid concentration in one area. The list was then presented to the vendor, American Traffic Solutions (ATS), who videoed and reviewed the intersections and made additional recommendations based on the review and constructability at the locations. The DPW Traffic Engineering Department made the final site installation decisions.

Deployment. Baton Rouge installed 27 active, permanent, fixed location cameras at 18 signalized intersections. The first camera was installed in February 2008 as a test site by DOTD and ATS. The official locations were installed between March 2008 and March 2010.

Photos of red light running vehicles are taken with digital cameras when the violator is in front of the stop bar and again on the other side of the stop bar with the red light in view. In addition to the cameras, a video is taken and reviewed by police officers to determine if a traffic violation is valid. The video is available for the public to view online. More recent DOTD policy guidelines for installing RLCs at intersections have not changed the Baton Rouge methodology.

ATS installs, maintains, and processes all data from the RLCs. The violations are sent to the Baton Rouge City Police Department to determine if the incident captured is a violation of their Code of Ordinance, and if appropriate, a violation notice is mailed to the registered owner of the vehicle. ATS is paid 35 percent of the amount collected for each violation. The remaining 65 percent is deposited into the Baton Rouge general fund and is used for traffic-related safety improvements as determined by the Baton Rouge City Council.

Outreach. A formal public education plan was not adopted prior to initiating the Red Light Safety Program. The public was informed through press releases, occasional interviews, brochures, and the website. The program brochure and additional information can be found on the City/Parish website at http://www.brgov.com/redlight/press.htm.

According to the program manager, the number of calls to the DPW Traffic Engineering Department has decreased considerably since the inception of the Red Light Safety Program. The Department used to receive many calls questioning the length of yellow light times and requesting clarification of point of entry into the intersection. The calls received in the last year involve an occasional person wishing to contest a violation, in which case the caller is forwarded to ATS who processes requests for Adjudication Hearings.

Citations. From the first RLC installation on February 18, 2008, through August 2011, 122,767 red light running citations have been issued; 1,762 were contested, 1,134 were dismissed, and 628 were upheld. One adjudication officer and one attorney review the violation contentions. Violators who wish to appeal a violation may do so by noting it on the notice and remitting it by the due date on the notice.

Effectiveness. According to the DPW Data Reports to DOTD for the 2008 and 2009 calendar years, the Red Light Safety Program has not been operational long enough to form conclusions about the effectiveness of RLCs at intersections in relation to reduction or increase in crashes. The data for the 2010 calendar year are not yet available at the time of this research. While DPW has seen a reduction in total crashes and/or injury crashes at several locations, they are concerned about an increase in crashes at several other locations. When data becomes available, DPW will conduct a study to ascertain whether the red light cameras should be continued.

Lafayette Parish Implementation

The DTT implemented a network approach for identifying RLC installation sites in Lafayette. They evaluated every signalized intersection (190) for right angle crash frequency, and identified crash rates for right angle crashes to determine a rank order for RLC installation. The crash rate was determined by using year 2000 turning movement data and projecting 24 hour total entering traffic volumes and establishing a ratio of traffic crashes

per million entering vehicles per year. Both rank order rate and rank order frequency were summed to establish the candidate intersections for red light enforcement.

Deployment. Of the 190 total signalized intersections, 12 have active, permanent, and fixed RLCs and an additional 17 have been identified for implementation. Cameras capture the plate image, an image of the vehicle as it enters the intersection, and again when it is in the intersection. Incidents videos are captured and reviewed by the DTT. Video is available to the public by request. Both a "plate" (rear end of the vehicle) and a "face" (front of the vehicle) imaged are captured. The "face" image may provide information about the vehicle driver (Baton Rouge only captures the rear of the vehicle).

Specific DOTD guidelines were lacking when the SafeLight Program first started; however, DOTD right of way permits were submitted and approved by the local District Office. LCG has not yet installed any RLCs under the new criteria. The guidelines for installation of the RLCs are outlined in the LCG ordinance, which was written by the DTT with the aid of attorneys. Lafayette currently defines point of entry as the prolongation of the curb line rather than at the stop bar, which is where DOTD prefers to regulate entry. The LCG decided designating the curb line is more consistent than the stop line, because the stop line location often changes or is pushed back for various reasons, such as crosswalks. Additionally, state law at the time of equipment installation also defined the intersection in the same manner. Recent changes in state law and the MUTCD now include the area from the stop bars within the legal definition of the intersection.

Redflex Traffic Systems, Inc. (Redflex) is the vendor for the SafeLight/SafeSpeed Program and is responsible for installing, maintaining, and processing data from the RLCs. Redflex is compensated monthly based on the number of paid violations. Failure to pay the original violation within the time prescribed on the notice of violation (30 days) imposes a 50 percent additional penalty. A financial lock box agreement is used to audit and account for the number of paid violations in an invoicing process, which distributes the funds monthly to the vendor and to LCG. The funds LCG receives are deposited into a Traffic Safety Fund which is intended to fund traffic safety projects and programs subject to the provisions of LCG's Home Rule Charter budget process. Table 3 explains the tiered system of payment to Redflex outlined in the vendor contract.

Table 3
Tiered system of payment to Redflex

Safelight Lafayette Program – Redflex Compensation		
Tier	Citations Paid	Fee Per Paid Citation
Tier 1	1-150 citations equivalent fully paid per calendar month	$39.00
Tier 2	151 to 300 citations equivalent fully paid per calendar month	$28.00
Tier 3	301 Plus citations equivalent fully paid per calendar month	$15.50

Source: *Final Contract Document, Exhibit D: Compensation and Pricing*. Provided by LCG DTT

Outreach. No formal public education plan was adopted, but intense reporting occurred on this matter by print and electronic media during the adoption and implementation of the SafeLight Program. Additionally the vendor implemented an initial media campaign. The vendor program consisted of radio and television spots, a 30 day warning period before violations were issued for the first group of cameras installed, and a press release when subsequent intersections were outfitted with the cameras. The LCG Council appropriated $50,000 in Fiscal Year 2010-2011 to begin a safety-oriented campaign, and a similar allocation has been appropriated for Fiscal Year 2011-2012 to continue the outreach.

Violations. LCG Council approved the RLC ordinance on September 21, 2006, and the contract with Redflex was signed in 2007. The DTT releases a monthly table of violations on its website. The total number of violations from the start of the program through March 2011 is 48,538.

An adjudication bureau of local attorneys hears appeals. If violators wish to take the matter further, they can appeal to the 15th Judicial District Court. Since the program's inception, no violator has proceeded to the 15th Judicial District Court, and no violations have been overturned other than those determined by the Adjudication Bureau during the initial appeal process. According to LCG, Redflex initially scheduled approximately 10 hearings every week, but currently holds between four and six hearings a year.

Effectiveness. According to the SafeLight/SafeSpeed Lafayette Program Status Report to LCG dated July 20, 2011, the program has not been operational long enough to perform a technically and statistically significant comparison of before and after crashes at intersections with RLCs. Lafayette has performed a trend analysis of traffic crash data, comparing data from the current operating time with the same amount of time prior to installation at an intersection. For instance, if a SafeLight intersection has been operating for 14 months, the data are compared with the data from 14 months prior to installation. A reduction in crashes

as well as improvement in driver behavior appears to be occurring. Table 4 summarizes this information.

Table 4
Summary of traffic crashes at SafeLight locations within 100 ft

Summary of Traffic Crashes at SafeLight Locations Within 100'				
	Before Period	After Period	Difference	Percent Change
Total Crashes	332	117	215	-65%
Right Angle Crashes	131	56	75	-57%
Rear-End Crashes	118	40	78	-66%

Source: Traffic Crash Statistics at SafeLight Locations, Program Status Report, July 20, 2011

Public Opinion. David Walker with Market Research and Analysis conducted two traffic safety public opinion surveys 2001 and 2005 in Louisiana: *Traffic and Public Safety in Lafayette Parish* (2001) and *Signal Light Cameras in Louisiana* (2005). The majority (65 percent) of those surveyed in the *Signal Light Cameras in Louisiana* survey support the placement of cameras at traffic signals, with 23 percent identifying red light running as a frequent traffic violation and 82 percent reporting red light running as either extremely or very dangerous. The results from the *Traffic and Public Safety in Lafayette Parish* survey were similar, with 65 percent indicating red light running as extremely dangerous and 25 percent indicating that it is very dangerous. The majority of respondents (64 percent) supported cameras at signal lights and 72 percent thought cameras would reduce the frequency of red light running. Table 5 shows public opinion regarding cameras at intersection prior to implementation.

Table 5
Public opinion of RLCs before installation

Do you support or oppose the use of cameras at traffic signals? (pre implementation)			
	Support	Oppose	Don't Know
Traffic & Public Safety, Lafayette, 2001	64%	30%	6%
Signal Light Cameras, Louisiana Voters, 2005	63%	16%	21%

Source: *Signal Light Cameras: State of Louisiana*, July 31-August 3, 2005, and *Traffic and Public Safety: Lafayette Parish*, October 11-13, 2001, Market Research and Analysis

Southern Media and Opinion conducted subsequent opinion polls and prepared a report after implementation of RLCs at intersections. These include two for Lafayette Parish in 2008 and 2009 and a statewide poll in 2009. A majority (71.2 percent in 2008 and 73 percent in 2009) of those surveyed in Lafayette believe the use of cameras will reduce the number of people who drive through red lights. Table 6 displays the survey responses related to support/ opposition of RLCs.

Table 6
Public opinion of RLCs after installation

Do you support or oppose the use of cameras at intersections with red lights? (post implementation)						
	Strongly Support	Support	(Neutral)	Oppose	Strongly Oppose	Don't Know
Lafayette 2008	31.3%	34.7%	6.0%	11.2%	15.6%	1.2%
Lafayette 2009	27.0%	32.5%	8.8%	11.3%	17.3%	3.3%
Louisiana 2009	26.5%	33.0%	5.2%	16.3%	17.0%	2.0%

Source: *Lafayette Parish Public Opinion Survey,* April 2008 & August 2009; *Louisiana Voters Public Opinion Survey,* August 2009, Southern Media & Opinion Research, Inc.

Public opinion surveys have not been conducted prior to or since the implementation of RLC programs in Baton Rouge.

Results of Tier 1 Public Opinion Intercept Survey

This section provides a summary of the responses to the Tier 1 survey questions by region (Baton Rouge, Lafayette, Alexandria, and statewide).

Presence of RLC Program

Respondents were asked whether there is a RLC program where they live or work. As expected, a higher percentage of participants in Baton Rouge and Lafayette indicated a RLC program where they live (70.9 percent and 74 percent, respectively) and where they work (90 percent and 74.7 percent, respectively) compared to respondents in Alexandria or statewide. However, although Alexandria currently does not have a RLC program, 37.1 percent of Alexandria respondents indicated a RLC program where they live. Figure 1 summarizes the participant responses by region.

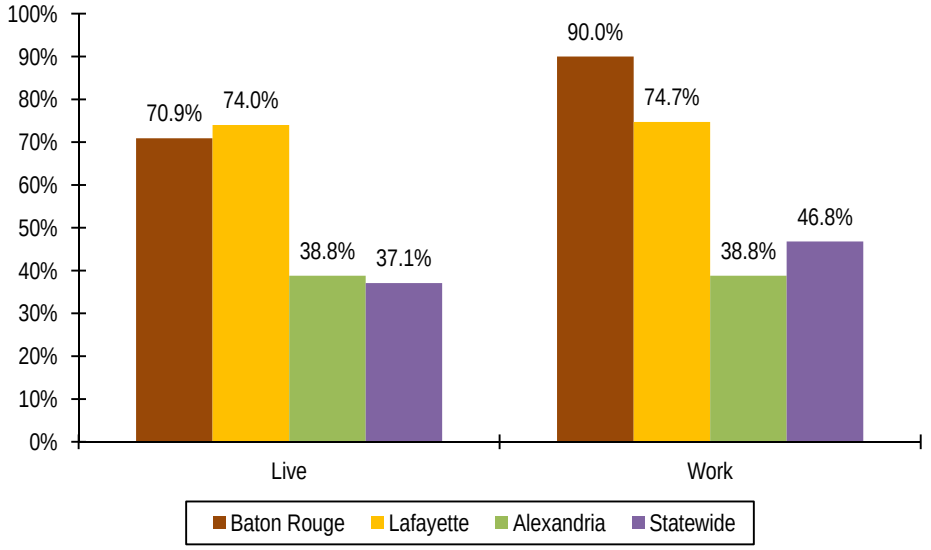

Figure 1
Percentage of respondents with a RLC Program by where they live/work

Opinion on Whether RLR is a Problem

Tier 1 respondents were asked whether red light running is a problem where they live. Of those who indicated yes or no, the results were nearly divided. In Baton Rouge, 43.6 percent of respondents believe red light running is a problem in the community in which they live, compared to 34.6 percent who do not believe it is a problem. Conversely in Lafayette, 32 percent believe it is a problem, while 41.3 percent do not. Nearly 39 percent of Alexandria respondents believe it is a problem, while 34.7 percent do not. Finally, 35.7 percent of the statewide respondents indicated red light running is a problem compared to 42.6 percent who indicated otherwise. Figure 2 summarizes these results. Accounting for the error rates, respondents are essentially evenly split in their opinion as to whether red light running is a problem.

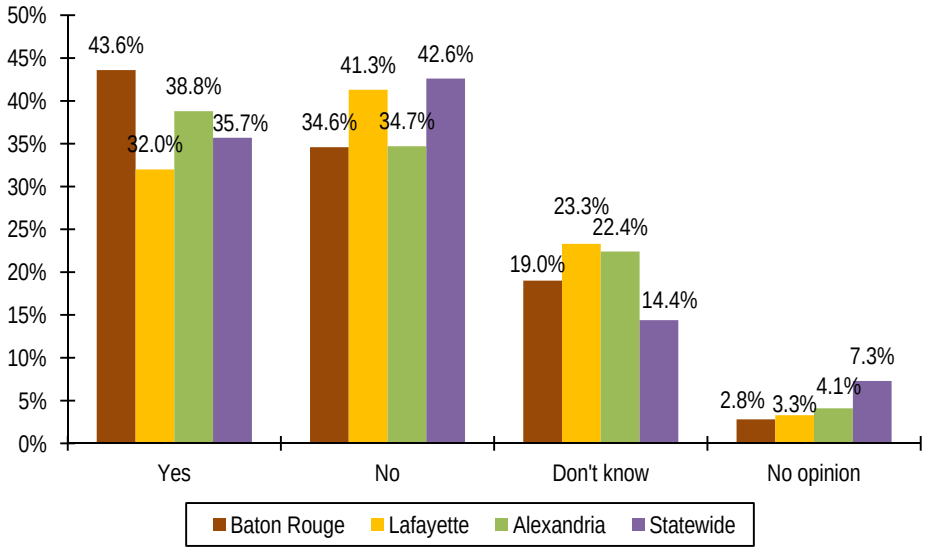

Figure 2
Percentage of respondents who believe red light running is a problem

The results in Figure 2 differ slightly from the public opinion survey conducted by Market Research and Analysis for Lafayette in 2005. In that survey, respondents were asked, "How much of a problem do you believe red light running is in your community? Would you say it's an extremely big problem, big problem, somewhat of a problem, or not a problem?" In the Lafayette survey, 58 percent of respondents felt red light running was either an extremely big problem or big problem with an additional 27 percent indicating they felt like it was somewhat of a problem. In this survey, only 9 percent of respondents did not believe red light running was a problem in their community as opposed to 41 percent in this survey. Five percent did not know or would not say.

Opinion on the Use of RLCs

Respondents also were asked to indicate whether they are in favor or opposed to the use of RLCs as a tool to reduce red light running at intersections. The responses in Baton Rouge and statewide were nearly evenly divided with 50.9 percent and 47.2 percent in favor and 48.4 percent and 49.2 percent opposed, respectively. In Lafayette, the percentage of respondents opposed to RLC programs was slightly higher with 54 percent opposed compared to 46 percent in favor. In communities with RLCs, there is roughly an even split between favoring and opposing RLCs.

Conversely, in Alexandria (where there currently is no RLC Program), 67.3 percent of respondents are in favor of RLC programs, compared to 28.6 opposed. Figure 3 summarizes these results.

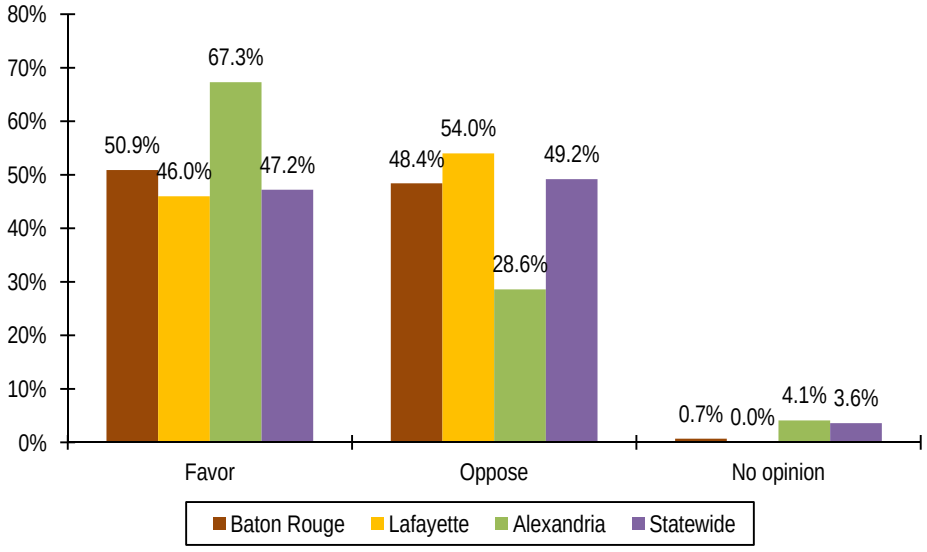

Figure 3
Percentage of respondents who favor/oppose RLC programs

The 2005 Market Research and Analysis survey for Lafayette posed a similar question. The 2005 survey asked respondents the following question: "Some local governments are considering placing cameras at certain traffic signals. The cameras would be activated only if a vehicle runs a red light, and the owner of the vehicle would be mailed a traffic citation. Do you support or oppose the use of cameras at traffic signals?" Sixty-three percent of the respondents supported the use of cameras, while 16 percent indicated opposition. Twenty-one percent of those surveyed said they did not know or would not say.

Reasons to Favor RLCs

Respondents who indicated they favor the use of red light cameras were asked to select reasons why they favor the use of RLCs. Respondents could pick more than one selection.

Their options included: "Reduces red light running," "reduces crashes," and "encourages drivers to obey traffic laws." Respondents could also fill in their own responses. With the exception of Alexandria respondents, the most popular reason to favor RLCs is to encourage drivers to obey traffic laws. Reducing crashes elicited the highest response for Alexandria respondents. Figure 4 summarizes the percentage of respondents selecting each option by region.

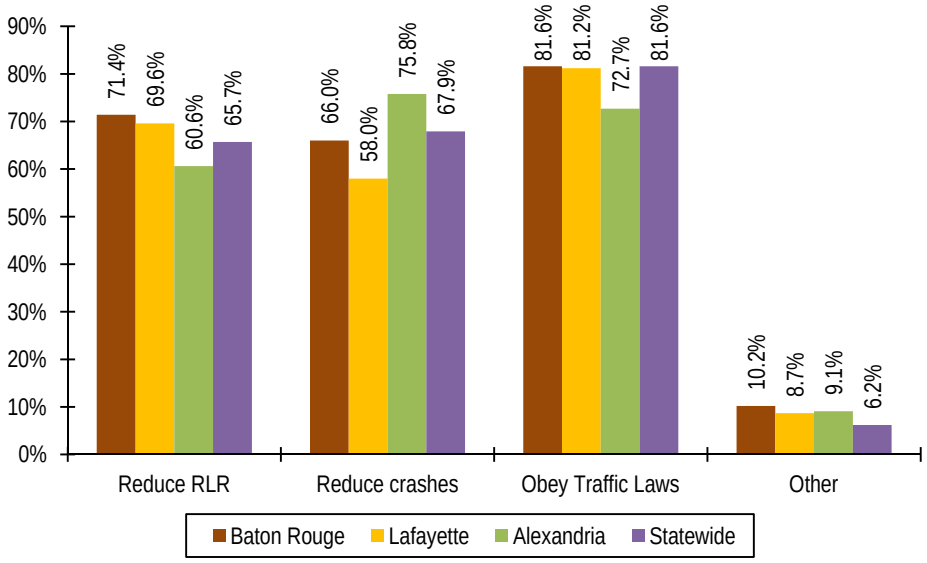

Figure 4
Reasons to support RLC programs (among those who favor)

While the "other" responses varied, a common response was RLCs encourage drivers to pay more attention. Others responded RLCs encourage drivers to obey traffic laws and reduce angle crashes, making them feel safer.

Reasons to Oppose RLCs

Of the Tier 1 combined survey respondents, the 581 respondents who indicated they oppose the use of RLCs were asked to select reasons why they oppose RLC use. Respondents were asked to select from the following options: "It is just a program to increase revenue for local government and/or the police department," "RLCs go against our system of justice since no police officer actually witnessed the driver committing the offense," and "Do not think they are effective." Respondents could select as many reasons as appropriate and also fill in their own response.

From the selections provided, the greatest percentage of respondents indicated RLC use goes against our system of justice and is a program to increase revenue. Fewer respondents indicated RLCs are not effective or selected the other category. These results are summarized in Figure 5.

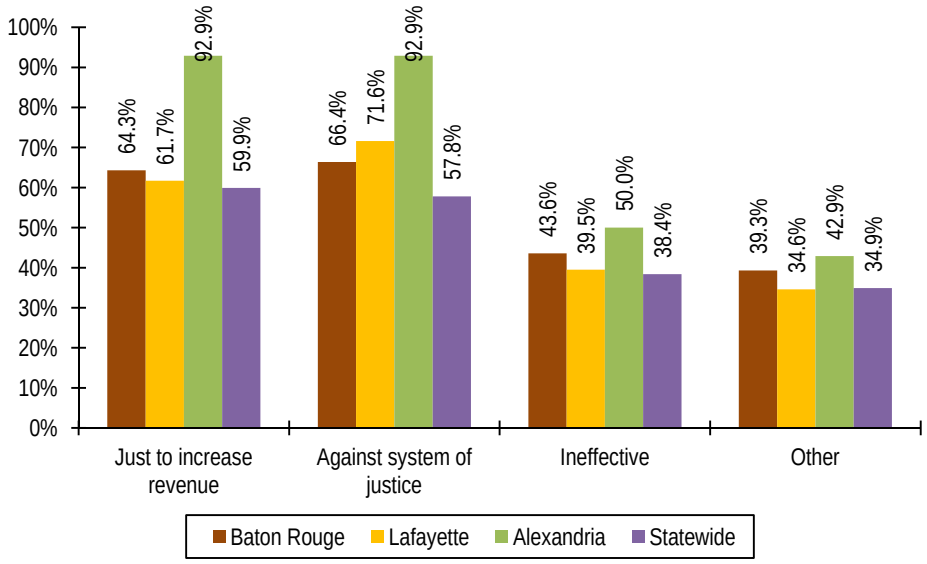

Figure 5
Reasons to oppose RLC programs (among those who oppose)

This question also allowed respondents to provide an "other" response. While the responses varied, several underlying opposition themes were identified:

- Increases rear-end crashes and creates a more dangerous situation because people slam on their brakes to avoid getting a citation.
- Removes officer discretion (i.e., extenuating circumstances, weather conditions).
- Disagree with a private company having a financial interest in someone breaking the law.
- Believe adjusting signal timing is a better option (e.g., increasing the all red interval or adjusting the yellow time intervals).
- Violates privacy and is a government intrusion (Big Brother).
- Question reliability and accuracy of system.
- Eliminates due process (i.e., guilty until proven innocent).
- Discriminates against certain sociodemographic groups based on installation locations.
- Imposes responsibility on owner, even if not the driver of the vehicle cited.

Strategies to Change Opinion on RLCs

Respondents who indicated they oppose the use of RLCs were also asked to select strategies that their community could use to change their opinion on RLCs. Once again, respondents were asked to select from a series of options, including: use the revenue generated to improve safety in the community; better warning about when and where RLCs will be implemented; education about the effectiveness of RLCs; and education about how the revenue from RLCs is actually used. Respondents could select as many as appropriate and also fill in their own response. With the exception of Alexandria, the greatest percentage of respondents indicated education on the use of revenue may change their mind. In Alexandria, the greatest percentage of respondents indicated they may change their minds about RLCs if the revenue generated is used to improve safety in the community, followed by better warning about RLC implementation. Figure 6 summarizes these responses.

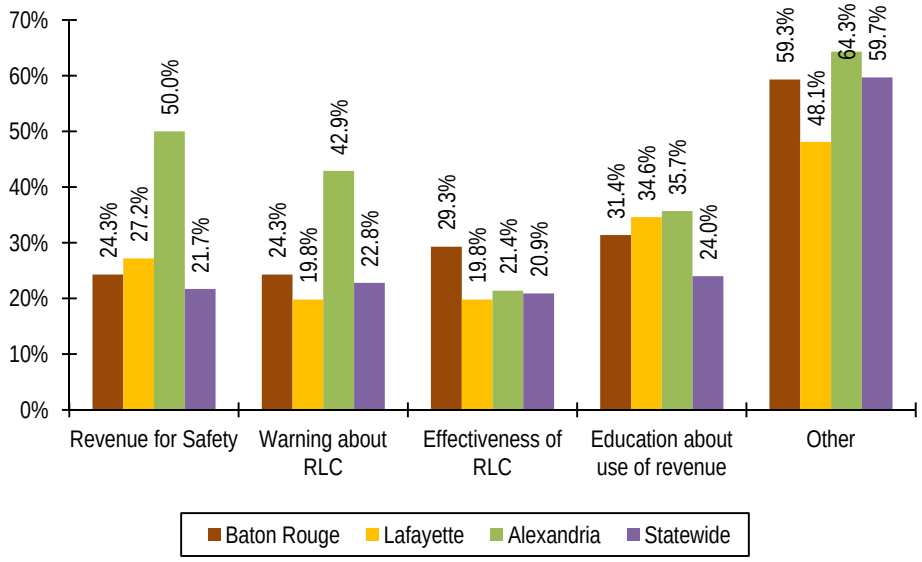

Figure 6
Leading strategies to change the minds of those who oppose RLC programs

Of the 311 respondents who selected "other," 180 (30 percent of those opposed) indicated nothing could be done to change their mind. While the remaining responses varied significantly, several respondents suggested making improvements to the signal systems before considering a RLC program in a community. Some felt they might be more supportive of a RLC program if it were managed by the local government or law enforcement agency instead of a private vendor, or if the cameras functioned properly. Others felt a less burdensome appeals process might change their mind. Some expressed concern about using funds to implement RLC in lieu of maintaining roads, fighting crime, and eliminating law enforcement jobs.

Opinion of Whether RLR is a Problem Compared to Opinion on RLC Program

A more in-depth analysis was conducted on the Tier 1 statewide Internet survey responses to provide a greater understanding of participants' opinions. In the statewide Internet survey, among the 35.7 percent of respondents who think red light running is a problem in the city where they live (Figure 2) 76.2 percent support a RLC program, while 23.3 percent oppose it (Figure 7). This trend is reversed for those who think no red light running problem exists. Among the 42.6 percent who do not think red light running is a problem (Figure 2), the opposition to RLC program stands at 71 percent compared to 27.9 percent support. These results are illustrated in Figure 7.

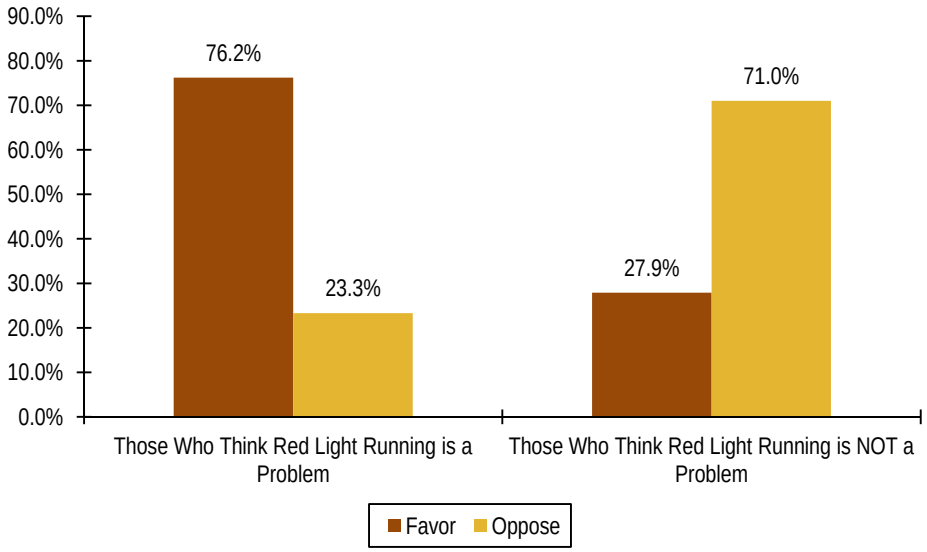

Figure 7
Percentage of statewide responses that favor/oppose RLC programs classified by opinion of whether red light running is a problem

Regions with RLC Programs versus Regions Without

Respondents' perception about whether their city has a red light running problem is similar in RLC and non-RLC implemented regions. In regions with RLC, 36.7 percent of the participants think red light running is a problem, while 40.3 percent do not. In regions without RLC programs, 34.2 percent of the participants think red light running is a problem versus 44.1 percent who do not (Figure 8).

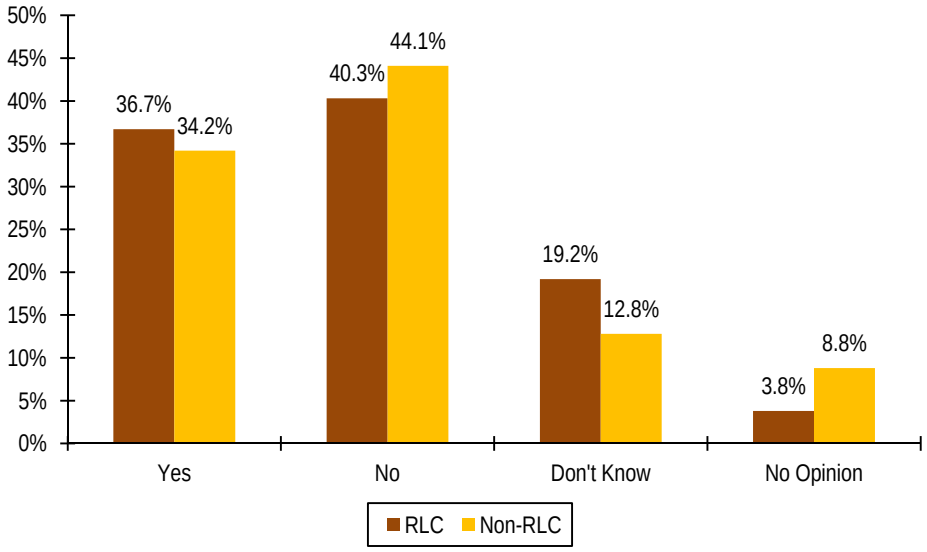

Figure 8
Percentage of respondents who think red light running is a problem in RLC and non-RLC regions

In regions with RLC programs, 46.8 percent of people support the RLC program, 52.7 percent oppose it, and less than 1 percent of the respondents have no opinion. In the regions without RLC programs, 46.6 percent support a program, 47.8 percent oppose it, and 5.6 percent have no opinion (Figure 9).

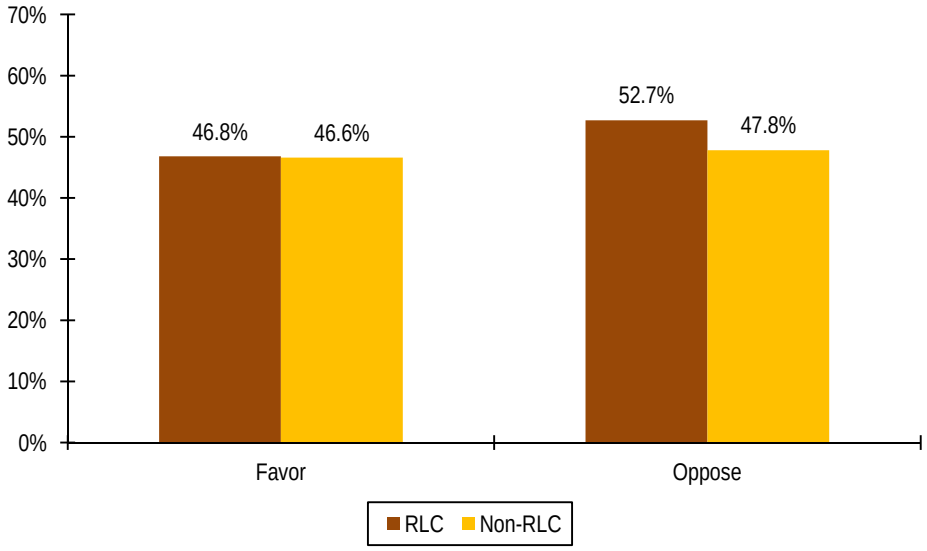

Figure 9
Percentage of respondents who favor/oppose RLC programs in RLC and non-RLC regions

Results of Tier 2 – Telephone Survey

The Tier 1 survey also asked for volunteers to share their name and telephone number to be contacted for an in-depth follow-up interview. Three hundred seventy participants provided their names and contact number for the Tier 2 survey. Fifty randomly selected volunteers were interviewed, with each interview lasting about 8 to 10 minutes.

Telephone Survey Results

The telephone survey results are summarized below.

- Perception of RLC effectiveness:
  - Fifty-six percent of the participants believe RLCs are effective to improve safety at intersections, compared to 30 percent who disagree.
  - Sixty percent of participants think warning signs and media attention about RLCs may stop people from running red lights.
- Received a red light violation from a RLC:
  - Ten respondents had received a red light running citation in the past two years, and nine of these citations were camera issued.
  - Twenty-four participants knew someone who had received a red light running citation, with 19 of those citations camera issued.
- Perception of enforcement:
  - Seventy percent of the participants think it is unlikely someone will be cited if they run a red light.
  - Thirty-four percent of participants think RLCs help law enforcement, and 30 percent think it is an effective way to give citations. However, 16 percent think it goes against our system of justice, and 12 percent think RLC programs are implemented to generate revenue.
  - Thirty percent of the respondents who received red light running citations think it is likely for someone to be caught if they run a red light. Twenty out of the 50 (40 percent) participants believe it is OK to enter an intersection during the yellow light. Sixteen respondents (32 percent) indicated they slow down immediately and prepare to stop when a traffic signal turns yellow.

- Opinions about implementation:
  - Two out of three people who think RLC programs are implemented to generate revenue feel more information about vendor payout would influence their opinion on RLCs.
  - Thirty-two percent of participants believe revenue generated from RLCs should go to road maintenance projects.

Alternative Development and Evaluation

Based on the results of the literature review, public opinion survey, and an evaluation of the state's existing policy, strategies to enhance public opinion of RLC programs were identified. This section discusses the noteworthy practices and, where appropriate, recommends changes to the state's automated enforcement policy. It includes an evaluation of the recommended policy changes and presents a qualitative comparative analysis of the cost and benefit of deploying a RLC program compared to a traditional enforcement program.

Development of Alternative Policies and Strategies

Alternative policies and strategies should incorporate lessons learned from previous RLC program implementation efforts and address many of the issues identified through public opinion surveys. Retting (2010) identified "lessons learned" based on two decades of automated enforcement experience:

- Focus on safety. Site selection should be well documented and based on violations, crash histories, and other safety factors. Private vendors should not be involved in the selection process, other than to perhaps collect and provide data as directed by government officials.
- Emphasize fairness in program design and operations. To help ensure the public perceives the RLC program as fair, the state or local agency should control all major aspects of camera enforcement, including site selection and the final decision on whether a citation will be issued to specific vehicles photographed. Utilize signing and public information campaigns to emphasize deterrence and avoid excessive penalties. Finally, include a variety of stakeholders in the planning and design of the program.
- Get the engineering right. Consider other engineering measures prior to implementing RLC enforcement and evaluate the yellow and all red intervals, posted speed limits, and site conditions.

- Avoid the appearance of revenue motive. Ensure the agency has adequate funding for operations and equipment to avoid reliance on revenue generated from citations. Establish vendor payment methods that are not based on the number of paid citations. Clearly alert drivers to the use of RLC enforcement through adequate signage. Finally, the agency should conduct financial audits of the program on a regular basis.

- Anticipate and avoid legal setbacks. The legal setbacks faced by existing programs are primarily related to program control, oversight, and preemption of ordinances by state laws. To anticipate and avoid legal setbacks, planning and implementation efforts should include state and local law enforcement officials, judges, and others with the appropriate legal expertise.

- Employ effective communication. Upfront and ongoing public information and education is a key component of a successful RLC program.

- Evaluate program performance and outcomes. Agencies should establish procedures to evaluate their programs and the effects on violations, crashes, and public attitudes on a regular basis.

These "lessons learned" were considered along with the results of the literature review and public opinion surveys to inform the development of the alternative policies and strategies. The resulting alternative policies and strategies are formatted in seven focus areas: public information and outreach, site identification, installation procedures, enforcement procedures, operations and maintenance, and effectiveness evaluation. A discussion of noteworthy practices and resulting policy recommendations accompanies each focus area.

Public Information and Outreach Noteworthy Practices

A public information and outreach campaign has been linked to the success of a RLC program and should be conducted prior to and throughout program implementation. Without an effective public information and outreach campaign, the public may be unaware of the existence of a new type of traffic enforcement program and may be confused if they receive a citation. A study conducted by FHWA in 1995 identified three objectives for an information campaign on RLC programs including:

- The campaign should make drivers more aware of their driving habits and the possible safety consequences of running a red light.

- A variety of media should be used to communicate the program objectives and program results to the public and elected officials.

- The campaign should provide advance warning to the community on RLC program implementation.

FHWA also identified the following elements to include in a public information and outreach campaign:

- Use clear and nontechnical language to describe how the RLC system operates;
- Clearly define program objectives;
- Describe the advantages of using RLC enforcement;
- Explain other measures being used to improve safety at intersections; and
- Describe how the program revenues are used.

Public information and outreach campaigns can employ a variety of different methods, which can help reach a greater proportion of the public. Some of the most common methods used by existing programs include posters, mailings, handouts, media, billboards, warning signs (including changeable message signs), press releases, websites, slogans, and bumper stickers.

Both Baton Rouge and Lafayette maintain web sites that provide public information on their RLC programs. For example, the Baton Rouge site provides press releases, camera locations, frequently asked questions, information on what to do if you receive a notice of violation, sample notice of violation, RLR facts, information on how RLCs affect driver behavior, and information on how a RLC works. Links to these sites are provided below:

- Baton Rouge: http://brgov.com/redlight/.
- Lafayette: http://www.lafayettela.gov/traffic/safelight.asp.

The FHWA Office of Safety web site provides a section on marketing/outreach materials for automated enforcement programs. While the focus in not directly on RLCs, these materials do provide information related to RLR. The site provides public service announcements in the form of video/television, radio, live read, and print ready. Printable materials include sample letters of invitation to participate in/support a program, sample press releases, presentations, and a sample biography to support a program. http://safety.fhwa.dot.gov/intersection/redlight/outreach/marketing/)

Following are links to example RLC public information web sites from other agencies around the country:

- City of Newark, New Jersey: http://www.ci.newark.nj.us/government/city_departments/engineering/red_light_cameras.php
- Pembroke Pines, Florida: http://www.ppines.com/police/red-light/index.html
- Suffolk County, New York: http://suffolkcountyny.gov/redlight/index.html
- Cary, North Carolina: http://www.townofcary.org/Departments/police/Red_Light_Signal_Cameras.htm
- Escondido, California: http://police.escondido.org/red-light-cameras.aspx

While the source may seem somewhat biased, RLC camera vendors may also provide public information and outreach materials. American Traffic Solutions provides promotional materials on their web site and posts a monthly newsletter with information on RLC media coverage:

- Web site: http://www.atsol.com/solutions/red-light-safety/.
- Newsletter: http://roadsafetyink.com/

Providing the public with outlets to address questions or concerns is a critical component of a successful public education and outreach program. One method is to hold public forums where city and law enforcement officials can explain how the technology works and answer questions. Another method is to provide the public with an outlet to ask questions or express concerns through telephone or web-based information centers. Agencies should establish a priority to respond to comments and questions received from the public. Outreach efforts may also utilize employers, schools, driver education classes, motorist associations, and local community groups to help spread the word on the program. It is also beneficial to address not only the public, but to educate elected officials, judges, and the jurisdiction's traffic engineer and attorney's office, and to keep them informed about the program.

Another option for educating the public is to issue warning citations to potential violators during the initial implementation phase. However, when the warning period ends and enforcement begins must be adequately communicated to the public.

Finally, a continuous public information and outreach campaign should be conducted to educate the public on the dangers of RLR and to provide information on RLC enforcement. The campaign should also be conducted using different media sources and specifically target audiences or situations identified as higher risk for RLR crashes.

Policy Recommendations. The current state RLC policy requires the implementing agency to deploy a public education program *prior to beginning* automated enforcement. The policy includes a warning period for citations and, at a minimum, annual disclosure of the location of RLCs. This policy should be enhanced to include a public education program *prior to beginning and throughout the duration of the program*. Information could include:

- Local effectiveness results – including change in violations and, if available, crash frequency and cost efficiencies of performing automated enforcement;
- Information about how and when citations are given at locations;
- Answers to common questions, such as what happens if someone other than the registered vehicle owner is driving the vehicle at the time of the offense;
- Program costs and use of program revenues;
- Comparative costs and benefits of traditional enforcement versus automated enforcement; and
- How the RLC program integrates with other safety programs in the community.

Identifying Sites for RLCs Noteworthy Practices

The first step in implementing a RLC program is to determine if a RLR safety problem exists. Not all intersections with a high violation rate have a high frequency of RLR-related crashes. Since RLCs are intended to improve safety, they should only be installed at locations with a RLR running related crashes (i.e., right angle crashes). This approach is more defensible to the public.

Agencies should conduct an engineering study and provide documentation of crash characteristics to identify candidate locations.

When investigating a potential RLR problem, it is necessary to collect the most recent information available on crash history (multiple years), traffic volumes, intersection geometry, pavement condition, and site surveys. Collision diagrams and crash summaries (i.e., crashes summarized by crash type and contributing crash factors) are useful tools for identifying crash trends and potential contributing factors.

If the crash history indicates the agency should conduct a field review to gather additional information and observe traffic patterns. At a minimum, the Institute of Transportation Engineers (ITE) (2003) recommends collecting data and making assessments on the following:

- Turning movement counts (including truck volumes);
- Signal timing parameters;
- Sight distance to signal;
- Geometric configuration;
- Traffic signs and markings (including condition);
- Pavement condition; and
- Traffic speed.

ITE prepared an intersection field review form for inspecting signalized intersections to reduce RLR (provided in Figure 10). Ultimately, the field review should help identify potential deficiencies at the intersection that may be contributing to the crash problem and/or other potential contributing factors to aid in countermeasure selection.

INTERSECTION FIELD INSPECTION FORM

LOCATION INFORMATION

Intersection Identification:_____with_____

Approach Name:_____ Direction Heading:_____

PART 1. CHECK SIGNAL VISIBILITY

Type of Signal Mounting: Span Wire Mast Arm Pole Structure Sight Distance to the Signal: _____*feet*

Requires Advance Warning Sign? Y N Advance Signal Warning Sign Present: Y N

Is anything blocking the view of the signals? Y N If yes, describe_____

Can signal faces on other approaches be seen? Y N If yes, do these signals have visors, shields, or programmable lenses? Y N

PART 2. CHECK SIGNAL CONSPICUITY

Could visual clutter detract from the signal? Y N

Are the signal indications confusing? Y N

If yes, explain:_____

_____

Are backplates present? Y N

Are backplates necessary? Y N

Are other glare-reducing steps needed? Y N

Signal lens type: Incandescent LEDs

Signal Lens Size Adequate?:

Red signal lens size: 8 inch 12 inch

Distance from stop line to signal: _____*feet*

Near side signal? Y N

Is existing size adequate? Y N

Number of Signal Heads Adequate?

Total number of signal heads for major movement: _____

Total number of lanes for major movement: _____

Is existing number adequate? Y N

Signal Heads Placement Adequate? Y N

PART 3. CHECK SIGNAL CONTROL PARAMETERS

Grade (as decimal) g =_____(uphill is positive)

Approach speed *V* =_____*mph*

Cross street width *W* =_____*feet*

Calculate the needed change period *(CP)* for this approach using agency practice or the following equation:

$$CP = 1.0 + \underbrace{\frac{1.47 * V}{(20 + 64.4g)}}_{\text{Yellow}} + \underbrace{\frac{W + 20}{1.47 * V}}_{\text{All-red}}$$

	Actual Value	Calculated Value	Is Existing Adequate?
Yellow Interval	_____	_____	Y N
All Red Interval	_____	_____	Y N

PART 4. CHECK OTHER FACTORS

Is horizontal location adequate? Y N Pavement condition on approach: Adequate Polished Severely Rutted

Should signal warranting study be conducted? Y N Other concerns:_____

PART 5. IDENTIFY PROMISING COUNTERMEASURES

Visibility Deficiency

___ Install additional signals on near side
___ Change signal mounting
___ Install SIGNAL AHEAD sign
___ Install Advance Warning Flashers
___ Remove/relocate sight obstruction
___ Install programmable lenses
___ Install shields and visors
___ Other_____

Conspicuity Deficiency

___ Add signals to achieve one per lane
___ Replace with LED lens type
___ Replace with 12" signal head
___ Install double red signal
___ Install/enhance backplates
___ Install rumble strips on approach
___ Install near side signal

Signal Timing Operation Deficiency

___ Change yellow interval
___ Add/change all-red interval

Other Measures

___ Determine if signal is warranted
___ Consider roundabout or innovative design
___ Improve pavement condition

Inspection By: _____ Date:_____

Source: ITE (2005).

Figure 10
Intersection field inspection form

Prior to considering implementation of a RLC, engineering, educational, and traditional enforcement strategies should be tried and proven insufficient. Table 7 identifies some strategies other than RLC to consider.

Table 7
Potential strategies to address RLR crashes

Type of Strategy	Strategy
Engineering Countermeasures	
Traffic Operation and Signal Control	Revise signal timing Add all-red interval Ensure appropriate yellow times Improve signal head visibility Install additional signal heads Install advance signalized intersection warning signs Install advance yellow flashing lights Adjust the approach speed Coordinate traffic signals Install advance vehicle detection Remove unwarranted traffic signals Remove on-street parking
Intersection Geometry	Improve geometric deficiencies, where possible.
Education	
Public Information and Education Campaign	Provide information and data that explains the RLR problem, why it is dangerous, and actions in place to reduce the number of violations. Design an ongoing educational program to address the interests, concerns, and needs of various target audiences using various media. Combine the education campaign with targeted enforcement.
Enforcement	
Random	Select random locations for officers to enforce.

Enforcement	
Targeted Enforcement	Identify problem locations and have officers enforce the location for a particular time period.

Source: ITE (2003)

Note: Effectiveness of potential countermeasures will be influenced by site-specific conditions; not all countermeasures identified in the ITE Guidebook will be effective in all situations.

Policy Recommendation. The existing state photo enforcement policy specifies intersections shall be identified for RLC programs based "primarily on vehicle/pedestrian" crashes. As written, this implies only crashes involving pedestrians should be considered as an indicator for red light camera enforcement. In fact, all crash types that could be prevented by a red light camera should be considered in the criteria for identifying locations. It is recommended the wording be modified to "intersections shall be selected based primarily on crashes that can be avoided with an automated enforcement countermeasure."

The existing state photo enforcement policy specifies red light enforcement is justified at an intersection if five or more RLR related crashes occur at an intersection within a continuous 12-month period. An issue with this approach is that it does not account for the random variation in crash frequency and could identify sites without a long term RLR crash issue and overlook sites with sustained RLR crash issues. Optional methods exist for identifying sites experiencing significant RLR crash problems. These include identifying RLR average crash rates or crash frequencies for similar intersections and comparing sites to the average; using statistical tests from the AASHTO Highway Safety Manual (HSM); or using the predictive method and Empirical Bayes method from the HSM.

It is recommended the state photo enforcement policy be modified to use enhanced methods to identify sites with potential to respond to RLCs.

Equipment Noteworthy Practices

FHWA (2005) identifies six "on-the-street" components of a RLC system:

- Camera units;
- Intersection lighting;
- Camera housing and supporting structures;
- Vehicle detection;

- Communications; and
- Warning signs.

The key components related to public perception are the camera units selected for the RLC system and installation of warning signs. Today's RLC systems typically use digital cameras to collect still images of the violation and video cameras to capture a video sequence of the violation. The use of video in a RLC system provides two major advantages from the public perspective: it allows the public agency reviewers to "see the context" of the violation when deciding if a citation should be issued and allows the driver to view the violation. Enabling drivers to view the violation via video clips should help in refuting the argument against RLC inaccuracies. Likewise, video clips can provide supplemental information to support a valid claim that a citation should not have been issued (e.g., vehicle entering on red under police direction).

FHWA identifies the ability to detect vehicle speed as another potential advantage of using a RLC video system. Vehicle speed can be used to predict whether a RLR violation will occur. This provides an opportunity to prevent a collision by preempting the signal to create an all-red interval. While this does not prevent the violation, it minimizes the crash potential.

Policy Recommendation. Signs warning drivers about the RLC enforcement should be installed as part of the driver awareness and education process. An evaluation conducted by Council et al (2005) concluded the net economic benefits of a RLC program are greater when warning signs were installed both at the intersection and city limits compared to intersection only. Signs should be in compliance with the MUTCD standards. The existing state policy allows for optional placement of warning signs at jurisdiction limits. It is recommended the state policy be modified to require signs indicating electronic traffic enforcement be installed at the jurisdictional limits of the local governments, perhaps at major entry points.

Installation Procedures Noteworthy Practices

To ensure proper installation, RLC installation plans should be prepared by a licensed engineer and in accordance with the system manufacturer's standard plans and technical specifications. Plans should also be developed in accordance with the state and local agency standard plans and specifications and processed through the appropriate review and permitting procedures.

According to FHWA (2005), proper installation of RLC systems includes:

- Installation consistent with the equipment manufacturer's guidelines and state or local agency specifications;

- Inspection of all installation work by state and local agency officials and, where necessary, by the project engineer;
- Testing the RLC equipment prior to its cutover for unattended operation; and
- Preparation of as-built drawings that reflect the actual construction conditions.

The RLC system should be comprehensively tested prior to initiating unattended operation. The installation should be thoroughly inspected, and the system should be tested using simulated and actual traffic. Until the system is deemed accurate and reliable, no warnings or citations should be issued. Once in operation, the system should be regularly evaluated to ensure it is working properly.

Policy Recommendation. No recommended RLC installation changes are offered to the state photo enforcement policy.

Enforcement Procedures Noteworthy Practices

Law enforcement officers in the field typically use judgment to decide whether to issue a citation for an observed traffic violation. For example, they may choose not to issue a citation for RLR if the driver's view of the traffic signal was obstructed by an oversized vehicle. To improve public perception of a RLC program, some degree of officer discretion also should be applied when issuing citations for through movement and possible right-turn-on-red violations recorded by a RLC. Officers reviewing violation photographs should consider whether any circumstances captured in the video or still images make a case for not issuing a citation. To provide program consistency and support the goal of providing fairness to motorists, agencies should establish a clear policy on how to determine if a citation will be issued and provide the appropriate training to officers. This includes identifying scenarios for which a citation would be issued, while allowing room for officer discretion to avoid issuing citations (with appropriate documentation) when mitigating circumstances are observed. Establishing a policy provides enforcement factors that can be explained to violators, promotes transparency in decision-making, improves the perception of fairness, and educates the citizens about traffic signal operations and safety. Ideally, the policy should be developed and applied consistently across the state.

Policy Recommendation. To limit public confusion and concern, RLC enforcement policies should be consistent within the state and with relevant national policies. A potential issue with Louisiana's existing law defining RLR is its lack of consistency with the national MUTCD, which establishes national standards for all traffic control devices. According to Louisiana Law Revised Statute Title 32 Section 232 (RS 32:232), "vehicular traffic shall not enter or be crossing the intersection when the red signal is exhibited." Louisiana law requires

vehicles to clear the intersection prior to the signal indication changing to red, but the MUTCD only indicates the vehicle shall not enter the intersection during a steady red indication. The state automated enforcement policy allows for a citation to be issued if the motorist is beyond the stop bar at the beginning of a red indication, which is permissible according to MUTCD procedures. This variation in Louisiana's law could cause confusion from out-of-state drivers and potential negative feedback from residents. Therefore, it is recommended the state further evaluate these issues and consider revising RS 32:232 to provide consistency with the MUTCD.

Right-Turn-on-Red

Prior to digital camera technologies, right-turn-on-red after stop violations were not enforced with RLCs due to limitations of cost and number of photos to be captured using wet film technology. However, with advances in camera technology, jurisdictions have started issuing citations for right-turn-on-red after stop violations, which has been met with significantly less public support.

McCartt and Eichelberger (2011) conducted a public opinion survey of drivers in 14 cities with existing RLC programs. They found nearly two-thirds of those surveyed favored the use of RLCs; however, only 41 percent favored using them for right-turn-on-red after stop violations. Drivers were primarily opposed because they did not believe these violations were a safety issue. Many of the survey responses suggested drivers were confused about when right-turn-on-red is permitted and when right turns can be made without stopping. Right-turn-on-red is defined in the existing state policy; however, agency applications of state policy may differ on whether a citation is issued for a rolling right turn on red, which was identified as a possible explanation for the confusion.

Policy Recommendation. The state automated enforcement policy permits motorists to enter the intersection to turn right on a red light after stopping and, as necessary, yielding to pedestrians and other motorists without receiving a red light running citation. Drivers who do not stop prior to turning right on red are in violation of the law and subject to enforcement. Agencies should operate their RLC programs consistent with this policy, and it should be deployed across the state. Imposing a reduced fine for right-turn-on-red violations may increase public support for enforcing these common violations, and it should be incorporated into state policy.

Operations and Maintenance Noteworthy Practices

A number of options exist for operating RLC programs. For example, system operations and citation processing may be fully carried out by the agency or some functions may be outsourced to a private vendor. FHWA (2005) identified four potential alternatives for

acquisition, installation, operation, and maintenance of a RLC system (see Table 8). Table 8 shows increasing degrees of state/local agency responsibility are associated with the typical activities required to develop and deploy RLC programs. To reduce public confusion about program implementation, a consistent model for deployment throughout Louisiana is recommended.

Table 8
Alternatives for RLC system acquisition, installation, operation, and maintenance

	Option A		Option B		Option C		Option D	
Responsibility	**State/Local Agency**	**Private Contractor**	**State/Local Agency**	**Private Contractor**	**State/Local Agency**	**Private Contractor**	**State/Local Agency**	**Private Contractor**
Project Planning and Management	■		■		■		■	
Equipment Ownership		■	■		■		■	
Design and Installation		■		■	■	■	■	
Plan Check and Installation Inspection	■		■		■		■	
Operation and Maintenance		■		■		■	■	
Citation Data Processing		■		■		■	■	
Decision to Issue Citation	■		■		■		■	
Violator Inquiries		■		■	■		■	
Public Information Program		■		■	■		■	

Source: Adapted from FHWA (2005).

Most RLCs installed in the U.S. are owned and operated by private contractors, which is one source of opposition. However, the cost associated with purchasing and maintaining the equipment provides benefits in minimizing or eliminating the costs to the state or local agency when contracting with a vendor to purchase and maintain the equipment. To decrease the public opposition and avoid a conflict of interest, the agency should make all decisions regarding site selection process and avoid a compensation structure based on the number of paid citations.

Agencies should provide complete oversight of the private contractors to avoid potential conflicts of interest that may arise as part of the development and operations of a RLC program.

While vendor compensation practices vary by agency, the compensation amount should be solely based on the value of the equipment and services provided by the vendor. Table 9 provides some different payment options for vendor owned and operated RLC systems.

Table 9
Payment options for contractor-owned and -operated RLC systems

Payment Option	Equipment	Equipment Installation	Equipment Maintenance	Citation Data Processing
Initial Fixed Price Payment	■	■		
Initial Fixed Price Payment and Fixed Monthly Payments	■	■	■	■
Fixed Monthly Payments	■	■	■	■
Initial Fixed Price Payment and Per Citation Payments				
Per Citation Payments				
Initial Fixed Price Payment and Fixed Monthly Payment Schedule, Depending on Predetermined Low/High Number of Citations Issued	■	■	■	■
Fixed Monthly Payment Schedule, Depending on Predetermined Low/High Number of Citations Issued	■	■	■	■
Time Worked and Materials Used			■	■

Source: FHWA (2005).

The current vendor payment structures in both Baton Rouge and Lafayette are based on the number of paid citations, which reflects some of the controversy with the existing RLC programs in Louisiana. New programs in Louisiana should consider other vendor payment options. The existing RLC programs may want to reconsider the vendor payment options when new contracts are negotiated. Overall, vendor contracts and payment structures should be consistent and transparent across the state.

Some opponents of RLC systems claim RLCs are inaccurate. Any system operations issues should be identified during the review process. Further, it is important to continue monitoring the systems to ensure proper operations. Agencies should develop and implement operations and maintenance procedures and conduct periodic checks of the system to verify it is functioning properly.

Policy Recommendation. To decrease the public opposition and avoid a potential conflict of interest, agencies should control the site selection process with vendor support limited to data collection under the direction of the local agency. Agencies should avoid a vendor compensation structure based on the number of paid citations.

Effectiveness Evaluation Noteworthy Practices

The safety effectiveness of RLCs has been evaluated in numerous studies throughout the United States and internationally. While the level of effectiveness varies, the results generally indicate a decline in right angle crashes and increase in rear-end crashes. Conducting effectiveness evaluations of RLC programs not only enables an agency to verify

the program is resulting in the intended outcome, i.e., a reduction in RLR crashes, the results can also be used to educate the public on the effectiveness of the cameras for improving safety. Many opponents of RLCs claim they are ineffective in reducing crashes, and effectiveness evaluations can provide documentation to refute this claim (assuming a decline in targeted crashes).

The type of study methodology used for evaluating effectiveness of the RLCs (site-specific or as a whole) is a significant factor in the reliability of the results. Simple observational before/after studies are commonly used by agencies to evaluate the effectiveness of safety treatments. While this methodology is simple, it lends itself to two significant flaws – the results may be biased due to the effects of regression-to-the mean and lack of control sites. Regression to the mean is a statistical phenomenon in which a period with a comparatively high observed crash frequency will likely be followed by a comparatively lower crash frequency. This also applies to the converse situation; a low crash frequency period will probably be followed by a high crash frequency period. Since RLCs are intended to be installed at high crash locations, it is likely the result of a simple before after study will overestimate the effectiveness of the RLCs in reducing crashes. Additionally, the simple before/after study does not account for changes in conditions at the camera site or in the broader community, such as traffic volumes, driver behavior, or weather, which can impact crash frequency.

Advanced statistical evaluation methods can provide a more accurate estimate of the effectiveness of RLCs by accounting for the potential effects of regression to the mean through the use of control sites. These methods include: observational before/after study using a comparison group, observational before/after study using the Empirical Bayes method, and cross-sectional studies. The HSM provides more information on evaluation study types.

An additional challenge with evaluating RLC effectiveness is the potential for spillover effects at intersections without RLCs. FHWA (2005) defined "spillover effect" as "the expected effect of RLCs on intersections other than the ones actually treated, resulting from jurisdiction-wide publicity and the general lack of knowledge of where RLCs are installed." Spillover effects actually increase the effectiveness of RLCs by spreading the benefits to other intersections in the jurisdiction. However, due to spillover effects, the actual effectiveness of RLCs may be underestimated, particularly when the evaluation study method has a strong reliance on comparison sites.

Previous RLC evaluation efforts can also provide some insight into considerations for the evaluation study design. The 2005 FHWA report on *Safety Evaluations of Red Light*

Cameras identified a number of lessons learned based on previous studies for developing a defensible RLC evaluation. These include:

- **Number of treatment sites.** Evaluating a low number of sites provides results with a low level of significance.

- **RLC "spillover effects" in the same city.** The RLC may impact the crash experience at control or comparison sites located in the same city. Therefore it may be necessary to use control or comparison sites located in similar cities for the evaluation or a study design that does not rely on comparison sites.

- **Differences in crash investigations and reporting practices between jurisdictions.** This can make it difficult to aggregate results or to make comparisons between different jurisdictions.

- **Defining "red light-running crashes."** Previous studies have lacked a precise definition of what constitutes a red light crash, making it difficult to compare results. Also, police crash report forms do not always clearly differentiate between angle and turning crashes, and it is difficult to determine whether a right turn on red crash was "legal."

- **RLC effects on rear-end crashes.** Since many previous studies have indicated an increase in rear-end crashes with implementation of RLCs, it is imperative to consider this crash type in the analysis and to provide a tradeoff analysis for the reduction in right angle crashes. An economic analysis provides a quantitative result that can help the public understand these tradeoffs.

- **Exposure changes between before/after periods.** Many RLC evaluation studies have not accounted for changes in traffic volumes during the before and after periods. Exposure is a major determinant of intersection crashes and should be accounted for in the evaluation methodology.

- **Regression to the mean effects.** Since RLCs are targeted at intersections with a high RLR crash experience, evaluation studies are subject to the effects of regression to the mean. If not accounted for in the evaluation study methodology, this may cause an overestimation of the effectiveness of the RLCs in reducing crash frequency or crash severity.

- **Yellow interval improvements (and other intersection improvements) made at the time of RLC installation.** It can be difficult to distinguish between the effects of

RLCs and other intersection improvements. However, since some studies have shown that other intersection improvements can be just as effective in reducing RLR crashes, it is important to separate the effects of these other improvements from RLCs when evaluating effectiveness.

- **Disaggregate effects by signalization variables.** Little knowledge currently exists on the effects of signalization variables (i.e., cycle length and yellow and all-red interval combinations). However, these effects would be useful in planning RLC programs or explaining the different results across sites or jurisdictions.

- **Effect of signage.** Previous evaluations have provided varying results on the effects of signage at intersections with RLCs, as well as other intersections in the jurisdiction. These effects need to be further investigated.

- **Public education level.** The impacts of public education on the effectiveness of a RLC program needs to be further investigated.

- **Definition of red light violation.** Defining what constitutes a red light violation may affect public perception and citation practices. For example, the amount of time allotted as a "grace period" after the signal turns red prior to issuing a ticket could have different impacts on the number of citations issued.

- **Relationship between changes in violations and changes in crashes.** A relationship has not yet been established; however, such a relationship would make it much easier to evaluate RLC installations.

As previously mentioned in the discussion of the effects of RLCs on rear-end crashes, an economic analysis would help the public understand the tradeoffs between a potential increase in rear-end crashes and a decrease in angle crashes associated with the installation of a RLC. Relative crash frequency may not change significantly, but crash severity will likely decrease because rear-end crashes are usually less severe than angle crashes. Similar crash effects are associated with the installation of traffic signals. The economic benefits of reducing angle crashes would be greater than the disbenefit of an increase in rear-end crashes. An economic evaluation also provides a method to compare the cost effectiveness of RLCs to the cost effectiveness of other countermeasures aimed at reducing RLR crashes at intersections.

In addition to the economic burden and the potential lack of data/methodological expertise in smaller communities to produce valid statistical evaluations, a multitude of evaluation

findings (some based on limited data or weak study designs) inevitably produces mixed results and confuses the issue of camera effectiveness.

Policy Recommendation. The effectiveness of RLCs in reducing fatal and serious injury crashes has been demonstrated numerous times in the research; hence, local governments in Louisiana need not be required to document the crash effectiveness of individual programs. Conducting crash effectiveness evaluations using statistically reliable methods is likely to be beyond many local practitioners' skill levels. The policy should be modified to eliminate the annual reporting requirement of changes in crash frequency or severity at RLC deployments. To more reliably evaluate the effectiveness of RLCs in Louisiana, it would be appropriate for LTRC or DOTD to conduct a multi-jurisdictional crash analysis based on statistically valid methodology and robust crash data. As an alternative and for the purposes of transparency, agencies should include information about outputs of the project as part of public education activities. This could include information such as citations issued and use of funds.

Evaluation of Policies Recommendations

The following recommendations to the existing state policy are proposed:

1. Modify the photo enforcement policy to require public education programs be conducted prior to and throughout deployment of a RLC program.
2. Modify the policy to clarify the type of crashes under consideration in the automated enforcement portion from "vehicle/pedestrian" crashes to "crashes that can be avoided with an automated enforcement countermeasure."
3. Modify the photo enforcement policy to required enhanced methods for screening signalized intersections to identify sites with potential for safety improvement.
4. Modify the photo enforcement policy to require signs indicating electronic traffic enforcement be installed at the specific installation location and at jurisdictional limits of the local governments.
5. Modify the Law Revised Statute Title 32 Section 232 (RS 32:232) or the photo enforcement policy to achieve a consistent definition of a red light violation. Louisiana law requires vehicles to clear the intersection prior to the signal indication changing to red. The MUTCD indicates the vehicle shall not enter the intersection during a steady red indication. Either the policy or the statute should be modified for consistency.
6. The state automated enforcement policy permits motorists to enter the intersection to turn right on a red light after stopping and, as necessary, yielding to pedestrians and other motorists without receiving a red light running citation. Drivers that do not stop prior to turning right on red are in violation of the law and subject to enforcement. Agencies

should operate their RLC programs consistent with this policy, and it should be consistently deployed across the state. Imposing a reduced fine for right-turn-on-red violations, as compared to traditional red light violations, may increase public support for enforcing these common violations, and should be incorporated into state policy.

7. To decrease the public opposition and avoid a potential conflict of interest, agencies should control the site selection process with vendor support limited to data collection under the direction of the local agency. Agencies avoid a compensation structure based on the number of paid citations.
8. Eliminate the requirement for local agencies to report effectiveness of RLC deployments.

Finally, the policy recommendations identified to address the public's positive and negative opinions of RLC programs were evaluated according to the following qualitative criteria:

- **Implementation** – Who would be responsible for implementing the change and is the recommendation likely to be relatively easy or relatively difficult to implement?

- **Consistency with Louisiana practices** – How consistent is the recommendation with existing Louisiana practices? More consistency with existing practices will make it easier for practitioners and stakeholders to adapt to the recommended change.

- **Effectiveness** – How effective is the recommendation likely to be in changing public attitudes about RLCs? Is making the recommended change likely to yield a large or small change in public perception of RLCs?

- **Benefits to public perception** – Would making the recommended change have a positive or negative impact on public perception? At a qualitative level, what is the magnitude of the impact to public perception?

Table 10 shows the results of the qualitative evaluation of each of these recommended policy changes.

Table 10
Evaluation of recommended policy changes

Policy	Implementation	Consistency with Other Practices	Effectiveness	Benefits to Public Perception
1. Public education throughout RLC Deployment.	DOTD to change policy. Cities only have to conduct public education prior to installation now. Instead this would be a continuous program and thus would require additional revenues to implement.	Extending public education program is consistent with local practices.	Perhaps the most effective and valuable policy change.	A well developed public education program could have significant positive impacts on public reactions to RLC programs.
2. Type of crashes for site selection should potentially respond to automated enforcement.	DOTD to change policy. Clarifies the type of crashes to evaluate. No major change in type of site analysis or data needs. Not difficult to implement.	Clarifies types of crashes for evaluation. Crash evaluation already required. Consistent with other practices.	Automated enforcement will be more effective in reducing crashes if appropriate crash types are targeted. This clarifies crash types for consideration.	Public perception of effectiveness will be enhanced with appropriate crash types targeted.
3. Modify the photo enforcement policy to require enhanced methods for screening signalized intersections to identify sites with potential for safety improvement.	DOTD to change policy, DOTD may have to provide staff support to identify appropriate network screening method and support data needs.	Enhanced methods would be new to practitioners. Would require training and possibly additional crash summary information from DOTD.	Would improve the likelihood of identifying sites with meaningful potential to respond to automated enforcement.	As sites positively respond to automated enforcement, public perception of value will improve.
4. Photo enforcement signs at installation and jurisdictional boundary.	Cities are required to install signs at sites with RLC. This change would require cities to install additional signs. Marginal additional expense.	Signs are already a requirement so this is consistent with existing practices.	Consistent with expense, this would have an incremental additional effect of providing information to the public about automated enforcement in a community.	Incremental benefit of public having early information that photo enforcement is implemented in the community.
5. Consistency between MUTCD and automated enforcement definition of violation.	May be the most difficult policy recommendation to implement as one option is to revise the Louisiana Statutes.	Would be a new definition of a red light violation so would be a change to the public and would require education.	Having consistent definitions would reduce one argument for opposing RLC programs.	Consistency would have a small benefit to public perception. Each increment will add value.

Policy	Implementation	Consistency with Other Practices	Effectiveness	Benefits to Public Perception
6. Ensure consistent implementation of state policy regarding permitting right-turn-on-red after stop without a citation.[a] Consider a reduced fine for right-turn-on-red violations	No policy change is required.	Consistent with other practice in state.	No impact on effectiveness of a program.	Consistent enforcement may improve public perception of RLC program.
7. The implementing agency should not involve the vendor in the site selection process; avoid a compensation structure based on the number of paid citations.	Limited challenges to implementation for new programs. Would not be possible for agencies to modify existing contracts.	Depending on contracting periods, there may be differences between current contract practices and new practices. Cities with existing contracts could renegotiate address issue.	Would be beneficial to public opinion about revenue neutrality.	Would be beneficial to public opinion about revenue neutrality.
8. Eliminate before/ after evaluation requirements.	DOTD would implement policy change.	Would require practitioner and public education to accept effectiveness research from other locations and not spend additional funding to research effectiveness.	Would reduce unnecessary public spending on data collection and studies.	Without appropriate public and practitioner education, the public may react negatively if local effectiveness evaluations are not conducted.

*Providing the motorist appropriately enters the intersection after stopping to confirm no pedestrians or vehicle conflicts.

Comparison of Traditional Enforcement to Red Light Cameras

A high-level comparative analysis was conducted to compare the costs and benefits of automated red light enforcement versus traditional traffic enforcement. Law enforcement colleagues and partners both inside Louisiana and in other states were contacted to gather information used in the comparative analysis to determine the approximate costs associated with traditional RLR enforcement. The literature review, community interviews, technology vendors, and sources in other states were used to identify and compare cost elements of automated enforcement.

A key objective of this comparative analysis was to match, as closely as possible, the costs and benefits of 24-hours-a-day, 7-days-a-week (24/7) coverage of automated red light enforcement with traditional police traffic enforcement. It is unlikely municipal agencies in Louisiana are able to assign police officers to enforce RLR at specific intersections on a 24/7

basis, but the comparative analysis made this assumption to match the costs and benefits of 24/7 coverage provided by RLCs.

Table 11 provides a summary of costs, benefits, and potential negative effects associated with traditional police traffic enforcement and RLCs. RLCs could also be compared to other engineering improvements such as roundabouts or grade changes; however, the analysis was beyond the scope of this project. The costs associated with traditional enforcement considered officer salary, use of a patrol car, additional time required to attend traffic court, and a fraction of a supervisor's salary. Training costs incurred when a new officer is hired were excluded. RLC costs considered include the costs to lease, install, maintain, and service camera equipment, as well the costs associated with installation and maintenance of warning signs and police officer oversight.

In terms of benefits, monetary values were not estimated; it was assumed the same reductions in angle crashes reported for RLCs would apply to traditional enforcement. Some additional benefits were assumed for traditional enforcement (i.e., other violations detected such as DUI, unlicensed drivers, and crime deterrence). If legally authorized, RLC technology can also be used to enforce speeding laws. Data were not available; therefore, the comparative analysis did not account for the respective numbers of RLR citations (and associated fine revenue) issued by RLCs versus traditional traffic enforcement.

As for potential negative effects, an increase in rear-end crashes (as reported in some studies) was assumed for both automated red light enforcement and traditional traffic enforcement. Some additional potential negative effects were assumed (see Table 2). Additional assumptions and references used in the analysis are provided in Appendix D.

Table 11
Comparison of traditional enforcement versus RLCs

<table>
<tr><th></th><th>Traditional Enforcement</th><th>Red Light Cameras</th></tr>
<tr><td>Cost</td><td>
<table>
<tr><td>Officer salary - Two (24/7)</td><td>$240,000</td></tr>
<tr><td>Patrol car - Two</td><td>$284,700</td></tr>
<tr><td>Court time</td><td>$16,000</td></tr>
<tr><td>Fraction of Sgt. Salary</td><td>$15,000</td></tr>
<tr><td>Total</td><td>$555,700</td></tr>
</table>
</td><td>
<table>
<tr><td>Vendor payments</td><td>$42,000</td></tr>
<tr><td>Installation (amortized over 10 years)</td><td>$4,400</td></tr>
<tr><td>Maintenance</td><td>$15,000</td></tr>
<tr><td>Install warning signs (amortized over 10 years)</td><td>$70</td></tr>
<tr><td>Maintain signs</td><td>$50</td></tr>
<tr><td>Officer oversight</td><td>$30,000</td></tr>
<tr><td>Total</td><td>$91,520</td></tr>
</table>
</td></tr>
</table>

Benefits	- Reduction in angle crashes (assumed to be the same for traditional enforcement and red light cameras) - Other violations detected (e.g., DUI, unlicensed) - Crime deterrent	- Reduction in angle crashes (assumed to be the same for traditional enforcement and red light cameras) - If legally authorized, red light camera technology can be used to enforce speeding laws
Potential Negative Effects	- Increase in rear-end crashes - Driver distraction - Traffic congestion	- Increase in rear-end crashes - Public controversy

This basic comparative analysis suggests automated red light enforcement is more cost effective than traditional enforcement, primarily because of its ability to function 24/7 without the need to be accompanied by either police officers or patrol vehicles. The added value of using police officers is the ability to detect violations other than RLR and to apprehend criminals. Public controversy associated with automated enforcement is a potential negative effect that must be considered when comparing red light cameras with traditional enforcement. Including comparative costs analyses in the ongoing public education campaign could help enhance public perception of automated enforcement.

CONCLUSIONS

RLC programs have been used in over 500 cities (IIHS) in the U.S. to augment efforts by law enforcement to curb intersection crashes in general and red light running crashes in particular. RLC program implementation has reduced angle crashes and injury crashes in a majority of the cities; however, rear–end crashes increased in many jurisdictions. A majority of the studies also show a decline in the number of RLR violations at intersections following RLC program implementation.

Jurisdictions with RLC programs in operation generally have higher support among residents than jurisdictions without RLC programs. Approximately two-thirds of the drivers perceive an increased likelihood of receiving a ticket if they commit a RLR violation at an intersection with automated enforcement. Critics view RLC programs as a means to generate revenue rather than improve safety.

Comprehensive crash data analysis is recommended by federal and state guidance documents for investigating intersections with an unusually high number of RLR violations and crashes. Violation data may not be the only basis of analysis, as violations may not necessarily directly translate to a RLR crash problem. Vehicle characteristics, intersection design and operations, and driver behavior are central to RLR phenomenon. Engineering and education countermeasures should be the first line of action adopted by traffic engineers to mitigate RLR violations and crashes. Intersections that continue to exhibit abnormal levels of RLR violations even after engineering and educational countermeasures have been in operation are typical candidates for RLCs.

The Red Light Safety Program in Baton Rouge and the SafeLight Program in Lafayette were implemented in response to high crash frequency. They underwent similar implementation methods using a network approach. Deployment is similar with permanent, fixed cameras at intersections taking multiple digital images and outreach primarily through press releases to the media. The vendors in Baton Rouge and Lafayette are contracted to manage installation, maintenance, and citations. They are compensated when fines are paid.

Lafayette Consolidated Government maintains a record of crash data available for public review online, and the SafeLight citation information per intersection is updated regularly. Baton Rouge DPW has had difficulty collecting data both before and after implementation due to insufficient access to and inaccuracies in crash reports. Traffic engineers typically use crash data three years before and after active implementation to make scientific comparisons. Baton Rouge's program has not been operating long enough to undergo traffic study comparisons until this year, and data for the 2010 calendar year is not yet available from DOTD. Therefore safety effectiveness evaluations have not yet been conducted.

The public opinion survey conducted in this project showed an even split between respondents who perceive RLR to be a problem and those who do not. Similarly, respondents were evenly split between being in favor of and opposed to RLC programs. Opposition was slightly higher in the regions with RLC programs compared to regions without. Whether or not an individual feels RLR is a problem may influence whether they support or oppose a RLC program. For example, those who believe RLR is a problem are more likely to support a RLC program than those who do not believe RLR is a problem.

Among those who favor RLC programs, the leading reasons to support the program (in order of response) are it encourages drivers to obey traffic laws, reduces crashes, and reduces RLR. Conversely, the leading reasons respondents oppose RLC programs is because respondents believe it is just a program to increase revenue and RLCs go against our system of justice. A smaller proportion feels RLCs are ineffective. Respondents also provided several other reasons to oppose RLC programs, such as RLCs increase rear-end crashes, removes officer discretion, disagree with a private company having a financial interest in the system, violates privacy, discriminates against certain sociodemographic groups, and imposes responsibility on vehicle owner, even if they were not driving the vehicle.

While almost half of the respondents are opposed to RLC programs, they did identify strategies that could be used in their community to help change their mind. The most popular strategy was to provide more information about how the revenue from the RLCs is actually used. Other strategies that might change their mind include using the revenue to improve safety in the community, providing better warning about when and where RLC programs are going to be implemented, and educating the public on the effectiveness of RLCs.

RECOMMENDATIONS

The project recommendations are:

1. Modify the photo enforcement policy to require public education programs be conducted prior to and *throughout* deployment of a RLC program.
2. Modify the policy to clarify the type of crashes under consideration in the automated enforcement portion from "vehicle/pedestrian" crashes to "crashes that can be avoided with an automated enforcement countermeasure."
3. Modify the photo enforcement policy to require enhanced methods for screening signalized intersections to identify sites with potential for safety improvement.
4. Modify the photo enforcement policy to require signs indicating electronic traffic enforcement be installed at the specific installation location *and* at jurisdictional limits of the local governments.
5. Modify the Law Revised Statute Title 32 Section 232 (RS 32:232) or the photo enforcement policy to achieve a consistent definition of a red light violation. Louisiana law requires vehicles to clear the intersection prior to the signal indication changing to red. The MUTCD indicates the vehicle shall not enter the intersection during a steady red indication. The State automated enforcement policy allows for a citation to be issued if the motorist is beyond the stop bar at the beginning of a red indication, which is permissible according to MUTCD procedures. It is recommended the state further evaluate these issues and consider revising RS 32:232 to provide consistency with the MUTCD.
6. Develop and maintain a consistent approach applying the state automated enforcement policy related to right turns on red. Existing policy permits motorists to enter the intersection to turn right on a red light after stopping and, as necessary, yielding to pedestrians and other motorists without receiving a red light running citation. Drivers that do not stop prior to turning right on red are in violation of the law and subject to enforcement. Imposing a reduced fine for right-turn-on-red violations may increase public support for enforcing these common violations, and should be incorporated into state policy.
7. Control the site selection process with vendor support limited to data collection or other activities at the discretion of the agency to decrease the public opposition and avoid a potential conflict of interest. Agencies should avoid a vendor compensation structure based on the number of paid citations.
8. Eliminate the requirement for agencies to report effectiveness of RLC deployments.

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AASHTO	American Association of State Highway and Transportation Officials
ATS	American Traffic Solutions
DOTD	Department of Transportation and Development
DPW	Department of Public Works
DTT	Department of Traffic and Transportation
DUI	Driving Under the Influence
FHWA	Federal Highway Administration
HSM	Highway Safety Manual
IIHS	Insurance Institute of Highway Safety
ITE	The Institute of Transportation Engineers
LCG	Lafayette Consolidated Government
LTRC	Louisiana Transportation Research Center
MUTCD	Manual of Uniform Traffic Control Device
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
OMV	Office of Motor Vehicles
RIP	Research In Progress
RLC	Red Light Camera
RLR	Red Light Running
RS	Revised Statute

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APPENDIX A

Tier 1 Survey

Your input is needed on red light running cameras. The Louisiana Transportation Research Center (LTRC) is conducting a public opinion survey regarding red light running camera programs. The information you provide will be used to support research developing guidance for communities considering implementing red light camera programs. Please take 5 minutes to complete the following survey questions. Thank you for your time!

---

1. In what zip code do you live? _____

2. In what zip code do you work or attend school? _____

3. Is there a red light camera program where you:

Live	Work or Attend School
___Yes	___ Yes
___ No	___ No
___Don't Know	___ Don't Know

4. Is running red lights a problem where you live?

___Yes ___Don't Know
___No ___No Opinion

5. Do you favor the use of red light cameras as a tool to reduce red light running at intersections?

___ Strongly favor
___Somewhat favor
___Somewhat oppose
___Strongly oppose
___No Opinion

If you **favor** the use of red light cameras can you tell us why?

___Reduces red light running
___Reduces crashes
___Encourages drivers to obey traffic Laws
___Other_____

6. If you **oppose** the use of red light cameras can you tell us why? *(select as many as appropriate)*

___It is just a program to increase revenue for local government and/or the police department.
___Red light cameras go against our system of justice since so no police officer actually witnessed the driver committing the offense.
___ Don't think they are effective.
___ Other _____

7. If you **oppose** using red light cameras, what could your community do to change your mind about red light cameras? *(select as many as appropriate)*

___Use the revenue generated to improve safety in the community.
___Better warning about when and where red light cameras were going to be implemented
___Education about the effectiveness of red light cameras
___Education about how the revenue from red light cameras is actually used
___ other _____

8. Would you be willing to participate in a more detailed phone interview about red-light running cameras? If so, please provide your name and phone number below.

Name _____

Phone Number _____

APPENDIX B

Tier 2 Survey

Hello, my name is _____. In late December or early January, you responded to a survey about red light cameras and indicated willingness to participate in a follow-up telephone interview. We do not record anyone's name and we do not share any of your personal information or telephone number with anyone outside the Transportation Research Center. Do you have about five minutes to participate in this eight question survey now?

IF THE RESPONDENT SAYS YES:
Great… thanks ! QUESTION 1.

IF THE RESPONDENT SAYS NO:
Okay, thanks for your time and interest in the initiative.

Please answer yes, no, or I don't know to the following questions.

1. Do you believe red light cameras are effective in improving traffic safety at intersections?
   a) Yes.
   b) No.
   c) Don't know.

2. Have you received a ticket for running a red light during the past two years?
   a) Yes. (If yes, ask: Was this a police-issued ticket or a red light camera ticket? Yes, no, don't know)
   b) No.
   c) Don't know.

3. Has someone you know received a ticket for running a red light during the past two years?
   a) Yes. (If yes, ask: Was this a police-issued ticket or a red light camera ticket? Yes, no, don't know)
   b) No.
   c) Don't know.

4. In your opinion, how likely is it for someone to get caught if they run a red light?
   a) Not likely.
   b) Likely.
   c) Very likely.
   d) Don't know.

5. I'm going to read a few statements to you, please select the statement that best reflects your views:

   NOTE TO SURVEYOR – ASK ITEMS "a" THROUGH "e" IN RANDOM ORDER.

   a) Red light cameras are just a way for the police department to make money.

ASK THIS QUESTION ONLY IF THE RESPONDENT SELECTED OPTION 5A –
What types of information about the REVENUE from red light camera programs would influence your opinion?

- Pause and wait to see if respondent provides answers. If the respondent provides an answer, record it.

- If the respondent does not provide an answer, make suggest:
  a) Information about ticket revenue and spending,
  b) Information about costs of crashes and emergency response,
  c) Costs of intersection safety improvements,
  d) Fees paid to red light camera vendors,
  e) Something else?

b) Red light cameras go against our system of justice because no law enforcement officer actually witnessed the driver committing the offense.

ASK THIS QUESTION ONLY IF THE RESPONDENT SELECTED OPTION 5b
What would you do to ensure that justice could be served with red light cameras?

- Pause and wait to see if respondent provides answers. If the respondent provides an answer, record it.

- If the respondent does not provide an answer, suggest possibilities such as:
  a) The use of video to backup the red light camera photos.
  b) Assurance that a sworn law enforcement officer viewed the red light camera photos and issued a ticket.
  c) Limiting the penalty for red light camera tickets to a fine, with no points or other effects on insurance.
  d) Something else?

c) Red light cameras are an effective way to give tickets to drivers for running red lights.

d) Red light cameras make it easier for law enforcement to do their jobs.

e) None of these reflect my views.

6. Select the statement that best reflects your views; the majority of drivers:
   a) Believe a yellow light is just a suggestion.
   b) Believe you can enter an intersection on a yellow light.
   c) Slow down immediately on a yellow light and prepare to stop.
   d) Don't know

7. Please answer yes, no, or I don't know to the following question. Do you believe warning signs and media attention about red light cameras stop people from running red lights?
   a) Yes.
   b) No.
   c) Don't know.

8. For this last question, where would you like to see red light camera revenues used in your community?

- Pause and wait to see if respondent provides answers. If the respondent provides an answer, record it.

- If the respondent does not provide an answer, make suggest:
  a) Safety projects in schools/colleges.
  b) Safety projects near parks/recreational areas.
  c) Road maintenance projects.
  d) Intersection improvements.
  e) New roads.
  f) Others.

That was the last question, thank you. We will be integrating your ideas from this survey into our research and policy guidelines for automated enforcement in Louisiana. I appreciate your time, have a nice day.

APPENDIX C

Current State Automated Enforcement Policy

REFERRED TO

_____
_____
_____
_____

_____ REFERRED FOR ACTION
_____ ANSWER FOR MY SIGNATURE
_____ FOR FILE
_____ FOR YOUR INFORMATION
_____ FOR SIGNATURE
_____ RETURN TO ME
_____ PLEASE SEE ME
_____ PLEASE TELEPHONE ME
_____ FOR APPROVAL
_____ PLEASE ADVISE ME
_____ _____

BY _____ DATE _____
BY _____ DATE _____
BY _____ DATE _____

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
INTRADEPARTMENTAL CORRESPONDENCE

PO Box 94245 / Baton Rouge / LA / 70804-9245

IN REPLY REFER TO
FILE NO.

MEMORANDUM

To: **Mr. Rhett Desselle, PE**
Assistant Secretary of Operations

From: **Mr. Richard Savoie, PE**
DOTD Chief Engineer

Subject: **Photo Enforcement Permits**

Date: **June 6, 2011**

The purpose of this memorandum is to inform you of revisions to the permit policy (previously dated December 2, 2010) for the installation of photo enforcement systems on state highways. It has been determined that it would be in the best interest of the safety of our highways for the Department to issue permits to local governments for the installation and operation of photo enforcement equipment in the state owned highway right-of-way.

Through the attached policy, the Department will regulate the site selection, installation, and operation of these permits to ensure that the photo enforcement systems function to improve safety. The policy was developed as a joint effort between the Department and members of the Louisiana Municipal Association in order to provide statewide consistency in the use of photo enforcement.

This policy replaces all other polices and memorandums issued on this subject. DOTD will begin accepting potential locations immediately. Beginning August 1, 2011, DOTD and State Police will begin checking for permits on all Traffic Enforcement Systems installed or located on state rights of way.

This memorandum and policy will be attached to all new permits and become part of the permit conditions. Copies of this policy will be forwarded to all districts. Copies will also be sent to the cities of Lafayette and Baton Rouge, which hold existing photo enforcement permits.

PAA
Attachment
cc: Louisiana Municipal Association
Secretary Sherri LeBas
Each District Administrator
Each District Traffic Operations Engineer
Each District Permit Specialists

_____ 6-6-11
RECOMMENDED FOR APPROVAL DATE

_____ _____
RECOMMENDED FOR APPROVAL DATE

_____ _____
RECOMMENDED FOR APPROVAL DATE

_____ 6-8-11
APPROVED DATE

Louisiana Department of Transportation and Development
Traffic Engineering Division
POLICY FOR
TRAFFIC ENFORCEMENT SYSTEMS ON
STATE HIGHWAY RIGHTS-OF-WAY

I. **Definitions:** The following are hereby defined for this document.

Intersection shall mean the place or area where two or more streets intersect; defined by the stop bars or if no stop bars are present, the area created by the projection of the curb lines through the intersection on curb and gutter streets and/or by the projection of the edge of pavement through the intersection of the crossing streets.

Owner shall mean the owner of a vehicle as shown on the vehicle registration records of the Louisiana Department of Public Safety, Office of Motor Vehicles, or the analogous department or agency of another state or country.

Electronic Traffic Signal Enforcement System or Enforcement System shall mean a system:

a. Consisting of an electronic/camera system installed to work in conjunction with an electrically operated traffic-control signal; and

b. Is capable of producing at least two recorded images depicting the rear of a vehicle that is not operated in compliance with the red-displays of the traffic-control signal. The license plate data shall be discernible from at least one of the images.

Electronic Vehicle Speed Enforcement System or Enforcement System shall mean a system:

a. Consisting of an electronic/camera system; which is

b. Capable of producing at least one recorded image depicting the rear of a vehicle that is being operated at a speed in excess of the posted speed limit. The license plate data shall be discernable from the image.

Recorded Image for Electronic Traffic Signal Enforcement Systems means an image recorded by a photographic traffic monitoring system depicting the rear of a vehicle and is automatically recorded as a photograph or digital image, which also depicts the recorded speed, duration the signal was red, date, location, and time of the recorded image.

Recorded Image for Electronic Vehicle Speed Enforcement Systems means an image recorded by a photographic traffic monitoring system depicting the rear of a vehicle and is automatically recorded as a photograph or digital image, which also depicts the recorded speed, date, location, and time of the recorded image

System location means the approach to an intersection where an Electronic Traffic Signal Enforcement and/or the site where an Electronic Vehicle Speed Enforcement System is directed and in operation.

Traffic control signal shall mean a traffic control device displaying alternating red, amber and green lights directing traffic when to stop at or proceed through an intersection.

Traffic violation defined — Red Light Running - A vehicle which proceeds past the trailing edge of an installed stop bar of a signalized approach into the intersection when the Traffic Control Signal for that vehicle's direction of travel is emitting a steady red signal indication shall be considered a red light running violation. A vehicle owner is subject to issuance of a civil notice of violation, except where the vehicle facing a steady red signal cautiously enters the intersection to turn right after stopping, and after stopping the vehicle yields the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.

Traffic violation defined — Speeding - Vehicles which exceed the posted speed limit and are traveling at a recorded speed as identified in the speed enforcement tables identified within this document shall be considered a speeding violation and are subject to issuance of a civil notice of violation.

II. Purpose

The purpose of this document is to provide guidance for the Louisiana Department of Transportation and Development (DOTD) in issuing permits to local governments for the installation of electronic traffic enforcement monitoring systems on state highway rights-of-way. Automated enforcement systems are designed to enhance safety and promote compliance with traffic laws. The DOTD permit gives the local governing authority and or its designated agent permission to install, maintain, and operate stationary and mobile enforcement systems on state rights-of-way. The use of these devices is the choice of the local government as part of their authority to enforce traffic laws.

This policy shall become effective for all new photo enforcement permits. Existing permits shall expire 18 months after the issuance of this policy if the permitted installation is determined by the DOTD not to be in compliance with the guidelines contained herein. The DOTD shall notify the Applicant of non compliant permitted locations, a minimum of 90 calendar days prior to the expiration of the 18 month period, to allow the Applicant to come into conformance to these guidelines. New and or amended permits may be issued once conformance to these guidelines is determined by DOTD.

III. Permits

The DOTD will, by "permit," allow the installation of electronic traffic enforcement systems in communities for the express purpose of reducing traffic violations and crashes. Communities which choose to employ electronic traffic enforcement shall engage a qualified professional engineer to prepare the permit and perform the required traffic engineering studies, field verification, and specified inspection(s).

Potential permit locations shall be submitted to the DOTD District for initial review and verification of crash histories. The potential permit locations shall be approved or denied within 15 days after delivery of receipt by the DOTD District permit offices. This initial submittal

shall include the following:

1. Cover Letter
2. Power of Attorney or Resolution authorizing the signee to represent and legally bind the municipality
3. Local Authority
4. Public Education Plan
5. Completed LADOTD Traffic Enforcement Systems Potential Permit Location Request Form
6. Location Map
7. Crash Diagram

If the locations are accepted by the District, the applicant may submit the permit form, local documentation, engineering reports, and plans for review and recommendation of approval by the District. The District shall forward the permits to the headquarters Traffic Engineering Division for review. The Traffic Engineering Division will forward the permits to the DOTD Permits Engineer for approval and issuance. The applicant may begin construction upon receipt of the issued permit.

The permits shall be submitted on the DOTD Traffic Enforcement Systems on State Highway Rights-of-Way permit form. A copy of this form is available on the DOTD web site at: http://www.dotd.la.gov

The permits shall be issued or denied within 30 business days after delivery receipt of the permit application within the DOTD District permit offices. The DOTD shall identify the reasons for rejecting any permit applications. The permittee will have an opportunity to resubmit a revised application to comply with the requirements identified by the DOTD. The permits shall only be authorized to local governments which have traffic regulation with enforcement authority. After the permit is issued, the District shall ensure the equipment is installed and operated in accordance with the approved permit.

The permit applications shall include the following:

1. Local Authority - The permit shall include documentation from the local government indicating the existence of a legal instrument authorizing the use of electronic enforcement within the municipality or parish and documentation from the chief law enforcement officer of the municipality or parish requesting and/or supporting the use of automated traffic enforcement monitoring systems. These documents shall include within them the definitions and standards of enforcement for civil notices of violations.

2. Public Education Plan – The permit application shall include a Public Education Plan which shall include, at a minimum, the following components:

    a. A 30 day warning period prior to the start date of violations being issued. During this period, construction may being for permanent enforcement fixtures.

    b. During the warning period, violations may be captured and warning notices

may be mailed out to educate the public about the electronic traffic enforcement installations.

c. Beginning no later than the first day of the warning period, a public information notice shall announce the start date of the warning period, the start date of enforcement, the enforcement locations, violation amounts, and the violation appeal process.

d. For permanently fixed speed enforcement locations, installation of radar speed signs are required as a component of the Public Education Plan and are not recognized a being part of the actual enforcement function. Radar speed signs are required as follows:

   i. For corridors with two or less permitted speed enforcement sites, the radar speed signs shall be required during the warning period at the permitted location and for a minimum of an additional 45 days during which enforcement is allowed.

      During the additional 45 days the radar speed signs shall be required at one of the following locations – at the original location, at a location elsewhere on the corridor, or on a nearby state highway with comparable volumes (ADT).

   ii. For corridors with three or more permitted speed enforcement sites, the radar speed signs are required during the warning period and as long as violations are issued. The radar speed warning sign shall be located at the beginning of the corridor being enforced.

e. On at least an annual basis, public information notices, shall announce enforcement locations, and the number of violations issued.

3. Locations

a. Monitored ***Electronic Traffic Signal Enforcement System*** intersections shall be selected based primarily on vehicle/pedestrian traffic crashes. Red Light enforcement is a safety tool intended to improve safety, therefore for a signal to justify installation of this safety countermeasure, the signal must have five or more of the following crash types, identified on LaCrash reports under "Manner of Collision" box within a 12 continuous month time window within the latest available 36 months:
   i. Right Angle – D
   ii. Left Turn - F
   iii. Left Turn – G
   iv. Right Turn – H (for signalized movements only)

b. Monitored ***Electronic Speed Enforcement System-*** The Department shall issue permits for specific sites for speed enforcement. Identified sites shall consider locations where:

i. A speed limit study verifies the posted speed limit has been established based upon an engineering study in accordance with acceptable transportation engineering principles and practices, and

ii. Photo enforcement vehicles and trailers shall not be allowed to be parked on the highway shoulder or within the clear zone except when protected by an embankment, bridge rail, or guard rail. Clear zones are defined by the "English Design Guidelines" which is available at http://www.dotd.la.gov/highways/project_devel/design/road_design/Memoranda/English_Design_Guidelines.pdf, and

iii. There is a minimum of one standard speed limit sign with supplemental Photo Enforced plaques in advance of the electronic speed enforcement site location.

3. Speed Tolerance — For ***Electronic Vehicle Speed Enforcement Systems*** it is recognized that a notice of violation shall be issued only after allowing an enforcement tolerance above the posted speed limit which has been established by the DOTD. This enforcement tolerance shall be in accordance with the following two tables and should be identified within the authorizing ordinance of the political entity, one for School Zones, and one for Non School Zones. Using these tables as an example, the Owner of a vehicle would receive a violation if the vehicle is traveling at a speed in miles per hour (mph) greater than the posted speed limit in accordance with the following tables at a System Location. The following tables reflects the minimum speed tolerances for various posted school zones which shall be utilized for DOTD permitted Electronic Vehicle Speed Enforcement Systems for School Zones and Non-School Zones:

Posted Speed Limit (Miles Per Hour)	Minimum Speed For Violation to be Issued in a School Zone (Miles Per Hour)	Minimum Speed For Violation To Be Issued (Miles Per Hour)
15	≥21	≥21
20	≥26	≥26
25	≥31	≥31
30	≥36	≥36
35	≥41	≥43
40	≥46	≥48
45	≥51	≥55
50	≥58	≥60
55	≥63	≥65
60		≥70
65		≥75
70		≥80
75		≥85

4. Engineering Report — As part of the ***Electronic Traffic Signal Enforcement System*** permit approval process, a licensed professional traffic engineer shall evaluate and include as part of the permit/report, specific recommendations which include, but are not limited to the following:

   a. ***Speed Enforcement*** - An analysis of existing vehicle speeds and their distribution shall be provided. The report on speeds shall include compilation of recorded speeds in non peak time periods of no less than 2 hours, and no less than 200 vehicle speeds are to be collected. The data shall be compiled to identify the 50^{th}%, 85^{th}%, speeds and the 10 mph pace of the vehicles stream where speed enforcement is being considered. The engineer may recommend continuation of the posted speed limit or a modification of the posted speed limit as part of the required report on this subject. The DOTD will determine if the speed limit needs to be modified and shall initiate action to cause this to occur before implementing electronic speed control enforcement. The DOTD will not unreasonably delay modifying speed limits.

   b. ***Electronic Traffic Signal Enforcement Systems*** of Red Light Running — A report signed and sealed by a Louisiana registered professional engineer shall be prepared. The report shall determine if the traffic signal meets or exceeds the minimum design requirements of the MUTCD, the DOTD Traffic Signal Design manual, and the standards contained in this policy.

i. The total change period (yellow and red) clearance intervals shall be determined and implemented under the permit as follows and shall be part of the engineering report:

FORMULA USED: $CP = t + [v/(2*a + 2*g*G)] + [(w + l)/v]$

FIRST TERM "Yellow" SECOND TERM "All Red"

CP = Yellow time plus all red time (sec.)
t = Driver Perception/reaction time (generally, 1 sec.)
v = Approach speed (ft/sec.)
a = Average Deceleration (values between 10 ft/sec*2 & 15)
g = Acceleration due to gravity (32.2 ft/sec*2)
G = Grade (percent/100)
w = Cross street width
l = Vehicle length (assumed to be 20 ft.)

			TOTAL CHANGE PERIOD (YELLOW AND RED) CLEARANCE INTERVALS								
			INTERSECTION WIDTH IN FEET								
SPEED LIMIT		FIRST TERM	FIRST TERM + SECOND TERM FOR VARIOUS CROSS STREET WIDTHS								
MPH	ft/sec	t+[v/(2*a+2*g*G)]	40	45	50	55	60	65	70	75	80
30	44.00	3.20	4.56	4.68	4.79	4.90	5.02	5.13	5.25	5.36	5.47
35	51.33	3.57	4.74	4.83	4.93	5.03	5.13	5.22	5.32	5.42	5.51
40	58.67	3.93	4.96	5.04	5.13	5.21	5.30	5.38	5.47	5.55	5.64
45	66.00	4.30	5.21	5.28	5.36	5.44	5.51	5.59	5.66	5.74	5.82
50	73.33	4.67	5.48	5.55	5.62	5.69	5.76	5.83	5.89	5.96	6.03
55	80.67	5.03	5.78	5.84	5.90	5.96	6.03	6.09	6.15	6.21	6.27
60	88.00	5.40	6.08	6.14	6.20	6.25	6.31	6.37	6.42	6.48	6.54
65	95.33	5.77	6.40	6.45	6.50	6.55	6.61	6.66	6.71	6.76	6.82

*** FOR SPEED LIMIT OF 55 MPH OR LESS, AND WHERE THE VALUES ABOVE ARE HIGHLIGHTED IN GRAY, THE YELLOW INTERVAL SHALL BE 5.0 SECONDS, AND THE ALL RED SHALL BE THE VALUE IN THE ABOVE TABLE MINUS 5.0 SECONDS. EXAMPLE, FOR 45 MPH AND A W VALUE OF 70 FEET = 5 SECONDS OF YELLOW TIME WITH AN ADDTIONAL 0.66 SECONDS OF ALL RED TIME.**

*** FOR SPEED LIMIT 60 MPH, THE YELLOW INTERVAL SHALL BE NO LESS THAN 5.4 SECONDS, AND THE ALL RED SHALL BE THE VALUE IN THE ABOVE TABLE MINUS 5.4 SECONDS. EXAMPLE, FOR 60 MPH AND A W VALUE OF 70 FEET = 5.4 SECONDS OF YELLOW TIME WITH AN ADDTIONAL 1.08 SECONDS OF ALL RED TIME.**

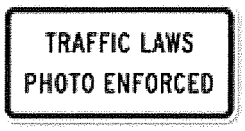
*** FOR SPEED LIMIT 65 MPH, THE YELLOW INTERVAL SHALL BE NO LESS THAN 5.8 SECONDS, AND THE ALL RED SHALL BE THE VALUE IN THE ABOVE TABLE MINUS 5.8 SECONDS. EXAMPLE, FOR 65 MPH AND A W VALUE OF 70 FEET = 5.4 SECONDS OF YELLOW TIME WITH AN ADDTIONAL 0.99 SECONDS OF ALL RED TIME.**

ii. All signal faces shall utilize LED-type indications to increase "target" value of the displays. Regulatory and/or warning signs approaching an enforcement system shall be visible and legible.
iii. New stop bars are to be installed or repaired to "like new" condition and located in accordance with the MUTCD and LADOTD Pavement Marking Standard plans.
iv. A red light running violation shall be defined as occurring whenever a vehicle driver proceeds past the trailing edge of the stop bar after the display of a steady red indication and enters the intersection.
vi. Once operational, the permittee or its designated agent shall notify the DOTD within 5 working days that the traffic signal installation is functioning as designed, and all detectors are working properly and indicate the specific time and date the system will commence electronic enforcement.

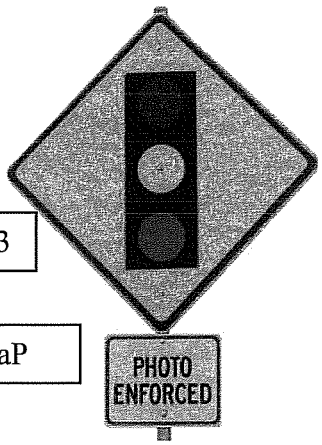
6. Plans - The permit application shall include plans stamped by a Louisiana professional engineer for each installation. These plans shall include the location of traffic enforcement system equipment, and the location of the required advance regulatory signs noted in this document. Connection to the traffic signal circuits shall utilize optically isolated switches and enforcement equipment will sense traffic signal phase changes by monitoring current flow, and not by communication with the signal controller. Monitoring of the signal conductors may occur within or outside of the traffic controller cabinet with all wires clearly labeled. Wires shall be enclosed in appropriate conduit or installed overhead in accordance with DOTD signal standard details. Cabinets shall only be accessed with a DOTD District Traffic representative for signals not covered under a full maintenance agreement.

7. Signing - Signs indicating traffic compliance is being enforced electronically may be placed at the jurisdictional limits of the local government, and shall be installed on each approach to the location where a traffic enforcement monitoring device is in operation. Signs at the municipality limits shall be the R10-18 as shown in the MUTCD, or an approved alternate. The details of each sign assembly and location of same shall be depicted in the supporting engineering report as part of the permit application for electronic enforcement systems as noted in this document.

    a. Signs for Electronic Traffic Signal Enforcement — Appropriate warning signs shall be installed on the approaches to the intersection where red light running is being monitored. These black on yellow background signs (W3-3 and W16-10aP assembly), shall be installed at locations in accordance with the current version of the adopted MUTCD guidelines for "Placement of Warning Signs" (where Condition B is 0, a potential stop condition.) Similar signs may be installed for non monitored approaches when at least one of the approaches utilizes electronic enforcement systems. Additional regulatory signs may be mounted adjacent to traffic signal heads and or mounted on traffic signal mast arms if a full maintenance agreement for traffic signals exists with the permittee. The permittee is responsible for installing and maintaining these signs.

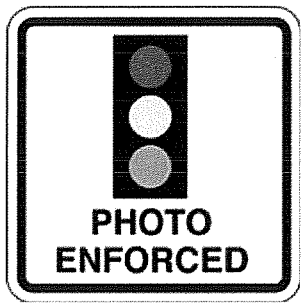


R10-18



W3-3

W16-10aP



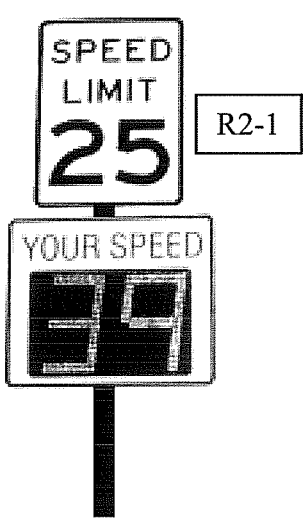
May be installed at municipality limits

Shall be installed prior to a signal where red light and or speeding is monitored at a signal

May be installed at a signal where red light and or speeding is monitored

b. Signs for Electronic Speed Enforcement —

i. Radar speed signs shall be installed and maintained on each corridor monitored by electronic speed enforcement as required under the Public Education Plan. These signs may be permanent or mobile as shown below. The exact location of the radar speed signs shall be determined by the DOTD District office. If a trailer is used, it shall be placed outside of the clear zone or protected by positive protection. The sign shall be programmed such that speeds over 15 mph of the posted speed shall not be displayed to avoid misuse of the sign.



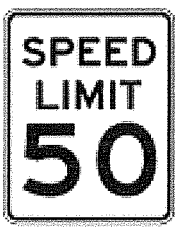
R2-1

Permanent Radar Speed Sign

Mobile Radar Speed Sign.

ii. The permittee shall install and maintain a minimum of one standard speed limit sign (R2-1) with supplemental Photo Enforced plaques (R10-19) in advance of the electronic speed enforcement site location. The permittee is responsible for installing and maintaining the speed limit sign assemblies.

Standard speed limit sign with supplemental Photo Enforced plaque.



R2-1

R10-19aP

8. Countermeasures – Prior to installing photo enforcement there are appropriate countermeasures that should be attempted at the intersection. Some of these countermeasures have been discussed in the ITE "Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running". The countermeasures shall be identified in the engineering report and noted how long they have been in place.

9. System Testing Plan – The local government and/or its designated agent shall provide tests for accuracy at devices at regular intervals. Each such test shall be made in accordance with the manufacturer's recommended procedure. Records shall be maintained indicating the results of each test. Such test results shall be public records subject to inspection. If any such device fails to meet the manufacturer's minimum accuracy requirements, such traffic enforcement system shall be removed from service and thereafter shall not be activated until it has been serviced and validated.

10. Reporting - The permittee shall prepare an annual traffic crash summary report for the preceding calendar year which shall be prepared and submitted to both the DOTD District and HQ Traffic Engineering Division, no later than July 1st of each year. For Traffic Enforcement Systems at intersections, this report shall summarize the number of reported traffic crashes within 200 feet of the stop bar of each approach of the permitted locations, using available traffic crash data and if performing speed enforcement shall include the present 85th percentile speed according to DOTD policy. For Traffic Enforcement Systems on routes, this report shall summarize the number of crashes on the route, excluding intersection related crashes and present the 85th percentile speed according to DOTD's policy.

Intersection and route reports shall contain an analysis of available traffic crash reports noting the differences, if any, prior to the activation of the permitted locations and a similar period after activation of the electronic enforcement equipment. Once the system has been installed for more than 3 years, the 3 year period prior to installation will be reported. Both types of reports shall also include a summary of the last year's total citations and basic statistics on the type of violations.

IV. System Operation

Maintenance Repair of Damaged Enforcement Equipment – The local government or its designated agent agrees to respond timely to reports of traffic enforcement system damage through any licensed local contractor or an authorized agent for that City or Parish, as a result of a traffic crash or other activity which disturbed the equipment from its permitted location. Other infrastructure repairs are anticipated to be completed within three calendar days upon notification by the public or the DOTD. The permittee shall hold the DOTD harmless for damages or injuries arising from the installation of the traffic enforcement system under the permit.

Streaming Video — The DOTD shall be allowed access to available streaming video at the permitted locations, subject to the DOTD providing communications complying with the permittee's and/or their agent's bandwidth and security protocol requirements to aide in traffic monitoring.

V. Removal

If the DOTD determines the permittee is not in compliance with the requirements of the permit, the DOTD shall immediately notify the permittee of the defect in writing. The permittee shall have 10 calendar days from receipt of the DOTD notice to rectify the specified defect and shall notify the DOTD of the resolution. If the permittee fails to correct the defect within the 10 days noted, to the satisfaction of the DOTD, said permit may be cancelled. No new permits shall be issued if an existing permit has been identified for removal, but has not been removed as directed.

If the annual traffic crash report indicates the overall number of total injury crashes increases, the DOTD may require that the system be removed. Removal will be considered if recommended by an engineering report that includes all relevant factors which might have contributed to the recorded increase in crashes, including but not limited to changes in nearby or adjacent land use and/or development, traffic volume increases or decreases, and or traffic signal phasing changes during the evaluation periods, etc..

Permits issued for the installation of traffic enforcement systems on state highway rights-of-way shall be contingent upon the local government meeting the requirements of this document. If the DOTD permit is cancelled, the municipality or its designated agent shall remove the equipment installed under the permit within DOTD's rights-of-way within 60 days of notice.

Any cost to remove traffic enforcement equipment shall be borne by the permittee or its designated agent. The permittee shall restore DOTD rights-of-way to as good as or better than before the permit was issued. Final inspection by the DOTD will be conducted to assure compliance.

APPENDIX D

Data Assumptions and References used in Comparison of Traditional Enforcement versus Red Light Cameras

Vendor payments for deployment of camera technology: Based on the following payment structure reported in Lafayette, LA and an estimate of 88 paid citations per month per intersection (based on average data across all monitored intersections in Lafayette):

- The number of paid citations from 1 to 150 per month at each intersection will be paid at $39 each
- The number of paid citations from 151 to 300 per month at each intersection will be paid at $39 each
- The number of paid citations exceeding 300 per month at each intersection will be paid at $39 each

In 2010 an estimated 1,051 red light camera citations were paid in Lafayette across 12 monitored intersections.

Officer salary & fringe: When nonsworn personnel are excluded, local police departments cost $116,500 per officer to operate for 2007. Source: U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics. 2010. Local Police Departments, 2007. http://bjs.ojp.usdoj.gov/content/pub/pdf/lpd07.pdf Assuming $120,000 per year based on inflation since 2007, and 2,000 working hours per year, an hourly cost of $60 is estimated.

Patrol car: $16.25/hr based on FEMA rate schedule
http://www.fema.gov/government/grant/pa/eqrates.shtm

Court time: assumes 4 days per month for a police officer assigned full-time to traffic enforcement

Fraction of Sgt. Salary: assumes a ratio of 1 Sergeant to 8 police officers

Red light camera costs: based on interviews with red light camera vendors

Officer oversight for red light cameras: assumes ¼ of officer salary; this cost is assumed to be the same for a single intersection or multiple intersections monitored by red light cameras