

Regular Council Meeting

May 21, 2026

FRESNO CITY COUNCIL



Public Comment Packet

ITEM(S)

2-CC (ID 26-638)

RESOLUTION - To Adopt the City of Fresno Vision Zero Action Plan (Citywide)

Contents of Supplement: Public Comment Received

Supplemental Information:

Any agenda related public documents received and distributed to a majority of the City Council after the Agenda Packet is printed are included in Supplemental Packets. Supplemental Packets are produced as needed. The Supplemental Packet is available for public inspection in the City Clerk's Office, 2600 Fresno Street, during normal business hours (main location pursuant to the Brown Act, G.C. 54957.5(2)). In addition, Supplemental Packets are available for public review at the City Council meeting in the City Council Chambers, 2600 Fresno Street. Supplemental Packets are also available on-line on the City Clerk's website.

Americans with Disabilities Act (ADA):

The meeting room is accessible to the physically disabled, and the services of a translator can be made available. Requests for additional accommodations for the disabled, sign language interpreters, assistive listening devices, or translators should be made one week prior to the meeting. Please call City Clerk's Office at 621-7650. Please keep the doorways, aisles and wheelchair seating areas open and accessible. If you need assistance with seating because of a disability, please see Security.

RECEIVED
2026 MAY 20 A 11:48
CITY OF FRESNO
CITY CLERK'S OFFICE

From: [REDACTED]
Subject: Public Comment - FW: Request to Amend Vision Zero Item 2-CC to Remove or Defer Red-Light Camera Recommendation
Date: Tuesday, May 19, 2026 9:18:00 AM
Attachments: [REDACTED]
[REDACTED]
[Yellow Interval Increase Studies R2.pdf](#)
[image001.png](#)

Good morning,

This comment was sent to our District 5 Office. Not sure if this comment was also sent to the Clerk's Office. If it has not, the commenter requested that this be added to the public comment record for item **2-CC "Vision Zero"**.

Best,

Leefong Mouavangsou
Chief of Staff • District 5
Office of Councilmember Brandon Vang
Fresno City Hall • 2600 Fresno Street • Fresno, CA 93721
Phone: [REDACTED]
Email: [REDACTED]

From: District5 [REDACTED]
Sent: Tuesday, May 19, 2026 9:10 AM
To: Leefong Mouavangsou [REDACTED]
Subject: FW: Request to Amend Vision Zero Item 2-CC to Remove or Defer Red-Light Camera Recommendation

FYI-

Best,



Carmen Iniguez (She/Her)
Deputy Chief of Staff • District 5
Office of Councilmember Brandon Vang
Fresno City Hall • 2600 Fresno Street • Fresno, CA
93721
[REDACTED]

From: Jay Beeber [REDACTED]
Sent: Tuesday, May 19, 2026 1:14 AM
To: District5 <[REDACTED]>
Subject: Request to Amend Vision Zero Item 2-CC to Remove or Defer Red-Light Camera Recommendation

External Email: Use caution with links and attachments

Councilmember Vang,

My name is Jay Beeber. I am Executive Director - Policy for the National Motorists Association, and I have worked extensively on automated traffic enforcement, red-light-running policy, signal timing, and the practical effects of camera programs on motorists and communities.

I am writing regarding Item 2-CC, the resolution to adopt the City of Fresno Vision Zero Action Plan. I am asking the Council to adopt the plan only if it is amended to remove or defer the red-light camera recommendation. At minimum, Council should sever that portion of the plan and direct staff to return with a separate, fully noticed policy item before Fresno takes any step toward implementing SB 720 automated red-light enforcement.

The issue is not whether Fresno should pursue safer streets. It should. The issue is whether automated enforcement should be embedded as a Priority Action in the Vision Zero plan before the Council has received a complete analysis of engineering alternatives, legal and due-process concerns, possible litigation risk, equity impacts, program costs, vendor incentives, crash causation, and the actual safety record of red-light camera programs.

The Vision Zero Action Plan identifies “Red Light Cameras” as Priority Action 1 under Safe Roads, lists Public Works as the lead agency, Fresno Police as a supporting partner, and identifies “Automated enforcement” as the key outcome. The plan also contains a separate SB 720 section recommending that Fresno explore automated enforcement of red-light violations and identify High Injury Network intersections where cameras could be deployed. That is more than a passing reference. It creates a policy direction that deserves separate review.

SB 720 also raises due-process issues that should be reviewed before Fresno moves toward implementation. The law allows citations to be issued to the registered owner rather than the identified driver, shifts these matters into an administrative process, and permits liability to be based on a camera-generated notice rather than the traditional traffic-court process. Before adopting automated enforcement as a policy direction, the Council should require a specific City Attorney review of owner liability, administrative adjudication, evidentiary standards, appeal rights, and potential litigation exposure.

There is also a practical financial question. Most SB 720 tickets will likely be \$100 civil penalties. From that amount, the City would still have to cover vendor compensation, staff time, citation processing, hearing administration, adjudication costs, public noticing, signage, data review, and program oversight. Unless the program issues a large volume of tickets, it

could become a net fiscal loss. If it does issue a large volume of tickets, that raises the separate concern that Fresno would be relying on mass ticketing of ordinary drivers to sustain the program.

I have attached several documents for the Council's consideration:

1. A Primer on Red-Light-Running and Automated Enforcement, explaining why many red-light violations are caused by engineering and signal-timing issues, especially inadequate yellow intervals and dilemma zones.
2. A Compendium of Yellow Interval Increase Studies, summarizing real-world examples where modest increases in yellow interval times produced large reductions in red-light-running violations.
3. How Automated Ticketing Programs Burden Low Income and Minority Communities, addressing the equity and financial impacts of automated ticketing programs.
4. Red Light Camera Candor from Officials, compiling statements from California and other local officials who questioned or ended camera programs after finding limited safety benefit, fiscal concerns, or public-trust problems.
5. How Dangerous Is a Rolling Right Turn?, addressing how camera programs often shift toward high-volume, low-risk violations rather than the most dangerous red-light-running behavior.
6. Engineering Videos Links, providing short explanatory videos on yellow intervals, indecision zones, red-light camera limitations, and engineering alternatives.

Before Fresno proceeds toward any automated enforcement program, the Council should require staff to return with a separate analysis that includes, at minimum:

1. intersection-specific crash histories, separated by crash type and movement;
2. time-into-red data where available;
3. yellow and all-red interval review using current engineering practices and actual approach speeds;
4. evaluation of signal visibility, clearance intervals, protected turn phasing, dilemma-zone mitigation, and other engineering countermeasures;
5. legal analysis of SB 720's due-process and owner-liability framework;
6. fiscal analysis showing expected citation volume, vendor costs, city revenue, administrative costs, and hearing and adjudication costs;
7. equity analysis showing where cameras would be located and which communities would bear the ticket burden;
8. clear rules excluding or limiting enforcement of minor, low-risk violations such as slow rolling right turns;
9. a public process separate from general adoption of the Vision Zero Action Plan.

My specific request is that Council amend Item 2-CC before adoption to remove the red-light camera Priority Action and related SB 720 automated enforcement recommendation. If Council is not prepared to remove it, then the red-light camera portion should be continued, severed, or referred back to staff for a separate public hearing and full policy review.

Please include this email and the attached materials in the public record for Item 2-CC.

Respectfully,

Jay Beeber

Executive Director - Policy

[National Motorists Association](#) | [REDACTED]

[REDACTED]

A Primer on Red-Light-Running and Automated Enforcement

by Jay Beeber

Member – Institute for Transportation Engineers
Executive Director - Policy – National Motorists Association

Setting Proper Minimum Yellow Change Intervals

Contrary to popular belief, the yellow traffic signal time is NOT set to allow drivers adequate time to STOP when the light turns yellow. Rather, the yellow time is set to provide drivers who don't have enough roadway to stop safely and comfortably with enough time to GO and enter the intersection before the light turns red.

All vehicles in motion have a “critical stopping distance” - the distance the vehicle will travel once a stimulus is observed, the driver decides to stop, applies the brakes, and brings the vehicle to a safe and comfortable halt. This distance is calculated using a basic physics equation of motion comprised of three variable parameters – 1) the vehicle's velocity, 2) driver's perception-decision-reaction time, and 3) vehicle's deceleration (how hard the driver applies the brakes). If the value of each parameter is known or correctly estimated, an accurate stopping distance can be calculated.

When the yellow light illuminates, drivers further from the intersection than their stopping distance have sufficient roadway to stop and are expected to do so. Conversely, drivers closer to the intersection than their stopping distance do not have sufficient roadway to stop safely and comfortably and are expected to keep going and enter the intersection. At a minimum, the proper yellow time would therefore be the time it will take for a driver to traverse their critical stopping distance. The equation that encompasses these principles has been widely in use since the 1960's for calculating the minimum yellow change interval, and is known as the “Kinematic Equation”.

Yellow times set shorter than calculated using these principles will create a “dilemma zone”, a place in the roadway where the driver can neither stop safely nor enter the intersection before the onset of red. Drivers caught in a dilemma zone have only two choices, either brake harder than is safe and comfortable or keep going and run the red light. In reality, though, drivers will likely not know they are in a dilemma zone and will just keep going, committing a red light violation in the process.

Note that this procedure for calculating the yellow interval simply provides the absolute minimum time necessary to eliminate the dilemma zone *provided* the values input into the Kinematic Formula are accurate. Unfortunately, there are a range of reasonable driver and vehicle behaviors and capabilities on our roadways, so no one yellow interval will be “right” for all drivers at all times. For example, older drivers have longer reaction times, and larger vehicles like trucks and buses decelerate at lower rates than smaller vehicles. Therefore, in order to account for these variations when calculating an appropriate yellow interval, engineers should employ “engineering tolerance” (a fudge-factor) to ensure the vast majority of drivers and vehicles are accommodated.

In March 2020, the Institute of Transportation Engineers (ITE) published an updated Recommended Practice, “Guidelines for Determining Traffic Signal Change and Clearance Intervals” to account for

the evolving knowledge in the field of traffic signal timing. Key to the updated protocols is the ITE’s endorsement of using the actual speed of traffic on approach to the intersection, rather than the posted speed limit, which can vary significantly from the roadway’s actual operational speed. If the operational speed of the roadway has not been measured, then ITE recommends adding 7 mph to the posted speed limit to more accurately estimate the speed of traffic on the roadway.

Additionally, ITE adopted an Extended Kinematic Formula to be used in turning lanes that accounts for the time for a vehicle to traverse the critical stopping distance while decelerating to a lower speed to safely navigate a turning maneuver.

It should be noted that while ITE protocols are generally recognized as the state of the art in traffic engineering, ITE does not set law or policy. While an individual state or jurisdiction may formally adopt an ITE protocol, ITE recommended practices are generally not “adopted” by Federal Agencies or any overall authority for use throughout the U.S.

The Complex Nature of Red Light Running

Red light violations fall into three broad categories: straight through, right turns, and left turns. Each of those categories can be further broken down into sub-categories. Each type of violation has unique causes and characteristics, and varies in its potential to cause serious collisions and injuries.

Table 1 lists the various types of red light running violations, when during the red interval they occur, their causes, and the relative danger associated with each.

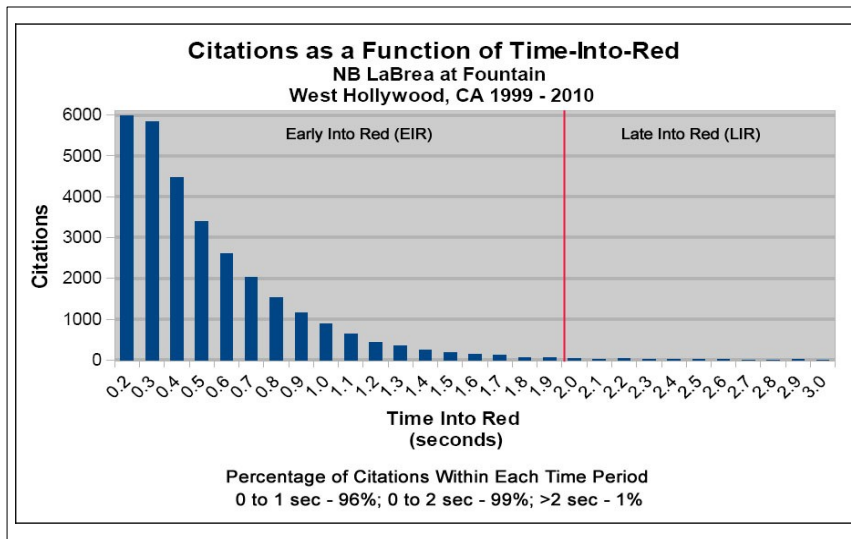
Straight Through	Early into Red	Too Short Yellow, Driver Error, Willful (pushing yellow)	Low
	Late into Red	Impairment, Fatigue, Distraction, Weather/Sun Glare/etc., Willful (rare)	High
Right Turn	Early into Red	Too Short Yellow, Driver Error, Willful (pushing yellow)	Low
	Late into Red	Willful (no safety need to stop completely)	Low
Left Turn	Early into Red	Too Short Yellow, Driver Error, Willful (Following in queue)	Low
	Late into Red	Impairment, Fatigue, Distraction, Weather/Sun Glare/etc., Willful (rare)	High

Straight Through Violations

Straight through red light running violations are separated into “early-into-red” violations - those which occur immediately after the light turns red when the intersection is relatively clear, and “late-into-red” violations - those which occur long after the light has turned red (>2 sec.) when cross traffic is potentially present within the intersection.

Violation data directly captured by red-light-camera systems highlight this pattern. Figure 1 below, shows the relationship between violation frequency and time-into-red at a photo enforced intersection

in West Hollywood, CA. Ninety-six percent of the citations issued were for violations occurring within the first second of the red interval, 99% of citations occurred within the first two seconds, and only 1% occurred after two seconds.



Early-Into-Red Violations

Straight through violations which occur early in the red interval rarely result in the catastrophic right angle (aka broadside or T-bone) crashes one generally envisions when discussing the dangers of red light running because cross traffic has not yet entered the intersection due to start-up delay or, where utilized, the presence of an all-red interval (where the light momentarily displays red for all intersection approaches).

Willful Violations

It is often assumed that red light violations are exclusively the result of the willful behavior of motorists who choose to “push the yellow”. Unquestionably, some aggressive drivers, when faced with a yellow light, will try to beat the light rather than stop appropriately. A portion of these drivers will fail in this attempt and will violate the light by a few tenths of a second. These types of violations, while unlawful, rarely result in collisions since they occur early in the red interval when the intersection is devoid of cross traffic. Therefore, even if massive enforcement efforts targeting these drivers were to be successful, the number of red light related crashes is rarely reduced by a significant amount.

Violations Due to a “Dilemma Zone”

In contrast, many early-into-red violations occur when drivers are forced to inadvertently violate traffic signals due to yellow signal times which are too short for the prevailing traffic conditions on the roadway. As explained in section one, this creates a dilemma zone, where a driver can neither stop safely and comfortably nor enter the intersection before the onset of the red interval. This occurs due to a mismatch between the assumed values engineers choose to input into the Kinematic Formula

versus the actual values which reflect the real-world needs of the traffic on the roadway. Where this condition exists - and it is ubiquitous throughout the nation - the use of red light ticketing cameras results in vast numbers of citations being issued to unsuspecting drivers who unintentionally violate the red by mere fractions of a second. Red-light-cameras can have no effect on these violations as they are not willful, and even if they could, would have little to no effect on collisions since the violations are occurring early in the red interval when no cross traffic is present. The solution to eliminate the dilemma zone is to establish yellow intervals based on the procedures set forth in the Recommended Practice with additional time added to account for “engineering tolerance”.

Violations Due to the “Indecision Zone”

Yellow change intervals established based on the procedures of the Recommended Practice may eliminate the dilemma zone, but there will always be an “indecision zone”, a place in the roadway on approach to the intersection where the stop or go decision is not immediately evident when the yellow light illuminates. Anyone who has been driving for any period of time has experienced this phenomenon. If a driver is close to the intersection when the light turns yellow, the choice to stop or go is obvious – the correct option is to keep going. Likewise, if the driver is far from the intersection, the clear choice is to stop. The problem arises in the “middle ground” area near the critical stopping distance. Drivers can’t readily determine whether they are in the must go or must stop section of the roadway, so they must take their best guess. Given enough attempts, even a careful and prudent driver will periodically make a mistake and Go when they should have STOPPED. Such a driver will violate the red by a few fractions of a second. Thankfully, these inadvertent early-into-red violations are unlikely to cause a collision, but the error could subject the driver to an expensive automated ticket. Red-light-camera programs designed with this understanding in mind and with a desire to not ticket minor driver errors that everyone makes periodically, will employ a reasonable “grace period” of 0.5 – 1.0 second.

It should be noted that while they are the most common type of straight through violation, the vast majority of early-into-red violations cannot be perceived with the naked eye but are routinely captured by red-light-camera systems which then issue a ticket.

Late-Into-Red Violations

As shown above, late-into-red violations generally represent a small fraction (less than 5%) of all straight through red light running violations. Because cross traffic is more likely to be present within the intersection when the traffic signal has been red for a duration of greater than two seconds, it is these violations which should be of greatest concern to safety proponents as they are the most likely to result in the severe right-angle collisions depicted in most red light running crash videos. Indeed, when a catastrophic red-light-running collision occurs, it is almost exclusively the result of a driver entering the intersection at full speed on a stale red light, often five seconds or more into the red.

The causes of late-into-red violations vary, but are generally the result of the driver being unable to stop or being unaware of the presence of the red signal. Most are due to 1) impairment, 2) distraction, 3) fatigue, 4) sun glare, 5) inclement weather, or 6) other adverse roadway conditions - rather than an aggressive driver willfully ignoring the red light. These somewhat unintentional late-into-red violations are therefore resistant to the effects of increased intersection-specific enforcement, especially in the form of red-light-cameras.

Right Turn Violations

Rolling Right Turns

Where the law permits, drivers may make a right turn on red after stopping behind a limit line. However, often drivers will frequently slow and yield to oncoming traffic and pedestrians, rather than come to a complete stop before executing the turn. This violates the letter of the law, and although they tend to occur both early and late into the red interval, rarely result in collisions, because these drivers are generally traveling at low speeds and are capable of yielding where appropriate to avoid a collision. In addition, a large portion of rolling right turns occur during the overlapping left-turn phase for traffic on the cross street. During this phase, a driver making a rolling right turn has no chance of colliding with cross traffic or pedestrians, as conflicts are prevented by the movement of the left-turning vehicles. Similar to early-into-red through movement violations, rolling-right-turns rarely result in a collision or pose significant danger to other roadway users.

Data from the National Highway Traffic Safety Administration and a 2011 study in Los Angeles, California confirm that the number of collisions which result from rolling right turn violations is infinitesimally small. The NTHSA study found that all types of right-turn-on-red crashes “represent a very small proportion of the total number of traffic crashes (0.05 percent)”. The Los Angeles study determined that although an estimated 15,540,500 rolling-right-turns occur annually in the City, the chance that a rolling right turn would result in a collision was fewer than 1 in 345,000, less than the chance of being hit by lightning. Further, rolling-right-turns represented just 0.079% of all accidents per year in Los Angeles. By way of comparison, about three times as many collisions are caused by drivers opening their car door into passing traffic. Additionally, the majority of rolling right turn collisions that did occur were classified as resulting in minimal or no injuries, even when pedestrians or bicyclists were involved. A subsequent study of rolling- right-turns throughout California found:

- On average there were 438,734 collisions each year in the State of California.
- Of those, an average of 330 collisions were caused by motorists making a rolling-right-turn.
- This means rolling right turns caused approximately 0.075% (75/1000th of 1%) of all collisions.
- In the entire State of California, there are an average of 27 rolling-right-turn collisions each year involving **pedestrians**.
- This represents 0.0063% (63/10,000th of 1%) of all collisions in the state each year.
- In the entire State of California, there are an average of 49 rolling-right-turn collisions each year involving **bicyclists**.
- This represents 0.0111% (111/10,000th of 1%) of all collisions in the state each year.
- 76% of rolling-right-turn collisions **do not** involve a pedestrian or bicyclist.
- Rolling-right-turns **rarely result in serious injuries** to bicyclists or pedestrians.
- In the entire State of California, there are an average of only **1.2** rolling-right-turn collisions that result in a **severe injury** to a **pedestrian** each year.
- In the entire State of California, there are an average of only **2** rolling-right-turn collisions that result in a **severe injury** to a **bicyclist** each year.
- In the entire State of California, there are an average of only 26 rolling-right-turn collisions that result in **any kind of injury** to a **pedestrian** each year. **65% are extremely minor** resulting in no visible injury (complaint of pain only).

- In the entire State of California, there are an average of only 44 rolling-right-turn collisions that result in **any kind of injury** to a **bicyclist** each year. **52% are extremely minor** resulting in no visible injury (complaint of pain only).

The overwhelming evidence indicates that the rolling-right-turn on red movement does not present a significant hazard to other motorists, pedestrians or bicyclists. Certainly, some aggressive drivers will fail to slow sufficiently or yield appropriately when executing a rolling-right-turn. But the best evidence suggests that the behavior of these drivers represents a very small minority of the rolling-right-turns that occur on our roadways with regular frequency and without incident.

Right Turn Violations Due to Short Yellows

Yellow intervals for right-turn movements are routinely set using the same timing protocol as for through-movements since the signal for the through movement often additionally controls the lane from which right turns are permitted. However, setting the yellow interval using the same method as for through movements does not provide the additional yellow time needed by motorists to slow down to prepare for the turn. Similar to through movements, yellow intervals which are too short for turning movements result in the creation of a dilemma zone and force some drivers to become violators during the first second or two of the red interval. Yellow intervals for right-turn movements controlled by a dedicated arrow signal are often set shorter than for the through movement, creating an even greater dilemma zone. However, since right turn violations due to short yellows generally occur early in the red interval, they rarely result in traffic collisions. Additionally, no amount of enforcement can eliminate these types of right-turn violations as they are due to an engineering defect, not poor driver behavior. The need for additional yellow time in turning lanes was recently addressed by the Institute of Transportation Engineers (ITE) through the introduction of an Extended Kinematic Equation within the new Recommended Protocols for traffic signal timing. However, some agencies have opted not to adopt this Extended Equation expressing concerns that its use resulted in Yellow Change intervals for turning lanes that seemed excessive. (see also Left Turn Violations Due to Short Yellows below).

Right turn on red violations almost never result in collisions, yet, in many instances, these are the types of violations primarily targeted by red-light-camera programs. In the City of Los Angeles, upwards of 75% of the approximately 60,000 annual citations were issued to drivers making slow rolling-right-turns. At some intersections the percentage was as high as 97%.

In Oakland, CA, 98% of the violations captured by one red-light-camera were for rolling right turns, although no collisions had resulted from a right-turn-on-red movement at this location in at least the previous decade. In a four year period, the city issued over 40,000 tickets costing \$490 each for these relatively innocuous violations.

Minor violations of this nature can be marginally reduced by the threat of automated enforcement cameras but the number of tickets will remain high even after years of enforcement.

This is illustrated by an email exchange between Menlo Park, California Traffic Sergeant Sharon Kaufman and the city's Redflex account representative Mark Riggs, in which Sgt. Kaufman asked:

“My only question is: since most of the violations are right turns, how long would that be sustainable? Once behavior changes will we see a drastic reduction in the number of citations/violations?”

In a surprising moment of candor, Rigs responded that Menlo Park did not have to worry that violations would be reduced causing the cameras to become unprofitable:

"The normal process for a new approach is the first few months there will be high numbers then it will begin to decline and stabilize. ... I can say that most intersections that have right turns enforced continue to produce consistent numbers."

However, even if right turn violations could be eliminated entirely - something which, according to the red-light-camera companies, never occurs even after years of red light camera enforcement – little to no improvement in safety can be achieved since the violations almost never result in collisions.

In recognizing the potential for abuse inherent in using red-light-cameras to cite massive numbers of drivers for relatively harmless rolling-right-turns, many lawmakers have banned the practice or have opted not to include this violation in their enforcement programs. Recently, the Insurance Institute for Highway Safety (IIHS) and AAA published an “Automated Enforcement Program Checklist”. Prominent among the recommendations is: “Target violations with the greatest safety consequences. For example, **you might decide not to ticket for right-turn-on-red violations**...The point is to target flagrant, rather than marginal, infractions.” (emphasis added). Even James Saunders, the former head of automated enforcement company Redflex Traffic Systems, is on record recommending that their customers refrain from issuing a ticket for a rolling-right-turn except when a pedestrian is in the crosswalk.

Left Turn Violations

Follow-Through Violations

The follow-through type violation occurs when drivers queued up in the left turn lane follow the vehicle directly in front through the turn. Since the length of the yellow signal can vary greatly, especially in dedicated turning lanes, drivers do not have a good sense of when the yellow time will run out. As a result, the last car through may cross the limit line just after the light has turned red. Since the vehicle that has violated the red is closely following the car ahead, there is little chance that a collision with cross traffic will occur. Conflicting traffic is unlikely to start up and enter the intersection until the full line of turning vehicles has cleared. While a minor annoyance to other roadway users, follow-through left turn violations generally do not result in collisions and targeting them with enforcement cameras can therefore provide no real improvement in safety, even if they could be successfully eliminated.

Left Turn Violations Due to Short Yellows

Similar to right-turn lanes, yellow intervals that do not account for a motorist's need to slow down to a lower speed to negotiate a turn also create dilemma zones in left-turn lanes. This issue is especially acute where drivers may initially be traveling at or near the prevailing speed of the through traffic in a long left-turn lane prior to slowing for the turn. Similar to the predicament encountered by right turning drivers, the problem for left turning drivers is made worse when the traffic engineer sets a

yellow time shorter than for the through movement. Not only is the driver cheated of requisite yellow time, his expectations are violated by a yellow interval shorter than what he has come to expect in through lanes. Left-turn violations of this type have the potential to result in right angle collisions if the opposing traffic is given a green signal immediately after the left turn signal turns red. Again, no amount of enforcement can eliminate these types of left-turn violations as they are due to an engineering defect - not poor driver behavior.

As explained previously, the need for additional yellow time in turning lanes was recently addressed by the ITE's new Recommended Protocols for yellow change intervals. While the new protocols for turning lanes have not yet been widely adopted, the engineering profession now recognizes that the formula used to set the yellow interval in through lanes is not applicable to turning lanes. Using the wrong formula provides insufficient yellow times and can create dilemma zones for some drivers leading to unintentional red light violations putting other roadway users at risk.

Although many states and local jurisdictions have not yet updated their protocols for proper signal timing in turning lanes, nothing prevents individual jurisdictions from adding additional yellow time for this movement or building in an enforcement grace period to account for this deficiency.

The vast majority of left-turn red light violations are either a minor safety hazard (follow-through violations) or can be significantly reduced with proper signal timing. However, similar to right-turn violations, many jurisdictions use automated enforcement to target these fairly common infractions rather than the more dangerous straight through movement violations. Jurisdictions should ensure that any red-light camera program focuses primarily on the most dangerous types of red light violations, rather than violations that are more common but significantly less dangerous, such as early-into-red, right-turn, and left-turn violations.

Final Takeaways

Catastrophic red light running collisions which cause serious injury or death are almost exclusively the result of a driver entering an intersection at high speed many seconds after the traffic signal light has turned red. These types of crashes are most often due to impairment, distraction, fatigue, weather and environmental elements, or other adverse roadway conditions, rather than an aggressive driver attempting to beat the red light. Red light cameras can have little to no effect on these causal factors and therefore cannot significantly reduce these types of accidents.

Likewise, red light cameras cannot prevent violations that are caused by engineering deficiencies, such as yellow intervals too short for prevailing conditions, as these transgressions are not intentional. In contrast, willful infractions such as those caused by drivers trying to beat the light, rolling-right-turns, and follow-through left turn violations may be somewhat reduced by photo enforcement. However, even if massive ticketing were to be successful in reducing these offenses, little or no safety improvement would be realized since these violations rarely, if ever, result in collisions.

Engineering Countermeasures to Reduce Red Light Running Collisions and Violations

Scofflaws don't cluster. If there are large numbers of red light running violations or collisions occurring at a particular intersection, there is likely an engineering deficiency that needs to be addressed. Identifying and fixing the engineering deficiency should eliminate the problem and obviate the need for massive enforcement targeted at particular intersections.

Within the ITE's Recommended Practice for traffic signal timing, ITE spells out the need to correct engineering deficiencies that lead to large numbers of red light violations:

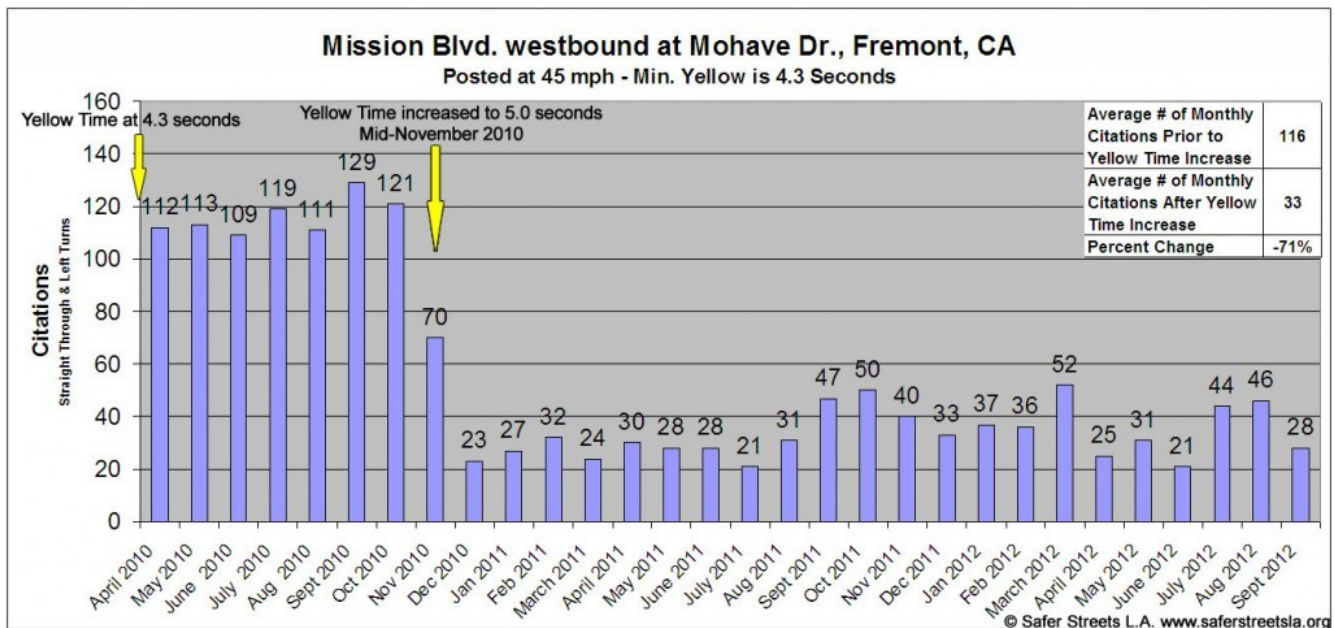
When the percentage of vehicles that enter on a red indication exceeds that which is locally acceptable, the yellow change interval may be lengthened until the percentage conforms to desirable standards.

Reducing Early-Into-Red Violations and Crashes

Relatively inexpensive engineering countermeasures can prevent crashes and violations due to vehicles entering into the intersection early into the red interval.

Increase the Yellow Change Interval

The ITE acknowledges that, in most cases, the transportation engineer can significantly reduce the number of motorists who violate the red light simply by increasing the yellow interval. Numerous studies found that increasing yellow duration by about 1.0 second was associated with reductions in red-light running ranging from about 36 to 90 percent. In one study conducted in Fremont, CA the average number of monthly red light running citations was reduced by about 71% after the yellow interval was increased by 0.7 seconds. Notably, the reduction in violations remained consistently reduced even after two years of study, verifying that drivers do not adjust to small changes in yellow timing.



The table below summarizes similar findings in other jurisdictions.

Reduction in Red Light Running After Increase in Yellow Interval	
Fremont, CA	77% reduction after 0.7 sec increase
Loma Linda, CA	93% reduction after 1.0 sec increase
Santa Clarita, CA (Left Turn Lanes)	58% reduction after 0.5 sec increase 70% reduction after 1.0 sec increase
Oakland, CA	87% reduction after 1.0 sec increase
Redlands, CA	88% reduction after 0.9 sec increase
West Hollywood, CA	47% - 70% reduction after 0.3 sec increase
Fairfax Co., VA	71% reduction after 0.5 sec increase

Several crash-based studies found that increasing the yellow interval timing is associated with reduced total crashes, injury crashes, and/or right-angle crashes. In these studies, reductions in total crashes ranged between 8 to 14 percent with reductions in injury crashes of about 12 percent. Some studies showed crash reductions upwards of 40%.

Employ Dilemma Zone Protection Technology

An advanced vehicle detection system for dilemma zone protection provided by Wavetronix is newly available which can significantly reduce the chance that drivers will encounter an indecision zone and run the red light. This technology uses sensors to detect the position of vehicles on approach to a signalized intersection and adjusts the onset of the yellow interval to prevent the traffic light from changing to yellow while vehicles are in the indecision zone. Before-and-after comparison of the frequency of red-light running indicated a significant reduction in red-light running (up to 80%) when this protection system was activated.

Ensure a sufficient “All-Red” Clearance Interval

Traffic engineers have long known that implementing an all-red clearance interval (where the light is red in all directions) prevents accidents by allowing vehicles entering toward the end of the yellow interval to clear the intersection prior to releasing cross traffic. Logically, an all red interval of 2 - 3 seconds will prevent crashes due to the roughly 95% - 99% of red-light violations that occur within the first two seconds of the light turning red. In fact, an extended all-red interval is sometimes used to compensate for a too-short yellow interval. However, since the length of the all-red interval does not affect the number of vehicles entering on red, the intersection may experience a high rate of red light running violations with no resulting collisions. Some jurisdictions employ this strategy so as to issue large numbers of citations without a concern that their failure to fix the deficient yellow interval will result in large numbers of collisions. Therefore, both the yellow interval and all-red interval must be sufficient in order to reduce both violations and collisions.

Employ a Protected Left Turn (Left Turn Arrow)

Left-turn-opposed crashes occur when drivers of left-turning vehicles waiting in the intersection at the end of a permissive phase turn in front of an opposing through vehicle, mistakenly believing that the oncoming driver will stop for the impending red indication. If the through driver violates the red

indication, he may collide with the left-turning driver. This situation is not likely to occur when protected-only left-turn phasing is provided. Therefore, at intersections where left-turn-opposed crashes are over represented, significant safety improvement can be achieved by implementing a protected left turn (red arrow) phase.

Reducing Late-Into-Red Crashes

Late-Into-Red violations represent less than 5% of all red light running violations, with very late-into-red violations being extremely rare. However, these violations are the most likely to result in the more severe right-angle crashes. The problem, from a crash reduction standpoint, is that late-into-red violations are most frequently unintentional violations and are therefore resistant to the effects of increased red-light enforcement.

Unintentional violations are committed by drivers who either are unable to safely stop or are unaware of the need to stop due to impairment, fatigue or inattention/distraction, as well as poor signal visibility. Unintentional violations can occur at any time during the red interval. Engineering countermeasures are the only viable intersection specific option to reduce accidents caused by unintentional red-light-running.

The following countermeasures are generally geared towards increasing the signal visibility/conspicuity to ensure that the signal, and specifically the red indication, captures the motorists' attention. They include:

- A. Place signals overhead vs. pole-mounted.
- B. Increase the number of signal heads to provide a signal for each approach lane.
- C. Use 12-in. or larger signal lenses as opposed to 8-in. signal lenses.
- D. Improve the motorists' line of sight to the signal head.
- E. Provide two red-signal displays within each signal head.
- F. Replace incandescent bulbs with brighter LED units.
- G. Install back plates to enhance the contrast between the signal head and the surrounding background.
This is particularly useful for signals oriented in an east-west direction to counteract the glare of the rising and setting sun or in areas with visually complex backgrounds.
- H. Install Signal Ahead signs and/or advanced warning flashers.

Some combination of the above countermeasures should reduce crashes due to unintentional violations. However, these types of crashes cannot be completely eliminated as there will likely always be some level of driver impairment, distraction or fatigue present on our roadways as long as humans are behind the wheel.

Additional Engineering Countermeasures

The following Table lists many of the engineering countermeasures cited in the literature as having some ability to reduce red-light violations, related crashes, or both. This information is provided as an illustration of possible additional countermeasures that can be applied to intersections with a red-light-running crash problem.

Table 8. Red-Light Violation Countermeasure Effectiveness.

Category	Countermeasure	Reported Reductions, %		
		Violations	Crashes	Reference ⁴
Traffic char.	Reduce approach speed by 5 mph	30	25 to 30	8, 8
Signal operation	Increase signal cycle length by 10 s, if v/c ratio < 0.60	15	--	8
	Increase yellow interval duration by 0.5 s	40	20 to 25	8, 8
	Provide green extension (advance detection) ⁵	65	--	23
	Add protected-only left-turn phasing ⁶	--	70	22
Motorist information	Improve signal visibility via better signal head location	--	--	--
	Improve signal visibility via additional signal head	--	47	20
	Improve signal visibility by clearing sight lines to signal	--	--	--
	Improve signal conspicuity by upgrading to 12" lenses	--	47	20
	Improve signal conspicuity by using yellow LEDs	13	--	14
	Improve signal conspicuity by using red LEDs	--	--	--
	Improve signal conspicuity by using back plates	25	32	8, 20
	Improve signal conspicuity by using dual red indications	--	33	20
	Add advance warning signs (no active flashers) ⁷	--	44	20
	Add advance warning signs with active flashers ⁷	29	--	21
Traffic operation	Reduce delay through re-timing if v/c ratio > 0.70	10 to 50	--	8
	Reduce unnecessary delay through signal re-timing	--	--	--
	Improve signal coordination ⁸	--	--	--
Geometry	Remove unneeded signals	100	100	--
	Add capacity with additional lanes or turn bays	--	--	--

Final Takeaways

Engineering countermeasures should be the first line of defense in reducing red-light-running violations and collisions. It is always a better strategy to prevent a violation or collision from occurring, rather than penalize a violator after the fact in the hope that their behavior will change in the future. Further, as discussed above, many violations and collisions are unintentional or the result of engineering deficiencies.

The IIHS/AAA Automated Enforcement Program Checklist also includes the recommendations to, “Make any engineering or signage changes needed to improve drivers’ compliance with the law. Ensure that yellow light timing conforms to the ...Institute of Transportation Engineers guidelines.”

Unfortunately, it is all too common for a jurisdiction to install red light cameras at locations with large numbers of violations, but which do not have a significant history of red light running related collisions. Month after month, year after year, these jurisdictions issue huge numbers of citations to motorists, but are reluctant to deal with the underlying engineering deficiencies which may be causing or contributing to the vast amount of red light running events. Presumably, the revenue being generated through ticketing provides an incentive for officials not to fix the underlying engineering problems.

Automated Enforcement Programs Often Abuse the Public's Trust

Automated Enforcement Programs often engender strong public opposition. It is easy to assume that this hostility stems from a small group of vocal scofflaws who do not wish to be held accountable for their bad behavior. But this view is highly simplistic. Many red-light or speed camera critics have never received an automated ticket, yet have serious concerns about how these programs are designed and who they are targeting. Further, while anecdotal evidence may lead some to believe that automated enforcement programs have wide public support, direct evidence suggests the opposite. In the 43 instances where the question of automated enforcement use has been put to a public vote throughout the nation, automated ticketing has been rejected 39 times, with an average rejection percentage of 65.3% of voters. Clearly, a problem exists when it comes to the public's trust and acceptance of automated enforcement. Additionally, many elected officials have soured on the use of automated enforcement when the promised revenue or safety benefits have not materialized.

Public Perception of Automated Enforcement

The most common complaints heard about automated enforcement programs include:

- Programs are implemented primarily to generate revenue.
- Cameras are placed where there are engineering deficiencies (short yellow intervals and arbitrarily low speed limits)
- Programs target primarily minor violations, not the most dangerous behavior
- Programs issue tickets that live police officers could/would never issue
- There is a lack of police discretion when issuing tickets
- Ticketing has disproportionate effects on lower income communities and communities of color
- Adjudication is rigged against the defendant – Fewer legal rights
- Untrustworthy analysis of program benefits – Cherry picking data
- For-profit private companies have too much influence

Unfortunately, in many instances, the public's perception about these programs is mostly correct, especially concerns about revenue generation. For example, the following statistics highlight the economic impact of automated ticketing in major cities in the US:

WASHINGTON DC (Speed Cameras)

\$765 million in fines collected between 2007 - March 2019

MARYLAND (Speed Cameras)

(\$40 tickets in school and construction zones)

\$288.5 million in fines collected since 2014

\$64 million in fines collected in 2018 alone

BALTIMORE (Speed Cameras)

\$48 million in fines collected from 2009 to April 2013

1.6 million speed camera tickets issued.

\$14.1 million in fines expected in 2021

NYC – Speed

(\$50 tickets in school zones)

\$31 million collected in fines in 2015

\$59 million collected in fines in 2016

After expansion from 140 to 750 cameras in 2019, the city issued over \$28 million in tickets in a 43 day period.

\$10 million in tickets were issued in January 2020 alone.

NYC SPEED CAMERAS WRITE 1 TICKET EVERY 7 SECONDS

NYC - RLC

(\$50 tickets)

\$166 million in tickets issued between 2012 - 2016

CHICAGO (Speed Cameras)

(\$35 tickets for driving 6 mph over the speed limit)

\$100 million a year projected revenue

CHICAGO SPEED CAMERAS WRITE 1 TICKET EVERY 12 SECONDS

CHICAGO (RLC)

\$550 million in tickets issued between 2008 – 2018

The first step in any successful government program is to determine the purpose of that program. For automated enforcement programs, one might ask, if the purpose of the program is to:

- Enforce strict compliance with the letter of the law?
- Enforce the spirit of the law?
- Solve a specific, identifiable violation problem?
- Solve a specific, identifiable collision problem?

Unfortunately, most programs are implemented without considering this basic question. As a result, the vast majority default to simply strict enforcement of the letter of the law, rather than a more reasonable approach that would more likely garner more public confidence. It's no wonder that the public rightly perceives these programs as simply revenue generation schemes.

Contact:

Jay Beeber

Executive Director – Policy

National Motorists Association



Engineering Videos Links

Videos on Traffic Signals

Yellow Time, Indecision Zones, Red Light Camera Enforcement

Are some yellow lights TOO SHORT?

<https://youtu.be/kyFLRXSxgPw>

Takeaway: When the light changes to yellow, sometimes it's safer to stop and sometimes it's safer to go. Too short yellow lights create dilemma zones where drivers have neither the distance to stop nor the time to go. The minimum yellow light time to eliminate the dilemma zone can be calculated using the ITE Kinematic Formula with proper inputs for the variables. It is critical to input the actual speeds that drivers are traveling on the roadway to calculate the yellow time or it will be too short for some drivers and they may encounter a dilemma zone and run the red light. The actual speed is measured as the 85th percentile speed of drivers (the speed 85% of drivers don't exceed). It can be estimated by adding 7 mph to the posted speed limit if the 85th percentile hasn't been measured. Drivers making turns need more yellow time than drivers traveling straight through because they are slowing down after passing the point of no return. A new "Extended Kinematic Formula" is used to calculate the yellow for turning lanes. **Bottom Line** – there is no perfect yellow time but it is common for cities to set yellow times too short, especially in turning lanes.

The Indecision Zone when Approaching a Yellow Light

https://youtu.be/P_EmAKRrlBc

Takeaway: No matter how well we engineer traffic lights, how well we set the yellow time, and how good a driver you are, the "Indecision Zone" at traffic signals causes some drivers to mistakenly run the red light. New technology is available that prevents the traffic signal from turning yellow when drivers are in the indecision zone.

Limits to Red Light Camera Enforcement

<https://youtu.be/uYnEdbRLmJM>

Takeaway: Red light cameras are not a panacea for eliminating red light running. Most catastrophic collisions caused by red light running are due to drivers entering the intersection long after the light has turned red. These drivers are generally unaware that the light is red due to impairment, distraction, fatigue, inclement weather, etc. A red light camera cannot prevent these people from running the red light. Most people who intentionally run red lights are just trying to beat the yellow and violate a fraction of a second after the light has turned red. Generally no collision occurs due to a 1 - 2 second "all-red" interval and cross traffic start-up delay. Engineering countermeasures, including setting the yellow light appropriately, can increase drivers' likelihood of seeing the red light and stopping, making red light cameras unnecessary. **Bottom Line** – Red light cameras can't prevent the majority of catastrophic red light running collisions. Engineering countermeasures, including setting a sufficiently long yellow time to eliminate the dilemma zone, can help significantly reduce both early and late into red violations. Red light cameras should not be used until all reasonable engineering countermeasures have been implemented.

Why LA and other Cities Dumped Red Light Cameras

<https://youtu.be/pH9dnJ8BmY0>

Takeaway: Too many red light camera programs are focused on revenue generation rather than improving safety. The revenue model for red light camera programs only work if the cameras are unsuccessful in eliminating red light running, so they target minor violations like fraction of a second

violations or slow rolling right turns which don't pose a serious danger to other roadway users. If the cameras work too well, there's be no revenue to pay for them. The desire for revenue generation also creates a perverse incentive for cities to not implement engineering countermeasures, like longer yellow light times, that would reduce red light running and make the intersections safer – but reduce revenue. Red light camera contracts can encourage cities to focus on enforcing minor violations. If cities employ proper engineering practices to reduce red light running and don't focus on extremely minor violations, the cities will likely issue few tickets. Red light cameras can also make intersections more dangerous by encouraging drivers to speed up or slam on their brakes due to fear of getting a ticket. **Bottom Line** – Red light camera programs that are seen as revenue generators and focusing on minor violations engender distrust between the citizens and government, between the citizens and law enforcement, between the citizens and the courts. This causes a loss of faith in our institutions and a breakdown of society. To avoid this: 1) Cities running red light camera programs should never make a profit and should voluntarily forego any excess revenue. This would prove the program is for safety and not revenue generation. 2) Before deploying red light cameras, implement all reasonable engineering countermeasures including generously long yellow times to ensure intersections are as safe as possible and drivers are given ample opportunity to comply. 3) Don't ticket for minor violations such as slow rolling right turns that don't pose an immediate threat to other roadway users. Consider issuing warnings only for these types of minor violations. Put all efforts into the most dangerous straight through violations.

Videos on Speed Limits

Why Lower Speed Limits Don't Result in Lower Speeds

<https://youtu.be/3oP-Ndvw1zw>

Takeaway: The way the road is built determines how fast motorists will drive on it. Drivers unconsciously choose their speed based on what feels comfortable, not the number on the Speed Limit sign. No amount of enforcement will change this reality. Sometimes we need wide, fast roads to get people where they need to go, but this is a trade-off since people will drive faster on these roads. Placing a Speed Limit sign with a lower number will not lower speeds or improve safety. In fact, it may make the roadway less safe by creating speed variation between drivers which is more dangerous than everyone going about the same speed but a bit faster.

Videos on School Bus Passing Cameras

Critical Errors in School Bus Stop Locations

<https://www.youtube.com/watch?v=9hSJ1u4AJmc>



National Motorists Association

THE VOICE OF REASON FOR DRIVING FREEDOM

Automated traffic enforcement programs, such as red light and speed cameras, are often promoted as racially neutral and non-violent alternative tools for improving road safety. However, mounting evidence reveals that these systems disproportionately burden low-income and minority communities. Rather than fostering equitable public safety, automated ticketing programs often result in excessive fines, financial hardship, and increased interactions with law enforcement for those least able to afford them. Research indicates that these ticketing cameras are more likely to be situated in lower-income and minority neighborhoods, resulting in disproportionately high rates of citations per capita in these areas. The financial strain of automated tickets extends beyond the fines themselves, often spiraling into license suspensions, mounting debt, and even bankruptcy for vulnerable individuals. This Policy Brief explores the evidence showing how automated enforcement exacerbates economic and racial disparities while failing to deliver meaningful safety improvements.

Impact of Automated Enforcement on Marginalized Communities

A study by the Woodstock Institute, *"The Debt Spiral: How Chicago's Vehicle Ticketing Practices Unfairly Burden Low-Income and Minority Communities"* illustrates how automated enforcement can have devastating effects on marginalized communities.¹

<https://woodstockinst.org/wp-content/uploads/2018/06/The-Debt-Spiral-How-Chicagos-Vehicle-Ticketing-Practices-Unfairly-Burden-Low-Income-and-Minority-Communities-June-2018.pdf>



National Motorists Association

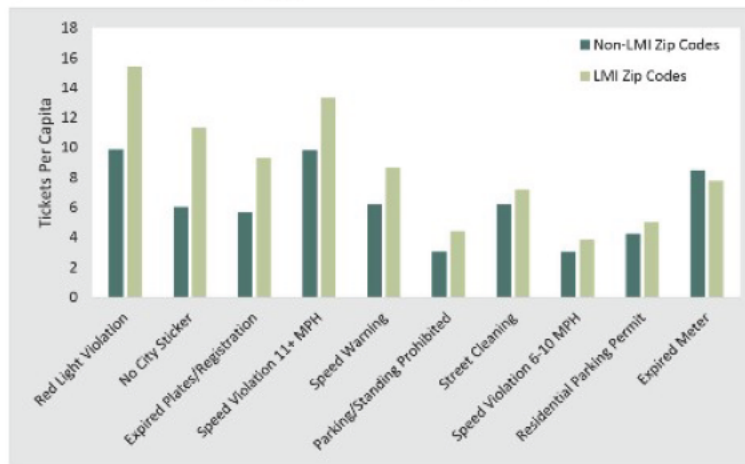
THE VOICE OF REASON FOR DRIVING FREEDOM

In 2017, the City of Chicago issued over 3.6 million vehicle-related tickets and warnings, with the bulk of these citations stemming from the city's extensive speed and red light camera programs. The majority of tickets were for red light violations (273,224), followed by speed violations exceeding 11 miles per hour (250,236).

The study found that tickets were far more likely to be issued to drivers from low- and moderate-income (LMI) zip codes and minority zip codes compared to other areas. This disparity persisted despite the fact that residents in LMI areas were less likely to drive or own a vehicle than those in wealthier neighborhoods.

Data from the study (Figure 7, page 6) shows that drivers in LMI areas received significantly more speed and red light camera tickets per capita than those in higher-income zip codes.

Figure 7: Tickets Issued Per Capita by Type, LMI and Non-LMI Zip Code Drivers





National Motorists Association

THE VOICE OF REASON FOR DRIVING FREEDOM

Figure 8: Tickets Issued Per Capita by Type, Minority and Non-minority Zip Code Drivers

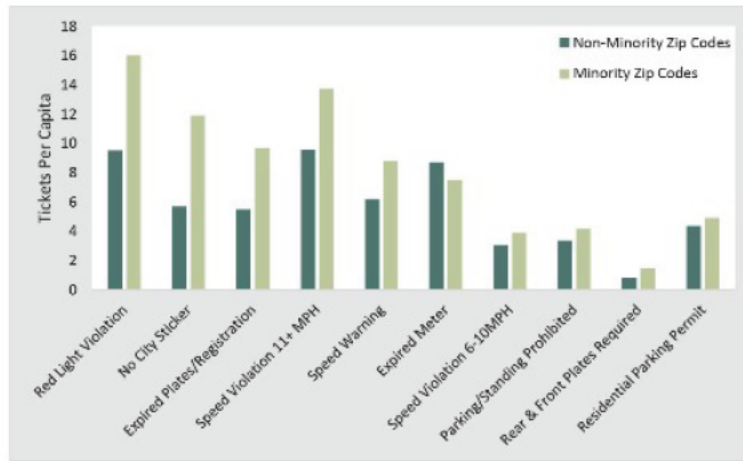


Figure 9: Proportion of Speed and Red Light Cameras, LMI and Non-LMI Zip Codes

	Zip Codes		Speed Cameras		Red Light Cameras	
	#	%	#	%	#	%
Non-LMI	33	57	70	46	75	50
LMI	25	43	81	54	74	50

Figure 10: Proportion of Speed and Red Light Cameras, Minority and Non-minority Zip Codes

	Zip Codes		Speed Cameras		Red Light Cameras	
	#	%	#	%	#	%
Non-minority	24	50	62	41	77	52
Minority	24	50	89	59	72	48

<https://www.illinoispolicy.org/south-side-gets-2-5x-as-many-tickets-per-red-light-camera-as-north-side/>



National Motorists Association

THE VOICE OF REASON FOR DRIVING FREEDOM

<https://www.947wls.com/2024/04/30/chicago-speed-cameras-issue-tickets-every-20-seconds-fine-motorists-over-102m-in-2023/>

<https://www.illinoispolicy.org/chicago-speed-cameras-fined-motorists-over-102m-in-2023/>

<https://www.illinoispolicy.org/red-light-cameras-take-another-500m-from-illinois-drivers-in-5-years/>



National Motorists Association

THE VOICE OF REASON FOR DRIVING FREEDOM

<https://comptroller.nyc.gov/reports/fines-and-fees-in-the-new-york-city-budget/>

<https://www.fox5dc.com/news/dc-issued-over-1-million-speed-camera-tickets-collected-over-100-million-in-fines-aaa-says>

<https://www.openthebooks.com/fox-45-discrepancies-in-funds-collected-from-baltimores-red-light-cameras/>



National Motorists Association

THE VOICE OF REASON FOR DRIVING FREEDOM

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3861844/>



National Motorists Association

THE VOICE OF REASON FOR DRIVING FREEDOM



HOW DANGEROUS IS A ROLLING RIGHT TURN?

by

Jay Beeber
Safer Streets L.A.



March 2011

©2011 Jay Beeber – This document may be distributed freely in verbatim form provided that no fee is collected for its distribution and this copyright notice is included. This document may be freely quoted provided attribution to the source and author is provided.

HOW DANGEROUS IS A ROLLING RIGHT TURN?

A Report by Safer Streets L.A.

Prepared by: Jay Beeber

INTRODUCTION

Safer Streets L.A. recently reviewed statistics regarding violation rates at the City of Los Angeles' 32 Photo Red-Light (PRL) Intersections from data provided by the LAPD covering the 9 month period Jan. 1 to Sept. 30, 2010. One criticism of the PRL program is that a majority of the citations are given for relatively benign rolling-right-turn (RRT) violations as opposed to the potentially more dangerous straight through violations which the PRL program is actually meant to curtail. The LAPD has previously stated that the percentage of citations given for rolling-right-turns was in the 67% range. However, using the data provided by the LAPD, we discovered that the percentage of rolling-right-turn violations averages 75% and at many intersection approaches in the City is significantly higher. The northbound intersection of De Soto and Roscoe has the distinction of having the highest percentage of rolling-right-turn citations of any red-light camera (RLC) monitored intersection approach in the City. Rolling-right-turn citations make up 97% of the violations at that approach. For the 9 month period, a full 1225 citations were given for rolling-right-turns and only 32 citations were given for straight through violations. For the southbound approach, the rolling-right-turn percentage was a comparable 95%. For comparison, the top 10 intersection approaches with rolling-right-turn violations appears below.

Citations at PRL Intersection Approaches Jan 1, 2010 - Sept. 30, 2010

	Council District	Through Citations	RT Citations	% RT Turn
DeSoto NB / Roscoe	3	32	1225	97%
Van Nuys NB / Nordhoff	7	23	474	95%
DeSoto SB / Roscoe	3	52	1000	95%
Van Nuys SB / Nordhoff	7	45	706	94%
La Brea SB / Rodeo	10	61	734	92%
Balboa NB / Vanowen	6	150	1322	90%
Manchester EB / Airport	11	92	790	90%
Whittier WB / Lorena	14	21	177	89%
Florence WB / Figueroa	8	45	337	88%
Sepulveda SB / Victory	6	204	1504	88%

Supporters of the PRL program have often claimed that high numbers of citations for rolling-right-turns are appropriate since this behavior poses a significant danger to pedestrians, bicyclists and other motorists. We set out to determine how much danger the rolling-right-turn presents by reviewing the number and severity of collisions in the City of Los Angeles caused by this behavior in comparison to collisions caused by motorists who first stop at a red light but then fail to yield appropriately to pedestrians and other vehicles in the roadway.

HOW DANGEROUS IS A ROLLING RIGHT TURN?

Prepared by: Jay Beeber

DATA COLLECTION

Accident statistics were compiled from the California Highway Patrol's Statewide Integrated Traffic Records System (SWITRS) database. The SWITRS database serves as a means to collect and process data gathered from collision scenes by multiple police agencies throughout the state. The most recent complete year for which data is available is 2009. No relevant data is yet available through this database for 2010, although local police agencies may have more up-to-date information.

For each accident, the SWITRS database provides information regarding the time and place of the accident as well as the primary collision factor (PCF) and California Vehicle Code violation if any. Number and severity of injuries and fatalities to pedestrians, bicyclists, and motorcyclists are provided when applicable as well as other relevant data. A separate Party Record data file is provided with information about each party involved in the collision including which party was at fault and each party's action immediately prior to the collision. Each collision in the Collision Record file is assigned a unique Case ID Number which is also assigned to the parties involved in the collision. This provides a cross reference between the Collision Record file and the Party Record file.

California Vehicle Code 21453A requires motorists to come to a full stop when facing a circular red or red arrow signal. CVC 21453B permits motorists to make a right turn on a circular red signal provided the motorist first comes to a complete stop as required under 21453A and yields to any pedestrians, bicyclists or other vehicles. The vehicle code does not currently distinguish between drivers who fail to come to a complete stop before making a right turn on red (a rolling-right-turn) and drivers who violate the red on a straight through movement. Therefore, drivers who make a rolling-right-turn are cited under CVC 21453A, while drivers who first come to a complete stop, but fail to yield to pedestrians, bicyclists and other vehicles are cited under CVC 21453B.

In order to determine the number of collisions caused by rolling-right-turns, we queried the SWITRS database to provide all accidents in the City of Los Angeles for the years 2002 through 2009. We combined the Collision Record file with the Party Record file to provide a full range of data points for each accident. We then filtered the list of collisions by choosing collisions in which the primary collision factor was a violation of CVC 21453A and where the movement immediately preceding the collision of the party at fault was a right turn. This set of data was designated as collisions resulting from a rolling-right-turn. We also compiled a list of violations of CVC 21453B where the movement immediately preceding the collision of the party at fault was a right turn. This set of data was designated as collisions resulting from a failure to yield (FTY) while making a right turn after stopping as required at a red light. We compared these two sets of data as to total number of collisions, severity of injury, whether or not the collision occurred at an intersection currently monitored by a red-light camera, etc. Collision data for all study years appears in Appendix A.

HOW DANGEROUS IS A ROLLING RIGHT TURN?

Prepared by: Jay Beeber

RESULTS

The average number of rolling-right-turn collisions each year was 45 out of an average of approximately 56,000 collisions annually in the City of L.A. The average number of failure to yield after stopping (FTY) collisions was 41. This suggests that when making a right turn at a red light, it is not the prior stop which determines whether an accident will occur, it is whether or not the driver yields appropriately. The 45 annual accidents attributed to rolling-right-turns represent just 0.079% of all accidents per year in the City of Los Angeles, an extremely low percentage. For comparison, about three times as many accidents are caused each year by drivers opening their car door into passing traffic. Additionally, the majority of collisions were classified as resulting in minimal or no injuries, even when pedestrians or bicyclists were involved. In fact, there were no fatalities noted due to RRTs for any of the 8 years studied, whereas 2 fatalities occurred due to FTY after stopping. This again suggests that the rolling-right-turn does not present a significant hazard to other motorists, pedestrians or bicyclists.

We also looked at how often a RRT movement might result in an accident. To determine this, we used the figures on rolling-right-turns at PRL intersections provided by the LAPD. For the first 9 months of 2010, the red-light cameras at the 32 photo enforced intersections captured almost 49,000 RRT movements. This translates to an annual rate of 65,000 RRTs at these intersections. Each intersection is monitored on 2 approaches with the exception of one one-way intersection that is monitored on only one approach. Therefore, the 65,000 rolling-right-turns which occur annually at the 63 intersection approaches represent approximately 1033 RRTs at each approach. The City of Los Angeles has approximately 4300 signalized intersections throughout the city. Assuming that the RRT behavior exhibited at the PRL intersections is typical of driver behavior throughout the city, and assuming 3.5 approaches per signalized intersection, we can estimate that there are approximately 15,540,519 rolling-right-turns occurring annually in the City of Los Angeles. Therefore, statistically speaking, the chance that a rolling-right-turn will result in a collision is 0.00029%. This means that a driver would have to make over 345,000 rolling-right-turns before they might be involved in an accident. In actuality though, a careful driver who yields appropriately prior to making a right turn on red, whether or not they come to a complete stop, may never be involved in a collision due to this behavior.

CONCLUSION

The question of whether a rolling-right-turn is so dangerous that it should be enforced with a nearly \$500 fine has been debated for some time. We now have the definitive answer and it is a resounding "no". The millions of taxpayer dollars the City of Los Angeles spends annually on the PRL program could be put to better use than giving thousands of otherwise law-abiding citizens tickets of \$466 each for a technical violation that rarely results in any type of accident.

Appendix A
Rolling Right Turn and Failure to Yield Collisions in Los Angeles
2002 - 2009

2002	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	45	0.0767%	0	1	14	17	13	5	10	2	1	22	58,685
21453B	39	0.0665%	0	0	10	20	9	4	12	2	1	11	58,685
2003	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	56	0.0947%	0	2	15	28	11	4	15	1	1	27	59,137
21453B	39	0.0659%	0	1	13	13	12	6	9	1	1	11	59,137
2004	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	49	0.0858%	0	2	12	17	18	4	5	2	4	23	57,083
21453B&C	51	0.0893%	0	1	13	26	11	15	10	1	0	18	57,083
2005	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	55	0.0960%	0	0	17	19	19	10	11	0	2	36	57,311
21453B&C	35	0.0611%	0	3	7	16	9	11	5	0	0	12	57,311
2006	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	40	0.0702%	0	1	6	22	11	9	3	0	4	18	57,005
21453B	48	0.0842%	1	1	12	24	10	10	7	2	0	17	57,005
2007	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	38	0.0673%	0	0	8	17	13	3	10	0	0	21	56,468
21453B	42	0.0744%	1	2	8	16	15	13	6	1	1	16	56,468
2008	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	30	0.0564%	0	1	3	14	12	0	10	2	0	12	53,184
21453B&C	44	0.0827%	0	0	7	20	17	6	5	3	0	13	53,184
2009	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	43	0.0850%	0	0	12	19	12	7	10	4	1	20	50,610
21453B&C	30	0.0593%	0	0	5	13	12	3	6	1	0	10	50,610
2002-2009	Total	% of Total Collisions	Fatal	Severe	Visible Injury	Pain Only	PDO ¹	Pedestrian	Bicycle	Alcohol ²	PRL Int. ³	H&R ⁴	Total LA Collisions
21453A	356	0.0792%	0	7	87	153	109	42	74	11	13	179	449,483
21453B&C	328	0.0730%	2	8	75	148	95	68	60	11	3	108	449,483

Citable Right Turn Violations at PRL Intersections 9 mos	48,790
Citable Right Turn Violations at PRL Intersections extrapolated to 1 yr	65,053
Citable Right Turn Violations per PRL approach extrapolated to 1 yr	1,033
Number of signalized intersections in LA per LADOT	4,300
Conservative estimate of signalized approaches in LA	15,050
Yearly estimate of RRT violations in Los Angeles	15,540,519
Average RRT accidents per year	45
Chance of RRT resulting in an accident	1 in 345,345
Chance of RRT resulting in an accident	0.00029%

Notes:

21453A = Rolling Right Turn Violations

21453B = Failure to Yield After Stop at Red Light

1. PDO = Property Damage Only

2. Alcohol = Alcohol was a factor in collision

3. PRL Int = Collision occurred at an intersection monitored by a photo red-light camera

4. H&R = Hit and run

RED LIGHT CAMERA CANDOR FROM OFFICIALS

City of **San Leandro**, California (cameras installed in 2006, still operating in 2017): In 2016, as part of its application to Caltrans for re-issuance of its annual red light camera encroachment permit, the City commissioned and submitted a study by an independent engineering firm. From the study, pages 6 & 10:

"After reviewing over 13 years of collision data for the two intersections, our findings are inconclusive with regards to an ARLE [red light camera] reducing collisions." "For whatever reason, it appears that the injury plus fatality collision rate at signalized intersections (with or without ARLE) has decreased dramatically over the most recent nine year period (when compared to the previous nine year period). ARLE cannot take credit for this reduction, because the collision rate decreased more at signalized intersections without ARLE."

Source: <http://www.highwayrobbery.net/TrcDocsSanLeanEncrPerm2016engrRepRecd2017jul26.pdf>

City of **Stockton**, California (cameras installed in 2004, closed in 2015): "Staff determined the program was not cost neutral for the city and found no evidence that it has significantly reduced traffic collisions. In February 2015, we sent Redflex a letter stating we were terminating the contract." Stockton police spokesman Joe Silva in 6-5-15 Stockton Record article. Source:

<http://www.recordnet.com/article/20150605/NEWS/150609770>

City of **Laguna Woods**, California (cameras installed in 2005, closed June 2014): "Staff studied incidents over a 10-year period of time and found that the number of collisions related to signal violations at the two photo enforced intersections fluctuated slightly, but did not change in any significant manner after initiation of the red light photo enforcement program." City Manager Christopher Macon in staff report prepared for 5-28-14 council item. Source:

<http://www.highwayrobbery.net/TrcDocsLagunaWoodsContr2014MayStaffRep.pdf>

City of **Walnut**, California (cameras installed in 2007, removed in 2014): "The statistical review of the RedFlex camera program did not reflect a reduction of traffic accidents, nor could the data support the cameras made the intersections safer." Mayor Tony Cartagena in 5-19-14 San Gabriel Valley Tribune article. Source: <http://www.sgvtribune.com/general-news/20140519/walnut-city-council-votes-to-end-red-light-camera-program>

City of **Riverside**, California (cameras installed in 2006, closed Sept. 2014): "Upon review CalTrans has determined that the accident rates do not warrant the camera systems at any of the five CalTrans locations and has requested their removal." Riverside Director of Public Works/City Engineer Thomas J. Boyd, in report prepared for Public Safety Committee meeting of 6-18-12, page 2-3.

Source: <http://www.highwayrobbery.net/TrcDocsRivers2012JuneStaffRepCloseProg.pdf>

More from Riverside: "It's impossible to attribute causality to one thing. *I don't know whether* and to what degree *the red light cameras have contributed to a reduction in traffic crashes.*" Chief of Police Sergio Diaz. Source: 7-14-12 Press Enterprise article: <http://www.pe.com/articles/-716731--.html>

More from Riverside: "I have spoken publicly against the program several times in the past, once before the public safety committee and twice before the entire council. Each time, I expressed my dislike of the general concept of the program, the *unethical tactics used to collect fees, inconclusive data regarding their effectiveness, and the realization of corporate profits at the expense of our citizens.* My position on these matters has not changed." Retired 28-year Riverside fire captain, in letter submitted for the Oct. 2, 2012 city council meeting. Source: <http://www.highwayrobbery.net/TrcDocsRiversideContractOpinionByRetdFireCapt.pdf>

City of **Poway**, California (cameras installed in 2004, removed in 2013): "On March 5, 2013, the City Council addressed the potential termination of the program and directed staff to turn off the cameras and evaluate the program's safety benefit for a six month period." "During the six month period preceding the March 9, 2013 turn-off date, there was a total of eight [later corrected to seven] at these three intersections. During the six month period *after the March 9, 2013 turn-off date*, there were five accidents. This represents *a decrease in accidents of 37.5% [later corrected to 28.6%]*. There were *no serious injury accidents during this period.*" City Manager, in report submitted for 10-15-13 city council meeting. Source: <http://www.highwayrobbery.net/TrcDocsPowayContr2013octStaffRepAndTwoSupps.pdf>

City of **El Cajon**, California (cameras installed in 2002, removed in 2013): "On February 26, 2013 the El Cajon City Council voted to suspend the "Agreement" with Redflex Traffic Systems, Inc. for a period of six months." "The data shows that from February 27, 2013 to August 31, 2013, while the cameras were covered, there were 39 reported collisions at red-light photo enforcement intersections as compared to 36 reported collisions during the same time period in 2012." "Based on these comparisons, the overall increase in traffic collisions is *statistically insignificant.*" Chief of Police, in report submitted for 9-24-13 city council meeting. Source: <http://www.highwayrobbery.net/TrcDocsElCajonContr2013SeptStaffRep.pdf>

City of **Emeryville**, California (cameras installed in 2004, removed in 2012): "Staff also analyzed the number of accidents for the same seven year period and found that *the red light cameras did not significantly impact the number of accidents.*" "Finance has estimated that *elimination of the program would result in a \$200,000 per year savings to the City.*" Chief of Police Kenneth James, in reports submitted for 5-15-12 city council meeting. Source: <http://web01.emeryville.org/sirepub/pubmtgframe.aspx?meetid=87&doctype=agenda>

City of **Los Angeles** (cameras installed in 2000, removed in 2011): "It was completely wrong." "It was strictly designed to bring in revenue and *didn't do anything for public safety.*" Councilmember Dennis Zine, who prior to his twelve years (termed out) on the council served 28 years with the LAPD, 18 years of which was on motors. Source: Los Angeles Daily News, 3-27-12: <http://www.dailynews.com/general-news/20120328/red-light-scofflaws-will-catch-a-break>

City of San Bernardino, California (cameras installed in 2005, removed in 2012): *"It was the consensus of the Council that the City has lost business because of the red light cameras and they're not making the City any safer."* Minutes, 1-24-11 city council meeting.

<http://www.highwayrobbery.net/TrcDocsSanBernContr2011JanMins.pdf>

City of El Monte, California (cameras installed in 2003, removed in 2008): *"A comparison of traffic collisions at Redflex monitored intersections vs. non-Redflex monitored intersections revealed that there is no statistical difference in the number of traffic collisions because of Redflex monitoring."* Chief of Police Ken Weldon, in memo presented at 10-21-08 council meeting.

<http://www.highwayrobbery.net/TrcDocsElMonteContrTerminateWeldonMemo.pdf>

More from El Monte: *"We're spending a lot of staff time on this just to gain \$2000 a month. It doesn't reduce accidents --that's what our studies and results have come back."* City Manager James W.

Mussenden. Source: Granicus video of council meeting of 10-21-08, at 1:28:40, available at City's website.

City of Upland, California (cameras installed in 2003, removed in 2009): *"The system appears to have little influence on the number of red light related collisions at monitored intersections. At times, rear end collisions have actually increased."* Chief Steve Adams, in memo presented at 3-9-09 council meeting.

Source: <http://www.highwayrobbery.net/TrcDocsUplandStaffReport2009Mar9.pdf>

City of Whittier, California (cameras installed in 2004, removed in 2010): *"... over the long term it didn't appear to lessen the number of injury accidents."* Assistant City Manager Nancy Mendez. Source: 12-6-

10 Whittier Daily News: <http://www.highwayrobbery.net/TrcDocsWhittierArticleProgTerminated.pdf>

City of Loma Linda, California (cameras installed in 2006, removed in 2010): *"I believe these red light cameras are ways for city governments to legally extort money from their citizens." "The month after we lengthened the yellow light by one second, the number of violations that we have seen dropped by 90 percent."* Mayor Rhodes Rigsby, M.D. Source: KABC -TV, 12-3-10,

http://abclocal.go.com/kabc/story?section=news/local/inland_empire&id=7824510

City of Gardena, California (cameras installed in 2005, removed in 2011): *"Our research in Gardena has revealed there is no significant traffic safety impact as a result of the use of the red light cameras. At almost every intersection where we have cameras, collisions have remained the same, decreased very slightly, or increased depending on the intersection you examine. When combining the statistics of all the intersections, the overall consensus is that there is not a noticeable safety enhancement to the public."* Chief of Police Edward Medrano, in memo presented at 2-9-10 council meeting. Source:

<http://www.highwayrobbery.net/TrcDocsGardenaContr2010staffRepFull.pdf>

City of **Bell Gardens**, California (cameras installed in 2009, removed in 2012): "To date, 95% of the funds collected from verifiable violations have been paid to RedFlex Traffic Systems for operating the cameras. The remaining 5% of funds collected have been utilized to partially offset costs of personnel to manage the system. The red light camera program has contributed to a moderate decrease in the overall number of accidents; however, **no change in the overall number of injury accidents**. Furthermore, **the police department has recognized unanticipated personnel costs to manage the program**. Based on this analysis, the red light camera program is **not significant enough of a community safety benefit** to justify the continuation of the program beyond the existing three (3) year agreement term that expires on March 29, 2012." Staff report presented at 9-26-11 council meeting. Source: <http://www.highwayrobbery.net/TrcDocsBellGdnsContr2011staffRep.pdf>

City of **Hayward**, California (cameras installed in 2008, removed in 2013): "In response to Council Member Zermeño's question for reasons **why cities chose to drop out of the Red Light Camera program...** City Manager David commented that another reason was the **lack of strong evidence in the industry that red light cameras were effective in reducing collisions**." Minutes, 10-11-11 council meeting. Source: <http://www.highwayrobbery.net/TrcDocsHaywardStaffRep2011Oct11mins.pdf>

More from Hayward: "There is no concrete data that supports the fact that red light cameras are supposed to reduce collisions." "That's not been our experience here in Hayward. **We've had much better results with a redeployment of our motor officers. I think that having that personal contact with our community members makes a lasting impression. It's an opportunity for us to change behavior when it's wrong versus getting a ticket in the mail 2-4 weeks down the road.**" Police Chief Diane Urban, during 3-5-13 city council meeting. Source: <http://sanfrancisco.cbslocal.com/2013/03/06/hayward-to-get-rid-of-red-light-cameras/>

City of **Hawthorne**, California (cameras installed in 2004, still operating as of 2017): "You need to study accidents overall. Some of the data that you don't have is **accidents for their entirety in our city. You know what, you're right, they're not going down. I wish they were.**" Hawthorne Police Captain Keith Kauffman, during 3-13-12 city council meeting. (In late 2015 Kauffman became Chief of Police in the City of Redondo Beach.) Source: <http://highwayrobbery.net/redlightcamsdocsHawthMain.html#Council2012>

City of **Escondido**, California (cameras installed in 2004, removed in 2013): "Staff's analysis is, the data on accident rates is **inconclusive.**" "We didn't find any change between photo enforced intersections and citywide. You're just as likely to be injured at a photo enforced intersection as you are citywide. So we didn't find anything to demonstrate that severity had been reduced." "Photo enforcement has the highest cost of all the countermeasures." Escondido Assistant Director of Public Works Julie Procopio. Source: Video of council meeting of 8-21-13, at 1:26:50, available on City's official archive site, at <http://escondido2.12milesout.com/>

Effectiveness of Other Counter Measures

Counter Measure	Crash Reduction Factor *	Cost per Intersection /Year
Left Turn Protected Phasing	27%	\$5,000
Retroreflective Backplates	13%	\$2,000
Countdown Pedestrian Heads	20%	\$4,800
Improve Signal Coordination	27%**	\$2,400
Automated Enforcement (RLPE)	12%	\$89,800

* FHWA study estimates

** Right Angle Crashes Only



Slide shown by staff at 8-21-13 Escondido council meeting.

More from Escondido: "Some of the best footage of really drastic collisions comes from red light cameras." "The cameras are there, the collisions still happen." Councilwoman Olga Diaz. Source: Video of council meeting of 8-21-13, at 1:30:00.

City of South Gate, California (cameras installed in 2003, removed in 2013): "The most disappointing thing from staff's perspective is the lack of change in behavior at the intersections." "If you look at the statistics that were provided by RedFlex, you didn't see a dramatic impact in the behavior over the years. In fact, a limited correlation between the implementation of RedFlex and the change in behavior. That's disappointing in the deployment, not just in this city, but everywhere." City Manager Michael Flad at council meeting of 9-10-13. Source audio:

<http://www.highwayrobbery.net/TrcDocsSouthGateContrQuit2013Sep10audioClipCityMgr.mp3>

City of Moreno Valley, California (cameras installed in 2008, removed in 2009, City of Riverside camera on shared border removed in 2012 at Moreno Valley's request): "We took the heat without having any control over it." "I'm happy to see all those red light cameras go. ... The few people that like them just haven't looked at the reality of what it does. It takes away the discretion of a police officer." Moreno Valley Mayor Richard Stewart. Source: Riverside Press Enterprise article 8-6-12

<http://www.pe.com/articles/camera-654226-riverside-city.html>

City of Glendale, California (cameras installed in 2008, removed in 2012): "In short, the nearly 4-year-old red-light camera program became 'cumbersome' and not 'the best use of our resources,' Capt. Carl Povilaitis said." Source: Glendale News-Press article of 3-13-12

<http://www.glendalenewspress.com/news/tn-gnp-0314-glendale-police-shut-down-redlight-camera-program.0,1343078.story>

The San Mateo County (California) Superior Court (beginning in 2005 nine cities in the County installed cameras and four still were operating cameras as of 2017): *"Are we doing right by the public?" "It's questionable whether the trade-offs are appropriate." "There's a balance there, and I don't think we have found it."* CEO John Fitton, San Mateo Superior Court, on 11-13-09. Source:

<http://www.highwayrobbery.net/TrcDocsSanMateoCountyArticles2009Nov13CourtExecAngry.txt>

More from the San Mateo Superior Court: *"I would advise cities who are contemplating installing red light cameras to move cautiously. I know these systems generate revenue for cities, but safety-wise there are questions about whether the red light cameras reduce accidents."* CEO John Fitton, on 2-16-10.

Source: KGO-TV, <http://www.abclocal.go.com/kgo/story?section=news/local/peninsula&id=7280823>

From the San Mateo County Grand Jury: *"Based on the data provided by the cities, there was no overall trend indicating a noticeable change in accident rates before and after installation of red light cameras." "Recently, the City of San Carlos extended the yellow light time to comply with state standards and found that the number of citations fell dramatically." "As a result the revenue from red light citations could no longer cover the associated costs."* Source: 2010 Grand Jury Report

<http://www.highwayrobbery.net/TrcDocsSanMateoGrandJuryFinalRep.pdf>

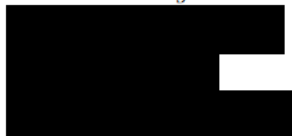
In 2015 the SFMTA staff made a camera-by-camera examination of the effect the nineteen-year-old program had had upon accidents and found that the installation of a red light camera seldom was followed by a drop in accidents. Instead, the drops occurred after engineering improvements like making the yellows longer, adding an all-red interval (both of which are cheap to do), the addition of an arrow for left turns, or a general upgrade to the signal.

"You are correct that engineering changes are the most effective way to reduce red light running crashes. We've had a long-standing record of improving intersection safety through signal upgrade improvements and signal timing changes." "We are in the process of starting a new Red Light Camera contract which will reduce the total number of approaches being enforced in San Francisco, keeping some locations we believe are still needed based on crash and citation history." Email from San Francisco City Traffic Engineer Ricardo Olea - May 2016.

A Compendium of Yellow Interval Increase Studies

**Jay Beeber, Executive Director – Policy
National Motorists Association
Member ITE**

Contact: Jay Beeber



**National
Motorists
Association**

Executive Summary

Transportation officials and engineers know that the proper timing of the signal change interval is essential to intersection safety. If the yellow interval is too short, a “dilemma zone” is created. Motorists who are unfortunate enough to be within this section of the roadway when the yellow signal illuminates may neither be able to stop safely nor legally enter the intersection before the onset of the red interval. Dilemma zones virtually assure that some percentage of drivers will be forced to brake suddenly or violate the red, thereby creating the potential for rear end collisions or vehicle conflicts within the intersection.

The safety benefit of longer yellow signal times has been proven in a number of studies. In a 2004 Texas DOT study, traffic engineers Bonneson and Zimmerman noted that when the yellow interval duration is set one second longer than the “minimum time” based on the 85th percentile speed, violations decreased by 53% and crashes decreased by 40%.

As for concerns that drivers will modify their behavior to account for relatively small increases in the yellow interval and still run the red, the available data shows that such an adjustment does not happen.

In the following series of studies, data from various jurisdictions where the yellow interval was increased confirm that a significant safety benefit can be achieved by increasing the yellow interval which consistently results in a reduction in red light running events. The table below summarizes the findings.

Reduction in Red Light Running After Increase in Yellow Interval	
Fremont, CA	77% reduction after 0.7 sec increase
Loma Linda, CA	93% reduction after 1.0 sec increase
Santa Clarita, CA (Left Turn Lanes)	58% reduction after 0.5 sec increase 70% reduction after 1.0 sec increase
Oakland, CA	87% reduction after 1.0 sec increase
Redlands, CA	88% reduction after 0.9 sec increase
West Hollywood, CA	47% - 70% reduction after 0.3 sec increase
Fairfax Co., VA	71% reduction after 0.5 sec increase

All results were compiled using violation data from red light camera installations. The results show that where there is a high number of red light running events, the yellow interval is likely too short for the needs of approaching traffic. Regardless of the yellow interval time that may have previously been calculated, red light running can be reduced simply by increasing the yellow interval. Further, the results show that the incidence of red light running does not “rebound” to previous levels.

A Before and After Study of Violations in Fremont, CA Subsequent to an Increase in the Yellow Duration

By Jay Beeber, Safer Streets L.A., Member ITE

Introduction

Fremont, CA has been using photo enforcement since the early 2000's. In November of 2010, CalTrans officials examined the intersection of Mission Blvd. and Mohave Drive and increased the yellow signal time for the straight through movement by 0.7 second above the minimum time required by state law to a full 5.0 seconds. (See attached email exchanges documenting the change)

On January 31, 2013 we requested violation statistics from Sgt. Mark Dang of the Fremont Police Department. Specifically, we requested the Monthly Redflex Redlight Offender Statistics (RROS) Report (aka Late Time Bar Charts) for the intersection of Mission Blvd. and Mohave Drive for the period April 2010 through December 2012. The reports were received in hard copy format on February 15, 2013. Digital scans of the original reports are available at <http://wp.me/a1mxAG-bz>

The report shows, in chart format, the number of violations recorded in each of the four photo enforced lanes of approach to the intersection. Three charts are provided (by time into red, by hour of the day, and by day of the week) for each lane as well as for all 4 lanes combined.

At the west bound approach to the Mission Blvd. and Mohave Drive intersection there are four lanes, all enforced with red light cameras. On the RROS Report, the lanes are numbered starting from the left hand side of the roadway closest to the center median. Lane 1 is the left turn lane, lanes 2 and 3 serve straight through traffic, and traffic in lane 4 may either proceed straight or turn right.

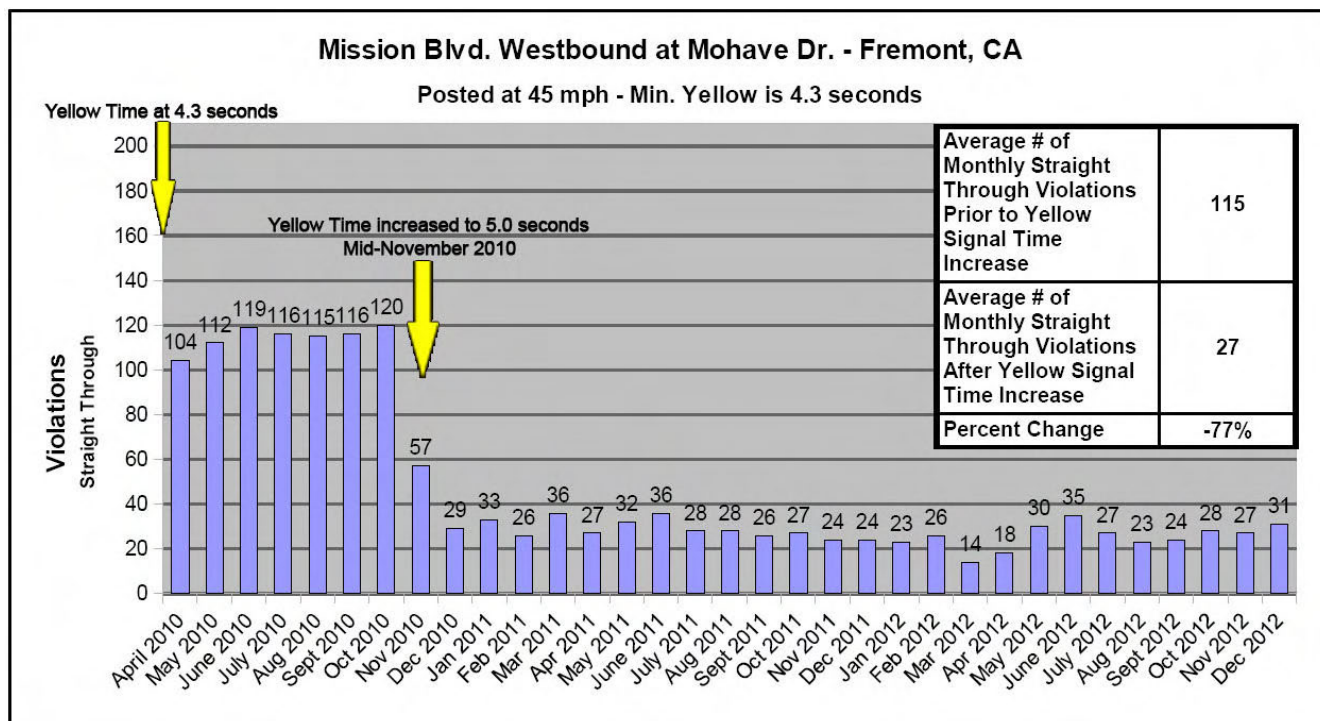


In order to perform the data analysis, we transcribed the data from the hard copy reports into an excel spreadsheet, listing the number of violations in each lane by month. (Spreadsheet available for download at <http://wp.me/a1mxAG-ct>) Since the goal of the analysis was to study the effect of the increase in signal timing for the straight through movement, we did not consider the violations in lane 1 as only left turns are permitted from that lane, nor lane 4 as that lane serves both straight through and right turn movements. We then added together the number of violations in lanes 2 and 3 to arrive at the approximate number of straight through violations occurring each month.

As stated previously, the signal timing was adjusted upwards by 0.7 second in November 2010. We therefore averaged the number of violations occurring in the previous 7 months to obtain the average number of violations in the “before” period. Since the timing change was made in mid-November, we eliminated that month's data from consideration and averaged the subsequent months' violations to obtain the average number of violations in the “after” period.

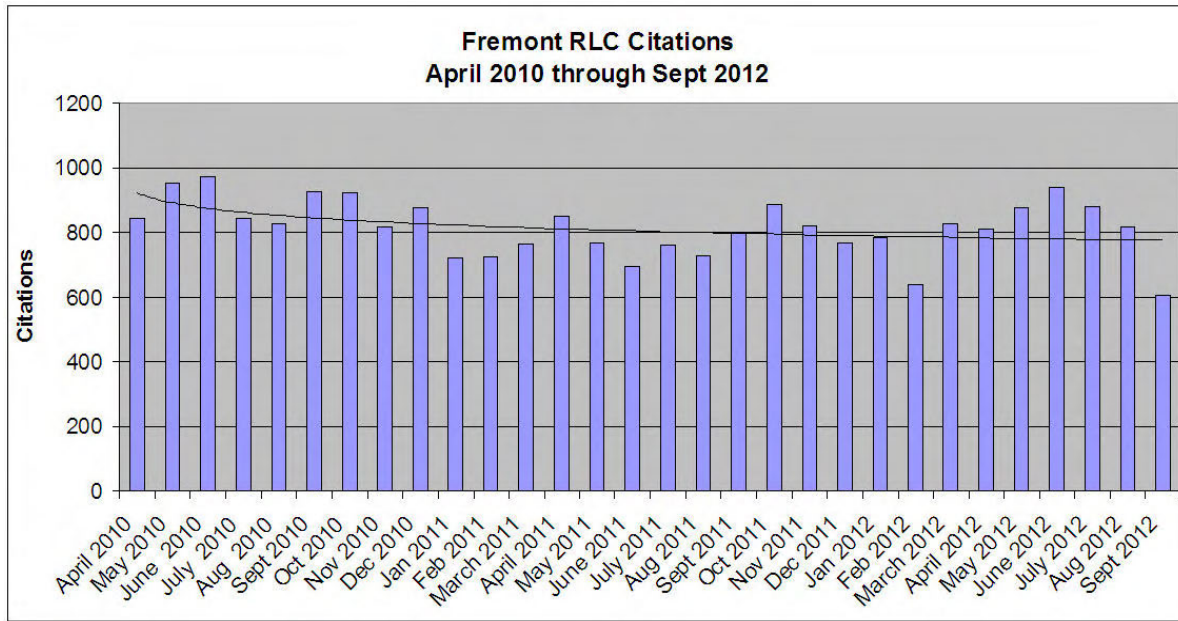
Results

The results appear in the table and chart below.



Immediately after the signal timing increase, the intersection experienced a significant reduction in straight through violations and the lower violation rate has not returned to earlier levels. As can be seen in the above chart, the positive safety results achieved by lengthening the yellow signal time have now remained in place for more than 24 months. Overall, there has been an average 77% decrease in violations during the study period and we have yet to observe any rebound to previous violation levels. In contrast, the violation rate for the left turn movement, where the yellow time remains unchanged at the state minimum of 3.0 seconds, increased approximately 25% during the same period (see spreadsheet). The reason for the increase is undetermined at this time, but regardless, it is almost a certainty that if the left turn yellow time had also been increased, the violation rate for that movement would have been significantly reduced as well.

In addition, since the yellow light time was not increased at any of the other red light camera intersections in Fremont, we analyzed the violation rates at those locations over the same time period to determine if there had been any change in violations over the study period. Using the data available at <http://highwayrobbery.net/redlightcamsdocsFremontMain.html> we charted the total number of monthly violations at all Fremont photo enforced intersections. As the chart below indicates, although the number of violations fluctuates from month to month, there was no overall change in violations at intersections that did not have the signal time increased.



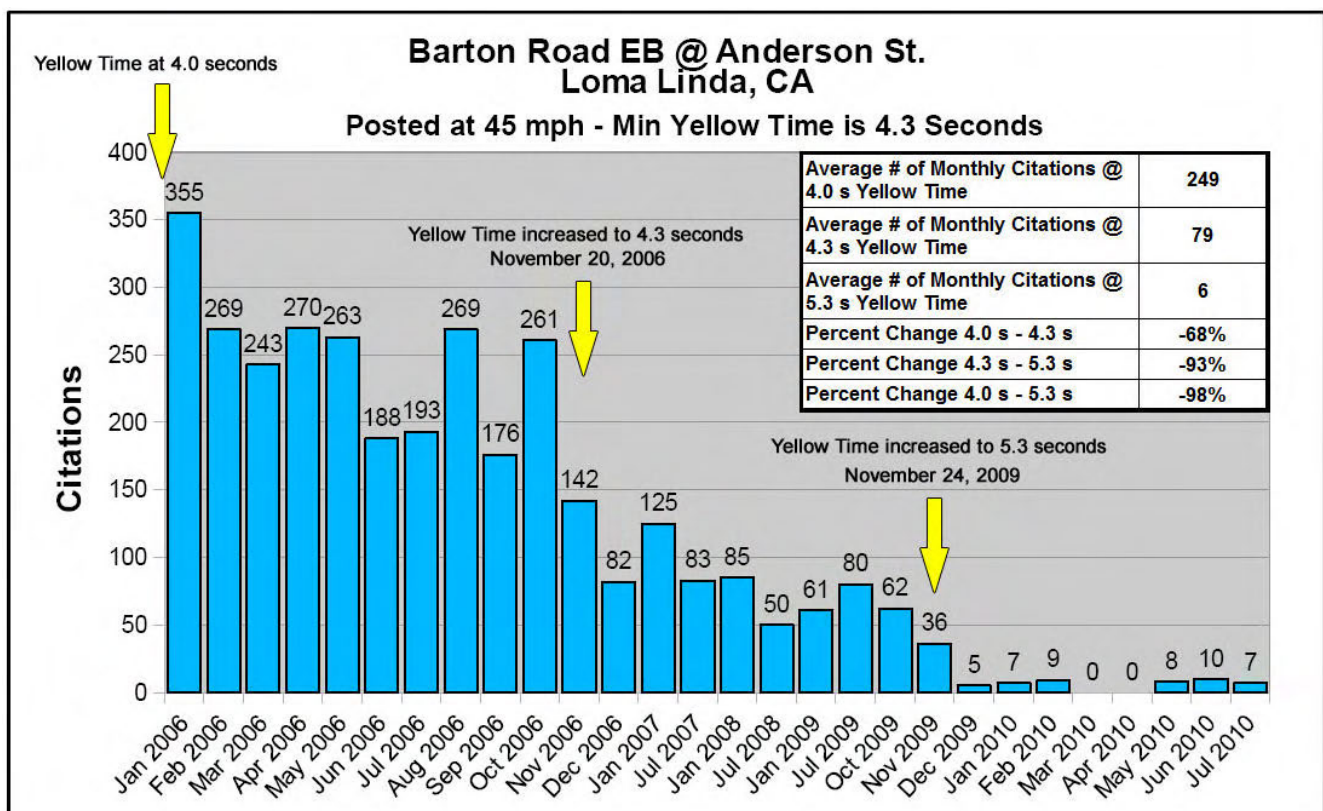
Conclusions

The absence of an increase in red light running violations both at intersections with longer yellow times and at intersections without increases clearly indicates that motorists do not adjust their driving behavior to any large extent to account for longer yellow times, as critics of this safety countermeasure have often claimed. Furthermore, the immediate and lasting reduction in violations which occurred upon lengthening of the yellow signal time strongly suggests that a large majority of the red light running incidents that had been occurring previous to the timing adjustment were inadvertent, not willful. This was likely primarily due to the use of the posted speed limit to calculate the minimum yellow duration rather than the true approach speed of the vehicles on the roadway.

A Before and After Study of Violations in Loma Linda, CA Subsequent to an Increase in the Yellow Duration By Jay Beeber, Safer Streets L.A., Member ITE

In Loma Linda, CA, at the intersection of Barton Road eastbound at Anderson Street, photo enforcement began in January of 2006. The roadway was posted with a 45 mph speed limit with at 4.0 second yellow duration. Per California MUTCD standards, the signal time was deficient by 0.3 seconds. On November 20th 2006, city officials increased the yellow signal time by 0.3 seconds to the statutory minimum of 4.3 seconds. As the chart below indicates, there was an immediate 68% decrease in the number of citations issued from a monthly average of 249 per month to an average of 79 per month. According to city officials, no other engineering or signal timing changes were made.

In the fall of 2009, city officials decided to arbitrarily increase the yellow signal timing an additional 1.0 second. This decision was not based on any engineering study or criteria, simply the will of elected officials to further reduce violations. The timing change was made on November 24, 2009. As before, no other engineering or signal timing changes were made. As the chart below indicates, when the yellow time was increased this additional 1.0 second, citations decreased a further 93% from the previous monthly average of 79 per month to an average of 6 per month. The total decrease in issued citations in Loma Linda was 98% when the yellow time was increased from the originally deficient 4.0 seconds to the arbitrary 5.3 seconds. The data supplied indicates that the reduction in violations was maintained through July 2010 and according to elected officials, through the end of the red light camera program in November of 2010 as well.



Raw data in spreadsheet format compiled from official red light camera monthly reports provided by the City of Loma Linda under the California Public Records Act is attached. Original documents available at <http://highwayrobbery.net/redlightcamsdocsLomaLindaMain.html>.

From: Rigsby, Rhodes
Sent: Tuesday, June 11, 2013 4:35 PM
To: [REDACTED]
Cc: Rigsby, Rhodes
Subject: Yellow Timing Study for Loma Linda

Dear Senate Transportation and Housing Committee:

I have reviewed the attached documents prepared by Jay Bieber of Safer Streets LA. His analysis is correct.

During our 5-year experience with red light cameras from 2005 to 2010, we modified our yellow light durations twice. The first time was after we discovered that our yellow lights did not meet the minimum California standard. At that point, we immediately made the change, which is recorded in Mr. Bieber's analysis as a change from 4.0 to 4.3 seconds. The second time was on my initiative in the fall of 2009, based on my reading of the Texas Highway Institute studies showing that increased yellow durations caused significant decreases in straight-through and left-turn violations. On this arbitrary basis, we added another 1.0 second to each yellow light at each camera-controlled intersection. We made no other engineering changes and made no change in our enforcement. As the chart shows, the violations decreased by another 90% overnight, which more than confirms the Texas experience.

I hope this attestation helps you in your deliberations on this topic.

Sincerely,

Rhodes L. Rigsby, M.D., MBA
Assistant Professor, Loma Linda University School of Medicine
Mayor, City of Loma Linda

**Analysis of Violation Data in Left Turn Lanes at RLC Intersections
in Santa Clarita After Yellow Interval Changes
by Jay Beeber, Executive Director Safer Streets L.A., ITE**

We reviewed the red light camera violation data supplied by the City of Santa Clarita for the ten red light camera monitored intersection approaches. Prior to signal changes, the yellow interval for the protected left turn movement was set at 3.5 seconds at all RLC approaches in the city. Yellow intervals for the left turn movement were increased at seven of the ten approaches. The yellow interval was increased by 1.0 second at both the eastbound and westbound approaches to the intersection of Valencia Blvd and McBean Parkway. The yellow interval was increased by 0.5 second at five additional approaches. The dates of the signal timing changes varied by intersection. Yellow intervals remained at 3.5 seconds at three RLC intersection approaches.

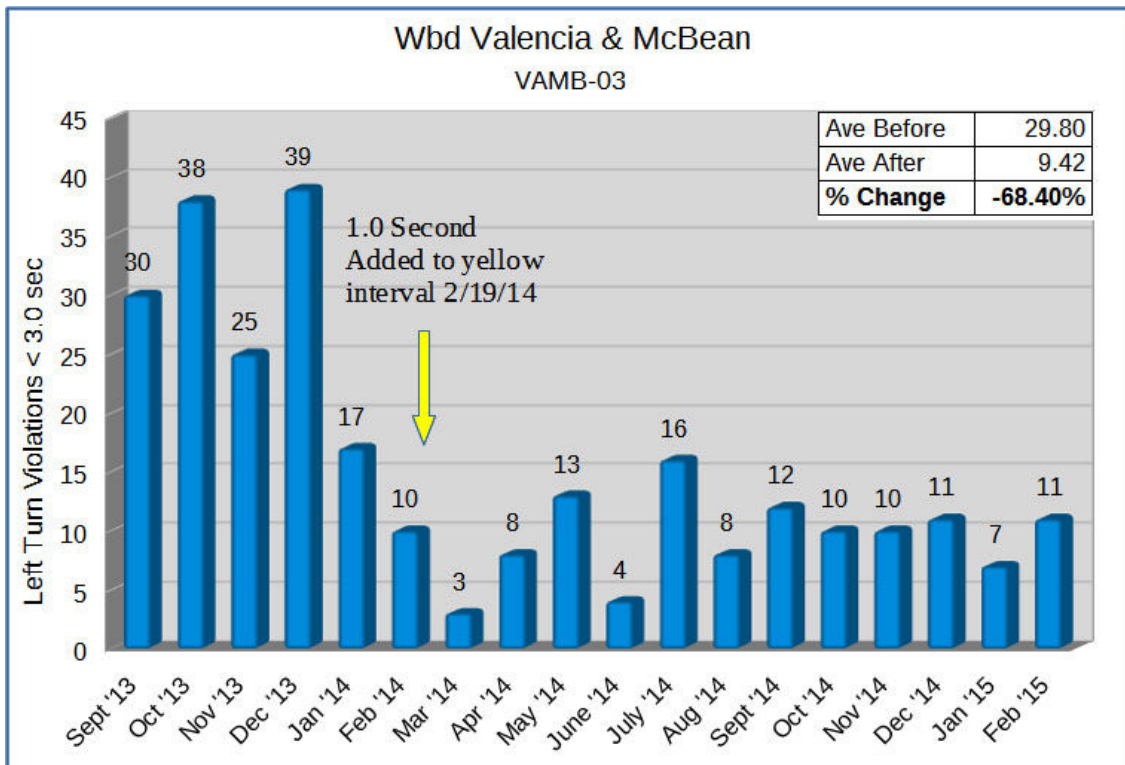
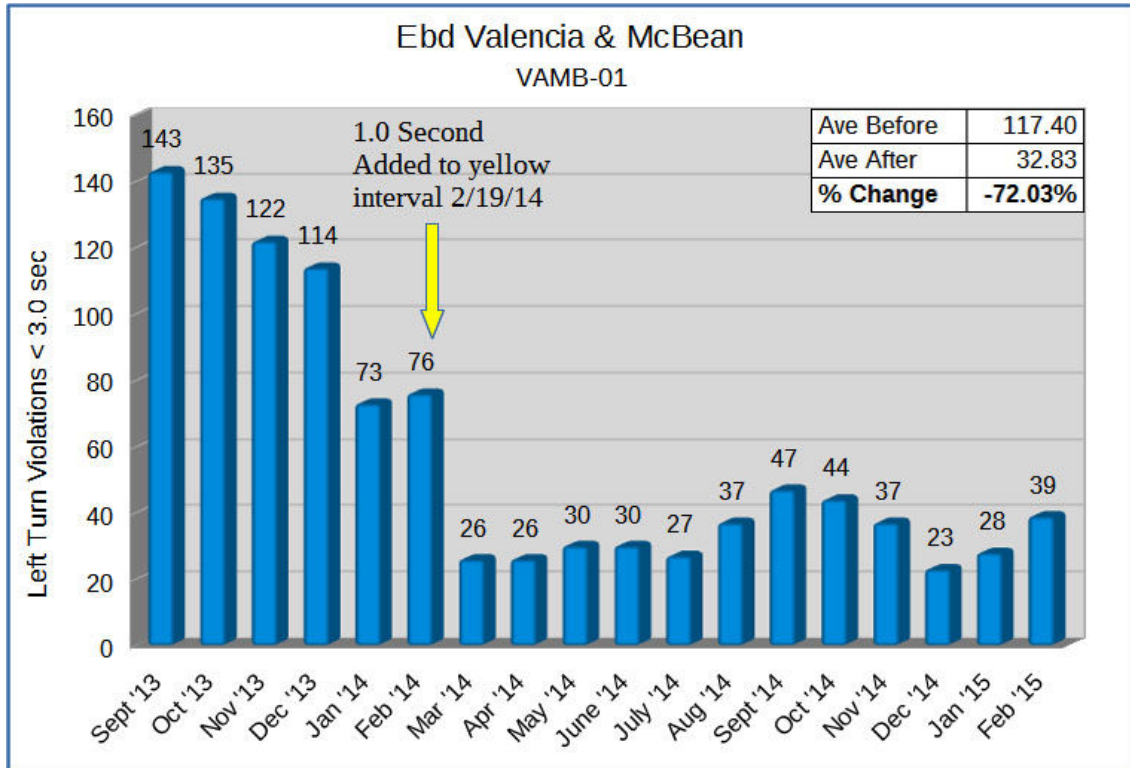
The violation data supplied by the city is broken down by the time-into-red of the violation. Violations occurring within the first 3.0 seconds of the red interval are listed by 0.1 second intervals. All violations over 3.0 seconds are grouped together as one category. The data included all violation events, including those events not deemed to be a citeable offense. Since changes in the yellow interval up to 1.0 second are unlikely to have any effect on violations occurring after 3.0 seconds and many of the late-into-red violations are due to non-citeable offenses such as emergency vehicles, we limited our analysis to violations occurring within 3.0 seconds of the onset of the red interval.

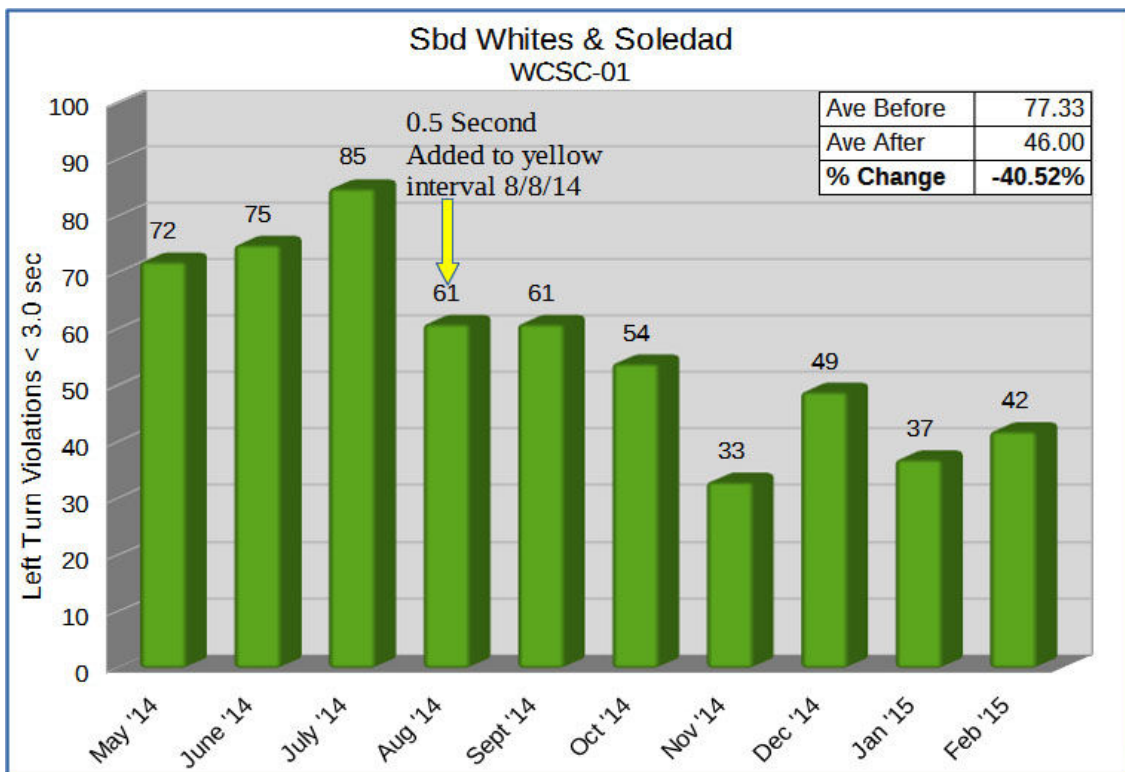
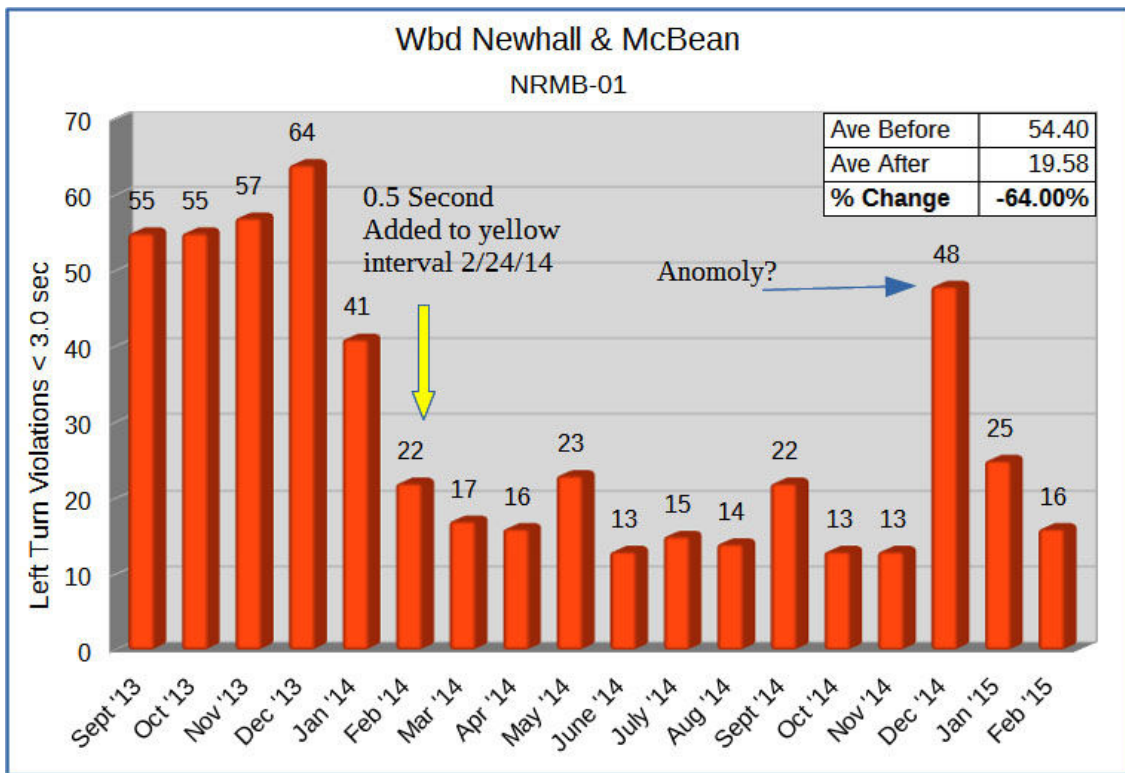
The table below shows the before and after violation numbers and calculated percent change in the average number of monthly violations occurring after the yellow intervals were increased.

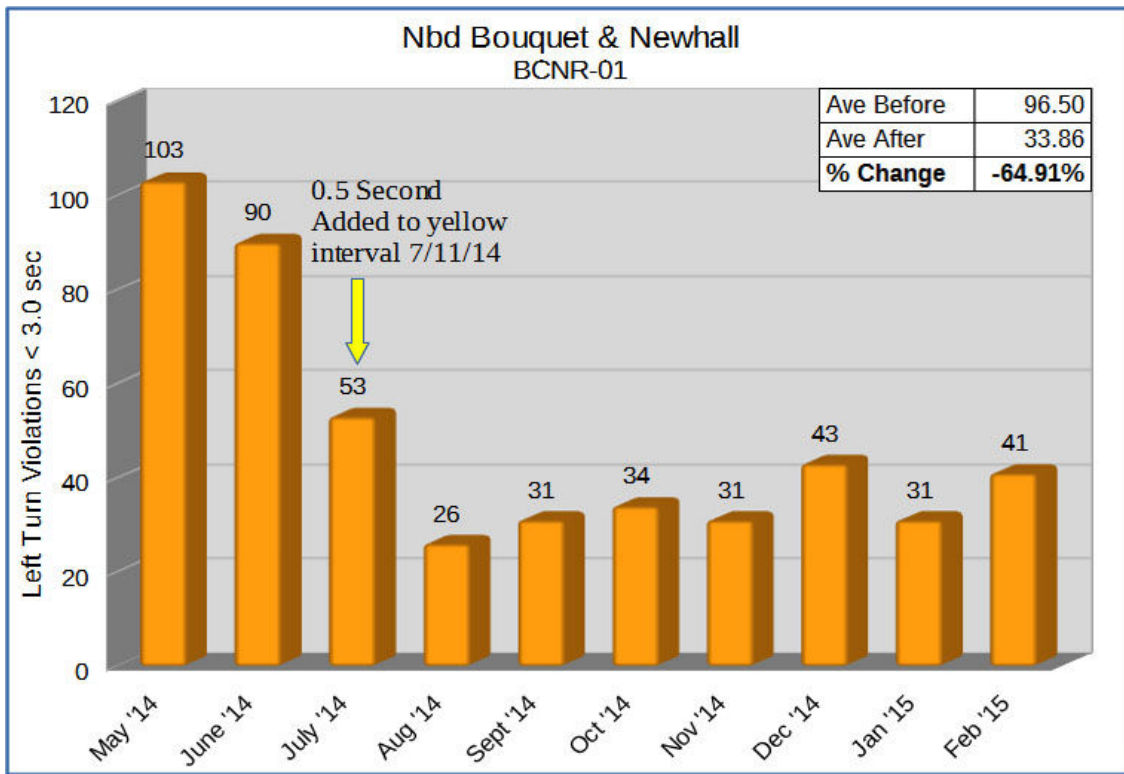
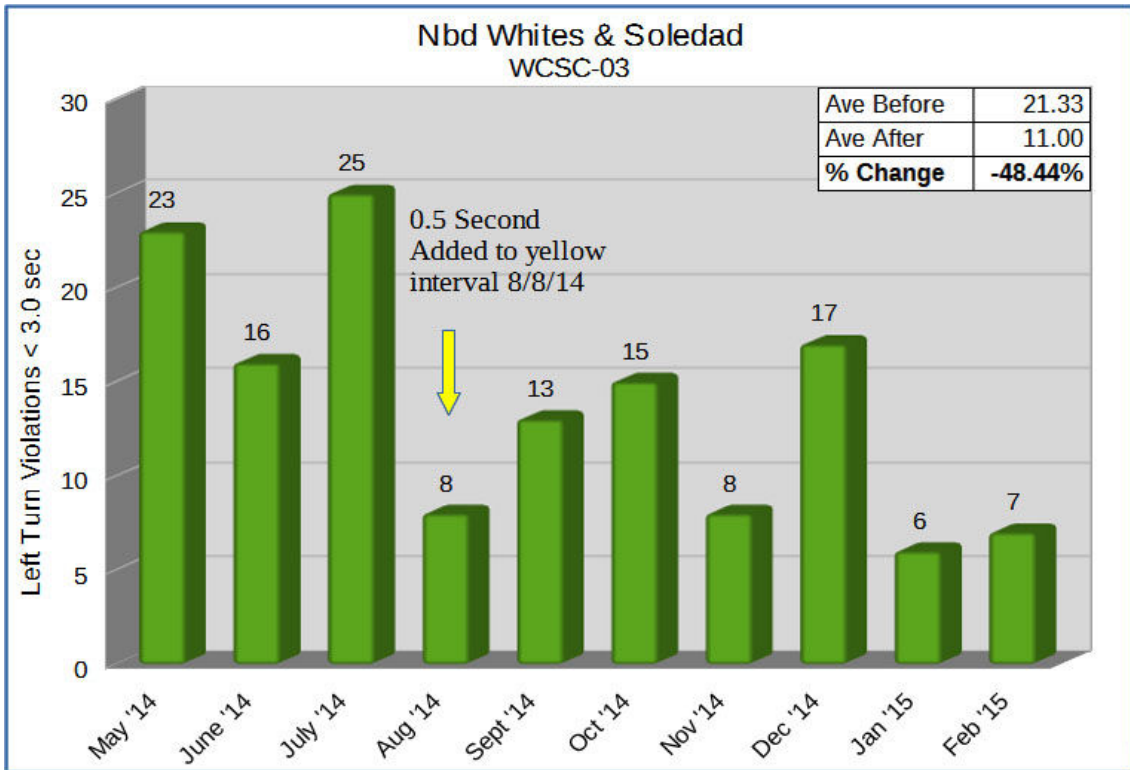
Santa Clarita RLC Violations Left Lanes < 3.0 sec										
Change Date	02/19/14	02/19/14	02/24/14	08/08/14	08/08/14	07/11/14	07/11/14			
Location	VAMB-01	VAMB-03	NRMB-01	WCSC-01	WCSC-03	BCNR-01	NRBC-01*	BCSC-01	MMMB-01	OVLV-01
Sept '13	143	30	55							
Oct '13	135	38	55							
Nov '13	122	25	57							
Dec '13	114	39	64							
Jan '14	73	17	41							
Feb '14	76	10	22							
Mar '14	26	3	17							
Apr '14	26	8	16							
May '14	30	13	23	72	23	103	93	92	73	16
June '14	30	4	13	75	16	90	89	85	100	17
July '14	27	16	15	85	25	53	59	86	67	16
Aug '14	37	8	14	61	8	26	31	105	91	13
Sept '14	47	12	22	61	13	31	24	114	72	24
Oct '14	44	10	13	54	15	34	30	120	82	25
Nov '14	37	10	13	33	8	31	33	91	60	15
Dec '14	23	11	48	49	17	43	41	78	79	24
Jan '15	28	7	25	37	6	31	40	79	68	14
Feb '15	39	11	16	42	7	41	37	78	74	17
Ave Before	117.40	29.80	54.40	77.33	21.33	96.50	91.00	92.80	76.60	18.10
Ave After	32.83	9.42	19.58	46.00	11.00	33.86	33.71			
% Change	-72.03%	-68.40%	-64.00%	-40.52%	-48.44%	-64.91%	-62.95%			

Note that as expected, all intersections where the yellow interval was increased saw significant reductions in red light running violations with the greatest reductions occurring at the two approaches where the yellow was increased by a full 1.0 second. No overall reduction in red light running occurred at the intersections where the yellow interval remained at 3.5 seconds.

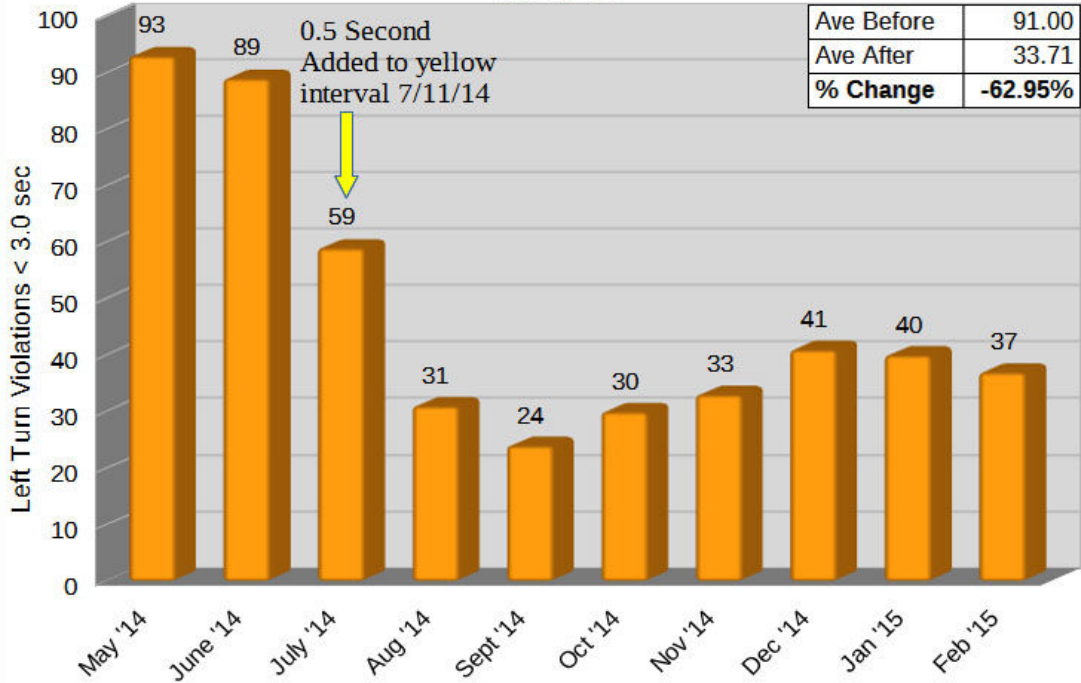
The following charts show the violation changes over time at each intersection approach where the yellow interval was increased. Although violations fluctuate month to month, overall, violations have not rebounded to previous levels.







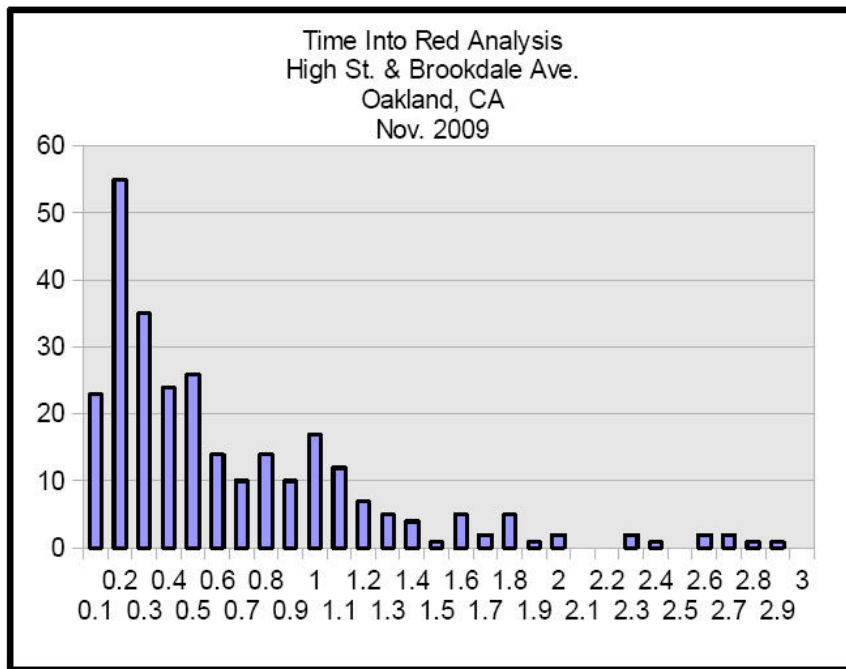
Ebd Newhall & Bouquet
NRBC-01



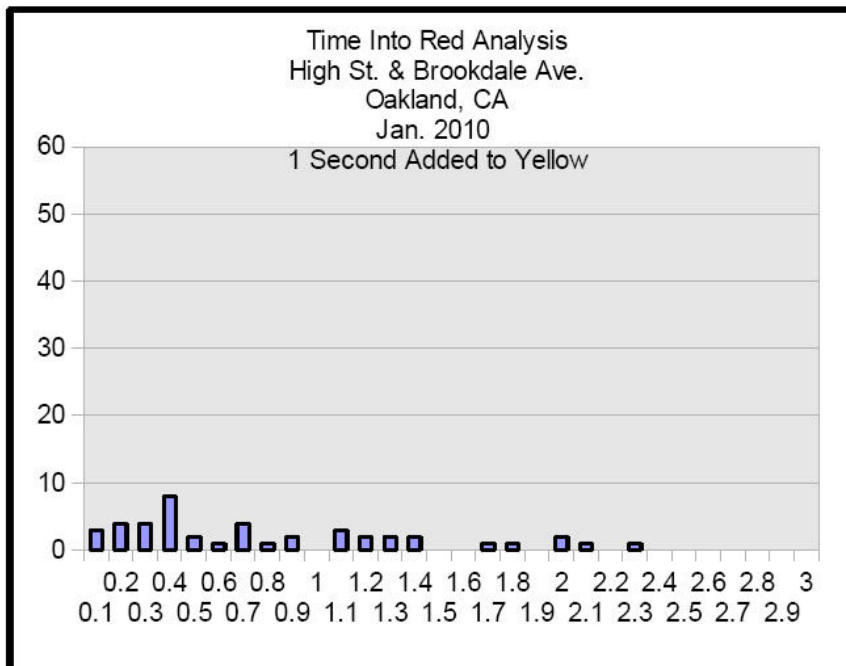
Effect of a One Second Increase in the Yellow Interval - Oakland, CA

By Jay Beeber, Safer Streets L.A., Member ITE

Many jurisdictions set the time of their yellow interval to the absolute minimum permitted by law. Often, this causes numerous drivers to inadvertently run the red light by a fraction of a second. The following chart graphs the violations occurring during the first 3.0 seconds after the traffic light has turned red at one such red light camera monitored intersection, High St. and Brookdale Ave., in Oakland, CA. As can be seen, the vast majority of violations are occurring within the first second of the red interval. This is the typical distribution of straight through violations by time-into-red at locations where the yellow interval is set too short for the needs of approaching traffic.



In December 2009, Oakland DOT increased the yellow signal time at this location by 1.0 second. As shown in the chart below from January, 2010, this immediately resulted in the virtual elimination of these early-into-red violations. Note that the high numbers of violations did not simply shift 1.0 second later, they were eliminated. Overall, there was an 87% reduction in the number of violations within the first second of the red interval.



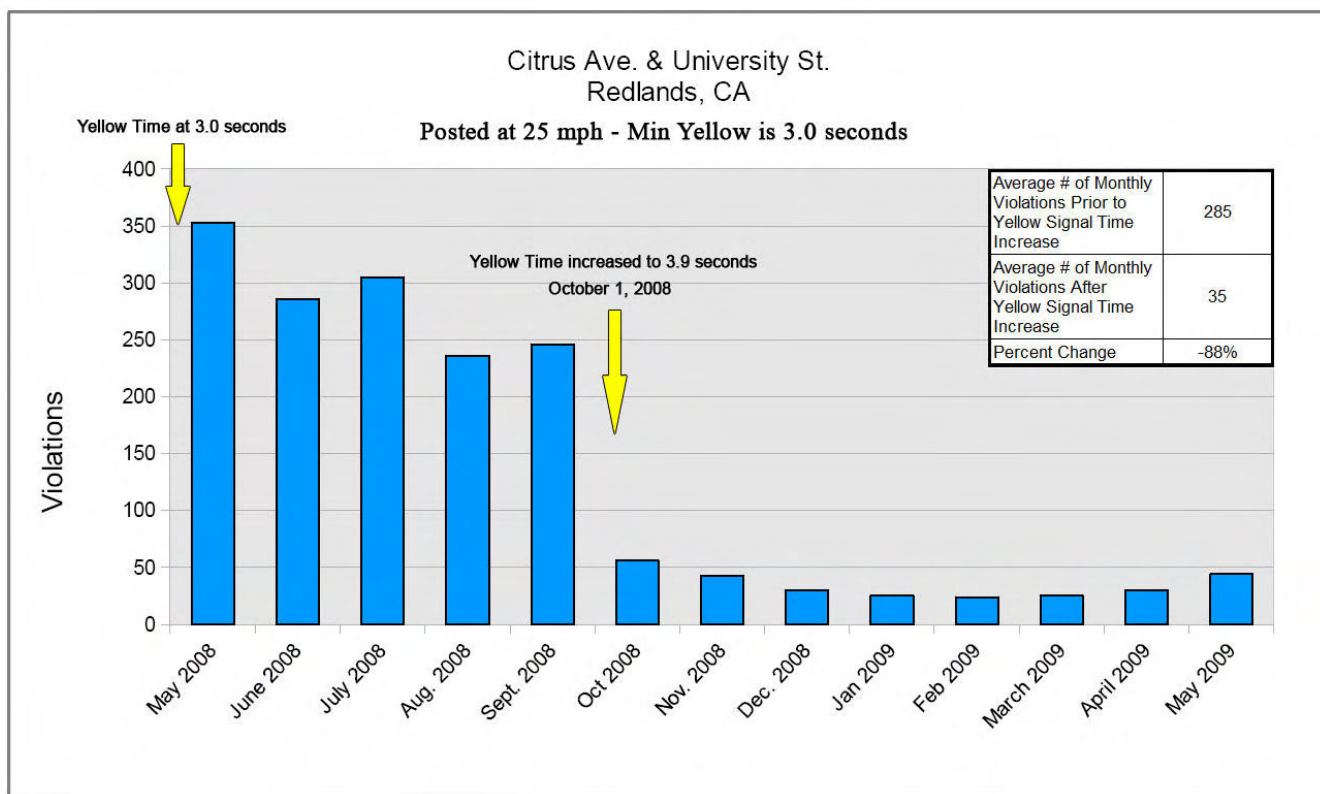
This lower violation level remained constant throughout the first half of 2010. Unfortunately, under pressure from the Oakland Police Department, who complained that the change was “negatively impacting” the red light camera program, after six months of increased safety for motorists, the Oakland DOT was forced to reduce the yellow interval by 1.0 second back to the prior timing. As a result, the early-into-red violations returned to their previous level.

In May 2014, the City of Oakland ended their red light camera program.

A Before and After Study of Violations in Redlands, CA Subsequent to an Increase in the Yellow Duration

By Jay Beeber, Safer Streets L.A., Member ITE

The City of Redlands installed one red light camera at the intersection of Citrus Ave. and University St. in May of 2008. The yellow time was set at 3.0 seconds, the minimum duration for a roadway posted at 25 mph. After numerous complaints and a court challenge, the city increased the yellow time by almost a full second to 3.9 seconds on October 1, 2008. Immediately, violations dropped an average of 88% and remained at the lower rate. The program was terminated at the end of May 2009.



Raw data in spreadsheet format compiled from official red light camera monthly reports provided by the City of Redlands under the California Public Records Act is attached. Original documents available at <http://highwayrobbery.net/redlightcamsdocsRedlandsMain.html>.

Case Study: West Hollywood, CA

The City of West Hollywood, CA implemented a red light photo enforcement program in 1999. Currently, 24 approaches at a total of 8 intersections are monitored by red light cameras. Of those, 16 approaches are monitored on a continuous basis. The enforcement systems at the remaining 8 approaches are activated intermittently. Uninterrupted monthly citation figures, therefore, only exist for the 16 approaches where the enforcement cameras are continuously functional.

Until recently, traffic signal yellow intervals in West Hollywood had been set at the absolute minimum time based on the posted speed limit of the roadway. In 2012, the city began implementing a new policy of setting the yellow interval based on the posted speed limit plus an additional 5 mph. This resulted in 0.3 s to 0.4 s of additional time being added to the yellow interval at intersections where the new timing protocol has been employed. The process of re-timing the signals throughout the city has yet to be completed.

The purpose of this analysis is to determine the effect this increase in the yellow interval has had on the citation rate at photo enforced intersection approaches.

The West Hollywood red light camera program provides an ideal test case for this analysis as the city only cites for straight through violations. As a result, all citation data consists only of vehicles proceeding straight through the intersection. At our request, Los Angeles County Sheriff's Deputy Zenon Porche, who administers the city's red light camera program, generated a report detailing the number of monthly citations issued for each intersection approach in the city from the inception of the program through September 2013. In addition, the city's traffic engineering department provided a listing of the months in which the yellow interval was increased at each intersection monitored by red light camera systems. The change dates, along with the before and after yellow interval times, for each red light camera intersection are listed in the table below.

West Hollywood RLC Intersections Yellow Interval Change Dates		NB/SB			EB/WB		
		Previous	Current	Difference	Previous	Current	Difference
Intersection	Date Changed	Yellow Phase	Yellow Phase	YP	Yellow Phase	Yellow Phase	YP
Fountain Av/Crescent Hts Blvd	Oct-12	3.6	3.9	0.3	3.6	3.9	0.3
Fountain Av/Fairfax Av	Nov-12	3.6	3.9	0.3	3.6	3.9	0.3
Fountain Av/La Brea Av	Oct-12	3.6	3.9	0.3	3.5	3.9	0.4
Santa Monica Blvd/ Fairfax Av	Jun-12	3.6	3.9	0.3	3.5	3.6	0.1
Sunset Bl/La Cienega Bl	Jun-13	3.0	3.6	0.6	3.6	3.9	0.3
Santa Monica Blvd/La Brea	N/A	3.6	TBD	TBD	3.5	TBD	TBD
Melrose Av/La Cienega Bl	N/A	3.7	TBD	TBD	3.7	TBD	TBD
Beverly Bl/Robertson Bl	N/A	3.6	TBD	TBD	3.7	TBD	TBD

Of the five intersections where the yellow interval had been increased at the time of this study, one was increased in June 2012, two were increased in October 2012, one was increased in November 2012, and one was increased in June 2013.

Data Analysis and Results

For this study, we compiled the number of citations issued at each photo enforced intersection approach before and after the yellow interval was increased. We eliminated any intersection approach where the enforcement system was not active for all months of the study. Additionally, we eliminated the eastbound and westbound intersection approaches at Sunset Blvd and La Cienega Blvd as the limited after period of three months did not provide sufficient data for a valid analysis. After this data reduction, figures for a total of seven intersection approaches were available for analysis.

For each intersection approach, the average number of monthly citations before and after the signal timing increase was calculated, as was the percent change in the number of citations. The before period for the analysis ran from January 2012 to the month prior to the month in which the signal timing was changed. The after period for the analysis ran from the month after the month in which the signal timing was changed to September 2013, the most recent month for which data was available. The month in which the signal timing was changed was eliminated from the analysis as it contained a mix of before and after data. The results appear in the table below. Months highlighted in yellow represent the months in which the signal timing changes were made.

N/B LaBrea At Fountain Yellow Interval Increase of 0.3 sec in Oct. 2012		S/B LaBrea At Fountain - Yellow Interval Increase of 0.3 sec in Oct. 2012		N/B Fairfax At Fountain - Yellow Interval Increase of 0.3 sec in Nov. 2012		S/B Fairfax At Fountain - Yellow Interval Increase of 0.3 sec in Nov. 2012		N/B Crescent Hts At Fountain - Yellow Interval Increase of 0.3 sec in Oct. 2012		S/B Crescent Hts At Fountain - Yellow Interval Increase of 0.3 sec in Oct. 2012		N/B Fairfax At Santa Monica - Yellow Interval Increase of 0.3 sec in June 2012	
Month	Citations	Month	Citations	Month	Citations	Month	Citations	Month	Citations	Month	Citations	Month	Citations
Jan 2012	217	Jan 2012	109	Jan 2012	108	Jan 2012	33	Jan 2012	46	Jan 2012	51	Jan 2012	43
Feb 2012	148	Feb 2012	135	Feb 2012	89	Feb 2012	27	Feb 2012	35	Feb 2012	50	Feb 2012	45
Mar 2012	160	Mar 2012	134	Mar 2012	93	Mar 2012	35	Mar 2012	49	Mar 2012	59	Mar 2012	48
Apr 2012	165	Apr 2012	129	Apr 2012	101	Apr 2012	34	Apr 2012	47	Apr 2012	53	Apr 2012	40
May 2012	186	May 2012	142	May 2012	120	May 2012	37	May 2012	49	May 2012	42	May 2012	44
Jun 2012	199	Jun 2012	156	Jun 2012	126	Jun 2012	36	Jun 2012	47	Jun 2012	58	Jun 2012	20
Jul 2012	156	Jul 2012	149	Jul 2012	129	Jul 2012	39	Jul 2012	53	Jul 2012	59	Jul 2012	28
Aug 2012	193	Aug 2012	168	Aug 2012	155	Aug 2012	38	Aug 2012	52	Aug 2012	60	Aug 2012	16
Sept 2012	194	Sept 2012	159	Sept 2012	110	Sept 2012	44	Sept 2012	48	Sept 2012	57	Sept 2012	21
Oct 2012	129	Oct 2012	128	Oct 2012	100	Oct 2012	42	Oct 2012	49	Oct 2012	20	Oct 2012	27
Nov 2012	89	Nov 2012	64	Nov 2012	95	Nov 2012	33	Nov 2012	25	Nov 2012	20	Nov 2012	16
Dec 2012	45	Dec 2012	24	Dec 2012	82	Dec 2012	18	Dec 2012	15	Dec 2012	19	Dec 2012	15
Jan 2013	42	Jan 2013	55	Jan 2013	54	Jan 2013	17	Jan 2013	19	Jan 2013	19	Jan 2013	22
Feb 2013	55	Feb 2013	54	Feb 2013	56	Feb 2013	25	Feb 2013	13	Feb 2013	18	Feb 2013	22
Mar 2013	63	Mar 2013	66	Mar 2013	64	Mar 2013	19	Mar 2013	23	Mar 2013	16	Mar 2013	23
Apr 2013	56	Apr 2013	48	Apr 2013	18	Apr 2013	21	Apr 2013	27	Apr 2013	15	Apr 2013	23
May 2013	56	May 2013	41	May 2013	76	May 2013	10	May 2013	19	May 2013	22	May 2013	27
Jun 2013	41	Jun 2013	58	Jun 2013	57	Jun 2013	16	Jun 2013	19	Jun 2013	15	Jun 2013	23
Jul 2013	46	Jul 2013	46	Jul 2013	49	Jul 2013	17	Jul 2013	33	Jul 2013	28	Jul 2013	32
Aug 2013	61	Aug 2013	39	Aug 2013	43	Aug 2013	18	Aug 2013	22	Aug 2013	17	Aug 2013	28
Sept 2013	49	Sept 2013*	38	Sept 2013	13	Sept 2013	17	Sept 2013	29	Sept 2013	24	Sept 2013	23
Average Before Change	180	Average Before Change	142	Average Before Change	113	Average Before Change	37	Average Before Change	47	Average Before Change	54	Average Before Change	44
Average After Change	55	Average After Change	48	Average After Change	51	Average After Change	19	Average After Change	22	Average After Change	19	Average After Change	23
% Change	-69.5%	% Change	-66.0%	% Change	-54.7%	% Change	-47.4%	% Change	-53.1%	% Change	-64.4%	% Change	-47.6%

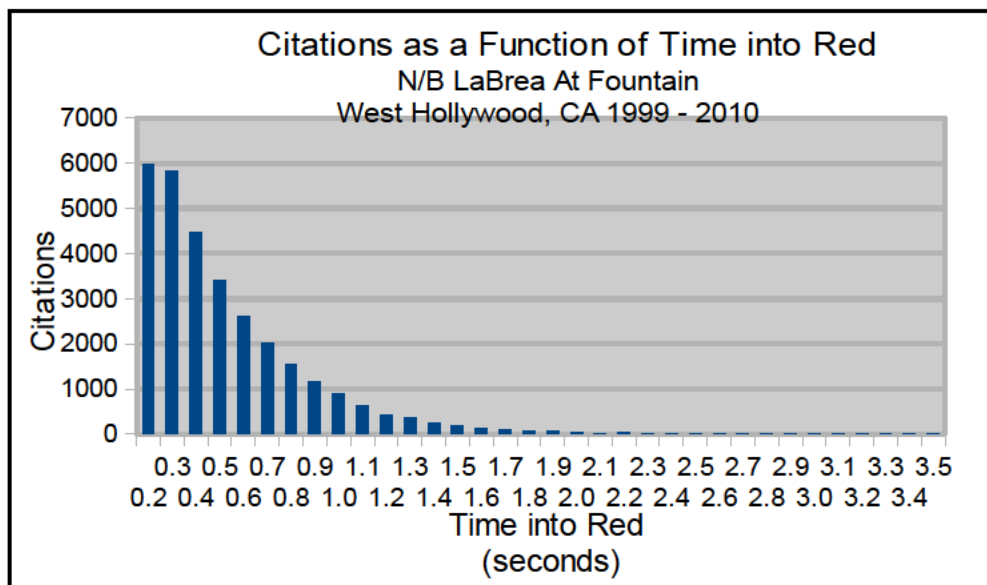
A summary table of the above results including a calculation of the overall rate of change in citations at the seven study locations appears below:

Change in Citations Issued After 0.3 Sec Increase in Yellow Interval West Hollywood, CA			
Location	Average Citations Before Change	Average Citations After Change	% Change
N/B LaBrea At Fountain	180	55	-69.5%
S/B LaBrea At Fountain	142	48	-66.0%
N/B Fairfax At Fountain	113	51	-54.7%
S/B Fairfax At Fountain	37	19	-47.4%
N/B Crescent Hts At Fountain	47	23	-51.3%
S/B Crescent Hts At Fountain	48	19	-59.3%
N/B Fairfax At Santa Monica	44	23	-47.6%
Totals	610	239	-60.9%

Discussion

By increasing the yellow interval by 0.3 s at intersections within the city of West Hollywood, traffic engineers were able to achieve an overall 61% reduction in red light running at the locations analyzed in this study. Individual intersection approaches saw reductions in the range of 48% to 70%, with the greatest percentage reductions occurring at locations with the greatest number of red light violations prior to the yellow time change. This result is to be expected as the number of red light violations at intersections where the yellow interval is set at or near the minimum time based on the posted speed limit is consistently found to be relatively high in the first few fractions of a second after the light turns red and decreases exponentially as the time into red increases.

The chart below illustrates the distribution of citations issued at the photo enforced intersection of LaBrea and Fountain Avenues in West Hollywood from the inception of the program through 2010 as a function of the time into red.



This is the typical distribution of red light running events seen for the straight through movement when the yellow interval is set at or near the minimum time based on the posted speed limit. When the yellow interval is increased, violations occurring during the corresponding time period are eliminated.

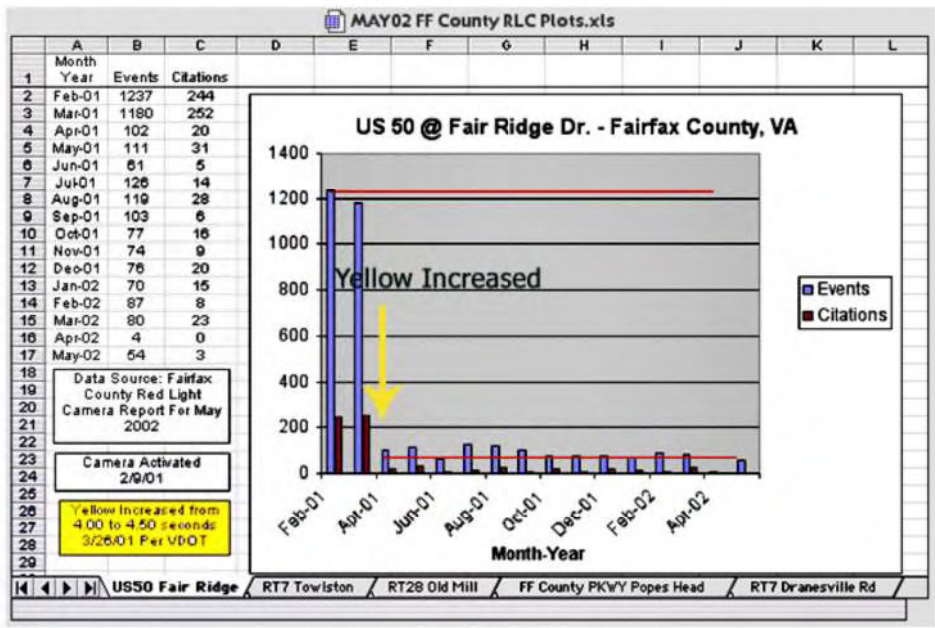
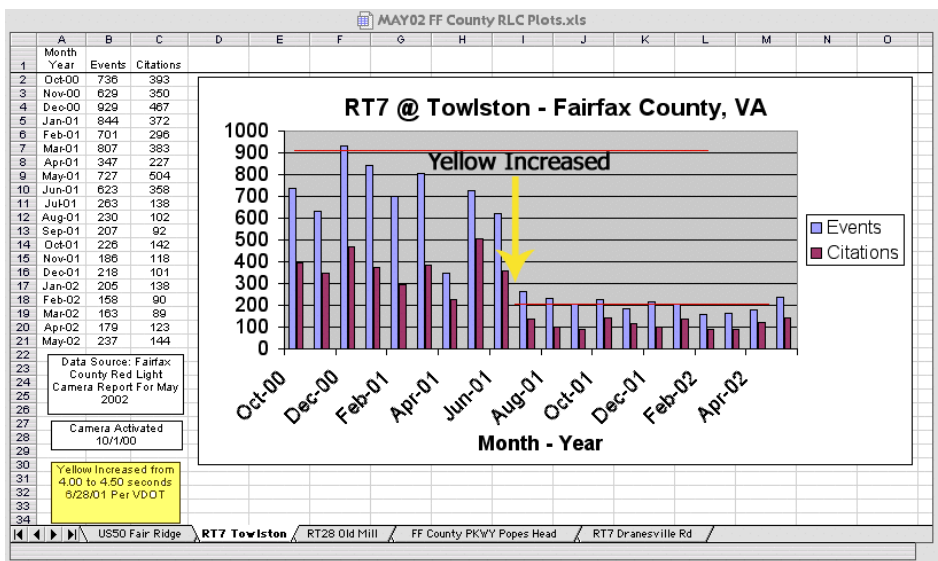
Conclusions

The decreased incidents of red light running brought about by the increase of 0.3 seconds in the yellow interval has likely increased safety at intersections where the change has been made. However, additional reductions in red light running incidents along with additional improvements in safety are achievable through additional increases in the yellow interval and possibly other engineering countermeasures. For example, a very modest 0.3 s increase in the yellow interval at the north and southbound approaches to the intersection of La Brea and Fountain Avenues resulted in an average 68% decrease in red light running from an average of 161 issued citations per month to an average of 52 issued citations per month. By increasing the yellow interval an additional 0.4 s to 0.7 s, red light running incidents would be further reduced. Based on experience at intersections in other jurisdictions where the yellow interval has been increased by 0.7 s to 1.0 s beyond the minimum time and which resulted in an overall 80% to 90% reduction in red light running, West Hollywood could expect to reduce the number of red light running events at this intersection, as well as others throughout the city, to no more than 10 and 20 per month by increasing the yellow interval to a similar extent.

Prepared by: Jay Beeber
Executive Director - Safer Streets L.A.
Research Fellow - Reason Foundation

Fairfax County, VA

The following two figures show how Fairfax County, VA achieved a significant, sustained reduction in violations when the yellow timing was increased by 1/2 second. Note also that although red-light cameras were present at these intersections during the entire review period, a dramatic reduction in violations was seen only after the yellow timing was increased.



San Diego

The chart below shows the 30% to 55% reduction in violations achieved at San Diego red-light camera sites when the yellow interval times were increased, even by as little as 0.2 second.

RESULTS FROM INCREASING YELLOW TIMES AT 6 of 19 SAN DIEGO RED LIGHT CAMERA SITES:

INT #	LOCATION	BEFORE YELLOW (seconds)	BEFORE VIOLATIONS (per 100 hrs)	AFTER YELLOW (seconds)	AFTER VIOLATIONS (per 100 hrs)	YELLOW INCREASE (seconds)	VIOLATION REDUCTION (percent)
1454	WB GARNET AVE @ INGRAHAM ST	3.00	98.8	3.20	55.9	0.20	-43.4%
1504	WB "F" ST @ 16TH ST	4.00	49.4	4.90	22.5	0.90	-54.5%
1534	WB MIRAMAR RD @ CAMINO RUIZ	4.40	42.5	4.80	29.8	0.40	-29.9%
1541	NB MISSION BAY DR TO WB GRAND AVE	3.10	363.4	4.70	42.2	1.60	-88.4%
1542	SB MISSION BLVD @ GARNET AVE	3.00	49.9	3.70	30.3	0.70	-39.3%
1553	EB MIRA MESA BLVD @ SCRANTON RD	3.90	98.7	4.30	52.7	0.40	-46.6%

SOURCE: San Diego Photo Enforcement System Review January 14, 2002

FHWA Recommended Practices

In addition to the ITE, the USDOT and FHWA also provide recommended standards for the setting of yellow signal times. In their presentation regarding countermeasures for red light running, available at http://safety.fhwa.dot.gov/intersection/redlight/outreach/marketing/rlr_pps022509/long/, under the heading "Improve Signal Timing" (slides 27 - 28) are the following guidelines:

- Traffic engineers should make sure that yellow change interval is set properly. This step is covered in the field review checklist that was presented in an earlier slide.
- Research shows that yellow interval duration is a significant factor affecting the frequency of red-light running and that increasing yellow time to meet the needs of traffic can dramatically reduce red-light running.
- When yellow intervals are set too short for the prevailing speed, there is likely to be a higher incidence of red-light running due to drivers being caught in the dilemma zone.
- **If the approach speed is not known, then the speed limit plus 10 mi/h is recommended. Studies show that most speed limits in general are 8-12 mi/h below the prevailing speed.**
- **An additional 0.5 sec of yellow time should be considered for locations with significant truck traffic, significant population of older drivers**
- Yellow times less than recommended by this equation result in more red-light violations and higher crash rates.
- Increasing yellow times that are shorter than recommended by this equation has been show to reduce severe red-light related crashes. A 1.0 sec increase in yellow time results in 40 percent decrease in severe red-light related crashes.

Using an approach speed of 10 mph over the posted speed limit results in an additional 0.7 second yellow time. Adding the recommended 0.5 second for truck traffic and older drivers yields a total of 1.2 seconds of additional yellow.

Drivers Do Not Adapt to Longer Yellow Durations of About 1 Second.

In addition to the evidence presented above from locations where yellow signal times have been increased with no adaptation by drivers, other independent studies have found similar results.

“The data show that the percentage of last-to-cross vehicles clearing the intersection ($T + 0.2$) seconds or more past the yellow onset was not appreciably changed by the extension of the yellow phase.”

The Influence of the Time Duration of Yellow Traffic Signals on Driver Response,
Stimpson/Zador/Tarnoff, ITE Journal (November 1980)

“Research has consistently shown that drivers do not, in fact, adapt to the length of the yellow.”

Determining Vehicle Change Intervals – A Proposed Recommended Practice, Institute of
Transportation Engineers (1985)

“Drivers do adapt to the increase in yellow duration[†]; however, this adaptation does not undo the benefit of an increase in yellow duration.”*

Effect of Yellow-Interval Timing on Red-Light-Violation Frequency at Urban Intersections,
Bonneson/Zimmerman, Texas Transportation Institute (January 2004)

*Note, however, that the adaptation found was minor, shifting the statistical curve about 0.2 of a second. Most other studies at photo enforced intersections over long periods of time show no increase in red light running after the initial reduction in violations. This suggests that drivers do *not* adapt to the increase in yellow duration in any meaningful way. Yet even in this one study that suggested that drivers may adapt to a longer yellow time, the evidence showed that the safety benefit of a 53% decrease in violations and 40% decrease in crashes far outweighed any driver adaptation.

Conclusions

If the yellow signal time was increased at red light camera locations, violations would be greatly reduced resulting in a significant increase in safety as well as eliminating the needless ticketing of tens of thousands of otherwise law-abiding motorists every year. The lack of a rebound in violations or collisions, even after a number of years of motorists experiencing longer signal times, belies the notion that motorists can perceive this change and will adjust their driving behavior. All the evidence to date indicates that this does not happen. In fact, the evidence shows just the opposite, that once the yellow light time is increased, violations and collisions are significantly reduced, never to return.