Pennsylvania
Automated Red-Light Enforcement
2017 PROGRAM EVALUATION

State Transportation Commission

pennsylvania
DEPARTMENT OF TRANSPORTATION

June 2017

Acknowledgements

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The Pennsylvania Transportation Advisory Committee (TAC) was established in 1970 by Act 120 of the State Legislature, which also created the Pennsylvania Department of Transportation (PennDOT). The Advisory Committee has two primary duties. First, the Committee "consults with and advises the State Transportation Commission and the Secretary of Transportation on behalf of all transportation modes in the Commonwealth." In fulfilling this task, the Committee assists the Commission and the Secretary "in the determination of goals and the allocation of available resources among and between the alternate modes in the planning, development, and maintenance of programs, and technologies for transportation systems." The second duty of the Advisory Committee is "to advise the several modes (about) the planning, programs, and goals of the Department and the State Transportation Commission." The Committee undertakes in-depth studies on important issues and serves as a valuable liaison between PennDOT and the general public.

The TAC consists of the following members: the Secretary of Transportation; the heads (or their designees) of the Department of Agriculture, Department of Education, Department of Community and Economic Development, Public Utility Commission, Department of Environmental Protection, and the Governor's Policy Office; two members of the State House of Representatives; two members of the State Senate; and 18 public members—six appointed by the Governor, six appointed by the President Pro Tempore of the Senate, and six appointed by the Speaker of the House of Representatives.

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Section 1: Introduction

The Automated Red Light Enforcement (ARLE) program was established by Pennsylvania state legislation enacted in 2002. Its intent is to improve safety by reducing vehicle crashes and injuries due to red-light running at signalized intersections. ARLE has been implemented at 30 intersections in the City of Philadelphia and three intersections in Abington Township, Montgomery County.

The ARLE system is a technological tool to help police by automatically monitoring signalized intersections for red-light-running violators on a 24/7 basis. This improves safety and allows law enforcement officers to focus resources on other critical police functions. ARLE cameras use still and video images to detect vehicles that travel through a signalized intersection when the traffic signal is in the steady red phase. The recorded traffic violation is then validated by appropriate enforcement officials, the vehicle owner identified, and a citation issued to the owner by mail.

The ARLE Funding Program is a state-administered competitive grant program established in 2004. It uses net revenue from ARLE violation fines to fund highway safety projects statewide. The net revenue, i.e., excess revenue after a municipality's ARLE program administration, operations, and equipment expenses have been satisfied, is placed in a restricted Motor License Fund (MLF) account to fund eligible transportation projects. However, the ARLE program's primary purpose is to improve safety, not to generate revenue—a misconception held by many.

> Red-light-running crashes caused 709 deaths and an estimated 126,000 injuries in 2014.
>
> --Highway Loss Data Institute, Insurance Institute for Highway Safety

A previous evaluation of the ARLE program was completed by the Pennsylvania Transportation Advisory Committee (TAC) in October 2011.

Background and Purpose

The TAC is fulfilling a legislative mandate authorized in Act 101 of 2016 to conduct an independent and objective assessment of the ARLE program in Pennsylvania. The assessment is to evaluate the effectiveness of the ARLE systems in the Commonwealth, including analysis of traffic volume, number of crashes and injuries, fine collection processes, and revenue limit. In addition, the assessment will examine the ARLE Funding Program revenues and allocation, and the conditions that should be present before a municipality considers approving ARLE enforcement systems.

The following aspects of Pennsylvania's ARLE program were evaluated for this report:

- ARLE legislative authorization
- Violation and crash data as well as fine revenue for ARLE intersections
- Issues and considerations for expanding the ARLE program into other municipalities
- Benefits and costs
- Statewide benefits of the ARLE Funding Program
- Relevant ARLE developments in other states

Objectives and Methodology

The TAC identified a work group to guide the work effort and review draft materials. The work group was comprised of individuals from the TAC, representatives from PennDOT, and delegates from the House and Senate Transportation Committees, as well as representatives of Philadelphia Parking Authority and Abington Township. A list of the Work Group members is provided with the Acknowledgements on page iv.

Data Collection

ARLE data was collected from a variety of sources including PennDOT, the Philadelphia Parking Authority (PPA), and Abington Township.

In-person interviews were conducted with representatives of PPA and Abington Township (Montgomery County) police officials, as well as representatives of Springfield Township in Delaware County. Interviews and questionnaire surveys were conducted with various Pennsylvania municipal officials, as well as the Executive Director of the Pennsylvania State Association of Township Supervisors (PSATS).

Section 2: ARLE Program Legislative Authorization

The Pennsylvania Vehicle Code (Title 75, Section 3116), provides the authority to establish the Automated Red Light Enforcement (ARLE) program within various municipalities throughout the Commonwealth of Pennsylvania. The original ARLE program in the Commonwealth was established in 2002 through Act 123. Additional legislation has been enacted to enhance the ARLE program since its initiation.

The original authorizing legislation, Act 123 of 2002, introduced an ARLE program within Cities of the First Class in Pennsylvania (i.e., Philadelphia) and set a program sunset date of December 31, 2005. The original program consisted of ARLE implementation at six intersections in the City of Philadelphia. Act 152 of 2002 extended the sunset date of the ARLE program to December 31, 2006. Act 8 of 2004 extended the sunset date of the ARLE program to December 31, 2007, and authorized development of the Transportation Enhancements Grant Program (ARLE Funding Program). In 2005, Act 50 reduced the ARLE warning period—the period after initial installation of ARLE in a municipality during which violators are warned but not fined—from 120 days to 60 days. Act 67 of 2007 authorized the use of digital video images to validate a violation and extended the expiration date of the program to December 31, 2011. The program expiration date was again extended by Act 129 of 2011 to June 30, 2012.

Pennsylvania is one of 24 states that operate ARLE programs.

In 2012, Act 84 extended the ARLE program to July 15, 2017, and reduced the warning period for any new ARLE intersections (when a municipality already has other ARLE intersections in operation) from 60 days to 30 days. Act 84 also revised the ARLE Funding Program to be a competitive grant program. Further, it authorized ARLE implementation in additional municipalities meeting the following criteria:

- Cities of the Second Class (Pittsburgh)
- Municipalities with a 2010 U.S. Census population greater than 20,000 that have a police agency accredited by the Pennsylvania Chiefs of Police Association (PCPA) and are located in the following types of counties:
    - Class 2-A counties as defined by the County Commissioners Association of Pennsylvania (Bucks, Delaware, and Montgomery)
    - Class 3 counties with a 2010 U.S. Census population between 490,000 and 510,000 (Chester)

Act 101 of 2016 extended the ARLE program to July 15, 2027, and required an evaluation of the program by June 1, 2017 (this report).

Figure 1 summarizes ARLE-related legislation.

Figure 1: ARLE Legislative Timeline

Year	Legislative Milestone	Noteworthy Elements
2002	Act 123 Vehicle Code (Title 75) provided enabling authority for ARLE program	• Authorized Cities of the First Class
2002	Act 152 extended ARLE through 2006	
2004	Act 8 extended ARLE through 2007	• Initiated Transportation Enhancements program (ARLE Funding Program)
2005	Act 50 revised public warning period for cameras (60 days)	• First ARLE cameras installed in Philadelphia
2007	Act 67 extended initial ARLE program through 2011	
2011	Act 129 extended ARLE program through June 30, 2012	
2012	Act 84 extended ARLE program through July 15, 2017	• Expanded authorization to Second and Third Class cities with total population greater than 20,000 • Revised the distribution of ARLE Funding Program grants
2016	Act 101 extended ARLE program through July 15, 2027	• Required an evaluation of the ARLE program

The full text of ARLE-related legislation is available at the following URLs:

Act 123 of 2002
http://www.palrb.us/pamphletlaws/20002099/2002/0/act/0123.pdf

Act 152 of 2002
http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2002&sessInd=0&act=152

Act 8 of 2004
http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2004&sessInd=0&act=8&mobile_choice=suppress

Act 50 of 2005
http://www.palrb.us/pamphletlaws/20002099/2005/0/act/0050.pdf

Act 67 of 2007
http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2007&sessInd=0&act=67

Act 129 of 2011
http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2011&sessInd=0&act=129

Act 84 of 2012
http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2012&sessInd=0&act=84

Act 101 of 2016
http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2016&sessInd=0&act=101

ARLE-Eligible Municipalities

Municipalities within the Commonwealth must comply with the parameters set forth in the legislative authorization to be eligible to implement an ARLE system. Currently, municipalities in only four counties in Pennsylvania are population-eligible. In addition to the population thresholds, the municipality must also have a police force that is accredited by the Pennsylvania Chiefs of Police Association (PCPA). Table 1 identifies those municipalities that are currently eligible to implement an ARLE system in Pennsylvania (by meeting both population and police accreditation prerequisites).

Table 2 lists municipalities that satisfy ARLE's population requirement, but do not yet have an accredited police department.

Table 1: ARLE-Eligible Municipalities (Population and Police Accreditation)

County (numbers correspond to Figure 2)	Municipality	Population
1	City of Philadelphia (ARLE implemented)	1,526,006
2	City of Pittsburgh	305,704
Bucks		625,249
3	Bensalem Township	60,427
4	Middletown Township	45,436
5	Falls Township	34,300
6	Warminster Township	32,682
7	Lower Makefield Township	32,559
Delaware		558,979
8	Springfield Township	24,211
9	Marple Township	23,428
Montgomery		799,874
10	Lower Merion Township	57,825
11	Abington Township (ARLE implemented)	55,310
12	Cheltenham Township	36,793

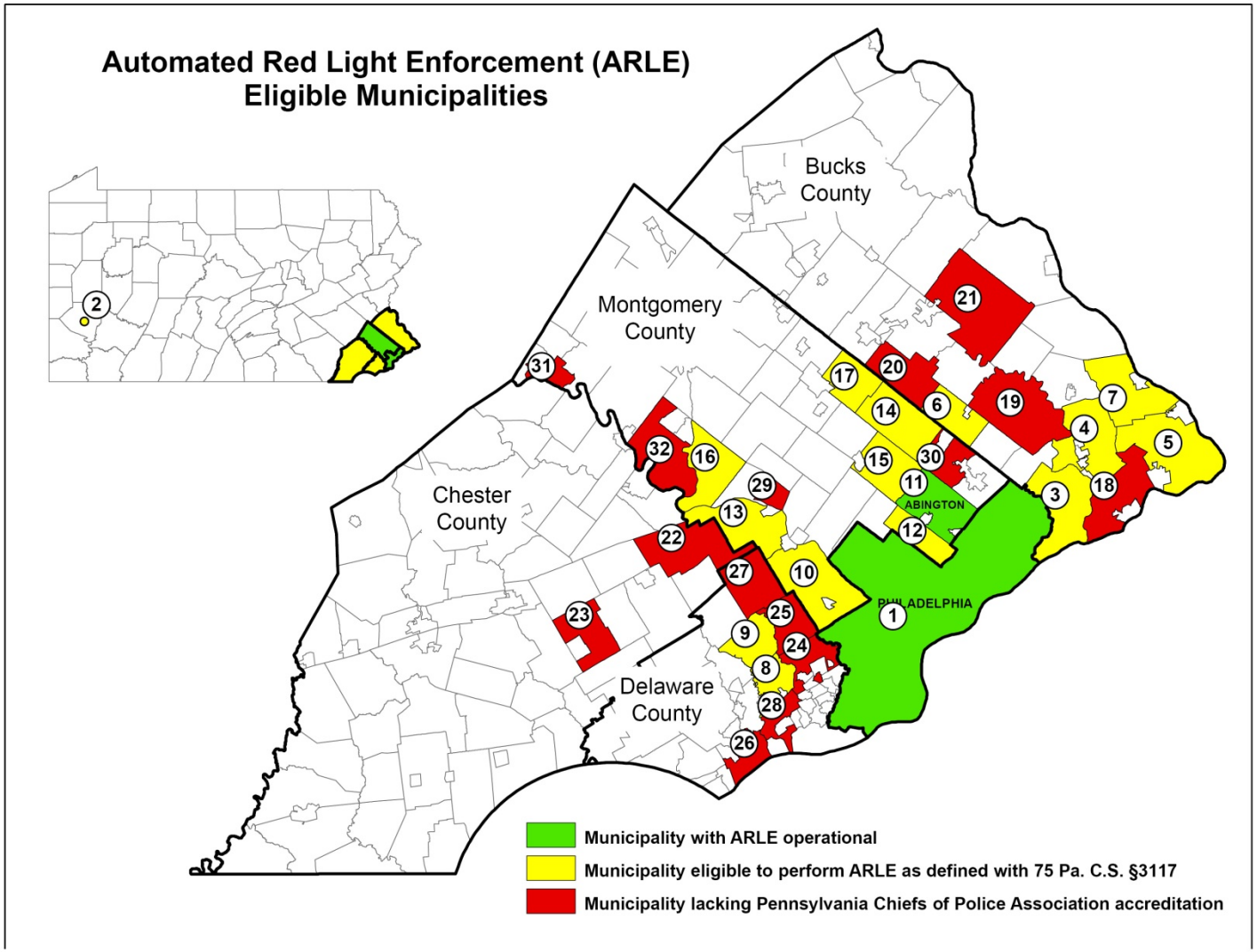
County (numbers correspond to Figure 2)	Municipality	Population
13	Upper Merion Township	28,395
14	Horsham Township	26,146
15	Upper Dublin Township	25,569
16	Lower Providence Township	25,436
17	Montgomery Township	24,790

Table 2: Population-Eligible Municipalities Lacking Police Accreditation

County (numbers correspond to Figure 2)	Municipality	Population
Bucks		625,249
18	Bristol Township	54,582
19	Northampton Township	39,726
20	Warrington Township	23,418
21	Buckingham Township	20,075
Chester		498,886
22	Tredyffrin Township	29,332
23	West Goshen Township	21,866
Delaware		558,979
24	Upper Darby Township	82,795
25	Haverford Township	48,491
26	Chester City	33,972
27	Radnor Township	31,531
28	Ridley Township	30,768
Montgomery		799,874
29	Norristown Borough	34,324
30	Upper Moreland township	24,015
31	Pottstown Borough	22,377
32	Upper Providence Township	21,219

Figure 2 maps the municipalities listed in Table 1 and Table 2.

Figure 2: ARLE Eligibility Status by Municipality



Section 3: ARLE Program Implementation and Analysis

The City of Philadelphia and Abington Township (Montgomery County) are the two Pennsylvania municipalities that have implemented ARLE cameras. Given the significant population difference between these municipalities, separate program details are provided in terms of program administration, safety impacts, violation history, and revenue yield.

ARLE in the City of Philadelphia

The Philadelphia Parking Authority has administered an ARLE program since 2005. ARLE is in operation at 30 intersections throughout Philadelphia.

Philadelphia: Program Administration and Roles

There are several primary entities currently involved in Philadelphia's ARLE program:

- **Philadelphia Parking Authority (PPA) –** ARLE program system administrator, as established by Philadelphia's ARLE-enabling ordinance. PPA is ultimately responsible for the implementation, operation, and maintenance of devices. PPA provides net revenue PennDOT.
- **Conduent** – PPA's current contracted vendor that installs, operates, and maintains the cameras and processes violations.
- **Philadelphia Streets Department –** Responsible for operation and maintenance of traffic signals at which ARLE systems are installed; reviews candidate intersections for ARLE enforcement.
- **Philadelphia Police Department –** Confirms each violation and signs the citation with an electronic signature.
- **PennDOT –** Reviews proposals for additional intersections to be controlled by red-light cameras. The Secretary of Transportation ultimately approves each intersection in conjunction with a crash evaluation and field review by District 6-0 traffic staff and PennDOT's Bureau of Maintenance and Operations. PennDOT's Center for Program Development and Management administers the ARLE Funding Program.

American Traffic Solutions (ATS) was PPA's ARLE vendor until 2014, when PPA entered into a three-year contract with Xerox (in early 2017, Xerox spun off its business services division into a new corporation named Conduent). With the ARLE program extended through 2027 by the PA General Assembly in July 2016, PPA will issue a Request for Proposals (RFP) in 2017 for a new ARLE contract.

PPA established an ARLE unit that was originally staffed with two people. As the program expanded over time with additional intersections and cameras, the number of staff members also

increased. It presently employs 11 people: one Executive Director (part-time), one manager, two processors, one coordinator, one quality assurance person, and five account clerks.

The staff responsibilities include:

- Evaluating images of apparent valid ARLE violations according to criteria; preparing citations for review by local police.
- Supporting customer service center in resolving escalated customer service issues.
- Transferring and reconciling funds between the ARLE system and the past-due collection system.
- Issuing approved refunds.
- Performing weekly visibility checks of all equipment (cameras, poles, posted signs, etc.) necessary to enforce ARLE intersections.
- Attending and providing ARLE support for weekly hearings and bi-weekly appeals.
- Supporting the ARLE vendor's project manager and staff.

All personnel are trained to assist with issuance review, refunds, hearings, appeals, and customer service.

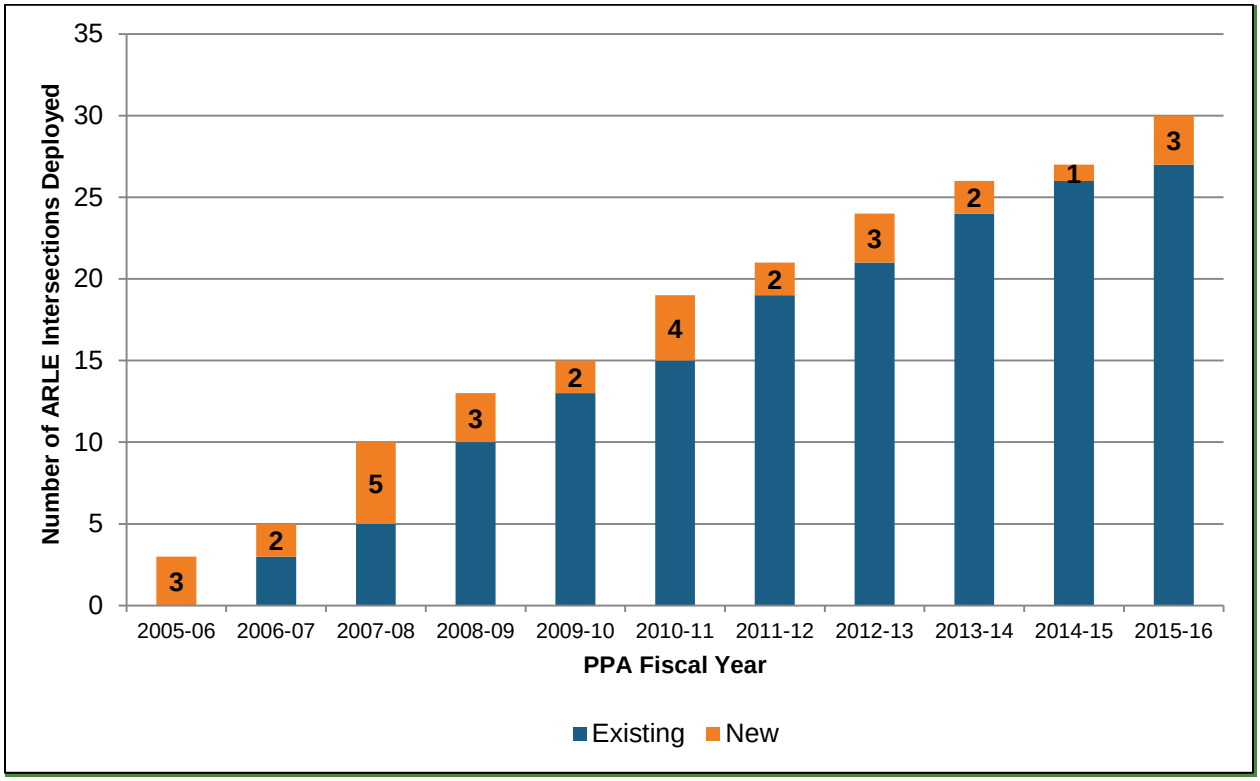
By law, the ARLE program is limited to red-light enforcement—motorists are not ticketed or fined for having an expired registration, faulty tags, etc. Registered vehicle owner information obtained as a result of a violation does not become the property of the vendor (Conduent) or PPA. Legislation further mandates that the program's cameras may not be used for surveillance purposes.

It is important to note that, in accordance with state authorizing legislation, the vendors contracted through PPA are paid a flat fee for their services and are not reimbursed based on the total number of fines collected. This contract provision eliminates a profit incentive for the vendor to maximize the number of violations ticketed.

Philadelphia: Approved ARLE Intersections

The Philadelphia ARLE program began in Fiscal Year 2005-06 with three intersections. It has steadily added intersections every year, reaching a total of 30 ARLE equipped intersections as of the end of 2016. Figure 3 presents the timeline of intersection deployments since FY 2005-06.

Figure 3: Number of Automated Red Light Enforcement Intersections Deployed in Philadelphia, FY 2005-06 to FY 2015-16



Source: Philadelphia Parking Authority

Most of the 30 ARLE intersections are in North and Northeast Philadelphia, mainly along US 1/Roosevelt Boulevard,[1] with additional intersections in Center City, West, and Southwest Philadelphia. Table 3 lists the ARLE intersections and identifies the implementation approval date as well as the date the cameras became operational. There are 134 cameras in operation for the 30 ARLE intersections in Philadelphia. The ARLE intersections are mapped in Figure 4 and detailed information for each intersection is provided in the Intersection Profile Sheets in the appendix.

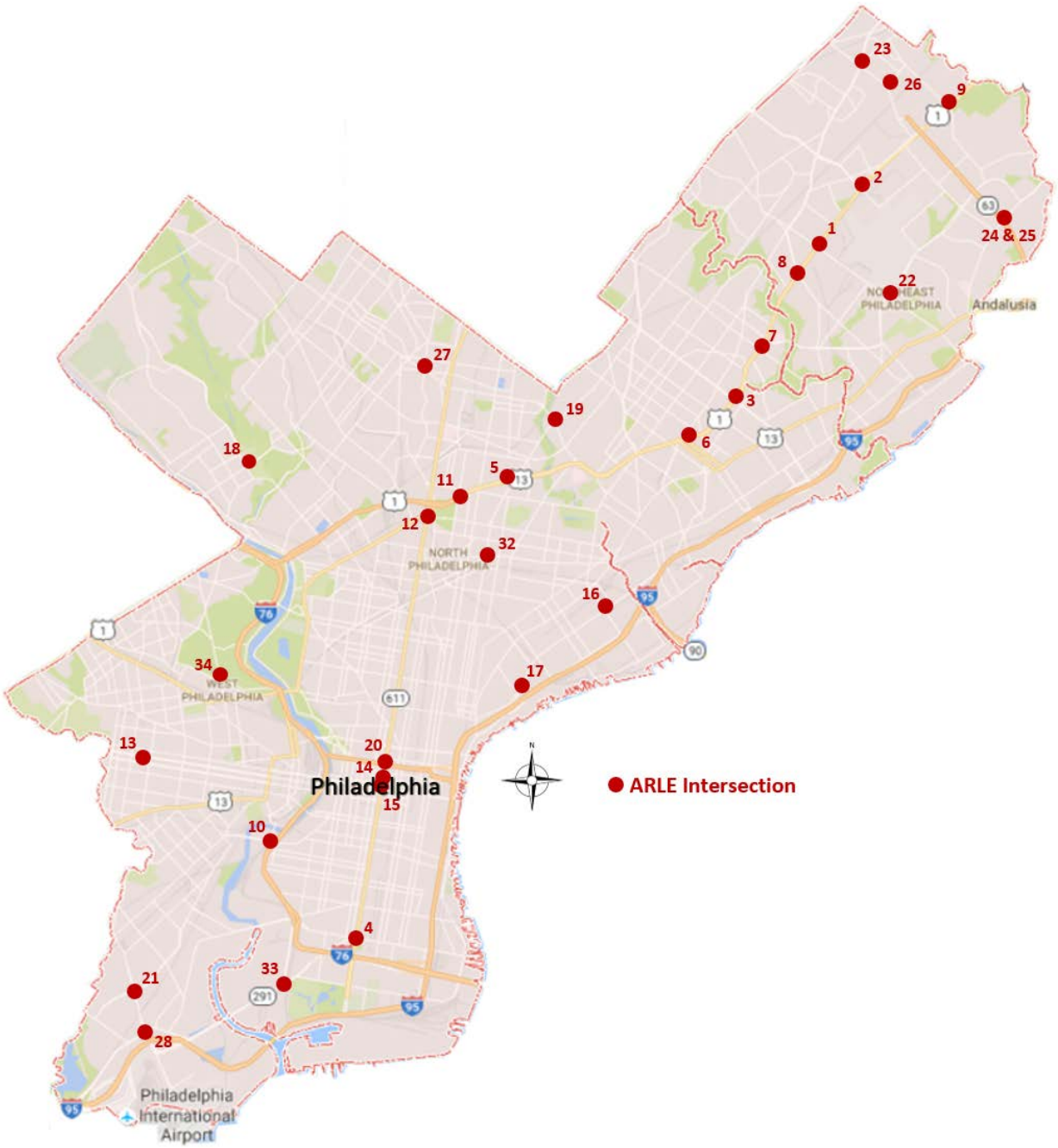
[1] Of the corridor's 52 signalized intersections, nine are monitored by red-light cameras.

Table 3: ARLE Intersection Locations by Approval and Enforcement Date

Location #	Intersection Name	PennDOT Approval Date	Enforcement Date
1	Grant Avenue & Roosevelt Boulevard	12/14/2004	6/23/2005
2	Red Lion Road & Roosevelt Boulevard	12/14/2004	9/15/2005
3	Cottman Avenue & Roosevelt Boulevard	12/14/2004	11/6/2005
4	Broad Street & Oregon Avenue	8/4/2006	11/21/2006
5	Mascher Street & Roosevelt Boulevard	2/8/2007	8/7/2007
6	Levick Street & Roosevelt Boulevard	2/8/2007	8/7/2007
7	Rhawn Street & Roosevelt Boulevard	2/8/2007	8/7/2007
8	Welsh Road & Roosevelt Boulevard	2/8/2007	8/7/2007
9	Southampton Road & Roosevelt Boulevard	2/8/2007	8/7/2007
10	34th Street & Grays Ferry Avenue	8/4/2006	12/21/2006
11	9th Street & Roosevelt Boulevard	8/20/2008	1/8/2009
12	Broad Street & Hunting Park Avenue	8/20/2008	1/8/2009
13	58th Street & Walnut Street	8/20/2008	1/8/2009
14	JFK Boulevard & Broad Street	9/3/2009	12/8/2009
15	South Penn Square & Broad Street	9/3/2009	12/8/2009
16	Aramingo Avenue & Castor Avenue	10/13/2009	3/2/2011
17	Aramingo Avenue & York Street	10/13/2009	3/2/2011
18	Henry Avenue & Walnut Lane	10/13/2009	11/13/2010
19	Rising Sun Avenue & Adams Avenue	10/13/2009	11/13/2010
20	Broad Street & Vine Street	6/7/2011	12/2/2011
21	Island Avenue & Lindbergh Boulevard	7/25/2011	2/11/2012
22	Grant Avenue & Academy Road	7/23/2012	12/18/2012
23	Bustleton Avenue & Byberry Road	7/23/2012	12/18/2012
24 & 25	Knights Road & Woodhaven Road	7/23/2012	12/18/2012
26	Byberry Road & Worthington Road	3/12/2013	7/25/2013
27	Ogontz Avenue & Stenton Avenue	11/19/2013	3/6/2014
28	Island Avenue & Bartram Avenue	12/6/2013	6/12/2014
32	2nd Street & Erie Avenue	7/25/2015	12/1/2015
33	26th Street & Penrose Avenue	7/25/2015	12/26/2015
34	Belmont Avenue & Parkside Avenue	7/25/2015	12/10/2015

Note: Intersection location numbers 29, 30, and 31 are assigned to ARLE intersections in Abington Township.

Figure 4: Philadelphia ARLE Intersection Locations



Note: Numbers correspond to list in Table 3.

Philadelphia: ARLE Procedures

Table 4 summarizes the City's process for adding ARLE intersections. PPA has made no changes to the procedures since program inception.

Table 4: Process for Adding Intersections to the ARLE Program (Philadelphia)

Step	Description	Notes
1	City Council approves a recommendation to add an intersection to the ARLE program.	PPA researches intersections at the request of City Council. PPA has red-light-running crash data it uses to advise the Council. PPA also weighs public input and crash projections in making a recommendation.
2	The recommended intersection request is reviewed by the City's Streets and Services Committee with PPA and vendor.	Group performs a site visit at the proposed intersection to consider alternative approaches and related elements such as sign placement and signal hardware.
3	City formally makes a request to PennDOT to install cameras at the proposed ARLE-controlled intersection.	In addition to data that PPA routinely uses, its vendor performs a Violation Incident Monitoring study. The vendor installs temporary cameras to examine red-light-running trends or right turns on red to evaluate the intersection.
4	PennDOT performs a field evaluation.	Representatives of PennDOT's Bureau of Maintenance and Operations and PennDOT District 6-0 participate with PPA and the City Streets Department to view the intersection and proposed installation.
5	PennDOT issues a decision on request for ARLE installation at the recommended intersection.	PennDOT responds with a letter from the Secretary or his or her designee. The letter indicates approval, disapproval, or to specify modifications that would be required.
6	City Council formally approves each ARLE-controlled intersection by ordinance.	The City approves a specific ordinance for each ARLE camera installation or a group of installations. A sample ordinance is included in the report appendix.
7	PPA's vendor installs cameras.	Equipment is installed and a 60-day warning period commences before fines formally go into effect. (Act 84 of 2012, Section 3117, changed the warning period for a municipality's first ARLE intersection to 60 days and the warning period for subsequent installations to 30 days.)
8	PPA operates and maintains ARLE intersections.	PPA issues a press release regarding the new ARLE-enabled intersection. PPA and the vendor inspect each site weekly to verify that signs are still in place and that the cameras have not been damaged or removed.

Source: Philadelphia Parking Authority

Philadelphia: Administration and Collection of Fines

The PA Vehicle Code (Title 75 – Section 3116) establishes a $100 fine for ARLE violations. Fine revenue first goes toward covering PPA's ARLE maintenance and operating costs, including its Executive Director and legal staff. After ARLE expenses are satisfied, all additional revenue is deposited into the ARLE account within the Pennsylvania Motor License Fund (MLF)

for use on safety improvement projects statewide, including Philadelphia. Additional information regarding the ARLE Funding Program is provided in Section 4. It should be noted that PennDOT does not use any of these funds to cover its administrative costs related to review of proposed ARLE intersections or the ARLE Funding Program.

ARLE-triggered penalties are lower than non-automated violations, as motorists who are ticketed by police for red-light infractions receive three points on their driving record and must pay a fine of $109.50.[2] Motorists who are identified by *both* the police and red-light cameras are treated as a non-automated violation. Motorists who are found in violation only through the use of red-light cameras do not receive any points because it is the vehicle (not the driver) that is identified.

It should be noted that per the Vehicle Code, PPA cites motorists only for red-light running.

The Philadelphia Streets Department sets the yellow signal time for each intersection based on the approved signal permit. The yellow signal time is based on the time needed for a vehicle traveling 10 mph over the posted speed limit, which allows for longer yellow times. The signal time can vary for each intersection. PPA uses the white pavement stop bar to determine whether a vehicle has entered the intersection in violation of a red-light signal. If a vehicle crosses the white stop bar on the pavement at any point before the light turns red, the violation is discarded to avoid any doubt when ticketing violators.

After a violation has been recorded by the ARLE system cameras, the still images and video are reviewed by Conduent, PPA, and the Philadelphia Police Department (PPD) staff to determine the authenticity of the violation. Once identified, the owner of a vehicle receiving the red-light violation must be notified within 30 days. The image cannot be utilized as legal evidence.

After the violation has been validated by PPA, the violation is forwarded to the PPD for electronic signature and the issuance of a violation ticket with an initial fine of $100. After 15 days of non-payment, PPA sends a second violation ticket with the fine remaining at $100.

Within 30 days of the first notice, violators may appeal the violation. Violation notices include space where the vehicle owner can sign/request an appeal to the Office of Administrative Review (OAR). If the OAR decision is also appealed, the matter then goes before the Philadelphia Municipal Court (Traffic Division). This step incurs a $35 fee, payable regardless of the court's decision.

If a violator does not respond within two consecutive 15-day violation notice periods, the ticket becomes delinquent. PPA sends a delinquent violation notice after 30 days of the original ticket

[2] Cities of the First Class may add a $10 surcharge.

notice and a penalty is assessed, increasing the fine to $120. After 60 days of non-payment a second violation notice is sent with an additional penalty increasing the fine to $145. After 90 days, the delinquent fine is increased to $175, and is sent to collections for non-payment. The violation fee structure is established by the Philadelphia City traffic code.

Following the first year of operation, the City amended the City Traffic Code to allow additional fees to be levied, as well as immobilization and impoundment of a violator's vehicle if red-light-running fines go unpaid after two notices or after being issued three citations. The vehicle may be removed by towing to the nearest Official Towing Station, or it may be immobilized by applying a boot and then towed to an Official Towing Station if not reclaimed. Since these procedures were implemented, PPA has increased its average collection rate from less than 65 percent to nearly 85 percent.

Candidate violations are discarded for reasons such as instances where the characters on the license plate cannot be identified conclusively. The use of digital image technology has greatly decreased the number of discarded violations due to equipment limitations. PPA has also encouraged funeral directors to apply stickers to the rear of vehicles in funeral processions (which are allowed to proceed through red lights uninterrupted) to reduce false ARLE violations.

According to PPA, camera operations typically experience some downtime. There have been interruptions due to hardware failures or power issues, and in such cases cameras are normally down for no more than one or two days. The only downtime of any noteworthy duration was during the transition between vendors in 2014 while equipment was being replaced.

The process for identifying and ticketing red-light violators is summarized in Table 5.

Table 5: Steps in Identifying and Ticketing Violators of an Automated Red Light Enforcement System

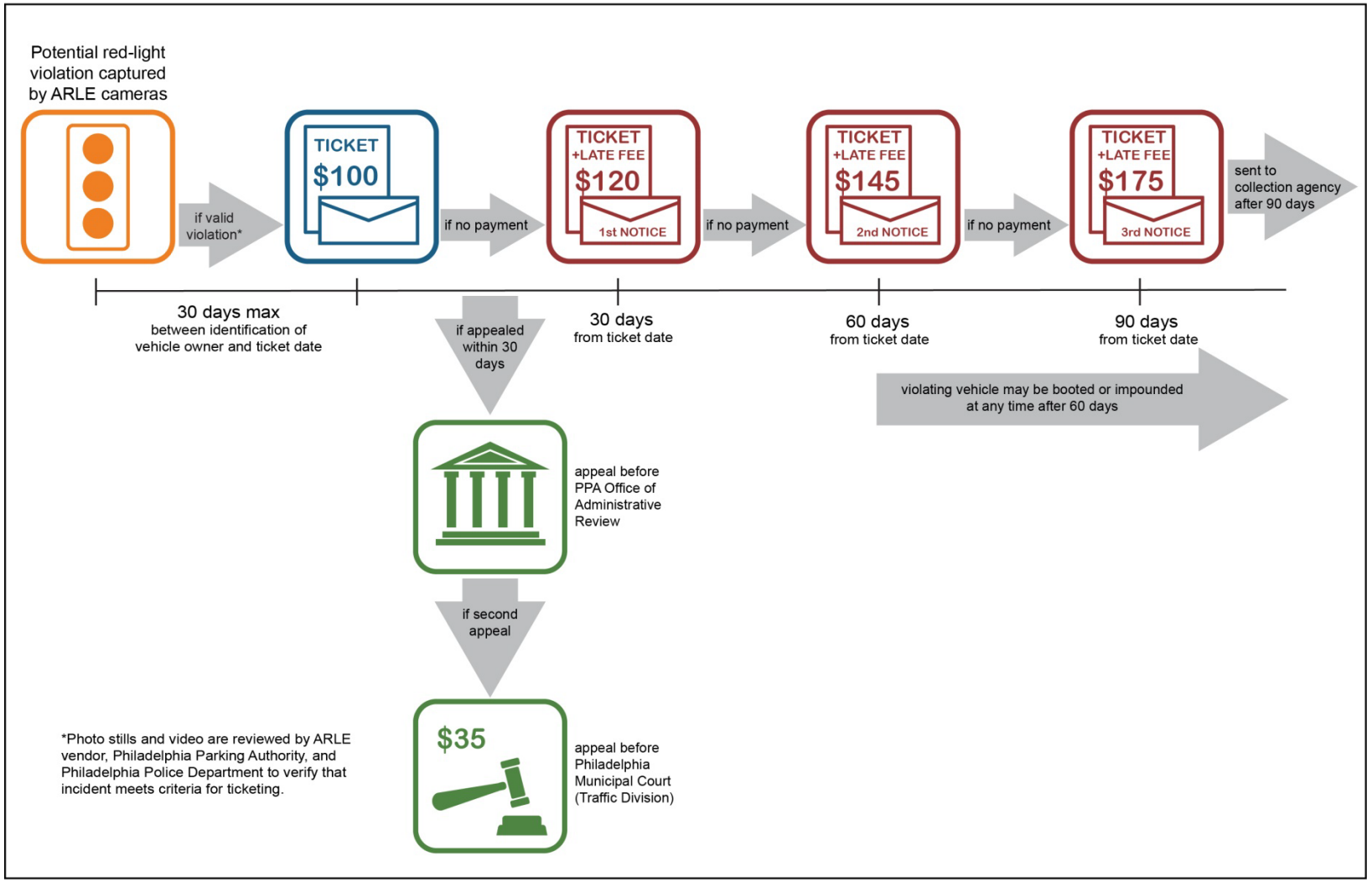
Step	Description	Process Notes
1	ARLE camera photographs motorist running red light.	• ARLE cameras are tied to the traffic signal controllers and detectors that monitor traffic and are locally controlled at the intersection (the ARLE system is separate from the traffic signal operations). The cameras automatically photograph vehicles that enter the intersection after the light has turned red. Photos are triggered immediately after the light changes to red. All signal timings are set according to an established signal plan using engineering practices identified in the federal Manual on Uniform Traffic Control Devices (MUTCD). (PPA uses both still images and digital video in reviewing violations). • Two images are captured—a first rear image and a second rear image.

Step	Description	Process Notes
		o First rear image: The "A" shot is captured from the rear, showing the scene of the violation including the back of the violating vehicle in front of the violation line, one or more visible red-light signals, and a clear image of the license plate of the offending vehicle, all from the single, base image. Vehicles need to be completely stopped before the white stop bar prior to the light turning red to avoid a violation. o Second rear image: The "B" shot is also captured from the rear, showing the scene of the violation including the back of the violating vehicle that has illegally entered the intersection, one or more visible red-light signals, and a clear image of the license plate of the offending vehicle, all from the single, base image. • Either the "A" image or the "B" image is then cropped to provide a magnified view of the license plate for easy identification. (For the court and police department, this is the most significant technology innovation in photo enforcement).
2	Vendor (Conduent) sends images to PPA clerks for review.	• PPA clerk reviews the photo and video images provided by vendor for potential violations. Plate characters are entered into a database to verify that the plate matches the vehicle in the DMV database. PPA has a secure Web-based log-in with two user IDs to the vendor's system. All activity can be traced by user to ensure accountability and transparency.
3	PPA Manager reviews image.	• A supervisor verifies the clerk's determination.
4	City Police review image.	• The City Police perform a final confirmation of the violation. An officer affixes an electronic signature on the citation, since the police department is the official enforcement authority.
5	PPA issues a violation notice.	• PPA prepares and sends the notice to the vehicle owner. A second notice is sent if no response has been received in 15 days.
6	After two notices of non-payment, vendor sends consecutive notices increasing the violation fine to $120, $145, and $175.	• When tickets become delinquent (after 30 days), enforcement of the penalty phase begins. In accordance with the Vehicle Code, the burden of proof rests with the vehicle owner.

Source: Philadelphia Parking Authority

The process for issuing tickets and collecting fines is depicted in Figure 5.

Figure 5: Philadelphia ARLE Violation Process

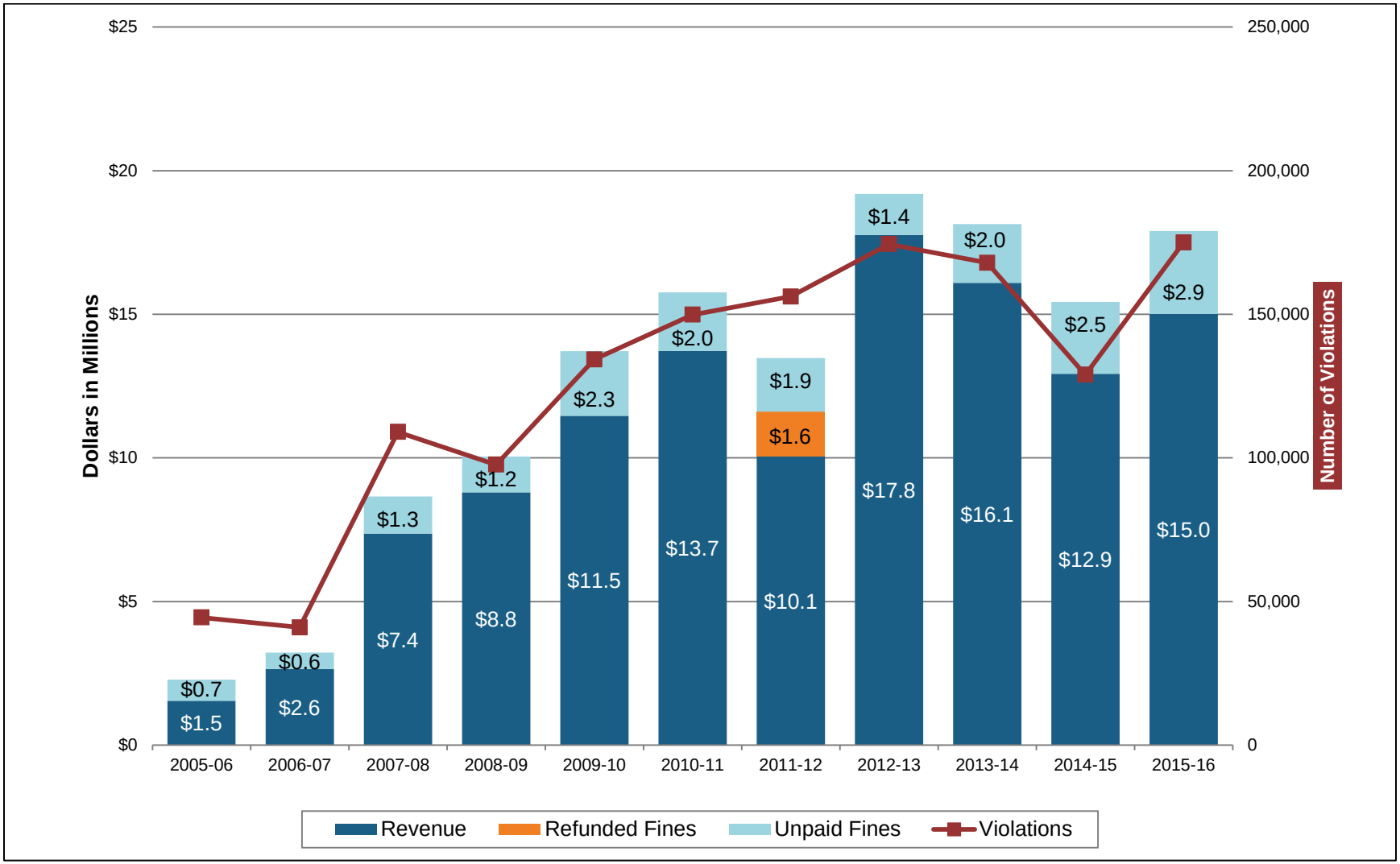


Philadelphia: Fine Revenues

Figure 6 shows a history of violations, collected fine revenue, and unpaid fines. The dip in revenues and in number of violations in FY 2015 is attributed to the change in vendors. The change in vendors resulted in a period during which cameras were not in operation and therefore violations were not recorded.

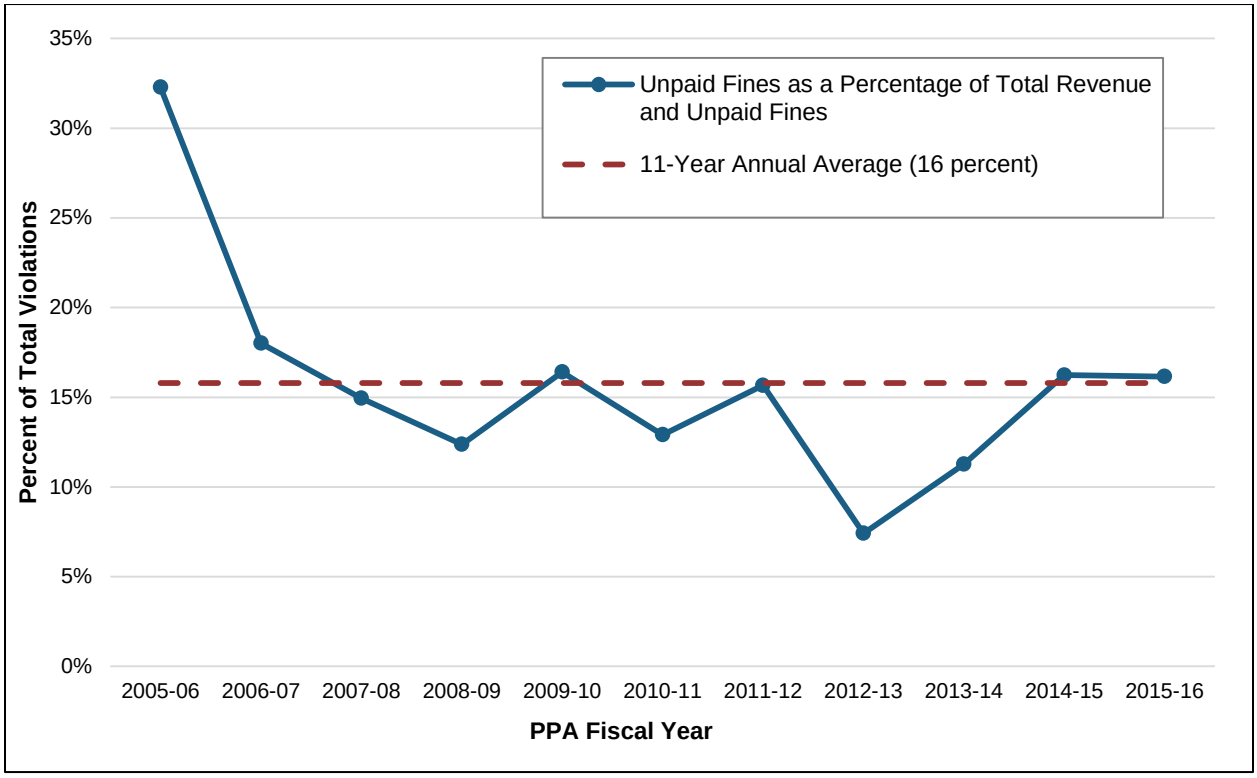
PPA has indicated that an error in implementing a new ARLE intersection may account for at least part of the low fine revenues in FY 2012. At the intersection of Island Avenue and Lindbergh Boulevard, red-light cameras were activated on December 13, 2011, without proper warning signs. Signs were not installed until February 13, 2012, at the end of the anticipated 60-day warning period. Due to this error, PPA determined the official 60-day warning period to be from February 13, 2012, to April 14, 2012, and refunded fines for all tickets issued during that period. The refund totaled nearly $1.6 million, which does not account for the entire gap in revenue.

Figure 6: ARLE Violations vs. Revenue



The fine collection rate is measured by comparing uncollected potential revenue from delinquent fines and penalties to collected revenue from fines and penalties. It is not a comparison of the *number* of violations unpaid to the number of violations issued, because PPA has no point at which it classifies a violation as "unpaid." The revenue-based rate, however, should closely track a rate based on the number of delinquent violations. At the program's inception in 2005, unpaid fines accounted for 32 percent of the program's total potential violation revenue (total potential revenue is the sum of collected and uncollected fines). The rate of unpaid fines declined dramatically after the program's inaugural year (and the traffic code amendment that imposed penalties for non-payment), and has consistently remained at or below 16 percent since 2007, as shown Figure 7. This rate is lower than that of other U.S. ARLE programs. For example, the unpaid violation rate is approximately 25 percent in the District of Columbia; 21 percent in Suffolk County, NY; 30 percent in Dallas, TX; and averages 22 percent for four cities in Iowa. The City's collection efforts, detailed above, include booting a vehicle for three or more unpaid parking and/or red-light tickets, law firm collections for difficult-to-collect amounts, and ongoing delinquent tax notices.

Figure 7: Unpaid Fines as a Percentage of Total Potential Violation Revenue

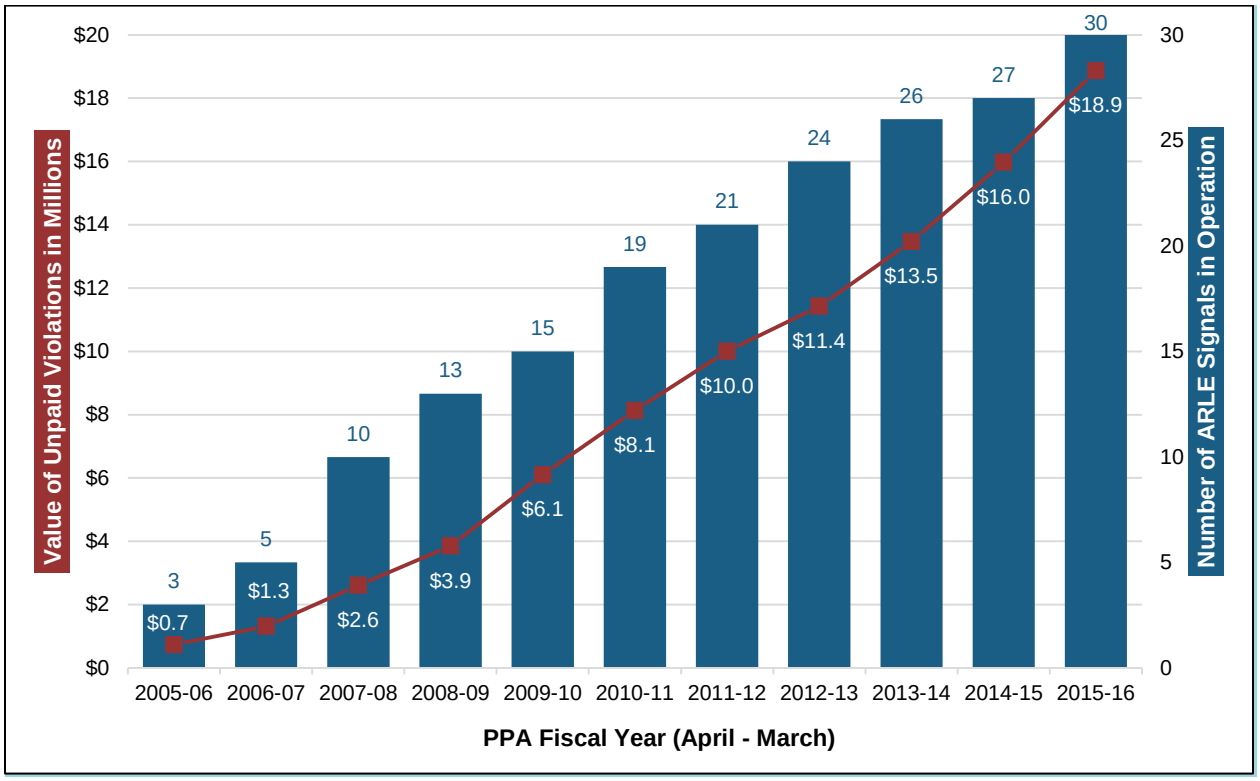


Source: Philadelphia Parking Authority Annual Reports

Note: Total Potential Violation Revenue is the sum of collected fines, including late payment penalties, and the value of unpaid fines, including late payment penalties on those fines. Because penalties increase the fine (to $120, 145, or $175), Total Potential Violation Revenue is a slightly different measure than total violations multiplied by the $100 initial fine.

Figure 8 shows the increase in cumulative unpaid violations since the program's start, which generally tracks with the increasing number of traffic signals in the ARLE program. While the $18.9 million in cumulative unpaid violations is significant, the recent average unpaid collection rate of 16 percent compares favorably to the experience in other states, as noted above.

Figure 8: Cumulative Unpaid Fines and Penalties, FY 2005-06 to FY 2015-16



Source: Philadelphia Parking Authority Annual Reports

Philadelphia: Program Expenses

Table 6 details the most recent five-year history of expenses incurred in administering the ARLE program in Philadelphia. A description of the expense line items in Table 6 is presented in Table 7. A significant share of program expenses is associated with the installation and maintenance of ARLE-related equipment as represented in vendor cost. In FY 2015-16, for example, vendor cost accounted for well over half of the program's expenses. PPA's administration accounted for one-third of total FY 2016 expenses. Its share was one-fourth in FY 2012.

Table 6: Philadelphia ARLE Program Expenses, FY 2011-12 to FY 2015-16

	For the Fiscal Year Ending March 31,					Percent of Total in 2016
	2012	2013	2014	2015	2016	
ARLE Equipment Vendor	$4,597,777	$5,165,877	$5,760,937	$4,921,242	$5,717,378	58.1
Ticket Processing Vendors	622,250	783,451	804,799	645,851	701,513	7.1
Subtotal Vendors	**5,220,027**	**5,949,328**	**6,565,736**	**5,567,093**	**6,418,891**	**65.3**
PPA Personnel	569,181	577,123	562,840	770,624	887,493	9.0
PPA Support	851,604	1,157,308	1,395,771	1,420,314	1,689,850	17.2
Rent	54,921	63,763	35,293	28,311	29,029	0.3
Gov't Relations/Media	22,500	37,500	37,500	30,000	10,000	0.1
Technical Program Review	11,561	2,079	16,913	3,810	4,500	0.0
Credit Card Fees	48,546	71,125	70,086	76,153	85,895	0.9
Other Expenses	261,323	226,942	152,287	597,471	552,034	5.6
Subtotal PPA Admin.	**1,819,636**	**2,135,840**	**2,270,690**	**2,926,683**	**3,258,801**	**33.1**
Phila. Police Department	42,179	69,413	74,107	72,570	78,611	0.8
Phila. Department of Finance	68,199	74,058	74,092	74,272	76,817	0.8
Subtotal Other Agency	**110,378**	**143,471**	**148,199**	**146,842**	**155,428**	**1.6**
Total Expenses	**$7,150,041**	**$8,228,639**	**$8,984,625**	**$8,640,618**	**$9,833,120**	**100.0**
Number of Intersections	21	24	26	27	30	
Total Cost per Intersection	$340,478	$342,860	$345,563	$320,023	$327,771	
Number of violations	124,023	171,105	166,314	128,936	168,756	
PPA admin. per violation	$15	$12	$14	$23	$19	
Total cost per violation	$58	$48	$54	$67	$58	

Table 7: Description of PPA Operating Costs

Line Item	Description
Vendor Processing Fee	Payment to vendor for installing and maintaining the cameras, managing data, and providing technical support
Ticket Processing Fees	Payment to ACS for collection services
Philadelphia Police Dept.	Reimbursement for reviewing and approving/rejecting violation photographs
Philadelphia Dept. of Finance	Reimbursement of the Office of Administrative Review for first-level hearings on contested violations
Personnel Costs	Includes current staff salaries and fringe benefits for 10 full-time employees in the ARLE unit
PPA Support	The allocated expense for PPA support services such as human resources, purchasing, IT, management, security, etc.
Equipment Rent Expense	Allocated rent expense of PPA equipment
Government Relations/Media Consulting	Expense for public awareness initiatives
Technical Program Review	PPA expenses for technical analysis including report production costs
Credit Card Fees	Fees paid to credit card companies for processing credit card payments
Other Expenses	Miscellaneous expenses such as office supplies, uniforms, auto expenses, etc.

Source: Philadelphia Parking Authority

Figure 9 displays the recent five-year trend of costs by subcategory. The figure depicts that the vendor costs account for the largest share of total program costs. It also displays a generally increasing total expense trend, which is consistent with the increasing scale of the program as the number of intersections has increased each year over this period. The decline in total expenses from FY 2014 to 2015 reflects a substantial decrease in the vendor cost as FY 2015 was the year that PPA entered into a contract with a new equipment vendor and the ARLE system was inoperative for a time. Figure 9 also displays the growing share of PPA expenses in total ARLE expenses. This is partly because the new contract shifts some of the cost burden to the PPA. For example, the PPA took possession of some underground assets and began expensing depreciation for them in 2015. Fiscal Years 2015 and 2016 are also affected by some one-time legal expenses related to the previous vendor contract and increases in staff pension costs.

Figure 9: Expenses by Agency, FY 2012-2016

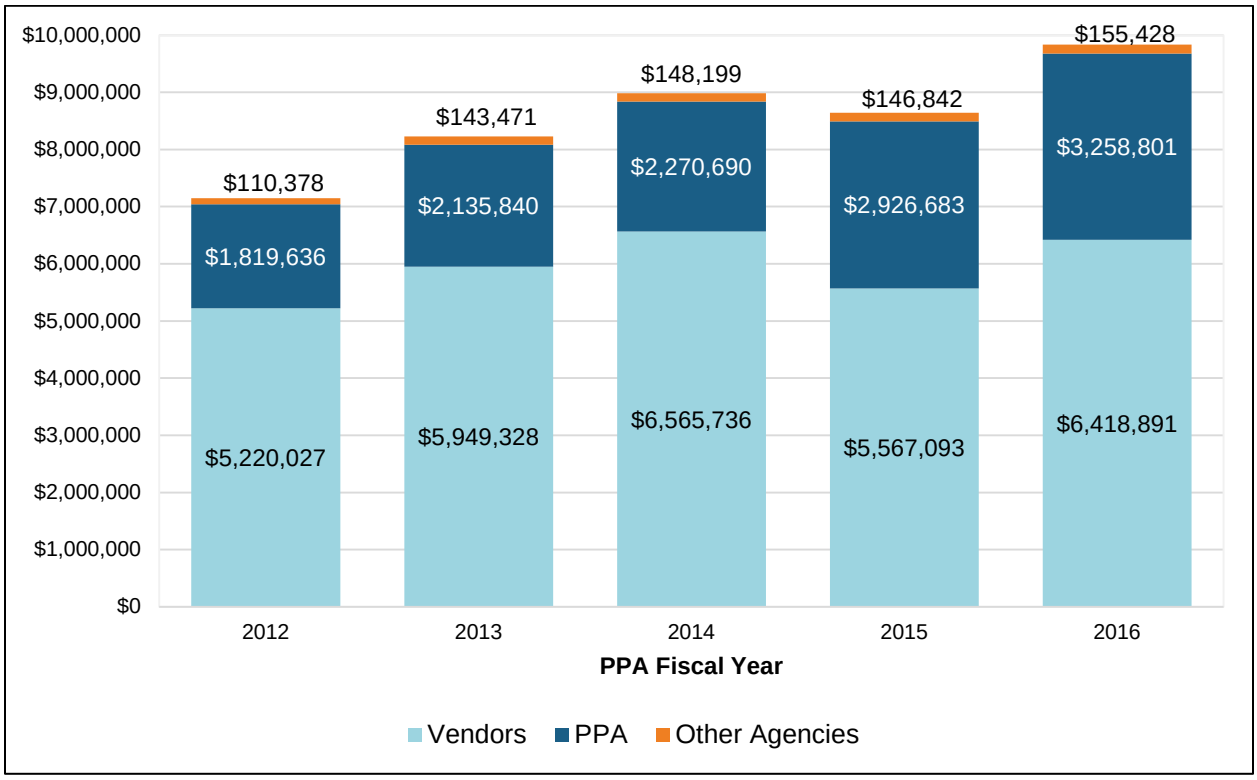
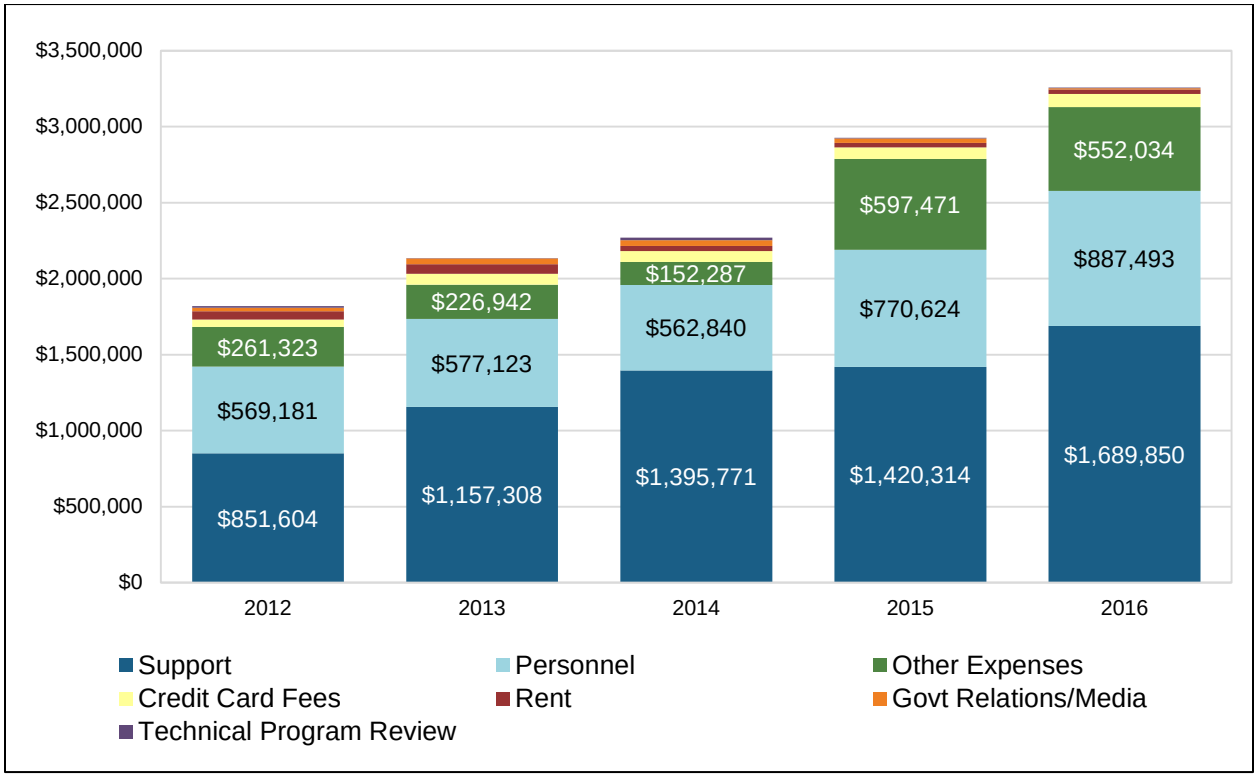


Figure 10 presents the trends in the itemized expenses for the PPA subcategory. The figure illustrates the increase in total PPA expenses from FY 2014 to 2015. This increase coincided with an increase (nearly 300 percent) in the expense category labeled "other expenses" as well as a 37 percent increase in personnel expenses. Even with the increase, personnel expenses, at $5.26 per violation in 2016, compare favorably to personnel expenses in Abington, which averaged $14 per violation in 2016 (see Table 10).

Support expenses, which are essentially equivalent to an overhead cost item, are a very substantial share (52 percent in 2016) of PPA ARLE administration costs. With the exception of Program Year 2014, the Support line item has been a roughly steady share of PPA administration in the past five years, ranging between 47 and 54 percent. In 2014 its share was 61 percent. Expressed as a multiple of personnel expenses, the Support expense varied from 1.5 times personnel expense in 2012 to nearly 2.5 times personnel expense in 2014. It was a multiple of 1.9 times personnel expense in Program Year 2016.

Figure 10: Itemized PPA Administration Expenses,* FY 2012-2016



*Excludes payments to equipment and ticket processing vendors and expenses at City Finance and Police Departments.

Philadelphia: Financial Performance

It is important to underscore that the purpose of the ARLE program is to improve safety by reducing the number of violations and crashes due to the running of red lights, not to generate revenue—even though revenues are realized through the collection of citation fees. The number of violations in the Philadelphia ARLE program is sufficiently large that the revenue collected from the violation fees exceeds the expense of operating the system. The ARLE Funding Program was established to use any net revenue generated from automated enforcement for safety improvements on roadways throughout the Commonwealth. The permissible uses of the ARLE Fund are described in Section 4.

Table 8 and Figure 11 show the historical trends in revenue and costs for the ARLE program. PPA reported a cumulative total net income of approximately $50 million for the ARLE program from inception in 2005 to March 31, 2016. Current ARLE legislation establishes a limit on the total revenue collected by a municipality, which may not exceed five percent of the municipality's annual budget. The total 2016 City of Philadelphia budget was $8.7 billion (see http://www.phila.gov/openbudget/), indicating an ARLE revenue limit of $435 million. The total revenue collected from the ARLE program is $117 million, which is less than the revenue limit.

Table 8: ARLE Financial History, Fiscal Years 2011-12 to 2015-16

	Fiscal Years	For the Fiscal Year Ending March 31,					
	2005-2009	2012	2013	2014	2015	2016	Totals
Total Program Revenue	$45,544,632	$10,057,700	$17,763,697	$16,091,899	$12,925,384	$15,004,869	$117,388,181
PPA Program Expenses	$24,656,251	$7,150,041	$8,228,672	$8,984,625	$8,640,618	$9,833,120	$67,493,327
Net Income	$20,888,381	$2,907,659	$9,535,025	$7,107,274	$4,284,766	$5,171,749	$49,894,854

Source: PPA Annual Reports

Figure 11: ARLE Program Expenses and Net Revenues, FY 2005-06 to FY 2015-16

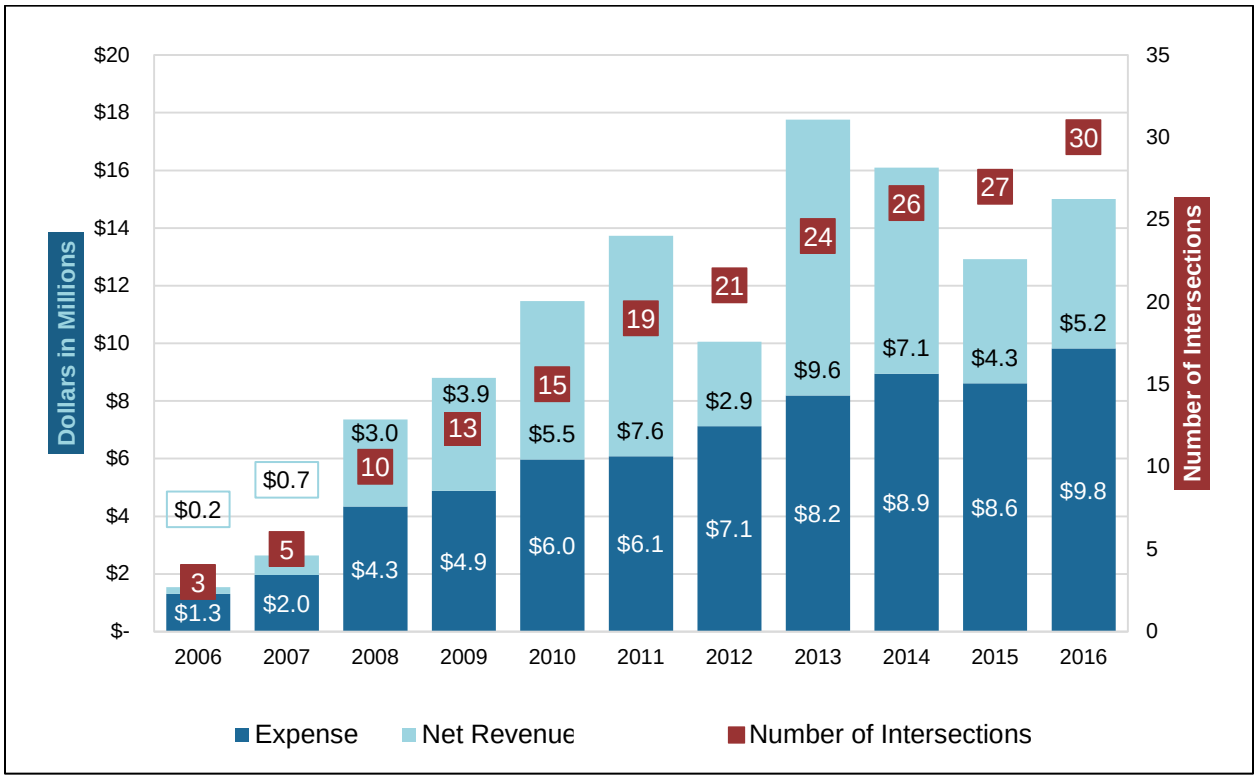


Figure 11 displays a consistently increasing trend in expenses and number of intersections since FY 2006. Total program revenue, reflected by the height of the bars, increases from the first full year (FY 2006) through FY 2011, and then becomes more erratic thereafter. The revenue decline in fiscal year 2012 was discussed under "Fine Revenues." Due to the variation in fine revenues, net revenues available for transfer to the ARLE Funding Program in the Motor License Fund varied considerably, with the peak at more than $9.5 million dollars in net revenue in FY 2013.

It should be noted that a general decline in average revenue per intersection can be expected if an ARLE program is having its desired effect of discouraging red-light running. Since 27 of the existing 30 ARLE intersections can be considered mature, with no significant decline in violations expected, violations going forward should be fairly stable, assuming no change in outside factors. With a fixed fine level of $100 and inflation expected to increase costs, some decrease in net revenue can be expected if no intersections are added. If any intersections are added, the net revenue effect could be positive or negative, depending on the number of cameras at the intersection (cost) and the number of violations (revenue).

Philadelphia: Violation Trends After ARLE Implementation

Violation numbers from each of the ARLE intersections were examined to determine whether ARLE appears to have a sustained effect on driver behavior. Unfortunately, only a partial picture

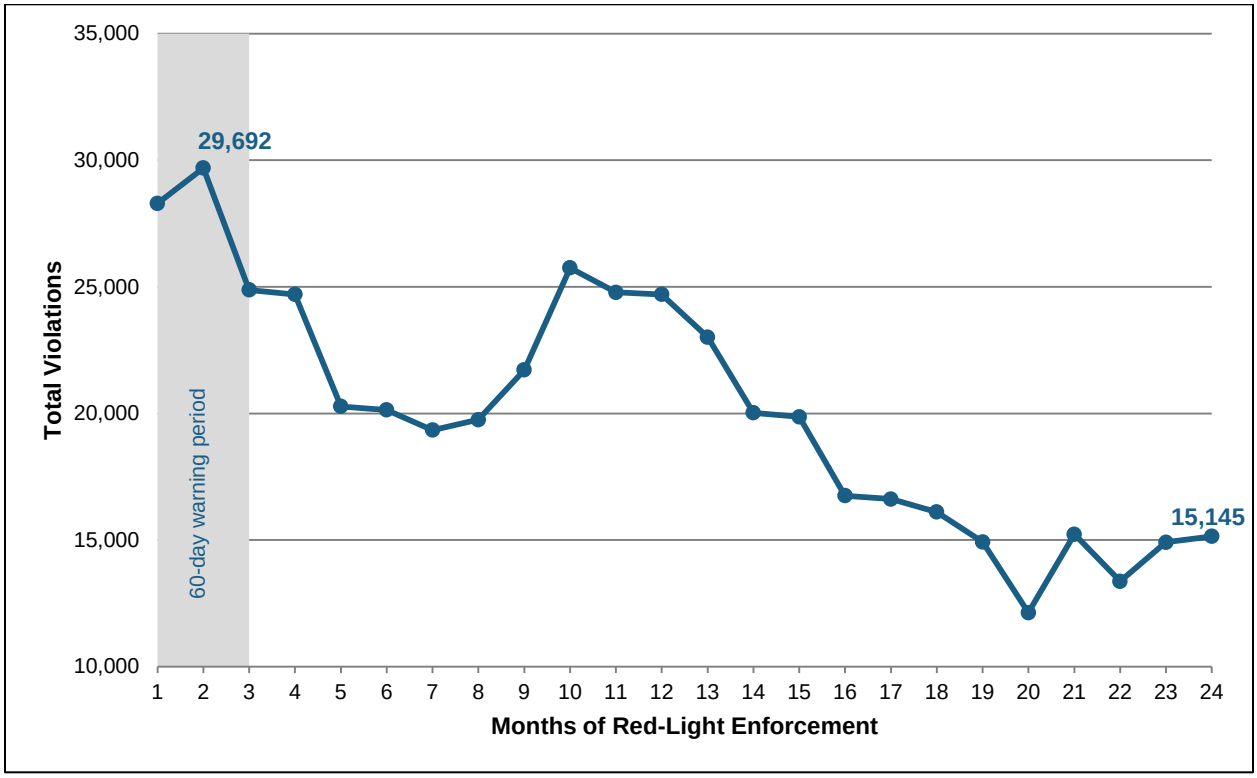
of ARLE effects on red light violations is possible because the number of violations prior to implementation at any intersection is not known.

Each Intersection Profile sheet in the appendix presents a graph of the monthly number of violations at the intersection since implementation. The violation data are aggregated over the 21 ARLE intersections that were in place as of 2012 to produce the time trend shown in Figure 12.

All violations counts are aligned according to the number of months from when the cameras were installed at the intersection. During the first two months of monitoring (reduces to 30 days for subsequent intersections), warnings are issued but no fines. The data show a peak of 29,692 total violations during the second month of the 60-day warning period,[3] then a sharp decrease to 24,878 during the first month of enforcement. Within one year of ARLE implementation, the number of monthly violations decreased to 23,013. By Month 24, violations decreased to approximately half the pre-ARLE level at 15,145. Individual intersections have considerable fluctuation in trends, but most experience a decline over the long term. Many of the intersections implemented in the early years of ARLE (mid-2000s) only experienced sustained, substantially lower levels of violations after several years of large numbers of violations.

[3] 75 Pa. C.S. §3116 (d)(1) requires a minimum 60-day warning period prior to fines being issued.

Figure 12: Total Automated Red Light Enforcement Violations



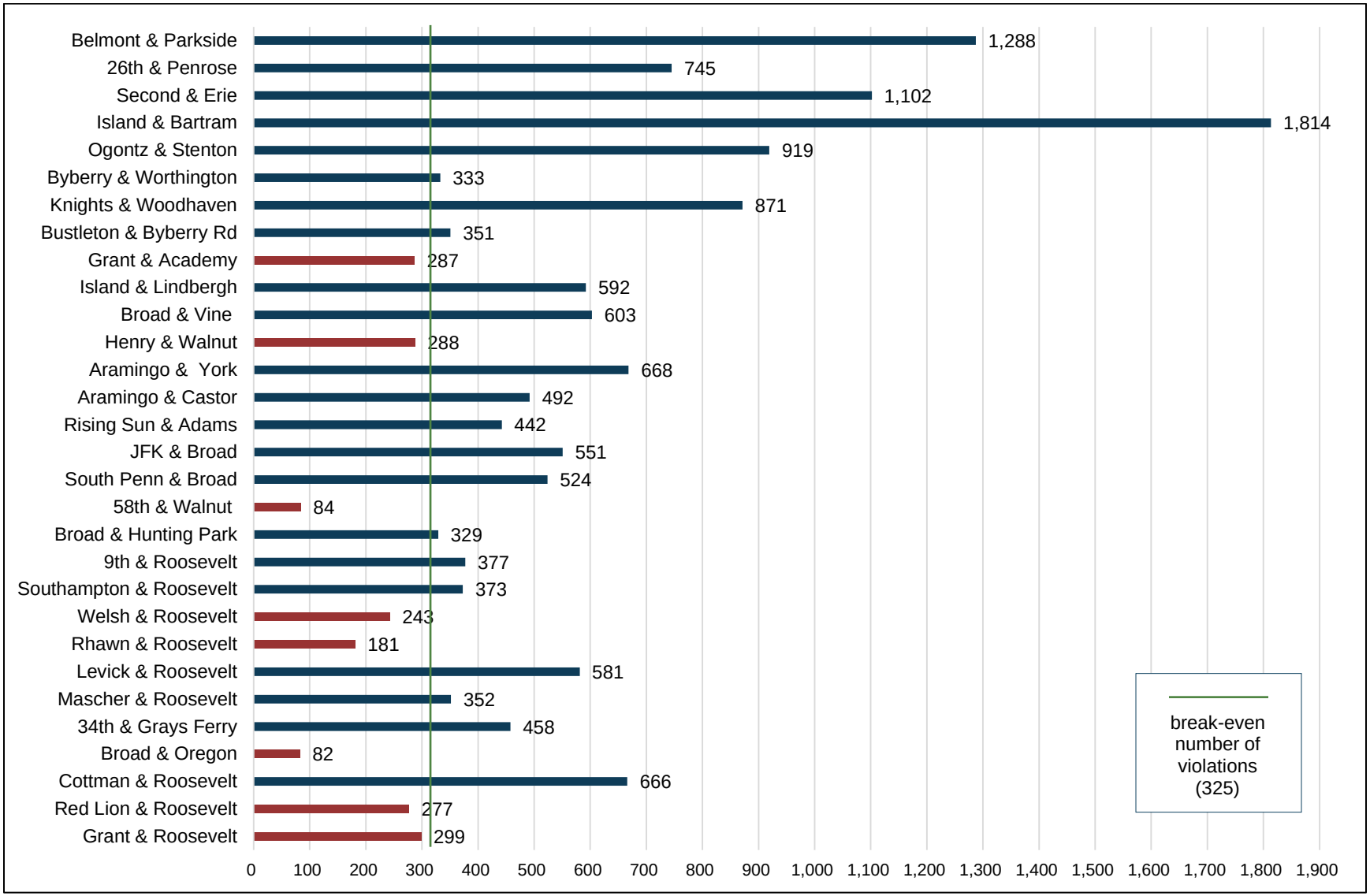
Source: Philadelphia Parking Authority

Five of the intersections included in the analysis did not follow the overall trend of decreasing violations by the end of Month 24. Had these intersections been excluded from the totals shown in Figure 12, the downward trend for the remainder would have been even more pronounced.

There is substantial variation among the intersections in the number of violations. Figure 13 displays the average number of violations per month in 2015 for each intersection, in reverse order of implementation (most recent first). The three intersections at the top of the chart were in their first few months of operation; a decline in future months can be expected for these intersections.

The vertical line at 325 marks the break-even number of violations, for which an intersection's expected fine revenues (at an assumed 84 percent collection rate) would equal the average ARLE cost per intersection. Eight of the intersections fall short of this break-even threshold, meaning that they likely contribute more to the costs of the Philadelphia ARLE program than they contribute to its revenue.

Figure 13: Annual Average Violations per Month by Intersection in 2015



Philadelphia: Intersection Crash Analysis

An analysis of crash data was performed to evaluate the safety effects of Philadelphia's ARLE program.[4] Various measures of safety were considered for examination. The reported number of injuries was selected as the measure for detailed analysis because it most closely captures safety effects. Other potential measures are the number of crashes in which there was an injury or fatality and the number of overall crashes (both injury crashes and property-damage-only crashes). The numbers of overall crashes (injury and property-damage-only), injuries in red-light-running crashes, and injuries in all crashes are reported for each intersection on the Intersection Profile Sheets in the appendix.

Analysis of Effects on Number of Injuries

The PennDOT Crash Report database was accessed to collect data on the number of injuries in crashes at each of the ARLE intersections for each year from 2000 through 2015 (the most recent available). By definition, "non-reportable" crashes are not in the crash database that was used for this analysis. Non-reportable crashes involve no injuries, fatalities, or towing. Because the crash analysis focuses on injuries and injury accidents, it is not of concern that the data source does not include non-reportable crashes. The number of injuries in crashes at an ARLE intersection was totaled for the five years before and five years after the year that ARLE was first implemented. The percentage change from the before to the after period was calculated. The number of injuries from crashes in the year that ARLE was implemented was not included because monthly violation data show that that period is typically one of transition. The percentage changes in the number of injuries from crashes were calculated for four sets of ARLE intersections: those added in 2005, 2007, 2009, and 2010. These intersections were chosen because there were at least three intersections added in the same year and there were five years of post-ARLE implementation crash data available. To account for the possibility that more general trends were affecting the crash incidences, the number of crashes in all signal-controlled intersections without ARLE was also tallied for the same five-year periods for comparison to the changes at the ARLE intersections.

Figure 14 and Figure 15 display the results for each of the groupings of ARLE implementation.

Injuries in Crashes with Red-Light Running

The figures display the percentage change in number of injuries occurring in crashes at intersections with red-light signals. Figure 14 focuses exclusively on injuries in crashes

[4] This analysis is not intended to meet all the requirements for a rigorous statistical study. A number of more statistically sophisticated analyses of ARLE safety effects in other communities and their findings are summarized under the Benefits and Costs discussion in Section 5 of this report.

attributed to red-light running. As shown in Figure 14, injuries caused by red-light-running crashes were lower after ARLE implementation in all of the groupings. For example, at the three intersections implementing ARLE in 2005, there were a total of 132 injuries reported in the five years before implementation and 30 injuries in the five years after, for a total decrease of 77 percent. During this period, injuries from red-light-running crashes also decreased at non-ARLE intersections, but not to as great an extent as at the three ARLE intersections. The results shown in Figure 13 strongly suggest that ARLE has safety benefits in the form of reduced injuries in crashes attributed to running red lights. The actual numbers of injuries for each individual intersection in the before and after periods can be seen on the Intersection Profile Sheets in the appendix.

Injuries in All Crashes

Evaluating the safety effects of ARLE requires measuring the injuries from all crashes, not only from those crashes caused by red-light running. An increase in other crashes, particularly rear-end crashes, could potentially outweigh the benefits of a decrease in red-light-running crashes. This analysis focuses on the number of injuries because it allows the expected difference in crash severity to be captured. Red-light-running crashes are considered to be generally more severe because they are typically angle collisions, rather than rear-end collisions. Even if rear-end crash rates are not affected by ARLE, the percentage injury reductions due to ARLE would be lower when all crashes are counted because red-light running is only one source of crashes.

Figure 15 examines the changes in the number of injuries caused by all crashes. It shows that for the intersections added in 2005, injuries in all crashes are actually higher after ARLE, and in fact the increase exceeds the increase at non-ARLE intersections. Of the three intersections, Roosevelt and Red Lion drives this negative result. Injuries there increased from 73 to 125, a 71 percent increase. This result suggests that ARLE is not the solution to this intersection's safety challenges and that other measures are required.

The other intersection groupings showed a modest safety benefit as measured by comparing percentage injury reduction at intersections with ARLE to injuries at intersections without ARLE. The most substantial percentage reduction was for the three intersections added in 2010. There were 74 injuries in the five years before implementation versus 52 in the five years following, for a 30 percent reduction. In comparison, injuries declined nine percent at intersections without ARLE.

Effects on Fatalities

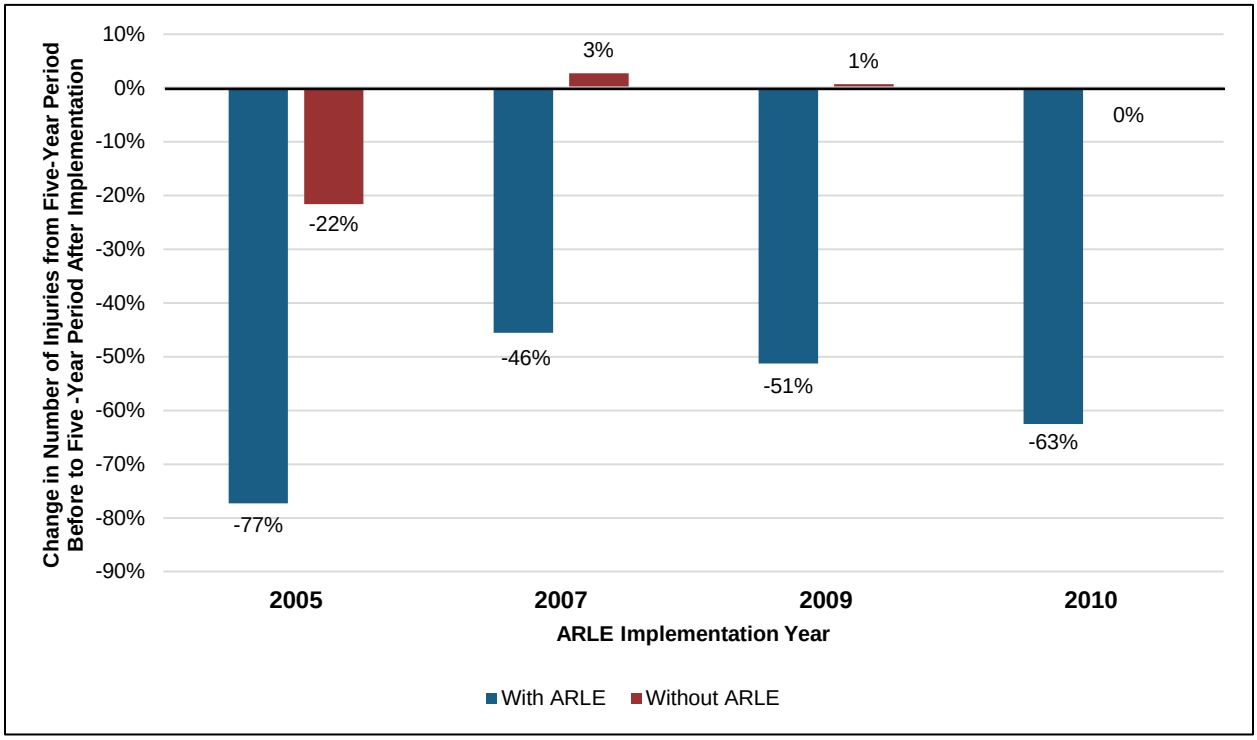
Due to the low number of fatalities both before and after ARLE implementation, it is not possible to draw a statistically definitive conclusion about ARLE's effects on fatalities. The 24 ARLE intersections for which sufficient years of crash reporting are available showed a total of

six fatalities in the five years before ARLE implementation and three fatalities in the five years afterward.

Effects on Number of Injuries in All Crashes

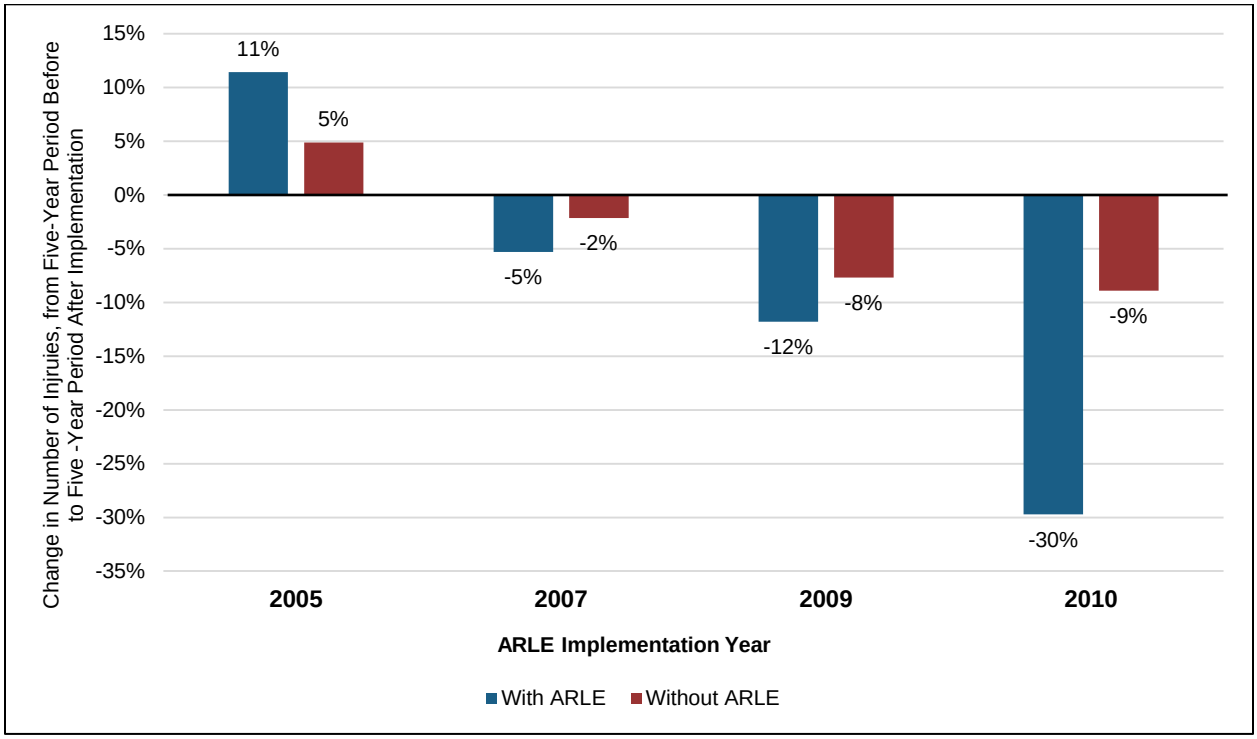
Crash data on all crashes, regardless of cause or type, were compiled at each of the ARLE intersections. Of the 27 intersections with at least three years of post-implementation crash data, 16 exhibited an *increase* in the number of injuries from all crashes after ARLE implementation. However, a statistical significance test applied to the data[5] found that the increase was not significant at the five percent level. When limited to injury crashes (excluding property-damage-only crashes), 16 of the intersections exhibited a *reduction* in crashes after ARLE implementation, and this decrease was found to be significant at the five percent level.

Figure 14: Percentage Change in Number of Injuries from Red-Light-Running Crashes at ARLE Intersections Compared to Non-ARLE Intersections



[5] The Wilcoxon signed- rank test. The increase in crashes was also not significant at the less demanding 10% significance level.

Figure 15: Percentage Change in Number of Injuries, All Crashes



ARLE in Abington Township

The Pennsylvania Vehicle Code (Title 75 – Section 3117) was amended in July 2012 to add Section 3117, which established the legal authority for automated red-light enforcement programs in smaller municipalities upon enactment of a local ordinance. To date, Abington Township, in Montgomery County, is the only municipality other than the City of Philadelphia to adopt an ARLE ordinance and implement a program.

The township has three intersections that experienced red-light-related safety hazards along with intersection configurations that limit police access to conduct enforcement. Township leaders concluded that automated enforcement was an additional tool to help improve the safety of these intersections. Abington Township enacted an ordinance (provided in the appendix and available at http://www.abingtonpd.org/wp-content/uploads/2014/01/Ordinance-No-2049-2-Red-Light.pdf) for ARLE implementation in 2013, and implemented the ARLE cameras at the three intersections in 2014.

Abington: Program Administration and Roles

Although the ARLE program operates on a far smaller scale in Abington Township than in Philadelphia, there are several agencies and positions involved in its development, management, and implementation. These include:

- **Abington Police Department –** The ARLE program system administrator responsible for implementing, operating, and maintaining the ARLE program at designated intersections (as per the local enabling legislation).
- **Gatso USA** – The Abington Police Department's contracted vendor that installs, operates, and maintains the cameras; sends reports; and processes and provides collection services.
- **Abington Police Department Staff** (Currently two police officers and one civilian staff person) – Responsible for operating the ARLE program within Abington PD, including approving and rejecting violation photos and videos, checking signage and field conditions, and preparing quarterly and yearly program reports.
- **Hearing Officer –** Responsible for first-level hearings of contested violations; appointed by the Abington Township Board of Commissioners.
- **Abington Township Police Chief** – Reviews candidate intersections for ARLE enforcement in coordination with the Abington Township Board of Commissioners.
- **Abington Township Board of Commissioners –** Reviews and approves candidate intersections for ARLE enforcement in coordination with the Abington Township Police Chief.
- **Municipal Collections of America –** Responsible for collection of unpaid violations.

- **PennDOT –** Reviews proposals for additional intersections to be controlled by red-light cameras. The Secretary of Transportation ultimately approves each intersection in conjunction with a crash evaluation and field review by PennDOT District 6-0 traffic staff and PennDOT's Bureau of Maintenance and Operations. PennDOT's Center for Program Development and Management administers the ARLE Funding Program.

Currently, Abington Township is under a three-year contract with Gatso USA through September 2017.

Two township police officers are tasked with administering the ARLE program. Their responsibilities include approving and rejecting violation photos and videos, checking signage and field conditions, preparing quarterly and yearly program reports, promoting public awareness, and recommending additional intersections to be added to the program. Additionally, a civilian employee in the Police Department aids in reviewing violations and contacting violators prior to first-level hearings.

The Abington Police Department's role in assessing violations from the ARLE system, like that of PPA in Philadelphia, is limited to red-light enforcement. That is, motorists are not ticketed or fined for having an expired registration, faulty tags, etc. Registered vehicle owner information obtained via the ARLE program does not become the property of the vendor or the Abington Township Police Department. State authorizing legislation prohibits the program's cameras from being used for surveillance purposes.

Abington: Approved ARLE Intersections

There are currently three ARLE intersections in Abington Township, all in operation since October 2014. Each is in the northern part of the township, as shown in Figure 16.

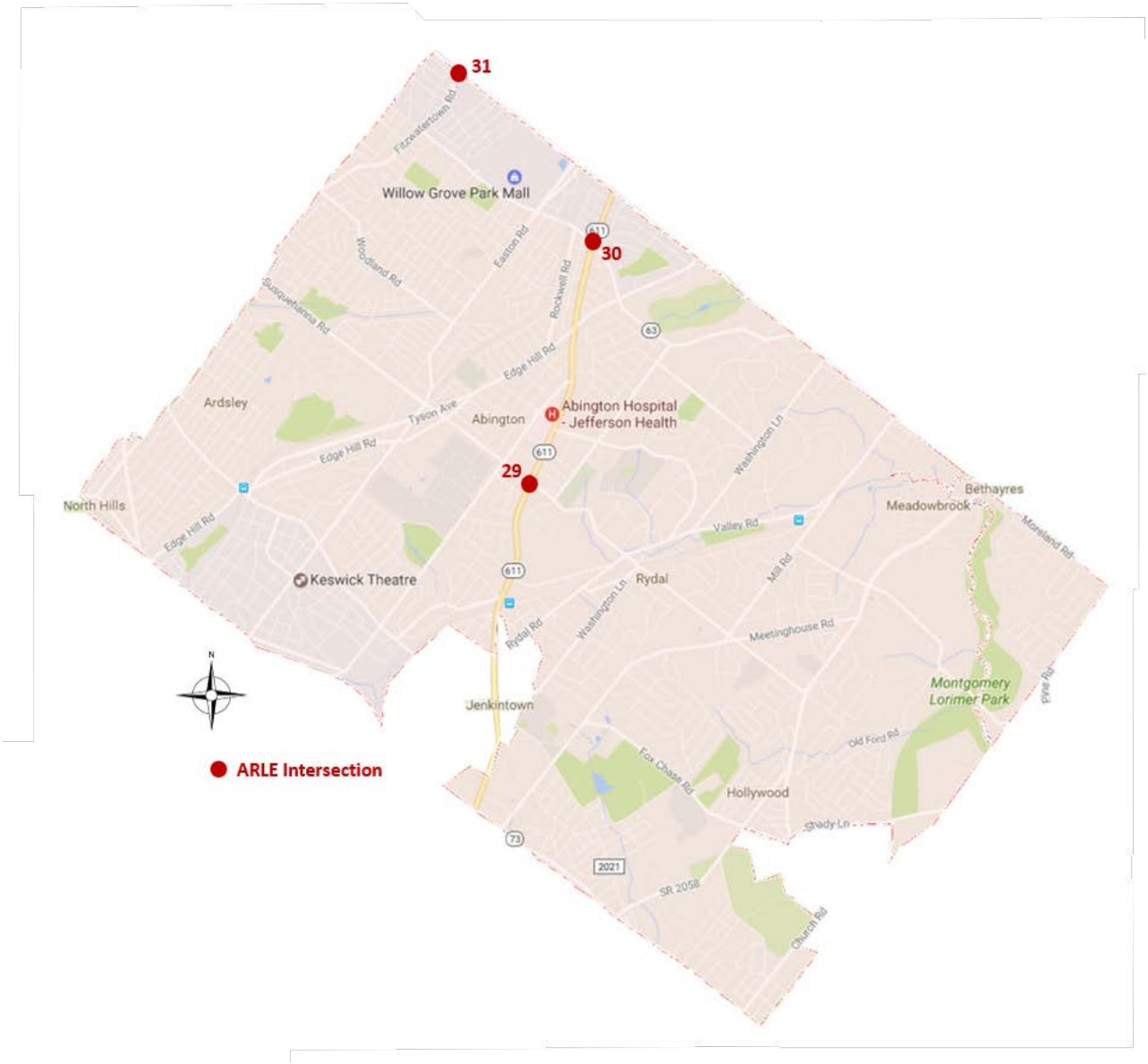
Table 9 lists the Abington intersections and the dates of PennDOT approval and the start of enforcement. There are 10 cameras: four at Old York Road and Susquehanna Road, four at Old York Road and Old Welsh Road, and two at Fitzwatertown Road and Moreland Road.

Table 9: ARLE Intersection Locations by Approval and Enforcement Date

Location Number	Intersection Name	PennDOT Approval Date	Enforcement Date
29	Old York Road & Susquehanna Road	9/27/2013	10/1/2014
30	Old York Road & Old Welsh Road	9/27/2013	10/1/2014
31	Fitzwatertown Road & Moreland Road	9/27/2013	10/1/2014

Source: Abington Police Department

Figure 16: Abington Township ARLE Intersection Locations



Note: Numbers correspond to Table 9.

Abington: ARLE Procedures

Specific procedures are followed when adding new intersections to the Abington ARLE program. The process begins with the Abington Police Department reviewing intersection crashes and conducting red-light-violation studies by plain clothes officers at those intersections being considered for the ARLE program. Following documentation that shows a potential benefit for implementing ARLE, a request is sent to the Police Chief for review. The Police Chief then sends the request to the Township Board of Commissioners for consideration. After an intersection has been approved by the Township, a formal request is sent to PennDOT, which makes the final determination in authorizing all intersections. Intersection selection procedures are outlined in PennDOT's ARLE Guidance Document.

Abington: Administration and Collection of Fines

The PA Vehicle Code establishes a $100 fine for ARLE violations in Pennsylvania municipalities.[6] In comparison, a non-automated red-light-running violation would cost a driver $128.50 in Abington Township as well as 3 points to their license.[7]

In addition to being the selected ARLE equipment vendor for Abington Township, Gatso USA provides ticket processing and collection services. Gatso USA prepares the violation reports and sends them to the Police Department for their review. After its review, the Police Department forwards its approved violations to Gatso USA, which then sends out letters with tickets and collects the fines.

When tickets become delinquent (after 79 days with no payment), the case is sent to Municipal Collections of America (MCA) and the fine increases to $135 inclusive of the $35 collection fee. Unlike in the City of Philadelphia, officers in Abington Township are not authorized to immobilize and impound cars with unpaid violations. Abington relies on reports to credit agencies as an incentive for owners to pay.

Figure 17 depicts Abington Township's process for issuing tickets and collecting fines.

Abington Police Department maintains high standards of accuracy and service to ensure program integrity with Abington citizens. The Police Department accomplishes this through the way in which they evaluate violations, with a bias to err on the side of rejecting possible violations. Violations are recorded through still photos and video and are accompanied by yellow- and red-light times determined through an optics system used by the camera. If the yellow-light time on a

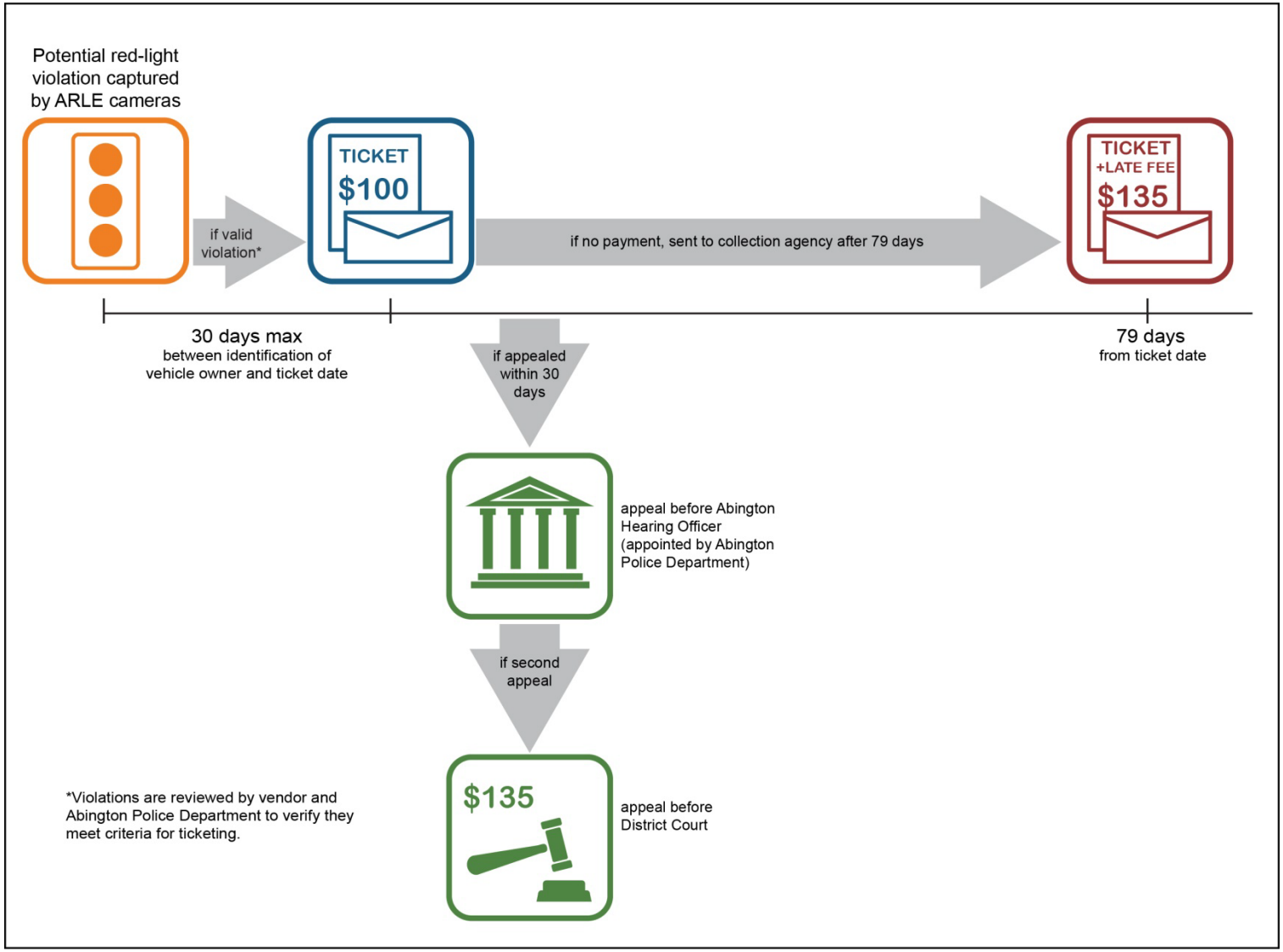
[6] 75 Pa. C.S. §3117 (e)(1) unless a lesser amount is set by ordinance.

violation is under four seconds, the violation is automatically rejected. Additionally, if the recorded video shows the vehicle touching the white pavement stop bar at any point before the light turns red, the violation is also rejected to avoid any doubt when ticketing violators. This helps avoid violations for vehicles making left turns while waiting for opposing traffic to pass.

The Abington Police Department is also accommodating when handling contested violations. All vehicle owners who receive a violation can log on to the website and securely view their individual photos and video. Prior to first-level hearings on contested violations, which has no additional associated filing charge, the Township reaches out to violators to assist them with the process. When the program began, there were roughly 20 contested tickets per monthly hearing. The number is now down to one to three per hearing.

Second-level appeals (to the District Justice) remain problematic, as the court system has not established a procedure specifically for such cases, meaning that they must be heard as civil cases, which involves a $135 filing charge.

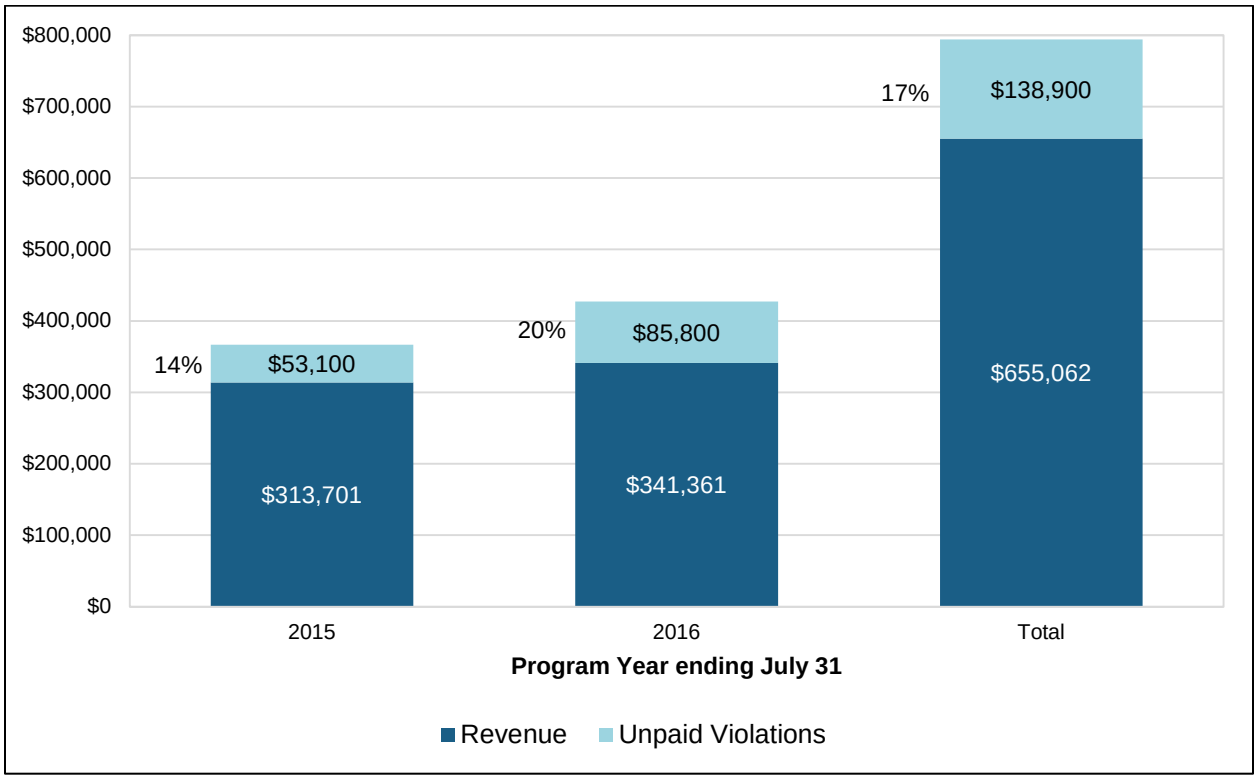
Figure 17: Abington Township ARLE Violation Process



Abington: Revenue and Unpaid Fines

The revenue collected from fines totaled $655,062 for the first two full years of the ARLE program. Unpaid fines have amounted to 17 percent of total violations. Figure 18 shows the revenue from paid fines along with the revenue forgone associated with unpaid fines since program inception. The height of the bar roughly reflects the revenue that would have been received if the Township received the $100 fine on all violations.

Figure 18: Revenue and Unpaid Fines, Program Years 2015 and 2016



Abington: Program Expenses

The expenses incurred for the Abington Township ARLE program, presented in Table 10, include all ARLE-associated Township personnel costs. Salary and benefits of the police and highway department staff are allocated to the ARLE program in proportion to their time spent on the ARLE program. Finance and highway departments each average two labor-hours per month. The civilian staff member in the Police Department averages more than 40 hours per month, and the police officers average a total of 35 hours per month. Personnel expenses also include payment of $150 per hearing for a hearing officer to attend one hearing per month. Abington Township does not assign any overhead expenses to its ARLE program. The program cost as expressed on a per-violation basis was $140 in the program year.

Table 10: Abington ARLE Expenses Incurred

	For the ARLE Program Year ending July 31,		First Quarter Program Year 2017[8]
	2015	2016	
ARLE Vendor (Gatso USA)	**$420,000**	**$504,000**	**$126,000**
Police Department	67,980	49,472	11,198
Highway Department	1,050	1,800	
Hearing Officer	900	1,500	450
Finance Department	1,200	1,800	
Subtotal Township	**71,130**	**54,572**	**11,648**
Total Expenses	**$491,130**	**$558,572**	**$137,648**
Violations	4,874	3,981	730
Personnel Cost/Violation	$15	$14	$16
Total Program Cost/Violation	$101	$140	$189

Notes: Vendor expenses are presented at the contract rate, but vendor expenses actually paid in these years is considerably lower, as explained in text. Vendor costs for program year 2015 reflect a phase-in period. Police costs are elevated for the first year by program start-up tasks.

The total cost of the program through September 2016 is approximately $1.2 million. Based on the total revenue of $655,062, the fines collected are not sufficient to cover the total cost of the program.

However, the contract is structured to assign the cost risk to Gatso. Specifically, Abington Township is only required to pay Gatso the monthly fee whenever the accumulated balance of ticket fine revenues net of Township personnel and administrative costs reaches the amount of the fee. The contracted monthly vendor fee is $42,000 ($4,200 for each of the 10 cameras). In practice this works out to a schedule in which Abington pays one month's contract cost roughly every two to three months. The contract specifies that any unpaid balance will be dropped at the conclusion of the contract. As of February 2017, Gatso had been paid $504,000, which brought the township up to date through September 2015. At its current rate of payment to Gatso, Abington Township's effective vendor expense is roughly $2,000 per camera per month, less than half the contracted rate of $4,200 per month.

[8] October, November, and December 2016

The Gatso contract with Abington Township ends in September 2017. It is difficult to predict whether Abington can secure favorable contract terms in the next contract. There is some precedent for contracts such as the one Abington currently has with Gatso. For example, Springfield Township, PA, had arranged similar contract terms. And research on experiences in other states has indicated that there are other instances of vendors taking on the revenue risks in similar ways to that of the Abington arrangement. If Abington Township is successful in securing another contract similar to the current one, it would demonstrate that it may be affordable for other municipalities in Pennsylvania to operate an ARLE program.

Abington: Financial Performance

Table 11 presents summary financial data for the Abington ARLE program. As of July 31, 2016, total program expenses incurred to operate the program were $1,049,702, while the total revenue from violations was $655,063, a deficit of nearly $400,000 over the first two fiscal years of program operation. The net deficit in the program year 2016 (the first full year of operation) was over $217,000. Clearly, there are insufficient violations in Abington Township to cover the full costs of the program *if* Gatso were to require the full contract payment of $4,200 per camera per month. However, Abington Township's favorable contract terms essentially guarantee that ARLE will be revenue-neutral for the township. There are no expectations that the program could ever yield positive net revenue to contribute to the ARLE Funding Program in the Pennsylvania Motor License Fund.

Table 11: Abington ARLE Financial Performance

	For the ARLE Program Year ending July 31,		Total to July 31, 2016
	2015	2016	
Violation Revenue	$313,701	$341,361	$655,063
Costs			
Township Personnel	(71,130)	(54,572)	(125,702)
Vendor	(420,000)	(504,000)	(924,000)
Total Cost	**(491,130)**	**(558,572)**	**(1,049,702)**
Net Revenue/(Cost)	($177,429)	($217,210)	($394,639)

Current ARLE legislation limits the total revenue collected by a municipality at not more than five percent of the municipality's annual budget. The total 2016 Abington Township budget was $56 million. The total revenue collected from its ARLE program as of July 31, 2016, is $655,000, which is less than the calculated revenue limit of $2.8 million.

Abington: Violation History

Twenty-seven months of violation data have been collected for the Abington Township ARLE program since its inception.

Figure 19 summarizes the monthly violation trends for the three ARLE intersections since their August 2014 deployment. The monthly violations peak in December 2014 at 782, followed by a sharp decrease that leveled off by May 2015. By July 2016, the number of monthly fines was down to 262—nearly half of what it was prior to fines taking effect. Apart from the spike in violations in December 2015, violations have remained relatively stable throughout the second year of the program. Some down time to upgrade the cameras in August 2016 reduced the number of violations recorded that month. Non-residents are reported to account for approximately 70 percent of violations.

Figure 19: Monthly ARLE Violations, Total for Abington

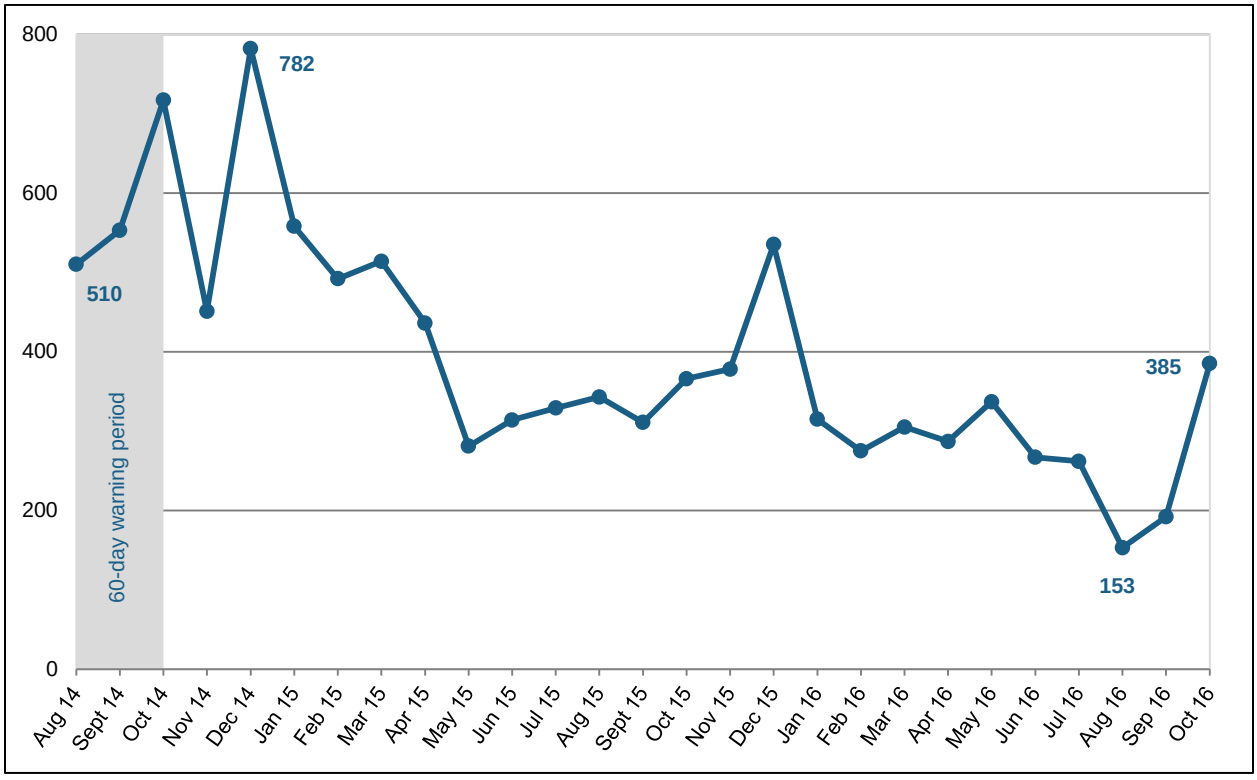
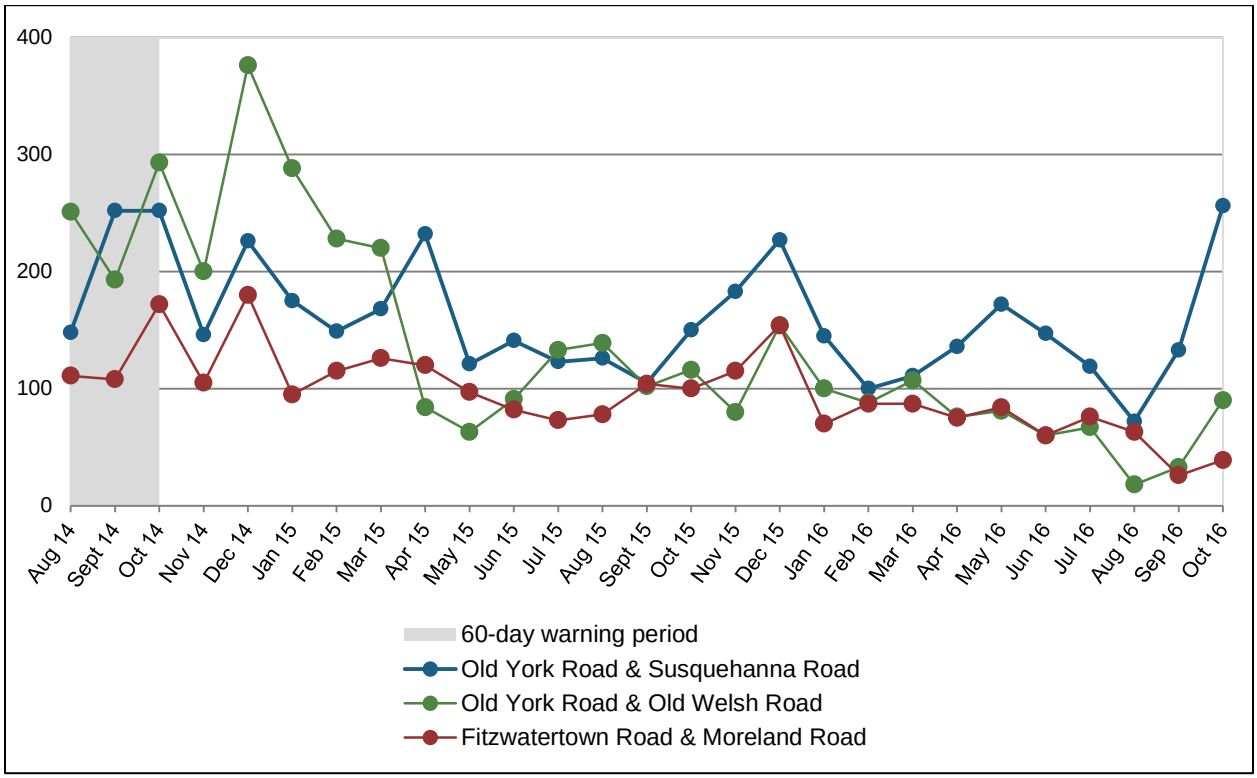


Figure 20 displays the monthly violation history for each intersection. As shown, the intersections are similar in terms of the number of violations. The intersection at Old York and Old Welsh Roads appears to have experienced the most substantial decline after the first several months of the program. The intersection at Old York and Susquehanna Roads displays the most fluctuation in number of violations. Each intersection experienced an increase in violations in December, in both program years.

Figure 20: Monthly ARLE Violations at Each Intersection



The average number of violations per month for each of the intersections is presented on Table 12.

Table 12: Average Number of Violations per Month by ARLE Intersection

Intersection	Program Year 2015 (includes warning period)	Program Year 2016
Old York and Susquehanna	178	143
Old York and Old Welsh	202	98
Fitzwatertown and Moreland	115	91
Township Average per Intersection	165	111

Abington: Crash Analysis

The ARLE program in Abington is too new to draw conclusions about its safety effects. Crash data are only available for 2015 and 2016. Nevertheless, Figure 21 and Figure 22 present the number of injuries in crashes attributed to red-light running and in all crashes for the five years before and two years after ARLE. The figures display the substantial year-to-year variation in number of injuries that prevents reaching conclusions about the effects of the first two years of ARLE implementation.

Figure 21: Abington Township ARLE Intersection Crash History: Number of Injuries, Red-Light-Running Crashes

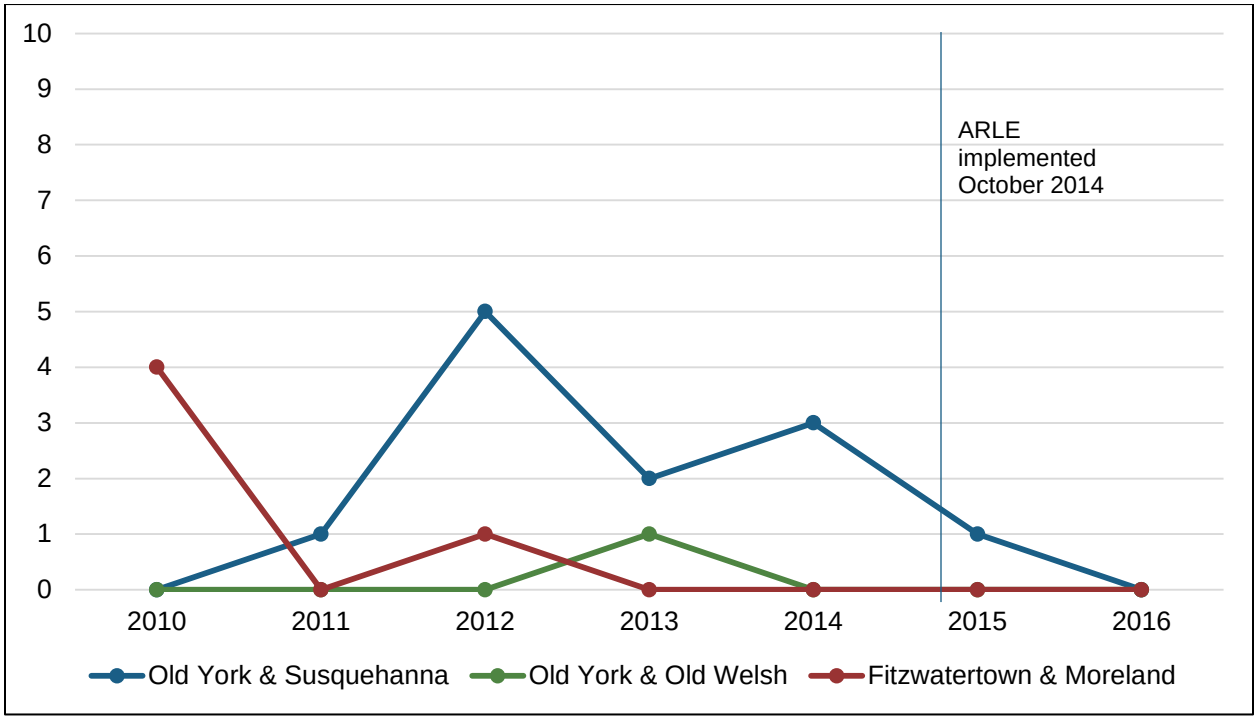
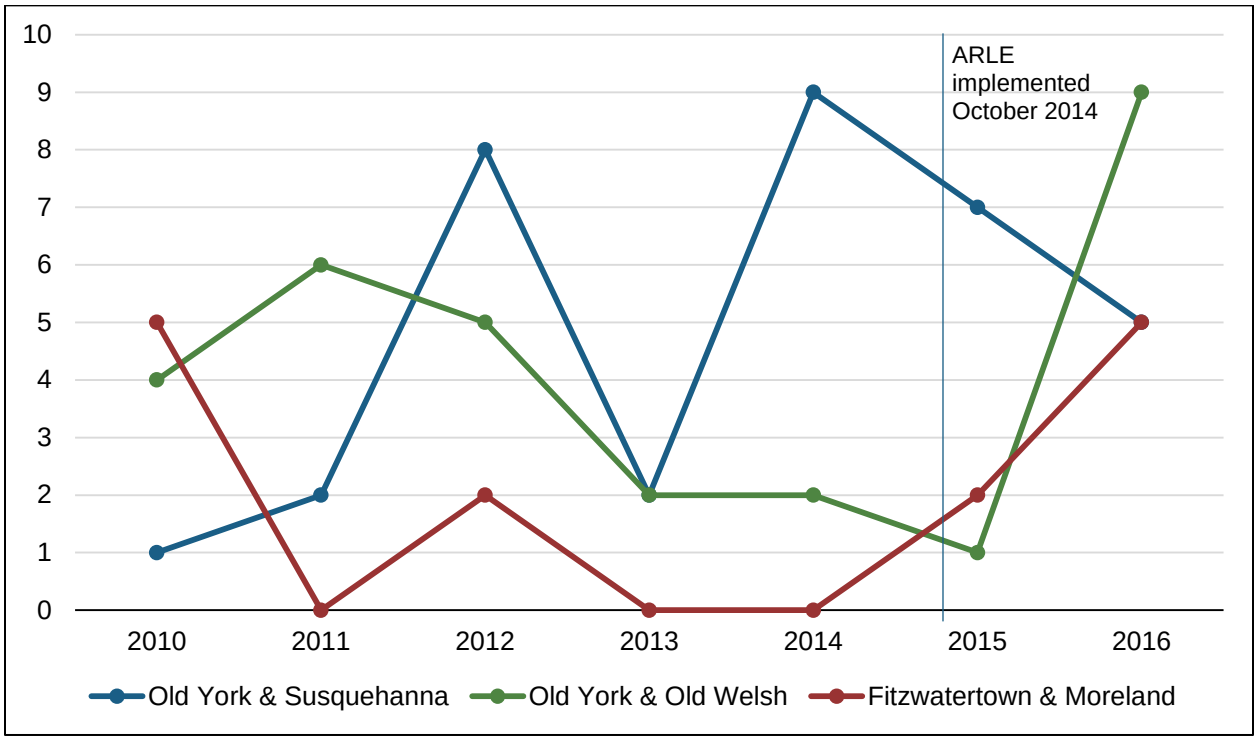


Figure 22: Abington Township ARLE Intersection Crash History: Number of Injuries, All Crashes



Section 4: ARLE Funding Program

As stated previously, the intent of ARLE implementation is to improve safety by reducing red-light-running violations and thus crashes and injuries—it is not primarily a revenue-generator. However, when a municipality's ARLE program does produce net revenue, state law requires that revenue to be used for safety-enhancing transportation projects, both in that municipality and statewide. The state-level program that administers the money is known as the ARLE Funding Program (Transportation Enhancements Grant Program).

Currently, the City of Philadelphia is the only municipality whose ARLE program produces a net revenue to fund the statewide ARLE Funding Program.

Legislative and Administrative Overview

The ARLE Funding Program requirements are specified in PA Title 75 (Vehicle Code) Section 3116 and Section 2117 (ARLE systems in certain municipalities) and promulgated in Title 67, Chapter 233. The ARLE Funding Program is 100 percent state-funded (per Appropriation 244) by a restricted Motor License Fund (MLF) account. That account is funded by net revenue provided to PennDOT by municipalities when payments of ARLE violation fines exceed the municipality's ARLE program costs, including payments to an ARLE vendor and municipal administration costs.

Appropriation 244 also specifies the types of projects that are eligible for ARLE Funding Program grants, as detailed later in this section. Broadly, the grants are provided to municipalities and agencies for low-cost projects that improve safety and reduce congestion.

The funding program is administered by PennDOT's Center for Program Development and Management and the Bureau of Maintenance and Operations. PennDOT does not use any ARLE Funding Program revenue to cover administrative costs related to its review of proposed ARLE intersections or the ARLE Funding Program. Chapter 233 was added to Title 67, outlining the policy PennDOT follows related to the ARLE Funding Program.

Funding Allocation

The original ARLE Funding Program legislation required that 50 percent of the program's grant monies be allocated to projects in the municipality that generated the violation revenue, with 50 percent allocated to safety improvement projects in other Pennsylvania municipalities.

In July 2012, Act 84 amended Section 3116 of Title 75, specifically, the 50/50 percent provision for disbursing ARLE Funding Program grant money. Instead, all net revenue would go to the restricted MLF account for statewide safety improvement projects. Grants would be awarded on

a competitive basis by PennDOT's Program Center based on the majority vote of an eight-member selection committee. The selection committee consists of four representatives of PennDOT, appointed by the Secretary—with the Secretary or designee serving as chair, and four members of the City of Philadelphia, appointed by the mayor.

However, through the application process discussed below, priority is still given to applicants seeking grant funds for transportation enhancements in the municipality where the ARLE system is operated. Thus the City of Philadelphia, which is the only municipality where the violation revenue exceeds the cost of the program, still receives about half of the annual funding from the ARLE Funding Program.

Eligible Project Types and Selection Criteria

Projects eligible for the ARLE Funding Program are aimed at improving safety and mobility, and address such items as upgrading, modernizing, and improving existing traffic signals or other traffic control devices as well as other types of safety improvements. A complete listing of all eligible types of safety improvement projects under the ARLE Funding Program is shown in the appendix.

Projects funded though the ARLE Funding Program are evaluated against the following criteria, as outlined in Table 13. Each criterion is referenced back to the appropriate regulation of 67 PA C.S. Section 23.8.

Table 13: ARLE Funding Program Selection Criteria

Grant Selection Criteria Description	Grant Selection Evaluation Questions
Project Benefits and Effectiveness	How does the project improve safety, enhance mobility, reduce congestion, and reduce greenhouse gases?
Project Costs	Is the request within the scope of available funds? Is the project cost effective?
Local & Regional Impact	How does this project support the regional transportation system?
Cost Sharing	Are there matching funds from other sources?
Other Criteria	What is the previous ARLE award completion status? How will the proposed project consider all modes of travel? Where is the project located on PennDOT's High Crash List? What is the expected HSM Crash Reduction Factor?
Maintenance and Operations	Does the applicant's past and current Operation and Maintenance performance meet the Department's expectations?
Evaluation by Others	Does the proposed project meet goals and priorities of the District and MPO/RPO?

Grant Application Process

The ARLE Funding Program requires an applicant (eligible sponsor) to submit an application compliant with 67 Pa. Code, Chapter 233. The eligible sponsor can be a local government, metropolitan planning organization (MPO), rural planning organization (RPO), county planning organization, or Commonwealth agency.

Grant applications are reviewed by an eight-member selection committee consisting of four PennDOT employees—including the PennDOT Secretary as chair—and four members appointed by the mayor of the municipality producing the net revenue to fund the grants.

The committee reviews the applications submitted by the project sponsors in each annual round of ARLE funding to determine their eligibility consistent with the approved types of safety improvement projects.

The committee then ranks eligible applications based on the project selection criteria. The process results in a prioritized list of projects that will be offered a grant from the funding available for that particular grant year. Priority is given to applications seeking grant funds for transportation enhancements in the municipality where the ARLE system is operated.

The ARLE Funding Program is 100 percent state-funded; no local matching funds are required. If a grant is offered and accepted, PennDOT reimburses the project sponsor within 60 days of the receipt of a quarterly status report.

The ARLE Guidance Document provided by PennDOT provides details of the ARLE Funding Program grant process and identifies the types of eligible projects. It can be found on the following PennDOT web page:

http://www.dot.state.pa.us/public/Bureaus/BOMO/Portal/ARLE%20Funding%20Program%20Policy_5-22-15.pdf

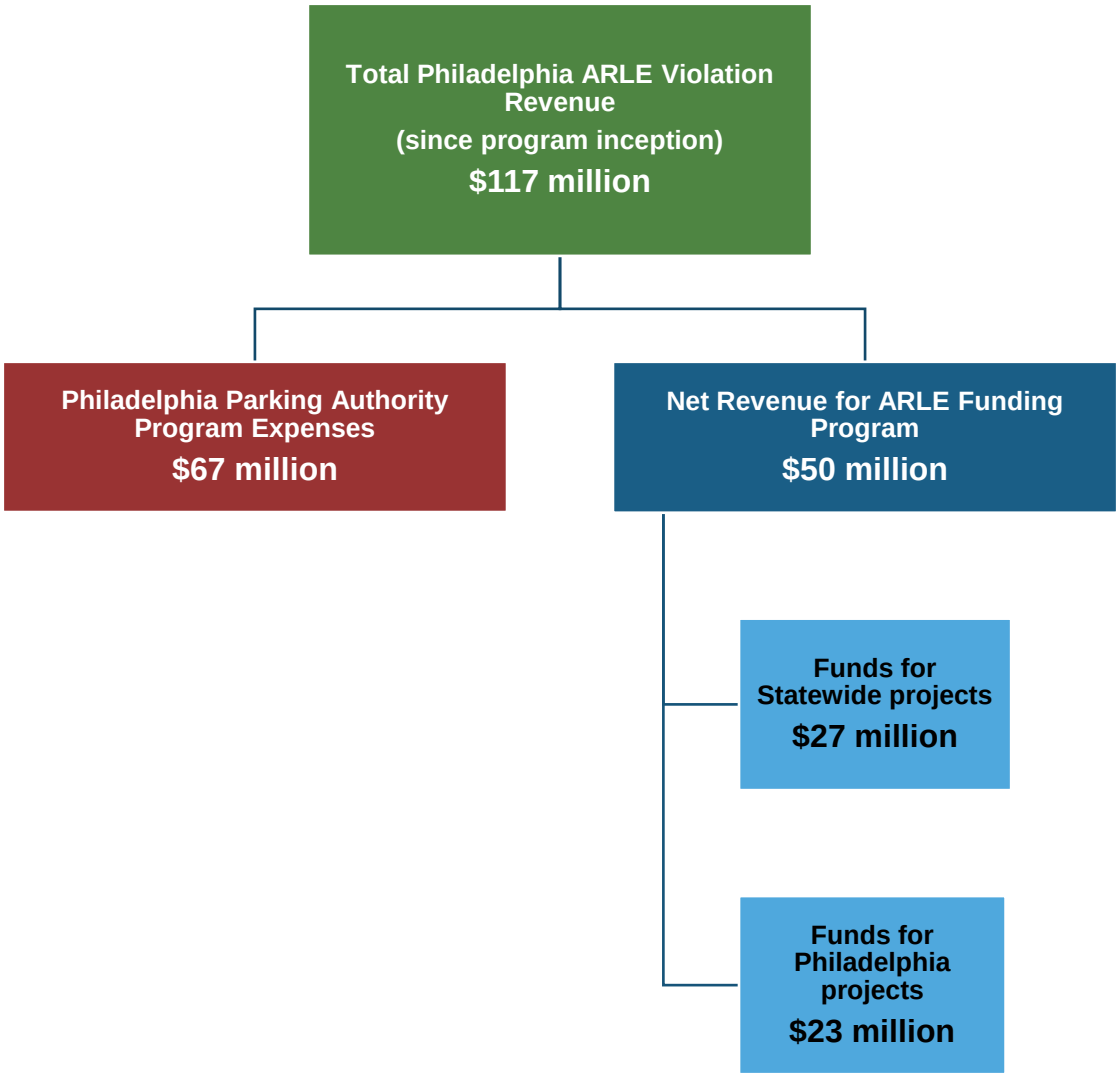
Funding History and Revenue Flow

As depicted in Figure 23, the total violation revenue collected since the inception of Philadelphia's ARLE program is $117.4 million. Through 2015, Philadelphia Parking Authority's (PPA—the City's ARLE administrator) total program expenses were $67.3 million, therefore the total amount of net violation revenue provided to the ARLE Funding Program was approximately $51 million. Currently, PPA provides PennDOT with quarterly deposits of net revenue, which is deposited into a restricted MLF account.

Philadelphia's City Streets department submits applications for proposed candidate projects through the ARLE Funding Program process. Philadelphia received about $23 million or approximately 46 percent of the ARLE Funding Program funds distributed by PennDOT for 27

safety improvement projects from the inception of the program through FY 2015. The remaining $27 million was available for other statewide transportation improvement projects funded through the ARLE grants.

Figure 23: Flow of Violation Revenue from the Philadelphia ARLE System through FY 2015



Source: PPA Annual Reports

The first distribution of ARLE Funding Program monies occurred on April 26, 2011, totaling $8.4 million in grants for 120 projects by 106 applications. The most recent round of ARLE funding was distributed in 2016 totaling $5.2 million. A total of 140 applications were received requesting more than $33 million in all.

Table 14 identifies the annual amount of funds distributed by the ARLE Funding Program, the number of improvement projects implemented, the number of applications submitted and awarded, and the associated dollar amounts since the inception of the ARLE Funding Program.

Table 14: Annual ARLE Funding Program Grant Awards

Year	Number of Applications	Funding Requested	Applications Awarded	Funding Awarded
2005-10	300	$68,516,084	128	$16,838,520
2011	307	$27,311,041	27	$2,999,168
2012	269	$25,562,747	47	$4,692,828
2013	131	$22,757,702	34	$8,798,895
2014	226	$41,048,116	41	$6,585,327
2015	194	$41,500,000	23	$5,500,000
2016	140	$33,700,000	27	$6,002,332
Total	1,567	$260,395,690	327	$51,417,070

The data in Table 14 and Figure 24 underscores the funding demand for these types of improvement projects. The total amount of funding requested far exceeds the available ARLE program funds, as depicted on Figure 24. The statewide benefits of the ARLE Funding Program amount to a total of 327 projects that have been awarded out of 1,567 applications submitted since the ARLE Funding Program inception. More than $51 million in ARLE funds had been awarded through 2016.

Figure 24: ARLE Funding Program – Requested Funding vs. Awarded Funding

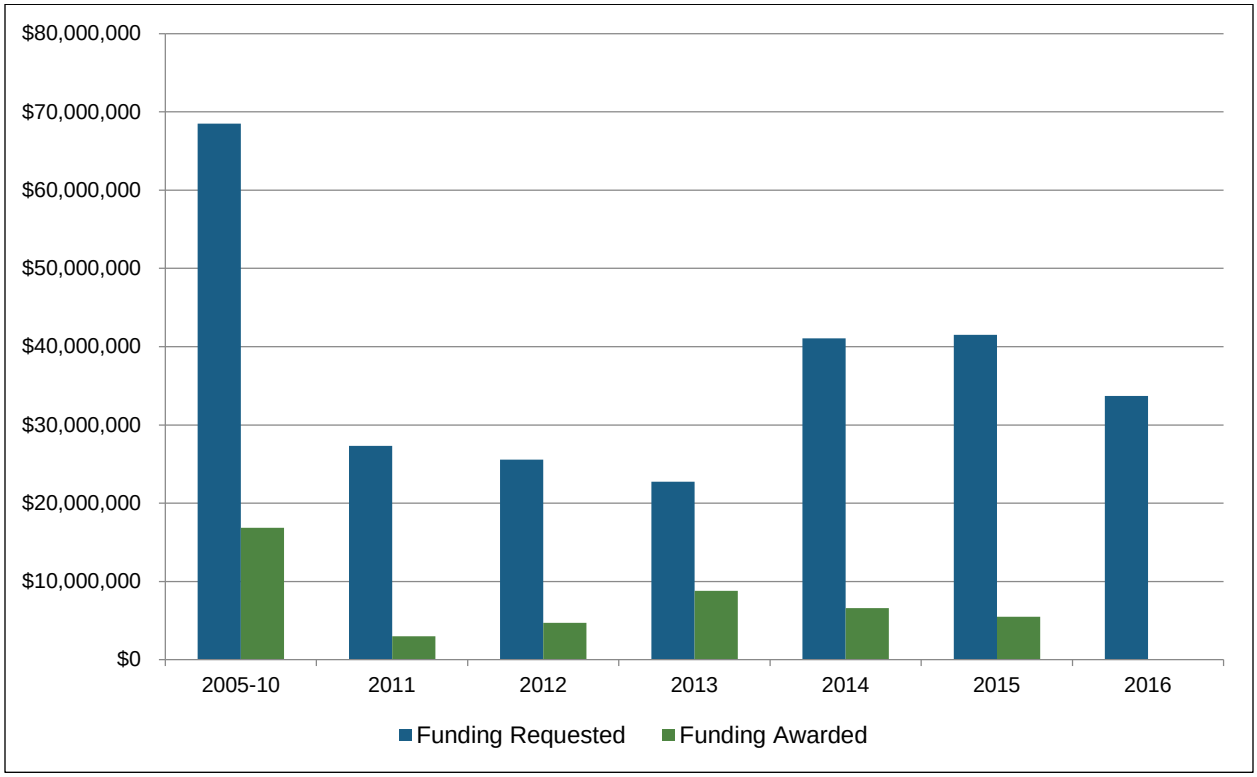


Table 15 lists the municipalities that have received ARLE funding to implement safety improvement projects. More than 115 municipalities in 44 counties throughout the state have benefitted from safety improvement projects funded by the ARLE Funding Program.

Table 15: Municipal ARLE Funding Program Grant Recipients by County

County Municipality			
Adams Biglerville Borough Hamiltonban Township **Allegheny** City of Pittsburgh Aspinwall Borough Bellevue Borough Coraopolis Borough Greentree Borough McKeesport City South Fayette Township West View Borough **Armstrong** Perry Township **Beaver** Franklin Township Potter Township **Berks** Heidelberg Township Perry Township Topton Borough Washington Township **Blair** Altoona City Blair Township **Bucks** Bensalem Township Bristol Borough Buckingham Township Chalfont Borough New Britain Borough Nockamixon Township Perkasie Borough **Butler** Butler City Franklin Township Oakland Township Saxonburg Township **Cambria** Sankertown Borough	**Carbon** Beaver Meadows Borough Lehigh Township **Chester** Charlestown Township East Brandywine Township East Whiteland Township Upper Uwchlan Township West Fallowfield Township **Clarion** Farmington Township Monroe Township **Columbia** Jackson Township **Crawford** East Mead Township West Mead Township **Cumberland** Lemoyne Borough Lower Allen Township **Dauphin** Highspire Borough Londonderry Township Millersburg Borough **Delaware** Aston Township Haverford Township Millbourne Borough Newtown Township Tinicum Township Upper Chichester Township Yeadon Borough **Elk** Ridgeway Township	**Erie** Venango Township Mercer Clark Borough Deer Creek Township Hempfield Township Sharon City Centre College Township Ferguson Township **Fayette** Menallen Township Washington Township Georges Township **Huntingdon** Huntingdon Borough Shirley Township **Indiana** Homer City Borough Indiana Borough White Township **Jefferson** Warsaw Township **Lackawanna** Scranton City **Lancaster** City of Lancaster Columbia Borough East Lampeter Township Manheim Borough Manheim Township Mount Joy Township Penn Township Warwick Township **Lawrence** City of New Castle **Lehigh** Lower Macungie Township	**Lycoming** McNett Township **Montgomery** Hatfield Township Norristown Borough Plymouth Township Upper Dublin Township Upper Merion Township **Montour** Danville Borough **Northampton** Hanover Township Moore Township Nazareth Borough **Perry** Bloomfield Borough Marysville Borough **Philadelphia** Philadelphia City **Schuylkill** Pottsville City **Somerset** Salisbury Borough **Westmoreland** Derry Borough Hempfield Township Murrysville Borough Rostraver Township Salem Township Unity Township **York** Hanover Borough Peach Bottom Township Red Lion Borough Shrewsbury Borough Shrewsbury Township West Manheim Township West York Borough

Information on the ARLE Funding Program is available on the PennDOT website at the following location:

http://www.dot.state.pa.us/Portal%20Information/Traffic%20Signal%20Portal/FUNDARLE.html

Section 5: ARLE Program Evaluation

Benefits and Costs

Effect of ARLE on Safety

Numerous studies have examined the safety effects of red-light cameras, and the overwhelming evidence is that red-light cameras make intersections safer. There are various ways to measure the safety effects: changes in fatalities and or injuries, changes in number of injury crashes, changes in total crashes, etc. Results of the most statistically rigorous studies are highlighted below.

> Cities that implemented ARLE saw 21% fewer fatal red-light-running crashes per capita than would have occurred without cameras.
>
> -Insurance Institute of Highway Safety (data from 57 cities, 1992 through 2014)

A study sponsored by the Insurance Institute for Highway Safety (IIHS) (Hu and Cicchino 2016) examined the effects of red-light cameras on the incidence of fatal crashes. Researchers looked at the 57 cities of 200,000 or more people that activated cameras between 1992 and 2014 without interruption. They compared the trends in annual per capita fatal crash rates in those cities with the trends in 33 cities that never had cameras. After accounting for the effects of population density and unemployment rates, the researchers found that there were 21 percent fewer fatal red-light-running crashes per capita in cities with cameras than would have occurred without cameras, and 14 percent fewer fatal crashes of all types at signalized intersections.

The IIHS study also reviewed 14 cities that ended their camera programs between 2010 and 2014. The researchers compared trends in annual crash rates in those cities with trends in crash rates in 29 cities (in the same regions) that continued their camera programs. The fatal red-light-running crash rate was 30 percent higher in cities that turned off cameras than it would have been if the cameras had remained on. Further, the rate of crashes with fatalities at signalized intersections was 16 percent higher. It should be noted that the studies measured crashes city-wide. Safety improvements at the intersections with ARLE cameras can be expected to be even greater.

A number of studies isolated different types of collisions and estimated effects on angle crashes, rear-end crashes, and the combined total of all crashes (Ko et al. 2013). All the studies that isolated right-angle crashes found reductions in those types of crashes. Many studies found increases in rear-end crashes following ARLE implementation. For example, Walden, et al. (2011) studied 39 Texas communities and found that, on average over all of the communities,

right-angle crashes decreased 19 percent while rear-end crashes increased 44 percent, and all crashes combined (right-angle, rear-end, and other) decreased 26 percent, with all of these changes statistically significant at the 5 percent significance level. The percentage changes in right-angle and rear-end crashes are not comparable because the number of rear-end crashes was approximately an order of magnitude lower than that of angle crashes. The analysis focused on the number of crashes considered to be red-light-related based on a review of the accident reports. Crash severity is not accounted for in the analysis; crashes include injury crashes as well as property-damage-only crashes.

Despite the overall evidence on safety benefits, studies have found that not every intersection appears to reap safety benefits. The varied experience across intersections in Philadelphia also illustrates this point. Intersections need to be selected carefully to maximize the likelihood of yielding safety benefits, and crash statistics should continuously be monitored.

Valuing Safety Benefits

U.S. Department of Transportation guidance on valuing crash reduction benefits recommends the following values, updated from 2014 to 2017 dollars using the U.S. CPI.

Table 16: U.S. DOT Guidance on Valuing Crash Reduction Benefits

Item	Statistical Cost or Value in 2017 Dollars
Value of a statistical life	$9,870,000
Critical Injury	$5,852,910
Severe Injury	$2,625,420
Serious Injury	$1,036,350
Moderate Injury	$463,890
Minor Injury	$29,610
Property damage per vehicle	$4,123

Based on these values, a camera enforcement program that avoids just one serious injury every five years yields an annual average benefit of more than $207,000 ($1,036,350/5) in avoided injury costs. This underscores an extremely important point regarding ARLE evaluation either on a statewide level or for a municipality considering ARLE—reduction of fatalities and injuries represents a major benefit. The cost of implementing ARLE must be considered in relation to these benefits that can accumulate to a very large extent even with the numbers of fatalities and injuries being seemingly few.

Net Program Costs

The two programs currently implemented in Pennsylvania operate at no net cost to either municipality. Philadelphia's program generates positive revenue that is contributed to the ARLE

Funding Program. Abington's vendor contract is structured to ensure that the Township bears no net cost. It might be possible for other municipalities to secure contract terms similar to those of Abington. Several contracts reviewed in other states also reveal similar contract terms that assured the municipality of no net cost. Whether this arrangement will be sustainable in the future, and the conditions required at an intersection to secure this arrangement, are unknown.

An illustrative cost scenario has been developed to present a relationship of net costs/revenues to the number of violations. The scenario uses the following assumptions, which are loosely based on the cost experiences in Philadelphia and Abington:

- Vendor Charge: $4,000 per camera per month
- Cameras at the intersection: 4
- Municipality administrative cost per violation: $16
- Collection Rate: 80 percent of issued tickets are paid, at $100 basic fine

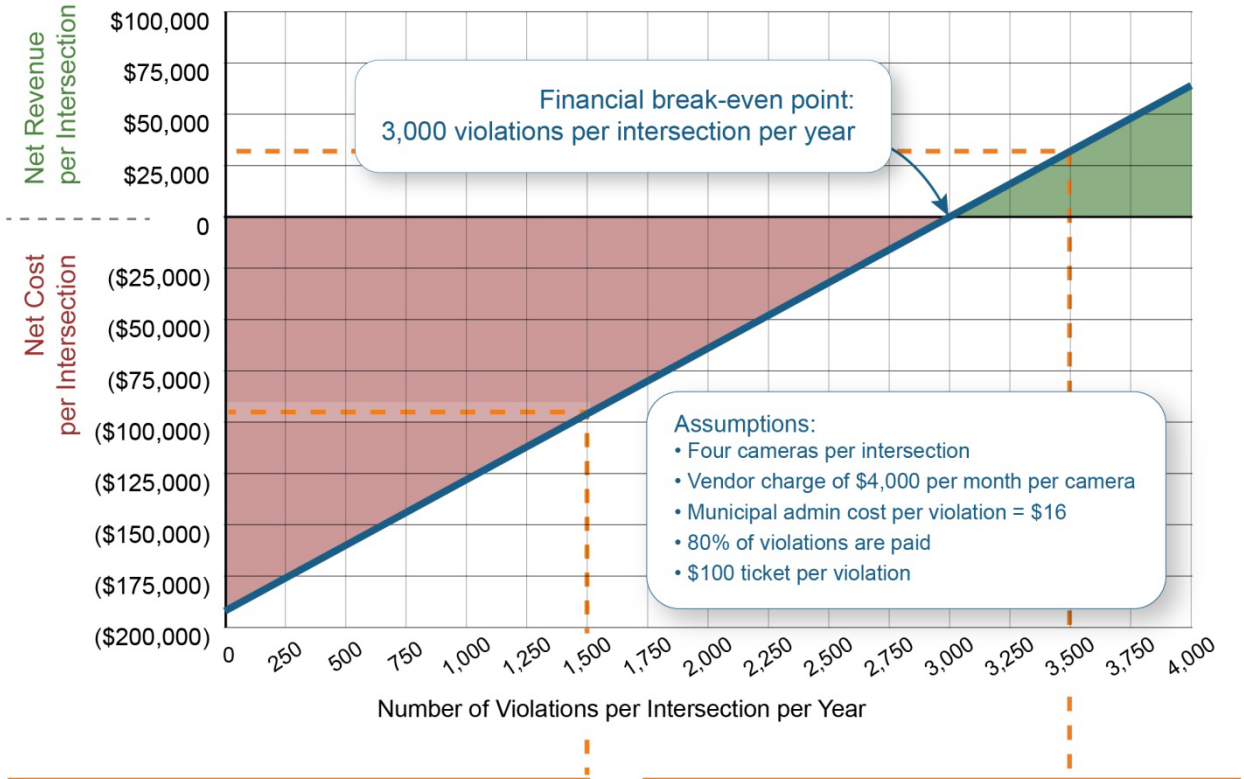
Figure 25 displays the resulting relationship of net cost to number of violations issued. If violations are less than 3,000 per year (250 per month), the program will have a net cost. Violations greater than 3,000 per year, however, would yield a net revenue to contribute to the ARLE Funding Program. Under the stated assumptions, an intersection experiencing 1,500 violations per year (125 per month) would have an annual net cost of $96,000. This is roughly the level at which Abington would find itself if it weren't for the contract terms that guarantee that its net cost line is a horizontal line through zero up until approximately 3,000 violations per year.[9]

Comparing Costs and Benefits

A municipality that is contemplating a possible net cost of $96,000 to operate ARLE at an intersection should, of course, compare such prospective costs to the possible safety benefit. For example, avoiding one serious injury every five years has a larger annual safety benefit ($207,000) than this cost. Viewed another way, a program that avoids just one serious injury every 10 years would offset this net cost with the annual average value of the safety benefit. The avoidance of even a single moderate injury every four years would more than offset this $96,000 cost. If the costs of automated enforcement technology decrease over time, the benefit-cost calculation would tip even further in favor of implementing ARLE at intersections with intractable red-light-running safety problems.

[9] The cost assumptions do not identically mirror Abington's, so the exact net cost and exact breakeven number of violations could be slightly different in Abington.

Figure 25: Illustrative Estimated Net Cost of ARLE



Sample Calculation #1

If a municipality projects 1,500 violations per year at a certain intersection, it can estimate a net cost of $96,000 per year for ARLE at that intersection.

Revenue:	
1,500 tickets x $100 fine =	$150,000
80% of tickets are paid =	x .80
	$120,000
Expenses:	
$4,000 x 4 cameras x 12 months =	$192,000
$16 admin cost x 1,500 tickets =	+ $24,000
	$216,000

Net cost to municipality = $120,000 - $216,000 = **($96,000)**

Sample Calculation #2

If a municipality projects 3,500 violations per year at a certain intersection, it can estimate a net revenue of $32,000 per year for ARLE at that intersection.

Revenue:	
3,500 tickets x $100 fine =	$350,000
80% of tickets are paid =	x .80
	$280,000
Expenses:	
$4,000 x 4 cameras x 12 months =	$192,000
$16 admin cost x 3,500 tickets =	+ $56,000
	$248,000

Net revenue to municipality = $280,000 - $248,000 = **$32,000**

Municipal Survey Results

Thirteen ARLE-eligible municipalities and 16 ineligible municipalities in Pennsylvania were surveyed to gauge their perception of the ARLE program and what factors, if any, would prevent them from participating in the program. Thirteen municipalities responded:

ARLE-Eligible Survey Respondents:

- Lower Providence Township
- Falls Township
- Middletown Township
- Marple Township
- Montgomery Township
- Lower Merion Township

ARLE-Ineligible Survey Respondents:

- City of Bethlehem
- Ferguson Township
- Lower Allen Township
- Straban Township
- West Chester Borough
- Lebanon County
- York County

All 13 respondents were aware of the ARLE program, but only seven had considered participating.[10]

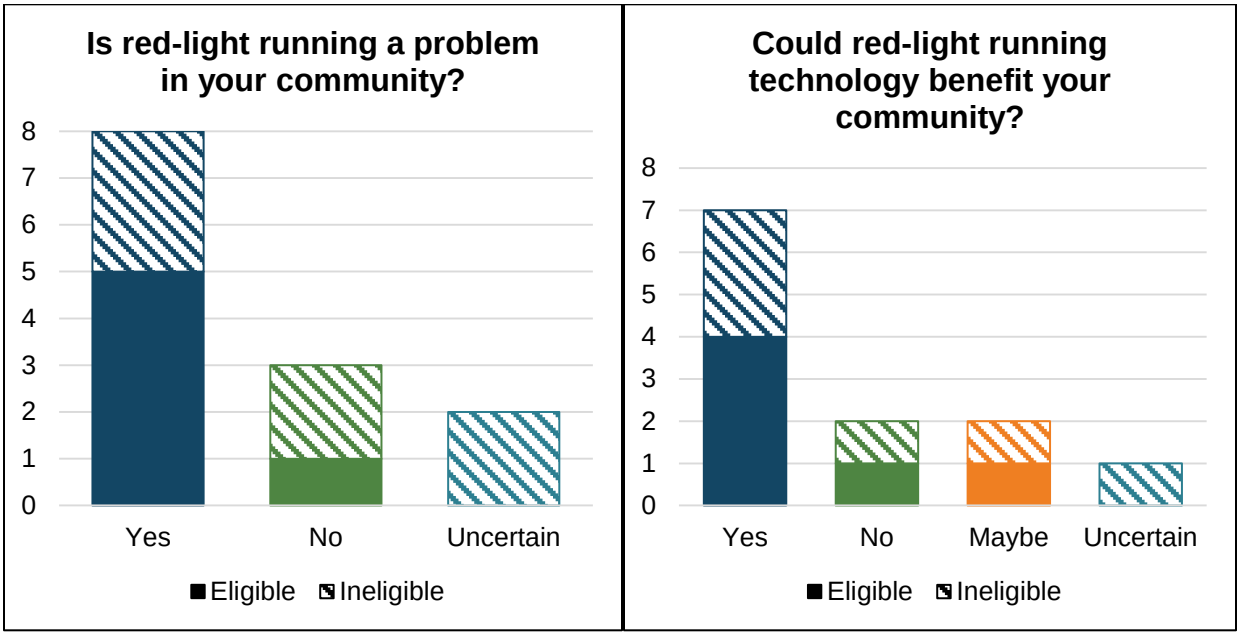
When asked if red-light running was a problem in their community, eight municipalities responded "yes," three responded "no," and two were uncertain. Of the eight municipalities that responded "yes," seven were addressing the issue through traditional enforcement, and the remaining municipality felt that the problem was not being addressed. Only one municipality felt that traditional enforcement was sufficient to combat red-light running.

Seven municipalities believed that red-light running technology could benefit their communities. Of the remaining municipalities, two believed that red-light running technology would not benefit their communities, two believed it might benefit their communities, and one was uncertain.

Responses to two of the survey questions are summarized in Figure 26.

10 Ineligible communities were asked if they would consider participating if they were/became eligible.

Figure 26: Municipal Survey Responses



When asked how the ARLE program could adjust to increase participation, answers differed between eligible and ineligible municipalities. Eligible municipalities cited cost and township officials/public support as factors that would need to change for participation. Ineligible municipalities requested more education on the ARLE program. The Pennsylvania State Association of Township Supervisors (PSATS) was also questioned on this issue and felt that the eligibility requirements (i.e., police department accreditation) might be burdensome for some municipalities to achieve.

Cost was cited as a major barrier for multiple reasons. Monthly equipment costs are higher than smaller eligible municipalities in Pennsylvania can afford, especially when considering the likely decrease in ticket revenue as violations decline over the course of the program. A means to address these high costs and decreasing revenues might encourage participation. There is also the issue of administrative costs to the municipality, especially the need to take a police officer out of the field to review violations and run the program.

Based on the survey, Township officials of eligible communities who are aware of the program show hesitation to implement ARLE programs due to public perception. This is driven by negative attention received by ARLE programs in other states.

Ineligible municipalities were interested in more education and training on ARLE implementation as well as ARLE Funding Program grants. Although they were familiar with the funding program, one municipality said that it would be more accessible if more expert/consultant resources were made available to smaller municipalities. Another municipality

stated that the ability to apply for funding further into the future would give municipalities more time to develop designs and receive approvals.

In terms of eligibility requirements, PSATS suggested that municipalities that would otherwise be eligible may find it too difficult to receive accreditation from the Pennsylvania Chiefs of Police Association (PCPA). Although 32 municipalities within the eligible counties[11] meet the population requirements[12] to participate in ARLE, only 17 are accredited by PCPA.

For both eligible and ineligible municipalities, lack of awareness and training appears to be the main obstacle to understanding and implementing an ARLE program. In contrast, PSATS felt that the program itself, in terms of eligibility prerequisites, might be preventing participation. Providing municipalities with more education on Pennsylvania's ARLE legislation and the safety benefits of the program has the potential to change the views of township officials.

Additionally, educating Pennsylvania municipalities on the potential agreements between vendors and other towns could dispel the belief that small municipalities cannot afford to run the ARLE program. PSATS expressed a willingness to partner on future initiatives and to communicate any new outreach, education, safety benefit, etc., PSATS was also willing to coordinate with PennDOT to have PennDOT ARLE experts present at the PSATS annual meeting.

11 This includes Class 2-A counties (Bucks, Delaware, and Montgomery) as well as Class 3 counties with a population between 490,000 and 510,000 as of the 2010 U.S. Census (Chester).

12 20,000 as of the 2010 U.S. Census.

CASE STUDY – Public Perception Challenge

Springfield Township, Delaware County, PA

Springfield Township began the process of adopting an ARLE program after the Township Board of Commissioners passed the required local ordinance. That action followed the 2012 change in state legislation allowing certain municipalities outside of Philadelphia to participate in the program. The process was initiated by the Chief of Police and the police department prepared to implement the program. The Board of Commissioners, traffic engineer, township solicitor, finance director, and township manager were all involved in the implementation process. It was determined that no additional staff would be required to administer the program for the Township. Springfield Township coordinated closely with Abington Township, as well as PPA, in developing the administration process, preparing and issuing the Request for Proposal, and navigating the vendor selection process.

Following Board approval, a Request for Proposals (RFP) was written based on examples from current ARLE programs in Pennsylvania and across the U.S. The RFP stipulated that the chosen vendor would only receive payments after all Township expenses were covered, and that if the program were to end, the vendor would absorb any losses. Springfield Township received three bids from vendors: ATS, Redflex, and Gatso USA. The Township ultimately selected Gatso as the most-qualified, best-priced vendor in compliance with the RFP.

From a top-10 list of intersections under consideration, the Township selected four along state highways with high crash rates and traffic volumes (all of which received PennDOT approval):

1. Collins Drive and State Road
2. SR 320 and SR 420
3. Springfield Road and State Road
4. Baltimore Pike and Woodland Avenue

By 2013 the vendor was selected, the intersections were approved, an operating procedure had been established, a police officer appointed, and workspace provided to run the program. However, in a split vote, the Springfield Board of Commissioners decided to stop the implementation of the ARLE program. An advocate of implementing ARLE in Springfield Township believes that controversy surrounding the New Jersey ARLE program (since discontinued) was a contributing factor to the opposition in the Township. New Jersey's program was subject to scrutiny as questionable adjustments of yellow-signal times produced high revenues in participating municipalities.

Although Pennsylvania legislation is written to prevent the issues faced by many other U.S. ARLE programs, and Springfield's Chief of Police continues to advocate for the program, the presence of very vocal opposition leaves the Township Board reluctant to participate.

Public Outreach

Experience to Date

Philadelphia: Philadelphia currently has no formal ARLE public outreach campaign, however, PennDOT and the Philadelphia Parking Authority (PPA) post ARLE program information on their public websites.

Abington: Although no formal public outreach program exists in Abington, the township posts general information and monthly statistics regarding their program on their public website. In addition, the township's police officers provide information on the effectiveness of their ARLE program to other interested communities. Officers have made presentations covering topics such as the reduction in crashes at ARLE intersections, the township's violation hearing process, and vendor contracting and selection.

In summary, public information is being made available by both Philadelphia and Abington Township. Both municipalities have been ambassadors for ARLE, sharing their knowledge, expertise, and experience with other communities.

Considerations for Enhancing Public Outreach

PennDOT should consider an intentional and strategic approach to public outreach. Awareness is a key element for strengthening and expanding the ARLE program. A focused message would be helpful for other communities that might consider implementing an ARLE program. Future public outreach and awareness should focus on the following:

1. Continuing to constructively correct and debunk the myths and misconceptions about the program.
2. Providing clear and concise information about accident reduction, cost-effectiveness, and the prevention of fatalities and serious injuries.
3. Publicizing best practices and success stories, highlighting problem intersections with a compelling before-and-after storyline.
4. Use of multi-media, including video, web, social media, and potentially public service messages.
5. Providing talking points and "frequently asked questions" (FAQ) materials to officials and media to encourage positive media attention, short interviews, etc.
6. Communicating strong thematic messages that will resonate with the public.
7. Incorporating ARLE information into ongoing MPO public outreach and engagement.
8. Consideration of a simple speaker's bureau concept in which a basic ARLE presentation would be made available for state and local officials and others who speak to various groups.
9. Offering presentations related to ARLE at university civil engineering, planning, and traffic engineering programs as a way of increasing the understanding and appreciation of the program for future professionals.

ARLE Program Expansion – Issues and Opportunities

The ARLE programs in Philadelphia and Abington Township (Montgomery County) have proven successful and cost-effective in reducing crashes. Nevertheless, ARLE in Pennsylvania has not yet expanded beyond these two municipalities. The central issues or barriers impeding expansion are summarized below, based on conversations with leaders of several municipalities and PennDOT staff.

While the issues are significant, they are not insurmountable. PennDOT and its partners have the opportunity to systematically address these issues through a strategic approach to advance broader ARLE implementation, producing an excellent return in the form of enhanced safety.

Issue 1: Lack of Public Support and Accurate Awareness

Even in ARLE-eligible communities, the general public—and its elected officials—may be largely unaware of the facts and benefits associated with ARLE. Many have unanswered questions or misconceptions about the program's purpose, operations, and results, leading to a lack of support for ARLE, or outright opposition to its use.

Common ARLE myths:

- ARLE is a money-making scheme.
- ARLE invades privacy.
- ARLE increases crashes.
- ARLE is too expensive.

As discussed below, the process for selecting ARLE intersections, configuring cameras, and evaluating potential violations optimizes safety benefits and safeguards against these potential concerns. Also, certain negative impressions of ARLE are based, at least in part, on the flawed programs of other states. Pennsylvania, however, has structured its program to prevent such problems.

Revenue-generator concerns: New Jersey, for example, did not continue ARLE after the end of its pilot program due to concerns over alleged manipulation of yellow-phase timing on ARLE-equipped traffic signals. Arbitrarily decreasing the duration of the yellow phase increases the likelihood that motorists will proceed through the intersection under a red signal. That, in turn, increases the number of violations and ultimately revenue. New Jersey's legislation did not specifically prohibit signal timing adjustment. Pennsylvania's statute does prohibit that practice, but the public may not be aware of this important distinction.

Privacy concerns: Public concerns over privacy should not be dismissed. However, Pennsylvania's legislation expressly prohibits:

- Utilizing cameras for surveillance purposes;

- Using violation information, including camera images, for any purpose not directly related to violation proceedings; and
- Using vendor-collected information for purpose other than red-light enforcement.

In addition, camera angles are set to photograph the vehicle (license plate), not the driver. However, in any system involving cameras, a considerable public information effort is necessary to allay public concerns—as has been the case with technologies used to increase security and prevent terrorism.

Safety Benefits: The facts of ARLE dispel negative misconceptions and tell a positive story that should be the central message of public information efforts. The public may be generally unaware of ARLE's safety benefits in reducing red-light-running, crashes, and injuries. Before-and-after statistical analysis of crash data demonstrates that ARLE has improved safety at some of Pennsylvania's intersections with the highest crash ratings.

Cost of ARLE: Vendors are willing to structure contracts to ensure that fees do not exceed violation fine revenue, making ARLE affordable even for smaller municipalities. ARLE systems in Pennsylvania are not subsidized by state transportation taxes. A further benefit is the statewide ARLE Funding Program, funded by net revenues from Philadelphia's ARLE violation fines and used for safety improvements statewide.

PennDOT and its partners have an opportunity to communicate the facts of ARLE, which can dispel misconceptions. A communications initiative should:

- Leverage the role of planning partners as trusted advisors to municipalities.
- Partner with municipal associations, primarily PSATS, as townships represent most of the ARLE-eligible communities.
- Target information for municipal officials.
- Expand public awareness of intersection safety and ARLE.

PennDOT's engagement of partners such as PSATS could be structured around a temporary task force or a permanent advisory group to develop and execute an initiative to build public awareness and support. This could also be the structure for developing and implementing a broader strategic action plan, focusing on other important opportunities such as technical assistance (see Issue 3).

Issue 2: Requirement for Municipal Police Force Accreditation

Currently, before a municipality is eligible to implement ARLE, it must meet population thresholds and have earned police accreditation from the Pennsylvania Chiefs of Police Association. Of the 32 municipalities in Pennsylvania that are currently eligible by population, only 17 municipalities also have police accreditation. An argument can be made that the police accreditation requirement will help allay public concerns regarding ARLE program enforcement

by providing better standards and accountability of the police force. However, the process for a municipal police force to become accredited is costly (in terms of dollars invested) and lengthy—it can be a three-year process. This may act as a deterrent for future municipality expansion of ARLE. However, it is important to note that there are 15 Pennsylvania communities fully eligible to participate in ARLE that have not done so.

Issue 3: Legislative, Technical, and Administrative Challenges for Municipalities

Implementing an ARLE program in any municipality involves expertise in several areas:

- Proper ordinances must be passed,
- traffic and crash data must be collected and analyzed,
- vendors and contracts must be evaluated, and
- processes must be developed for evaluating potential violations, issuing tickets, and collecting fines.

PennDOT already provides technical support at key milestones, however there is an opportunity to provide additional guidance through programs such as the Local Technical Assistance Program (LTAP). This should include peer-to-peer assistance as well as the services that are provided through local government associations and their consultants, such as newsletters, open portal data sharing, web-based training, etc. Additionally, metropolitan planning organizations and rural planning organizations (MPOs and RPOs) can be a conduit for information and best practices. Nationally, many MPOs have recognized the need to be more involved with transportation operations.

A related opportunity is to enable municipalities to access ARLE vendor services using a statewide contract vehicle. This approach would greatly assist municipalities that lack the expertise to contract effectively with vendors. It would also reduce the time and money municipalities need to invest in the contracting process, and it could provide valuable economies of scale. The value of statewide contracting mechanisms has been demonstrated through the Commonwealth Costars program and statewide contracts for pooled bus purchasing by transit agencies.

Perhaps the most promising program of technical assistance would be for PennDOT to oversee an ARLE feasibility evaluation for the 15 communities that presently meet both eligibility requirements but have not opted to participate in ARLE. The feasibility approach would be comprehensive, addressing the benefits of ARLE and the intersections for which it would have the greatest impact. It should engage and educate both elected and appointed officials in the process, raising awareness of the program's benefits. This effort could also result in a prioritization of both communities and intersections, to target those communities that have most to gain by implementing ARLE technology.

ARLE Intersection Considerations

Determining Locations for ARLE Intersections

Evaluating existing conditions at a proposed signalized intersection is necessary to determine whether ARLE cameras may help to reduce violations, crashes, and injuries.

The following general information should be considered by eligible municipalities considering the ARLE program and for validating the conditions that should be present at signalized intersections:

- **Crash History** – What percentage of crashes at the intersection are caused by red-light running?
- **Violation History and Trends** – How many red-light-running violations occur at the intersection over a specified time period?
- **Daily Traffic Volume** – How many vehicles pass through the intersection every day?
- **Enforceability** – Is it possible to use traditional enforcement such as a police officer(s)?
- **Public Opinion** – Do citizens feel there is a red-light-running/safety issue at the intersection?

An eligible municipality that proposes to implement ARLE at an intersection should first determine the extent of the issues. This can be accomplished by the municipality's streets and police department conducting an evaluation of the intersection's existing safety and violation conditions. It is important to first determine whether satisfactory alternatives to ARLE could be implemented before implementing ARLE.

A 2013 Transportation Research Board (TRB) study conducted by Texas A&M Transportation Institute (TTI),"Effectiveness and Site Selection Criteria for Red Light Camera Systems,"13 evaluated the effectiveness of ARLE systems in reducing red-light-running (RLR) vehicle crashes at signalized intersections. The study reviewed 254 signalized intersections in 32 Texas jurisdictions. The study results suggest that a significant safety benefit for RLR cameras is achieved if intersections have four or more RLR crashes per year or have two or more RLR crashes per 10,000 vehicles. While these criteria have not been formally adopted by PennDOT for ARLE intersection selection, they do provide a threshold for a municipality to consider when evaluating the best candidate intersections for the implementation of an ARLE program.

[13] *Transportation Research Record: Journal of the Transportation Research Board, No. 2327, Washington, D.C., 2013, pp. 53-60.*

The municipality should also coordinate with the local PennDOT district engineering staff to obtain technical assistance for evaluating additional traffic volume and crash data, and for correspondence with the general public.

Items to Consider Before Pursuing ARLE

PennDOT has developed general guidelines to ensure all proposed ARLE intersections have documented data that satisfy the requirements for implementing an ARLE program: "ARLE systems are not necessarily intended for all signalized intersections, rather, only those intersections where documented red-light violations and/or crash problems exist."

Other appropriate countermeasures should be implemented prior to considering an ARLE system. Prior to considering an ARLE system:

- Determine whether appropriate signal visibility is available in compliance with PennDOT's Traffic Signal publication and the 2009 Federal Manual on Uniform Traffic Control Devices (MUTCD). A field evaluation should be considered prior to deciding whether ARLE should be installed at the intersection. If obstructions such as signage may be creating the red-light-running violations, remove the obstructions and monitor the site for several weeks. If no traffic signal visibility problems exist, document and incorporate a note onto the plan that signal visibility should be evaluated routinely.
- Ensure that the yellow change and all-red clearance intervals are in compliance with PennDOT guidance unless engineering judgment is documented indicating otherwise. See ftp://ftp.dot.state.pa.us/public/PubsForms/Publications/PUB%2046.pdf#page=181.
- Ensure that sight distance, alignment, grade, sightlines and/or other intersection geometry is not causing the red-light-running problem. If so, document all safety improvements that were made to correct this issue before pursuing an ARLE system.
- Ensure existing signing and pavement markings are appropriate and are not exacerbating red-light running issues.

Intersection Approval Process

PennDOT has outlined the following intersection approval process for eligible municipalities that have adopted an ARLE-enabling ordinance and are considering implementing ARLE at a specific intersection:

1. An eligible municipal traffic signal owner/ARLE system administrator shall identify a candidate intersection(s) for an ARLE system.
2. The eligible municipal traffic signal owner/ARLE system administrator shall obtain a municipal resolution indicating that the municipality concurs with the placement of an

ARLE system at an intersection(s), contingent upon the Secretary of Transportation's approval.

3. The eligible municipal traffic signal owner/ARLE system administrator shall complete a TE-154, Application for ARLE Intersection Approval [available at via the link below].
4. The eligible municipal traffic signal owner/ARLE system administrator shall submit a completed TE-154, municipal resolution, and other requested documentation electronically to ARLE_Grants@pa.gov (preferred), or by U.S. Mail to:

   Secretary of Transportation
   Automated Red Light Enforcement Approval Request
   400 North Street – 8th Floor
   Harrisburg, PA 17120-0064
5. The Secretary of Transportation will review each request and will issue a recommendation to the municipality which may include the following:
   - Concurrence that the proposed intersection can be an ARLE intersection.
   - Request for additional information regarding the proposed ARLE intersection.
   - Identification of an alternative intersection to apply ARLE.

   Note: Each ARLE intersection request undergoes a field evaluation by PennDOT to ensure existing compliance with current standards prior to the Secretary of Transportation responding.
6. After receiving notification from the Secretary of Transportation regarding the ARLE intersection request, the municipal traffic signal owner/ARLE system administrator shall proceed in accordance with direction provided in the approval letter.
7. The system administrator shall notify the Secretary of Transportation two weeks prior to beginning an ARLE warning period.

Additional information regarding the specific procedures and requirements for the implementation of ARLE are provided on the PennDOT website:
http://www.dot.state.pa.us/public/Bureaus/BOMO/Portal/ARLE_Summit_Document.pdf

Removing ARLE Cameras from Intersections

Since 2005 when the first ARLE cameras were installed in Philadelphia, new cameras have been added consistently through 2015. No intersections have been "decommissioned" yet from ARLE to non-ARLE status. Occasionally, components of an ARLE system may be temporarily out of service due to equipment malfunction, maintenance, or system upgrades. Representatives from both PPA and Abington Township have indicated that at this time there are no plans to eliminate ARLE systems at any of the 30 ARLE intersections operating in Philadelphia or the three intersections operating in Abington Township.

PPA noted the possibility of eliminating specific cameras on individual intersection approaches rather than eliminating ARLE from the entire intersection. Typically, cameras are placed on all approaches to an intersection; however, there is no requirement that all approaches be monitored. PPA would consider eliminating cameras where the number of violations has been reduced significantly and the revenue is not meeting the cost of the cameras for that approach. Another option would be to turn off the cameras but leave them installed along with the warning signs as a continued visual deterrent to red-light running. However, at this time, there are no plans for the removal of any of the existing cameras associated with either PPA's or Abington Township's system. This option could have the effect of compromising and confounding the overall integrity of the program despite its good intention.

Some studies have suggested that removing ARLE systems has led to an increase in both violations and crashes at intersections that previously had operating cameras.[14]

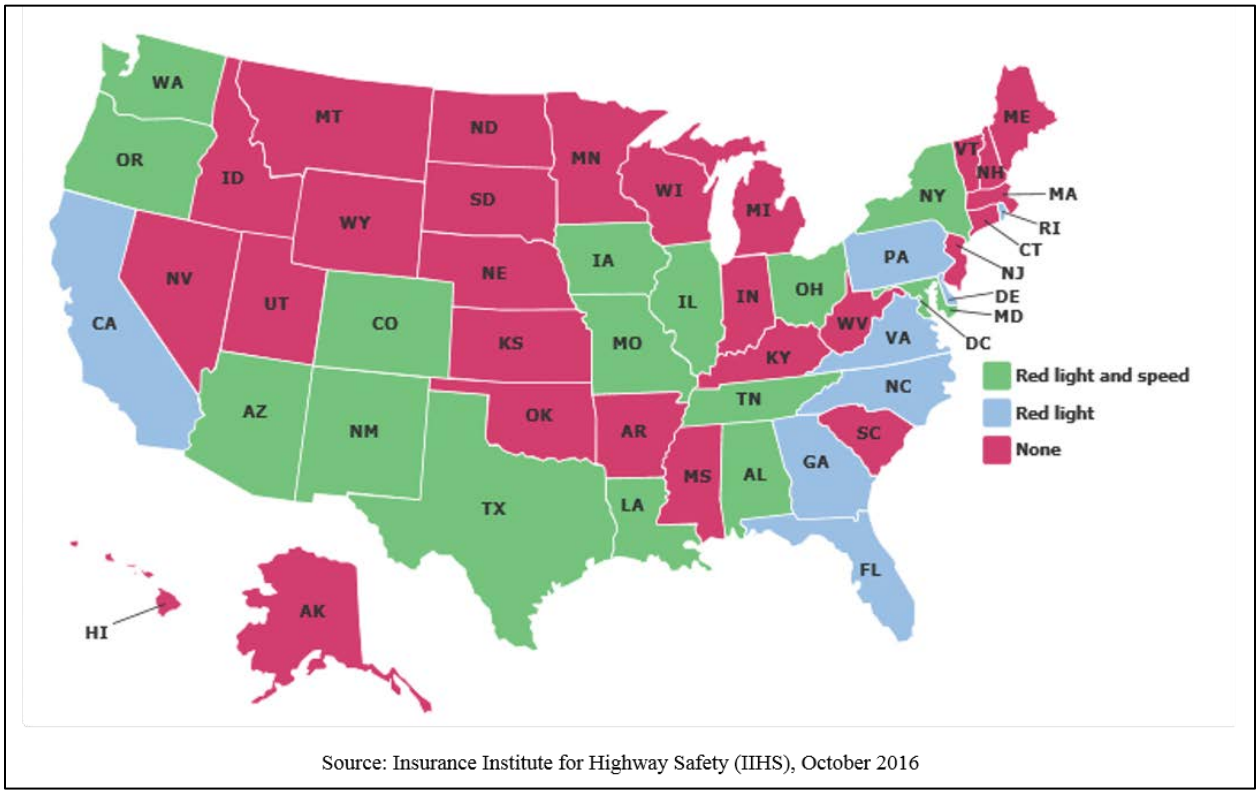
PennDOT has determined that when a municipality wants to remove an ARLE intersection or system, a resolution shall be passed stating the municipality's intent to remove the ARLE system from the operation of the traffic signal. The municipal traffic signal owner/ARLE system administrator shall submit a letter along with the resolution to the Secretary of Transportation. It is recommended that the letter describe the basis for determination of removal.

[14] http://www.iihs.org/iihs/news/desktopnews/turning-off-red-light-cameras-costs-lives-new-research-shows

Review of Other States

Red-light running has been identified as a serious intersection safety issue across the nation. According to the Insurance Institute for Highway Safety's (IIHS) Highway Loss Data Institute, red-light running crashes alone caused 709 deaths and an estimated 126,000 injuries in 2014. To curtail this alarming trend, local governments across the nation have been installing ARLE systems. ARLE programs have been in use in the U.S. since 1993, when New York City implemented the first system. According to the IIHS, U.S. red-light-running fines range from $25 to $500 per violation. Pennsylvania is one of 24 states, along with the District of Columbia, that operate ARLE programs, as shown in Figure 27. This section discusses some of the other states' ARLE programs and documents some of the successes and failures they experienced. TAC's review of other states is targeted to items of interest and potential consideration by PennDOT.

Figure 27: Red-Light Enforcement States



Source: Insurance Institute for Highway Safety (IIHS), October 2016

Other States: Practices

Since the initial implementation of ARLE in New York City, other states have implemented an ARLE program and municipalities have been installing red-light-running cameras with varying levels of success. Local government/state programs vary in some ways, but generally the programs operate similarly.

A few ARLE programs were investigated in more detail, such as programs in cities comparable to Philadelphia and other eligible municipalities in Pennsylvania, along with those in neighboring states with potential problems. Table 17 summarizes some of the positives and negatives of each of the examined programs.

Table 17 : Other States Research – ARLE Experience

Program	Positives, etc.	Negatives
New Jersey[15] (program suspended July 2014)	• Local jurisdiction must submit a list of intersections to the Commissioner of Transportation for approval. • Legislation requires yellow signal timing to be reviewed. • Legislation requires installation of warning signs along each roadway that leads to an ARLE intersection. • Legislation requires violation review by law enforcement officer. • Citations are mailed to vehicle owner regardless of driver's identity.	• Legislation does not place parameters on the cost of the citation. • Legislation allows for vendor payment per violation, rather than a flat fee, thereby incentivizing revenue-generation. • Legislation does not prohibit adjustment of yellow signal time.
Suffolk County, NY[16]	• Citations are mailed to vehicle owner regardless of driver's identity. • Legislation places a cap on the fine. • Legislation requires the county to submit an annual report of the program to the state government.	• Legislation allows for vendor payment per violation, rather than a flat fee. • Legislation does not require state department approval of selected intersections. • Legislation is vague and does not specify how the ARLE program is to operate. • ARLE is limited to 100 intersections maximum
Virginia[17]	• Legislation requires violations review by law enforcement official. • Legislation places a cap on the fine. • Citations are mailed to vehicle	• Legislation does not require state department approval of selected intersections. • Legislation did not address requirement of in-hand summons for unpaid violations.

[15] http://www.state.nj.us/transportation/refdata/rlr/
[16] http://codes.findlaw.com/ny/vehicle-and-traffic-law/vat-sect-1111-b-nr5.html
[17] http://lis.virginia.gov/cgi-bin/legp604.exe?131+ful+HB1879

Program	Positives, etc.	Negatives
	owners regardless of driver's identity. • Legislation requires vendors be paid a flat fee, not a per-violation rate. • Legislation requires yellow signal timing to be in compliance with the methodology of the Institute of Transportation Engineers. • Legislation requires installation of warning signs along each roadway that leads to an ARLE intersection.	
Texas[18]	• Citations are mailed to vehicle owner regardless of driver's identity. • Legislation requires vendors be paid a flat fee, not a per-violation rate. • Legislation requires a traffic engineering study of selected intersections to identify alternative solutions (retiming, upgrades, etc.) prior to or along with ARLE implementation. • Candidate intersections must meet certain criteria (crash history, traffic volume, high incidence of red-light-running, etc.) before installing cameras. • Legislation requires installation of warning signs along each roadway that leads to an ARLE intersection. • Legislation requires the local authority to submit an annual report of the program to TXDOT. • Legislation requires yellow signal timing to be reviewed. • Legislation places a cap on the fine.	

[18] http://www.txdot.gov/driver/laws/red-cameras.html

Other States: Legislative Concerns and Issues

Some states have suspended their ARLE programs in recent years, in particular, red-light enforcement was suspended in New Jersey in December 2014 after a five-year pilot program, and red light cameras are no longer in operation. New Jersey's ARLE program had numerous problems during its pilot period.

One concern with New Jersey and Suffolk County, NY, is that both laws allow vendors to be paid on a per-violation basis rather than a flat fee. This approach can cause a conflict of interest when vendors are responsible for processing citations, and it fosters a public perception that revenue-generation is the intent more so than public safety. Neither the New Jersey nor the Suffolk County, NY, legislation requires that a law enforcement official—rather than the vendor—process citations.

Another concern with New Jersey legislation is that it did not limit the dollar amount for citations. Most states cap the automated-red-light- running citation fine to prevent municipalities from continually raising fines to increase revenue.

In Suffolk County, NY, and more recently in Virginia,[19] legislation does not require state department of transportation approval of ARLE intersections. State approval, such as in Pennsylvania, helps to ensure that fine levels are managed and reasonable. Further, states provide a level of technical review that is beneficial for the community and from a statewide perspective. When state department approval is not required, municipalities may select intersections with short yellow lights (increasing the likelihood of violations and thus revenue) rather than intersections with a crash history requiring increased safety measures. State oversight and program management has technical benefits and bolsters ARLE integrity.

Other States: Violations Experience and Safety Benefits

Although the safety benefits of ARLE programs are often debated, numerous studies have shown that the most dangerous types of crashes decrease with the implementation of red-light cameras.

An August 2011 study performed by the Texas Transportation Institute (TTI) reported an 11 percent statewide decline in overall crashes at the 275 study intersections following ARLE implementation. The report also documented that the 275 intersections

> Approximately 1,300 lives have been saved in 79 large U.S. cities with active automated red-light-enforcement programs through 2014.
>
> --July 2016 study by the Insurance Institute for Highway Safety

[19] In 2012, the Virginia General Assembly removed VDOT from the approval process.

with red-light cameras experienced a 25 percent decrease in red-light related accidents and a 32 percent decrease in right-angle crashes, considered to be among the most dangerous crash types.

A July 2016 study conducted by the Insurance Institute for Highway Safety (IIHS) reported that approximately 1,300 lives have been saved in 79 large U.S. cities with active ARLE programs through 2014. Additionally, as more cities are opting to shut down the programs, the same study found that fatal red-light-running crashes increased by nearly 30 percent in cities whose red-light cameras were put out of operation.

While many studies observing crash reduction at automated-red-light-enforced intersections produce mixed results, programs almost universally see a decrease in red-light-running violations.

A January 2013 IIHS study found that red-light-running cameras reduced red-light-running violations in Arlington, Virginia. The most dramatic reduction was achieved for the most dangerous violations—those happening 1.5 seconds or longer after a light turns red—which decreased by 86 percent after one year of ARLE. Violations occurring 0.5 seconds and 1 second after the light turned red decreased by 39 percent and 48 percent, respectively.

Other States: Revenue Distribution

Similar to Pennsylvania, where 100 percent of net ARLE revenue is redirected to the Motor License Fund, other states also redirect a portion of their ARLE revenue. In Florida, $10 from every $158 ticket is forwarded to the Department of Health emergency medical fund, and $3 is directed to a state brain and spinal cord trust fund. In Texas, all agencies participating in an ARLE program must direct half of their net revenue toward local transportation expenses and regional trauma centers that treat car-crash victims.

A 2013 USA Today article discussing the potential controversy associated with red-light camera revenue highlighted Pennsylvania's success in preventing incentives for revenue generation by redirecting their funds into traffic safety grants.

Other States: Contracting Observations

Vendor agreements vary greatly between states and between the municipalities within those states. Some agreements are as simple as a flat fee, such as in Portland, Oregon, where Conduent receives about $2,500 per camera monthly,[20] similar to the current agreement in Philadelphia. Other contracts are more complicated, such as in Cerritos, California, where ATS offered a five-year contract with rental fees stepping down each year.[21] Additionally, some agreements have

20 http://www.oregonlive.com/commuting/index.ssf/2014/04/portland_accounting_change_sto.html
21 http://www.presstelegram.com/government-and-politics/20160712/cerritos-looks-to-make-more-money-from-its-red-light-cameras

involved the vendor retaining the net violation fine revenue after paying the municipality and state a fee per camera. For example, in Palm Coast, Florida, ATS pays the city $700 per camera per month and pays the state $83 per ticket.[22]

What many agreements have in common is the stipulation that a municipality will not have to pay the vendor any amount greater than what is produced in violation revenue. Like the agreement Abington Township has with Gatso, other municipalities have similar contracts, not only with Gatso, but with other vendors as well. Gatso has contracts with Albany, New York,[23] and DeLand, Florida,[24] in which the municipality pays the full fee per camera only if it receives sufficient fine revenue. ATS also has similar deals in Aventura, Florida,[25] and in Tampa, Florida,[26] where the municipalities are only required to pay if the revenue collected exceeds the monthly cost of the cameras.

Other States: Public Perception of ARLE

The parameters of an ARLE program and how it is operated seem to shape public perception. As expected based on material presented in earlier sections, New Jersey residents have divided views of the system and generally perceive it as a revenue-generator for local governments. Virginia residents, on the other hand, generally support the use of red-light-camera programs and perceive the safety benefit. Local governments that alert the public of new intersection installations and the dangers of red-light-running typically have a better public perception.

Most of the information available on red-light cameras displays positive results regarding improving safety. A 2015 study by the American Automobile Association (AAA) Foundation for Traffic Safety[27] noted that 57 percent of people surveyed were in favor of using ARLE on residential streets, and that 28 percent strongly favored it. Additionally, 94 percent of drivers believed it was unacceptable to drive through a red light when possible to stop safely and 59 percent felt that red-light running was a serious threat to their personal safety. Table 18 provides more detail on the results of the AAA study.

22 https://flaglerlive.com/53890/florida-ats-red-light-cameras/
23 http://alloveralbany.com/archive/2015/04/24/albany-red-light-camera-program-set-to-start-soon
24 http://www.news-journalonline.com/news/20120924/deland-holding-off-on-red-light-cameras-for-more-info
25 http://www.biscaynetimes.com/index.php?option=com_content&id=952:traffic-c
26 http://www.wtsp.com/news/buckhorn-red-light-cams-too-close-for-comfort/236279406
27 https://www.aaafoundation.org/sites/default/files/2014TSCIreport.pdf

Table 18: Opinions about Red-Light Running and Red-Light Cameras in the U.S.

Survey Question	Percent	
How much of a threat to your personal safety are:	Very serious threat	Somewhat serious threat
• Drivers running red lights	58.6 %	26.1 %
How strongly do you support or oppose:	Strongly support	Somewhat support
• Using red light cameras in urban areas	26.3 %	27.2 %
• Using red light cameras on residential streets	27.8 %	29.2 %
How acceptable is it for a driver to:	Unacceptable	Somewhat Unacceptable
• Drive through a red light when possible to stop safely	72.7%	21.3%

Section 6: Summary of Findings

This study was conducted as a broad program evaluation. "Program evaluation" is the language contained in Act 101 of 2016, which is the statutory basis for the study. As such, a program evaluation typically entails the following kinds of study activity:

- A review of program effectiveness, especially in relation to stated goals and/or objectives;
- Analysis of benefits and cost to determine if the program is cost-effective;
- Opportunities for improved performance, efficiency, and delivery; and
- Opportunities for improved organization and program design.

A program evaluation is not an audit, nor does it include many of the elements that an audit typically entails—particularly a financial audit. The distinction between a program evaluation and an audit is of particular importance as the Pennsylvania Auditor General was conducting an audit of the ARLE program concurrent with this TAC study. This program evaluation was conducted in ways to ensure that it did not devolve into an audit.

Nevertheless, PennDOT, having responsibility for ARLE on a statewide basis, does require reasonable assurance that all ARLE programs at the local level are effective, efficient, and fully accountable. The TAC does not have the information to indicate that this is not the case. However, in the course of this TAC study, it became clear that there is sufficient need related to good governance and public program management to strengthen PennDOT's oversight of the ARLE program. This may be done means of the considerations outlined in the body of this report, including legislative amendments and other recommendations.

General

- The ARLE program in Pennsylvania has been successful in improving safety by reducing the number of injuries and fatalities associated with intersection crashes.
- The ARLE program has proven to be successful in two distinct categories of municipality: major city (Philadelphia) and large township (Abington, Montgomery County), indicating that wider replication is possible.
- The reduction of fatalities and injuries represents a major benefit for the ARLE program. The cost of implementing ARLE must be considered in relation to these benefits that can accumulate to a very large extent even with the numbers of fatalities and injuries being seemingly few.
- Improvements to Pennsylvania's ARLE statute have enhanced the ARLE program.

- Only two of the 17 municipalities currently eligible to implement an ARLE program in Pennsylvania have done so. This suggests that there are barriers to a broader implementation that should be addressed.
- The ARLE Funding Program continues to be successful, providing a source of funding for low-cost safety improvement projects throughout the state. Net revenues available from the fines associated with ARLE violations (after ARLE operating costs have been satisfied) are used to fund the safety improvements.
- ARLE programs in smaller municipalities with comparatively lower traffic volumes and fewer violations would not be likely to generate sufficient revenue to cover program administration and operating costs, or provide additional revenue for the ARLE Funding Program. However, there may be ways to address this such as through the current methods by which vendor contract terms are set.
- ARLE reinforces safe driver behavior. After an initial peak in red-light-running violations, intersections equipped with ARLE typically maintain a lower, but relatively steady, level of violations.

Safety

Philadelphia

- Based on an analysis of the number of injuries from crashes at intersections before and after ARLE implementation, there is evidence that ARLE has reduced injuries attributed to running red lights. Although the number of crashes varies at intersections equipped with ARLE cameras, some intersections have had crashes reduced by as much as 75 percent.
- Due to the relatively low number of fatalities both before and after ARLE implementation, it is difficult to draw a statistically definitive conclusion about ARLE's effects on fatalities. The 24 ARLE intersections for which sufficient years of crash reporting are available showed six fatalities before ARLE implementation and three fatalities afterward. Even anecdotally, this suggests that ARLE may be saving lives—the greatest safety benefit possible.

Abington

- The ARLE program in Abington is too recent to draw definitive conclusions about its safety effects. However, the number of injuries in crashes attributed to red-light-running crashes since the implementation of ARLE has decreased from 3 to 0 at the intersection of Old York Road and Susquehanna Road, while the other two intersections remained at zero injuries since the implementation. Continued analysis of the safety impacts, along with additional years of trend data, will help to better define the program's benefits.

Financial

Philadelphia

- The revenue collected from violator fines has generally tracked consistently with the number of violations over the 12 years since the first cameras were installed. The cumulative total fine revenue collected since the inception of the program is $117 million. The cumulative total uncollected fine revenue to date is $18.9 million (14 percent of potential violation revenue collected). When the program was initiated, however, unpaid fines accounted for 32 percent of the total revenue collected. The rate of unpaid violations declined dramatically after the program's inaugural year and has consistently remained at or below 16 percent since 2007. This compares favorably to other U.S ARLE programs.
- A significant share of program expenses is associated with the installation and maintenance of ARLE-related equipment, amounting to $5.7 million, or more than half of the Philadelphia program total expenses for FY 2015-16. A total of 168,756 violations occurred in 2016. The total program cost per violation in 2016 was about $58. The cost per violation has remained consistent since 2012. The total cost per intersection averaged about $334,000 over the last five years. Typically, within the first 24 months of ARLE implementation, the intersection violation rate decreases significantly; after two years it typically levels off.
- The relationship between program expenses and the number of intersections added since program inception has been fairly consistent. Philadelphia Parking Authority (PPA) personnel expenses have increased about 20 percent over the past five years as new staff were added to keep pace with the additional ARLE intersections.
- Since 27 of the existing 30 ARLE intersections can be considered mature or established, with no significant decline in violations expected, violations going forward should be fairly stable, all other things being equal. With a fixed fine level of $100 and inflation expected to increase costs, some decrease in net revenue can be expected if no additional intersections are ARLE-equipped. Adjusting fine levels for inflation should be considered at some point in the future in order to keep pace with costs to a reasonable degree.
- The Philadelphia ARLE program would require on average 325 violations per intersection month (approximately 11 per day) to be revenue-neutral (revenue equal to costs).

Abington

- Were it not for the vendor contract terms that place the cost risk with the vendor, the violation fine revenues would not be sufficient to cover the costs of operating the system. Since ARLE was implemented in Abington Township in October 2014, the total amount

of fine revenue collected from violations as of September 31, 2016, was $655,062. The total program operating costs over the same two-year period were $1,049,702, for a deficit of more than $394,000. Abington Township's costs for administration of the program are reimbursed from the violation revenue collected. Due to the smaller number of violations, there are no expectations that the program could ever yield positive net revenue to contribute to the ARLE Funding Program. The amount of uncollected fine revenue to date is $138,900. The average rate of unpaid violations was 17 percent of the total potential violation revenue. This compares favorably to Philadelphia and other U.S ARLE programs.

- The number of violations decreased from a 725 to 385 over the two-year period from October 2014 to September 2016, for an average reduction of 45 percent. Like the Philadelphia ARLE program, the intersection violation rate decreased significantly over the first 24 months of operation. Additional program years will determine any future rate fluctuation. The program cost as expressed on a per-violation basis was $140 in the 2016 program year.

Institutional

- PPA continues to effectively administer the ARLE program in Philadelphia. The number of intersections has increased to 30. The process that PPA uses to add intersections has remained unchanged since the program's inception.
- Abington Township is the only municipality to implement an ARLE program since 2012, when the Pennsylvania General Assembly authorized ARLE in municipalities with populations lower than Philadelphia's.
- PennDOT's ARLE Guidance Document developed in 2014 has clarified and streamlined the process municipalities must follow to initiate, administer, operate, and maintain an ARLE program.
- PPA is evaluating additional intersections for possible inclusion in a new vendor contract currently being developed to expand the ARLE program in Philadelphia.

Legislation

- The Pennsylvania legislation (Act 123 of 2002) that initially authorized ARLE has been amended seven times to improve various aspects of the program. The legislation is considered well-crafted and prevents many of the problems that have been experienced in other states with less-stringent legislation.
- In addition to the City of Philadelphia, the PA state legislation now permits smaller municipalities in certain counties to implement an ARLE system. Based on the requirements outlined in PA Title 75, Section 3117, a total of 32 communities meet the

population threshold to implement ARLE. However, only 17 of those 32 municipalities meet the police force accreditation requirement. Abington Township is the only additional municipality to implement and ARLE system since the 2012 legislation authorized other municipalities to participate.

- Extending the ARLE program expiration date to 2027 (Act 101 of 2016) makes possible longer-term contracts with vendors that may improve financial terms for PPA and Abington Township. This 10-year period also provides an opportunity to take a strategic approach toward expanding ARLE, particularly among those communities that satisfy both population and police accreditation eligibility criteria.

- Pennsylvania's ARLE legislation has been recognized by other states to be an effective model.

Municipal Survey

- All 13 of the municipalities surveyed are aware of the ARLE program.
- Of the eight survey respondents who believe red-light running is a problem in their community, only one indicated that traditional labor-intensive enforcement was sufficient to effectively combat the problem. Technology offers a legitimate and cost-effective alternative to officer surveillance.
- Lack of support among public officials was cited as a key factor for not participating in ARLE among surveyed municipalities.
- Municipal officials apparently are very conscious of the negative public perceptions and misconceptions associated with the program.
- Lack of awareness and lack of correct information appears to be a major obstacle to expanding the ARLE program.

Public Outreach and Awareness

- No formal public outreach program is currently undertaken either by Philadelphia (PPA) or Abington Township, however, both municipalities provide information and data regarding the programs on their public websites.
- Both PPA and Abington Township have assisted other municipalities in evaluating or implementing a potential ARLE program.
- PennDOT does provide information and data regarding the ARLE Program on their website, however, PennDOT does not have a public outreach / educational program for advancing ARLE programs in other municipalities.

ARLE Funding Program (Safety Grants)

- A total of approximately $51 million in revenue collected from violations has been made available for the ARLE Funding Program over the 12-year period since the first cameras were installed. The Philadelphia ARLE program is the sole contributor to the ARLE Funding Program; the City has received back about $23 million in grants for safety improvements within the City—a little less than half of the total amount of grants distributed statewide.
- Since the initial ARLE Funding Program was authorized, more than 300 applications for safety improvement projects statewide have been awarded from the more than 1,500 applications submitted. More than 115 municipalities in 44 counties throughout the state have benefitted from safety improvement projects funded by the ARLE Funding Program. As such, it is important to keep this significant secondary benefit of ARLE much in view as part of this overall program evaluation.

Section 7: Recommendations

A. Continue to promote and expand the ARLE program.

The ARLE program in Pennsylvania has been successful in improving safety by reducing the number of injuries and fatalities associated with intersection crashes.

TAC recommends that the municipalities with current ARLE programs consider additional intersections where ARLE treatment may aid in reducing red-light-running violations and injuries resulting from crashes.

In addition, TAC recommends that PennDOT move to a new phase in the program's development by promoting ARLE and assisting other eligible municipalities in implementing an ARLE program. With only two of the 17 eligible municipalities having implemented an ARLE program, there appear to be substantial barriers to further program expansion that now need to be strategically addressed. PennDOT should consider establishing a target or a goal such as helping to add one new municipality per year on average over the remaining period of program authorization (through 2027).

B. Consider legislative changes to further improve the ARLE program.

Pennsylvania legislation authorizing the ARLE program is generally viewed as well-crafted and comprehensive. Since the initial ARLE program was authorized in 2002, the legislation has been periodically amended. In continuing to improve upon the ARLE program in Pennsylvania, it may be appropriate to refine the ARLE law as follows:

Consider amending legislation to expand the number of counties in which municipalities are eligible to implement ARLE.
Currently, the legislation does not include a Second Class County (Allegheny County) and includes only one of the 12 Counties of the Third Class. These counties have municipalities that meet the 20,000 population threshold and could potentially benefit from ARLE.

Consider amending legislation to require additional supporting documents with the quarterly reports. (Alternatively PennDOT should consider advancing this recommendation if the statute does not expressly prohibit it in any way.)
Currently, the legislation requires the local System Administrator to provide an annual report of the ARLE program and remittance of the fine revenue to PennDOT after deducting the municipality's administration and operating costs. Currently, quarterly payments from the municipality for deposit into the Pennsylvania Motor License Fund account are not supported by financial documents that clearly describe and document the transaction. This change would make ARLE more consistent with other public programs that require supporting data for financial transactions, such as grant programs.

Consider amending legislation to remove the requirement of police force accreditation.

Currently, ARLE legislation requires that a municipality's police department be accredited by the Chiefs of Police Association prior to implementing ARLE. Only 17 of the 32 municipalities that meet the population criteria also meet the police accreditation requirement. Earning accreditation can be an arduous process that may deter municipalities from pursuing ARLE. Accreditation could possibly be encouraged in various ways rather than being an absolute requirement.

Consider amending legislation to index the violation fine to inflation.

The original ARLE legislation established a $100 fine for a violation. The amount has remained constant with no adjustment due to inflation. The current legislation extended the program to 2027, at which point the program will have been in operation for more than 20 years. Indexing the fine to inflation through an annual adjustment would help revenue keep pace with rising administration costs.

Consider amending legislation to provide PennDOT the authorization to remove cameras from ARLE intersections.

Currently, the legislation only specifies that the Secretary of Transportation has the authority to approve the intersections proposed for the implementation of ARLE cameras. Consideration should be given to amending the legislation to provide the Secretary of Transportation the authority to remove camera enforcement from ARLE intersections, provided an evaluation of the intersection is made in coordination with the ARLE administrator. (Alternatively PennDOT should consider advancing this recommendation if statute does not expressly prohibit it in any way.)

C. Establish an ongoing process for future ARLE program evaluations.

Effective public program design and delivery typically entails periodic program evaluations. This may include any or all of the following:

- A review of program goals and objectives – Are program outputs and outcomes measured and what do the measures show?
- Cost effectiveness and cost efficiency – Respectively, results or outcomes in relation to cost and program outputs or units in relation to costs.
- Customer / public satisfaction.
- Other focus areas or measures specific to the program being evaluated.
- Performance measurement.

The General Assembly required this evaluation of the ARLE program that TAC has undertaken. ARLE, like any program, should periodically be considered in terms of key objectives and metrics. PennDOT diligently oversees the program and can benefit from a basic evaluation at a regular interval such as annually or bi-annually. In several ways this report has been structured so that portions of it can be used to update data, etc., and provide elements for

regular evaluations. The routine measures of effectiveness and efficiency normally can be simply a matter of updating the report when new data is available and examining any trends, anomalies, etc.

The challenging and sometimes more valuable evaluation process focuses on the qualitative aspects of the program. This could include, for example, progress made implementing any of the recommendations made in this report.

D. Update the ARLE Summit Document.

In September 2014, PennDOT's Bureau of Maintenance and Operations produced an ARLE Summit Guidance document covering a wide range of topics. TAC recommends that the document be updated after the Department has determined any new directions or emphasis areas related to this study, or otherwise. New areas of emphasis could include:

- An FAQ document or brochure that debunks some of the misconceptions regarding ARLE
- Program goals or objectives
- Program evaluation or performance measurement
- Municipal reporting
- Raising awareness of the public and public officials
- Incorporating additional program details into PennDOT policy

E. Reinvest ARLE Funding Program dollars back into ARLE.

The ARLE Funding Program has provided more than $50 million in safety improvement grants throughout the Commonwealth. This provision is established in the ARLE legislation and certainly serves a laudable purpose. At the time the legislation was enacted this provision may have been necessary to garner support from legislators in less-populated areas of the state.

The ARLE Funding Program provides a means to reinvest in transportation related projects and therefore counters the misconception ARLE is a "revenue-only" driven program. The ARLE Funding Program has become a competitive grant program and PennDOT has developed a standardized process to rank submitted applications and select projects that best meet the goals of the program. More than 114 municipalities have benefitted from the distribution of ARLE Funding Program funds throughout the Commonwealth.

However, in light of ARLE's effectiveness with a low rate of implementation, additional uses of the net revenues for ARLE-specific purposes should be considered. Few programs are self-sustaining, let alone provide sources of subsidies or transfers to other programs.

At this point in time, ARLE faces significant challenges in terms of expanding the use of this effective tool for reducing injuries from crashes at certain intersections. As such, PennDOT should consider reinvesting a portion of net revenues back into the ARLE program for purposes that particularly relate to expansion.

F. Require local match for projects funded by ARLE Funding Program.

PennDOT's 2014 ARLE Guidance Document provides that no matching funds are required for ARLE Funding Program grants. However, the total funding requested is substantially higher than the available program funds. Requiring a local match may encourage municipalities to prioritize projects for which they seek ARLE Funding Program grants. It would also help stretch the funding to potentially allow additional safety improvements projects to advance.

G. Establish a standardized municipal reporting protocol to provide documentation supporting PennDOT's oversight.

PennDOT receives payments from ARLE municipalities of net revenues. At this point in time, that only includes Philadelphia, as Abington does not have net revenues from its program. There is no supporting reporting presently when the payment is made. For an appropriate audit trail and to reconcile the payment with the associated violations/fees, it is recommended that PennDOT develop a reporting template or protocol. Further, depending on the information contained in the report, it might not be limited to payment reconciliation. Other fields may be useful for routine reporting from Abington and other future municipalities participating in the ARLE program. This should be done in a way that provides useful information while not creating an unreasonable burden on municipalities.

H. Provide a program of technical assistance to prospective and current ARLE municipalities.

PennDOT has a tremendous track record with local government technical assistance through programs such as the Local Technical Assistance Program (LTAP), which could be the vehicle or model for an expanded ARLE technical assistance effort. This can and should include peer-to-peer assistance as well as the services that are provided through local government associations and their consultants. Additionally, metropolitan planning organizations and rural planning organizations (MPOs and RPOs) can be an information and assistance source for municipalities interested in implementing an ARLE program and to advance the potential implementation in other eligible municipalities.

I. Consider a statewide contracting vehicle for ARLE to encourage municipal participation.

Presently, each municipality must establish its own contract with its selected vendor. The opportunity for cost savings through a statewide contract should be considered and could be substantial. This could provide economies of scale for each municipality and would reduce their time and cost associated with the contracting process. Many eligible municipalities may also lack the expertise to contract as effectively as possible with vendors.

The Commonwealth Costars program is leveraged by many municipalities and authorities to

procure a wide range of services and products through Commonwealth-wide contracts. Statewide contracts have also been used by transit authorities for pooled bus purchasing. Municipalities can also take advantage of existing best practices in established processes for the administration of an ARLE program, e.g., violation verification and fine notices and the violation appeal and hearing process.

J. Provide targeted information and awareness for elected officials and municipalities.

Pennsylvania has numerous training venues and platforms for municipal officials, many of which are offered through the various municipal associations such as the Pennsylvania State Association of Township Supervisors (PSATS). One advantage, among others, is that this provides an independent third party known and respected to provide the training and/or information exchange. ARLE in the near term should be presented at conferences attended by local leaders simply to raise awareness about what ARLE is and is not.

K. Strategically engage MPOs in the ARLE program.

PennDOT's partnership with the metropolitan and rural planning partners across the state is recognized as one of the best in the nation. These 24 planning organizations are key in working with PennDOT to establish local priorities for transportation investment. Typically their work entails various studies, data collection efforts, and collaborations with local municipalities. The MPOs should be engaged by PennDOT as a key strategic partner for ARLE. This should also entail providing training and information for the planning partners to provide to local municipalities and/or hold seminar programs. Further, PennDOT's new PennDOT Connects initiative can be leveraged for this purpose as it relies on PennDOT and the planning partners to increase their joint engagement of local communities.

L. Provide updated PennDOT website data.

ARLE falls below the radar in various ways, including public information. Another area to consider for greater information dissemination is program and performance data. The PennDOT website for the ARLE program should be enhanced to include public information, best practices, performance and trend data, profiles of successful communities and intersections, and FAQ-type information to help dispel misperceptions. An ARLE performance dashboard could be a valuable addition to the website.

Best practices of municipalities could be designed to promote networking and peer-to-peer exchange through the inclusion of points of contact, etc. A more robust and engaging website should also be conspicuously linked with local governments, local government associations, and other websites addressing highway safety.

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