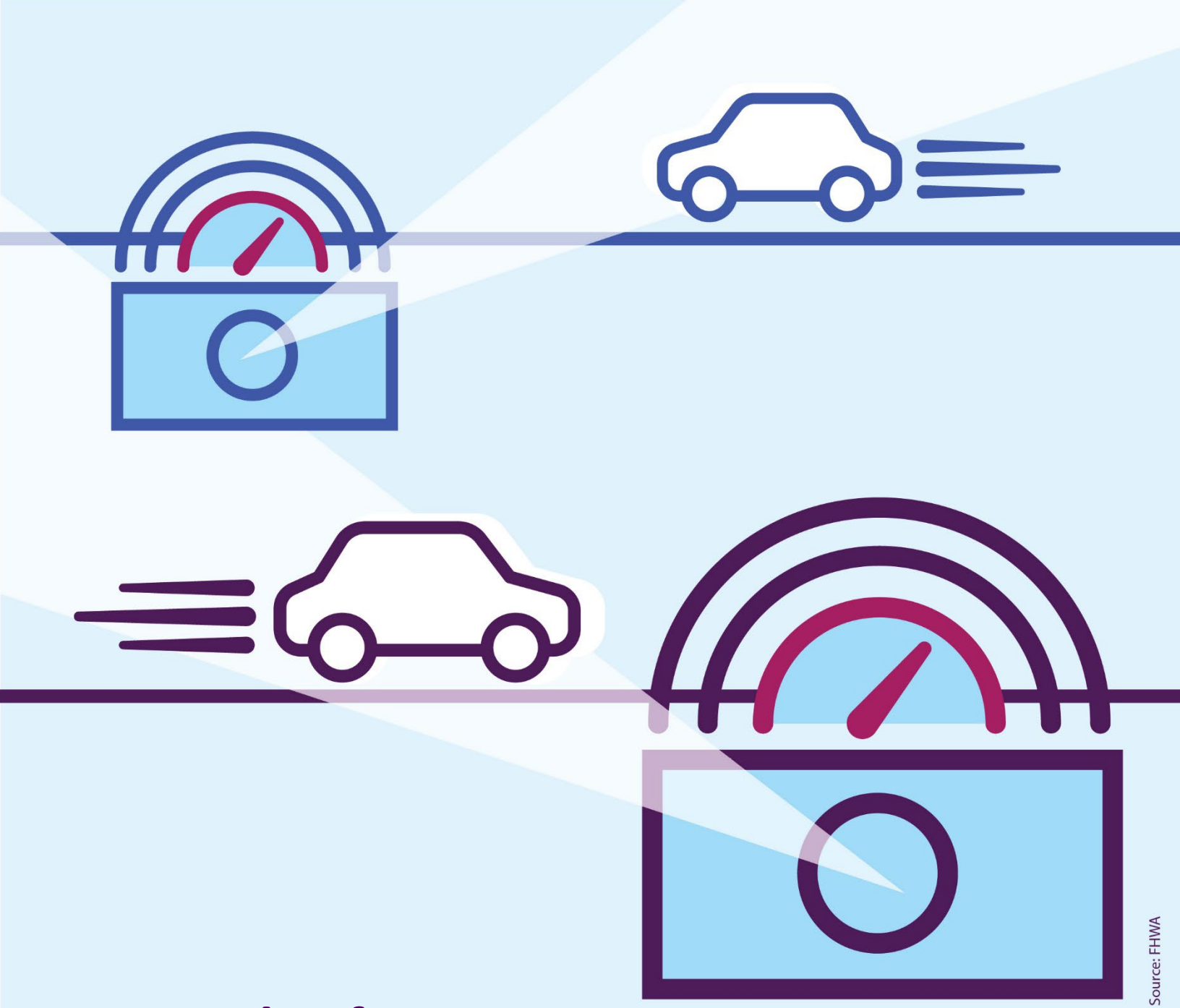

Source: FHWA

Speed Safety Camera Program Planning and Operations Guide

U.S. Department of Transportation
National Highway Traffic Safety Administration

U.S. Department of Transportation
Federal Highway Administration

FOREWORD

More than 40,000 people died on our roads last year. "For more than two decades, speeding has been involved in approximately one-third of all motor vehicle fatalities."[1] In 2020, speeding was a contributing factor in crashes that resulted in 11,258 fatalities.[2] Effective speed management practices can reduce fatalities and serious injuries and save lives. States and local governments have been working with transportation agencies and law enforcement to promote and achieve safety on the Nation's roads. The option of taking an enforcement action when people engage in risky driving behaviors, especially speeding, is an important component in the Safe System Approach and leads to general and specific deterrence to curb the incidence of unsafe driving behaviors. This enforcement can be conducted by law enforcement officers and also by automated means, including speed safety cameras. This report focuses on the use of speed cameras, in response to growing demand from State and government partners – including law enforcement – for best practices in planning and operation of these devices which can complement traditional enforcement techniques.

Speed safety cameras (SSCs), also called photo radar or automated speed enforcement (ASE), use speed measurement devices to detect vehicles that are exceeding the speed limit. Local governments have found that when used appropriately as part of a broader strategy SSCs can reduce traffic fatalities – especially around schools and constructions zones.[3,4] SSCs have been shown to reduce roadway fatalities and injuries by 20 to 37 percent.[5,6]

Local governments have used the SSC program to address safety problems within a jurisdiction where crashes cannot be addressed more effectively with other countermeasures, such as traditional enforcement, signage, public outreach, and speed feedback signage. Additionally, as a traffic safety device, the motivation for SSC programs must be safety for road users using data-driven approaches, and not based on revenue generation. In order to build public trust, SSC programs should be transparent about the use of revenue from citations. Revenue generated from SSCs in some jurisdictions has been put back into safety programs, rather than to finance unrelated expenses for the city or county.

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[1] NHTSA. (2022a). Overview of Motor Vehicle Crashes in 2020. U.S. Department of Transportation, DOT HS 813 266. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266

[2] NHTSA. (2022b). Traffic Safety Facts: Speeding 2020 Data. U.S. Department of Transportation, DOT HS 813 320. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813320

[3] New York City Department of Transportation. (2018). Automated Speed Enforcement Report 2014-2017. https://www.nyc.gov/html/dot/downloads/pdf/speed-camera-report-june2018.pdf.

[4] Maryland Department of Transportation. (2019). Maryland SafeZones: The Facts about Maryland's SafeZones Program. https://www.roads.maryland.gov/OC/Maryland_SafeZones_Fact_Sheet_2019_Winter.pdf.

[5] Montella, A., Imbriani, L.L., Marzano, V., and Mauriello, F. (2015). Effects on speed and safety of point-to-point speed enforcement systems: evaluation on the urban motorway A56 Tangenziale di Napoli. *Accident Analysis and Prevention*, 75, 164–178. 10.1016/j.aap.2014.11.022.

[6] Li, R., El-Basyouny, K., and Kim, A. (2015). Before-and-after empirical Bayes evaluation of automated mobile speed enforcement on urban arterial roads. *Transportation Research Record: The Journal of the Transportation Research Board*, 2516(1), 44–52. 10.3141/2516-07. Last accessed May 18, 2021.

Additionally, equity must be considered in the implementation of safety programs to determine if SSCs are a suitable countermeasure or if other speed management countermeasures may be needed to complement or be used instead. Local governments who explore or are implementing the use of SSCs need to consider equity, civil rights, and civil liberties concerns in all stages, from planning to operation to evaluation. A prime example of this comes in site selection during the planning phase where implementors of SSC programs must consider whether speed safety cameras are being disproportionately installed in some areas and not in others. With proper implementation by local governments, SSCs have the potential to offer fair and equitable enforcement of speed limits, regardless of driver age, race, gender, or socio-economic status.

Agencies that have implemented safety strategies with SSCs in the U.S. can offer lessons on how to maintain a safety focus, increase program reliability, reinforce fairness, and achieve and maintain public support. Some jurisdictions have found success using SSCs for special circumstances, such as in work zones and school zones, which focus on the safety of construction workers and children.

- In 2020, Pennsylvania implemented an Automated Work Zone Speed Enforcement (AWZSE) pilot program which allows the use of SSCs in active work zones. Many aspects of the program, such as how fines are used, are outlined in authorizing legislation. Fine revenue first goes to the costs of running and maintaining the program. Any excess revenue goes to the Pennsylvania State Police, the Pennsylvania Department of Transportation, and the Pennsylvania Turnpike Commission based on various percentages and depending on the year of the program.
- Similarly, New York City implemented a school zone SSC program, which also started as a pilot program but was eventually expanded to include more school zone locations. NYC used a geographic balance as part of the criteria for site selection, which may help to prevent disproportionate enforcement of certain neighborhoods. As a result of NYC's school SSC program, speeding during school hours was reduced by 63 percent and injuries from pedestrian crashes decreased by 17 percent at SSC locations.
- The City of Seattle also first piloted SCC in school zones using mobile vans in 2009. Following this pilot, the city launched a fixed camera program in 2012. The program began with eight cameras at four schools. The SCC program expanded in 2014 adding five more schools and expanded again in 2015 adding four more schools. SSC is only authorized in school zones, which have speeds limits set at 20 mph.

These are just three examples that illustrate ways that SSC, when properly implemented can complement traditional law enforcement work, improve road safety for all users, and help reverse the recent and alarming trend of roadway deaths in our nation.

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<tr><td colspan="4">16. Abstract
The Speed Safety Camera Program Planning and Operations Guide (Guide) provides an update of the United States Department of Transportation (USDOT) 2008 Speed Enforcement Camera Systems Operational Guidelines. Speed safety cameras (SSC), formerly referred to as speed camera enforcement or automated speed enforcement (ASE), is a proven safety tool that jurisdictions may use as part of a comprehensive speed management program to target speeding-related safety problems. The purpose of this Guide is to help jurisdictions plan, deploy, and operate SSC programs to improve safety and maintain program reliability and accountability. SSCs are inherently objective in enforcing speed limits but should be implemented carefully and with significant community input. Responsible public agencies should also maintain strong oversight to ensure the program maximizes the intended benefits to the public. This update places increased emphasis on ideas and considerations for planning in States that lack current authorization for SSC, and highlights recommendations to the States and U.S. DOT from the National Transportation Safety Board. The Guide incorporates updated research and practices from the U.S. and from international jurisdictions, including information on new technologies such as point-to-point (average speed-over-distance) systems. The Guide emphasizes SSC as one component of a comprehensive speed management program to be carefully applied. The Guide provides four new case studies on how five different jurisdictions in the United States have implemented or taken steps toward implementing programs.</td></tr>
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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LIST OF ACRONYMS & ABBREVIATIONS

ASE	Automated speed enforcement
AWZSE	Automated Work Zone Speed Enforcement
CTW	Countermeasures That Work
DC	District of Columbia
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DSRC	Dedicated short-range communications
FAQ	frequently asked questions
FHWA	Federal Highway Administration
Guide	References the present report
HSIP	Highway Safety Improvement Program
HSP	Highway Safety Plan
IIHS	Insurance Institute for Highway Safety
MUTCD	Manual on Uniform Traffic Control Devices
NC	North Carolina
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NCSL	National Conference of State Legislatures
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
NYC	New York City
OR	Oregon
PII	personally indefinable information
P2P	point-to-point
PPP	Public-Private Partnerships
SDOT	Seattle Department of Transportation
SHSP	State Highway Safety Plan
SPD	Seattle Police Department
SSC	Speed safety camera
US	United States
USDOT	United States Department of Transportation

EXECUTIVE SUMMARY

In January 2022, the United States Department of Transportation published its *National Roadway Safety Strategy* (NRSS) which outlines the Department's comprehensive approach to significantly reducing serious injuries and deaths on our Nation's highways, roads, and streets. Road deaths are at crisis levels in the United States. This is the first step in working toward an ambitious long-term goal of reaching zero roadway fatalities. Safety is U.S. DOT's top priority, and the NRSS represents a Department-wide approach to working with stakeholders across the country to achieve this goal. The NRSS sets a vision and goal for the safety of the Nation's roadways, adopts the Safe System Approach principles to guide our safety actions, and identifies critical and significant actions the Department will take now in pursuit of five core objectives: Safer People, Safer Roads, Safer Vehicles, Safer Speeds, and Post-Crash Care. Safer speeds receives special attention because it continues to be a leading contributing factor in crashes year after year. Studies clearly show that higher speeds result in greater impact at the time of a crash, which leads to more severe injuries and fatalities. This is especially concerning for more vulnerable road users, such as motorcyclists, bicyclists, and pedestrians. Achieving safe speeds requires a multi-faceted approach that leverages road design and other infrastructure interventions, speed limit setting, education, and enforcement. As local and state governments are working to make the roads safer, speed safety cameras are one tool to consider as part of this approach.

Speed safety cameras (SSCs) are included in FHWA's newest set of Proven Safety Countermeasures and are estimated to reduce roadway fatalities and injuries by 20 to 37 percent (Montella et al., 2015; Li et al., 2015). NHTSA's Speed Enforcement Program Guidelines provide information for establishing and maintaining successful speed enforcement programs, one piece of a broader speed management program (NHTSA, 2008).

This *Speed Safety Camera Program Planning and Operations Guide* (the SSC Guide) provides information for state and local governments on the planning, implementation, and operation of an SSC program aimed at reducing traffic fatalities and serious injuries resulting from speeding-related crashes – especially in school areas and construction zones. Throughout the SSC Guide, SSC is presented as one part of a broader speed management program.

Jurisdictions who explore the use of SSCs need to consider equity, civil rights, and civil liberties concerns in all stages of an SSC program, from planning to operation to evaluation. Because the technology used in SSC operations does not identify speeders based on driver characteristics, it may reduce enforcement bias. However, site selection and the burden of penalties can introduce concerns about equity unless these factors are carefully considered when planning and operating SSC programs.

The SSC Guide is an update of the *Speed Enforcement Camera Systems Operational Guidelines* published by the FHWA and NHTSA in 2008. The update adds new information on program practices, technologies, such as speed-over-distance or point-to-point (P2P) enforcement, and case study examples from jurisdictions using SSC. The Guide is organized into eight chapters:

- **Chapter 1** introduces the rationale and benefits of using SSC to help reduce speeding and provides an overview of the purpose and use of this Guide. The Guide provides information for decision-makers, practitioners, and other stakeholders interested in

starting and operating an effective, reliable, transparent, and publicly supported SSC program to help address speeding-related safety problems.

- **Chapter 2** outlines initial steps stakeholders should take to assess safety needs, the legal framework, and community and stakeholder engagement. It includes identifying safety needs, conducting an expert review of SSC legal status, and developing a communications framework. The chapter highlights the importance of developing meaningful engagement and strategic communications with community partners to move towards SSC authorization and implementation.
- **Chapter 3** guides SSC program developers through steps to implement SSC enforcement in a jurisdiction. It outlines setting program goals; determining the scope, scale, and type of program; and developing an SSC program plan, which sets up administration and oversight of the SSC programs and plans the communications.
- **Chapter 4** details aspects of enforcement planning, including site selection based on demonstrated safety and equity needs and the strengths and uses of different SSC enforcement strategies and technologies.
- **Chapter 5** describes steps and potential issues for timely, reliable, and equitable processing of violations (and oversight of this process), access to and protection of violator data, and issuing and tracking citations, adjudication, and performance outcomes. Chapter 5 describes information to provide to citation recipients and potential use of fine revenues.
- **Chapter 6** details the final steps to implement the enforcement and violation processing plans. This chapter describes the steps for procuring equipment, entering agreements with vendors that may provide on-going services (if used), developing inter-agency agreements and coordination, managing and securing data, and marketing and communicating SSC program details.
- **Chapter 7** outlines program monitoring and evaluation, including data and methods that may be used in evaluations. Evaluation is critical to success and improvement of an SSC program. Besides regular monitoring of program elements, robust evaluations should be conducted regularly to determine if programs are accomplishing safety goals and to identify whether changes in strategy or scheduling, communications, or specific performance elements are needed.
- **Chapter 8** presents four new case studies that describe implementation of SSC in five different areas and jurisdictions. These case studies include work zone pilot tests of SSC in Pennsylvania and Maryland and SSC applications in school zones in New York City (NYC) and Seattle. A case study from California describes initial stakeholder steps in a State that lacks current authorization for using SSC.

The Guide also includes one appendix:

- **Appendix A** provides a summary of general trends in use of SSCs in the U.S. derived from Insurance Institute for Highway Safety (IIHS) data. This section lists sources of information on current laws and proposed legislation as well. Because SSC enforcement is one tool jurisdictions can use as part of a comprehensive speed management program, appendix A highlights some key resources on comprehensive speed management and countermeasure effectiveness.

CHAPTER 1: INTRODUCTION

In January 2022, the U.S. Department of Transportation (USDOT) released a National Roadway Safety Strategy (NRSS) aimed at combatting the disturbing rise in traffic fatalities on our nation's roadways and to set the nation on a course towards zero traffic deaths. The NRSS recognizes that the USDOT cannot achieve this goal alone and builds on the important work that transportation agencies across the country have been doing to set and embrace goals of eliminating traffic fatalities and serious injuries. Organizations, programs, and partnerships have dedicated themselves to advancing this Vision Zero Movement and identifying ways to plan and implement a cross-disciplinary and collaborative approach—a Safe System approach—to achieving the Vision Zero goal. As one example, the National Safety Council (NSC), National Highway Traffic Safety Administration (NHTSA), Federal Highway Administration (FHWA), and Federal Motor Carrier Safety Administration announced the Road to Zero (RTZ) coalition in October 2016 (NSC, 2016). The RTZ coalition seeks to eliminate traffic fatalities in the U.S. by 2050 through a Safe System Approach that accommodates human error.

Speed and effective speed management practices that reduce fatalities and serious injuries will be central to achieving a Vision Zero goal. In the three years following the RTZ coalition announcement (2017-2019), more than 29,000 people were killed in speeding-related crashes in the U.S. Another 1 million people were injured in speeding-related crashes, with more than 91,000 of those injuries classified as incapacitating injuries by a reporting officer (NHTSA, 2021). Speeding-related crashes impact all users of the road transportation system. In the same 3-year period, more than 11,000 speeding-related crashes involved a motor vehicle striking a pedestrian or cyclist. In a report published by NHTSA, Blincoe et al. (2015) estimated the annual economic cost of speeding-related crashes was $52 billion based on an analysis of 2010 data.

National surveys of driving attitudes show that speeding is a common behavior. A 2019 telephone survey conducted by the AAA Foundation for Traffic Safety (2020) revealed that nearly half of drivers said they had exceeded the speed limit on a freeway by at least 15 miles per hour (mph) in the past month; over 40 percent of drivers reported exceeding the speed limit by at least 10 mph on residential streets. Although speeding behavior may be a conscious decision, it is often rationalized based on perceptions of peer behavior (Yannis et al., 2013), time-saving convenience (Peer, 2010; Fleiter et al., 2010), or an unrealistic perception of driving ability (Mouter et al., 2018). Speeding can also be unintentional and influenced by prevailing traffic conditions and cues from the built environment (Richard et al., 2016).

Speed management programs seek to reduce speeding-related fatalities and injuries through coordinated and cooperative efforts that span engineering, enforcement, and driver education activities (NHTSA, 2006). The primary function of a speed safety camera (SSC) program is to address speeding-related safety problems within a jurisdiction that cannot be addressed more effectively with other countermeasures. An SSC program should be one component of an agency's speed management efforts, which, in turn, may be a component of a broader, strategic traffic safety vision. Plans such as Vision Zero, strategic safety plans, or speed management plans may articulate the longer-term vision and goals for traffic safety and speed management. The SSC program can draw from those plans to develop appropriate goals for the program.

SSCs, formerly referred to as speed camera enforcement or automated speed enforcement (ASE), can be an effective tool as part of a broader speed management program. SSCs use speed measurement devices to detect vehicles that are exceeding the speed limit and then

record the speeds and capture photographic or video evidence of the speeding vehicles. Data from SSC technologies can be automatically transmitted to agencies charged with the review of speed violations and issuance of citations.

SSC is well-documented as an effective and sustainable technology to reduce crashes (Richard et al., 2018; Thomas et al., 2008). Published safety performance evaluations have demonstrated the effectiveness of SSC for improving public safety. Li et al. (2020) reported a decrease in fatal and injury crashes that ranged from 1.8 to 21.4 percent for all crash types within a 200 m (656 ft) radius of a speed camera in England. Additionally, mobile units can reduce crashes on urban principal arterials up to 20 percent for fatal and injury crashes (Li et al., 2015). When using fixed units, Shin et al. (2009) found a 54-percent decrease in all crashes and a 47 percent decrease in injury crashes on urban limited access freeways in Arizona. When using point-to-point (P2P) units, Montella et al. (2015) found SSCs can reduce fatal and injury crashes on urban expressways, freeways, and principal arterials up to 37 percent. SSC can lead to such documented safety benefits by:

- Enforcing at locations and under conditions that might be dangerous to officers and the public with traditional traffic stops.
- Producing a crash reduction upstream and downstream, thus generating a spillover effect (Montella et al., 2015).
- Generating a high rate of speeding violation detections and citations. This may provide greater deterrence of speeding.
- Reducing congestion that may result from traditional traffic stops or from speeding-related crashes (NTSB, 2017).

Newer technologies improve the viability of SSC for enforcing speed limits on more types of roadways. For example, average speed-over-distance, also called P2P enforcement, can be used on limited access roads to help achieve more uniform speed compliance over a length of highway. This type of system can also seem fairer to drivers than enforcement based on speed measured at a single spot location.

Public trust is an essential component of any type of enforcement. With proper implementation, SSC has the potential to offer fair and equitable enforcement of speed limits, regardless of driver age, race, gender, or socio-economic status. Because the technology used in SSC operations does not identify speeders based on driver characteristics, it may reduce enforcement bias. However, site selection and the burden of penalties can introduce concerns about equity unless these factors are carefully considered (Alvarado, 2021; Farrell, 2018; Hopkins and Sanchez, 2022). Agencies using SSC technology should work to ensure that there is no discrimination in the siting of SSC or burden of penalties. Experiences with SSC in the U.S. offer lessons on how to maintain a safety focus, increase program reliability, reinforce fairness, and achieve and maintain public support.

State laws and policies may prohibit or restrict the use of SSC, and legal considerations affect multiple aspects of an SSC program, such as fine structure, type of liability, and the locations where SSC can be implemented. These laws and policies, the strong personal and societal incentives to speed, and real-world experiences suggest that jurisdictions considering SSC as an enforcement tool may encounter legal barriers and other opposition to SSC enforcement. Strong

partnerships, community engagement, and carefully designed programs or pilot authorizations have helped some jurisdictions overcome legal barriers and common objections to SSC.

SSCs may not be a solution for all jurisdictions with speeding issues and may require a significant commitment of time and energy to implement in States that lack legal authorization. However, U.S. jurisdictions and road safety agencies across the world have found SSC to be a valuable strategy to deter speeding and improve safety. In targeting a goal of zero fatalities and serious injuries, SSC can be one part of a Safe System approach to road safety management.

1.1. PURPOSE AND SCOPE OF THE GUIDE

This *Speed Safety Camera Program Planning and Operations Guide* (the SSC Guide) provides information on the planning, implementation, and operation of an SSC program aimed at reducing traffic fatalities and serious injuries resulting from speeding-related crashes. Throughout the SSC Guide, SSC is presented as one part of a broader speed management program.

Definition of an SSC Program

An SSC program, as the term is used in this Guide, encompasses the activities associated with planning, implementing, and operating SSCs as a safety strategy and the laws, funding, administration, oversight, and partnerships that influence these activities.

The SSC Guide is an update of the *Speed Enforcement Camera Systems Operational Guidelines* published by the FHWA and NHTSA in 2008. The update adds new information on program practices and technologies, such as speed-over-distance or P2P enforcement. The SSC Guide reiterates ideas from the 2008 guidelines while drawing on additional program experiences, evidence-based information on safety effectiveness, and other research published after 2008. The guide includes four new case studies displaying different SSC programs. These case studies may provide insights for jurisdictions seeking to implement new SSC programs or improve existing programs.

1.1.1. Target Audience

The target audience of the SSC Guide consists of program managers, administrators, law enforcement, traffic engineers, safety professionals, program evaluators, and other individuals responsible for road safety. These individuals tend to work for State Departments of Transportation (DOTs), State Highway Safety Offices (SHSOs), local transportation departments, and State and local law enforcement agencies. The Guide may also be a useful resource for other SSC program stakeholders, such as metropolitan planning organization staff, community safety advocates, and the general public, to gain a greater understanding of how to start and maintain an SSC program and the expected benefits of such a program.

The SSC Guide is written from a U.S. perspective and emphasizes U.S. contexts and best practices. However, it also draws from the experience of exemplary programs internationally. The SSC Guide focuses on issues that are directly related to SSCs. For more general information on safety plans and safety programs within a State refer to the Strategic Highway Safety Plan (SHSP), Highway Safety Plan (HSP), or Highway Safety Improvement Program (HSIP). FHWA

and NHTSA also have numerous resources on their respective websites on safety management, Safe System, speed management, and enforcement.

1.1.2. Guide Organization and Content

The SSC Guide has eight chapters:

- Chapter 1 provides the background, scope, purpose, and intended audience for the Guide.
- Chapter 2 describes the initial steps to assess the safety needs and legal framework in a jurisdiction and engage partners and other stakeholder to determine if SSC is a viable safety strategy.
- Chapter 3 provides information on planning the program goals, scope, communications, and operations.
- Chapters 4 through 7 includes more detailed information to guide developers on program elements including enforcement operations (chapter 4), violation processing (chapter 5), program startup (chapter 6), and program evaluation (chapter 7).
- Chapter 8 discusses experiences of five SSC programs in four case studies.

CHAPTER 2: PLANNING PART 1 – STRATEGIC PLANNING

This chapter outlines initial steps for an agency leading the development of an SSC program in their State or local jurisdiction. While this chapter is most relevant for agencies considering a new program, it may also help those with existing SSC programs by identifying new types of partners and approaches.

A first step for jurisdictions considering a new program is to identify the safety needs that SSC may help to address. An overview of this type of safety needs assessment is described in section 2.1 of this chapter. The next step is to conduct an expert review of the legal status for SSC and document how the authorization status will determine and affect SSC program decisions. This type of expert legal and policy review is discussed in section 2.2 of this chapter. A third important aspect of developing an SSC program is to thoughtfully engage with community stakeholders. These stakeholders may be important partners in responding to initial challenges identified in the safety needs assessment and legal reviews. It is important to gather perspectives from a diverse community of safety stakeholders (section 2.3 of this chapter) and use the information gathered to guide program development (section 2.4 of this chapter).

2.1. CONDUCT SAFETY NEEDS ASSESSMENT

States or local jurisdictions that have not previously had an SSC program may find it useful to conduct a system-level analysis to determine the nature of the speeding-related safety problems in the jurisdiction as a whole. This assessment can help to inform whether an SSC program could fill a needed speed management gap and contribute to reducing traffic fatalities and serious injuries resulting from speeding. This system-level problem identification differs from safety analysis for site selection (described in chapter 4) by focusing on the big picture. Both analyses use similar data types, but at this stage it is not necessary to delve into the characteristics of specific sites that may later be chosen for SSC enforcement. The point of this system-level analysis is to identify the types of safety problems that could benefit from an SSC program and generate ideas on how the data could guide the program scope. The details of this system-level analysis may vary depending on the type of jurisdiction (e.g., State, region, municipality), size, and types of data available, as well as whether such analyses have already been performed for one or more safety plans.

2.1.1. Data Types for System Analysis

Crash data, which are typically maintained by State DOTs and SHSOs, are the primary data for a system-level safety analysis. These data should include the crash type, characteristics, and severity of the crashes. Jurisdictions may want to place more emphasis on crashes resulting in serious injuries and fatalities since these crashes represent the greatest burden to victims and society. Roadway, land use, neighborhood characteristics, and traffic volume data may also be useful to provide more context for the types of speeding problems that exist. There may be limitations in the crash data with respect to fully understanding speeding-related safety issues. Crash reports are the primary source of crash data and vehicle speeds prior to crashes are usually not available to officers completing the crash reports. The officers must instead determine the role that speed played in a crash by examining other evidence collected after the crash has occurred. Engineering speed studies or other types of speed monitoring data, overlaid with crash

data, may help to fill gaps in determining where speeding is contributing to the occurrence of crashes. In addition, overlaying demographic and social data with crash data and speed studies may uncover potential disparities in traffic safety, including disparities in the presence of safety countermeasures, the built environment, and local traffic regulations. This analysis may be particularly useful in guiding decision making in the broader speed management program to prioritize engineering solutions on these roadways and decrease the reliance on SSC, and the burden of their penalties, in these communities.

Care should be exercised in using citation data to help determine the extent of speeding-related safety problems. Citation concentrations may reflect where speeding enforcement has been conducted previously but may not always reflect where speeding-related crash problems are highest, creating potential equity concerns about the selection of sites for SSC based on citation data. Selecting sites for SSC based on citation data can replicate this disparate enforcement and perpetuate the financial burden borne by these communities (United States Department of Justice, 2015).

2.1.2. Information Gained from Safety Analysis

The system-level safety analysis can help inform the potential objectives and strategies for an SSC enforcement program. Along with the legal status review and public input activities described in later sections of this chapter, the safety analyses can guide SSC program developers toward a program that will maximize safety benefits. If this type of safety analysis has not already been performed for other safety or speed management plans, the analysis should focus on uncovering the following types of information about speeding in the jurisdiction:

- Extent – whether speeding and speeding-related crashes are widespread or more localized to certain specific areas or area types.
- Location types – which types of locations (e.g., urban/suburban/rural, work zones, residential, school areas, commercial zones) or roadway types (e.g., expressways, arterials, local streets) are most associated with the speeding-related crashes, especially more severe crashes that result in fatalities and serious injuries.
- Times of day – when speeding and speeding-related crashes are most problematic (e.g., peak/off-peak, day or night, weekday, or weekends).
- Vulnerable populations and demographic data – which communities and road users are most affected by crashes involving speeding (e.g., certain communities or neighborhoods, non-motorists, persons who were also impaired, etc.).

Other safety partners (e.g., law enforcement, first responders, public health, judiciary) may provide valuable information and context for the speeding problems identified in the data and the resources available for addressing them—whether through engineering measures or other strategies. They may also identify some current constraints. For example, law enforcement agencies may be unable to provide a sufficient level of traditional speed enforcement (speed enforcement performed by police officers) for some times of day or days of week due to limited resources. These considerations can influence the need, scope, and focus for SSC implementation.

2.2. CONDUCT LEGAL AND POLICY REVIEW

The objective of a legal and policy review is to determine if SSCs are legally authorized within the jurisdiction and how the authority and other traffic laws will affect the SSC program. According to a NHTSA-sponsored review of programs, 95 percent of respondents from programs started between 2008 and 2011 performed a legal review (Miller et al., 2016).

One of the largest challenges facing States and local jurisdictions is obtaining legal authorization for an SSC program that has enough flexibility to fully realize SSC's safety benefits. As of March 2021, SSC enforcement was authorized for use in 21 States by State law and/or city ordinance and all of those authorizations imposed some restrictions on SSC use (e.g., location of operations) (IIHS, 2021a). NTSB indicated that these restrictions may unreasonably limit the potential of SSC enforcement to address the most problematic speeding-related crash locations (NTSB, 2017, p. 40, and Appendix E). Twenty-one States had no State laws or city ordinances on the use of SSC and seven States specifically prohibited SSC use (IIHS, 2021a). States that lack legal authorization could consider authorizing State and local use of SSC. Such changes would better allow jurisdictions to target the most problematic speeding problems with SSC.

The presence or absence of legal authority and any restrictions on use will profoundly affect program development. A legal review for an SSC program therefore includes an expert review of the legal status of SSC use in the State and within the local jurisdictions that will be involved in the program. SSC-related State and local ordinances should also align with other State traffic regulations and statutes and with State constitutional requirements (e.g., regulations about use of revenues from traffic infraction fines).

2.2.1. Program Components that May be Affected by Legal Authorization

State and/or local laws granting authority to operate an SSC program typically specify components or elements of the program. These laws may affect program efficiency, reliability, public perception, and safety outcomes. Examples of program elements that may be defined under State or local law, not Federal Law, include:

- Authorization for any camera/photo-based (automated or partially-automated) enforcement.
- What traffic laws (or new laws) will be subject to camera-based speeding enforcement.
- Requirements for administration, oversight, equipment testing, and vendor agreements.
- Status of photographic evidence in the State or other specific evidence requirements.
- Potential restrictions or requirements on the type, locations, or timing of enforcement operations, signing and publicity, enforcement speed thresholds, and potentially other related factors. Some States have authorized time-limited pilot programs to test SSC, sometimes limiting their use to particular situations such as work zones or school zones.
- Vehicle owner versus vehicle operator liability, and types and scaling of penalties for violators.
- Violator rights and responsibilities, receipt of penalty payments, and use of fines.
- Sources of funding that can legally be used for program start-up and operations.

- Data sharing and privacy of camera footage requirements.

Independent, expert legal guidance will help agencies navigate these complex issues and variations in the legal environment across States and local communities.

2.2.2. Violation and Penalty Types

Each State has a system of traffic laws and penalties for traffic offenses (Richard et al., 2018). A review of those laws and penalties should be part of the legal review for the SSC program. This section describes various mechanisms for violation and penalty types; however, enforcement experts should be consulted when selecting violation and penalty types for an SSC program. Depending on State and local law, SSC violations may be considered moving violations like other speeding infractions, with the potential to assign driver license points and license sanctions to drivers. Or, SSC violations may be treated as civil infractions. According to Miller et al. (2016), the most used sanctions are civil penalties.

Driver liability. As implied, driver liability means liability for the infraction is assigned to the driver of the vehicle, which often requires some form of identity verification for issuing an SSC citation. This identity verification may raise civil liberties concerns from communities.

Vehicle owner liability. Vehicle owner liability means liability for the infraction is assigned to the owner of the vehicle. Although drivers could also be held liable for civil penalties, a survey of six cities with SSC programs found that the programs in four of the six cities held vehicle owners liable for SSC violations (City and County of San Francisco, 2015). Since 2000, additional SSC programs have held vehicle owners responsible for SSC speeding violations (Miller et al., 2016). A safety evaluation of an SSC program in Montgomery County, Maryland found vehicle owner liability programs to be effective in decreasing operating speeds and reducing the likelihood of a fatal or incapacitating injury crash (Hu and McCartt, 2016). However, in vehicle owner liability schemes, owners of shared use vehicles, who are more likely to be people from low-income communities, may end up shouldering a disproportionate burden of penalties.

Penalty structures. According to Miller et al. (2016), jurisdictions holding drivers liable for moving violations have tended to provide more severe sanctions, including driver license points (and potentially higher insurance rates) compared to jurisdictions with owner liability (Miller et al., 2016); however, this may vary by jurisdiction. Notably, drivers or owners with low incomes may experience significant burden and disadvantage, as elaborated below, from fines. Alternative penalties can be considered.

Table 1, below, provides information on owner and driver liability and penalty structures being used in six U.S. cities with SSC programs (City and County of San Francisco, 2015). The data, collected from peer cities for San Francisco, CA, show that four of these six cities reported holding owners liable for violations. Five of these six cities issued fines proportionate to the degree that the speeding violation was above the speed limit (City and County of San Francisco, 2015). Maximum fines in the four programs with owner liability were $300. NYC and Seattle issued a flat fine regardless of degree of speeding. Portland, a driver-liability jurisdiction, imposed a range of fines from $110 to a maximum fine of $1,150 based on enforcement area and speed, while Denver, another driver-liability jurisdiction, had a maximum fine at the time of the study of $80. None of these jurisdictions raised the rate for repeat violators. (The table also

includes data on enforcement speed thresholds, or the minimum amount above the speed limit at which a violation will be recorded. This topic is discussed in chapter 5, section 5.2.1.)

Table 1. Owner and driver liability penalty structures from surveyed cities in San Francisco study (City and County of San Francisco, 2015, exhibit 9).

JURISDICTION	CITATION RESPONSIBILITY	ENFORCEMENT SPEED THRESHOLD (MPH)	CITATION FINE SCHEDULE
CHICAGO	Vehicle Owner	10	$35 for 10 mph; $100 for 11+ mph
DENVER	Driver	10	$40-$80 based on type of enforcement area
NEW YORK CITY	Vehicle Owner	10	$50
PORTLAND	Driver	10	$110-$1,150 based on enforcement area and mph (typically $160 fine)
SEATTLE	Vehicle Owner	6	$234
WASHINGTON, DC	Vehicle Owner	11	$100-$300 based on mph

Research is inconclusive about whether court-administered driver sanctions or graduated penalties provide greater deterrence of traffic law violations and greater safety benefits compared to administrative penalties and lower fines. There is some evidence from an analysis of multiple studies that administrative penalties triggered by driver license agencies may be more effective than court-administered penalties (Masten and Peck, 2004). Regarding the difference in fine amount, a potential disadvantage of owner liability is that wealthier drivers may pay the fines and continue to speed in the absence of driver license sanctions. In contrast, low-income drivers, disproportionately likely to be black and Hispanic, may experience significant harm from even low fines and driver license sanctions that accompany the inability to pay fines. This propagates the cycle of poverty as the lack of access to reliable transportation makes it more difficult for individuals to get and keep jobs, further impeding them from paying their ever-growing debt. In 2015, the California Department of Motor Vehicles (DMV) reported that over 4 million people – 17 percent of adult Californians – had their driver license suspended because they did not appear or could not pay citation fines and fees, many for traffic tickets (Bender et al., 2015).

A report by the Wilson Center for Science and Justice (2021) showed a similar pattern in North Carolina and emphasized how this disproportionately impacts Black and low-income communities. The Department of Justice's 2015 Investigation of the Ferguson Police Department highlighted that processes involving failure to appear or pay traffic tickets are onerous and unjust, highlighting that the primary motive of traffic tickets was revenue generation instead of public safety. When determining the processes for violation and penalty type, jurisdictions

should use transparent, data-driven systems to place SSC and report results to ensure that public safety is the primary interest and not revenue generation.

According to Richard et al. (2018), the amount and degree of penalty may be less critical to deterrence than the expectation of being caught and swiftly receiving a penalty (Richard et al., 2018). These considerations should be balanced with the potential harm to which individuals in underserved communities may experience from fines and sanctions. Although driver improvement interventions, including the threat of license suspension, can have some effect on deterrence and future crashes (of all types) for the specific violators (Masten and Peck, 2004), the effectiveness of citations and penalties is also thought to be related to consistent implementation.

Inconsistency in upholding citations and levying sanctions by the courts may affect the perceived legitimacy and effectiveness of speeding enforcement (Neuman et al., 2009). Inconsistent prosecution and adjudication may also result in unequal treatment of violators. Driver-liable citations may be more challenging to issue and consistently achieve convictions than vehicle owner citations based on license plate identification. For example, driver images may not be feasible with motorcyclists wearing helmets (Wijers, 2016; Eccles et al., 2012). These factors may result in unequal treatment of violators, with some operators regularly escaping punishment.

While license sanctions can be imposed if drivers are held accountable, there is also evidence that many drivers, even with suspended or revoked licenses, continue to drive and become involved in speeding-related crashes. One quarter of speeding drivers involved in fatal crashes nationwide in 2018 did not have valid driver licenses at the time of their crashes; this compares to 12 percent of non-speeding drivers in fatal crashes that had no valid license (NCSA, 2020). Thus, license sanctions are not guaranteed to deter individual drivers from further speeding. Additionally, license sanctions may disproportionately impact low-income and minority individuals.

Internationally, the European Transport Safety Commission determined that owner versus driver liability contributes more to improvements in road safety (Wijers, 2016). Due to the increased efficiency and reliability of processing, more citations can be issued with owner liability programs using predominantly automated means, which can increase the deterrent effects. Safety performance evaluations in North America of owner liability programs, such as those in Montgomery County, Maryland (Hu and McCartt, 2016) and in Edmonton, Alberta Province, Canada (Li et al., 2015), have also found the programs to be effective at deterring speeding and reducing crashes.

There is a need for further research in the United States on the relative effectiveness of different program and penalty or reward structures, with a focus on their safety and equity impacts on underserved communities.

Social Effects of SSC in NYC

NYC SSC stakeholders aimed to limit and reduce social harms of SSC enforcement through equitable site selection procedures and by keeping fines low (NYCDOT, 2018; Transportation Alternatives, 2015). SSCs only monitor the speeding vehicle, not the driver's age, race, or gender. Lower fines may help reduce the disproportionate impacts of differences in violators' abilities to pay. The NYC case study in chapter 8 (Overcoming Legislative Barriers) provides more information.

Further reading on legal issues:

Douma, F., Munnich, L., Garry, T., and Loveland, J. (2012). Identifying issues related to deployment of automated speed enforcement. Intelligent Transportation Systems Institute Final Report No. CTS 12-23, 44, Minneapolis, MN.

Maisel, M. S. (2013). Slave to the traffic light: A road map to red light camera legal issues. *Rutgers Journal of Law and Public Policy*, *10*, 401–434.

Rodier, C. J, Shaheen, S., & Cavanagh, E. (2007). Automated Speed Enforcement for California: A Review of Legal and Institutional Issues. UC Davis: Institute of Transportation Studies. https://escholarship.org/uc/item/4hv9204h. Last accessed August 18, 2020.

2.3. IDENTIFY COMMUNITY STAKEHOLDERS

Identifying and engaging a diverse group of community partners is an essential component of developing any broadly-supported safety program, including an SSC program (Sanders et al., 2019; Miller et al., 2016; Harsha and Hedlund, 2007). By bringing the diverse expertise of traffic safety stakeholders and broader community perspectives together, the lead agency may improve collaboration and more effectively determine whether SSC is needed and define why SSC may be appropriate to enhance safety in the community. Effective engagement could also help to minimize unforeseen challenges or unintended consequences of SSC program choices. Community partners, functioning as a strong, collective team, can work to align the safety goals of SSC with other community goals. Understanding neighborhood perspectives about the problem and potential solutions may help improve program development (or alternative countermeasure development) to maximize benefits and minimize potential harms to each community.

The lead agency can engage stakeholders by forming a committee or advisory panel of stakeholder representatives to gather input and public support of the SSC program (Miller et al., 2016). Potential stakeholders to engage in the needs assessment and planning of an SSC program are described in this section, although there may be other partners beyond those in this section.

Law enforcement – Law enforcement agencies are the lead agency for the SSC program in many jurisdictions. Law enforcement officials may also provide oversight of certain components of the program such as violation processing.

Law enforcement personnel can coordinate traditional enforcement efforts with the SSC program to help maximize the benefits of the combined enforcement efforts, while minimizing potential inequitable results of violation adjudication. Leadership support for SSC may contribute to, or increase, staff-level buy-in of SSC. A survey of law enforcement personnel indicated mixed views on SSC programs, including whether they would like to use such programs (NTSB, 2017). Localities should be aware that the majority of law enforcement agencies with existing SSC programs indicated that SSC does not limit in-person speed enforcement abilities and said that their SSC programs should be continued or expanded (NTSB, 2017).

Traffic engineers and transportation agency officials – State and local partners with responsibilities for the design and operation of roadways and with expertise in road safety analysis can be effective leaders in assessing and documenting speeding-related safety problems. Traffic and safety engineers also review speed limits within the context of the traffic, road design, road purpose, and land use contexts. Traffic and safety engineers also tend to be experienced in problem diagnosis and site selection, weighing alternative treatments, and determining the suitability of sites to support SSC enforcement. State DOTs may be good candidates to provide primary leadership and oversight of an SSC program due to their continuous road safety management responsibilities and public perception (Maisel, 2013). In some States, State DOTs may be perceived by the public as the agency most focused on road safety. At a minimum, DOTs are well-positioned to be engaged in site selection, which relies heavily on problem diagnosis, such as through road safety audits (RSAs) and speed studies, evaluation of treatments, and other engineering practices

State or municipal DOT attorneys – State or municipal DOTs typically have in-house attorneys who can offer legal advice to DOT employees attempting to start an SSC program. These attorneys can help interpret State and local laws pertaining to the legality and use of SSC. Laws in this area are likely to develop over time as more SSC programs are implemented.

Motor vehicle department – State motor vehicle administrations typically maintain vehicle registration and driver licensing information needed to process and issue violation notices. A state division of motor vehicles can inform SSC program managers on issues such as who has access to the vehicle registration and driver licensing data, data security, information flow, processing time, staffing, training, and other requirements.

Courts and Judiciary – During the adjudication phase of issued citations, the court and court personnel play an important role. In the case of SSC where enforcement can take place continuously in a given location, the number of cases to be adjudicated can increase dramatically. It is important to involve personnel early in the planning and set up of an SSC Program. In addition to issues of increased workload, if citations are to be electronically sent to the courts, it is important to assure system compatibility.

Public health agencies – Reducing fatalities and serious injuries to all road users that result from speeding-related crashes is the primary impetus for implementing an SSC program. Speeding may also have other adverse effects on the perceived safety and well-being of the community, and public health agencies are often active partners in Vision Zero initiatives. Public health agencies may provide valuable input to an SSC program, particularly in

provision of information and datasets on injuries, injury prevention, and health disparities useful in program strategies and communications.

Communications experts – A well-framed communications strategy is critical to addressing the diverse perspectives on speeding and the use of SSC. Communications experts could be from partner agencies, research and consultant teams, or community advocacy organizations. Engaging communications experts early in program development will help the partners have a common understanding of the goals and benefits of the planned SSC program, gather perspectives from the community, and provide a consistent message about the SSC program, including the program's fairness and equity. Two-way communications between public agencies and the public, as well as effective publicity, are important aspects of all stages of an SSC program.

Elected officials – Elected officials at the State and local levels have the power to enact legislation or regulations that affect SSC. In some cases, new legislation may be required to enable SSC. Elected officials may help identify potential concerns regarding SSC and communicate with the public about the program.

Members of the public and other community groups – Community input on crafting an equitable and supported program is an important component of implementing an SSC program. Community stakeholders, including members of underserved communities, may provide insight into the speeding problem, perspectives on traditional and SSC enforcement, other potential measures to reduce speeding and improve safety, and differences in the built environment and local traffic regulations. Members of the public, advocacy groups, community groups, economic development agencies, and community non-profit organizations can be important partners when developing an SSC program. These groups can provide representation for school leaders, fire and rescue personnel, the medical community, racial equity and social justice organizations and advocates, transit operators and riders, pedestrian, bicyclists, and other non-motorists.

Researchers – Independent researchers may be helpful as objective evaluators of an SSC program and help to enhance public confidence in the findings (Eccles et al., 2012). Researchers may help design studies and determine data collection needs before programs begin to provide the best opportunity for robust program and safety evaluations after the programs are in place. Cross-disciplinary research spanning engineering, planning, public health, sociology, and criminal justice may provide comprehensive, proactive knowledge about maximizing the safety and equity benefits of an SSC program while minimizing its burdens and unintended consequences.

2.4. DEVELOP COMMUNICATIONS FRAMEWORK

Because of the importance of effective two-way communications, engaged partners may want to determine a communications framework for both internal (within the partner group) and external communications, and agree on communications goals and strategies. In general, it may be beneficial to formalize a work plan, meeting schedule, and roles and responsibilities among the core partners.

Early stages of SSC program planning can benefit from a clear framework that defines and facilitates communications between partnering public agencies within the jurisdiction considering SSC, community stakeholders, and the public. The communications framework depends on specific jurisdiction needs, but may include steps to:

- Set internal and external meeting and communications objectives and guidelines.
- Determine responsible agency and spokespersons for the partner group.
- Frame core messages for the planning phase of program development.
- Develop messages and communication activities for public education.
- Address communications issues as they arise.
- Determine methods for gathering and using public input, particularly from underserved communities.

These steps may be useful for jurisdictions in States that have existing authorization for SSC enforcement but especially for those that do not yet have such authorization. The voices speaking about the program are important to public perceptions and effective communication. Miller et al. (2016, table 7) found that 42 percent of programs that had operated (whether continuously or discontinuously) between 1987 and 2011 were advocated for solely by the police department. In only three programs, the responsibility was shared by police department, city managers/council, mayor, and other elected officials, and incorporated public demand. Nine programs included some advocacy by SSC vendors, of which two programs were advocated for solely by vendors. It should be clear that vendors are not engaged or responsible for organizing or advocating for the program in any way, since vendor engagement at this stage may provide the appearance that the program is being developed to raise revenues or profits instead of addressing safety issues.

The core message—about the expected safety benefits of the SSC program—is the rationale that should be adopted by all partners in the development of the program and its communication. As discussed elsewhere in this manual, methods to ensure that SSC programs address speeding-related fatal and serious injury crashes and counter perceptions of SSC cameras as methods of revenue generation include making transparent data-driven site selection decisions; dedicating revenue to infrastructure improvements that encourage more appropriate speeds; attending to concerns about program fairness and equity, engaging in robust public input, and making outcome data on crashes, speed, demographics and citations publicly available to increase public trust and accountability. SSCs focus only on speeding, a dangerous practice that significantly increases the likelihood of serious injury or death from a car crash. This focus can alleviate community concerns about surveillance and revenue generation from enforcement that also targets low level offenses. To this effect, Philadelphia recently passed a law banning traffic stops related to expired vehicle registration, incorrect registration permits, unfastened registration plates, a single headlight out, mirror obstructions, minor bumper damage, no official certification of inspection, and no evidence of emission inspection. It could also be clarified and communicated that vendors will not be involved in selecting sites to avoid any real or perceived influence on program revenues (Eccles et al., 2012; Maisel, 2013).

As other program decisions are made, the rationale for these can also be communicated. Because of the importance of incorporating public input into these program decisions, the next sections

provide more background and information on gathering and using public input to guide program development.

2.4.1. Gather Public Input

One of the most important aspects of a communications strategy is to is encourage public input describing the need for and the characteristics of the ideal SSC program. Public opinion is a major factor in the success of an SSC program, so it is important to listen to people's concerns and to address them in program design. If the jurisdiction is perceived as being secretive or disengaged, people may become distrustful of the program's intentions and rationale. Equity and perceptions of fairness, trust in the safety need for the program, and on-going public support may affect program success and sustainability.

There are many ways to seek public input, but a diverse set of strategies may be needed to engage a broad representation of the public, including members of underserved communities, and establish effective two-way communications. Professional assistance or strategic partners engaged in community-based participatory research to help address health and other disparities in the community may be valuable for helping with this task. Community-based participatory research embodies recognizing a community as a unit of identity; building on community strengths; involving equitable participation and shared learning by researchers and community participants; building trust and fostering empowerment, systems development, and local capacity building; and balancing research and action, in an iterative process (Minkler, 2010; Israel et al., 2010; Israel et al., 1998).

Often, individuals in underserved communities and community groups may not have access to the money, capacity, connections, or institutional knowledge to participate in committees, advisory panels, or outreach efforts (Abonour, 2018). To equitably implement an SSC program, the lead agency could consider using a variety of engagement techniques and channels, including virtual public involvement and remunerating participants for their work, to empower members of underserved communities to meaningfully participate in every part of the SSC program development and implementation process. Importantly, these opportunities should meet people in underserved communities where they are – rather than making unnecessary demands on their time - and provide them with culturally-sensitive, dignified decision-making power. A meaningful, continuous public engagement process may have the added benefit of building long-term trust, support, and accountability for an SSC program.
Ideas for the organization(s) tasked with gathering and including public input in decision-making include:

- Surveys – Surveys may be a good way to assess overall public opinion on a broad scale but are not particularly suited for allowing individuals to express the sort of open-ended responses that best reflect individual and neighborhood concerns.
- Outreach – Effective outreach may require considerable effort and coordination with partner groups and community representatives to overcome barriers to engagement and achieve an effective two-way communication. Representatives of community agencies and organizations described in the list of potential stakeholders can increase representation of diverse perspectives.

- Websites and distribution of public information – To help the public follow the SSC planning and startup process, program developers can post information on a community website, start a mailing list, or use social media to send updates to interested individuals.
- Open meetings – Individuals or groups seeking to present their views could also be invited to do so during open meetings, which can also be recorded and posted on the website for more transparency and access for individuals who cannot attend in-person.

Public support may also vary among different road user groups, which should be considered in survey design and outreach to engage different perspectives. For example, women and older drivers (who also tend to be less represented in speeding instances), tend to support SSC at higher rates than men and younger drivers (Cicchino et al., 2014). Pedestrians (people who mostly walked in the period leading up to survey), when asked, have also expressed stronger support for SSC than drivers (people who mostly drove) (Cicchino et al., 2014). Additionally, people with higher household incomes and drivers defined as regular speeders felt SSC are more about revenue than safety (Schroeder et al., 2013).

Community stakeholders may provide valuable perspectives on what is causing the speeding problem in their communities, how it affects them, and what the solutions should be. Some of the types of information to gather from a community may include:

- The health and social impact of speeding on the community – for example, speeding-related crashes may generate long-term emotional, health, and financial impacts to victims and their families and society; prevent children from playing near speeding traffic; or limit walking to school due to fears of speeding.
- Beliefs and attitudes about speeding as a problem.
- Perspectives on what is causing the problem.
- Perceptions and experiences of traffic enforcement.
- Perceptions and experiences about different safety measures or countermeasures.
- Innovative ideas about implementing the program in an equitable way that increases benefits while minimizing burdens.

Community members and organizations (such as medical and first responder organizations) are important partners in sharing their experiences with the problem of speeding and its impacts in ways that resonate with policy-makers responsible for authorizing SSC as a speeding-enforcement tool. Lived experiences may help policymakers connect with the problems that speeding causes in peoples' lives, perhaps more so than statistics on speeding, fatalities, and injuries, by providing a human face to these serious facts.

Communicating the need for SSC in NYC

Families for Safe Streets, Vision Zero for Youth, other community stakeholders, and the national organization Transportation Alternatives provided advocacy to gain State authorization for an initial school-zone focused SSC program in NYC. In addition, these partners are working to obtain authorization for a less restricted program that will allow SSC to be deployed in more locations where speeding-related crashes are a problem. Through NYC's SSC program, there was a citywide decrease in pedestrian facilities and injuries from pedestrian crashes at SSC locations (NYCDOT, 2017). The case study on Overcoming Legislative Barriers – NYC/Families for Safe Streets/Transportation Alternatives in chapter 8 provides more detailed information on the communication techniques of these groups.

2.4.2. Respond to Public Concerns

Responsiveness to resident or public concerns, complaints, and lived experience is important because people who live, work, or play in an area may be affected by both speeding and enforcement. Some traffic safety issues may affect certain communities more than others. For example, pedestrian injury or unsafe conditions for walking are often experienced more strongly in low-income neighborhoods or involve black, American Indian, or Alaska Native people (Smart Growth America, 2019; Urban Land Institute, 2015). Equity of site selection and penalties for enforcement may also be concerns. As mentioned in the introduction, speeding is a complex issue, and these different outlooks are important to consider and address for achieving broad program support.

Public opinion research has generally found that public support for SSC is above 50 percent (at least in some contexts), with higher support often being measured for enforcing certain location types. For example, a nationally representative survey by the AAA Foundation for Traffic Safety (2016) found 35 percent of respondents strongly or somewhat supported SSC enforcement on freeways, 41 percent in urban areas, 45 percent on residential streets, and 56 percent supported SSC in school zones. NHTSA's 2011 National Survey of Speeding Attitudes and Behaviors found higher rates of support for enforcement on roads near schools, on roads with high rates of fatalities or speeding, in construction zones, and locations that are difficult or dangerous to enforce by traditional means (Schroeder et al., 2013).

Public opinions are not unchangeable and are a starting point for two-way communications. Thoughtful outreach and engagement activities can shift public opinions on SSC. For example, researchers in Minnesota tested a method of interactive surveying that helped shift negative attitudes toward SSC. Public support also tends to increase after programs are begun (Cicchino et al., 2014), illustrating that well-run programs with effective communications can increase public support.

As mentioned previously, public support may also vary among different road user groups, which should be taken into consideration in survey design and outreach to engage different perspectives. Program developers can use the information gathered on public opinions to guide program decisions and communications strategies. Survey results can also be used as a baseline

for later evaluation on how attitudes toward the program may have changed (Douma et al., 2012). (The use of surveys for measuring public opinion are discussed further in chapter 7.)

Surveys in Minnesota

Researchers in Minnesota performed interactive surveys that highlighted ways to discuss SSC that may help to shift preconceived attitudes (Peterson et al., 2017). Participants were first questioned on their attitudes toward SSC. Participants were then given new information and questions that framed the discussion in new ways, enabling participants to consider other perspectives. Researchers found nearly half of participants with negative opinions shifted their mindset through the engagement process. Topics that encouraged shifts in attitudes about the SSC program included discussing safety—especially mentioning the application of SSC for high-risk situations such as work zones and school zones—or addressing the worst levels of speeding in a community (Peterson et al., 2017).

2.4.3. Seek Experience and Lessons from Peer Jurisdictions

No matter how well it is planned, developing and running an SSC program is a learning experience. Successful programs have adapted to changing situations, and successful managers have modified elements of their programs that needed improvement. Direct contact with successful program managers in peer jurisdictions can benefit an SSC program by sharing information on important topics and can assist program managers in staying abreast of current events and trends relevant to SSC. For example, jurisdictions with concerns on disparate impacts on low income and Black/Latino drivers may be able to learn from jurisdictions with the same concerns.

A few States have conducted in-depth safety analyses, reviewed literature on speeding-related safety measures, performed legal and stakeholder assessments, and held a variety of types of meetings, stakeholder workshops, and interviews to document need and potential for using SSC enforcement to improve safety. Among these are assessments for California (Rodier et al., 2007 and CalSTA, 2020, which is discussed in a case study in chapter 8) and Minnesota (Douma et al., 2012).

This chapter has outlined initial steps to identify speeding concerns that SSC enforcement may help to address; assess the legal conditions for SSC enforcement and penalties; engage stakeholders in discussion of the problem, issues, and solutions; and develop a communications strategy. Chapter 3 describes the next steps for partnerships that are ready to move forward to plan or pilot an SSC program.

CHAPTER 3: PLANNING PART 2 – SSC PROGRAM PLANNING

Most safety program plans have common elements including defining the problem to be addressed, setting goals of the program, selecting the best methods to achieve the goals, publicizing the program and its benefits, evaluating the program and the safety effects, and updating the program based on what was learned. An SSC program plan usually contains these same elements. However, once authorized, setting up and operating a legal, reliable, effective, and publicly supported SSC program entails specialized needs that include identifying leadership, providing program oversight and training, planning operations which may require new types of technologies, developing new program and partnership arrangements and data sharing agreements; and determining procedures for processing and adjudicating citations (which may differ from procedures used in traditional traffic enforcement). Program developers may also need to decide how to use citation revenues and will need to plan program evaluations.

States or local jurisdictions must understand that receipt of federal financial assistance means that all of that agency's programs and activities are covered by Title VI of the Civil Rights Act of 1964 (Title VI). Title VI provides that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.[7] In addition, the term "programs and activities" is defined to mean all of the operations of a recipient agency or entity that distributes federal financial assistance—whether those programs and activities are federally-assisted or not.[8] If recipients do not comply with Title VI, then FHWA may suspend, terminate, or refuse to grant or to continue Federal financial assistance—or enforce Title VI by any other means authorized by law.[9] Taken together, this means states and local jurisdictions must ensure that any SSC programs and activities do not involve intentional discrimination or have the effect of subjecting persons to discrimination because of their race, color, or national origin. The following sections are intended to guide SSC program developers through steps to implement SSC enforcement in the jurisdiction.

3.1. DEFINE PROGRAM GOALS

The primary function of an SSC program is to address speeding-related safety problems within a jurisdiction that cannot be addressed more effectively with other countermeasures. An SSC program should be one component of an agency's speed management efforts, which in turn, may be a component of a broader, strategic traffic safety vision. Plans such as Vision Zero, strategic safety plans, or speed management plans may articulate the longer-term vision and goals for traffic safety and speed management. The SSC program can draw from those plans to develop appropriate goals for the program.

While goals should be tailored to individual jurisdictions, a focus on injuries and fatalities related to speeding may be warranted. The *Highway Safety Manual* (AASHTO, 2010) and many related studies have documented that traffic operating speeds are closely linked to injury and fatal

[7] 42 U.S.C. § 2000d.
[8] *See* Civil Rights Restoration Act of 1987, Pub. L. No. 100-259, 102 Stat. 28 (1988); Implemented by the U.S. Department of Transportation at 49 CFR 21.23(e).
[9] 49 CFR 21.13(a).

crashes (i.e., Elvik et al., 2019), and impact speeds are related to risk of fatal and severe injuries to pedestrians and bicyclists (Tefft, 2011).

Safety goals may include:

- Reductions in speeding-related crashes.
- Reduction in specific crash types related to speeding (such as roadway departure crashes or nighttime crashes) or those involved in crashes such as school children, pedestrians, and bicyclists.
- Reductions in fatal and injury crashes.
- Reductions in disparities in crashes.

An SSC program may also help to achieve other goals related to speeding or enforcement of speeding. Examples of other potential goals for SSC programs may help include:

- Reductions in congestion related to speeding-related crashes or traditional speeding enforcement.
- Reductions in public concerns about speeding enforcement bias
- Reductions in potential harms to officers or the public, or fear of harm that may relate to traditional traffic enforcement and driver sanctions.
- Improvements of other community concerns linked to speeding.

Agencies may also set goals for specific roadway types (e.g., urban arterials), specific sites, corridors, or areas (e.g., work zones), depending on the program scope. These goals should encourage progress and should be aggressive yet realistic based on expected treatment effectiveness accounting for where and when the program may operate. Agencies may also consider incorporating aggressive yet realistic time horizons for achieving goals. Stakeholders may wish to refine the goals established after the SSC program plan (section 3.3) is more fully developed.

3.2. DETERMINE SCOPE, SCALE, AND TYPE OF PROGRAM

The safety need assessment, legal review, and stakeholder input provide context for the many decisions on the scope, scale, and type of program. The program scale and scope should be constructed to target the types of speeding-related safety problems in the jurisdiction, meet legal requirements, have support of the public, and meet the selected program goal(s) for the size of jurisdiction. In assessing scope, program developers should coordinate with infrastructure development plans, as SSC are often used to address speeding until longer-term, engineering solutions can be implemented.

In general, program developers will need to describe the following general aspects of the program:

- Jurisdictions eligible for SSC program.
- Types of locations or road types that will be enforced.
- If known, the users of the road by location type or road type.

- Times of day for enforcement operations (if constrained).
- Whether overt (highly conspicuous) or covert (hidden) enforcement operations will be used (which may be determined by law or in the program scope).
- Whether to implement the SSC program as a pilot program.

These aspects should all be considered in relation to the needed scale and scope to achieve the program goal(s) within the given constraints (e.g., legal requirements). If not determined by law, the need for site-specific versus general speed and crash reductions should be a main concern in whether the program will have highly visible enforcement operations (overt enforcement) or use hidden operations (covert enforcement). Highly conspicuous programs tend to target site-specific problems and may be perceived as fairer by the public, whereas covert operations may provide more generalized deterrence of speeding across the network but raise significant equity concerns. Both strategy types may be used to provide complementary deterrence effects. Specific uses of different speed enforcement technologies (e.g., fixed, mobile, speed-over-distance) may also come into play in the program authorization and determining the rationale to help achieve desired safety benefits. These interrelated issues are discussed in more detail in chapter 5.

States may opt to authorize SSC programs as a pilot that would be limited in time and scope. A pilot program allows testing the program before a full authorization and may help, through demonstration, to alleviate concerns about how the program will operate. If evaluated, it can also be used to identify ways to improve the program before a more permanent authorization. As described in chapter 6, a pilot, like any new SSC program, would also benefit from a warning phase, during which warnings instead of actual citations are issued to violators. See the case study on Pennsylvania's pilot work zone speed enforcement authorization in chapter 8.

3.3. DEVELOP SSC PROGRAM PLAN

This section provides an overview of setting up administration and oversight of the program and planning communications. It then discusses the planning steps for organizing the operations and violation processing portions of the SSC program, which is followed by information about coordinating these activities with startup activities and evaluation. These activities are detailed further in subsequent chapters as this chapter focuses on the planning of these activities.

3.3.1. Determine Administration and Coordination

Partners should determine how the program will be administered. Decisions include determining what agency will lead the program and what individual will have responsibility for oversight of the entire program. Leadership of the program, in turn, should plan the program to optimize the ability to meet safety goals, meet all legal and other requirements to operate reliably and transparently, and maintain public trust. As mentioned previously, DOTs may be well-positioned to provide program oversight and ensure the program is operated reliably and with a focus on safety. In many jurisdictions, law enforcement agencies have traditionally served as lead agencies in SSC programs, but DOTs may provide the engineering knowledge to maximize the safety benefits and increase public trust while reducing concerns about revenue generation.

The lead agency should work with the partners to establish the roles of the involved partner agencies, and potentially vendors, in implementing various aspects of the program. These roles may include communications, site selection, enforcement operations, and violation processing.

Protocols, expectations, and training should be provided to all staff involved to provide a reliable and consistent program. More information is provided within each program area, especially chapters 4, 5, and 6 about potential ways partners may structure tasks and oversight.

3.3.2. Plan Communications and Publicity

As discussed in chapter 2, a strategic communications plan provides a framework for all partners to communicate about the program before, during, and after the program. Chapter 2 also stressed the importance of gathering public input equitably (e.g., input from broad representation of the public including people from underserved communities) to help guide program development, including encouraging public input when describing the need for and characteristics of an SSC program and listening to and addressing people's concerns about an SSC program.

Once a program is authorized and moving forward, communications continue to be an important component. These communication measures can support operations, enhance program safety benefits, and improve acceptance of the SSC program by keeping the focus on safety and the benefits of the program. Partners may plan marketing and communications messages, publicity strategies, websites, and information to accompany citations, among other types of communications.

Some of the objectives of a communications plan, which span activities in several chapters of this Guide, include:

- Understanding the legal requirements and planned operations of the program so that communications explain the reasons for different aspects of the program (e.g., how the revenues from citations are allocated and used).
- Outlining the responsibilities of citation recipients and providing supplemental information to recipients and the public. (Chapter 5 discusses these communications issues.)
- Promoting safety benefits of the program and communicating overall program outcomes. (Chapter 6, Program Startup, discusses marketing and communications in more detail.)
- Recognizing and meaningfully addressing community concerns related to surveillance and enforcement (Chapter 4, Enforcement Planning, discusses how to site SSC more equitably and Chapter 5 discusses alternative penalties that minimize the burden to underserved communities.)
- Boosting effectiveness of the enforcement while minimizing unintended inequitable consequences. (Chapter 6 also discusses this use of publicity.)
- Understanding perceptions about the program and helping determine actions and communications to maintain strong public support. (Chapter 7 covers methods to monitor public opinion.)

3.3.3. Develop Enforcement Plan

The enforcement plan is the set of procedures and policies that determine how enforcement is conducted. The enforcement plan should focus on achieving the program goals with efficient use of resources, public support, and within the constraints of laws and policies. Enforcement planning is led by partners knowledgeable about identifying sites with safety issues and determining treatment plans to address safety concerns. Often, these may be safety engineers

with State or local DOTs who are experienced in analyzing data, diagnosing problems, and weighing alternative treatments.

The enforcement plan typically includes a variety of components:

- Site selection – Determine the data and criteria for selecting specific sites for enforcement (building on the scope of eligible sites).
- Enforcement speed threshold – Defines the threshold above which a citation will be issued.
- Enforcement strategy and equipment types – Select whether mobile (van or trailer), fixed, or P2P will be used. For each location, select whether it will be overt/conspicuous or covert/hidden.
- Signing and feedback strategies – Determine how signing and other strategies support the enforcement and identify specific site, corridor, or jurisdiction-wide signing strategies.
- Scheduling – Plan the deployment by times and locations of the different types of SSC to be used. (Continuous operations are most effective but may not always be possible or allowed by law).
- Coordination with other enforcement and safety efforts – Outline the method for program partners to share relevant information that affects the need for SSC programs or affects operations at particular sites.
- Engagement with public health and community organizations – Plan how unintended consequences from penalties for underserved communities will be mitigated to meet traffic safety goals without exposing individuals to significant burdens to personal safety and financial stability.
- Monitoring – Develop a list of the data and performance measures that will be used to monitor operations of the program.
- Other special concerns.

Chapter 4 provides more information about these elements to help developers optimize the potential benefits of the program. The enforcement plan will also influence the type of equipment needed to implement the plan. Equipment procurement considerations are described in chapter 6, Program Startup.

3.3.4. Develop Violation Processing and Adjudication Plan

The responsible agency or agencies should plan the process for citation issuance from receipt of enforcement unit data through resolution of citations. At this point in the planning process, the legal review has determined the legal requirements for issuing an SSC-related citation. These specifications should be included in the plan. Some additional decisions may remain if not prescribed by legal codes. Program developers may enhance program effectiveness and public support by developing a reliable and timely process for citations, providing public agency oversight of the process, providing clear information to help citation recipients, and communicating the benefits of the program as part of the citation process. Steps outlined in the violation process in chapter 5 that should be addressed in the processing and adjudication plan may include:

- Documenting that a violation occurred.
- Matching violation information to vehicle and driver records.
- Tracking non-issuance of violations.
- Determining citation information.
- Determining alternative options, including payment plans, reduced fines, road safety courses, and community service, to minimize disproportionate burden of penalties on underserved communities.
- Providing supplemental information to alleged violators.
- Providing clear and accessible citations.
- Delivering citations in a timely manner.

In addition, the processing and adjudication plan should specify:

- The actions or responsibilities of citation recipients.
- The procedures and agencies involved in adjudication of contested citations.
- Tracking the status of citation dispositions and follow-up.
- Special situations that may be encountered.
- Receipt and use of fines.

3.3.5. Plan Startup of Operations, Procure SSC System, and Execute Inter-Agency Agreements

The equipment types and system needed to implement the planned enforcement operations should be in place in advance of startup. Jurisdiction partners will need to determine whether to purchase or lease the equipment and the role (if any) of a vendor in operating or maintaining the equipment or providing other services. Chapter 6 provides more information on system procurement (section 6.1) and vendor agreements (section 6.2). These agreements may cover several aspects of the program, potentially including equipment maintenance and calibration, violation notice processing, issuing citations, data sharing, and privacy. Contracts and performance metrics related to these services are important components of SSC program reliability, transparency, and effectiveness, and how these agreements are structured may have a bearing on public perception of the program and program performance.

3.3.6. Plan Safety and Program Evaluations

A program evaluation plan provides a structure for periodically evaluating the SSC program's progress toward achieving the program goals. Certain performance aspects of the program should also be monitored regularly and frequently to confirm program reliability (i.e., is the system functioning appropriately).

The program evaluation plan describes:

- Program monitoring needs and performance measures.
- Elements of program evaluated (e.g., safety effects, speed effects, equity effects, operations outputs, public opinion, enforcement outcomes).

- Data collection and analysis plan.
- Reporting methods for disseminating findings.

The partners may determine responsibilities for evaluation, which may be divided according to the evaluation type (e.g., safety, program performance, public opinion, equity). The evaluation plan should be established before startup of the program to allow for collecting baseline data and setting up data linkages to enable the most robust evaluations possible. Digital databases enable agencies to identify enforced and comparison sites and collect and link data on site characteristics with crashes, speed data, demographic data, and implementation dates. Jurisdictions can also track other roadway changes or engineering improvements that may affect enforcement operations and outcomes and add this information to the database. Jurisdictions should make data on crashes, speed, demographics, and citations publicly available to increase public trust and accountability.

Outside expertise may be needed for conducting safety evaluations, designing and administering effective surveys, or performing other aspects of the program evaluation. Evaluation results are used to determine whether the program is achieving safety goals, operating as intended, and garnering public acceptance. The results also identify when adjustments should be made to enforcement strategies, site selection, communications, or other strategies. Chapters 6 and 7 provide more information on program monitoring and safety evaluations.

This chapter introduced planning considerations for implementing SSC in a jurisdiction. Because of the interrelated nature of many program elements and operations, some topics are discussed in more than one of the remaining chapters, and this chapter highlighted some of those varied considerations.

CHAPTER 4: ENFORCEMENT PLANNING AND FIELD OPERATIONS

Building on the SSC program planning discussion in chapter 3, this chapter provides additional detail on developing an enforcement plan and preparing for field operations.

4.1. ENFORCEMENT PLAN

Traditional enforcement strategies can vary from passive strategies, like parking an occupied or empty cruiser along busy roadways to deter speeding, to active ones, including patrol of roadways. To develop an SSC enforcement plan, practitioners should analyze what types of traditional enforcement strategies have been used and evaluate their effectiveness or lack of effectiveness in improving road safety. This analysis should inform the types of traditional enforcement and SSC program that a jurisdiction may use to improve road safety as part of a broader speed management framework.

Depending on State and local laws, traditional enforcement officers may stop a vehicle for varying reasons beyond/other than dangerous driving behaviors, like speeding (Sprattler and Statz, 2021). If general enforcement efforts are concentrated in low income and minority neighborhoods, this may lead to more citations for "minor violations which may result in fines and license suspensions that may deepen existing economic hardships (Sprattler and Statz, 2021)." Over-enforcement in low income and minority neighborhoods without a focus on speed management may not address speeding or speeding-related crashes, may not improve road safety, and may increase racial and economic disparities and distrust. To address these concerns, some jurisdictions have used "precision-based" or "intelligence-based" enforcement traffic stops to focus on specific risky driving behavior which has been shown to reduced traffic stops involving Black and Hispanic drivers (Sprattler and Statz, 2021). Some jurisdictions have combined this focus with equitable SSC implementation. This section will discuss developing an SSC enforcement plan focused on reducing zero traffic deaths equitably.

Developing enforcement plans before beginning SSC operations can help jurisdictions target program resources most effectively. The enforcement plan should be detailed enough to provide clear internal guidance for conducting enforcement operations and addressing public concerns. The enforcement plan should also be flexible enough to allow for modifications to the procedures as the program matures and opportunities for improvement are identified. The remainder of this chapter describes eight key components of enforcement planning:

1. Site selection.
2. Enforcement speed threshold.
3. Enforcement strategy and equipment types.
4. Signing strategies and driver feedback.
5. Scheduling SSC.
6. Coordination with other law enforcement and stakeholder efforts.
7. Monitoring of the enforcement program and ongoing improvement.
8. Special concerns and conditions.

Not every SSC program will follow the same enforcement plan, and many of these enforcement planning components are interconnected and dynamic. For example, the enforcement strategy (overt versus covert) and equipment type (fixed or mobile) of the SSC operation may vary depending on the problems being addressed. Similarly, the days and hours of operation may need to change if new speeding-related problems appear. Agencies should include some flexibility in their enforcement plans to be responsive to changing safety concerns over time, including adjusting as infrastructure improvements are made. SSCs are an immediate solution to address speeding at high crash locations, and the goal should be to reduce enforcement as longer-term engineering solutions are implemented.

4.1.1. Site Selection

The site selection process is a good starting point for an enforcement plan. Sites for SSC programs can be selected to support jurisdiction-wide deterrence of speeding or site-specific problems, depending on the goals and program scope. Some jurisdictions may focus on certain types of locations such as school and/or neighborhood zones, work zones, or specific types of roads that meet legal requirements and were defined in the planned scope of the SSC program (described in chapter 3).

Sites may be defined as specific sections of roadway, as corridors where multiple sites may be enforced (intermittently or continuously), or as areas (such as residential neighborhoods). To select appropriate sites, agencies will need to collect and analyze relevant data (e.g., speeding-related crashes, speed data, social and demographic data), and conduct more detailed site reviews to diagnose the type of problems. These steps are covered in the following subsections. Jurisdictions may want to focus on sites with the greatest risk of speeding-related fatalities and injuries. Such sites may be identified based on the historical occurrence of speeding-related fatal and injury crashes. Sites can also be identified using a proactive, systemic approach, which is based on the presence of factors expected to increase the future chances of speeding-related fatal and injury crashes. Jurisdictions should include equity considerations in their site selection process for the program to be effective and meet its safety and public trust goals. As mentioned in chapter 3, DOTs may have the most expertise to lead safety analysis and site prioritization efforts.

4.1.1.1. Data collection and analysis

Agencies should, at a minimum, use law enforcement-reported crash data to identify sites that have experienced speeding-related crash problems. Data that are most relevant to site selection are discussed below, while data useful for ongoing evaluation are discussed in chapter 7 (Program Evaluation).

For a starting point, the lead agency may examine the number of speeding-related crashes (Eccles et al., 2012). These crash types may allow agencies to identify locations with speeding-related safety problems based on the number of speeding-related crashes. According to NHTSA, a crash is speeding-related "if any driver in the crash was charged with a speeding-related offense or if a police officer indicated that racing, driving too fast for conditions, or exceeding the posted speed limit was a contributing factor in the crash (National Center for Statistics and Analysis, 2020)." Although the availability of information on speeding in crash data may vary by State (NHTSA, 2011), two designations on crash reports are frequently used to indicate speeding-related crashes according to NHTSA's definition: "driving too fast for conditions" or "in excess of posted speed limit" (Liu and Chen, 2009). Since there is some uncertainty in how

reporting officers make these designations, analysts may examine each separately and the two types combined.

Agencies may further consider the severity of speeding-related crashes. Severe crashes are typically denoted as those resulting in a death or serious injury, and higher speeds typically result in more severe outcomes (Jateikiene and Vaitkus, 2017). This additional lens may allow agencies to prioritize sites with more severe crashes.

Another way to identify sites that may have speeding-related crash problems is to examine the proportion or percentage of crashes that are speeding-related in comparison to the rest of the roadway network or other similar sites. If certain sites have a higher proportion of speeding-related crashes than the average percentage at other comparable sites (based on roadway geometry and traffic volumes), those sites may be candidates for SSC.

A third way to identify sites is using a systemic approach. A systemic approach focuses on selecting sites based on road and other contextual factors that indicate the highest potential for future speeding-related crashes (Preston et al., 2013). By using factors that indicate future crash potential at a site (as opposed to using crash history at a site), a systemic approach is a proactive approach to safety management. Systemic improvements are often deployed widely across the road system based on the presence of risk factors. The ability to deploy SSC as a systemic safety strategy will depend on the allowable scope of the SSC program in a jurisdiction. FHWA provides a variety of resources for assisting jurisdictions interested in implementing a systemic approach to safety management (FHWA, 2020a).

Agencies can also validate speeding issues with field-collected speed data. One method for collecting speed data is detailed in the *ITE Traffic Engineering Handbook* (Wolshon and Pande, 2016). This method requires the agency to measure individual vehicle speeds during typical traffic flow patterns along a length of roadway and then plot those speeds by percentage (Wolshon and Pande, 2016). The agency can use this methodology to identify the percentage of vehicles traveling more than some threshold speeds selected in consultation with their partners. Relying on historical speeding ticket patterns may not fully identify speeding issues and may reinforce past inequitable enforcement.

Community input or concerns may also be used to identify areas with potential speeding issues. The risk of identifying locations based on community input is that these types of data are not uniform across a jurisdiction and may be inequitable. Program partners may wish to discuss whether and how to use community input to help prioritize specific sites for enforcement. More criteria for site selection are discussed in the next subsection.

In all of these strategies, it is important to proactively consider the equitable siting of SSC to avoid disproportionate use of automated enforcement on people driving in disadvantaged communities (Farrell, 2018). As mentioned above, individuals in underserved communities, particularly pedestrians, are disproportionately affected by traffic fatalities and serious injuries, in part because of historic disinvestments that have resulted in roads with minimal safety infrastructure and housing patterns that may have increased safety issues as automobile commuters pass through disadvantaged communities. It is important to site SSC in overburdened communities, as in any other community, for their safety benefits and to reduce the risk of fatal and serious injury crashes caused by speeding. However, it is critical to monitor any disproportionate impacts of SSC to minimize the burdens of penalties on underserved communities. Additionally, since overburdened communities may experience a disproportionate

impact from SSC, these communities can be prioritized for longer-term engineering solutions as part of the broader speed management safety (e.g., self-enforcing roads) plan.

4.1.1.2. Problem diagnosis

Once the data analysis has confirmed where speeding-related safety problems may exist, the next step is to conduct further diagnosis to confirm that speeding-related crashes are a problem at each location and determine whether an SSC program is an appropriate treatment. Engineering studies, including speed limit and safety assessments should also be conducted for each candidate site to determine if speed limits are appropriately set, limits are properly posted, and to review other safety factors. Both speed data and crash data should be disaggregated by time of day and day of week to better understand when speeding-related safety problems occur; agencies may conduct site visits at those times.

Interdisciplinary RSAs are one method that may be used to diagnose safety problems and simultaneously collect other information that can help agencies prioritize sites. An RSA is "a formal safety performance examination of an existing or future road or intersection by an independent audit team" (Synectics Transportation Consultants Inc. et al., 2006). Agencies can use an RSA after the initial location identification to refine the list of potential sites. An RSA aims to consider the safety needs of all road users and leverages the interdisciplinary team's expertise to comprehensively review road conditions and user behaviors. The team can consider the presence or potential for alternative speed treatments (e.g., roundabout intersection designs, speed humps, curve delineation treatments). During the RSA, the team can identify engineering deficiencies—such as inadequate posting of speed limits, obscure markings, or others—that should be remedied before SSC implementation (Eccles et al., 2012).

4.1.1.3. Other Selection Criteria

Conditions that affect placement, set-up, or safe operations of SSC are, as mentioned, also important in determining sites for SSC. An RSA team can review site characteristics that affect whether an SSC program may be safely implemented given sight distance, geometrics, and other constraints (Eccles et al., 2012). An example of a site characteristic that impacts safe operations of SSC is the presence of a median. Soole et al. (2013a) indicated that enforcement sites that lack raised medians may allow drivers to drift into the approaching lanes to avoid detection by an SSC camera if the camera is not positioned to monitor all lanes of traffic. As part of the site-selection process, the responsible agency may consider median presence, sight distance, and available technologies when determining whether SSC or another treatment can be applied effectively at this type of site.

Some types of SSC have additional criteria that may apply. For example, P2P enforcement (which measures a vehicle's speed over a distance between two points) may require sufficient distances between enforcement sites to adequately measure speed over the length of roadway and the system should be able to measure speeds in all lanes of traffic (Soole et al., 2013a). Agencies may also be limited in the selection or placement of covert or overt enforcement by roadside features that obstruct camera angles or prevent mobile units from being parked on the side of the road. If mobile operations are to be deployed at roadside locations, there should be sufficient roadside clearance so that the presence of SSC units will not create obstructions or safety concerns. For covert SSC operations, sites should also have adequate geometry to obscure SSC units without impeding traffic operations or causing a sight obstruction. There is more information on SSC locations and equipment set up in section 4.2 (under Field Operations).

If there is a need to limit the number of sites with SSC, agencies can use geographic balance, where sites are distributed across a jurisdiction and not all sites are located in one area. Including geographic balance as a criterion in site selection can also help to address concerns about equity within the community.

Equity Considerations in Site Selection

Both NYC and Seattle use geographic balance as part of the criteria for site selection. Geographic balance may help to prevent disproportionate enforcing of certain neighborhoods. RSAs and other diagnostic steps may also be used to determine whether alternate treatments such as roadway retrofits or operational improvements may be used instead of SSC to reduce speeding.

Ultimately, site selection depends upon properly identifying speeding-related safety problems by examining crash and speed data and then determining if those problems can be addressed with SSC. Other considerations, like roadway and roadside design features, traffic volume characteristics, equity considerations, presence of vulnerable road users, and geometric and site limitations can influence the selection of sites and the type of SSC that may be most appropriate at selected sites. The type of deployment is discussed in section 4.1.3.

4.1.2. Enforcement Speed Threshold

The enforcement speed threshold is the lowest speed at which a violation is recorded at a site. Agencies should identify this speed before conducting operations. SSC technology should aim to minimize the data collected on vehicles that violate the established speeding threshold and follow data storage guidelines that minimize privacy concerns, as discussed in section 4.2.4 (Data Transfer) and section 6.4 (Data Management). There is no threshold that will fit all sites and jurisdictions. The lead agency should strive for consistency between traditional and SSC enforcement speed threshold throughout a jurisdiction. Some jurisdictions begin with an enforcement speed threshold baseline at 11 mph above the speed limit, but that baseline may be proportionately high in lower speed environments. Lower thresholds are appropriate where speed limits are lower (e.g., school zones, locations with high child pedestrian traffic, etc.).

Agencies may determine whether to publicize speed thresholds. Publicizing the speed thresholds supports transparency but the public may view this as a tacit approval of speeding behavior. In some cases, the threshold is legally determined and therefore public knowledge. In public communications about the program, jurisdictions should inform drivers that SSC devices are accurate and impartial. Properly calibrated machines should be accurate to within 1 mph (City and County of San Francisco, 2015). Acknowledging a small tolerance before citations will be issued *may* allow agencies to address concerns about this accuracy or perceptions of fairness.

Table 1 in chapter 2 provides different thresholds and proportionate fining schedules employed by six U.S. cities with SSC programs. Many of the listed programs focus on school zones or areas within a certain distance of schools. Chapter 6 addresses penalties in more detail.

Miller et al. (2016) also summarized numbers of jurisdictions using different enforcement tolerance practices from both operating and discontinued programs. The range of enforcement

speed thresholds (i.e., minimum and maximum thresholds set, as well as standard deviations) were collected by survey responses. These findings are reproduced in table 2.

Table 2. Enforcement speed thresholds at various locations including current and discontinued programs (Source: Miller et al., 2016, table 48).

SSC LOCATION	AVERAGE SPEED OVER POSTED SPEED (IN MPH)	MINIMUM ENFORCEMENT SPEED OVER POSTED SPEED LIMIT (MPH)	MAXIMUM ENFORCEMENT SPEED OVER POSTED SPEED LIMIT (MPH)	NUMBER OF SAMPLES	STANDARD DEVIATION
SCHOOL ZONES	9	1 *	15	70	2.89
RESIDENTIAL NEIGHBORHOODS	11	6	15	45	1.31
MAJOR (ARTERIAL) ROADS	11	6	15	47	1.33
EXPRESSWAYS	11	6	15	20	1.63
HIGHWAY WORK ZONES	11	6	15	20	1.63
OTHER	11	10	12	11	0.7

* One agency reported that they allow "zero tolerance" in school zones. The research team in Miller et al. (2016) confirmed that this agency begins enforcement at 1 mph over the posted speed limit in school zones.

4.1.3. Enforcement Strategy and Equipment Type(s)

Different strategies of enforcement are available for agencies to consider when developing SSC programs. They include visible and conspicuous (overt) efforts or covert enforcement efforts that are hidden from plain site. Either strategy may be conducted with mobile units that can be relocated as needed, fixed units that are installed at one location and are not moved, fixed locations where cameras are moved between housing locations, or P2P units which use two or more units to measure a vehicle's speed over a distance. The type of SSC enforcement used should be suited for the sites selected for enforcement and the goals of the program.

When selecting appropriate SSC strategies and equipment types, agencies may consider how speeding behaviors are distributed across a jurisdiction. For example, the review of crash and speed data may show that speeding behaviors and the crashes that result are concentrated at specific sites. Conversely, data may show that speeding behaviors are common across the entire roadway network and contribute to crashes across multiple corridors or neighborhoods. Therefore, agencies may select strategies that will be most effective in producing site-specific effects or jurisdiction-wide effects.

4.1.3.1. Overt or Covert Enforcement

Overt enforcement refers to highly visible enforcement practices (Diamantopoulou and Cameron, 2002), typically denoted with signing; pavement markings; speed display boards;

modified enforcement vehicles; conspicuous, fixed camera hardware; and other feedback mechanisms. These visible measures serve to inform drivers that speed limit enforcement is being conducted at a specific site.

Conversely, covert enforcement is conducted with SSC units that are unmarked (Diamantopoulou and Cameron, 2002) and with no specific advance warning to drivers approaching an enforced site. This type of enforcement typically aims to lower speeds across a roadway network by creating the perception that drivers may be ticketed for speeding at any time and place.

Covert enforcement is not often used in the United States because of negative public perceptions, and numerous jurisdictions have laws that forbid covert operations. Covert enforcement may increase people's concerns that the program is designed for revenue and to penalize speeders rather than deter them. If used, agencies should publicize the fact that an enforcement program is in place with a marketing and media campaign (Richard et al., 2018). Jurisdictions may also inform drivers with signs on major roads and entrances to the jurisdiction or use signs to indicate to drivers they are in the general vicinity of an enforcement site, not at the exact location (Richard et al., 2018).

Overt speed enforcement may be most appropriate when specific sites have substantial speeding-related safety problems rather than as a solution to network-wide or corridor-wide speeding problems (Richard et al., 2018). Site-specific, overt enforcement can substantially reduce speeds at enforced sites. Researchers in Canada found an 11-percent reduction in speeding violations up to 500 m (1,640 ft) upstream or downstream of an overt enforcement site, although this percent reduction varied widely depending on enforcement hours and technology used (Gouda and El-Basyouny, 2017). This beneficial "halo effect" of overt enforcement and the distance it extends could use further study. A fact sheet from a European research organization suggests that highly visible, fixed cameras generate larger distance halo effects (SWOV, 2013).

Overt speed enforcement may also result in potential negative spillover effects from drivers decelerating abruptly near enforcement units then accelerating once they pass the unit. This sudden braking behavior may cause disruptions to traffic flow and potentially result in rear-end crashes. One study found strong speed reductions near cameras, but a slight increasing trend in speeds downstream of camera sites, and abrupt changes in speed both before and after some overt camera sites (DePauw et al., 2014). More study is needed on the potential for these behaviors and potential negative safety effects that might result. Agencies may consider this driver behavior when selecting the appropriate type of SSC strategy and related signing to notify drivers and consider the use of advance warning signs on the approach to the camera location. Finally, there may be more potential for drivers to divert to other routes to avoid cameras if highly conspicuous SSC is used (Decina et al., 2007). If diversion is a concern in the jurisdiction, overt enforcement could be better applied to routes of high demand with speeding-related crash problems where traffic is unlikely to divert to other routes.

Methods for improving compliance with overt enforcement include:

- Publicize overt speeding enforcement at selected sites using common communications channels (Richard et al., 2018).
- Publish a list of fixed enforcement sites and post advance warning signs (Carnis, 2011).

- Use P2P camera technologies to overtly enforce homogenous stretches of road (Soole et al., 2013a). (The next section discusses this technology.)

Agencies may find benefit by using both overt and covert enforcement so that drivers are encouraged to comply with limits everywhere, not only at known enforcement sites. Drivers may receive warnings about enforcement efforts through smartphone applications, so a mix of both enforcement types may encourage speed limit compliance across the roadway network.

4.1.3.2. Mobile, Fixed, or Point-to-Point Enforcement

Mobile, fixed, or P2P enforcement systems can be used with either overt or covert enforcement strategies. Although SSCs should not be used as a long-term solution to engineering problems, fixed, visible cameras may be the most viable solution to curb significant speeding problems at certain types of locations or before engineering improvements can be implemented. Conversely, if speed is a network-wide (or corridor-wide) concern, mobile units that can be shifted from site to site or P2P may be well-suited.

Figure 1 shows an example mobile SSC unit with the additional benefit that the unit (equipped police van) provides instantaneous speed feedback to the drivers. Agencies that used fixed unit systems may even install "dummy" housings at various sites to give the appearance of widespread, overt enforcement or may rotate systems between housings to increase the locations the program can cover.

Source: FHWA.

Figure 1. Photograph. Mobile SSC unit with speed display board in Portland, OR.

A key consideration in the type of SSC is the available technology. Different SSC equipment types may have different capabilities in terms of data storage and collection, as well as operational capabilities in different environments. If roadway or roadside features limit the effectiveness of SSC installations—for example, by limiting the ability to monitor all lanes of traffic simultaneously—agencies may need to consider other technologies or treatments. Agencies should communicate with equipment vendors to understand the technological parameters to select the most appropriate device. Additionally, existing data transmission infrastructure at some sites may make data transmission easier, lowering the cost of equipment installation for fixed units (Newstead, 2016).

Domestic experience with P2P is limited. Internationally, many jurisdictions such as Australia and the United Kingdom (IIHS, 2021b) are using P2P enforcement to help enforce homogeneous lengths of roadway, especially limited access highways (NTSB, 2017). The P2P systems work by measuring the average vehicle speed between two sites, thereby reducing the sudden decelerations and accelerations that can result when drivers react to overt, site-specific speed enforcement (NTSB, 2017). When a vehicle passes the first site, a fixed camera makes a record. When that vehicle passes the second site, a time-synchronized camera captures images at the second site, and the system calculates the average speed between the two sites. Internationally, automatic plate recognition is typically used to match vehicles. Automatic plate recognition may raise community concerns about a higher level of surveillance since data on all vehicles is collected compared to only those who commit an infraction with fixed technology. Agencies may consider alternative technologies for collecting P2P data that do not collect or store data on all vehicles. If the average speed is above the enforced speed threshold, a citation may be issued.

Site characteristics that may favor selecting P2P enforcement include:

- Roadway volumes – P2P enforcement may be more effective as volumes increase making freeways better candidates for this type of enforcement (La Torre et al., 2019).
- Section length and consistency in traffic volumes along adjacent road sections or nearby roads – P2P enforcement may be more effective when traffic cannot effectively divert to alternate routes over a length of road (Jateikienė and Vaitkus, 2017) such as on limited access highways.
- Length of enforcement section – International evidence suggests P2P enforcement can be effective from 2 km (1.24 mi) to 10 km (6.2 mi) (Jateikienė and Vaitkus, 2017).

Several international research studies found reductions in speeding and reductions in crashes from using P2P enforcement:

- Transport Scotland measured a 90-percent reduction in the number of vehicles exceeding the speed limit on divided roadway segments and an 80-percent reduction along undivided roadway segments (Soole et al., 2013b; Speed Check Services, 2010) in the first few years of deploying P2P.
- De Pauw et al. (2014) found a 74-percent reduction in the odds of drivers exceeding the speed limit and an 86-percent reduction in drivers exceeding the speed limit by more than 10 percent on divided, access-controlled highways in Belgium following the implementation of P2P enforcement.
- After evaluating P2P enforcement along a divided, access-controlled highway in Italy, Montella et al. (2015) found greater compliance with posted speed limits, a 32-percent reduction in total crashes, and a 44-percent reduction in single-vehicle crashes where the P2P system had been activated.
- La Torre et al. (2019) conducted a before-after study of P2P enforcement on divided, access-controlled highway segments in Italy and found a 22-percent reduction in expected crashes and an 18-percent reduction in fatal and injury crashes.

These results demonstrate the potential benefits to both speed limit compliance and traffic safety from P2P enforcement. Not all jurisdictions will find these same benefits and not all P2P

enforcement deployments will produce jurisdiction-wide effects (Sanders et al., 2019). Soole et al. (2013a) conducted an international review of P2P systems. They concluded that it may be most effective to conduct P2P enforcement overtly rather than covertly to have public support and use P2P systems as complementary to other SSC deployments. They also recommend there should not be excessive distances between ends and all lanes of traffic should be monitored.

The matrix shown in table 3 displays various selection criteria and the different types of SSC that can be used, based on several references synthesized in this report. It can assist agencies in deciding between the different types of enforcement.

Table 3. Decision matrix for choosing type of SSC deployment.

CONSIDERATIONS	MOBILE UNITS	FIXED UNITS	P2P UNITS
Problems are long-term and site-specific.	-	X	X
Problems are network-wide, and shift based on enforcement efforts.	X	-	X
Large speed variances exist between enforcement site and downstream sites.	X	-	X
Overt enforcement is legally required.	X[1]	X	X

[1] Temporary signs, published lists of enforced sites, and social media communications can be used to make mobile enforcement operations conspicuous.

- No information.

4.1.4. Signing Strategies and Driver Feedback

Proper signing is an important part of any overt SSC deployment and may complement covert strategies as well. Signs support SSC programs by providing information to drivers about the enforcement efforts. Signing practices should follow Manual on Uniform Traffic Control Devices (MUTCD) practices for appropriate signs and deployment locations (MUTCD, 2012). Signs may be used to alert drivers to the presence of SSC, to enhance site-specific deterrence of speeding, and to build awareness regarding SSC to enhance area-wide deterrence.

Multiple types of signs are typically used to alert drivers to conspicuous, fixed, or mobile enforcement operations. If covert enforcement is deployed, signs at key entrances and other locations throughout the jurisdiction can be used to make the enforcement more transparent, enhance perceptions of fairness, and enhance general deterrence of speeding (Richard et al., 2018).

Types of signs and their uses include:

- General signs about the SSC enforcement – Signs to advise road users that some of the traffic regulations within that jurisdiction are being enforced by photographic equipment. The general sign that can be installed at jurisdictional boundaries is the standard TRAFFIC LAWS PHOTO ENFORCED (R10-18) sign, as shown in figure 2. Such signs might be placed on major roads and at entrances to the jurisdiction to notify drivers that SSC is used in the jurisdiction and induce them to follow limits. Such signs are intended to enhance deterrent effects throughout the jurisdiction.
- Fixed advance signs – Signs to alert drivers to the possible presence of SSC ahead, if used, should be implemented according to the MUTCD provisions (MUTCD, 2012; Chapter 2B) and located at a sufficient distance. See figure 3 and figure 4 for example of fixed, advance signs.
- Temporary advance signs – Temporary signs or message boards placed upstream of an active, mobile, enforcement unit may be required by law. As with permanent signs, these signs should be spaced sufficiently close to provide a warning to drivers, but not so close that drivers engage in dangerous braking maneuvers. Signs should also not obstruct driver views or endanger other road users.
- Driver feedback signs or other 'alerts' – These signs provide immediate information to the driver such as the driver's speed and may be used in overt operations in conjunction with enforcement units. Some laboratory research has supported that immediate feedback to drivers may facilitate greater compliance with speed limits (Marciano et al., 2015). Immediate feedback enables drivers to associate speeding with violation notices received later (if detected speeding). For this reason, it may be best to provide feedback only to drivers exceeding the limit rather than to all drivers to make this cause and effect relationship clear. As wireless technologies continue to evolve, in-vehicle alerts may also be triggered to notify drivers that they have been caught speeding (Molloy et al., 2019).

Source: FHWA.

Figure 2. Photograph. R10-18 sign from the MUTCD (MUTCD, 2012).

Source: FHWA.

Figure 3. Photograph. Signs in advance of fixed enforcement site signs in Scottsdale, AZ.

Source: FHWA.

Figure 4. Photograph. MUTCD-approved R10-19P sign, which can be implemented below speed limit signs on an enforced corridor (MUTCD, 2012).

4.1.5. Scheduling SSC Enforcement

Multiple research studies have shown correlations between hours of operation and reductions in speeding violations (Goldenbeld et al., 2019; Gouda and El-Basyouny, 2017; Hamzah et al., 2013; Li et al., 2015). These studies indicate that, if possible, SSC operations should be conducted continuously rather than intermittently. However, some types of SSC may require in-person operators and agencies may have funding or staffing limitations that prevent continuous operation. Additionally, continuous operation may lead to concerns from communities, particularly underserved communities, about surveillance. During the planning phase, stakeholders and the public should be engaged to address concerns about intermittent or continuous operations. In these situations, agencies should enforce sites at times that pose the greatest risk to the public.

Some additional considerations for conducting intermittent enforcement include:

1. Speed limits should be enforced every day at one or more enforcement sites.
2. SSC deployments in school zones may be legally limited to school hours.
3. Mobile units may be better suited for short periods of enforcement, while fixed units may be better for continuous enforcement.
4. If enforcement is to be conducted at night or in low-light conditions, agencies should confirm with technology vendors that the available units function correctly and meet all requirements in low light or darkness.

Enforcement Times in California

Fremont, California performed a crash analysis as a part of their Vision Zero efforts. The analysis showed that most speeding-related fatal or serious injury crashes occurred between 6 PM and 10 PM. However, most police patrols for speeding enforcement were scheduled for daytime. Fremont altered the patrols to target times of day when speeding-related offenses and crashes were highest, which nearly tripled the number of stops for speeding. Fremont also tried to focus more effort on educating drivers about the dangers of speeding. Sanders et al. (2019) conducted an evaluation of the implementation of Fremont's Vision Zero action plan and found crashes on high-speed roads decreased 55 percent.

4.1.6. Coordination with Law Enforcement and Other Partners

SSC operations, as a part of a broader speed management program, can complement other speed-reducing efforts. Well-placed and efficiently operated speed cameras may allow enforcement officers to focus on conducting speeding enforcement where SSC cannot be used and on other enforcement priorities (Sanders et al., 2019).

As mentioned in chapter 2, law enforcement may not be the lead agency. Regardless of the lead agency, law enforcement agencies and officers need to be fully aware of the program and understand its goals and relationship to their enforcement activities. Similarly, DOTs also need to be kept apprised of traditional and SSC enforcement efforts. In turn, these partners should share all information from their operations and activities that may affect specific sites or SSC operations. For example, if the DOT implements a new treatment at an enforced site, it is important that they document what was done and share the information with program managers, especially if the treatment could affect traffic flows or overall operations at the enforced site.

4.1.7. Monitoring of Enforcement Program and Ongoing Improvement

Careful and ongoing monitoring of the enforcement operations and outcomes is critical to an SSC program's success. Agencies should respond appropriately when performance or safety goals are not met. Generally, types of data often collected as part of ongoing SSC evaluations include:

- Crash data (Li et al., 2015) including crashes by type, crash rates, and crash severity (Eccles et al., 2012).
- Enforcement operational information, such as number of enforcement sites, speed differentials of cited vehicles, and number of citations issued (Li et al., 2017).
- Roadway and traffic data, such as traffic volumes and average speed of traffic (Li et al., 2015).

These data can be used to perform a variety of evaluations to determine if the SSC operation is effective. Performance measures that may help determine the effects at a specific site or identify a needed change in the deployment strategy may include:

- Safety performance (such as reductions in total crashes, speeding-related crashes, fatal and severe injury crashes, etc.).

- Speed measurements (such as total number of vehicles speeding, percentage of vehicles speeding well above the speed enforcement threshold, and average vehicle speed per site by different times of day).
- Citation (such as the total number of citations issued or citations issued per site).

On-going monitoring of a program helps agencies use available resources efficiently and maintain public confidence that SSC is conducted to benefit safety. Evaluation may result in a change in where the units are deployed, enforcement speed thresholds, hours of enforcement, or type of speed enforcement conducted. Evaluating the equity impact of an SSC program by disaggregating citation data along demographic and social categories can determine if underserved communities are disproportionately impacted by SSC citations and fines or excessive surveillance. Making meaningful changes based on this evaluation can increase public trust in the fairness of the program. Chapter 7 provides more information on routine monitoring and on periodic, in-depth safety and program evaluations.

4.2. FIELD OPERATIONS

Once an enforcement plan is in place, agencies should establish procedures for SSC operations in the field. Field operations topics, described in more detail in the subsequent sections, include:

- Operator staffing and training.
- Unit location and set-up procedures.
- Event documentation.
- Data transfer.
- Equipment maintenance and calibration.

4.2.1. Operator Staffing and Training

Generally, SSC programs may require staff to carry out two major functions: operate equipment and issue citations. Citation issuance is covered in chapter 5. Both functions may be accomplished by staff from the lead agency, jurisdictions may divide duties between agencies, or the lead agency may engage a vendor. Some agencies may also engage a trusted public agency to provide independent oversight from the agency carrying out day-to-day operations.

It is common (and in some jurisdictions, required) for law enforcement officers to staff SSC operations due to their role in traditional speed limit enforcement and familiarity with other, ongoing enforcement efforts. In jurisdictions where operators are not legally required to be sworn law enforcement officers, agencies can consider staff from other agencies (for example, engineering or public works) which may provide a less expensive staffing option (City and County of San Francisco, 2015). Engineering and public works employees are often already responsible for setting speed limits, collecting data, and integrating speed management into long-term roadway planning; SSC program operations may fit well into their current staffing responsibilities.

Agencies may also employ third-party vendors (or contractors) for installation and for ongoing operation of SSC deployments. An advantage to this approach is that vendors may have more in-depth understanding of the equipment in use and can perform maintenance or address other

technical problems. However, there are privacy, equity, and perceptual concerns to employ vendors for ongoing enforcement, so agencies should be transparent in the form of structured arrangement with a vendor as addressed in the Vendor Agreements section in chapter 6 (Program Startup).

Regardless of who staffs the SSC enforcement operations, training is required. Agencies should seek proper training on set-up, maintenance, calibration, and event documentation from vendors on the technologies employed in the SSC operation. Staff will also need to be aware of MUTCD signing requirements (MUTCD, 2012; Chapter 2B). This training should include using deployed technologies in different light (i.e., daylight or dark) and weather conditions. Agencies should also consider training regarding civil rights as they relate to SSC operation.

4.2.2. Unit Location and Setup

SSC deployment sites should be clear of sight obstructions, should allow cameras or other devices to scan all intended lanes of traffic, and should not distract drivers. If environmental factors such as sun glare obstruct a camera's view, other enforcement methods may be more appropriate (Mitchell, 2012; Roy et al., 2011). Units should be placed or installed to minimize the risk of being a hazard on the roadside. Qualified engineers with expertise in roadside safety and hardware can help address these needs.

Operators should not unduly affect the traveling public, including pedestrians and bicyclists, when setting up or maintaining enforcement units. Therefore, agencies may consider performing setup procedures or maintenance during off-peak hours or when the risk of impacting safety will be minimized. Temporary work zones or traffic barriers, accompanied with advanced signage, may be appropriate for some setup procedures (depending on the technology used). Some arrangements may require third-party vendors to set up enforcement units, and agencies may, in these cases, consider setting up additional traffic control to protect workers. Agencies should carefully abide by safety protocols during setup and maintenance.

A common complaint of prior SSC programs has been related to the blinding effect of the camera flash in low light conditions not only from drivers but from residents and airports located near the camera sites. Arizona was able to successfully mitigate this issue using red filters on the flash and infrared photography following testing involving pilots near Sky Harbor International Airport in Phoenix, Arizona.

4.2.3. Event Documentation

To preserve the transparency of SSC operations and maintain public trust in the program, operators should keep logs of ongoing operations. These logs should be defensible, as they may constitute evidence in legal proceedings. The logs should also be included in ongoing monitoring and evaluation efforts.

Agencies may consider documenting the following in their logs:

- Deployment site locations.
- Deployment site hours of operation.
- Responsible staff.
- Enforcement speed threshold.

- Observed behaviors.
- Citations issued.
- Maintenance logs.
- Calibration dates.
- Other data required by law.

Agencies may collect other data as necessary to maintain transparency of the program, although operators should also be careful to abide by privacy and data confidentiality requirements in compiling these logs. Chapter 5 provides more information on processing violations and data documentation.

4.2.4. Data Transfer

The data collected though SSC operations and as part of event documentation are critical to both ongoing evaluation and public approval of the SSC program. Therefore, data security is critical to a successful operation. Collected data should abide by the program's privacy policy and data confidentiality requirements.

The time required for transmission and the security needed for data storage may vary by type of data collected so agencies should train operators involved in the SSC program on the legal requirements surrounding data collection and storage. Some data, such as photographs, electronic records, event logs, and more, may need to be stored permanently with authorized officials. Agencies should use the appropriate technology (such as dedicated short-range communications (DSRC)) for time-sensitive data transmissions (Chiu et al., 2013).

4.2.5. Equipment Maintenance and Calibration

Equipment involved in the SSC operation should be regularly maintained and calibrated, especially speed-measuring equipment. This equipment is critically important to the operation, as the public should remain assured of the accuracy of the equipment and the fairness of the enforcement speed threshold. Agencies should use accurate equipment and should perform the required maintenance to continue this accuracy. Vendors may also be employed in the initial and ongoing calibration of SSC devices as part of the staffing plan (City and County of San Francisco, 2015).

This chapter provided information on safety-based site selection for potential SSC deployment and additional information for helping choose among overt or covert enforcement strategies and types of equipment to carry out the enforcement. The chapter described fixed, mobile, and P2P systems and potential applications for these, along with signing strategies. The chapter also outlined field operations including staffing, training, and equipment set-up.

CHAPTER 5: VIOLATION STRUCTURE, PROCESSING, DELIVERY, AND ADJUDICATION

SSC violation types and penalty structure were discussed in chapter 2. This chapter addresses violation processing, options for citation recipients, follow-up of violation notices, and the use of fine revenues. The responsible agency or agencies should plan protocols for violation processing, validation and oversight, and citation issuance in compliance with laws, policies, and other program requirements. The violation procedures are important components to support the reliability, integrity, and equity goals of SSC programs.

FHWA has expertise and experience with engineering and highway infrastructure safety and NHTSA has expertise and experience with highway behavioral safety, including enforcement. The content of this chapter is not intended for the purpose of providing legal advice nor intended to provide legal guidance on how to structure SSC enforcement and adjudicatory program. Rather, this chapter represents a high-level summary of common elements found in known State and local programs. The development of any such program should be done in close coordination with appropriate legal counsel.

5.1. DISTRIBUTION OF RESPONSIBILITIES

Citation process responsibilities should be outlined in SSC program plans and follow State and/or local law(s). Potential processing staff can be law enforcement agency employees, DOT or public works employees, other jurisdiction employees, or authorized employees of subcontractors or equipment vendors. Citation processors should be trained according to policies, and procedures for identifying a valid violation, as well as trained in the citation issuance and follow-up procedures. Given privacy concerns, citation processors should also be trained on data management and security, and accountability processes should be established. Violation processors should ideally not be processed by the same individuals operating the SSC enforcement.

In a well-structured program, a supervisor oversees violation processing and provides assurance that violations are valid before being issued. The supervisor could be from a different agency than the agency performing operations and initial violation processing. In some jurisdictions, supervisors ensure procedures are followed, conduct audits and checks to confirm the chain of evidence is accurate, and ensure efficient and timely processing. These checks should be conducted at system start-up to detect any initial problems, and they should be conducted on an on-going basis. Appointing a supervisor who is responsible for the violation processing and quality control could be a way for an SSC program to establish accountability (Miller et al., 2016). This person may also serve as an “expert witness” in cases of contested citations (see section 5.3.3).

5.2. STEPS IN VIOLATION ISSUANCE PROCESS

Staff should be trained to make sure that photographs or videos only depict license plates (unless driver image is required by law), maintain data confidentiality, and abide by the privacy policies of the State and/or locality. As mentioned earlier, agencies may consider employing someone external to the operating agency to review infractions and help maintain program reliability. For example, jurisdictions may employ public agency staff from finance, transportation, or law

enforcement to review potential citations, eliminating the need for third-party contractors in the review process (City and County of San Francisco, 2015). Due to concerns of data privacy and to mitigate staffing costs, some international jurisdictions automate the violation issuance process and remove interactions between ticketed drivers and SSC program staff (Carnis, 2011).

The basic procedures for evaluating citations include:

- Violation detection – Review violation data to verify that a violation, as defined in the SSC statutes, occurred and that the recorded speed was above the enforcement speed threshold.
- Vehicle owner identification – If a violation occurred, license plate data can be used to retrieve relevant vehicle registration data.
- Citation issuance – Issue a citation based on vehicle registration data.

5.2.1. Violation Documentation

Violation detection parameters and procedures include making sure the vehicle exceeded the speed limit enforcement threshold and making sure any other legal requirements are met (authorized type of site, hours of operation, etc.) using a series of images and speed data, time stamps, and location data. As discussed further in chapter 6 (Program Startup), digital technologies enable rapid transmission of the data for processing and validation of offenses.

Agencies may wish to train operating staff in ethical operation and data protocols to protect both the public and the viability of the enforcement program. Some jurisdictions may require that at least two individuals review prospective violations. If two reviewers disagree on whether a violation is valid, a supervisor may also be required to review the violation.

If automation is used for processing and issuing citations, external staff may be required to oversee the reliability and accuracy of the process, event documentation, and data protection protocols. An advantage of automated citation processing in comparison to manual citation processing is the ability to process more violations quicker, which may enhance the deterrent effects of the enforcement (Wijers, 2016) due to the quicker receipt of citation. However, legal requirements in the United States may require review by certain agencies before citations are issued.

The following items are suggested violation processing needs, though they are not required under Federal law:

- The first suggested step in violation notice processing is to review and determine whether there is sufficient evidence to indicate that a violation occurred in accordance with legal requirements that apply to the program.
- Processors should ensure that the session information recorded by the SSC operator (e.g., location, lane(s) observed, date, time) or automatically collected by the technologies is correct and that SSC was authorized at the time and location a citation occurred.
- Each photograph should be reviewed to ensure that only one vehicle was within the detection zone at the time that speed was recorded, and that vehicle images captured a legible license plate.

- If driver liability is used and the program requires photographs of the driver, photographs that include the driver's face should be examined for quality and facial recognition.
- If the system captures or is required to capture more than one photograph (e.g., multiple photos during the event or photos of both the front and rear of the vehicle), the photos should be compared to ensure that they represent the same vehicle.
- Event data recorded by the speed-measuring equipment should be reviewed to ensure that the vehicle's speed was in excess of the enforcement threshold, and that other values such as vehicle distance from the enforcement unit are within reasonable bounds and consistent with the photographic evidence.
- Processors should review event logs to ensure that the SSC operator's documentation supports the evidence provided by the photograph and other violation requirements.

5.2.2. Matching Violation Information to Vehicle and Driver Records

If the violation documentation proves a violation occurred and the evidence is sufficient to identify the vehicle license plate details, the suggested next step is to retrieve information about the registered owner of the vehicle. Vehicle owner records are typically maintained by motor vehicle administrations (e.g., DMVs) and arrangements and procedures should be in place for obtaining access to the needed records. Data security and privacy are important considerations for handling this information. The motor vehicle administrators may limit access to vehicle owner records to only those vehicle records needed.

Owner or driver liability should have been determined in the SSC legal assessment and program planning stage. Processing violations may be less cumbersome and quicker if owner liability is used (and legal by State law) as opposed to driver liability. When the owner of the vehicle is liable for violations, there is no need for driver images (Eccles et al., 2012) and fewer processing steps may be needed.

If driver liability is used, some agencies first conduct an image match. For example, agencies in Arizona took additional steps to match driver images with driver license photographs (Miller et al., 2016). Up to 20 percent of recorded violations were reported to have been dismissed in jurisdictions due to a gender mismatch (Eccles et al., 2012). For some jurisdictions, glare on the windshield is another common reason for non-issuance of a citation in driver-liable jurisdictions (Eccles et al., 2012). If there is a gender match between the photograph and the vehicle owner-registration information, a violation notice can be sent to the registered owner indicating that the vehicle was observed committing a violation.

Program Evaluation in the District of Columbia (DC)

The D.C. Policy Center evaluated SSC in DC using residential segregation data from the American Community Survey and number of violations, amount fined, and number of crashes from the DC Open Data Portal. The researcher developed different residential segregation categories based on whether a neighborhood had predominately black residents or white residents and looked at crashes, citations, and fines for each category. The research determined that "predominately black neighborhoods receive more moving violations and higher fines," and also determined that there are outlier locations where there is a failure of street design that should have more direct interventions than using SSC (Farrell, 2018). Program evaluation can be used to uncover such issues.

5.2.3. Tracking Non-Issuance

Reasons for invalidating violations should be documented. Supervisors can use the data to follow-up on the issue that led to invalidation. If the issue is related to equipment or human operational issues, equipment should be recalibrated, repaired, or replaced or operators should be retrained. If violations are invalidated due to normal limitations of the equipment (e.g., unclear license plate images, inability to detect speed in all lanes), options for upgrading or improving equipment, altering siting, or other operations changes could be explored.

5.2.4. Citation Information

All information necessary for the violator to understand the violation and their response options should be included on the citation notice and may sometimes be determined by law. The notice should identify the following information:

- Violation identification number that can be used for tracking.
- Responsible, issuing agency.
- Date, time, and specific location of the violation.
- Measured speed of the vehicle and speed limit at the location.
- Traffic law that was violated.
- Fine and any other associated penalties, including alternative options.
- Notification that the violation was sent to the registered owner of the vehicle.
- At least one photograph of the vehicle that shows the context.
- A video clip of the vehicle traveling through the camera location showing tracking history, which can be useful showing context to other vehicle movement.
- A legible image of the license plate (this can be enlarged).
- An image of the driver, if driver liability is assigned.

- Options for translation or other language access and accessibility options.

Information on the required response and options should also be provided on the violation notice. This information includes:

- Payment methods.
- Due date.
- Follow up processes.
- Due process and appeal rights.
- Methods for requesting a hearing or trial.
- Method for indicating if the recipient cannot afford the fine.

The burden for response should be minimized as much as possible, and alternative payment methods (electronic, by mail, in-person), alternative fine structures (ability to pay determinations, reduced fines, payment plans) or alternatives to monetary fines (road safety courses, community service) should be provided. Links to secure on-line payment sites could be included on the citation. A pre-stamped envelope or forms (such as to deny responsibility) could be provided for recipients to mail in their payment or to provide other response to the notice.

5.2.5. Supplemental Information Provided with Citations

Programs can provide supplemental information to accompany violation notices that may help recipients understand the purpose of the SSC program and how it operates. Types of supplemental information include the following:

- Type of technology used.
- Support for the legality of the program (e.g., citations to the laws and regulations that authorize the SSC program).
- Description of the violation review process including supervision and quality control procedures.
- Purpose and goals of the program (e.g., to reducing speeding-related crashes and potentially other messages developed and tested by the program).
- Summary of positive effects of the program.
- Options for the recipient to respond to the violation notice.
- Information on alternative equitable options for payment, including reduced fines and community service, if applicable.
- A list of frequently asked questions (FAQs) and answers.
- References to sources of additional information (SSC website), violator support contacts, or links to secure sites with photographic and video evidence.

Other types of information may be provided with the violation notice, such as data protections and how long violation evidence will be kept. Additional help and support should be readily available to people who have questions or comments about a citation or the program in general. Provision for comments may be made on the SSC website, through a phone line, or in person.

Comments and concerns should be recorded and regularly reviewed. These interactions and comments may become the subject of additional FAQs and program monitoring and evaluation. The information can be used to help improve program materials and communications or to make other improvements to the program.

5.2.6. Accessibility of Violation Notice

Violation notices should be designed to maximize accessibility to recipients. Information should be presented in plain language, and small "fine print" should not be used. If there is a large non-English speaking population in the jurisdiction, the violation notice may be fully or partially multilingual. The violation notice may also include a reference to a website, phone number, or other source where information or support is available in other languages or for the deaf or hard of hearing.

5.2.7. Timely Delivery of Citation

Appropriate levels of staffing should be in place for violation processing and delivery to keep pace with the rate of violations being detected. Citation processing and delivery should not be at the expense of accuracy and quality control, but violation notices should be mailed to registered vehicle owners (or drivers, as required by the program authorization) as soon as accurate processing allows. Timely issuance of citations could improve driver feedback and recall of the incident of speeding and increases public approval (Eccles et al., 2012).

Programs may establish time goals and performance metrics to evaluate timely processing and issuing of citations. These time goals, or in some cases the related laws, may restrict issuance of citations beyond a specified time. Since technologies and procedures are constantly evolving, the program should aim to keep up with best practices in terms of minimizing the lag time between the violation and the ticket being issued. Agreements with DMVs should also foster timely and efficient acquisition or delivery of vehicle registration data.

Delivery of Citations in Oregon

Enabling legislation for Portland, OR to initiate an SSC program in 1995 required the citation to be mailed to the registered owner within six business days of the alleged violation (Eccles et al., 2012). The recipient was given 30 days to respond from the date the citation is mailed.

5.3. OPTIONS FOR CITATION RECIPIENTS

As noted above, information about the options for citation recipients should be clear on the citation itself and should allow recipients of a citation a response time of at least 30 days. Supplemental information provided with the notice can improve clarity on the needed response and provide links to additional information and support for violators. Options for citation recipients include accept responsibility, deny responsibility, and contest violations, described below. Critically, agencies should work to create easily navigable and accessible methods to contest citations, particularly to address concerns from individuals in underserved communities who may not have the flexibility with work to take time to deal with burdensome court processes and for Low English Proficiency (LEP) populations who may need help navigating the system.

Failure to simplify processes to contest citations or to provide alternative penalties that do not impose a financial burden on recipients may contribute to concerns that the system is aimed to generate revenue as opposed to increase safety.

5.3.1. Accept Responsibility

The most common way for recipients of violation notices to accept responsibility for the violation is to pay the fine. Jurisdictions may provide options for extending payment deadlines or providing a payment plan if payment is a financial burden. Additionally, jurisdictions can provide alternative options, including ability to pay determinations, reduced fines, and community service. Non-response by citation recipients may also be deemed as acceptance of responsibility in some jurisdictions.

As discussed above, fines may create a disproportionate burden on underserved communities. Specifically, a flat fee is a regressive scheme that disproportionately burdens underserved communities. If a flat fee is going to be applied, low fines may be considered (see the New York City case study elaborated in chapter 8). But even low fines may create a disproportionate burden on low income communities. Some jurisdictions may implement progressive penalty structures that factor the income of violators into the fine issued. More research is needed on the effectiveness of these alternative penalty or reward structures; jurisdictions may consider piloting and researching the effectiveness of these various programs to determine the most effective SSC program structure, which may not be fines that impose a significant burden on people who may not be able to afford them. Innovative structures may be considered to minimize the burden of penalties while maintaining the safety benefits for all communities.

5.3.2. Deny Responsibility

As mentioned in chapter 2, State and local laws should define whether the owner or driver is to be held liable and whether the owner is presumed to be the driver (unless disputed). States commonly enact statutes presuming that the registered owner of the vehicle was the operator at the time of the violation (Maisel, 2013). Common defenses for denying responsibility allowed for owners presumed to be drivers include the owner renting or leasing the vehicle to others; license plate lost or stolen; or vehicle used without permission. States may require the owner to identify the operator, provide other evidence that they were not driving the vehicle at the time of the violation, or go to court to rebut the charges. While this situation does not mean the driver is denying culpability, some States have enacted provisions that limits double jeopardy. In other words, a driver may not be held responsible for multiple tickets for the same infraction as could occur if a driver was ticketed by a law enforcement officer and was issued an SSC citation for the same speeding event (Maisel, 2013).

5.3.3. Contest Citations

While procedures for contesting a citation and requesting a hearing will depend on applicable laws within a particular jurisdiction and there are no Federal requirements, it may be useful to provide such procedures along with the violation notice. Hearings may be administrative for fines that do not result in moving violations or points on driver license records. Court procedures may be required in jurisdictions where drivers are held liable and the violation is considered a moving violation. These procedures and responsible agencies should be agreed upon during the program planning stage. Consistent and fair program administration may benefit the adjudication process or the program. As noted above, agencies should consider minimizing the burdens to

contest citations, particularly addressing concerns from underserved communities who may not have the time, resources, or institutional knowledge to contest citations.

A best practice is to have a staff member with either direct knowledge or supervisory responsibility over the unit that issued the citation present at the hearing to represent the SSC program. This could include a representative from the jurisdiction or an expert provided by a vendor. If the violation was recorded by a mobile SSC unit with a human operator reviewing the violation at the time of occurrence, for example, the operator whose unit recorded the violation may represent the SSC program. If the violation was recorded automatically, staff member from either the jurisdiction or the vendor with SSC program experience should review the violation evidence and be prepared to represent the SSC program.

One of the most important responsibilities of the expert is to explain the technology and assert its validity and reliability. This is especially important when the individual presiding over the hearing may be inexperienced in hearing SSC cases. Testimony by SSC program representatives may be scripted to make sure that thorough and accurate information is presented about the SSC technology, violation processing procedures and quality control steps, and the violation in question. Communications specialists can support this task.

If available, the unit operator's event log should be used as evidence to support the prosecution and to refute any erroneous claims by the defendant. Supplementary material, such as a video of the violation, site photographs, crash history statistics, and site speed distribution charts, can provide additional support.

5.4. STATUS TRACKING AND FOLLOW-UP PROCEDURES

Agencies should consider developing procedures for tracking violations. Vendors may provide a proprietary computer system to track violations, but jurisdictions should confirm that the vendor's system meets the needs of the program and is consistent with all applicable laws, regulations, and data security policies. Data ownership may be an issue in contracting with vendors. An example of a procedure to track a violation includes assigning a unique identifying number to each violation so that photographs, event data, and event log information can remain linked and accessible. The status of violation records (e.g., violation confirmed, violation notice issued, fine paid) should be noted within each record. If violation information is retained for analytical purposes, personally identifiable information (PII) (name, address, registration, etc.) should be removed from these records and may be required to be removed under applicable law. Legal requirements may also dictate how PII is handled.

Recipients of violation notices may fail to respond to the violation notice by the due date for a variety of reasons (Eccles et al., 2012). Agencies may want to consider developing procedures for what to do if a recipient does not respond to a violation notice if it is not determined by law. For example, when the due date has passed, agencies could consider sending a reminder notice to the recipient of the violation. The notice should specify a new due date and any penalties associated with the failure to respond to the initial notice or the subsequent notices. Care should be taken to avoid burdensome and excessive fines, late fees, license suspension, or vehicle immobilization (e.g., by booting or impounding a vehicle) as these raise significant equity concerns for underserved communities and may contribute to a cycle of poverty. Innovative methods may be piloted and evaluated to ensure collection of non-fine based penalties consistent with local and State law, including community service.

5.5. VIOLATION NOTICES ISSUED TO GOVERNMENT AND BUSINESS VEHICLES

Private sector, fleet owners, and SSC program developers should be engaged regarding SSC violations and vehicle owners and drivers. Bus, police, fire, rescue, and other government fleet vehicles as well as vehicles owned by businesses may be detected speeding. As these vehicles are unlikely to be driven by owners, special procedures may be required.

When registration records indicate that a speeding vehicle is owned by a government agency or a business, a form may be sent to the registered owner or fleet manager requesting the identification of the driver of the vehicle at the time of the violation. To do this, vehicle fleet managers may need to consult vehicle-use logs to determine who was driving the vehicle at the time of the violation. This level of compliance may be expected by policy and prior agreement among government agencies but may be more difficult to achieve with business vehicles. If no response to the notice is received or the responsible individual is not identified, State and local laws may determine whether the organization may be held responsible for the violation notice or if it should be dismissed.

Business Vehicle Violations in Australia

In Victoria, Australia, businesses that do not identify the driver of a violating vehicle are subject to a fine greater than the maximum fine for an SSC violation; however, license sanctions are not assessed (Victorian Road Safety [General] Regulations 1999, 2005).

5.6. RECEIPT AND USE OF FINE REVENUES

State statutes commonly prescribe how revenues from paid citations may be used. Programs should ensure compliance with State laws (or even constitutional requirements for disposal of revenues from paid traffic citations). In some cases, net revenues may be allocated to traffic safety programs or improvements, and these types of uses may increase support for SSC programs. SSC programs may be understood and communicated as temporary, cost-effective safety countermeasures against speeding to prevent traffic fatalities and serious injuries. Allocating revenues from SSC to long-term safety design projects, including Complete Streets implementation, may increase public support for SSC as a safety strategy. Prioritizing design improvements in communities experiencing disproportionate rates of fatalities and serious injuries, particularly underserved communities that have experienced historic disinvestment, can address both safety and equity goals of speed management and broader road safety programs. Another option includes directing revenue to a general fund. However, this may create perverse incentives for SSC to be used to increase government budgets and support the common perception that an SSC program is used for revenue generation rather than for serious crash prevention. It may be useful to communicate with the public how revenues are being used. Chapter 8 provides examples of how some jurisdictions spend the revenue from paid citations.

Use of Fine Revenue in Pennsylvania

In Pennsylvania, legislation delineated the use of revenues, which were first applied to costs of running and maintaining a work zone SSC program. Remaining revenues were divided among the State Police, with part used for expanding enforcement in work zones, transportation agencies overseeing the work zones, and the State Motor License Fund (Pennsylvania General Assembly, 2018). The SSC Enforcement in Work Zones section in chapter 8 has more information on the Pennsylvania pilot program.

Use of Fine Revenue in Seattle

The regulations of Seattle's SSC school-zone-focused program require that the City pay the exact amount collected through revenues for school traffic safety and pedestrian safety infrastructure projects; safety education for pedestrians, bicyclists, and drivers; and the operating costs of the program. Safety improvements at school locations funded through the SSC program include curb ramps, new sidewalks, speed humps, painted curb bulbs, and new signalized pedestrian crossings (Seattle Municipal Code; Seattle Department of Transportation, n.d.). The Seattle's School Zone Speed Camera Program case study in chapter 8 provides more information.

This chapter described violation processing steps and considerations to ensure timely, efficient, and accurate issuance of valid citations, as well as follow-up procedures and status tracking. The chapter also described information and supporting resources to provide to citation recipients that may help improve responses to violation notices and public support. The chapter briefly describes use of revenues.

CHAPTER 6: PROGRAM STARTUP

This chapter provides details of the final program startup steps, which occur prior to initiating enforcement operations in a warmup phase or warning period, though these steps are not required under Federal law. The operations plan, including site selection and enforcement strategies, along with the violation processing procedures should be largely established to complete these steps, allowing for some revisions to these plans and procedures if needed before full system initiation.

The following sections provide more information on setting up the physical infrastructure, staffing, and procedures needed to implement the planned enforcement. These steps, described in the sections below, include:

- Procuring equipment.
- Entering agreements with vendors that may provide on-going services (if used).
- Developing inter-agency agreements and coordination that comply with Title VI requirements.
- Managing and securing data.
- Marketing and communicating SSC program details.

When the program first begins enforcement operations, a warm-up or warning period is suggested. The last section of this chapter describes the rollout and warning period of the program. During the warning period, the program operates within all prescribed laws, operating parameters, and inter-agency and vendor agreements, but only warning letters (not citations) are sent to violators. This period allows testing of all aspects of the program and provides advance warning to drivers that actual enforcement operations are about to begin. A warning period is encouraged for all programs, including programs begun under special pilot program authorization.

6.1. EQUIPMENT PROCUREMENT

Chapter 3 discussed planning SSC program elements, and chapter 4 discussed the requirements for the enforcement operations. Once those program needs have been identified, the next step is to procure the necessary equipment. Agencies should consider not only the initial equipment costs but also the operations and maintenance of the equipment, the staffing and expertise required, and compatibility with other parts of the system and existing jurisdictional infrastructure.

Chapter 2 discussed the importance of the lead agency engaging a group of partners and community stakeholders in the development and operation of an SSC program. The stakeholders can provide the needed expertise in safety, technology, contracting, and law, as well as potential public interest concerns.

The lead agency's decision on whether and how to engage a contractor or vendor in the operation or maintenance of the enforcement equipment is a critical decision and must be consistent with applicable State/local procurement requirements. Some vendors provide both equipment and

violation processing or other services as a package. Advantages to relying on a vendor as a third-party operator may include their knowledge of the technologies, maintenance, and data needs for specific equipment, and may include expertise on the legal requirements for enforcement and evidence. However, public agencies may be perceived as more accountable to the public if they operate the systems themselves. The next section further discusses vendor agreements.

6.2. VENDOR AGREEMENTS

As discussed in the previous section, some agencies enter an agreement with vendors to provide needed expertise and operate some aspects of their SSC program. Jurisdictions may also purchase or lease equipment for a flat fee and operate the system themselves. However, as many jurisdictions rely on contractors to handle some aspects of the program, it is important for the lead agency to determine the criteria and agreements to best meet program needs.

Prior to launching any SSC operations involving vendors, agencies should establish contracts with the selected vendor on the services required. Contracts are critical to operating a program in a consistent and neutral manner. Contracts establish needed services, compensation structure, and oversight and performance criteria. The lead agency structures these contracts so that programs are operated in accordance with safety, reliability, and legal requirements for issuing violations; that potential for financial or other public harm is minimized; and to avoid negative public perceptions (such as that the programs are about raising revenues rather than improving safety).

6.2.1. Vendor Services

When selecting vendors and determining vendor responsibilities, the lead agency should solicit requests for the specified services using a competitive bidding process (Eccles et al. 2012). Vendors should not initiate the conversation. The contracted services may include:

- Supplying (through purchase or lease), maintaining, calibrating, and monitoring (on an established schedule) of the equipment needed to implement the planned operations.
- Processing citations (based on criteria established by the jurisdiction).
- Mailing citations (once approved by the oversight agency).
- Managing fine collection.
- Transferring, securing, and managing data.
- Supplying data and performance reports to the jurisdiction.

Other potential services could include legal support, website, publicity, or responding to concerns. See chapter 8, section 4 on Seattle's School Zone Speed Camera Program for an example of a vendor services agreement.

The contractual agreements reached for SSC operations should be legally defensible, transparent, and accountable to the public (Wijers, 2016). Some of the requirements for vendor agreements may be specified in legislation or local ordinances. Public agencies may wish to consider maintaining oversight of the program, however, there are no Federal requirements to do so. Again, legal expertise should be consulted so contracts, performance, and payment arrangements

comply with all laws, as some programs have been discontinued for violating State or local laws (Maisel, 2013).

6.2.2. Vendor Compensation

The vendor compensation agreement is another critical decision for SSC programs. State or local laws may specify the allowed payment structures. The approach most often used in the United States compensates vendors for equipment and services on a flat-fee basis, regardless of numbers of citations issued. The flat fee can be for the entire program, or per camera. This arrangement may be more acceptable to the public since a flat fee payment structure avoids payment per citation issued, which may help reduce the appearance of financial incentives in selecting sites and issuing citations (Douma et al., 2012; Eccles et al., 2012; Maisel, 2013). However, a flat fee structure may offer little incentive for the vendor to perform well, since the number of citations issued affects the workload (Eccles et al., 2012). Mixed or tiered payment arrangements, based partly on numbers of citations issued and partly on flat fee structure (per camera or per program), may be used to compensate vendors for work performed in relation to the workload.

Eccles et al. (2012) also mentions that there may be a need for specifying liquidated damages in the contract in case the vendor fails to provide quality work. Keeping the initial contract period short would allow for review and adjustment of contract terms after officials have had a chance to evaluate the current terms and conditions. All contracts should have a thorough legal review.

Seattle's Vendor Agreement

In Seattle's agreement with their vendor, Seattle leased the cameras from the vendor for $4,750 per month. The fixed-price agreement means that the vendor does not charge on a per-ticket basis and revenue collected through citations does not enter into the agreement. Criteria and performance measures are contractually established for processing and mailing out citations, once approved by Seattle's police department; maintaining hardware and software; supplying data on citations; and providing legal support (SDOT, 2013). See the case study on Seattle's School Zone Speed Camera Program in chapter 8 for more information.

6.2.3. Oversight, monitoring, and vendor performance

Oversight and monitoring safeguards may help reduce public perceptions that the program is operated for revenue rather than safety. In general, any services that may be provided by a vendor should have specific performance criteria included in the contract, though such a contract will be based on State law. For example, a maximum amount of time between violation detection and data transfer [or citation issuance] may be a mandated performance criteria to ensure timely violation processing. Public agency oversight of performance and procedures is another safeguard, although not required by Federal law.

An NCHRP report (Eccles et al., 2012) also recommended daily monitoring of program operations such as citations issued by camera/site to verify that the program is operating as expected. These data may be collected and reviewed by the agency or vendor operating the SSC and should be stored and regularly provided to the agency and responsible staff person. With daily monitoring, corrections in the system's operation can be made quickly before issues affect

the reliability and public confidence in the program. Citation data may be used to identify potential issues with the equipment or system and can also identify potential changes in the environment such as traffic volume or signal operations, which may affect the number of citations. Unusual changes to these data may suggest a need for field inspection to determine the causes.

Regular field inspections (weekly and yearly) should also be part of program monitoring to ensure that units remain compliant with unit location and signing requirements and are calibrated and functioning correctly. Any camera enforcement systems with identified problems should be taken offline and there should be no citations issued for that location until the issues can be corrected (Eccles et al., 2012). In some cases, it may be necessary to consider relocating the SSC to other sites if changes in the roadway, traffic, or operations at a location affects the criteria for deployment or anticipated safety benefits. Citation and other monitoring data will ultimately be useful in program performance evaluation (chapter 7).

France's National Processing Center

ITS International, which reports on industry and technologies, reports that France has deployed thousands of fixed and mobile speed violation detection systems with digital cameras as part of a fully automated enforcement and violation processing system that operates from a national center (ITS International, 2012). This centralized, automated system can efficiently and cost-effectively process many citations and can reduce unnecessary exposure of private data to human processors. It is important for data security safeguards and program checks to be built in to such an automated system. State laws typically address the legality or authorization of a fully automated system for issuing citations in the United States.

6.3. COORDINATION WITH DMV AND OTHER AGENCIES

Another step for the program partners is to coordinate responsibilities and procedures with the DMV or other agency that manages registration and or driver license data and with other agencies that may be involved in processing or adjudicating citations. This coordination should begin during the planning stage.

As discussed in chapter 5, during the planning stage, the lead agency and associated stakeholder partners determine responsibilities and arrangements for acquisition of vehicle registration data. These data are typically managed by State DMVs. Typically, these partners determine who will have access to and acquire the needed data, and whether acquiring the data will increase the DMV's workload and the impact of that workload on staffing levels.

6.4. DATA MANAGEMENT

Given the sensitive nature of violation data, it is critical that agencies efficiently and securely document, transfer, process, and store data collected through SSC operations with a carefully constructed data management program. Upon startup of an operation, agencies should have the technologies, procedures, and security measures in place for handling data transfer from

enforcement units to the violation review/processing agency. Processes for data sharing with violators should also be developed to ensure transparency, while maintaining privacy and following legal requirements. For example, as noted in Chapter 8, in New York City, violators are given access to a video of their vehicle when the ticket was issued.

The lead agency should determine data linkage procedures for the data transferred documenting the violation event, and additional processing steps including validation/citation determination, registration information, citation issuance, payment status or other outcome/adjudication. (These events are described in chapters 4 and 5.) The hardware and software systems for secure flow and storage of data among the different operations and needs should be compatible with each other, and with existing data systems in the jurisdiction. Computer and network security experts should be involved in the implementation of security procedures and selection of technologies.

The lead agency should also consider the compatibility of database formats and documentation from violation detection, processing, citation issuance, tracking, and storage to structure a secure, seamless process of violation evidence. Since technologies evolve rapidly, the jurisdiction should gather insights from peer agencies, vendors, and technical experts on the data requirements, transfer, storage, and use of data for security and privacy protection at all steps. Violation data and images should be electronically encrypted at the time of their capture to prevent unauthorized access or tampering. Any identifying data for non-infracting vehicles, such as license plate information, should not be stored. Handling and storage of such data should comply with applicable legal requirements. (Details on the data collected are described in chapters 4 and 5.)

6.4.1. Data Security

Information security is essential for an SSC program. Violation evidence should be securely stored and managed according to standard rules and applicable legal requirements for the security and preservation of legal evidence. Only authorized and trained program staff should have access to the data. These precautions can help reduce public or legislative concerns about privacy (Eccles et al., 2012).

Sensitive personal information such as social security numbers should not be used or linked with names unless it is necessary and should never be printed on violation notices mailed to recipients. Once a violation notice has been settled and is no longer outstanding, the record should be processed according to jurisdiction policies and applicable laws.

6.4.2. Data Retention

The lead agency should determine data retention requirements. States may specify data elements to be retained for different purposes and may differ in legal requirements for how long data may be kept (once violations are paid). Driver identification is a matter of State law, so agencies in driver liability States should comply with those laws while maintaining privacy and data confidentiality (review of programs by City and County of San Francisco, 2015).

Violation data may be needed for statistical analyses and program evaluation. If data are retained for monitoring or program evaluation purposes, personal identifiers (name, address, registration) should be removed. Programs may track rates of violations per site, citations issued per violation detected, and numbers of vehicles detected in repeat violations over a period of time, among others. Programs should secure these data among those tracking and using the data for these purposes. Programs may request operators to summarize these types of data according to pre-

established criteria that do not require PII. Again, anyone with access to the data should be trained and responsible for security and confidentiality.

SSC Data Management in Pennsylvania

Pennsylvania work zone SSC-enabling legislation requires that any images captured by the system be destroyed within one year, and no one can be granted access to images for purposes other than reviewing and issuing a citation unless ordered by a court in relation to a criminal act. The State maintains sole ownership of vehicle or owner data, and the data are not owned by the system vendors (Pennsylvania General Assembly, 2018). More information is included in the SSC Enforcement in Work Zones case study in chapter 8.

6.5. MARKETING/COMMUNICATIONS AND PUBLIC EDUCATION

A comprehensive communications campaign is essential to maintain positive public relations and promote the goal of improving safety. Publicity of a pending SSC program should begin well before the program startup or the program warning period. Some aspects of startup communications include the following:

- Identify target audience – Use crash data to understand which drivers are most involved in speeding-related crashes. This will help manage outreach and education resources and target the appropriate audience for messaging.
- Pre-program and start-up publicity – Program startup and warning period publicity should be used to enhance public awareness of the program and its safety purpose. Communications outlets and influencers should be identified to maximize outreach to primary target audiences.
- Program information - Describe the program and how it will work. This may involve developing website materials to accompany citation notices and other program communications. These actions can enhance program transparency and public acceptance, and smooth program operations by conveying important information about the purpose of the program. Programs should determine the right level of information to share related to safety and transparency (how sites are selected based on safety and legality), reliability (how violations are validated), privacy protection (how personal data are protected and stored), public accountability (publicly release data on crashes, speed, demographics and citations), and other aspects that may be of public interest.
- Monitor public opinion and respond – To maintain an effective program, it is important to measure and evaluate public opinion and counter negative perceptions or objections to the program. These evaluations may also require professional assistance for effective survey design and establishing a link to program evaluation measures.

6.5.1. Pre-program Publicity

Publicizing the pending SSC program can enhance effectiveness by increasing support for the program, increasing drivers' perceived risk of being cited for speeding, and boost the perceived fairness of the program by conveying that there will be a warning period phase during which

actual citations will not be issued. These actions and publicity help convey that the aim of the SSC program is to deter speeding and improve safety, not to unfairly 'trap' speeders. The warning period (described in the next section) gives drivers a chance to adjust their behavior.

Communicated messages should comply with the strategic communications plan and resonate with the target audience and larger community. The program warning phase also offers a chance to test public information resources, publicity messages, and channels of communication.

Publicity in Australia

Australian researchers also found that publicity campaigns associated with SSC programs were associated with safety effects independent of the amount of enforcement (Delaney et. al., 2004).

Some jurisdictions that have successfully implemented SSC have done so in conjunction with their Vision Zero programs. In this manner, use of SSC deployment is directly tied to safety initiatives. Vision Zero plans may already provide information about the impacts of speeding on the community and benefits of reducing speeding and traffic speeds.

Vision Zero Communications in Portland

In the City of Portland, Oregon, Vision Zero has led to the city expanding a mobile SSC program that initially began in low-speed school zones to allow fixed cameras along their high-injury network identified within the Vision Zero plan. Through the communications component of Vision Zero, Portland provides information to support the reasoning behind employing cameras that detail the crash incidence on the high-injury network, the role of speed in increasing the likelihood and injury severity of a crash, and the effectiveness of using SSC to address speeding. The City also clearly identifies how revenue from citations will be used. Cameras are called "speed safety cameras" rather than enforcement, highlighting the safety goal of Vision Zero, as a whole, and how the cameras are part of the Vision Zero program (Portland Bureau of Transportation, 2019).

6.5.2. Program Information

Media messaging should communicate the goals and operation of the program to the public and other stakeholders and serve as education. Concerns that relate to the specific program (e.g., covert or overt strategies), or that were identified through stakeholder input can be addressed with appropriate messages communicated with the target audiences.

Most SSC programs have a website to document the purpose and safety benefits of the program, provide program details and answers to FAQs about how the program works, and provide opportunities to submit questions or comments. The public should be made aware of the penalties for violations and their rights and options, for example, how to contest a citation or request a court date, if they receive a violation notice. Depending on the program parameters, the website may list and provide maps of potential SSC deployment sites, hours of operation, and other details. A well-planned website that provides necessary information may help reduce staff

time needed to respond to queries and concerns; it may also reduce the need for hearings for contested citations (Eccles et al., 2012).

The public could find more credibility if operators clearly communicate that site selection is based on evidence, that camera operations are not a means of generating revenue (Fleiter and Watson, 2012). Moreover, the public may have more trust if data on crashes, speed, demographics, and citations are publicly available and regularly updated. If the program is revenue neutral or fines are used to enhance other safety programs that can reduce reliance on SSC, agencies should communicate these aspects with the public.

Program materials and spokespersons should explain the program structure and how elements of the program benefit reliability and public safety. For instance, it may be important to explain the following:

- The site selection process and criteria for enforcement.
- The reasons that SSC units operate overtly or covertly.
- Relationship to other enforcement.
- The quality control measures taken to confirm that recorded violations are valid.

In addition, jurisdictions could also describe program options and measures relating to privacy and data protection.

6.5.3. Monitoring and Responding to Public Concerns

Information collected during the planning phase can be used to identify community concerns, document how concerns were addressed in the program and plan potential responses for when objections are raised. Maintain flexibility to implement meaningful changes in the program in response to community concerns.

6.6. PROGRAM ROLLOUT AND WARNING PERIOD

Before the SSC program goes into operation, a warning period should be conducted to confirm that all system components are functioning properly, all staff are following correct procedures, and identify any potential issues for correction. During a warning period, the program is in full operation, but violations do not carry fines or license sanctions. Instead, violators receive a warning notice in the place of a citation. One advantage of a warning period is that managers can evaluate the program and correct problems, provide additional training to staff or increase staffing to handle expected work volume, or adjust procedures before fines are implemented for violations. A warning period can also be used to preliminarily identify any disparities in enforcement. If used, a warning period should last at least one month (Eccles et al., 2012).

In contrast to a warning period, a pilot program, as mentioned in chapter 2, is a program that may have a time-limited authorization and may also include other restrictions such as a limitation to certain sites. While it is possible that a pilot authorization may also restrict violation notices to warnings without levying fines or other sanctions, this may not be the case. A warning period, during which violations do not carry penalties, should also be used in a pilot program (as was required in the Pennsylvania work zone pilot program described in section 8.1.1).

Another benefit of a warning period is that the warning period and associated publicity provide public notification that SSC enforcement is starting soon. These actions alert individuals speeding during the warning phase, as well as other drivers who may speed, that they can modify their behavior before actual ticketing begins. This period, therefore, may enhance perceived fairness by offering drivers a chance to alter their behavior.

Besides the use at program startup, a warning period and other forms of publicity may also be used at sites of new deployments of SSC (Eccles et al., 2012), or where the speed limit has recently decreased or increased. The warning phase allows time for drivers to notice and adjust to the new enforcement or change in posted speed limits.

Program publicity should emphasize that other speed enforcement measures will continue during the warning phase. Whether a warning period is used, other methods, such as speed feedback signs, increased posting of speed limit signs (as deemed appropriate by traffic safety engineers), and increased traditional enforcement, may be used prior to full implementation and enforcement thresholds for SSC and traditional enforcement may not be the same.

This chapter described the final steps suggested to roll out the implementation of SSC, including equipment procurement, vendor agreements and coordination among agencies, data management, and marketing and communications. Programs are encouraged to use publicity and program warning periods to test the operations, promote a sense of fairness, and boost effectiveness.

CHAPTER 7: PROGRAM EVALUATION

Evaluation is critical to the success of any SSC program. Evaluations should be conducted regularly to determine if programs are accomplishing their original safety goals, to identify whether changes in strategy or scheduling are necessary, and to understand how the program is perceived by the public. Traffic safety problems can be dynamic in nature, with land development and the roadway infrastructure both altering driver behavior and mitigating or creating new risks. Therefore, a thoughtful approach to program evaluation will allow agencies to shift priorities and deployments as part of a flexible and responsive traffic safety management program. This chapter presents both basic and advanced evaluation considerations. Agencies should consider how to structure their data collection and evaluation program around the safety problems they intend to address in the jurisdiction and how to gather and monitor other performance measures and measures of public opinion.

7.1. BASIC PROGRAM MONITORING

Agencies should collect basic program operations data for program monitoring. This includes speed measurements for SSC deployments and relevant crash data for assessing the SSC deployment's effect on the targeted safety problem. The SSC deployments constantly collect speed data as part of their function, as they are used to monitor speeds relative to the speed enforcement threshold. This data can be used to determine the range of speeds of passing vehicles and the frequency of speeding violations. Ongoing evaluations of these speed data may assist agencies in the calibration and maintenance procedure and help reinforce to the driving public that speed cameras are not used as a revenue source.

In the near term, monitoring crashes at enforced sites may enable agencies to adjust their strategy or seek other countermeasures if the SSC program is not working as expected to improve safety. At a minimum, agencies should consider collecting crash data at deployment sites to facilitate longer-term evaluations of effectiveness, which is described in the next section.

Beyond crash and speed data, additional data metrics can be monitored to inform decisions on the maintenance and operations of the system. Demographic data should be used to evaluate any disproportionate effects of citations and fines on Black and Latino and low-income communities. For example, system performance measures such as rates of citations issued per violation (and causes of non-issuance) should be reviewed on an on-going basis to detect potential problems and monitor system reliability. Other metrics may include tracking equipment maintenance and calibration, staff training, and other program elements to monitor program fidelity. These metrics can be established as part of program planning. Chapter 8 presents an example of metrics used in Seattle, WA.

7.2. EVALUATION OF SAFETY (CRASH AND SPEED EFFECTS)

A robust, periodic safety evaluation of the crash and speed effects is an essential component of an SSC program. For any type of program safety evaluation, it is important to structure data collection before the program begins so that sites are clearly identified and are linkable to roadway and crash data. Most robust safety evaluations also use comparable sites, or reference sites, that are not part of the SSC program. Data about site characteristics, traffic, and crash

histories are relevant for enforced and comparison locations. If a jurisdiction-wide, covert, or mobile enforcement program is in place that may have a jurisdiction-wide impact, comparison sites outside the jurisdiction and hence outside the likely influence area of the SSC enforcement, may be appropriate. Safety analysis experts may assist with these tasks.

The evaluation plan should consider the type (overt or covert and mobile, fixed, or point-to-point), extent (number and distribution of sites), and other relevant characteristics of the program in determining how to structure sites, corridors, or areas for data collection. If sufficient data exist, the evaluation can include more than just before the SSC program began operations compared to after the program began operations (before and after periods). It can also include a more detailed analysis of the different phases of a program, as defined in the following stages of deployment:

- Pre-installation: The stage prior to marketing and media and before site locations are announced.
- Approach: This is the pre-installation stage that happens after the marketing and media campaign has begun.
- Warning period: An optional phase during which the SSC deployment is operational, but warnings are issued instead of citations.
- Full implementation: The enforcement period during which SSC units are in operation and citations are issued.
- Post-enforcement feedback: An optional period during which SSC units may be removed but feedback signs and messaging remain.
- Post-implementation: The period after SSC operations have ceased and units are removed.

The pre-installation and full implementation stages are the most important measures to use to evaluate the SSC units (and related publicity) effect on crashes, but the other stages may produce crucial information about behavior changes and lingering effects. Agencies may, for example, test the effects of messaging and marketing on speeding behavior during the approach stage.

Crash data provide the most relevant measure of safety and is discussed next. However, speed data may provide earlier indications of SSC effectiveness, and traffic speeds have been shown to link to crash frequency and severity. Both measures are useful in evaluating a program intended to improve safety by reducing speeding.

7.2.1. Crash Effects

Agencies should, at a minimum, collect crash data at deployment sites as a measure of a program's performance. An agency may aim to measure changes in collision frequency and severity at enforced and comparison sites and at jurisdiction-wide levels (Kim et al., 2016).

These crash data may include specific crash types (e.g., roadway departure crashes, crashes during off-peak periods, speeding-related crashes), crash severity (e.g., fatal and injury crashes as a proportion of total crashes), demographic data, or other speeding-related crash indicators (e.g., crashes or proportions of crashes occurring at certain speeds above the enforcement speed threshold) that provide agencies insight on the effects of the SSC program.

These data need to be compiled at least annually. When evaluating crash data, agencies should consider performing a before-after analysis using multiple years of crash data from before the SSC unit or units were installed compared to at least a year of crash data after installation (Eccles et al., 2012). Typically, because of relative scarcity of crashes, more sites and years of data available for analysis may increase the potential of obtaining reliable estimates of crash effects of the program. Multiple years of data can also help to account for annual fluctuations in crashes that may not be related to treatment effects. Unless there are many crashes per site, it may be challenging to obtain crash effects by site.

Agencies can use the crash data at each location to either conduct a simple before-after study, comparing the crash data before and after the SSC unit was installed and began operations, or the agency can use the crash data to conduct a more robust evaluation such as one that incorporates a comparison group or similar evaluation design that helps to provide some context on other factors (e.g., weather) that may have impacted crashes at the location between the two periods. If used, comparison locations should be similar to the treatment groups in terms of geometric design, traffic volumes, and posted speed limits.

Evaluations should consider more than just crash frequency, if possible. Changes in traffic volumes, crash severity, and characteristics of crashes also provide meaningful insight into the effect of the SSC units. The crash types evaluated should ideally reflect the goals of the program. The Highway Safety Manual (AASHTO, 2010), which is non-binding, provides further information on different performance measures and evaluation methods.

Internationally, additional data types have been used to evaluate the safety impacts of SSC programs. For example, hospital or trauma center data, if already available and linked, may supplement reported crash data to develop a fuller picture of injury outcomes before and after SSC deployment (Alghnam et al., 2017; Skubic et al., 2014).

While they are not required, the following basic steps will help agencies use those crash data effectively:

1. Gather crash and speed data for relevant phases for SSC treatment and comparison sites.
2. Compile with other relevant data about sites and comparison sites (roadway variables and volume data by year). If changes are made to the roadway, these changes may also need to be factored into the analysis by year of implementation.
3. Evaluate those data in comparison to the data before installation and, if possible, in comparison to similar sites without SSC installations.
4. Determine if the SSC has impacted speed-related crashes at the site by lowering crash frequency, frequency of severe crashes, or speeding-related crashes, proportion of severe crashes, or other measures as previously identified.
5. Shift enforcement efforts to other sites if they become higher priorities based on crash and speed data.
6. Continue to monitor crash data at enforced sites.

Some agencies conduct more rigorous safety analyses using measures like ‘predicted’ crashes (Jateikiene and Vaitkus, 2017) or ‘expected’ crashes (a measure where predicted crashes are weighted by historic, observed crashes) (AASHTO, 2010) in before-after analyses. Controlled

before-after analyses (such as Empirical Bayes method) may provide clearer pictures of the safety effects of a treatment compared to simpler safety measurements, so jurisdictions might consider using these or other robust statistical methods in evaluations of SSC programs.

Beyond collecting crash data at enforcement sites, agencies may also collect crash data at potential enforcement sites and across the roadway network to identify applicable locations or safety problems to be addressed through a change in SSC strategy. For example, through evaluation of a specific enforcement site, agencies may find that the target crashes have been substantially eliminated, so the resources can be reallocated to sites with higher crash and speed limit violations (Kim et al., 2016). Agencies may maintain a database of other potential sites, ranked by crash histories, crash severity, predicted crashes, expected crashes, or some other risk measurement to identify which sites are the highest priority for subsequent treatment (AASHTO, 2010).

7.2.2. Speed Effects

As mentioned previously, speed can be linked to crash severity and can serve as an early indicator of effectiveness of the SSC program. Therefore, evaluating the program's impact on speed or speeding at the enforced locations provides a measure of effectiveness (Hu and McCartt, 2016). An evaluation of speed can take a similar structure to an evaluation of crashes regarding periods to evaluate and the use of comparison sites. Speed evaluations should also consider time of day in the evaluation to understand the SSC unit's effectiveness under different conditions (e.g., peak versus off-peak, different lighting levels, etc.).

As mentioned in chapter 4, one problem that can arise within a roadway network when an SSC program is in place is the potential for speed and/or crash migration to other nearby locations (Decina et al., 2007). There may be positive or negative spillover effects of enforcement at nearby sites or alternate routes due to driver adaptations. To assess whether these potential behaviors are affecting safety at other locations, agencies may consider collecting speed, crash, and volume data at the enforcement site and nearby sites, as well as comparison sites not expected to be affected by the enforcement. These data may allow the agency to determine if beneficial or negative effects are migrating to other locations on the network. If negative effects are found, agencies may consider altering their SSC programs. Examples of changes could include increasing covert enforcement or adding dummy fixtures and publicity to give the appearance of corridor- or area-wide enforcement, though there are no Federal requirements regarding enforcement.

7.3. EVALUATION OF PUBLIC AWARENESS AND ATTITUDES

Surveys are a common method for measuring public awareness and acceptance of safety programs. Ideally, agencies should measure public acceptance prior to SSC installation, at program start up, and periodically during operations to identify any changes in acceptance. Information from surveys should be disaggregated across demographics and neighborhoods/zip codes, if possible.

Early survey results can provide a baseline for comparison and evaluation. Attitudes and perceptions can change based on communications and messaging (Peterson et al., 2017), and a carefully designed survey instrument can reveal areas of concern such as equity, privacy, or revenue. These data can help jurisdictions' approach in communications with the public. Surveys

may also reveal reasons for public support that can be reinforced through communications or identify groups that have not yet been included in outreach programs (Cicchino et al., 2014). Tracking publicity measures, such as earned media coverage and others relating to communications strategies used, provides additional context for interpreting results of public awareness and opinions about the program.

Carefully constructed surveys may even allow agencies to measure behavior changes linked to SSC. Causation is difficult to prove, especially with survey data, but some agencies have measured changes in speeding behavior using survey results. Compliance with SSC may also be validated by comparing survey responses to recorded speed and citation data. Discrepancies between the two may indicate issues with communication and public acceptance. These data may provide insights into targeted outreach so long as the focus remains on improving safety (Hu and McCartt, 2016).

Data collected for SSC surveys could include the following types of elements:

- Awareness of the program's existence.
- Awareness of companion marketing and media campaign.
- Sources of information (i.e., how did respondents learn about the program).
- Awareness of program features and operational aspects.
- Presence of incorrect beliefs (i.e., misconceptions) of SSC features and operations.
- Perceptions of the purpose of SSC.
- Perceived appropriateness of site selection and amount of enforcement.
- General attitudes toward safety, speeding, and enforcement.
- Perceived likelihood of self or others being cited.
- Perceptions of changes in own driving behavior corresponding to SSC deployment.
- Perceptions of changes in behaviors of other drivers.
- Perceptions of equitable implementation of the SSC program.
- Level of support for the SSC program.
- Perceptions of others' support for the SSC program.
- Awareness of effects of SSC on road safety.
- Desired changes to SSC program.

If possible, survey instruments should be constructed by an expert in survey design to avoid surveys that are confusing or unwieldy and which may produce uninformative data. Therefore, agencies may consider adding an item for survey development into the program's total budget.

An important consideration for survey distribution and public awareness measurement is equity. Agencies should take precautions to not indirectly expose vulnerable populations to scrutiny or disproportionate enforcement through survey methods or measurements of (self-reported) compliance. Although surveys tend to be one of the lowest-risk forms of data collection, survey

respondents could still be at risk if the data collected relates to legal topics and if anonymity is breached (AAPOR, 2005). Some demographic groups may also not be well-represented through conventional survey distribution methods for various reasons (e.g., lack of internet connection, different spoken language). Agencies may consider partnering with local advocacy groups or other community organizations to understand barriers to survey response and to develop engagement strategies that reach deeper into communities. Most importantly, survey results should be used to understand disparities in outcomes or perceptions and how to improve programs to serve the entire community.

Evaluating Community Support in the District of Columbia

A survey of residents in Washington, D.C. (the District) highlights the needs for engaging the community when planning or expanding an SSC program. To address the high incidence of pedestrian traffic fatalities (one in three traffic deaths), the District planned to expand the existing SSC program from speed and red light cameras to cameras specifically mobilized to enforce right-of-way laws at crosswalks and stop sign laws. Prior to implementation of the expansion, researchers conducted a phone survey of 801 adult residents and found that 76 percent of respondents supported the existing SSC program and 87 percent supported the red light cameras. Respondents who had not driven in the past month (walked more frequently) were also more likely to support SSC than those who had driven recently, illustrating the importance of gathering input from people who travel by diverse modes. However, only 50 percent of respondents supported the proposed expansion into stop sign cameras, and only 47 percent of respondents favored crosswalk cameras. This study allowed the District to gather valuable insights into community concerns that could then be addressed in the strategic plan and marketing rollout prior to program expansion (Cicchino et al., 2014).

Survey questions could also potentially be developed to help track community perceptions about the SSC program and equity. Currently, there is little published research or practice in this area, so jurisdictions may weigh alternatives or multiple measures for assessing potential harms. Different methods of community engagement may be needed to help determine if certain populations or areas are over-represented or suffer disproportionate harms (or benefits) from the SSC program.

Evaluating Bias in San Francisco

To assess potential racial bias in enforcement, San Francisco's public health department evaluated data collected during a targeted high visibility speed-enforcement campaign to compare police-reported race of cited drivers to the race proportions of drivers on the enforced corridors estimated from crash involvement (Vision Zero SF, 2019).

This chapter provided an overview of data and evaluation needs and the potential to include professional guidance in establishing effective monitoring and evaluation plans. The chapter identifies the need for evaluations of program performance, safety effects (crash and speed-based evaluations), and public awareness and attitudes.

CHAPTER 8: CASE STUDIES

This chapter presents four case studies that describe implementation of SSC in five different areas and jurisdictions.

8.1. SPEED SAFETY CAMERA ENFORCEMENT IN WORK ZONES

8.1.1. Pennsylvania Automated Work Zone Speed Enforcement (AWZSE) Pilot Program

The Pennsylvania AWZSE program began with authorizing legislation in 2018 that directed the Pennsylvania DOT (PennDOT), the Pennsylvania Turnpike Commission, and the Pennsylvania State Police to establish a five-year pilot program for AWZSE. Program operations began in early 2020, and, following a 60-day test period, the program began issuing citations in March 2020 (PennDOT, 2020).

In the authorizing legislation, the Pennsylvania General Assembly set the parameters within which the AWZSE program would operate. The legislation defined permissible areas for camera usage and restricted SSC to active work zones, meaning that workers must be present for SSC operation. Following this regulation, any work zone locations with photo enforcement present will not operate during times workers are not present. The legislation also requires specific signage to identify work zones with AWZSE in place. PennDOT must provide two or more signs before the work zone, one of which must inform drivers whether the system is actively monitoring speeds. The work zone must also include a sign marking the end of the enforcement area (Pennsylvania General Assembly, 2018).

Along with regulations specifying locations and signage, the legislation featured requirements to safeguard privacy for drivers. First, the cameras are only permitted to photograph the rear of vehicles, with a focus on capturing the license plate. The use of cameras for surveillance is specifically forbidden, with the legislation ensuring that the cameras are not to be used to view live footage or to be controlled remotely. The legislation requires that any images captured by the system be destroyed within one year, and no one can be granted access to images for purposes other than reviewing and issuing a citation unless ordered by a court in relation to a criminal act. Concerning any vehicle or owner information, the legislation makes sure that the State maintains sole ownership of data and not the private vendors for the system (Pennsylvania General Assembly, 2018).

The AWZSE system registers a violation when a vehicle is traveling 11 mph or more above the posted work zone speed limit. When addressing penalties, the legislation places full responsibility on the vehicle owner in the case of a speeding citation. To issue a citation, the system administrator must review the record of the violation before the citation is issued (PennDOT, 2020).

The program requirements include several phases of penalties. Upon first setting up a new camera location, the system cannot issue citations for the first 30 days. Once a camera is in the active phase, a driver receives a written warning for the first violation. For the second violation, the driver receives a citation with a fine of $75. For third and subsequent violations, the fine is $150. The legislation requires that citations not be considered criminal penalties and are instead

civil penalties. No points accrue on a driver's license, and the citations cannot be considered in determining insurance coverage (PennDOT, 2020).

The authorizing legislation also delineates how revenues from the AWZSE citations are to be allocated. Revenues first go to the costs of running and maintaining the system. Funds remaining after covering these costs are divided among several sources. The Pennsylvania State Police receive 45 percent of the remaining funds. Of that amount, 55 percent is dedicated to police cadets and 45 percent covers expanded enforcement in work zones. PennDOT or the Pennsylvania Turnpike Commission, depending on who has jurisdiction over the roadway where the citation was issued, receives 15 percent of remaining revenues, which they must use on safety efforts and education specifically focused on work zones. Finally, the State's Motor License Fund receives 40 percent of net revenues (Pennsylvania General Assembly, 2018).

PennDOT maintains a website with details on the AWZSE program, as required by the authorizing legislation. This includes a list of current and past camera locations throughout the State. PennDOT also features information providing background information on the program to both emphasize and justify the safety focus and the reason for specifically focusing on work zones. Regulations that govern the program are listed on the website to provide information on how the program operates, and a set of FAQs are available on the website to give more detail on operations, privacy questions, and penalties. Those who receive a citation can use the website to pay fines or contest their citation (PennDOT, 2020).

Key Takeaways from Pennsylvania

- PA allows use of SSC in active work zones as a part of a pilot program.
- SSC warning signs must be provided in advance of the work zone.
- Only images of the rear license plate can be captured.
- Cameras for surveillance is specifically forbidden.
- Driver receives a written warning for the first violation.
- Authorizing legislation delineates how revenues from the AWZSE citations are to be allocated.
- PennDOT maintains a website with details on the AWZSE program, which is required by the authorizing legislation.

8.1.2. Maryland SafeZones: Work Zone Automated Enforcement Program

Maryland conducted a pilot test of SSC in work zones between 2009 and 2010 through the State's SafeZones program. Based on this pilot, Maryland began a long-term program. Maryland employs mobile SSC for its work zone program, using cameras mounted on vehicles at each work zone location. As mobile units, enforcement can be moved among different work zones or work zone sites. When a new site is established, cameras are operational, but no citations are issued for the first three weeks. Drivers receive warnings during this period for violations, similar to the Pennsylvania program. SSC sites are listed and displayed on a map on the Maryland SafeZones website (Maryland DOT, n.d.).

Enforcement has occurred at 84 work zone sites throughout Maryland since the SSC program became fully operational in 2010. A 2019 evaluation of the program showed a 90-percent

decrease in vehicles traveling at speeds above the citation threshold, which is 12-mph over the work zone speed limit, since the beginning of the program (Maryland DOT, 2019).

Key Takeaways from Maryland

- Maryland's work zone SSC program started as a pilot and later became a fully implemented program.
- Maryland uses mobile units for their work zone SSC.
- An evaluation of the program found a 90-percent decrease in vehicles traveling at speeds above the citation threshold, which is 12-mph over the work zone speed limit.

8.2. OVERCOMING LEGISLATIVE BARRIERS – NYC/FAMILIES FOR SAFE STREETS/TRANSPORTATION ALTERNATIVES

NYC established a school speed camera program to protect New Yorkers from traffic violence with a focus on its school children. The program was created as a small pilot in 2013. Transportation Alternatives (TA) and Families for Safe Streets (FSS) led a large and successful multiyear campaign in partnership with over 300 organizations to expand the speed camera program. This case study examines the effectiveness of SSC, their use as an equitable tool, the legislative barriers to expansion, and the tactics used by transportation safety advocates to overcome the legislative barriers in NYC.

8.2.1. NYC Program Summary

The New York State (NYS) Legislature and former New York Governor Andrew Cuomo enacted Sec. 1180-b of New York State's Vehicle and Traffic Law (VTL) granting NYC the authority to pilot an SSC program in 2013 (NYCDOT, 2018). NYCDOT funded the program and owned and maintained the cameras with the goal of providing consistent, visible, and widespread enforcement to deter speeding within the City. The SSC program began as a small pilot of only 20 cameras, and its start coincided with a successful campaign to lower the city-wide speed limit from 30 mph to 25 mph (City of New York, 2014a).

The NYS law authorizes the use of speed cameras in 140 out of 2,300 of NYC's school zones. Placement of the cameras was only permitted within a quarter mile stretch of roads abutting kindergarten to 12th grade public, charter, private, and parochial schools. The cameras can only enforce within one hour before, after, or during school hours, or one-half hour before, after, or during school activities (NYCDOT, 2018). Under the current pilot program, SSCs are prevented from operating between 10 PM and 6 AM (City of New York, 2014b). The program issues a $50 fine to the registered vehicle owner if the driver exceeded the speed limit in the zone by 10 mph, regardless of the vehicle speed or whether it was a repeat offense. No points are given to the vehicle owner's license. In 2015, NYCDOT began installing cameras in the 140 school zones to better address speeding in both directions (NYCDOT, 2018).

The NYCDOT uses specific criteria to prioritize school zone selection for SSC. The criteria include (FHWA, 2020c):

- Crash history during school hours on school days in school speed zone.

- Speed data.
- Roadway geometry.
- Engineering judgment.
- Pedestrian Safety Action Plans.

8.2.2. Messages Used by Advocates

The FSS were crucial advocates for the use of SSC in school zones by advocating for a program based on both safety and ending traffic violence. The coalition consisted of organizations and dignitaries, including elected officials, parent-teacher associations, schools, unions, colleges, businesses, trauma hospitals, nonprofit organizations, faith groups, and community groups. Their support and messaging techniques were critical to the NYC SSC program (Families for Safe Streets, 2017).

Since 2016, TA's and FSS's #EverySchool campaign became a multi-agency coalition fighting for SSC to be used in every school zone. During campaign events, students and school leaders regularly shared their stories of losing their classmates or loved ones while holding photos of those killed in crashes and moved legislators to act. They joined in lobby days at the NYS capital along with leadership from major trauma hospitals, the United Federation of Teachers, the American Association of Retired Persons (AARP), and others. The FSS, TA, and their coalition partners spoke at press conferences, held rallies, wrote op-eds, and engaged in innovative campaign tactics (Families for Safe Streets, 2017).

The State authorization for the SSC program was set to expire in July 2018, prompting campaign strategies and acts of civil disobedience aimed at expanding the program (Transportation Alternatives, 2018). In June 2018, FSS members held a 24-hour vigil outside a key decision-maker's home and encouraged passersby to write their support for the initiative on post-it notes which were then placed next to photos of FSS members killed in crashes. The following week, members and elected officials held a 26.2-mi walk around that same block to draw attention to the failure to pass the Assembly Bill (AB) that would have extended and expanded the program. After multiple attempts to reach out to some elected officials with no progress, FSS and TA supporters blocked traffic with a banner reading "Children are going to die" outside of two elected official offices. Despite these efforts, the bill was not brought to a Senate vote, and NYC was forced to turn off existing SSCs on July 25, 2018 (Transportation Alternatives, 2018).

The FSS and TA continued to target elected officials to pressure the NYS Senate to reconvene for a special session. In August 2018, former Governor Cuomo and NYC Mayor Bill de Blasio issued an emergency order to temporarily reinstate and expand the program until the legislature could reconvene. The NYS legislature ultimately reauthorized the program for 4 years, which included permitted cameras in 750 school zones, expanded the hours that cameras could operate (6 AM to 10 PM), and increased the location to a quarter-mile radius of a school entrance (instead of the previous requirement that cameras were only permitted on the street where students enter the building). Former Governor Cuomo signed the bill into law in 2019 on Mother's Day, surrounded by FSS members who had lost children in crashes (New York State, 2019).

8.2.3. Program benefits

The NYCDOT completed a study on the NYC school SSC program and found it to be highly effective in deterring speeding and preventing crashes within school zones. At fixed SSC locations from 2014 to 2017, speeding during school hours reduced by 63 percent, and 81 percent of vehicle owners ticketed did not receive a second SSC violation. Injuries from pedestrian crashes decreased by 17 percent at SSC locations, and there was a citywide drop in pedestrian fatalities (NYCDOT, 2018).

The SSC in NYC issued more tickets than police officers. In 2015, police officers issued 135,000 speeding tickets. However, the SSC program, despite being limited to locations near less than 5 percent of NYC schools, issued 1.35 million tickets (Transportation Alternatives, 2015). The predictable, consistent enforcement from SSC is considered a key factor in changing driver behavior.

The TA and FSS were effective at helping legislators and the general public understand the benefits of speed cameras and overcome misstatements made by opponents. The benefits promoted by TA and FSS include:

- SSC is focused on safety: The FSS members were at the forefront not only of the fight for SSC but at the forefront of the public awareness campaign on why SSCs are important. The FSS members spoke at press events about the expansion of the program and regularly shared their stories of loss and trauma as a way for the public to understand why SSC are a life-saving tool (Families for Safe Streets, 2017).
- SSC is fair: Drivers are given a ticket if they drive 11 mph or more above the speed limit. The fine is $50, as compared to a higher fee for a ticket from a police officer. The FSS members who share their stories helped opponents, who argued that speeding is a right and tickets are unfair, recognize that people do not have a right to endanger others on the street (Transportation Alternatives, 2015).
- SSC is constitutional: Courts have upheld SSC to be legal, despite assertions that they do not allow drivers to confront their accuser, because the citations are only civil fines and not criminal penalties. In NYC, violators are given access to a video of their vehicle when the ticket was issued. Additionally, there are examples of other methods of issuing tickets where accusers are also not faced, including toll booths and parking tickets. Moreover, the cameras in NYC only record vehicles that exceed the speed limit, not the driver. This helps alleviate fears that the cameras are a form of surveillance (Conner, 2017).

Key Takeaways from NYC

- NYC uses SSC in school zones which started as a pilot in 20 school zones and was eventually expanded to be used in 140 school zones.
- Advocates were crucial in the implementation of SSC in school zones, including parent-teacher associations, schools, unions, colleges, businesses, trauma hospitals, nonprofit organizations, faith groups, and community groups.
- Fines are sent to the registered vehicle owner.
- As a result of the school SSC program, speeding during school hours reduced by 63 percent, and Injuries from pedestrian crashes decreased by 17 percent at SSC locations.
- Courts have upheld SSC to be legal, despite assertions that they do not allow drivers to confront their accuser, because the citations are only civil fines and not criminal penalties.

8.3. CALIFORNIA ZERO TRAFFIC FATALITIES TASK FORCE

In 2019, California's Assembly Bill (AB) 2363 directed the formation of the California Zero Traffic Fatalities Task Force (Task Force). The bill identified policy development with the goal of reaching zero fatalities on roadways in California as the primary function of the Task Force. The bill further specified that the Task Force address the role of speed and speeding in traffic safety with a particular focus on evaluating current speed limit setting practices and considering methods for setting speed limits other than based on the 85th-percentile speed on the roadway. The Task Force also explored other avenues for addressing speeding issues and improving safety for road users.

The Task Force held three workshops in the latter half of 2019. Each workshop topic explored different aspects of the relation between speed and safety and opportunities for reducing speeding to impact safety. In the final workshop of the series, a representative from Arizona presented details and findings from the State's SSC program. This presentation highlighted the process of moving from a pilot program to a full program, types of camera operations (mobile and fixed), regulations that governed signage, revenue issues, and types of penalty. The presentation also included results both in terms of speeding rates and changes in public perception (CalSTA, 2019).

8.3.1. Task Force Findings and Report

Following the series of workshops and according to the stipulations of AB 2363, the Task Force published a report that included information learned during the workshops and information from a commissioned research report. The report included a section that recognizes SSC as a potential component of a comprehensive traffic safety program.

In its report, the Task Force also highlights the general benefits of SSC. The first benefit would be a potential shift of law enforcement resources away from enforcing speed limits to other needs. The SSC programs also remove the officer from potentially dangerous traffic environments while still allowing for the enforcement of speed limits. The SSC also allows for

continuous enforcement rather than enforcement that only occurs when an officer is present. Finally, the report notes that SSC is a proven safety countermeasure for addressing speeding issues (CalSTA, 2020).

In addition to benefits, the Task Force recognized general challenges to implementing SSC and challenges specific to California. The first challenge is that currently SSC is not legally permitted in California; therefore, the initial task in adoption of SSC is gaining legislative authorization. More specific to SSC operations, the Task Force saw other challenges and shortcomings that would need to be addressed when implementing SSC. First is the timing of the penalty. With SSC, the penalty (a warning or citation with fine) arrives by mail following the incident so that the speeding episode may continue until the warning or citation is received. There are also several constitutional challenges to confront when approving and sustaining an SSC program. These include the right to due process, rights of equal protection, and rights of privacy. Lastly, the Task Force acknowledged the importance of dealing with public perception concerning revenue from an SSC program that often overshadows the perception of a safety benefit.

8.3.2. A Statewide Conversation on SSC

As a component of the Task Force's report, SSC is an emerging part of a statewide conversation on traffic safety and speed in California. The report and the Task Force workshops represent a first step in what is to a be an inclusive discussion of how SSC would work in the State. Past attempts at passing enabling legislation were led by cities and, thus, did not include many groups whose influence spans the State. These groups include the California Highway Patrol, which has a stake in enforcement on major highways in the State and is represented on the current Task Force.

Though no plans are in place for implementing full SSC in California, the Task Force has identified recommendations that are still being discussed and will need to be addressed with the inclusion of stakeholders from across the State (CalSTA, 2020, Recommendations for Policy Consideration, Number C-EF2). Much of what remains to be decided would address the parameters of a potential program and its operations. These include establishing criteria to determine camera locations, procedures for driving public awareness, regulations regarding signage, developing a structure for penalties and how these are classified, deciding what level of speeding would trigger a violation, and how a warning phase would work for operations. The task force report also discussed citation amounts for future consideration by policy-makers: "The citation amount needs to deter speeders but should not be so large that it criminalizes those who cannot afford to pay the penalty (CalSTA, 2020, p. 64)."

Many discussions and decisions would also be geared toward gaining both public and legislative approval. Privacy is a significant concern, with the need to protect privacy of vehicle owners with considerations of what PII is shared and how it is handled. Communicating to the public how revenues are used may improve program transparency and support. Of a similar concern, there is a need for transparency regarding who is responsible for managing the program.

As conversations continue, there are several key elements being considered for establishing operation guidelines. First is creating a data-driven process for SSC site selection. Rather than a wide-ranging system of cameras, data would allow for identifying problem areas for speeding. Then, solutions could be identified to address speeding using a systematic data analysis approach, one of which could include SSC. In these conversations, equity is also a key consideration, with a focus on vehicle owners' ability to pay in the event of a citation and

location of cameras. Finally, the conversations aim to make sure law enforcement are overseeing SSC operations and that California Highway Patrol is active in the planning and implementation process.

While SSC is recognized in the Task Force's report on safety and speeding in California, the discussion is continuing, and no formal recommendations have been made regarding establishment of a program. A potential first step, however, could be the development of a pilot SSC program in work zones.

8.3.3. Previous SSC Efforts in California

While conversations are continuing regarding starting statewide SSC programs in California, municipalities have led previous efforts at establishing SSC programs in California with the larger cities in the State attempting to gain legislation that would authorize SSC limited to the cities' metropolitan areas. An early SSC program in California occurred in San Jose which lasted from 1996 to 2007. The program, which ended in 2007, used mobile cameras mounted on vans that rotated throughout the City. Other efforts to use SSC in California have been attempted at the municipal level but have not been successful (Brekke, 2017; Rodier et al., 2007). Another SSC effort in CA included a proposed AB, which has not been passed. CA Assembly Bill 342 proposed a five-year SSC pilot program for San Jose and San Francisco, which included reduced fines, payment plans, or community service for low-income SSC violation recipients (California Legislative Information, 2017).

Key Takeaways from California

- California formed a Zero Traffic Fatalities Task Force, which explored methods to address speed issues and improve safety, including the use of SSC as a potential component of a comprehensive traffic safety program.
- In addition to exploring the benefits of SSC, the Task Force also noted challenges to implement SSC in California. One of which is that it is not legally permitted.
- While the use of SSC is being discussed in California, it has not been legally permitted, although there have been attempts with proposed bills.

8.4. SEATTLE'S SCHOOL ZONE SPEED CAMERA PROGRAM

The City of Seattle first piloted SCC in school zones using mobile vans in 2009. Following this pilot, the City launched a fixed camera program in 2012. The program began with eight cameras at four schools. The SCC program expanded in 2014 adding five more schools and expanded again in 2015 adding four more schools. The city maintains a list of locations on its School Zone Speed Camera website. The program has not expanded since 2015, but the city does perform speed evaluations at 130 schools to determine any needs for camera relocation or cameras at additional sites (SDOT, 2013).

In Seattle, SSC is only authorized in school zones, which have speeds limits set at 20 mph. Cameras operate only during set times of the day when school zone signs are flashing. Some cameras are wired to the beacons so they can only operate when the beacons are activated, and other cameras are set to function on a schedule aligned with the schedule for the school zone

beacons. The system determines vehicle speed through a pair of loop detectors installed in the pavement that measure the time the vehicle takes to cover the distance between the two loops. When the system measures a speed that registers as a violation, the camera photographs the license plate (Seattle Police Department, 2020).

8.4.1. System Operation Responsibilities

Seattle contracted with a vendor for the school zone SSC program. In the initial agreement with the vendor in 2012, the city established a fixed-price agreement with the vendor and leased the cameras from the vendor for $4,750 per month. The fixed-price agreement means that the vendor does not charge on a per-ticket basis, and revenue collected through citations does not enter into the agreement. Because the vendor owns the cameras, the vendor assumes responsibility for the following elements of operating the program (SDOT, 2013):

- Processing citations based on the criteria set by the Seattle Police Department (SPD). This gives the vendor the authority to reject cases that fall outside the violation criteria.
- Mailing citations once approved by the SPD.
- Providing a website where those receiving citations can review videos and submit fine payments.
- Maintaining hardware and software required for camera and system operation.
- Supplying data to city agencies on citations.
- Providing legal support. This provides an assurance that the program complies with State laws governing the use of SSC. The vendor also provides support when it is needed to prosecute tickets.
- Calibrating the camera systems monthly to maintain speed measurement accuracy.

Other responsibilities for program operation are held by various city departments that include the Seattle DOT (SDOT), SPD, and the municipal court system. These responsibilities break down as follows:

- An SPD officer reviews citations following the first review by the vendor. Only SPD has authorization to issue a citation. The department is required to issue the citation within 14 days of the recorded violation.
- The SPD provides support for management of the overall program through funding and personnel.
- The SDOT installs and maintains other required infrastructure for the system, including the flashing school zone beacons, signage for school zone and camera enforcement, and pavement repair.
- The SDOT is responsible for setting criteria and evaluating locations for cameras.
- The municipal courts process citations and appeals and collect revenue for citation fines. Additionally, for those unable to pay the full fine, the municipal court can assist in setting up a payment plan.

8.4.2. Site Selection

The SDOT established a set of criteria to identify locations for SSC. The SDOT monitors vehicle speeds to determine where there are high 85th-percentile speeds. The cutoff for inclusion is 5 mph above the 20-mph speed limit. SDOT then considers other countermeasures that would slow speeds and evaluates traffic volume before recommending SSC. The SDOT works to maintain geographic balance when siting cameras. One a site is selected, SDOT evaluates the physical conditions of the roadway to be sure installing a fixed camera system is feasible (Seattle Police Department, 2020).

By setting and evaluating these criteria, SDOT monitors the speed and safety situation in various school zones and determines where to place cameras in future program expansions. Through this process, SDOT also evaluates which sites are no longer experiencing speeding issues best solved by SSC. Continuous monitoring and evaluation allow SDOT to identify locations where 85th-percentile speeds have dropped closer to the school zone speed limit. The Department also keeps track of countermeasures such as lane reconfigurations, speed cushions, and curb extensions that impact speed to determine if these countermeasures were effective at lowering speeds and preclude the need for SSC (Seattle Police Department, 2020).

8.4.3. Revenue Regulations and Financial Transparency

Current fines for a citation from the SSC program are set at $237. Under the regulations governing the school zone SSC program, Seattle must pay the vendor only for the costs of equipment and services. As noted above, Seattle's SSC program is a flat-fee program and revenues from collecting fines have no bearing on payments to the vendor. The regulations require that the City pay the exact amount collected through revenues for school traffic safety and pedestrian safety infrastructure projects; safety education for pedestrians, bicyclists, and drivers; and the operating costs of the program. Past safety improvements at school locations that have been funded through the SSC program include curb ramps, new sidewalks, speed humps, painted curb bulbs, and new signalized pedestrian crossings (Seattle Municipal Code; SDOT, n.d.).

For transparency, the city maintains records of revenues and expenditures related to the SSC program and submits annual reports which maintain transparency for its operations and guide budgeting based on expected revenue. Further, the program administrator posts citation data and revenue information online on a yearly basis. The program also employs a dedicated program manager listed on the website who serves as public-facing source of information on the program. This person keeps information updated on the website and is also available by phone or email to answer the questions from the public about SCC program details.

Key Takeaways from Seattle

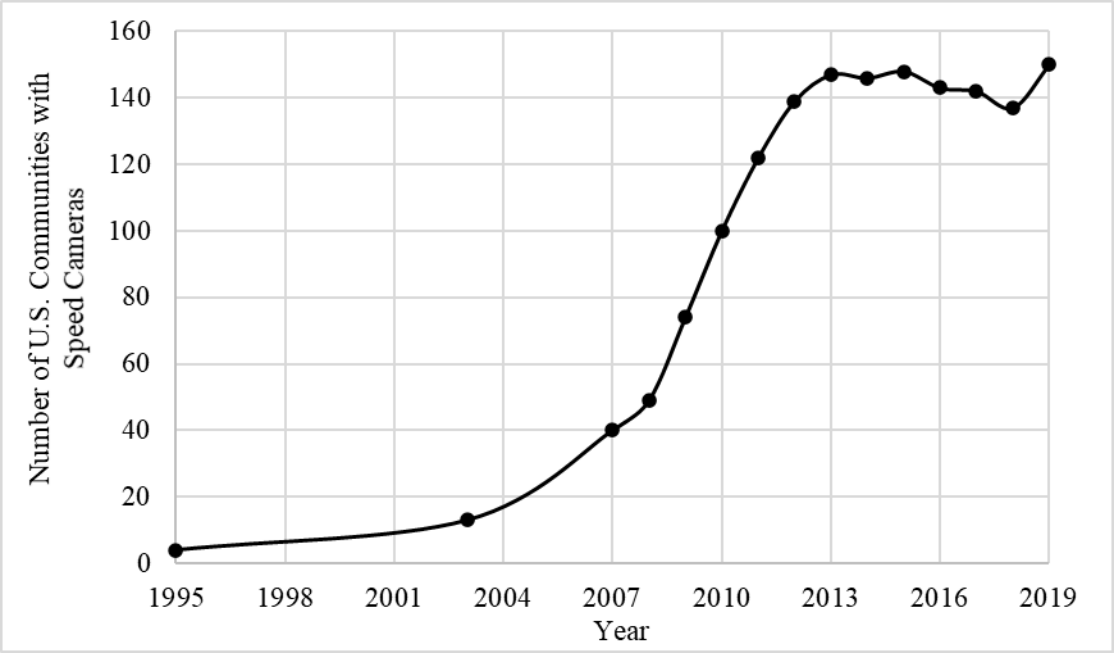
- Seattle piloted SSC in school zones using mobile vans, which led the city to launch a fixed school zone SSC program.
- Seattle contracted a vendor to run their school zone SSC program using a fixed-price agreement.
- While a vendor runs their program, some program responsibilities are held by various city departments SDOT, SPD, and the municipal court system.
- One component of SDOT's site selection process for SSC includes maintaining geographic balance when siting cameras.
- For transparency, the city maintains records of revenues and expenditures related to the SSC program and submits annual reports.

APPENDIX A: ADDITIONAL RESOURCES

This appendix presents information regarding SSC trends and offers additional information regarding speed management.

TRENDS AND OTHER RESOURCES ON SPEED SAFETY CAMERAS

The Insurance Institute for Highway Safety (IIHS) website (IIHS, 2021b) tracks SSC and red light camera programs in operation across the U.S. Figure 5 displayed the rise and number of programs operating over time in the U.S. as of 2019 based on data from IIHS. During 2019, current programs were concentrated in 16 States and the District of Columbia (IIHS, 2021b). There has been some leveling off of the number of programs in recent years. However, as of March 2021, IIHS reports that 158 communities had active programs, an increase since 2019. IIHS mentions that not all programs may be detected and counted, especially programs that may start up with little publicity (IIHS, 2021c).



Source: FHWA.

Figure 5. Graphic. Number of communities in the U.S. with speed cameras (Data source: IIHS, 2021b).

Other resources that may be useful for review include the following:

- The National Conference of State Legislatures (NCSL) tracks proposed State legislation on traffic safety and provides a searchable database of bills proposed, including a database on Automated Enforcement/Photo Monitoring (NCSL, 2021).
- The NCHRP report, *Automated enforcement for speeding and red light running* (Eccles et al., 2012), provides additional case and research information on SSC.
- *System Analysis of Automated Speed Enforcement Implementation (*Miller et al., 2016) summarizes program and practice information collected from managers and operators of

current and discontinued programs. This study compared reported practices to those encouraged in USDOT's 2008 *Speed Enforcement Camera Systems Operational Guidelines*. However, the authors acknowledged that, in some cases, those reporting on the programs may not have had access to or full knowledge of some of the practices or decision factors relating to, for example, why programs may have been discontinued.

OTHER GENERAL RESOURCES ON SPEED MANAGEMENT

Up-to-date information about the national problem of speeding and effectiveness of SSC and other countermeasures to address speeding behavior can be found in the below resources:

- *Countermeasures That Work* (CTW) (Richard et al., 2018), which is updated approximately every other year by NHTSA. The CTW is used to inform State highway safety offices and their partners about a wide variety of traffic safety measures, including strategies to reduce speeding.
- The Crash Modification Factors (CMF) Clearinghouse (FHWA, 2020b) continually updates and provides information on expected crash effects of speed-lowering measures such as SSC (catalogued under automated speed enforcement on this site), roadway reconfigurations (road diets), roundabouts, signal timing, signing, delineation, and other traffic calming and engineering safety measures. The CMF quality ratings, and information about each CMF on the roadway and land use contexts under which CMFs were developed, can be used to help agencies identify the CMFs that may be most appropriate for use.
- FHWA administers a web site on Speed Management Safety (FHWA, 2022) with tools and resources on speed concepts and definitions, setting speed limits (including the US Limits tool), developing a speed management action plan, effectiveness of traffic calming measures, and others to aid in address speeding and safety problems.
- The ITE also operates a resource hub on Speed Management for Safety (ITE, n.d.) compiling information and links to resources from other sites to aid in managing speed for improving safety.
- *Speed Management: A Road Safety Manual for Decision-Makers and Practitioners* (2008), developed for the Global Road Safety Partnership by a team of researchers from the Australian Road Research Board, the Transport Research Laboratory, and the Swedish National Road and Transport Research group, also provides an adaptable framework, information, and case studies for organizing an effective program for managing speed. This Guide is available from the World Health Organization (WHO, 2020).
- FHWA selects certain countermeasures that have been proven to reduce roadway fatalities and serious injuries to be a part of their Proven Safety Countermeasures initiative. One of these PSCs includes SSCs, which FHWA determined to be "an effective and reliable technology" that has safety benefits (FHWA, 2021).
- NHTSA's Speed Enforcement Program Guidelines provide information for establishing and maintaining successful speed enforcement programs.

GLOSSARY

The glossary describes how terms are used in this document, but they are not defined in FHWA and NHTSA regulations. As noted in some descriptions, some terms depend on State or local law.

Basic Speed Rule - The Basic Speed Rule requires vehicle operators to drive at a speed that is reasonable and prudent. As a corollary to this rule, State laws usually provide that every person shall drive at a safe and appropriate speed when approaching and crossing an intersection or railroad grade crossing, when approaching and going around a curve, when approaching a hill crest, when traveling upon any narrow or winding roadway, and when special hazards exist with respect to pedestrians or other traffic or by reason of weather or highway conditions.

General deterrence – General deterrence refers to the impact on the public at large that results from a general expectation of being detected and punished for violating traffic laws (Adapted from Zaal, 1994).

Specific deterrence – Specific deterrence is the influence of enforcement on those who have offended traffic laws that results from previous detection and punishment experiences (Adapted from Zaal, 1994).

Speed Safety Camera (SSC) – SSC as used in this *Guide* is the combination of technologies used to: 1) measure speeds of passing vehicles, and when vehicles are detected exceeding speed limits by certain amounts within the program requirements, 2) capture photographic evidence for the purposes of issuing citations to violators, and 3) transmit and store the event data using appropriate technologies.

Speeding – Speeding is defined as "exceeding the posted speed limit" or "driving too fast for conditions." Driving too fast for conditions flows from the "Basic Speed Rule."

Speeding-related crash – According to the Model Minimum Uniform Crash Criteria (MMUCC, 5th edition, NHTSA and GHSA, 2017), a speeding-related crash is an "indication of whether the investigating officer suspects that [a] driver involved in [a] crash was speeding based on verbal or physical evidence and not on speculation alone." The attribute values include: No, Exceeded speed Limit, Racing, Too Fast for Conditions, or Unknown.

SSC citation – As used in this *Guide,* an SSC citation may be issued when the speeding motor vehicle met all the conditions for an SSC violation.

SSC enforcement – SSC enforcement is the use of speed safety cameras to enforce compliance with speed limits.

SSC program – An SSC program, as the term is used in this Guide, encompasses the laws, funding, administration and oversight, and any public/private partnerships needed for implementing enforcement operations, violation processing, administering penalties, adjudicating citations, evaluating the program, and other components that are collectively needed to conduct SSC in the jurisdiction.

SSC violation – As used in this Guide, motor vehicles may be detected exceeding the speed limit by the designated amount, but the authorization for SSC enforcement may impose additional conditions on what constitutes an SSC violation for the purposes of issuing a citation. An SSC violation is one that meets the requirements for issuing a citation. For example, an SSC

violation may only occur at certain clearly-defined types of sites, and under certain hours of operation. (See also SSC citation.)

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