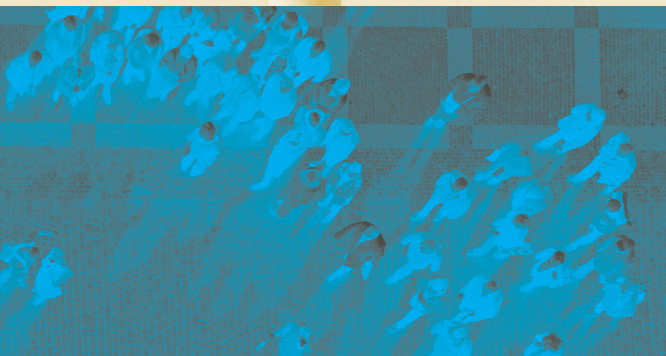# *Using Public Surveillance Systems for Crime Control and Prevention:*

A Practical Guide for Law Enforcement and Their Municipal Partners

Nancy G. La Vigne
Samantha S. Lowry
Allison M. Dwyer
Joshua A. Markman

URBAN INSTITUTE
Justice Policy Center

COPS
COMMUNITY ORIENTED POLICING SERVICES
U.S. DEPARTMENT OF JUSTICE

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Table of Contents

The Office of Community Oriented Policing Services (the COPS Office) is the component of the U.S. Department of Justice responsible for advancing the practice of community policing by the nation's state, local, and tribal law enforcement agencies through information and grant resources. The community policing philosophy promotes organizational strategies that support the systematic use of partnerships and problem-solving techniques to proactively address the immediate conditions that give rise to public safety issues such as crime, social disorder, and fear of crime. In its simplest form, community policing is about building relationships and solving problems.

The COPS Office awards grants to state, local, and tribal law enforcement agencies to hire and train community policing professionals, acquire and deploy cutting-edge crime-fighting technologies, and develop and test innovative policing strategies. The COPS Office funding also provides training and technical assistance to community members and local government leaders and all levels of law enforcement.

Since 1994, the COPS Office has invested more than $16 billion to add community policing officers to the nation's streets, enhance crime fighting technology, support crime prevention initiatives, and provide training and technical assistance to help advance community policing. More than 500,000 law enforcement personnel, community members, and government leaders have been trained through COPS Office-funded training organizations.

The COPS Office has produced more than 1,000 information products—and distributed more than 2 million publications—including Problem Oriented Policing Guides, Grant Owners Manuals, fact sheets, best practices, and curricula. And in 2010, the COPS Office participated in 45 law enforcement and public-safety conferences in 25 states in order to maximize the exposure and distribution of these knowledge products. More than 500 of those products, along with other products covering a wide area of community policing topics—from school and campus safety to gang violence—are currently available, at no cost, through its online Resource Information Center at www.cops.usdoj.gov. More than 2 million copies have been downloaded in FY2010 alone. The easy to navigate and up to date website is also the grant application portal, providing access to online application forms.

Dear Colleagues,

Today's technology-driven world is constantly changing, requiring the public safety community to quickly evolve, and endeavor to be ahead of the game. Public surveillance systems—once referred to as closed-circuit televisions—which have previously been utilized only by private businesses, are now expanding to encompass both private and public sector agencies, giving law enforcement agencies a new tool in their public safety toolbox.

In partnership with the Urban Institute, I am pleased to present Using Public Surveillance Systems for Crime Control and Prevention: A Practical Guide for Law Enforcement and Their Municipal Partners—a guidebook based on an in-depth look into public surveillance systems.

This guidebook summarizes lessons learned from an in-depth data collection effort in regards to the use and benefits of public surveillance systems, as well as providing answers to implementing or expanding your own system. The companion technical report, Evaluating the Use of Public Surveillance Cameras for Crime Control and Prevention, provides an extensive qualitative study of three urban cities, Chicago, Illinois, Baltimore, Maryland, and Washington, D.C. These case studies illustrate the pros and cons of utilizing this technology while highlighting the most prominent lessons learned from each of these jurisdictions.

I hope you will find this publication helpful in your local efforts, and we encourage you to share your experiences—both positive and negative—with our office and other law enforcement practitioners.

Sincerely,

Bernard K. Melekian, Director
Office of Community Oriented Policing Servicesx
U.S. Department of Justice

Acknowledgments

Introduction

Municipalities across the country are in a constant search for effective public safety interventions that will curb crime and improve the livability and economic well-being of their communities. This is particularly true among law enforcement agencies that embrace a community policing philosophy, which has become a key component of policing efforts in most mid- and large-sized law enforcement agencies across the United States.[1] While many believe that the adoption of community policing has led to more efficient and effective policing strategies,[2, 3] law enforcement agencies continue to grapple with limited resources and are therefore interested in employing new, cost-effective tools that can enhance their community policing efforts. Among the latest wave of public safety tools is the use of public surveillance systems, often referred to as Closed-Circuit Television (CCTV).[4] While public surveillance systems are widely employed in the business sector to improve security,[5, 6] until recently the use of cameras to monitor public spaces has been much less common in the United States, in part due to concerns about privacy and civil liberties.[7, 8] Community policing, which embodies a combination of proactive crime prevention and community engagement with more traditional policing functions, may benefit from this technology because public surveillance can enhance problem solving strategies, aid in arrests and investigations, and ultimately increase offenders' perceptions that they will be both caught and prosecuted. Public surveillance systems might also yield a secondary impact, serving to increase legitimate users' perceptions of safety and thus their presence in public areas, which in turn may increase guardianship, improve police-community partnerships, and reduce crime.

The potential contributions to policing and public safety of public surveillance systems perhaps explain why their use has expanded in recent years.[9] Unfortunately, these investments of scarce public safety resources are being made in the absence of research documenting the decisions

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1 Skogan, Wesley. 2004. "Community Policing: Common Impediments to Success." In Community Policing: The Past, Present, and Future, ed. Lorie Fridell and Mary Ann Wycoff, 159–168. Washington, D.C.: Annie E. Casey Foundation and Police Executive Research Forum.

2 Fridell, Lorie and Mary Ann Wycoff (eds.). 2004. Community Policing: The Past, Present, and Future, Washington, D.C.: Annie E. Casey Foundation and Police Executive Research Forum.

3 Skogan, Wesley. 2006. "The Promise of Community Policing." In Police Innovation: Contrasting Perspectives, ed. David Weisburd and Anthony Braga, 27–44. New York and Cambridge: Cambridge University Press.

4 While CCTV is the most commonly used term for public surveillance systems, it has become antiquated given the introduction of new video recording technologies that are not closed-circuit.

5 Nieto, Marcus. 1997. "Public Video Surveillance: Is it an Effective Crime Prevention Tool?" CRB-97-005. Sacramento, CA: California Research Bureau.

6 National Institute of Justice (NIJ). 2003. "CCTV: Constant Cameras Track Violators." NIJ Journal 249(July): 16–23.

7 Gill, Martin. 2006. "CCTV: Is it Effective?" In The Handbook of Security, ed. Martin Gill, 438-461. New York: Palgrave Macmillan.

8 National Institute of Justice, "CCTV: Constant Cameras Track Violators" (see note 6).

9 Gill, "CCTV: Is it Effective?" (see note 7);
Nestel, Thomas J. III. 2006. "Using Surveillance Camera Systems to Monitor Public Domains: Can Abuse be Prevented?" Monterey, CA: Master's thesis, Naval Postgraduate School.

behind camera investment and use and the lessons learned by cities that have employed this technology.

This guidebook aims to fill that gap, detailing the results of an in-depth qualitative data collection effort to examine and synthesize the experiences of three large urban cities that have invested in public surveillance systems in recent years. It serves as a companion document to an evaluation of the impact of public surveillance cameras in three cities that found that cameras can have a significant and cost-effective impact on crime.[10] While cameras hold promise as an effective crime prevention tool, however, it is important to note that their impact is not a given, and varies considerably based on where cameras are located and the degree to which they are monitored and integrated into other law enforcement activities. This report is therefore designed to guide city administrators, law enforcement agencies, and their municipal partners in making decisions regarding their public surveillance systems in a manner that will yield the greatest intended impact. The guidebook answers many of the important questions that arise when implementing or expanding a public surveillance system. It details the various aspects of a system that are integral in realizing a cost-beneficial impact on crime, including budgetary considerations, camera types and locations, how best to monitor cameras, and the role that video footage plays in investigations and prosecutions. This publication also highlights the most prominent lessons learned in an effort to guide both city administrators and jurisdictions that are currently investing in cameras for public safety purposes, as well as inform those that are contemplating doing so.

FOR MORE INFORMATION ON VIDEO SURVEILLANCE'S IMPACT ON CRIME REDUCTION:

A companion publication to this guidebook, entitled Evaluating the Use of Public Surveillance Cameras for Crime Control and Prevention, presents three case studies of public surveillance camera implementation and use. It details the decisions behind camera investment, implementation, and use and highlights the role that public surveillance systems play in supporting arrests, investigations, and prosecutions. It also presents the results of a quantitative analysis of the impact of public surveillance on crime, possible displacement or diffusion of effects in surrounding areas, and a cost-benefit analysis of camera investment and impact in two jurisdictions.

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10 La Vigne, Nancy G., Samantha S. Lowry, Joshua A. Markman, and Allison M. Dwyer. 2011. "Evaluating the Use of Public Surveillance Cameras for Crime Control and Prevention" Washington, D.C.: U.S. Department of Justice Office of Community Oriented Policing Services.

Purpose of this Guidebook

The purpose of this guidebook is to aid municipalities and law enforcement agencies in making informed decisions on the implementation or expansion of a public surveillance system. It is intended to equip city administrators with details regarding the cost considerations behind camera use and the potential benefits of such a system, and provide guidance on how to yield the greatest possible crime prevention and investigative impact.

Drawing from the wisdom and experiences of city administrators, law enforcement agencies, and criminal justice system representatives from the Baltimore Police Department, the Chicago Police Department, the District of Columbia Metropolitan Police Department, and other experts in the field, our research set out to answer the following questions:

- Why do cities choose to invest in public surveillance technology?

- What do they hope to gain from their investment?

- What factors go into decisions about the types of cameras that are purchased and how they are deployed and monitored?

- How is the public involved in decisions to invest in and use public surveillance systems?

- How are cameras used to support real-time arrests, and how are they used for investigative purposes?

- What are the advantages and limitations to using video footage from public surveillance cameras for prosecution and defense purposes?

This guidebook answers these important questions and raises additional questions that are integral in understanding both the mechanics of and critical issues related to how public surveillance is best used for crime prevention and investigation. The guidebook begins by highlighting ten takeaway lessons that are integral in developing a public surveillance system. It then guides readers through the key aspects of planning, emphasizing legal restrictions, and the importance of addressing privacy concerns. Specific attention is paid to explaining the importance of choosing camera locations that will yield the greatest impact on crime. Insight on how best to use public surveillance is provided, with examples of how some law enforcement agencies use it primarily as an investigative tool, while others use it to employ more proactive, real-time monitoring of high crime areas. It then discusses the types of public surveillance systems and what other technologies could be used in conjunction with cameras. In addition, throughout the guidebook the potential costs and benefits associated with a public surveillance system are provided, along with what implementers have found to be the advantages and disadvantages of cameras. Although private video surveillance plays an important role, with footage serving as complementary evidence in investigations by many law enforcement agencies, this guide focuses specifically on public camera use. The guide concludes with a brief technical appendix that features additional sources of information on public surveillance systems for municipalities and law enforcement agencies.

Defining Public Surveillance

In order to understand the mechanisms by which public surveillance may impact crime and disorder, as well as to examine the relevant information that can help inform future camera investments, it is first necessary to define the various terms that are used to refer to a public surveillance system and the components of such a system. Over the years, surveillance technology has been referred to by a number of names. While closed-circuit television is the most commonly used term for public surveillance systems, it has become antiquated because of the introduction of new video recording technologies that are not closed-circuit. Thus "public surveillance" is the term employed throughout this report.

"Closed-circuit" refers to a network of several cameras that were originally linked through a closed-circuit, with the camera footage leading to a single, centralized television monitor equipped to record the images that were captured. This system was similar to public television, with a camera to receiver-television design, but without the public broadcasting aspect. Advancement in technology has changed many aspects of the original version of a CCTV. The camera footage has remained somewhat "closed" in that it is protected or secured footage, viewable by only those people who have permission to access the feed. The concept of a "circuit" still remains, with a loop of several cameras being used in most jurisdictions and tied to a central location. However, the technology available today now allows for cameras to be fully operated remotely. Many types of cameras can now be implemented into a wireless system, with multiple operators watching the same feed from several locations. Camera systems today are more interactive and computer-based, allowing an operator to pan, tilt, and zoom [11] the camera and change what is being recorded in real-time. Other terms employed to describe these types of public surveillance systems include: Police Observation Device (POD) and Portable Overt Digital Surveillance System (PODS).

The various types of cameras that are employed for public surveillance purposes include overt, semi-covert, and covert cameras, each having its own purpose. Overt cameras are intentionally designed to be visible to the public and for the most part, one can easily detect what is being recorded by the direction of the camera (see example to the right).

Example of Overt Camera

Semi-covert cameras have become increasingly more common. These cameras have a dome-shaped covering that prevents the public from identifying the direction the camera is facing. For crime prevention efforts, this type of camera is more effective for deterrence purposes because

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11 Pan, tilt, and zoom (PTZ) refers to the ability of a camera to move along two axes, side-to-side and up and down, to record the areas that are within the cameras turning radius. This mechanism can be controlled by an operator or be programmed to follow a specific pattern of movement, without human interaction and on a regular basis.

*Example of
Semi-Covert Camera*

would-be offenders are unable to determine whether they are being recorded and may therefore refrain from criminal activity due to fear of apprehension.

Covert cameras are typically employed for homeland security purposes. These cameras are hidden for security reasons and used primarily for observation rather than to achieve a deterrent effect. The focus of this guidebook is on overt and semi-covert cameras, although covert cameras are discussed in brief.

The following technologies may complement these camera types: bullet-proof casing that protects the camera itself from being disabled; signage notifying the public that they are under surveillance; audio equipment that enables gunshot detection; motion detectors that sense activity and reorient the camera in the direction of movement; and higher-quality images with capabilities such as color recording and night vision.

As discussed in more detail later in this guide, there are a number of elements to take into consideration when planning and implementing a public surveillance system. The type of camera is key for achieving the desired impact, whether it is strictly for investigative purposes or intended for more proactive prevention purposes.[12] The capabilities of the camera also play a prominent role in camera investment decisions. Cameras that are expected to be actively monitored should have the ability to pan, tilt, and zoom, and the image will need to be of high quality in order for a monitor to discern what is happening. The placement of the camera is another important consideration, with some agencies utilizing a single camera in low crime areas or private spaces and others employing multiple cameras that span an entire neighborhood or crime hot spot. Jurisdictions anticipating the need to employ several departments or operators for surveillance in multiple neighborhoods will likely want to invest in a system of cameras that can be accessed from several locations or via the Internet.

A related placement decision pertains to where cameras are mounted and how footage is recorded, stored, and downloaded. Typically cameras are mounted onto poles or buildings. These mounting surfaces require the proper infrastructure to store video footage and, if desired, transmit footage back to an operator. In some cases, the footage is recorded locally in a box connected to the pole and requires either a technician to periodically download it or hard-wires that connect to a central location for recording. Other designs include wireless devices that send the information via an Internet Protocol (IP)-based platform.

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12 There are two basic monitoring approaches cities employ in their camera systems. Some "passively monitor" their cameras, meaning they review historical footage from one or more cameras in the area of a recent incident to determine whether the footage offers any investigatory leads. Alternatively, cities may choose to "actively monitor" their cameras. In this case individuals, usually current or former officers, proactively view what cameras are recording in real-time, and are able to manipulate the camera's movements.

In summary, when determining whether and how to implement a public surveillance system, a number of factors merit consideration. Cameras have been installed for the stated purposes of crime prevention and deterrence, as an investigative tool, in emergency response situations, as an eyewitness in investigations and prosecutions, and as a virtual guard or security system. This guide is designed to walk readers through each type of camera system use, detailing the decision-making processes underlying these uses and answering many of the questions that typically arise along the way.

TOP 10 LESSONS FOR PUBLIC SURVEILLANCE USE

1. Assess your needs and budget before investing

2. Plan ahead for maintenance, infrastructure, and other ongoing costs

3. Plan camera locations to maximize the view-shed

4. Consider integration with other technology

5. Balance privacy protection with system utility

6. Weigh the costs and benefits to using active monitoring

7. Integrate camera systems with existing practices and procedures

8. Set and manage realistic expectations for video footage quality

9. Use surveillance systems to complement, not replace, routine policing, investigations, and legal proceedings

10. Incorporate video evidence with witness testimony in court

Chapter 1.

What are the "Top 10" takeaway lessons for public surveillance?

When considering installing a public surveillance system, stakeholders must keep many issues in mind. Implementing a new system is a significant undertaking, and requires city administrators and jurisdictions to confront both financial and political challenges. Careful planning, integration, and innovation can help both law enforcement agencies and their municipal partners successfully navigate these challenges in order to implement and employ a public surveillance system. Several cities with existing surveillance systems have generated lessons that can pave the way for jurisdictions contemplating such an investment, providing constructive guidance on both best practices and potential pitfalls. This chapter details the top 10 takeaway points from the cities of Baltimore, Chicago, and Washington, D.C. In each lesson below, the text box indicates which guidebook chapter the reader can refer to in order to learn more about the topic addressed.

LESSON 1.
ASSESS YOUR NEEDS AND BUDGET BEFORE INVESTING.

For more information, refer to the following chapters:
- Chapter 2, Planning
- Chapter 4, Camera Systems
- Chapter 8, Investigations
- Chapter 9, Use in Trials

Installing a public surveillance system is a resource-intensive endeavor, requiring a substantial time and labor investment in addition to equipment costs. Stakeholders in cities that have

installed such systems caution that jurisdictions should invest from the start in the highest quality cameras and networks. While it may be tempting to purchase less expensive equipment, keep in mind that the usefulness of the system for investigations and trials depends on the quality of the images captured. A lower quality camera, for example, may be unable to produce images with identifiable faces during darkness or inclement weather.

Carefully assessing the needs of your jurisdiction and the budget available for camera installation can inform the decision on the proper level of technology. Many options for surveillance systems are available, and determining the option that is most appropriate for a given jurisdiction will depend on the location of cameras, their intended purpose, and the available budget. As detailed in chapter 4, cameras can be stationary or moving, networked or stand-alone, and have varying levels of visibility, signage, and protection. Typically, jurisdictions are able to blend technology, enabling it to be tailored to specific locations within the system. While most jurisdictions opt for a wireless network with PTZ cameras that are hardened (physically protected, i.e., using a bullet-resistant casing that encloses the camera), have lights and signs, and are more overt, a system of this type will be less helpful for undercover operations. Jurisdictions should clarify the purpose and intended use of a proposed system and their available budget in order to determine the best system to fulfill their needs.

LESSON 2.
PLAN AHEAD FOR MAINTENANCE, INFRASTRUCTURE, AND OTHER ONGOING COSTS.

For more information, refer to the following chapters:
- Chapter 2, Planning
- Chapter 7, Monitoring

Initial equipment costs are only a small part of the budget required for a fully functional surveillance system. It is important for jurisdictions to plan ahead for ongoing costs associated with using and maintaining an effective system. The value of a surveillance system depends on the continued functionality of its cameras and network. Cameras themselves will wear out, be vandalized, or require maintenance for other reasons. Camera technicians in one jurisdiction noted that cameras must be replaced every few years. If a jurisdiction wants to implement a wireless network, antennae will have to be readjusted regularly as weather or accidents cause misalignment and lines of sight must be maintained. Similarly, camera viewsheds must be regularly cleared of plant growth or other local obstructions. The infrastructure of a camera system, as well as the hardware involved, will likely need replacing on a somewhat regular basis. One city's camera technician estimated a five-year life cycle for equipment involved in regular surveillance.

In addition to maintenance expenses are the ongoing costs associated with staffing and operating the surveillance system. Staff, either uniformed or civilian, must be assigned to monitor cameras or retrieve footage from internal hard drives for non-networked cameras. The use of existing sworn officers for monitoring may necessitate the hiring of additional patrol officers to maintain the current police presence, though effective use of active monitoring may nullify

the need for such action. Cameras may also require additional technical staff to manage the demands of the new system.

LESSON 3.
PLAN CAMERA LOCATIONS TO MAXIMIZE THE VIEWSHED.

For more information, refer to the following chapters:
- Chapter 2, Planning
- Chapter 3, Policies
- Chapter 6, Locations

Camera placement is an important but potentially controversial component of public surveillance implementation. Several strategies may guide where to install cameras, including mapping crime in the community to identify hot spots; consulting local-level police heads or representatives; soliciting feedback from the public; or blanketing distribution throughout an area. Crime mapping determines locations with the highest number of incidents, and may enable police to get the most use out of a system. Political and public concerns, however, may make relying solely on crime data unfeasible. Similarly, environmental factors, such as inadequate lighting, the location of buildings, vegetation or other obstructions, may preclude camera placement at the site. While considering the public's perspectives is important for enlisting support for cameras, jurisdictions must take care not to undermine the usefulness of a surveillance system through poor placement decisions.

Even with the best placement plan, some individuals or groups will likely be unhappy with the final decisions regarding installation. Jurisdictions have worked with discontented neighborhoods in several ways. In one city, for example, council members used their own budgets to purchase and install cameras in neighborhoods in which their constituents live to then link to the police network for monitoring purposes. In other cities, citizen groups have purchased their own cameras and monitored them independently of the police. It is also likely that camera implementers will encounter resistance to camera installation, as citizens may perceive them as decreasing property values by labeling their neighborhood as crime-prone. Others may object on civil liberties grounds, voicing concerns that cameras are an invasion of privacy and free speech. Involving the public in planning and educating them about regulations and intended uses may alleviate some of these concerns.

LESSON 4.
CONSIDER INTEGRATION WITH OTHER TECHNOLOGY.

For more information, refer to the following chapters:
- Chapter 2, Planning
- Chapter 5, Meshing Technology

Public surveillance systems can work in concert with other technology to enhance the amount or quality of information available to police, investigators, and attorneys. Several jurisdictions have been able to successfully integrate new surveillance systems with technologies already in regular use within the police department, such as gunshot detection

systems or incident mapping software. License plate recognition software, which enables automatic analysis of video, is currently in use around the country and already relies on cameras to operate. Other technologies, including facial recognition and video analytics, are not yet sophisticated enough for routine use in the field without ideal conditions and are quite costly. However, jurisdictions may want to stay attuned to developments in complementary technology and build systems with an eye toward integration as advancements are made.

LESSON 5.
BALANCE PRIVACY PROTECTION WITH SYSTEM UTILITY CAREFULLY.

For more information, refer to the following chapters:
- Chapter 3, Policies
- Chapter 7, Monitoring

When writing policies regulating public surveillance systems, jurisdictions must strike a careful balance between protecting citizens' privacy rights and enabling police to utilize camera technology in an effective manner. The rules governing operation of a public surveillance system should be carefully designed to ensure that both safety and individual rights are protected. The First, Fourth, Fifth, and Fourteenth Amendments address citizens' rights to privacy, anonymity, and equal protection of the law. Where camera viewsheds overlap with private property, anything that would not ordinarily be in plain sight is legally protected. While no courts have ruled that public surveillance on public property is a violation of constitutional rights, individuals have expressed legitimate concerns regarding how footage may be used.

These concerns, however, should be balanced with the interests of using public surveillance to its fullest potential crime prevention and investigative capacity. Monitors, police officers, investigators, and attorneys must be able to access video feeds in order to put them to good use. For monitors, it is important to allow for the manual manipulation of cameras to provide the clearest and most useful footage. In cities with more restrictive regulations, active monitoring can be challenging and may, as a result, fall by the wayside. Given the significant investment required to install and maintain a surveillance system, jurisdictions should draft policies that allow them to maximize utility within legal boundaries. Cities with extant surveillance systems have dealt with this issue in different ways and with varying degrees of success. In addition to learning from the experiences of other jurisdictions, consulting with legal counsel early in the planning process may guide decision-makers in striking an appropriate balance.

LESSON 6.
WEIGH THE COSTS AND BENEFITS OF USING ACTIVE MONITORING.

For more information, refer to the following chapters:
- Chapter 4, Camera Systems
- Chapter 7, Monitoring

While active monitoring is a more expensive option than passive monitoring due to additional staffing and equipment costs, it can provide law enforcement with opportunities to respond to crime that they would not have otherwise

had. Active monitoring affords law enforcement the same investigative benefits as passive monitoring, but it also may enable law enforcement to engage in real-time identification of witnesses and respond to crimes in progress. Employing monitors to watch cameras in real-time enables law enforcement to prevent or disrupt crimes and dispatch officers quickly, sometimes even before a call for assistance has been placed. In addition, having trained staff monitor a live feed can provide first responders with information about potential dangers, people of interest, and other circumstances at the scene. Such information can enhance both officer and civilian safety.

LESSON 7.
INTEGRATE CAMERA SYSTEMS WITH EXISTING PRACTICES AND PROCEDURES.

For more information, refer to the following chapters:
- Chapter 3, Policies
- Chapter 4, Camera Systems
- Chapter 7, Monitoring
- Chapter 8, Investigations
- Chapter 9, Trials

Jurisdictions have employed many different techniques to use cameras in concert with existing policing strategies and practices. For example, one jurisdiction reported focusing patrol efforts in the areas just beyond the view of the camera, enabling officers to anticipate displacement by strategically deploying patrols to areas where criminals are likely to migrate, in order to prevent crime and apprehend perpetrators. Integrating cameras with community policing strategies may also help cities tailor systems to the particular needs of local neighborhoods. In other situations, police may find it useful to incorporate new tasks into usual routines. In one jurisdiction, police began photographing suspects upon arrest to document their clothing for later comparison to footage of the incident in question. Cities may also find it beneficial to integrate camera systems into their CompStat programs, which use crime statistics to strategically deploy officers and target neighborhood crime. Using portable cameras may be especially useful in this context for following crime hotspots as they emerge and responding to evolving crime patterns.

LESSON 8.
SET AND MANAGE REALISTIC EXPECTATIONS FOR VIDEO FOOTAGE QUALITY.

For more information, refer to the following chapters:
- Chapter 4, Camera Systems
- Chapter 7, Monitoring
- Chapter 8, Investigations
- Chapter 9, Trials

Even the best public surveillance technology has limitations, and jurisdictions installing systems should take care to manage the expectations of the public, police, attorneys, and other stakeholders. Footage quality may be adversely impacted by darkness, inclement weather, equipment damage, or dirt collecting on the dome or lens of the camera itself. As a result, images can be grainy, cloudy, or otherwise unclear. Furthermore, it is unrealistic to expect that all cameras will be actively monitored at all times, resulting

in cameras operating on preset tours instead. With pre-programmed tours,[13] cameras may be diverted to another viewable area when an incident occurs and catch little or nothing of the incident itself.

The realities of camera footage contrast sharply with how this technology is portrayed in the popular media. Due to the prevalence of crime and forensics related television shows, practitioners must contend with the unrealistically high expectations jurors and attorneys may have of surveillance systems and other technology. To combat these expectations, practitioners should be educated in how to use and present footage effectively. While the cameras may not capture the incident in full or fine detail, useful information can still be gleaned from the surrounding circumstances and individuals that are captured on camera. That said, cameras should be viewed as a supplement to an investigation rather than as a replacement for other investigative tools.

LESSON 9.
USE SURVEILLANCE SYSTEMS TO COMPLEMENT, BUT NOT REPLACE, ROUTINE POLICING, INVESTIGATIONS, AND LEGAL PRACTICES.

For more information, refer to the following chapters:
- Chapter 7, Monitoring
- Chapter 8, Investigations
- Chapter 9, Trials

Public surveillance systems are useful "eyes on the street," but they cannot replace patrol officers or investigators. As with other technologies, camera systems are best viewed as tools to support and enhance traditional policing. Cameras typically produce color images, when there is sufficient lighting, and black and white images at night without audio and often with varying image quality. Alone, these images may mean little. In the hands of trained officers and investigators, however, these images can provide information on people, circumstances, and incidents leading to arrests and prosecutions.

Video offers both officers and investigators the unique ability to see incidents, circumstances, and people of interest with their own eyes. Investigators can use footage to assist them in interviewing witnesses and corroborating stories. Patrol officers, familiar with individuals residing in neighborhoods, may be especially helpful in identifying witnesses, suspects, or victims. The cameras allow police officers to identify the people that were present at the scene of the crime and then use their personal ties with the neighborhood to gain cooperation of those eyewitnesses.

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13 A camera "tour" is a pre-programmed instruction to the camera indicating which direction, using its pan, tilt, and zoom capabilities, and at what interval, it should record. This pre-determined pattern of movement is used when operators are not viewing the footage in real-time. Though leaving a camera in a fixed position may capture more details if a crime were to be committed in that exact location, a touring camera increases the area being recorded, thereby increasing the probability of capturing a crime committed in its vicinity.

LESSON 10.
INCORPORATE VIDEO EVIDENCE WITH WITNESS TESTIMONY IN COURT.

For more information, refer to the following chapters:
- Chapter 8, Investigations
- Chapter 9, Trials

Video footage can be powerful evidence in court, but it cannot take the place of witness testimony. Attorneys who have used video in courts report that jurors view footage as an unbiased account of the events in question. This perceived reliability can be an asset or a hurdle for attorneys. Footage alone typically does not include audio and could have a poor image quality and presents a completely objective view of what transpired. Nonetheless, most attorneys recommend using any available footage, as the lack of expected footage can be more of a handicap than poor footage. In cities where citizens are aware of the existence of cameras, jurors may expect footage to be presented in a case and mistakenly attribute the lack of it as a lack of evidence overall. Attorneys should learn to manage juror expectations and use the available video footage with traditional witness testimony.

Indeed, witness testimony provides the context that footage alone often lacks. When presenting video footage, a police officer is often required to authenticate and explain events as they unfold. Video footage can also be used to confirm or refute the testimony of individuals at the scene of the incident. Even small details about the scene, timeline, or actions surrounding the incident can be used to create reasonable doubt or bolster witness credibility.

Chapter 2.
What type of planning is needed before implementing a public surveillance system?

Detailed planning is crucial to successfully implementing a useful public surveillance system. Prior to investing in public surveillance technology, jurisdictions should carefully examine their goals, assess their budget, consult relevant stakeholders, anticipate possible public reaction, and review policies and legal implications. Proceeding without first considering these issues impairs the ability of stakeholders to determine the best possible camera system for the jurisdiction and may diminish the utility and functionality of that system in the long term.

Purpose

Clarifying the purpose of the proposed public surveillance system enables stakeholders both to evaluate benefits and to select the best possible complement of technology. Generally, the goal of any camera system is to reduce crime. Placing cameras and reducing local crime increases citizen perceptions of safety within neighborhoods. Furthermore, averting crime precludes resource and psychological costs associated with victimization. Preventing crime saves the jurisdiction the cost of investigating crime, as well as the costs associated with arrest, prosecution, and incarceration. Jurisdictions with clear goals will make more informed decisions about camera type and placement. Different camera technologies are more appropriate for different situations, as discussed in chapter 5 of this guidebook. For example, a covert camera may have less of an impact on street-level crime than a large-sized overt or semi-covert camera with the police emblem and flashing blue lights. The latter will be unhelpful in the course of police sting operations, however. Clarifying the specific goal of each camera allows for a more informed and effective technology investment.

Budgeting

When implementing a public surveillance system, planners should distinguish between two types of anticipated costs: initial startup costs and ongoing costs. Costs will vary by the system selected and the conditions of the existing city infrastructure. Initial costs include expenses such as cameras, software, site preparation, and the installation of either a wired or wireless network to connect the cameras. The ongoing costs of maintenance, utilities, upgrading systems, and monitoring are often overlooked or underestimated by cities implementing surveillance systems.

Initial Costs

The cost of the cameras themselves varies by the quality and features included. A trade-off exists between camera quality and price; public surveillance veterans advise adopting jurisdictions to invest in the highest quality system possible, as poor quality images have limited utility in investigations and court proceedings. When installing cameras, thought should also be given to vandalism prevention techniques, such as bulletproof casings, locked electrical boxes, or enclosing exposed wires with metal casing. While such camera protections will add to the cost of cameras, they are also likely to extend the life of cameras placed in high-crime neighborhoods.

While cameras may each cost several thousand dollars, these costs can be dwarfed by the expenses associated with developing the necessary infrastructure to support a surveillance system. The most significant costs are those associated with creating a network and connecting cameras to a reliable power source. Camera mounting sites, poles, or buildings must have the necessary electrical wiring to power the cameras. If installing cameras on a light pole, for example, the pole will need to be reconfigured to draw power throughout the day rather than only at night. Other infrastructure considerations include the lighting at the site and objects that may block the camera's line of sight, such as plant overgrowth. Depending on the location, the installation of additional street lighting and significant tree pruning may be necessary. For more information on strategic camera placement, refer to chapter 6 of this guidebook.

Another initial cost involves the expense of additional infrastructure expenditures to network the cameras, which enables footage to be seen from a local or central station without physically retrieving the camera hard drive. For a wired network, fiber optic cable must be laid throughout the city to connect cameras to a monitoring site. If using a wireless network, the city must install cameras with a clear line of sight to each other, using the camera's antennae to relay information across the network. These are not concerns for free-standing cameras, though such

INITIAL COSTS

- Camera Purchase and Installation

- Software

- Vandalism Protection

- Connecting to Power Supply

- Wireless/Wired Network Creation

- Site Preparation (lighting, pruning, etc.)

- Labor Costs

cameras have another set of costs associated with retrieving the hard drive from the camera each time an incident occurs. Whether selecting network or freestanding cameras, the jurisdiction must also budget for the appropriate software to monitor or view footage.

Ongoing Costs

Though the initial costs of camera system implementation are high, jurisdictions should not consider a surveillance system a one-time investment. Rather, the system requires constant maintenance, repair, and resources in order to continue operation and yield the greatest benefits. Many costs are routine and easily anticipated, while others require some budgetary flexibility to address. Electricity, data servers, rent and utilities for monitoring facilities and computer equipment fall into the routine category. Similarly, the cameras themselves must periodically be serviced and cleaned. Depending on the type of system implemented, other costs may include personnel for active monitoring, technicians with bucket trucks to retrieve hard drives from stand-alone cameras, wireless antennae realignment, or cable replacement. Ongoing costs are also incurred to cover the salary and benefits of camera monitors.

ONGOING COSTS

- Camera Cleaning, Repair, and Replacement
- Upgrading Systems
- Regular Site Maintenance
- Accident Repair
- Monitoring Personnel
- Technical Personnel
- Utility Fees

In addition to these routine and ongoing costs, all camera systems are subject to periodic challenges posed by adverse weather, traffic accidents, vandalism, and foliage overgrowth. Public surveillance cameras have been subject to assaults including spray paint, cut wires, gunshots, and other forms of vandalism. Wireless networks may be especially sensitive to weather conditions and changing site conditions, as they are dependent on a line of sight to connect to the network.[14] Even if not vandalized or damaged in an accident, cameras running on a constant tour may require replacement every 1–5 years as their motors wear out.

Key Stakeholders

Another aspect of public surveillance system planning involves engaging those who have a vested stake in both the use of cameras and the well being of the community in which they are located. These key stakeholders include public officials, members of the law enforcement community, and local residents. With regard to fundraising and implementation decisions, cities that have implemented surveillance systems have typically relied on a combination of city officials and law enforcement representatives as the primary champions and decision-makers

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14 Several cities use camera systems that require an unobstructed, wireless path between each camera or node. Cameras in these cases not only serve as video recording devices, but are also equipped to be both receivers and transmitters of other cameras' recorded video feeds. Each camera assists in transmitting all recorded data or camera footage between nodes until it reaches a viewing terminal.

for the project. Law enforcement actors likely include the chief of police, district commanders, and information or technical officers; they have made logistical arrangements of camera placement and monitoring, interfaced public surveillance systems with existing law enforcement technology, and established policies and procedures to prevent misuse. Public officials and city representatives who have been involved in other public surveillance implementations include mayors, city administrators, and city council members. These representatives can take responsibility for any necessary legal changes, public relations, and provide an important link to the community.

Community Involvement

Community representatives are equally important stakeholders in the planning and implementation of camera systems. Cities have solicited community involvement by convening public meetings, sending representatives to community meetings, and posting rules to city registers. Members of the community often have mixed reactions to the introduction of a public surveillance system. On the positive side, cities that have implemented surveillance systems have been lobbied by residents in high-crime areas requesting cameras. In one jurisdiction, city council members used their own budgets to purchase cameras demanded by their constituents, since the demand for cameras far exceeded the funds initially allocated by the city. In contrast, citizens and community groups have also raised concerns about civil liberties, racial profiling, and visibility of private homes and property (see **Evaluating Privacy and Civil Liberties** in the next chapter). Jurisdictions must consider the potential negative impact of public surveillance on residents' privacy rights and civil liberties and should design systems to minimize those potential harms. These measures should be fully communicated to citizens through open dialogue that discusses the explicit regulations that will govern camera use. Community education about camera use and efficacy can also raise awareness of the potential public safety benefits of cameras. Such education can take the form of media awareness campaigns, open hearings, and sending representatives such as uniformed officers to discuss cameras at neighborhood meetings. Signage can also play a role in informing the community of the presence and purpose of cameras in their neighborhoods.

They [CCTV cameras] show the community that we will use every available resource to stop crime.

Public Official, Camera Implementation Site

Legal Consultation

Legal counsel should be involved early in the planning stages of surveillance system implementation to review existing surveillance laws, address legal issues as they arise, and work with stakeholders to draft new regulations as necessary. Some legal issues to consider include legal viewing areas, the rights of people in public and private areas, and any existing state or local laws regarding surveillance. Special consideration should also be paid to the First and Fourth Amendment rights to freedom of speech, freedom of press, freedom of assembly, freedom of religion, freedom to petition the government, and protection from unreasonable searches and seizures. These concerns are addressed more fully in chapter 3 of this guidebook.

Sound and prudent plans for surveillance systems require the anticipation and valuation of both one-time and ongoing costs and the involvement of both city decision-makers and those most likely to be affected by camera implementation. Considering and planning for these factors will make a city well positioned to yield the greatest possible impact from its camera investment.

Chapter 3.
What policies and procedures should be considered prior to implementation?

Policies that bear consideration prior to camera installation fall into two categories: protecting civil rights and ensuring the credibility of footage collected. Surveillance, even in public areas, raises several constitutional concerns, including privacy, anonymity, and equal protection under the law. Jurisdictions have addressed these concerns through a variety of policies aimed at narrowing camera viewsheds, establishing monitoring procedures, and regulating footage use. In order to ensure that footage collected is valuable for prosecutions and investigations alike, policies to prevent tampering should also be established before implementing the surveillance system. This chapter of the guidebook is not designed to replace legal counsel, which is highly recommended when addressing such policies. Rather, it is designed to provide an overview of the legal and civil rights issues camera system implementers should consider.

Legal and Civil Rights

When planning the installation of a camera monitoring system, it is important to consider the constitutional implications of surveillance, most notably those arising from the First, Fourth, Fifth, and Fourteenth Amendments. Within the context of a surveillance camera system, these Amendments require camera implementers to consider issues of privacy, anonymity, and equal protection under the law.

The First and Fourth Amendments, taken together, provide individuals with the right to privacy; this right needs to be considered in developing monitoring and storage policies. The First Amendment protects the right of individuals to freely associate and express ideas either verbally or in written form. The Fourth Amendment protects individuals from unreasonable searches and seizures. Locations and contexts for which there can be a reasonable expectation of privacy are often disputed. While no courts have ruled that public surveillance on public

property constitutes an unreasonable search, the Supreme Court has made two relevant rulings about privacy.[15] First, individuals have the right to act anonymously when exercising their first Amendment rights to free association and expression. Second, policies that discourage people from exercising these rights may be struck down.[16]

A comprehensive public surveillance system has the potential to infringe upon these rights in several ways. Footage establishes an extensive record of the associations, speech, and reading material of individuals within the camera's sight. If footage is not properly regulated and securely stored, this information could be used to infringe on an individual's ability to act anonymously, a right that dovetails with consumer protections against publishing places of patronage.[17]

> **POLICY ISSUES TO CONSIDER**
>
> ■ Protecting Anonymity and Personal Privacy
>
> ■ Respecting Private Property
>
> ■ Preventing Discrimination
>
> ■ Providing Training and Supervision to Monitors
>
> ■ Ensuring Evidence Quality and Integrity

Concerns surrounding private property stem primarily from Fourth Amendment rights. Due to the typical height and location of camera placements, viewsheds can easily overlap with private property. This can become a problem if cameras are able to view things not normally in plain sight, and thus protected from warrantless search. For example, a camera may be able to view into a second story window, an area normally out of view to police or other observers.

The Fifth and Fourteenth Amendments establish the right to due process, or fundamental fairness and equal application of law. To prevent conflict with these Amendments, monitors and stakeholders should ensure that surveillance is not conducted in an unequal or discriminatory manner. Protections should be put in place to ensure that monitoring efforts do not focus unduly on certain groups or individuals on the basis of race, gender, religion, or sexual orientation.

Protecting Civil Liberties

Given the importance of safeguarding these constitutional rights, jurisdictions should establish guidelines, policies, and procedures prior to the implementation of a camera system to ensure that the constitutional concerns are addressed and individual rights are adequately protected. Such protections should be considered for three aspects of the surveillance system: camera installation, monitoring, and footage use.

When installing cameras, steps can be taken to protect privacy by masking inappropriate views

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15 The Constitution Project. 2007. Guidelines for Public Video Surveillance: A Guide to Protecting Communities and Preserving Civil Liberties.

16 Ibid.

17 Ibid

such as yards or second story windows. This can be achieved manually by situating the camera so that it cannot physically pan in the direction that should be prohibited. With the right software, camera tours can also be programmed to avoid panning toward private areas or digitally blur selected areas. In the absence of these measures, which may be constrained by financial or logistical limitations, most jurisdictions rely upon stringent monitoring policies.

Regulating monitoring practices through training and supervision is a critical component of protecting civil liberties. Training serves to raise monitors' awareness of civil liberties while also instructing them on prohibited behavior. Both the type and degree of training required may depend on the background of monitors, as a sworn officer is likely to have a background in civil liberties while a civilian may not. Jurisdictions may also include training on identifying suspicious behavior in order to prevent monitors from relying on profiling as a proxy for suspicion. A second strategy to ensure that monitors adhere to standards of privacy, anonymity, and equal protection is to require supervision in the form of a ranking officer, formal supervisor, or the presence of other monitors. The notable tradeoff is that more supervision requires additional resources in the form of labor costs.

In addition to monitoring practices, written, publically accessible policies should be developed to address how and under what circumstances footage obtained from surveillance cameras can be used, and what the disciplinary consequences are for misuse. Establishing clear guidelines may alleviate public concern and establish a clear role for camera footage in investigations. Questions to address include whether and in what form the footage can be released to the public or the media, and whether the footage can be distributed internally for informational or training purposes. Such guidelines should also address the data retention policies associated with historical video footage in order to limit the potential for abuse through fishing expeditions of footage databases and the development of digital dossiers on individuals that are not based on probable cause or reasonable suspicion.

Ensuring Evidentiary Integrity

Equally important to the civil liberty considerations that public surveillance systems present are those pertaining to the integrity of the video footage that such systems produce. The value of a camera system is limited if footage cannot be shown to be accurate, reliable, and admissible in court. Some jurisdictions have found it helpful to develop specific procedures to augment the effectiveness and credibility of camera evidence. Such practices include noting camera presence when police first arrive at a crime scene and photographing arrestees to record the clothing they are wearing to increase the ability to identify them in video footage. Ensuring a reliable chain of custody protects footage from both actual tampering and unfounded accusations of tampering. Attention should also be paid to electronic trails such as encryptions, authenticity certificates, and time stamping, which provide additional assurance that footage has not been altered.

Taking civil liberty and evidentiary concerns into account prior to camera installation can preempt or minimize legal challenges. By establishing clear guidelines for footage storage and use, such as those discussed in chapters 8 and 9 of this guidebook, jurisdictions can ensure that any evidence collected is admissible in court. Discussing civil liberties early may have the additional benefit of bolstering public support for a surveillance system and alleviating community concerns of misuse. When drafting regulations, jurisdictions should keep in mind that restrictions on how footage is used may also limit its utility for police, investigators, defense attorneys, and prosecutors. Each jurisdiction that uses public surveillance must determine its own balance of regulation and utility, based on its local context.

For all of these privacy and civil liberties safeguards, it is important for jurisdictions to document policies and practices in written form and make them publically accessible. Doing so will hold camera users accountable, while assuring the public that the policies exist and will be followed. Such written policies should also include information regarding the consequences associated with misuse of cameras by both sworn and civilian personnel. For guidance in designing written guidelines for public surveillance systems, see The Constitution Project's Guidelines for Public Video Surveillance at http://www.constitutionproject.org/manage/file/54.pdf. Readers may also wish to review the well-documented policies developed by the Metropolitan Police Department at http://www.dcregs.dc.gov/Gateway/ChapterHome.aspx?ChapterNumber=24-25 .

Chapter 4.
Which camera system is the best for public spaces?

When deciding to implement a camera system, one of the many questions facing city stake-holders is what type of camera to employ. While technology is constantly changing, an array of options already exists. For example, one study site that had used public surveillance cameras for several years had already matured through a number of phases of camera models. During initial discussions and implementation plans, stakeholders should assess their current needs and where this camera program fits in their overall crime-fighting strategy; certain models may be more applicable to serving these needs than others.

Fixed-View, Stand-Alone Cameras

The most basic camera type is one designed to be fixed to a pole or other structure, with no ability to pan, tilt, or zoom (PTZ). These cameras record a single view and the most rudimen-tary among them has a stand-alone hard drive that can be set to over-write its contents when it becomes full. If an investigator needs to review a camera's footage, however, a technician would be required to manually switch out the hard drive for the camera location and download its contents before the investigator could view it. As police are using this model less frequently for crime control purposes, it is quickly losing ground to its successors, for which pan, tilt, zoom possibilities are standard and the ability to transfer video wirelessly across an encrypted network is commonplace.

PTZ Cameras

The stand-alone, fixed-view camera is deficient in a number of ways, the first being its inability to move. A camera needs to be able to move left, right, up, and down in order to record crimes as they are being committed. Urban centers are known for constant locomotion; a camera lacking any ability for motion reduces law enforcement's ability to capture wrong-doers; pan, tilt, zoom (PTZ) cameras were developed to address this mobility problem. Depending on

how they are mounted, these cameras can rotate nearly 360 degrees in any direction; in some cases, multiple lenses within a single camera provide images from more than one direction at once. PTZ cameras are programmed with a touring sequence that pans the camera and periodically zooms in and out as it is recording. When compared to the recording abilities of fixed-sight cameras, PTZ cameras afford a much higher likelihood of capturing a crime, provided it transpires near the camera location. Though clearly an upgrade, PTZ cameras may prove even more valuable when multiple cameras are linked through a network. In addition, when teamed with 911 communications centers, PTZ cameras can be switched from passive to active when a crime in progress call is received. This enables communications personnel to view where police have been dispatched to respond.

Network Cameras

Networking cameras can accomplish multiple goals. They solve the problem of the stand-alone hard drive in that networking allows cameras to send footage to an external terminal where it can be viewed both in previously-recorded video and live footage. In the network, not only do the cameras record, they also serve as a relay, transmitting video from one camera to another until it reaches a camera that is connected to a terminal in the network web. Cameras are linked in one of two ways: wired or wireless transmissions. When cameras are connected to each other via wires, high-speed fiber optic cables are used. The information from one camera is sent to another camera or to the terminal if the camera is directly wired to it. The benefit to wired-cameras is that there is a dedicated line between the two units. However, if this line is severed and no other lines exist, the cameras will not be able to transmit. Wireless technology helps to solve this problem by removing the need for wires in order to transmit information. Instead, cameras contain antennae that send the information via radio waves to each other or the main terminal station. Their benefit manifests itself in lower costs because a fiber optic network doesn't need to be built.
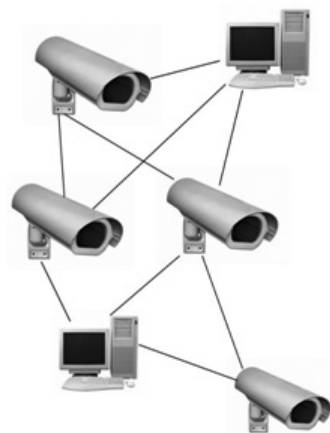
Source: Urban Institute. Representation of camera network.

In a wired system, when one fails, it incapacitates any other cameras with which it is linked. By removing wires, wireless cameras can transmit to any other cameras that are within its range; creating a redundant network that provides several avenues for information to arrive at its destination, and improving a camera system's ability to successfully transmit video to a terminal. Networking cameras provides a jurisdiction with the opportunity to view previously-recorded footage, within a specific timeframe, or real-time footage of any camera at any moment. Stand-alone cameras, on the other hand, do not allow for the real-time viewing of multiple cameras, and require a technician to retrieve the hard drive. The ability to view what the camera is seeing

as it is happening is essential to implementing active monitoring into a city's public surveillance system. A significant downside to wireless networking is the fragility of the transmission bridge; absent ongoing maintenance, transmission can become inoperable due to age, weather, or vandalism.

POD Cameras

Another camera available to most cities implementing a public surveillance system is the Portable Observation Device (POD). As the name implies, these cameras are designed to be mobile, allowing for law enforcement to change the camera's location as crime or resources dictate. Within the POD category of cameras, there are sub-categories, each of which has varying levels of ease in portability. One type of POD is large and highly overt as it can display the police department's emblem as well as flashing lights. These cameras are wireless and contain their electronics within a bullet- and tamper-resistant casing, which adds to the overt nature of the POD. This particular type of camera, while portable, is more cumbersome to move than most other PODs. Other, smaller versions of POD cameras have separate electronics units. These models offer increased flexibility in camera placement, as the smaller stand-alone camera can be mounted in areas that would not be possible if it was connected to the larger unit, such as on a police squad car or dashboard. Similar to the aforementioned POD, the camera and/or unit can display the department's emblem and flashing lights. There are additional POD models significantly smaller in size and designed primarily for covert surveillance. Even if their use is not covert in nature, the smaller size of the camera and electronics unit is more versatile in placement when compared to the other two POD models described above.

Camera Hardening

Regardless of camera type, physical protection—often referred to as "hardening"—can shield cameras and electronic equipment from vandalism and the elements, which is critical to a camera's continued operation. Camera hardening involves protecting all aspects of the camera, including the lenses and electronic conduits. Indeed, there are several different ways to incapacitate a camera's ability to record unless proper steps are taken. In one city, for example, the initial camera installation involved enclosing the camera in a bullet-resistant casing, yet foregoing protection of the electronics conduit, which brings electricity to the camera. Instead of using a metal covering and lock to secure the wires, they were merely wrapped with electrical tape. Vandals soon exploited this vulnerability by cutting the wires, rendering the camera inoperable. While this was a relatively simple fix, it underscores the importance of protecting all components of the camera system. For example, many jurisdictions reported that vandals have spray-painted the domes covering the cameras, thus obstructing anything the cameras may be able to record. To combat this, several camera manufactures have produced domes made of materials that prevent spray-paint from drying. While the paint will still cover the dome and

affect its ability to view and record, the maintenance time and costs are significantly reduced to reinstate the camera into full use.

Signage and Lights

The key purpose of camera signage and lights is to advertise the camera's presence, enhancing its prevention and deterrence value. Prominent signs and flashing lights remind would-be criminals that there is a camera in the area that could potentially record any illegal activities they might attempt. Regardless of whether or not a monitor is actually viewing the cameras, the mere potential that someone might be watching should serve as a deterrent.

In addition to crime prevention, lights and signs help advertise the presence of cameras to law-abiding citizens as well. One of the major concerns the public has with the implementation of a public surveillance system is the potential for the technology to infringe upon their right to privacy. While the cameras are placed in public settings and thus no legal protections to privacy exist, many citizens remain uncomfortable with the idea of being video recorded. In the absence of knowledge about where cameras are located, they may perceive that they are always being recorded. By affixing signs and flashing lights to cameras, the municipality is identifying that cameras are in the area and that a person's actions could potentially be recorded. Additionally, the signs and lights remind both law abiding citizens and potential criminals that the police have a presence and are engaged in ensuring their safety.[18]

Visibility

In terms of camera visibility, law enforcement may choose among overt, semi-overt, and covert camera options, depending upon need and intended impact. Police typically employ highly visible cameras for their deterrent effect and the fact that they symbolize the city's commitment to the safety and security of the public. These cameras are the ones most likely to have signs, police emblems, and flashing lights.

Semi-overt cameras are often smaller and may have some but not typically all of the features of an overt camera, such as signs but no lights. For example, a camera lacking signs and lights may be used in lieu of its more overt counterpart because of its proximity to residences. Neighborhood cameras have become commonplace as part of one city's surveillance system, but residents have complained at times that the cameras are too visible; they may drive down property values by advertising the area as "crime-ridden" and the lights in particular may disturb people in their homes. Reducing the size and removing the lights from these cameras allows them to reflect a law enforcement presence without affecting the quality of life of residents.

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18 Alternatively, well-advertised cameras may increase citizens' expectations that law enforcement is available to intervene on the spot.

The security context and environment in which a camera is located may dictate whether an overt or semi-overt camera is more desirable. Much of the size of a surveillance camera is associated with the hardened, bullet-resistant casing that encloses the camera. If a camera is not easily accessible to vandals due to its height or other safety measures, then such precautions may not be warranted and a smaller, more compact camera is appropriate. In these instances, the camera may be less overt, but the inclusion of a flashing light or police emblem could easily add to its visibility.

Covert cameras can be roughly the same size as semi-covert cameras; however, they are generally black and lack signs, emblems, or flashing lights. While they can be seen were someone to know their location and be looking closely for them, their size and ability to blend into the surrounding makes them much less visible than their overt and semi-overt alternatives. Additionally, covert cameras can be disguised as a different, less obstructive item such as a light or smoke detector. The covert cameras are typically employed in homeland security activities, specifically to monitor and guard against terrorist activities.

Which camera system package is best?

Camera system packages can be configured to accommodate a variety of camera models and options. Decisions guiding the choice of camera systems are typically guided by the intended use of the system and are often restricted by budgetary limits. Nevertheless, most agencies opt for hardened cameras that have lights and signs. A wireless network, in comparison to one that is wired, provides redundancy and often costs less to install; wired networks require a commitment to building an entire infrastructure of wires if one does not exist already. Finally, cameras that have lights and signs provide for the possibility of deterrence that covert cameras, by design, will not deliver.

When making a purchasing decision, a city does not have to commit itself to a single type of camera model with a standard set of options. It is possible to network a variety of camera models, each having different options. However, this approach creates challenges, in that different camera models employ different encryption methods for securing data transmitted along the network, because the receiving terminal must be able to decrypt the information in order to see the footage. Employing a variety of camera models requires a system capable of decrypting the information in each of these various forms to ensure that all footage can be easily monitored. Cities intending to purchase a mixture of PTZ and fixed-site, overt and covert cameras, should therefore be prepared to ask additional questions of the camera provider and gain assurances that the cameras and network components are fully interoperable.

Chapter 5.
What technology might integrate well with a public surveillance system?

After a city decides to implement a camera system as part of its crime-control strategy, jurisdictions also have the opportunity to integrate this technology with other extant devices. Doing so may enhance crime prevention and investigation abilities in areas where they are implemented. This chapter discusses gunshot detection, license plate recognition, facial recognition, and video analytics technologies, describing each technology, illustrating how it can be integrated with a public surveillance system, and discussing its potential to improve crime prevention and response capabilities.

Gunshot Detection Systems

Gunshot detection systems (GDS) employ acoustic sensors, which are installed throughout a given geographic location in order to provide real-time alerts to law enforcement about the time and location of fired weapons. Each acoustic sensor is connected to a larger system which serves to network all of them together. These sensors scan sounds in the surrounding area, discerning whether a sound is a gunshot by comparing incoming sounds to a set threshold. If a sound is flagged as a possible gunshot, the sensor triggers the software to compare the wavelength and other factors, which help determine whether it is likely that it was a fired gun producing the sound instead of something with a similar sound, such as an engine backfire. If an incident passes this next level of review, the system analyzes other area sensors to confirm whether they too encountered wavelengths of that type near the time the initial sensor reports it occurred. If, upon accessing other sensors, they too report the same wavelength and deem it likely to be a fired gun, the system begins analyzing the times each sensor reports the sound and the strength of the wavelength, among other factors. These elements allow the system to triangulate the location of the gunshot within seconds of it taking place.

Each type and model of gun produces different sounds and wavelengths, and gunshot detection systems are better able to identify some over others. For example, Watkins et al. (2002) found in their evaluation that the system was best able to identify a fired shotgun, followed by a pistol, and was least effective in identifying gunfire from an automatic rifle. Gunshot detection systems, however, have made several advances since the release of that report, and they are designed to be adaptive. Because the sensors are continuously recording, technicians can analyze what sounds and wavelengths a given sensor documented when law enforcement confirms a gun was fired. If the sensors did not identify the incident as such, the system can be updated to correctly classify future wavelengths as gunfire.

GDS can be paired with other complementary technologies, such as crime-mapping software. By integrating GDS technology with crime mapping, officers are able to know the specific neighborhood and even the specific block where the gun was fired. Several jurisdictions and municipalities have taken a next step and incorporated gunshot detection systems as part of their Computer-Aided Dispatch (CAD) systems. This enables law enforcement dispatchers to see both where a gun was fired and what units are best able to respond to the scene; this often includes not only officers but emergency medical services as well.
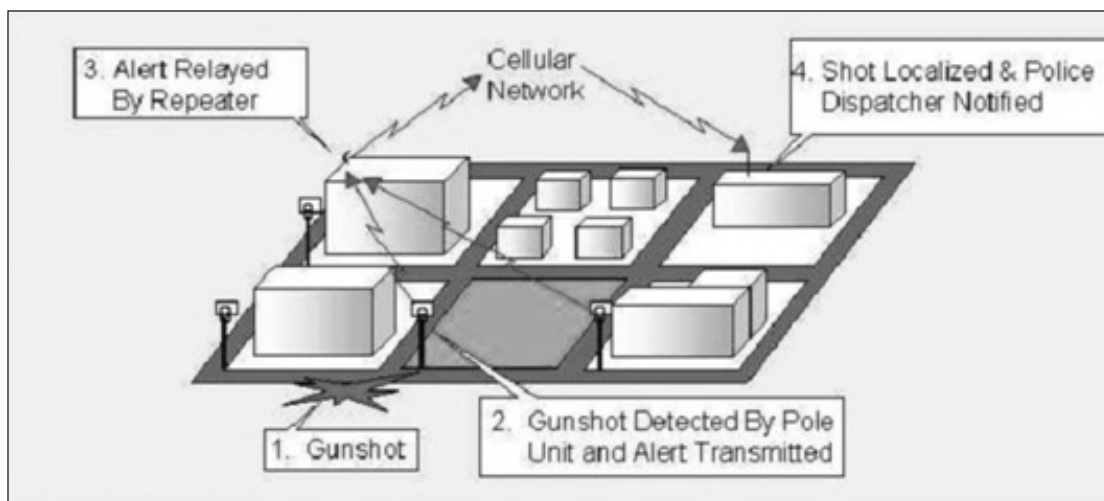
Figure 1. Model of Gunshot Detection Process [19]

Camera surveillance offers many advantages as a stand-alone tool, but incorporating the power of gunshot detection with it is a logical next step. For example, by incorporating GDS with surveillance cameras, when a gunshot is detected, it may trigger a passive camera to point in the direction of the shot or send a signal to an active monitor to "zero in" on the source or location

19 Litch, M., M. Calhoon, P. Scharf, et al. 2006. "Operational Outcomes of the SECURES® Urban Gunshot Detection Technology for Law Enforcement Crime Intervention Strategies and Force Protection." Proceedings of SPIE 6201(62011R): 1–11.

of the detected gunfire. For the purposes of integration with camera surveillance specifically, GDS technology would act as an alert mechanism, assisting both passive and active monitoring approaches in identifying and capturing crimes that may have otherwise gone unnoticed.

License Plate Recognition

A License Plate Recognition (LPR) system does exactly what the name suggests: it is able to scan license plates on vehicles—even those moving at high speeds—and check the plates against state and federal databases to determine if the car was reported stolen or if the driver has any tickets or outstanding warrants. Though there are a variety of vendors selling various models, most LPR systems employ one or more cameras mounted on or in a police vehicle. For those models utilizing multiple cameras, the preferred placement is on the light bar across the roof of the car. These cameras link to the police cruiser's computer and display images on the computer's screen. If more than one camera is being utilized, a split-screen display is used to show two vehicles at a time. The cameras often have more than one mode, such as regular color capture as well as infrared (for use at night); some have other settings such as multiple pictures using varying shutter speeds and anti-glare features to combat the weather and other elements that may inhibit the system's ability to read and process the license plate. These systems have the ability to scan in excess of 3,000 plates in a given patrol shift, whereas the average officer checking manually may only be able to process 100–200 license plates per shift. [20]

While the license plate images are being displayed on the screen, they are simultaneously being compared against databases to which the system has access. For example, the images could be run through a database containing all locally stolen vehicles, vehicles wanted because of their use in the commission of a crime, vehicles with warrants issued for the owner of the vehicle, and any other state or federal databases that the system has access to as well. During the course of its scanning, if a license plate image generates a match, the system can inform the officer visually on the screen and audibly as well. The in-car system also provides the user with the ability to manually key-in observations about the vehicle in question. These notes, as well as the information usually maintained after a license plate scan, are kept in the computer's database for a predetermined number of days (approximately 10 days on average), and are also transmitted to a larger database housed in police departments for indefinite storage. Similar technology is implemented at highway tolls and pay-to-park lots to identify motorists who try to proceed without paying the designated fee. The success of a system such as this, however, is largely based on the database against which the image is being compared. Without a robust collection of license plate numbers, the ability to scan a license plate in real-time does not add much value; being able to access information about that license plate number, the vehicle, and its owner by comparing it to a database is what truly provides the value to this system.

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20 City of Chicago, 2007. "Staying Ahead of the Curve." Technology Update. Information Services Division, Bureau of Administrative Services, Department of Police, City of Chicago, Summer.

This type of technology offers many opportunities to law enforcement. First, it allows officers to learn in real-time whether there are outstanding tickets or warrants associated with the vehicle or the vehicle's owner, or if it has been reported stolen or used in the commission of a crime. The ability to access all of the other previous scans of the license plate enables officers to discern if the plates had been switched from a previous vehicle. This may indicate that the plates were stolen or that some other illegal activity has taken place, thus necessitating further inquiry. In terms of investigating or prosecuting a crime, LPR technology can aid in verifying or refuting a suspect's alibi, or in confirming the location of a suspect's vehicle at the time an incident took place.

Integrating LPR technology with a public surveillance system can yield additional benefits. Personnel engaged in active monitoring have reported that one of the first things they look for when viewing a camera, besides the faces of suspects or suspicious individuals, is the license plates of the vehicles that suspects are operating. By focusing the camera on the license plate, investigators reviewing the footage later will be able to access information about the vehicle and its owner. Joining public surveillance with LPR technology provides for a more automated approach. Just like officers driving a patrol cruiser equipped with cameras to automatically identify, focus on, and capture an image of a vehicle license plate, surveillance cameras that are being actively or passively monitored could be programmed to execute a similar process. During the course of a monitor's active surveillance or an automated camera's pre-programmed tour, a subsystem could be in place that captures images of any license plates it encounters and then compares them against specified databases as described above. In its current form, because license plate recognition systems are usually attached to police cruisers, suspects may attempt to elude detection. Incorporating this technology into a surveillance camera system, which is less noticeable than police cruisers, may increase its effectiveness compared to its use as a stand-alone technology.

Facial Recognition

As with license plate recognition systems, the power of facial recognition systems rests with an underlying database from which a unit scanning an image in real-time can compare it to in order to relay important information to law enforcement. Facial recognition technology[21] captures images continuously, and transmits those images to a computer using a pre-programmed algorithm that matches the image to a face in the database. The camera's software is programmed to identify eyes, nose, mouth, and/or ears, due to their relatively stable distance away from each other, and these combined data points are flagged as an image of a face. After this process, the face—a set of landmarks at given distances away from each other—is scanned into a database containing facial images of known criminals. When scanning the database, the computer is

21 Woodward, J., C. Horn, J. Gatune, and A. Thomas. 2003. "Biometrics: A Look at Facial Recognition." Documented Briefing prepared for the Virginia State Crime Commission.

attempting to match the suspect landmarks to the known. If the computer declares a match, officers in the area can be dispatched to confirm the match as well as question the suspect further. If, upon detaining the suspect, it is determined that the match was made incorrectly, the program is adaptable. Thus, each incorrect match helps refine the system for its next use with the purpose of reducing the instances of incorrect identification in the future.

While such technology is compelling in theory, it is not currently refined enough for use in mainstream police departments. However, the National Institute of Science and Technology has been conducting yearly evaluations of algorithms and systems working on face recognition technology as well as iris scanning and recognition to assess the current state of the science in this area. As of 2006, facial recognition systems outperformed humans conducting the evaluation manually under a variety of illumination settings and facial positions, given an error rate of 0.05.[22] Currently, however, facial recognition could only be instituted if all images were taken in a controlled setting, with ideal lighting and a full facial image of the subject. This limitation, combined with the challenges of developing a robust database of facial images of known suspects, may render the technology inappropriate for adoption at this time.

In the future, however, partnering facial recognition systems with a city's public surveillance cameras seems logical. The cameras could be integrated with software enabling facial scanning while the camera is recording in both active and passive modes. By using an automated algorithm for facial recognition, human interaction with this process could be limited, enabling a monitor to focus on real-time activity while faces were being compared to a database to look for warrants or other flags which would suggest an officer should be dispatched to investigate further. Given the potential for merging these technologies within a single unit, facial recognition technology holds promise for providing added value to both proactive and reactive crime surveillance. Such a system could alert police to the location of a person of interest, provide monitors with information that may compel them to view one camera in favor of another, and assist investigators and prosecutors in confirming or disproving alibis. Though this technology does have potential, advancements in both image capture and processing, in addition to the creation of a robust, searchable database, must be made before this is a viable system for cities to consider integrating into its camera system.

Video Analytics

Video analytic technology,[23] unlike the technologies discussed above, is not its own standalone system; instead, it is software that reviews and processes information, and is able to flag events or alert users when it encounters an item that it was previously programmed to identify.

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22 Phillips, P. J., W. T. Scruggs, A. J. O'Toole, P. J. Flynn et al., 2007. FRVT 2006 and ICE 2006 Large-Scale Results. U.S. Department of Commerce, National Institute of Science and Technology.

23 Hampapur, Arun, Lisa Brown, Jonathan Connell, et al. 2005. "Smart Video Surveillance, Exploring the concept of multiscale spatiotemporal tracking." IEEE Signal Processing Magazine 22(2): 38–51.

For example, the automated component in license plate recognition utilizes a type of video analytics. The software is programmed to scan images, searching for license plates. The system identifies what a license plate "is" through front-end programming of spatial references and other factors. This is similar to the discussion above regarding facial recognition; the distance between the ears, nose, mouth, and eyes are used as data points in an algorithm to determine the "face." These coordinates can then be compared against coordinates in a database to find a match. Video analytics software would automatically extract these data points and by design scan them in the database.

Video analytics, especially when coupled with surveillance cameras, can potentially support a variety of law enforcement activities. Among them are tracking of movement in areas restricted by police; detecting moved objects, which may indicate a theft has taken place, or the converse; detecting the addition of an object, which could be an abandoned object containing an explosive or other device; and identifying a shooting based on the muzzle-flash emitted by a firearm.

Such a technology may enhance both passive and active monitoring activities. Even among jurisdictions that engage in active monitoring, there are countless hours of activity that go unmonitored, and in passive monitoring jurisdictions, even more footage goes unwatched. Unless there is a crime reported in the area, it is unlikely that anyone would spend precious resources reviewing this footage. By using video analytics, however, the review process could be automated and would require human intervention for only those items in which the user-defined parameters resulted in an incident being flagged. In this manner, crimes that may have gone unreported as well as other activity of interest to law enforcement --would become known to police whereas without video analytics, that information would not be culled.

With the exception of license plate recognition systems, very few jurisdictions in the United States currently have video analytic systems integrated with other law enforcement technologies that they might use. And while some cities in the UK have incorporated video analytics with surveillance cameras, there are no rigorous evaluations in the published literature.

A wide array of current and emerging technologies are available to agencies interested in enhancing the capabilities of their public surveillance systems. While many of these tools can be used in a stand-alone fashion, it appears evident that packaging them into one unit can yield benefits beyond increasing the efficiency of any one product. The promise of such integrated technology may benefit jurisdictions interested primarily in one component but attracted by the benefits of complementary technologies as well. Additional efforts to research and develop these systems have the potential to add vastly to the crime control and prevention measures already at the disposal of law enforcement.

Chapter 6.
Where should the cameras be located?

Before deciding where cameras should be installed, several steps should have already been completed. First, city stakeholders should assess their city's needs, deciding how surveillance cameras will be introduced into the police department's overall crime-control strategy. Reviewing existing policing strategies, such as CompStat, and visiting cities that have already adopted the technology may assist with informing this decision. The second critical consideration is the type of camera that the city will employ. As discussed in chapters 4 and 5, a variety of camera types exist, each with unique configurations, which when used alone or in concert with other crime-fighting technologies, can help support law enforcement. Given the type of camera and the supporting technologies, if any, that will be utilized with the cameras, stakeholders can then turn to the question of where the cameras will be installed. Several factors will influence this decision, including assessing what areas would benefit most from cameras and determining whether the physical locations of proposed camera sites have the properties necessary to support the cameras. It is important to weigh many criteria—including the mounting location, maximizing the camera viewshed while minimizing overlap, privacy considerations, and weather issues—when determining a camera's installation location.

Camera Placement Considerations

In order to make an educated decision about where to install cameras, one must first determine how many cameras the city would need in order to serve its law enforcement purpose, and how many it can afford to purchase, install, and maintain. The availability of resources may affect a city's ability to enact a strategy in the way in which it initially intends. Adding enough cameras to survey every area of a city, for example, would be highly resource-intensive and difficult for most cities to implement. This does not, however, preclude a city with limited resources from using a select number of cameras to reduce crime. What these limitations do is force critical thinking of the city's problems, various strategies that would help combat them, and creative ways in which surveillance cameras can enhance these strategies. These considerations should be deliberated in the context of alternative options to cameras, such as adding more officers on

the street. Many city stakeholders choose to install cameras because they feel that they have an identified high-crime area and their main goal is to reduce victimizations in a specific location. Effective deployment of surveillance cameras requires additional information. Is the crime concentrated in a few select areas of the city? Are some crime types more prevalent than others? Do some crime concentrations affect citizen's perceptions of safety more than others? Are there other critical or vulnerable areas of the city that are not necessarily affected by crime, but nonetheless may be important enough to dispatch additional surveillance for security reasons (e.g., downtown or entertainment districts, or areas bordering college campuses)?

In mostly every city, crime is not equally distributed across the jurisdictions, so it is not typically necessary to completely saturate the entire city. It may be sufficient to install cameras only in neighborhood(s) or district(s) experiencing specific crime problems. By mapping historical crime data in the city, stakeholders may find that the purchase and strategic installation of a small number of cameras can provide added value without incurring the enormous expense of purchasing cameras city-wide. Placing cameras in these crime hotspots, and integrating them with the patrol tactics and other law enforcement strategies, yield benefits while minimizing camera expenses.

> **QUESTIONS TO CONSIDER BEFORE DEPLOYING A SURVEILLANCE SYSTEM**
>
> - Is crime concentrated in a few select areas of the city?
>
> - Are some crimes more prevalent than others?
>
> - Do some crime concentrations affect citizens' perceptions of safety more than others?
>
> - Are there other critical or vulnerable areas of the city that are not necessarily affected by crime, but nonetheless are important enough to dispatch additional surveillance for security reasons (e.g. downtown or entertainment districts, or areas bordering college campuses)?

In some cases placement is not dictated by overall crime concentrations, but rather by specific crime problems. These problems, such as motor vehicle theft, can still be identified by mapping specific crime types and identifying their location. In a city where drug crimes—particularly dealing and use in public areas—are rampant, cameras could play a crucial role. For example, installing cameras in locations with known narcotics activities enables police to record activity and dispatch officers as an incident in progress is recorded, as well as use the camera in pre-planned drug busts and other such uses.

While the actual risks to citizens' safety are of top concern to city administrators, they must also be cognizant of the citizens' perceptions of safety. One common concern of installing crime cameras or changing patrol beats is that it will displace or shift the crime elsewhere. Residents in an area without cameras that is adjacent to an area with cameras may fear that the technology will push crime into their neighborhood. The potential for crime displacement due to cameras is real, and should be considered by law enforcement prior to camera installation in order to modify patrol practices to minimize the possibility. Stakeholders should be cognizant of these concerns and proactively engage with residents about the steps law enforcement are

taking to prevent such an occurrence. Public reaction can push the other way as well; there may be instances where crime is high enough to warrant placement in an area but the community is opposed to installation. Some residents fear that cameras, and their associated signs and/or lights, mark the community as a high-crime area and would thus lower property values. Others find them unattractive and thus oppose their installation due to aesthetic reasons (See "Community Involvement" in chapter 2).

Within cities, there may be areas of such critical importance or areas that have particular vulnerabilities such that implementing camera surveillance may be an attractive strategy—even if there is not a demonstrated crime problem in that area, but that increases in crime are anticipated in the absence of proactive law enforcement strategies. For example, the erection of a new retail area may merit installation of cameras in an effort to prevent crimes that are likely to occur in their absence. Additionally, locations that present homeland security risks are also important to consider when developing a city's camera placement strategy. Cameras have been installed in and around likely targets for terrorism, such as subways and notable landmarks or monuments, which can aid law enforcement in identifying suspicious behavior. The potential utility of cameras for this purpose has led many metropolitan areas to include cameras in their terrorism preparedness strategies.

Physical Location Attributes

After determining the number of cameras needed and their general locations, there are a variety of factors to consider regarding the exact physical location of where each camera will be placed. Each location should be surveyed to discern:

■ Whether there are any pre-existing objects to which the camera may be mounted;

■ How electricity will be routed to power the camera;

■ Whether there is anything that might obstruct the camera's view and how that can be removed;

■ What the final viewshed of each camera would be; and

■ How natural elements might affect the performance of a camera.

Each of these criteria should be considered carefully prior to camera installation.

PHYSICAL ATTRIBUTES TO CONSIDER

■ Is there a pre-existing object to which the camera can be mounted?

■ Are there objects obstructing the camera's view that will need to be removed?

■ How will electricity be run to this location?

■ If the camera is able to view private areas, how will individuals' privacy rights be ensured?

■ If the camera is exposed to the elements, how might that affect its operation and longevity?

Mounting Location

While installing a camera may appear straightforward, several considerations need to be addressed at the outset. To install a camera, it must be mounted to an object that is both sturdy enough to support the weight of the object and high enough to provide the camera with the proper viewshed needed to observe and record activity. In an ideal situation, there is a pre-existing, city-owned pole (such as a traffic light pole) on which the camera can be mounted. When such a pole is not available, a utility pole is often an alternative option. This is less appealing, however, because it requires the city to negotiate a leasing agreement to use the pole for that purpose. This approach does help prevent a larger construction effort to install such an object were it not already in place, however. Before installing the pole, workers may need to survey the ground where the pole would be placed to ensure it would not disrupt power, phone, or internet lines as well as piping and other public works items that could potentially be beneath the ground. Due to the costs of this option, it is typically the least desirable course of action.

When considering existing poles or the installation of a new one, it is important to determine whether the existing pole already has electricity running to it and if not, if it is feasible to install an electrical conduit to it. While many camera models do have batteries, they are reserved for use in the event of a power outage only. To power the camera and maintain its ability to send and receive information to the network on a continual basis necessitates a dedicated line of electricity. This electrical source must be adequately protected from vandals, who may attempt to cut the wiring or deface the camera in some way; protective boxes and locks may be a suitable option for cities attempting to restrict such access. In addition, to facilitate standard maintenance and repairs as needed, electrical conduits should be installed in an accessible location for technicians to use. Indeed, considering how to power and protect the complementary camera items can be just as important to ensuring the proper and continued functioning of the cameras themselves, and thus should not be overlooked when surveying potential camera installation locations.

Ensuring Maximal Viewshed

Another important consideration regarding camera placement is to position the camera so that it has an unobstructed view. This is particularly important with cameras equipped with the ability to pan 360 degrees, in that the camera's vast viewshed is more likely to encounter obstructions, such as tree branches, utility poles, and buildings. In some cases the obstruction could be removed easily by trimming tree branches or removing trees altogether. Other obstructions, such as buildings or other telephone or utility poles, cannot be moved. In these cases, stakeholders must assess whether the location meets all of the other selection criteria so that it remains a suitable location despite its inability to utilize the camera's entire viewing ability.

Overlap

Another viewshed problem could manifest itself if two cameras are located in close enough proximity that their viewsheds overlap, thus reducing each camera's potential area-coverage. On the one hand, having cameras in close proximity may be appealing to law enforcement, as it affords monitors the ability to track activities from one camera to another. This is particularly useful when monitoring crimes in progress, as monitors can follow a suspect as he attempts to evade police. If the city adopts a saturation approach, some degree of camera overlap is unavoidable. While camera saturation may be appealing, the cost of this approach—in terms of financing the installation of cameras, their maintenance, and monitors to watch them—is its limiting factor. If saturation is not an objective, proximity to other cameras and the potential camera viewshed should be considered before any installation.

Privacy Considerations

The camera's viewshed itself is an important consideration even if there are no physical impediments to its view. Because of its expansive reach, privacy issues should also be evaluated before selecting a location. When examining potential viewsheds, surveyors need to determine whether any of the space within the camera's view includes areas for which there is a reasonable expectation of privacy. This is particularly the case for cameras that can see inside a home or office building. In these instances, some cities have incorporated a technology that "blacks-out" private spaces so that no images are recorded of activities in those areas. If similar steps cannot be instituted, an alternate location that does not pose privacy problems may become more attractive.

Weather Issues

Weather considerations also play an important role in determining camera location. While rain, snow, and wind do not typically choose one city block over another, it is possible for the elements to impact camera functioning depending on where they are positioned. When tall buildings flank each other, for example, they tend to funnel wind. Not only could this pick up debris that may affect camera visibility and its effectiveness, but it has the potential to physically damage the camera or its mounting apparatus when exposed for extended periods of time. Rain and snow require the protection of cameras so that the precipitation does not short-circuit them. Even the sun can cause problems for cameras; sun glare can at times "blind" cameras similarly to the way looking directly into the sun affects the vision of drivers. Though manufacturers are producing cameras with anti-glare lenses and other features to mitigate this risk, stakeholders should be aware that installing cameras in areas with abundant direct sunlight or reflective surfaces may present a glare issue.

Together, these criteria outlined above are critical to consider before choosing camera installation locations. While using one criterion alone may make an area appear more suitable than others, reviewing other criteria may reveal a critical deficiency. Using these elements to compare them against each other may reveal that due to an important deficiency, such as the inability to run electricity to a pre-existing pole, the initial location is less desirable. By evaluating several possible places to mount a camera and determining how functional it would be in each location, stakeholders can determine the best possible camera site. Camera placement decisions require considering the most appropriate and feasible mounting pole and determining whether that would provide an ideal viewshed, whether electricity could power that spot, whether the proximity of another camera makes the space less ideal, and whether private areas are within the camera's view. In the event that the answers to these questions are satisfactory, stakeholders should encounter few unanticipated problems to overcome post-installation.

Chapter 7.
Do the cameras need to be actively monitored?

Active versus Passive Monitoring

ACTIVE MONITORING

Pros:
- Has potential to disrupt crimes in-progress
- Assists in coordinating police and emergency response

Cons:
- May not catch every crime in its viewshed
- Cost

PASSIVE MONITORING

Pros:
- Less-expensive alternative
- Enables would-be monitors to be assigned to other roles

Cons:
- Reactive, not proactive
- More likely to miss crimes and related investigative information

During the course of deciding to implement a public surveillance system, city stakeholders should also decide whether the cameras should be monitored and to what extent. When cameras are monitored in real-time, it is referred to as "active monitoring," which involves an employee viewing camera footage and manipulating the camera's panning and zooming features to look for crime or suspicious activity. "Passive monitoring" refers to the reviewing of camera footage after a crime has taken place in an effort to identify a suspect, victim, witnesses, and any other information that might help assist investigators in closing the case. When not being actively monitored, cameras are typically set on automatic programming, which pans and zooms the camera on a preset sequence.

While reviewing footage is possible with active monitoring, viewing cameras in real-time offers an additional benefit in the ability to control the camera's viewshed, following events as they unfold. In the case of a crime in progress, a camera on passive monitoring could conceivably miss critical elements of the event simply because it was panning in a different direction from where the activity was taking place, rendering the camera footage of little or no use to investigators. If the same camera were being actively monitored, however, the person controlling the camera's movement could manipulate it to focus on the encounter between victim and offender, to follow the suspect after committing the crime, and to record other useful information, such as license plate numbers (See chapter 5) or potential witnesses. While it is conceivable that a camera being actively monitored still might nonetheless miss a crime taking place,

passive monitoring significantly increases those odds of doing so.

When considering active versus passive monitoring, a combination of both may be the best option for many agencies. By linking PTZ cameras to computer aided dispatch systems, passive cameras can be identified for active monitoring whenever a crime in progress call is received in that camera's viewshed. This minimizes the number of monitors necessary and flags specific areas at specific times for active viewing.

Value-Added through Active Monitoring

Public surveillance system administrators may choose among several types of camera monitors, including retired police officers, light-duty officers, officers on assignment, and civilian employees (at least one jurisdiction had interest in using citizen volunteers to monitor cameras for a time; however, this approach has since been discarded due to lack of interest by citizens in that community). Retired and light-duty officers are people most commonly employed as monitors. Several police departments believe the patrol experience translates into being a more effective camera monitor; patrol experience enables monitors to anticipate and detect crime events based on firsthand knowledge of situations and contexts that are conducive to crime. Indeed, the goal of active monitoring is to be aware of the situation before a crime takes place. If a situation is suspicious, an on-duty officer on patrol might be dispatched in order to disrupt a would-be crime before it happens. Even if an officer is not dispatched, a monitor watching a camera as the crime unfolds is able to focus on specific details that might prove fruitful in investigating and prosecuting the crime, such as the perpetrator's face, the license plate of the car the perpetrator used, or the escape route taken following the crime.

Public surveillance can provide critical information at a crucial time to first responders who do not know what dangers they may encounter.

In the absence of actively monitored cameras, response personnel responding to a call arrive with little to no information about the incident or potential dangers that may be present. If cameras are in the area, monitors can survey the scene while officers are in route, telling them the number of suspects, whether any of them are armed, their current location, and whether there is a need for medical personnel or additional back-up. This increases officer safety and allows for a more effective and directed response.

In addition, active camera monitoring can provide support for officers making an arrest until additional units arrive. When arresting a suspect, an officer remains in a potentially dangerous position. The suspect may try to resist arrest, possibly violently; other individuals may try to assault the officer as well. Active camera monitoring affords the ability to view the officer, the suspect, and the surrounding area continuously, providing real-time information to responding officers as needed.

While active monitoring has tangible benefits over passive monitoring, it is not always possible, particularly in areas that may have more cameras than monitors able to view them. In such cases, camera administrators program cameras to operate passively until a monitor brings the camera(s) into active mode. For example, in one study site, monitors are able to view up to four cameras simultaneously. When the operator moves on to another camera, that camera changes to active monitoring while the other ones revert back to a passive panning and zooming sequence.

Another limit to the appeal of active monitoring is the price tag. Active monitoring involves personnel and equipment that would otherwise not be required for passive monitoring, adding potentially hundreds of thousands of dollars to a police department's camera system expenditures each year. In addition, because many monitors are sworn personnel, a police department must determine its best allocation of resources, weighing whether it is more effective to have an officer monitoring a camera rather than out on patrol. Civilian personnel, retired officers, or light duty officers may be useful alternatives in this regard as they would not be eligible for other policing duties beyond monitoring.

Monitor Training

Training for monitors should entail both guidance on how to use cameras and interact with dispatch and patrol as well as cover the policies and procedures in place to safeguard privacy. Most agencies employ on-the-job learning to train monitors on actual camera use, with current monitors overseeing the training of new monitors. Because monitors tend to be sworn officers already, they typically need less instruction on what to look for or what constitutes a crime and more on how to use the technology itself to better assist officers in making an arrest and providing prosecutors with evidence that is used to secure a conviction. Active monitoring affords officers the ability to zoom in on facial features, other distinguishing marks, and movements that one would not otherwise be able to observe. One site reported, for example, that its monitors are trained to focus first on "faces and tags," as these elements are likely to prove the most useful when investigators review the footage later to generate suspect and witness lists. One monitor found that suspects apprehended after being caught via active monitoring were later claiming that there was a misidentification made and this individual was not the person who committed the crime. The monitor began requesting officers to bring the suspect to her in order to have a Polaroid picture taken. The monitor wanted to establish that the features and clothing of the person caught on video matched that of the suspect arrested so future claims of misiden-

tification could be proven to be unfounded. This is merely one of the lessons learned while on-the-job that do not fit neatly into a training manual, leading monitors to express a preference for the apprentice style of training over a more structured, classroom setting.

While experience may trump teaching for the most part in monitor training, it is nevertheless important for agencies to train all monitors in privacy and civil liberty rights before they begin working with the surveillance cameras. Although cameras are in public space, minimizing privacy expectations to some degree, their viewsheds at times can potentially see activities that are protected under First and Fourth Amendment rights. As such, monitors should be trained in what they can and cannot monitor, and must often sign pledges acknowledging disciplinary sanctions, including termination, for the violation of protected rights when monitoring.

Monitors are prohibited from viewing activity inside the windows of buildings. One city reported that residents can contact the police department and have particular windows appear "blacked-out" even during active monitoring, while another has strict monitoring guidelines that prohibit the focusing on literature being distributed or placed in public space in order to maintain citizens' rights to free speech (See chapter 3 for further information on this topic).

Variations in the Degree of Active Monitoring

Beyond deciding whether to actively monitor, several gradients within active monitoring are available to law enforcement. One city, for example, commits to active monitoring 24 hours per day, 7 days per week. Camera administrators there believe that unless a police department is utilizing active monitoring, it is not using the technology to its fullest potential. By contrast, another study site uses active monitoring to a much lesser degree, and was originally restricted to events with large crowds, such as concerts and protests. The site has since increased its use of active monitoring, but not nearly to the extent that the other sites do. Though these examples are at the poles of active monitoring, there is also an opportunity to incorporate active use somewhere in between. A city that is interested in active monitoring but is unable to afford paying one or more salaries for around-the-clock monitoring may chose to monitor actively during certain times of the day and to monitor passively during the remaining hours. For example, a city experiencing elevated crime activity during the hours of 8 PM – 3 AM could choose to actively monitor the cameras during those times, yet have the cameras passively recording during times of lower activity. This process would still enable officers and investigators to review footage if a crime occurred near a passive camera.

Typically, city stakeholders who decide to implement a surveillance system envision that the cameras will not only solve crimes, but will prevent them as well. If the objective of a criminal is to commit a crime without being caught, police cameras potentially monitoring and recording criminal activity should theoretically deter the criminals from offending. This theory is valid, however, only to the extent that cameras are used to catch perpetrators in the act or shortly thereafter. Without the ability to monitor cameras in real-time, the cameras may become

nothing more than an idle threat, losing their power with every crime committed in front of them without a prompt police response.

Camera administrators are confronted with many factors to weigh when deciding to monitor actively, passively, or to institute some combination of the two into a city's camera program. Costs, including time and resources, are certainly a critical consideration for many jurisdictions. These costs must be weighed against the enhanced ability to view and react to crimes in order to help solve and prevent criminal activity.

Chapter 8.
How is video footage used in investigations?

As described above, surveillance cameras can be useful in viewing crimes in progress, allowing monitors to dispatch officers to the scene of the event, and even holding potential for preventing a crime before it occurs. Yet cameras also have a purpose after a crime has occurred: aiding investigators in solving the case. Understanding the sequence of events that transpired when a crime occurred can be critical information for an investigator trying to locate evidence or develop a list of potential witnesses and suspects. Camera footage has the ability to assist this investigative process. Even if a camera does not capture an incident in its entirety, historical camera footage can still provide leads as to who witnessed the crime, how the series of events came about, and where evidence that may have been missed during the initial evidence collection process might be located. Video retrieval involves the extraction and review of footage while paying careful attention to chain-of-custody procedures, which are critical to the prosecutorial stage (See chapter 9). While cases are rarely solved solely by video evidence, investigators have found it an immensely useful and powerful tool when used in conjunction with other investigatory processes. This chapter discusses the process behind video retrieval and chain-of-custody safeguards. It then describes how investigators employ video footage to solve crimes and discusses investigators' perceptions of the advantages and limitations of video footage for investigations.

Video Retrieval

Investigators employ a variety of methods to learn whether a camera was located near the scene of a crime being investigated. In some cities, incident reporting forms include a box that the responding officer can check to indicate that a camera was in the general vicinity of the crime scene. In other jurisdictions, police departments maintain a centralized list of all camera locations, whereby an investigator needs only to reference the list to determine whether a camera could be potentially helpful; in some cases, computerized mapping is employed for this purpose. Many investigators, however, indicate that they know where most of the cameras are in their jurisdictions from previous experience, based on an intimate knowledge of the neigh-

borhoods in their area.

The locations of existing cameras in a city can be invaluable because investigators must often request video footage quickly after receiving the facts of the case. Camera hard drives typically have enough memory to record on a continuous loop for 24 to 72 hours—depending on the model of the camera and size of the hard drive—before overwriting the previously-recorded footage. Thus, an investigator may lose critical investigative information if he or she is not able to act quickly. For several cities, however, the process is streamlined so that an investigator can either access images directly, allowing for immediate review, or submit requests to a technician and receive the recording from one or more cameras in as little as one hour.

While investigators are always hopeful that a camera recorded the crime of interest in its entirety with perfect clarity, useful information can often be obtained from surveillance footage even when the recording captured only parts of the event or the resolution is poor. As mentioned in chapter 4, there are two general types of cameras, fixed-site and those cameras with panning capabilities. With a stationary camera, if it happens to be pointed in the direction of a crime, it may be able to capture it more fully. With these cameras, however, events not within its immediate viewshed are not captured. Panning cameras, on the other hand, are able to survey larger areas, but their drawback is that during passive (non-monitored) surveillance, they may pan away from a crime in-progress. Even with seemingly incomplete video recordings, investigators can piece together information to identify the perpetrators, victims, and witnesses to a crime. This has been particularly useful for investigators combating a culture of "no snitching." Armed with proof that a particular person was in fact present at a crime scene, investigators have found it easier to persuade a witness to speak with them. In addition, cameras enable investigators to recreate the sequence of events leading to, during, and following the incident. In some cases, camera footage has revealed that an individual who appears to be the obvious victim was actually the aggressor. Recorded video has also been useful in identifying evidence that might not otherwise have been recovered through traditional investigations, such as license plate numbers of vehicles used by individuals at the scene of the crime or the location of weapons discarded by perpetrators after commission of the crime.

Evidence Recovery Using Video Footage in One Study Site:

Investigators found a man unconscious, having been struck in the back of the head with an object. Once revived, the victim reported that he did not see his attacker or the weapon. Checking nearby camera footage revealed not only that the attacker used a large tree branch to assault the man, but also where the perpetrator discarded it. Police found DNA on the branch, which assisted them in identifying the attacker.

Training, Storage, and Chain-of-Custody

Many of the skills and strategies that are typically employed in investigating cases are applicable when using cameras to assist investigations. For instance, paying close attention to subtle details and connecting them to other known facts about the event are strategies regularly

employed by investigators regardless of the presence or absence of camera footage. As such, investigators do not usually participate in any formal training designed to enhance use of public surveillance as an investigative tool. When they do receive training, it is typically technical in nature, instructing detectives on how best to use the software rather than how best to incorporate video into their overall investigative approach. These technical issues tend to focus on chain-of-custody procedures.

Once video is retrieved, it becomes evidence in a case and is subject to all of the reporting and chain-of-custody requirements that are applicable to other pieces of evidence. In order to protect the rights of those who are documented on camera and the admissibility of the footage in court, proper storage policies surrounding where and for how long the recorded video should be kept becomes an important legal concern. There is no set standard for the period of time that video footage should be retained once it is downloaded from cameras. However, the CCTV Code of Practice, which is guided by the United Kingdom's Data Protection Act, advises that "images should not be retained for longer than is necessary" (Information Commissioner's Office 2008: 14) and should be guided by the purposes for which the footage was recorded. This advice is echoed by The Constitution Project, which prescribes that "recorded footage lacking evidentiary or other documented value should be destroyed as a matter of course after a specified time. Any decision to retain footage past the time period allotted in the policy should be specifically documented for subsequent review and audit" (Constitution Project: 26). For example, if footage was explicitly captured in the course of developing a case against a known group of organized criminals, prudence suggests that the footage is retained throughout the period of prosecution and case disposition, if not beyond that period. However, retaining footage of everyday activities with no explicit law enforcement or criminal justice purpose increases the risk that the footage will be misused and that individual privacy rights will be violated. This underscores the importance of ensuring that footage is both stored and destroyed securely.[24]

Maintaining strict chain-of-custody is important to investigators and prosecutors alike. For investigators, it ensures the quality and integrity of the case. For prosecutors, as discussed in chapter 9, when presenting video evidence, they need to prove the footage is authentic, detailing the steps that were taken to prevent alteration of any kind. One way to prove this is referencing chain-of-custody documents, which hold the person or persons in possession of the evidence accountable were the court or any agency to determine that tampering had occurred.

In early stages of public surveillance system adoption and use by law enforcement, investigators were able to obtain a computer disk of the video, and were they to deem it useless in assisting the investigation they would often simply throw it away. However, authenticity claims in court have led several jurisdictions to enhance chain-of-custody procedures, requiring that each disk be inventoried in the department's evidence room. Some jurisdictions allow for a

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24 For further guidance, refer to The CCTV Code of Practice http://www.ico.gov.uk/upload/documents/library/data_protection/detailed_specialist_guides/ico_cctvfinal_2301.pdf (Information Commissioner's Office 2008) and the Guidelines for Public Video Surveillance http://www.constitutionproject.org/pdf/Video_Surveillance_Guidelines_Report_w_Model_Legislation4.pdf (Constitution Project 2009).

second copy to be placed in the case file for ease of reference. However, the copy used in trial would come from the evidence room, where records of who accessed it and for how long can be submitted at trial.

How Footage Supports Investigations

License plate of vehicle used after offense may lead investigators to the person responsible for the crime.

Video footage can assist detectives in investigating a case in a variety of ways: through both the identification of suspects, victims, or witnesses, and the recovering of evidence that was not collected initially. Cameras have an obvious ability to assist in identifications. Because they provide a visual record, given sufficient clarity, investigators may be able to identify persons who had left the scene of the incident before first responders could arrive. Take for example a perpetrator who attacks a victim and flees on foot. Were a camera to record a clear image of the perpetrator, this would be an extremely helpful piece of evidence in advancing the investigation. It is unlikely however, that camera evidence alone would be sufficient to close a case. Investigators will still need to talk to other officers or neighborhood residents or consult booking photos to put a name to the face. In addition, without additional investigative work to understand the full context of the crime event, cameras may erroneously lead to false conclusions. For example, a camera could falsely identify a person as a perpetrator who may well have actually been acting in self-defense. It is therefore important to emphasize that, while video can be a potentially powerful tool, detectives should not replace traditional investigative techniques with video footage in order to solve crimes. Rather, video should be viewed as augmenting investigative strategies, serving as an additional resource with the potential to increase the efficiency and effectiveness of an investigation.

In addition to identifying suspects and victims, surveillance cameras can assist in identifying witnesses, who can be critically important to investigators and prosecutors alike. Cameras assist in the witness identification process in two ways. First, as previously mentioned, they can identify witnesses who can provide a better account of what transpired during the incident, es-

pecially if the camera was not able to record the entire crime. Second, because cameras provide an objective account of the events, they can serve to corroborate or dispute witness statements. Cameras thus enable detectives to sift through statements to determine, for example, which individuals or components of their statements are truthful. On occasion, detectives have found individuals reporting what happened at the crime recant their statements or request to drop a filed complaint when the detective informs them that surveillance cameras will be consulted to verify their account.

Sound and thorough investigative work requires the collection of all possible evidence. Even if witnesses are identified and are forthcoming with information and the victim or victims are able to recount many of the details from the incident, surveillance footage has the potential to provide further information that is not available from any other source. Imagine a hypothetical case in which a perpetrator shoots a victim and then flees the scene. Though witnesses attempt to relay all possible information to detectives, the perpetrator remains unidentified. However, in reviewing video evidence from multiple cameras, detectives track the perpetrator along his escape route, identifying where he discarded his weapon. Detectives are then able to retrieve the firearm and lift fingerprints, which are then used to identify the perpetrator. In an example such as this, camera technology is invaluable.

Investigators also note that cameras are adept at creating leads through motor vehicle license plates. License plate numbers, retrieved from video footage, have been employed to identify suspects or witnesses. Using Department of Motor Vehicle records to obtain names and addresses, investigators have been able to generate and follow-up on additional investigative leads.

While outside the scope of this particular evaluation, investigators have also reported success in using private business camera footage to solve crimes. Implemented and utilized in a similar fashion to police cameras, detectives have found private cameras are often newer and therefore have better picture quality. When attempting to identify a suspect, this additional clarity increases the odds of a positive identification of suspects and witnesses. There are, however, drawbacks to using private cameras. First, because they are privately owned, businesses are not required to provide detectives with camera footage unless they are issued a subpoena to do so. By the time a subpoena is issued, however, the footage may have been overwritten. Investigators may have to invest extra time in speaking to the owners of these cameras and developing relationships in order to obtain the video. Further, these cameras are not police department property and the owners are not officers or contracted police department personnel. This factor may threaten chain-of-custody protocols and authenticity claims, because safeguards to prevent tampering are not employed until after the investigator receives the footage from the business owner. It is also important for jurisdictions to emphasize that investigators and prosecutors should not rely on private camera footage as an end-run around the rules and regulations governing public cameras. Moreover, if jurisdictions do acquire private footage, once that footage comes into government hands it should be governed by the same rules and regulations that apply to any government footage, whether the source is public or private. In summary, private

cameras can assist investigations, but detectives should understand the possible complications that are associated with this source of video evidence.

Investigator Perception of Video Utility

For detectives in jurisdictions aspiring to expand an existing camera program or to adopt a new one altogether, one of their concerns may be whether their workloads will increase due to the effort involved in incorporating video footage into the investigatory process. Detectives who have experience with video technology have observed that, although it is an additional step added to the process, the workload increase is negligible. Requesting the footage, reviewing it, and following-up on leads do take time. On the other hand, cameras can expedite investigations by identifying witnesses or evidence that may have otherwise taken longer to obtain. Detectives also report that they can typically determine, within an hour's time, whether camera evidence will assist the investigation.

The advantages of video evidence, however, are not without their complications. Investigators have found that cameras that could have recorded useful information for a case failed to capture critical images due to the fact that their hard drives had already overwritten the footage from that incident. It is not uncommon for a detective to find, after successfully obtaining the video, that the camera was not pointed in the right direction to capture pertinent details for the case, or that the footage it did record was too blurry to be useful to the investigation. Detectives caution against expecting too much from the technology due to these limits on its capabilities. Investigators also make a strong argument for active monitoring, as a camera is more likely to capture key events in a crime when operated by a person rather than a pre-programmed touring pattern. They also note that integrating other technology (elaborated further in chapter 5 of this guidebook) may further assist investigations. In fact, conventional wisdom suggests that any video footage recorded of a crime in progress should be retained regardless of image value. Regardless of their past experiences with the technology, detectives who have incorporated cameras into their standard investigative procedures stress that while video footage has the potential to substantially contribute to an investigation it is not a tool that replaces other practices. Rather, it must be an integrated component along with other investigatory processes that are all necessary to successfully solve a case.

Chapter 9.
How can video footage be used in trials?

Prosecutors and defense attorneys primarily use video footage from public surveillance systems as an investigatory tool, employing similar strategies as those discussed in the preceding chapter addressing use in investigations.[25] In the ideal scenario, video footage can clearly identify a suspect, victim, or witness. While video footage often falls short of this ideal, attorneys have developed strategies to employ footage to build or cast doubt upon cases. Camera footage has the potential to influence four key points in a legal case: the decision to prosecute, plea negotiations, witness deposition, and testimony in court. Typically, attorneys use footage to confirm or refute the accuracy of witness testimony or provide useful context for the incident in question. While public surveillance video is not universally helpful in trials, its potential benefits may outweigh the additional administrative costs associated with its use.

Use in Cases

Video footage can assist both prosecutors and defense attorneys at each stage in a case by providing a means of corroborating or discrediting witness statements or events. When deciding whether to prosecute a case, attorneys use footage to examine the incident itself and the activity surrounding the scene, as well as activities occurring shortly before and immediately after the criminal event. Attorneys can dismiss unfounded complaints or charges if footage refutes or casts doubt upon an alleged incident. Conversely, a case that may have been dismissed can be bolstered through video confirmation. This type of confirmation can be particularly helpful when either the victim or witness lacks credibility, such as a case in which the victim was the initial aggressor in a conflict.

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25 Information on video evidence used in trial derives from interviews conducted with attorneys in each of the study sites. Information on defense attorney usage is drawn primarily from two studies with similar methodologies conducted on the Los Angeles and San Francisco camera systems (see Cameron, Aundreia, Elke Kolodinski, Heather May, and Nicholas Williams. 2008. Measuring the Effects of Video Surveillance on Crime in Los Angeles. CRB-08-007. Sacramento, CA: California Research Bureau; King, Jennifer, Deirdre Mulligan, and Steven Raphael. 2008. CITRIS Report: The San Francisco Community Safety Camera Program. Berkeley, California: University of California Center for Information Technology Research in the Interest of Society.).

Following the decision to prosecute, the existence of video footage can influence both the willingness of defense attorneys to seek a plea agreement, as well as the terms negotiated. A clear image of the defendant committing the crime provides the prosecutor with significant leverage in a plea negotiation, while ambiguous or ameliorating footage assists the defense.

Should a case move to trial, video footage is typically used to validate or refute witness testimony, providing a visual statement for jurors. Footage plays a role in determining witness quality and informing decisions on who to subpoena to testify. If a witness' testimony is confirmed by video evidence, his or her story gains credibility in the eyes of the jurors or judge deciding the case. Attorneys also rely on footage to cast doubt on witnesses by showing discrepancies or inconsistencies between the testimony and details included on the film, showing limitations in the vantage point of the witness, or questioning alibis or presence at the scene. Additionally, video footage may depict subtleties such as body language, interactions between witnesses or key actors, and the presence of a weapon that could add context to testimony.

Advantages and Disadvantages of Video Evidence

Attorneys report that for many jurors, video evidence can be more credible than an eyewitness. Attorneys tout video footage as an unbiased account of an event since a tape, unlike a witness, cannot lie or forget details. Those who have used footage in trials therefore report it to be a very powerful and effective piece of evidence. The prevalence of public surveillance technology in popular culture, however, also presents a challenge for attorneys in jury trials. Jurors have come to expect advanced forensic and technological evidence and hold unrealistic expectations about the quality of such evidence like camera footage, a phenomenon known as the "CSI Effect" by many criminal justice professionals. As a result, jurors may falsely conclude that the lack of such evidence means that the defendant is not guilty. To compensate for this perception, attorneys may wish to present footage even if quality is poor, and offset jurors' assumptions by addressing technological limitations at the outset.

Indeed, issues with camera tours and image quality can seriously limit the usefulness of video footage in a trial. When an unmonitored camera captures a crime in progress, for example, it does not typically record the entire event due to its automatic panning tour. In this situation, attorneys must resort to circumstantial evidence or the surrounding events captured by the camera to piece together a story for the court. Limited visibility at night or in inclement weather also restricts the utility of camera footage, as images may not be clear enough to provide an accounting of events.

Procedural Considerations

Video footage is subject to the same standards as other evidence submitted during a trial. Specifically, attorneys must establish a foundation for the video evidence and demonstrate its authenticity. Footage cannot be introduced independently or in lieu of testimony, and requires one or more witnesses to establish the appropriate context. Typically, a police officer or IT professional is called upon to testify about authenticity by explaining encryption protections, the chain-of-custody for footage, and any relevant security certificates. This testimony should also include location, time, whether the footage could have been tampered with, and who had access to the footage. Once a video is demonstrated to be authentic, the attorney must then provide a witness who can explain who is captured on the video and describe the events shown. This witness could be a civilian witness or a police officer, and may be the same individual used to establish authenticity.

Preparing and using video footage in trials clearly involves additional effort. However, while time estimates vary widely, the general consensus among prosecutors is that video footage adds nominal time to case preparation, and is no more labor intensive than other forms of evidence. In some jurisdictions, however, the technology associated with presenting video footage in court can involve additional preparation time. In one study site, for example, footage can only be viewed from specific security-enhanced laptops available for use in the courtroom. Attorneys must therefore go through the extra step of procuring the appropriate technology or technicians to view the footage. In some circumstances, the availability of footage has actually reduced case preparation time by filtering out unfounded charges or reducing the time required for identifying witnesses and convincing them to testify.

While few jurisdictions offer formal guidance on the uses and procedures for video use in trials, training could aid prosecutors and defense attorneys in presenting video evidence in the most effective way. Attorneys may benefit from formal introductions to topics such as software use for presenting footage in court; the capabilities and limitations of the public surveillance system generally; strategies for presenting evidence in a convincing way during trials; and evidentiary integrity procedures.

For trials, video footage can be an extremely compelling piece of evidence that requires little, if any, additional time. Indeed, video footage can limit the number of officers necessary to prosecute a criminal case. By having video evidence available for court proceedings, officers may be relieved from their responsibility to attend and present testimony.

Though quality and content may fall short of juror's expectations, video footage can be useful in providing an unbiased depiction of details or context surrounding witness testimony even if the crime itself is not captured. As with other forms of evidence, video evidence cannot stand alone and requires witness testimony to establish relevance to the court case. For most attorneys who have used video evidence, the potential benefits outweigh the procedural and technological costs of the system.

Chapter 10.
Conclusion

As this guidebook has outlined in detail, those charged with implementing or expanding public surveillance systems must consider many factors in their decision-making processes. While each factor on its own may have a marginal effect on the utility and cost-effectiveness of a public surveillance system, together they are critical to ensuring that public funds are used soundly and that investments yield the greatest possible crime control benefits. Doing so requires detailed planning, collaborative decision-making, strategic investments, and the full integration of public surveillance into the operations of a law enforcement agency.

Perhaps the single greatest investment of staff resources associated with a public surveillance system should occur during the planning and implementation phase, particularly in setting the groundwork for system implementation. Soliciting community input through the convening of open public meetings, the invitation of public comment, and the clear explication of the rationale behind camera placement decisions are important undertakings. In addition, developing and disseminating written policies on the proscribed use and dissemination of footage, including planned restrictions and security measures, can go a long way toward building public support for a camera system. Doing so sets in stone what is permitted and what is not. Written policy educates but it also serves as a basis for implementing discipline when a member uses the technology in a manner for which it is not intended. That said, jurisdictions should carefully consider the advantages of implementing relatively restrictive guidelines on camera use versus the disadvantages of overly restrictive guidelines that may limit the ability to use cameras to their greatest capacity.

While the groundwork for camera investment is being laid, jurisdictions should give careful consideration to planning and procurement activities. As revealed by the experiences of evaluation sites, the cost of the cameras themselves is minimal compared to the costs of installation, maintenance, and monitoring. Toward this end, jurisdictions investing in public surveillance systems should be prepared to do their own homework rather than relying on the advice of vendors, as it is not in a vendor's interest to highlight in detail all the hidden costs associated with surveillance systems. Those planning an investment in public surveillance should also be aware of the fact that camera technology is constantly evolving: each subsequent generation of cameras offers greater resolution and potentially more useful features. Thus, a thoughtful investment strategy will involve the procurement of the best affordable technology while building in plans

for camera upgrades. One caveat to that advice, however, is for jurisdictions to weigh the pros and cons of cameras that produce superior image quality, because the greater the image quality, the greater the strain on video storage capacity.

With regard to camera placement, jurisdictions should understand at the outset that regardless of identification of hot spots of criminal activity, the ultimate locations of cameras will be guided by infrastructure (including proximity to power sources) and the camera technology employed, as well as characteristics of the natural and man-made environment. Wireless camera systems, for example, require consideration of the location of cameras and antennas in relation to trees, physical obstructions, and other cameras.

Public surveillance system decision-makers will also need to carefully weigh the costs and benefits of active monitoring. Active monitoring can aid in the disruption of crimes in progress and is also useful for later investigative and prosecution purposes because monitors can zoom into a scene to record important details that may not be captured through a pre-programmed camera tour. However, active monitoring requires significant resources and may also raise concerns among the public about whether cameras are being used in accordance with constitution rights.

Regardless of whether cameras are actively or passively monitored, this guidebook highlights the importance of training. All those engaged in camera monitoring and video footage use must be trained in constitutional law, privacy policies, and chain-of-custody practices. Moreover, while on-the-job training for camera monitors is typically sufficient, training is often necessary for detectives and prosecutors on how best to employ camera footage in their investigations and cases. This training should include information on how to retrieve and use footage and its potential value to their cases, as well as the limitations associated with video evidence and the fact that it typically enhances rather than serves as a substitute for witness testimony. Training is also critical in ensuring that policies are clearly defined with regard to how, when, and to whom video images may be released, which individuals and agencies possess the authority to release them, and what restrictions and safeguards apply in doing so.

Finally, inasmuch as the promise of public surveillance as a crime prevention and control tool is a powerful motivator for those investing in the technology, it is important to view it in the context of a larger community policing framework. Public surveillance alone is not a silver bullet, but simply another crime control and investigative tool. That tool should be employed along with other policing strategies, such as CompStat and community-oriented problem-solving strategies. Further, it is important for jurisdictions to understand that surveillance technology is only as good as the manner in which it is employed. If it is employed minimally or is not well integrated into other policing functions, it is unlikely to yield a significant impact on crime.

Appendix A.
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Appendix B.
Additional Resources

The following guidebooks from the Office of Community Oriented Policing Services (the COPS Office) offer practitioner oriented advice. Guidebooks such as *Sting Operations and Dealing with Crime and Disorder in Urban Parks* discuss how public surveillance systems can be employed to support other law enforcement activities. Others cover how to best implement public surveillance as a strategic problem solving tool.

> *Guidelines for Public Video Surveillance: A Guide to Protecting Communities and Pre-serving Civil Liberties*, by The Constitution Project (Washington, D.C.: 2007). This publication offers comprehensive and detailed guidance for state and local officials investing in or already using public surveillance systems, enabling them to use the technology in a manner that protects residents' privacy rights and civil liberties. http://www.constitution-project.org/pdf/Video_Surveillance_Guidelines_Report_w_Model_Legislation4.pdf

> *Video Surveillance of Public Places*, by Jerry Ratcliffe (U.S. Department of Justice, Office of Community Oriented Policing Services 2006). Part of the Problem-Oriented Guides for Police, Response Guides series, this guidebook provides an overview of public surveillance systems for a law enforcement audience. Specifically, it addresses logistical considerations, implementation and use questions, and offers background on managing the concerns of the public. The document is available at http://www.cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=226.

> *Analyzing Crime Displacement and Diffusion*, by Rob T. Guerette (U.S. Department of Justice, Office of Community Oriented Policing Services 2009). Discusses concerns about diffusion and displacement surrounding the implementation of problem-oriented policing efforts. This study, part of the Problem-Oriented Guides for Police, Problem-Solving Tools series, also offers strategies for measuring and managing crime prevention impact at the local level. The document is available at: http://www.cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=531.

> *Dealing with Crime and Disorder in Urban Parks*, by Jim Hilborn (U.S. Department of Justice, Office of Community Oriented Policing Services 2009). This guidebook for managing crime in park settings, one in the Problem-Oriented Guides for Police, Problem-Specific Guides series, addresses how surveillance cameras have been used as part

of a policing strategy to prevent crime in parks and recreational areas. The guidebook is available at http://www.cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=527.

Improving Street Lighting to Reduce Crime in Residential Areas, by Ronald V. Clarke (U.S. Department of Justice, Office of Community Oriented Policing Services 2009). This guide evaluates the public safety outcomes associated with improving street lighting and discusses lighting enhancements as a potential alternative to surveillance cameras. This report is in the Problem-Oriented Guides for Police, Problem-Specific Guides series. The guide is available at http://www.cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=510.

Sting Operations, by Graeme R. Newman (U.S. Department of Justice, Office of Community Oriented Policing Services 2007). This guidebook, part of the Problem-Oriented Guides for Police, Response Guides series, provides information on how public surveillance can be employed for sting operations. The guidebook is available at http://www.cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=443.

Implementing Responses to Problems, by Rick Brown and Michael S. Scott (U.S. Department of Justice, Office of Community Oriented Policing Services 2007). As a part of the Problem-Oriented Guides for Police, Problem-Solving Tools series, this guidebook offers assistance in implementing problem-oriented solutions to crime problems. The guidebook is available at http://www.cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=432.

The following four studies describe evaluations of public surveillance use in other jurisdictions, detailing the challenges and strategies cities and key stakeholders have faced in public surveillance implementation:

CITRIS Report: The San Francisco Community Safety Camera Program, by Jennifer King, Deirdre K. Mulligan, and Steven Raphael (University of California, Berkeley, Center for Information Technology Research in the Interest of Society, 2008). This report evaluates the effectiveness of the Community Safety Camera program in San Francisco, California. This detailed report examines program goals; measures crime impact; and evaluates management, use, and perceptions of the system. For more information, refer to the following website: http://www.citris-uc.org/news/SFcamerastudy.

Measuring the Effects of Video Surveillance on Crime in Los Angeles, by Aundreia Cameron, Elke Kolodinski, Heather May and Nicholas Williams (California Research Bureau, 2008). This report includes an overview of public surveillance use in the state of California, a meta-analysis of 44 public surveillance evaluations, and a more specific evaluation of the impact of public surveillance cameras on crime rates in the city of Los Angeles. The report is available at http://www.library.ca.gov/crb/08/08-007.pdf.

CCTV Camera Evaluation, by Jerry Ratcliffe and Travis Taniguchi (Temple University, 2008). Authors measured crime in the vicinity of CCTV cameras within the city of Philadelphia, Pennsylvania, using weighted displacement quotient (WDQ) and hierarchical

linear model (HLM) analyses. The report is available at http://www.temple.edu/cj/misc/ PhilaCCTV.pdf.

Effects of Closed Circuit Television Surveillance on Crime, reviewed by Brandon C. Welsh and David P. Farrington (Home Office Research, Development, and Statistics Directorate, 2008). This is the most comprehensive meta-analysis of evaluations of CCTV effectiveness, containing 44 studies spanning various settings and countries, though most evaluations included were conducted in the UK. For more information, refer to the following website:
http://www.campbellcollaboration.org/library.php.

The resources cited below describe how mapping can be employed with public surveillance. For example, mapping crime "hot spots" can guide camera placement decisions, and mapping crime following camera installation can help identify crime reduction, displacement, and diffusion. If your jurisdiction does not currently employ mapping, partnering with local experts such as universities or nonprofit data centers can be an effective strategy in acquiring mapping expertise and support.

The National Institute of Justice (NIJ) Mapping and Analysis for Public Safety (MAPS) program. Provides resources and publishes reports on the use of mapping in criminal justice research and practice. More information is available at their website: http://www. ojp.usdoj.gov/nij/maps/welcome.htm.

Crime Mapping and Analysis Program (CMAP). Funded by the National Institute of Justice, this program provides no-cost mapping training courses for law enforcement personnel. For more information, refer to the following website: http://www.justnet.org/ Pages/cmap.aspx.

Police Foundation Crime Mapping and Problem Analysis Laboratory (CMPAL). This COPS-supported project offers practical assistance on mapping software, use, and current applications in the field. For more information, refer to the following website: http:// www.policefoundation.org/docs/crime_mapping.html.

Using Public Surveillance Systems for Crime Control and Prevention is designed to guide city administrators, law enforcement agencies, and their municipal partners in implementing and employing public surveillance systems in a manner that will have the greatest impact on public safety. It details the various aspects of a system that are integral in yielding a cost-beneficial impact on crime, including budgetary considerations, camera types and locations, how best to monitor cameras, and the role that video footage plays in investigations and prosecutions. This publication also highlights the most prominent lessons learned, in an effort to guide both city administrators and jurisdictions that are currently investing in cameras for public safety purposes, as well as inform those that are contemplating adopting their own public surveillance systems.