



BUS LANE ENFORCEMENT STUDY

June 2017



National Capital Region
Transportation Planning Board

EXECUTIVE SUMMARY

INTRODUCTION

The National Capital Region (NCR) is consistently ranked one of the most congested metropolitan areas in the United States.¹ The region's congestion impacts all roadway users, including those using public transit. Washington Metropolitan Area Transit Authority (WMATA) buses typically operate with average speeds reaching less than 10 miles per hour on most corridors and less than five miles per hour in downtown D.C. during peak periods.² As regional bus speeds continue to drop and bus performance suffers from congestion, regional interest in potential transit preferential treatments has increased, including transit signal priority, queue jump lanes, and bus lanes. New bus lanes are operating in several of the region's jurisdictions, and many are being implemented or planned.

THE SUCCESS OF BUS LANES DEPENDS ON THE DEVELOPMENT AND CAREFULLY PHASED IMPLEMENTATION OF A COMPREHENSIVE EDUCATION AND ENFORCEMENT STRATEGY PRIOR TO AND AFTER LANE INSTALLATION.

Bus lanes have the potential to significantly improve bus speeds and reliability. For transit agencies, bus lanes can result in shorter running times, which in turn lead to increased reliability, decreased schedule recovery times, and reduced operating cost. For bus passengers, bus lanes can decrease in-vehicle travel times as well as reduce average waiting times at stops and vehicle crowding resulting from the improved reliability - increasing the attractiveness of transit and potentially increasing transit ridership. However, these benefits are not solely achieved through the design and installation of a bus lane. Sufficient public support for regulating the use of bus lanes and enforcing those regulations are key factors. Effective design, education and outreach strategies are critical during both the planning and post-implementation phases, and all play critical roles in achieving the potential benefits of bus lanes.

As part of the Technical Assistance Program of its Unified Planning Work Program (UPWP), the National Capital Regional Transportation Planning Board (TPB), in coordination with WMATA, commissioned a study to research, identify, and develop strategies to improve observance with and enforcement of bus lanes in TPB jurisdictions. This study reviewed national and local best practices for bus lanes with a focus on enforcement strategies, legal restrictions on camera enforcement strategies tailored to TPB jurisdictions, and comprehensive educational strategies for drivers, pedestrians, and law enforcement agencies. The findings were then used to create a *Bus Lane Implementation Plan* (Section 3 provides an overview) with specific recommendations, strategies and time frames for actions to be taken in TPB jurisdictions, and region-wide, to ensure the success of bus lane initiatives.



1 The INRIX 2016 Global Traffic Scorecard, <http://inrix.com/scorecard/> [Accessed June 15, 2017]

2 Washington Metropolitan Area Transit Authority, Evaluation of Bus Speeds (July 2010).

STUDY OBJECTIVES

1.

IDENTIFY ENFORCEMENT STRATEGIES FOR EFFECTIVE BUS LANE MANAGEMENT

2.

OVERCOME LEGISLATIVE BARRIERS IN THE IMPLEMENTATION OF BUS LANES

3.

DEVELOP EFFECTIVE EDUCATION AND PUBLIC OUTREACH

This study focused primarily on the period following corridor selection and the completion of the planning process, and the associated actions key to successful implementation and management of bus lanes. The assessment and feasibility of bus lanes, which occurs earlier on in the planning process, was not within the scope of this study.



EFFECTIVE BUS LANE MANAGEMENT

This study identified barriers to implementation and strategies for effective bus lane management by local jurisdictions, with a focus on:



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STAKEHOLDER COORDINATION

Case studies from across the country indicated that it is essential to have cooperation among state, regional, and local agencies, as well as traffic engineering and transit service planning officials, at all phases of implementation. Interagency cooperation is not just essential in the planning, design, and construction phases, but also in the operational phase of a project. The transit operating agency is rarely the agency responsible for maintaining lane markings, setting traffic signal timings, and other essential components of effective bus lanes. In addition, many bus lanes will cross jurisdictional boundaries, therefore the sponsoring agency must take the lead to consider all agency stakeholders and their roles throughout the life-cycle of the bus lane. Planning, design, construction, enforcement, and maintenance could all involve different agencies and divisions, each of which need to be at the table from the beginning of the process to help establish effective and lasting coordination procedures.



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ENFORCEMENT

Although practices vary, enforcement of bus lane use is needed to ensure that buses are not adversely affected by vehicle traffic. Police enforcement and automated camera enforcement are the two most common enforcement tools utilized to minimize bus lane violations.

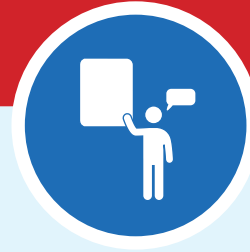
- **Police Enforcement:** Several studies indicated that the perception of limited bus lane enforcement increases violation rates, diminishing the effectiveness of bus lanes and resulting in reduced bus speeds. Some level of police presence is needed to discourage potential violators from entering the bus lanes. However, agencies need to consider the financial, legislative, and human resources required by police enforcement. Budget limitations and conflicting priorities can make it difficult to sustain a continuous police enforcement program.
- **Automated Camera Enforcement:** Cameras installed on buses (or stationary cameras installed along the bus lanes) can automate the enforcement process, generating automatic citations for both moving and parking violations. Compared to active police enforcement, automated enforcement can have significant fiscal and enforcement benefits. However, transit agencies are rarely authorized to enforce restrictions in the bus lanes they operate within, presenting significant enforcement challenges. Automated camera enforcement usually requires new enabling legislation and administrative processes.



LEGISLATION

As noted above, automated camera enforcement usually requires enabling legislation. There are various types of camera-based enforcement of parking or moving violations for bus lanes in use today, but New York City and San Francisco have the most robust, most explicit, on-board camera enforcement of violations in bus lanes in the United States. Key elements of their respective enabling legislation includes:

- Pilot/demonstration project sunset provision
- Legislative reporting requirements
- Warning periods before fines are issued for violations
- Identification of camera locations (on-board buses or stationary) and locations of corridors with camera enforcement
- Enforcement hours
- Violation types and fine amounts
- Enforcement processes and privacy protections
- Education
- Monitoring



EDUCATION

Educational campaigns are a crucial piece of any transit project. They serve the interests and knowledge of pedestrians, cyclists, drivers, and transit operators and promote project support. Key educational strategies are summarized as follows:

- Start educating and messaging early, and continue both during and after implementation.
- Tailor engagement methods to fit the project. Using data and professional judgment, target relevant constituencies/populations and identify project partners.
- Signal the exclusivity of a bus lane to road users through striping, marking, or signage.
- Always educate transit vehicle operators.
- Provide simple, clear, and informative project details online through websites and social media, as well as in print materials and brochures.
- Use creative public engagement methods.

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MONITORING

Enforcement, legislation, and outreach activities are all critical pieces of implementing effective bus lanes. However, designing a successful bus lane also requires continuous monitoring after the bus lanes are installed. The monitoring actions post-implementation should include performance measures that are meaningful and measurable for evaluating the effectiveness of bus lanes as well as compliance and violation rates.

IMPLEMENTATION PLAN

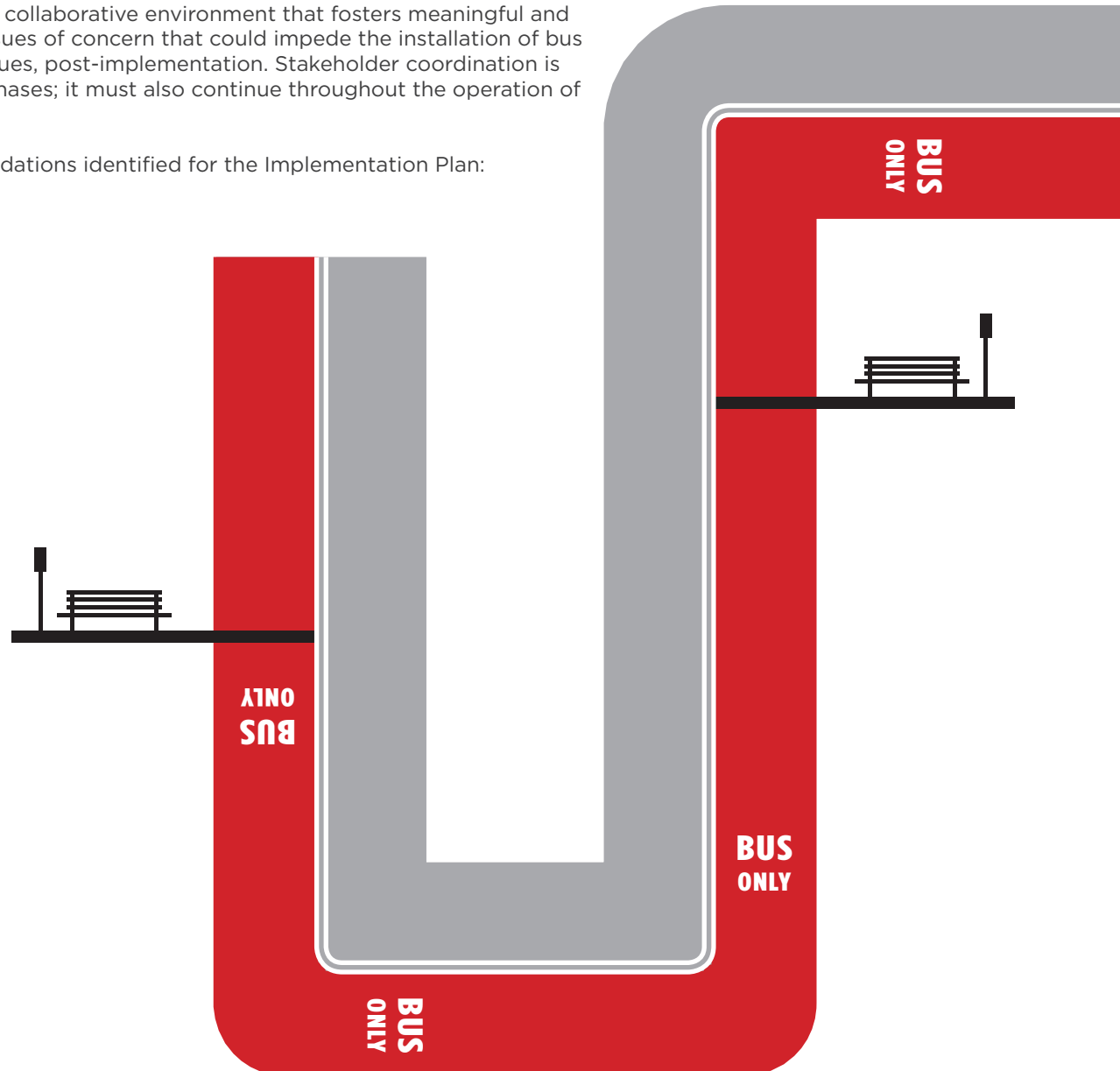
A successful bus lane implementation plan is a multiphase process that includes three elements of effective bus lane implementation strategies: enforcement, legislation, and public education. Each of these elements overlaps with the most critical component of a project's success: stakeholder coordination. The engagement of various stakeholder groups helps build consensus around major project decisions and provides support for the legislative and executive actions needed for successful implementation. Transit operators are rarely the only agency responsible for the design, operation, and enforcement of bus lanes. Identifying and engaging key stakeholders in a structured and deliberate manner early on, and throughout the process, is essential to successfully implementing bus lanes. Creating a collaborative environment that fosters meaningful and substantive involvement throughout the process addresses issues of concern that could impede the installation of bus lanes and helps identify problem locations and operational issues, post-implementation. Stakeholder coordination is not only necessary in the planning, design and construction phases; it must also continue throughout the operation of a project.

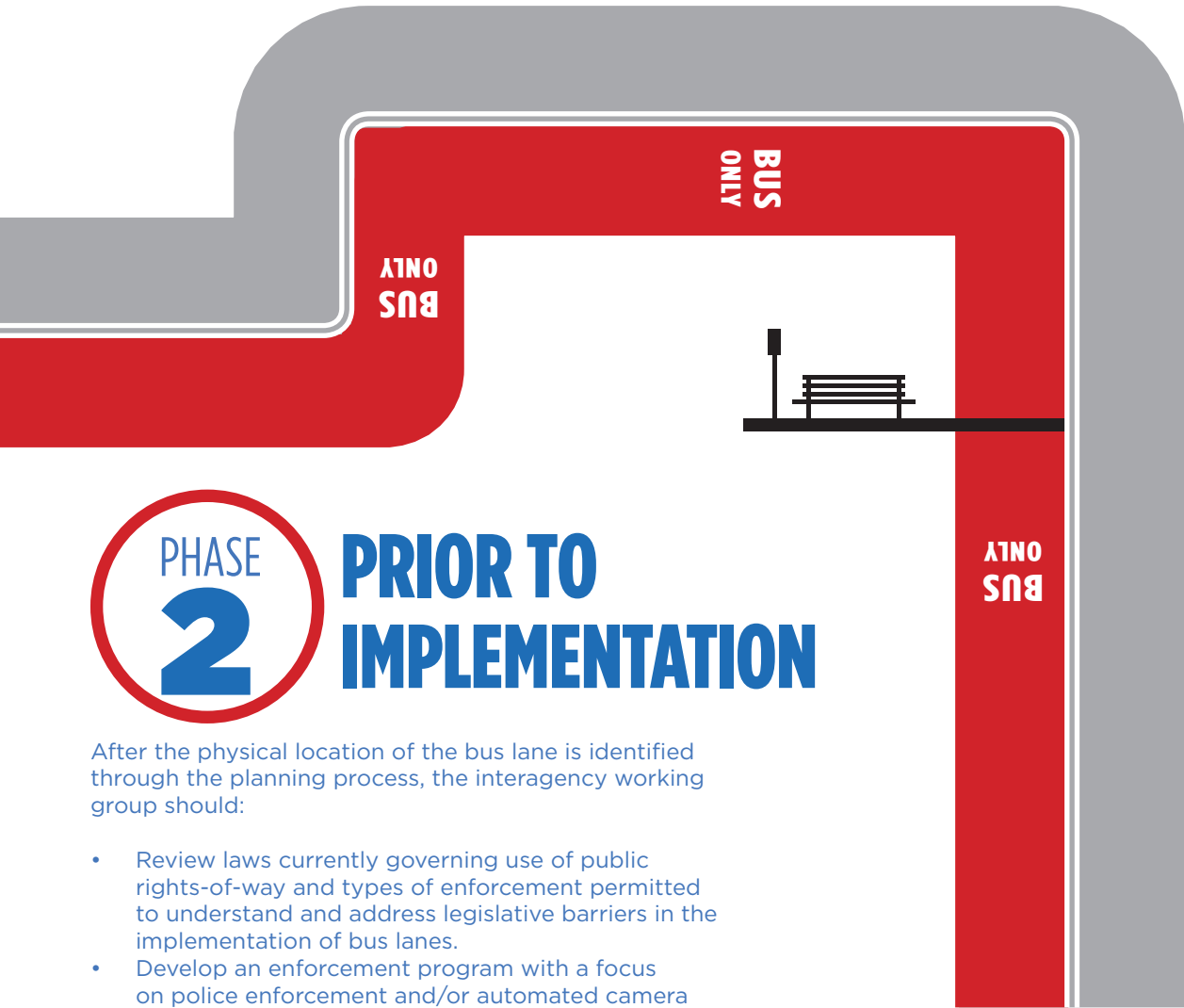
The following describes the phases and associated recommendations identified for the Implementation Plan:

PHASE 1 1 PLANNING STAGE

Develop a corridor selection and planning process, and establish an interagency working group. This includes:

- Developing key performance measures for bus lane assessment that are consistent across the region.
- Conducting a performance evaluation to determine ideal corridors that would benefit most from transit improvements.
- Identifying key stakeholders that need to be most actively involved in the project's early engagement, as well as determining parties that should be updated periodically.





PHASE 2 **PRIOR TO IMPLEMENTATION**

After the physical location of the bus lane is identified through the planning process, the interagency working group should:

- Review laws currently governing use of public rights-of-way and types of enforcement permitted to understand and address legislative barriers in the implementation of bus lanes.
- Develop an enforcement program with a focus on police enforcement and/or automated camera enforcement.
- Identify various interest groups and appropriate types of engagement.
- Establish a strategic plan to engage the public and promote project support.

PHASE 3 **AFTER OPENING**

After bus lanes are in operation, the interagency working group should:

- Continue education and public outreach to promote project support and education.
- Ensure that targeted police enforcement is conducted for the first few weeks as part of the enforcement program.
- Monitor performance measures and violation types to evaluate the efficiency of enforcement strategies.

SECTION 1.0: INTRODUCTION

TPB, in coordination with WMATA, commissioned this study to *research, identify, and develop strategies to improve observance with and enforcement of bus lanes in TPB jurisdictions.* This study reviewed bus lane enforcement strategies of national and local transit agencies and jurisdictions, legal restrictions on camera enforcement strategies in TPB jurisdictions, and comprehensive educational strategies for drivers, pedestrians, and law enforcement agencies. The scope of this study did not include bus lane planning and operations phases.

As part of this study, the Bus Lane Implementation Plan was developed to offer specific recommendations, strategies and time frames for actions to be taken in TPB jurisdictions, and region-wide, to ensure the success of new bus lane initiatives. This report documents the results of the study process.

SECTION 1.1: PROBLEM DEFINITION

Bus lanes have the potential to significantly improve bus speeds and reliability. For transit agencies, bus lanes can result in shorter running times, which in turn lead to increased reliability, decreased schedule recovery times, and reduced operating cost. For bus passengers, bus lanes can decrease in-vehicle travel times as well as reduce average waiting times at stops and vehicle crowding resulting from the improved reliability – increasing the attractiveness of transit and potentially increasing transit ridership (Figure 1).

FIGURE 1 POTENTIAL BUS LANE BENEFITS



However, these benefits cannot be solely achieved through the design and installation of a bus lane. A successful bus lane must have sufficient public support for regulating the use of bus lanes and enforcing those regulations. Effective design, enforcement, and education strategies are critical during both the planning and post-implementation phases (Figure 2).

FIGURE 2 KEY ELEMENTS TO EFFECTIVE BUS LANE IMPLEMENTATION



SECTION 1.2: LOCAL CONTEXT

The NCR is consistently ranked one of the most congested metropolitan areas in the United States.¹ The region's congestion impacts residents, businesses, the traveling public, and policy makers. While all road users experience the impacts of congested conditions, the effect on public transit users riding buses operating in mixed traffic is more significant as transit routes are typically fixed, not allowing buses to change their routes to avoid congestion. Furthermore, due to the need to make frequent stops, buses generally travel in the right-most lane, which tends to have the most friction with parking and loading activities, taxis, and right-turning vehicles. Due to the impacts of congestion and right-lane friction, WMATA buses typically operate with average speeds less than 10 miles per hour on most corridors and less than 5 miles per hour in downtown D.C. during the peak periods.² Regional roads with a significant amount of transit (at least six buses in the AM peak hour) experience more congestion during peak times than the regional average of all roads.³

As bus speeds continue to drop and bus performance suffers from congestion, regional leaders recognize and have responded to the need to implement, on a coordinated basis, transit preferential treatments, including transit signal priority (TSP), queue jump lanes, and bus lanes. New bus lanes are operating in several of the region's jurisdictions, and many are being implemented or planned (**Table 1**).

³ TPB Congestion Management Process Technical Report, 2016. <https://www.mwcog.org/documents/2016/09/09/congestion-management-process-cmp-technical-report-congestion-management-process/>



TABLE 1 RECENTLY IMPLEMENTED AND PLANNED TPB JURISDICTION BUS LANES

TPB Jurisdictions	Current/Planned Bus Lane	Year Completed or Implementation Phase
City of Alexandria, VA	Crystal City Potomac Yard Transitway	2014 - in operation as Metroway service
	West End Transitway	Currently in design, planned opening early 2020s
	VA 7 BRT*	Preliminary design anticipated to begin in late 2017, opening mid 2020s
Arlington County, VA	Crystal City Potomac Yard Transitway	2016 - in operation as Metroway Service
Montgomery County, MD	US 29 (Burtonsville to Silver Spring)	Preliminary design underway, planned opening late 2019/early 2020
	MD 586 (Veirs Mill Road, Rockville to Wheaton)	In planning
	MD 355 (Clarksburg to Bethesda)	Ongoing planning study
Fairfax County, VA	US 1 BRT (Embark Richmond Highway)	Ongoing planning into 2018
	VA 7 BRT	Preliminary design anticipated to being in late 2017, opening mid 2020s
Washington, DC (DDOT)	Georgia Avenue NW	2016 - in operation
	H Street NW and I Street NW	Ongoing planning study
	16th St NW	Preliminary design underway, planned opening in 2018-2020

*VA 7 BRT study from Tysons to Alexandria recently completed by Northern Virginia Transportation Commission (NVTC); work continues with the Commission, Alexandria, and Fairfax County

Each configuration has contextual challenges in terms of education, safety, and enforcement. For example, in 2003, bus lanes were installed on 7th St NW (between Mt. Vernon Square and Pennsylvania Ave NW) and 9th St NW (between Mt. Vernon Square and E St NW) in the District of Columbia. Neither the public nor the drivers were educated prior to installation, causing confusion among drivers regarding how the lanes should be observed, and by police regarding enforcement. These lanes have been largely unsuccessful due to the low level of observance by drivers of other vehicles.

SECTION 1.3: PROJECT GOAL/VISION

The following goals were identified as part of this study:



IDENTIFY ENFORCEMENT STRATEGIES FOR EFFECTIVE BUS LANE MANAGEMENT

A review of the state of the practice, along with national and local agency interviews, indicated that some level of enforcement, either through automated enforcement (camera) or active police enforcement, is essential to the success of bus lanes. Understanding local conditions and challenges, as well as highlighting opportunities, are the key steps towards successful implementation. *Section 2.2* provides detailed information on the key enforcement strategies and barriers to implementation.



OVERCOME LEGISLATIVE BARRIERS IN THE IMPLEMENTATION OF BUS LANES

To enable effective bus lane enforcement strategies, legislation is generally needed both at the local and state level. Prior to the implementation of bus lanes, jurisdictions should review the legislation to identify challenges (e.g., public support) and, where necessary, develop potential modifications to the legislation that may be required for the design and operation of bus lanes. *Section 2.3* offers further insight on potential legislative issues that agencies may encounter during the implementation phase and provides guidance to overcoming legislative barriers.



DEVELOP EFFECTIVE EDUCATION AND PUBLIC OUTREACH

Educational campaigns and public outreach are key to identifying potential impacts, promoting project support, and ensuring success of any transit project. *Section 2.4* identifies effective messaging tactics, key target groups, and educational campaign plans for bus lane implementation.

SECTION 2.0: EFFECTIVE BUS LANE MANAGEMENT

This section identifies barriers to implementation and strategies for local jurisdictions to effectively manage bus lanes, with a focus on the following elements:

- Stakeholder Coordination
- Enforcement
- Legislation
- Education
- Monitoring

A comprehensive literature review, along with interviews with local and national transportation agencies, was conducted to evaluate successful enforcement, legislative, and educational techniques in the United States and abroad. Detailed information for each strategy is provided in separate technical memoranda in the appendices to this document.

SECTION 2.1: STAKEHOLDER COORDINATION

A wide variety of sources reported that interagency coordination plays a critical role in the overall success of any bus lane implementation project. Case studies from across the country reiterated that it is essential to have cooperation between state, regional, and local agencies, and between traffic engineering and transit service planning officials, at all phases of implementation. Interagency cooperation is essential not just in the planning, design, and construction phases, but also in the operational phase of a project. The operating agency is rarely the agency exclusively responsible for maintaining lane markings, setting traffic signal timings, and other essential components of a preferential treatment.

As an example, transit-only lane implementation in New York City is a “joint venture” of two different agencies, the New York City Department of Transportation (NYCDOT) and Metropolitan Transportation Authority (MTA) New York City Transit (an entity of the State of New York). Throughout the process, there has been a high level of interagency cooperation to successfully implement these initial lanes, as well as subsequent transit-only lane projects in New York City. Given that many projects of this nature require collaboration from multiple agencies as well as other stakeholders in the community, getting these groups on the same page can greatly improve the success of a project.

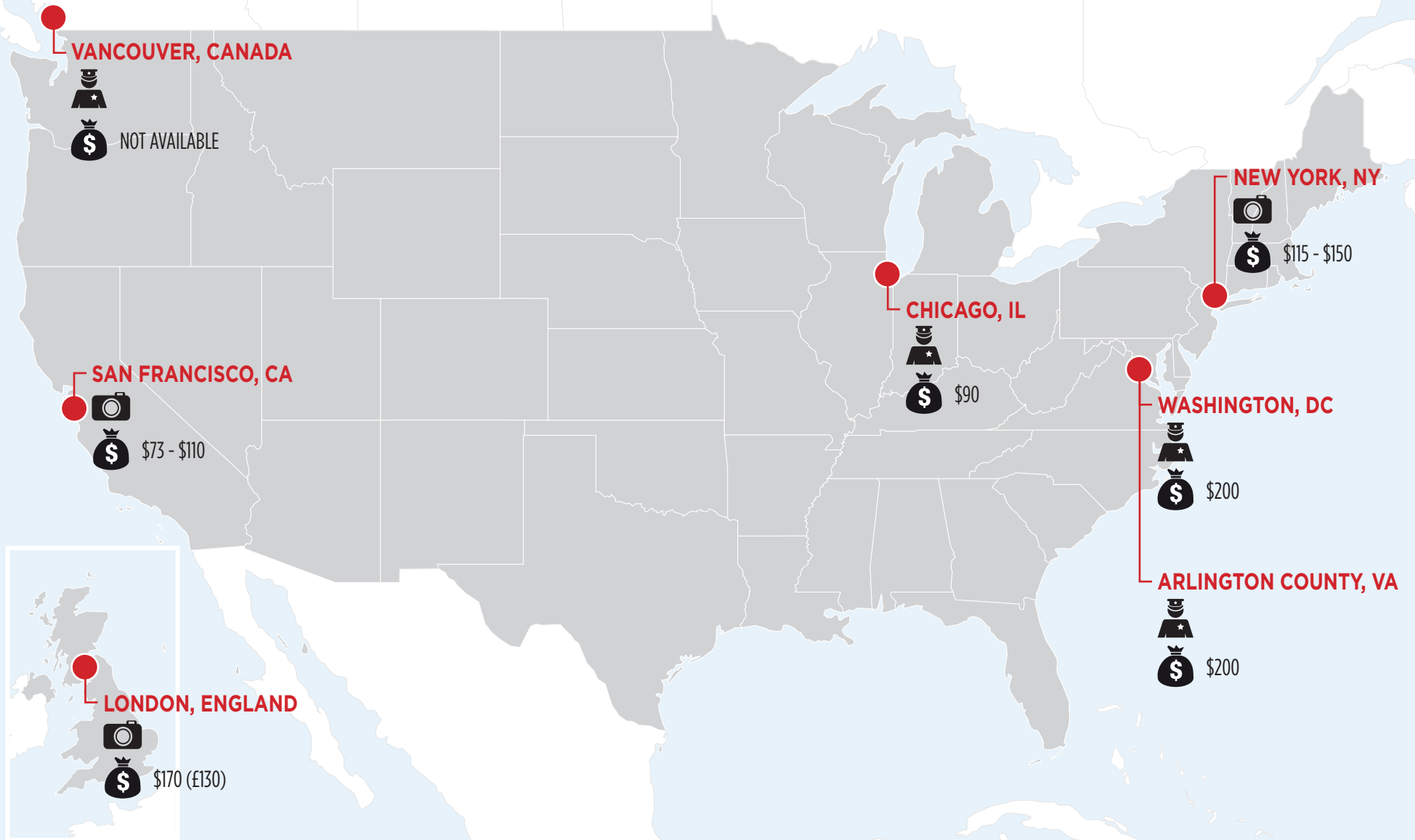
Reviewing past projects and identifying best practices is also useful to ensure the success of future projects. NYCDOT stress that agencies must be willing to reevaluate practices to improve implementation, whether using case studies from an agency’s own experience or the experience of others.

Agencies in the TPB region should consider these findings and examples when considering bus lanes in their jurisdictions. Many bus lane facilities will cross jurisdictional boundaries and warrant coordination, and the sponsoring agency must take the lead to consider all agency stakeholders that should be involved, as well as their role throughout the life-cycle of the bus lane. Planning, design, construction, enforcement, and maintenance could all involve different agencies and sub-agencies. All relevant entities need to be engaged from the beginning. Furthermore, mechanisms must be established to ensure that the coordination is lasting.



SECTION 2.2: ENFORCEMENT

Although practices vary, police enforcement and automated enforcement (e.g., camera) are the two most common enforcement tools utilized to minimize bus lane violations. This page shows the enforcement strategies for agencies interviewed for this study, including bus lane violation fines.



SECTION 2.2.1: POLICE ENFORCEMENT

Several studies indicated that the perception of limited bus lane enforcement increases violation rates, diminishing the effectiveness of bus lanes and resulting in reduced bus speeds.^{4,5} When automated camera enforcement is not practical, some level of police presence is needed to discourage potential violators from entering the bus lanes.

Typically, transit agencies and jurisdictions place more emphasis on police enforcement when bus lanes first open. However, targeted enforcement tends to diminish afterwards due to several challenges associated with police enforcement:

- **Resources:** Police enforcement requires considerable financial and human resources. Budget limitations and conflicting priorities can make it difficult to sustain a continuous police enforcement program.
- **Authorization:** For most agencies, including local jurisdictions in the TPB region, transit agency staff (including transit police) are rarely authorized to enforce bus lane restrictions or moving violations. This increases reliance on police enforcement, which compounds budget and resource allocation issues.
- **Physical Infrastructure:** Low-cost, low-resource bus lane concepts, such as curbside lanes with no paint, are the easiest to implement but also the most difficult to consistently enforce. It is necessary to find a balance between building a “self-enforcing” lane (e.g., offset bus lanes with red paint) and paying to enforce restrictions.
- **Compliance Impact on Operations:** Pulling over non-compliant vehicles in the bus lanes can block buses, negatively affecting bus operations. To address this issue on recently implemented bus lanes in Baltimore City, Baltimore police pull violators over on side streets.
- **Other Permitted Users:** Curbside bus lanes often allow other vehicles such as taxis, shuttles, and right-turning vehicles to use bus lanes. While allowing other vehicles in bus lanes increases utilization of roadway space, it creates enforcement challenges.

4 Assessment of bus lane violations in relation to road infrastructure, traffic, and land-use features: The case of Thessaloniki, Greece, Gavanas et al., 2013

5 Factors contributing to bus lane obstruction and usage in New York City: Does design matter? Safran et al., Transportation Research Record, Vol. 2418, 2014

CONCEPTS THAT ARE EASIEST TO IMPLEMENT ARE THE HARDEST TO CONSISTENTLY ENFORCE AND REQUIRES CONSTANT POLICE PRESENCE.



SECTION 2.2.2: AUTOMATED ENFORCEMENT

Generally, transit agencies or law enforcement use two types of camera enforcement to automate the enforcement process:

1. Stationary cameras installed at selected locations/corridors
2. Cameras on buses

Both types can generate automatic citations for both moving and parking violations. Compared to active police enforcement, which is resource-intensive, automated enforcement can have significant fiscal and enforcement benefits.

However, transit agencies are rarely authorized to enforce restrictions in the bus lanes within which they operate, presenting challenges in ensuring that only buses use the lanes designated solely for their use.⁶ Automated enforcement via cameras is usually permitted by legislation, and usually cannot be implemented without new enabling legislation (see *Section 2.3* for legislation details). New York and California are the only states in the U.S. with specific bus lane camera enforcement, and each required enabling legislation before implementing camera enforcement. Specific legislation enabled each state to begin camera-based bus lane enforcement as a pilot or a demonstration program, then extended and expanded their pilot programs as part of an iterative legislative process.

None of the agencies or jurisdictions currently operating bus lanes in the TPB region use automated enforcement as part of the bus lane enforcement program. However, agency interviews indicated that jurisdictions would be open to switching to automated enforcement if bus lanes receive strong negative feedback both from the public and transit operators related to enforcement and violations.

NEW YORK

The implementation of “Select Bus Service (SBS)” in New York is one of the most successful examples of introducing bus lanes as part of bus rapid transit in the United States. Due to the heavy volume of traffic on New York City streets, bus lane enforcement cameras have been useful in automating a process that would otherwise require significant human capital, while also developing an enforcement regime that discourages potential violators from entering the bus lanes.

New York’s initial legislation (2010) granted NYCDOT and MTA New York City Transit the ability to install bus lane enforcement cameras on five specified SBS routes. In 2015, the New York State Legislature and Governor extended the law for ten years, allowing the city to use bus lane cameras on up to 15 additional routes. New York’s enabling legislation includes a maximum fine amount, requirements for camera-related signage along corridors, and a time span for enforcement (bus lane cameras may only be operated on designated bus lanes during weekdays from 7:00 AM to 7:00 PM).⁷

Two types of camera enforcement have been used in New York City to date: Stationary Cameras and On-Bus Cameras. On-bus cameras record standing violations; stationary cameras primarily record driving violations in the bus lane. Stationary cameras, installed along SBS corridors, are operated by NYCDOT; a pilot program with on-bus cameras was administered by MTA New York City Transit. Each enforcement method was designed to capture multiple photos to ensure that a violation was being committed, and to allow MTA New York City Transit staff (on-bus cameras) or NYCDOT staff (stationary cameras) to determine if there was a legitimate reason for a private vehicle to enter the bus lane. An adjudication process, managed by the New York City Department of Finance, was also established to allow drivers who felt they were wrongly cited to appeal the fine. As of 2012, only two percent of all citations were overturned.⁸

Before photo enforcement was implemented on the M15 SBS route, the New York Police Department placed officers along the route who issued both moving and parking violations to vehicles illegally obstructing the bus lane.⁹

6 Shared-Use Bus Priority Lanes on City Streets: Case Studies in Design and Management. Mineta Transportation Institute, 2012.

7 Laws of New York, Vehicle and Traffic Law, § 1111-c.

8 New York City Department of Transportation, 2012 Bus Lane Camera Enforcement Update Report

9 Select Bus Service on M15 in New York City, Transportation Research Board, 2012.

CALIFORNIA

California's initial automated bus lane enforcement legislation (2007) established a Transit-Only Lane Enforcement (TOLE) pilot program on a pre-defined list of specific streets in San Francisco. In 2011, the state legislature extended the pilot project through 2015 for 25 miles of dedicated curbside transit lanes. In 2015, the TOLE pilot program was made permanent. California defines "transit-only traffic lane" as any designated transit-only lane on which use is restricted to mass transit vehicles, or other designated vehicles including taxis and vanpools, during posted times.¹⁰

San Francisco uses forward facing cameras on buses for its TOLE program (**Figure 3**). If a vehicle is using the lane illegally (detected by cameras automatically, doesn't rely on driver initiation), the bus camera takes a photograph of the vehicle's license plate and a citation is issued to the vehicle's owner.¹¹ San Francisco's legal ability to install cameras on city-owned public transit vehicles is enabled by changes made to the California Vehicles Code, as well as municipal regulations.¹² The City and County of San Francisco¹³ can issue citations (civil penalties) for violations captured during the posted hours of operation for a transit-only traffic lane; the video image is confidential, and destroyed after six months (or 60 days after the final disposition of the citation). Bus lane use violation is not treated as a traffic infraction, and thus does not result in points assessed to the driver's license.¹⁴

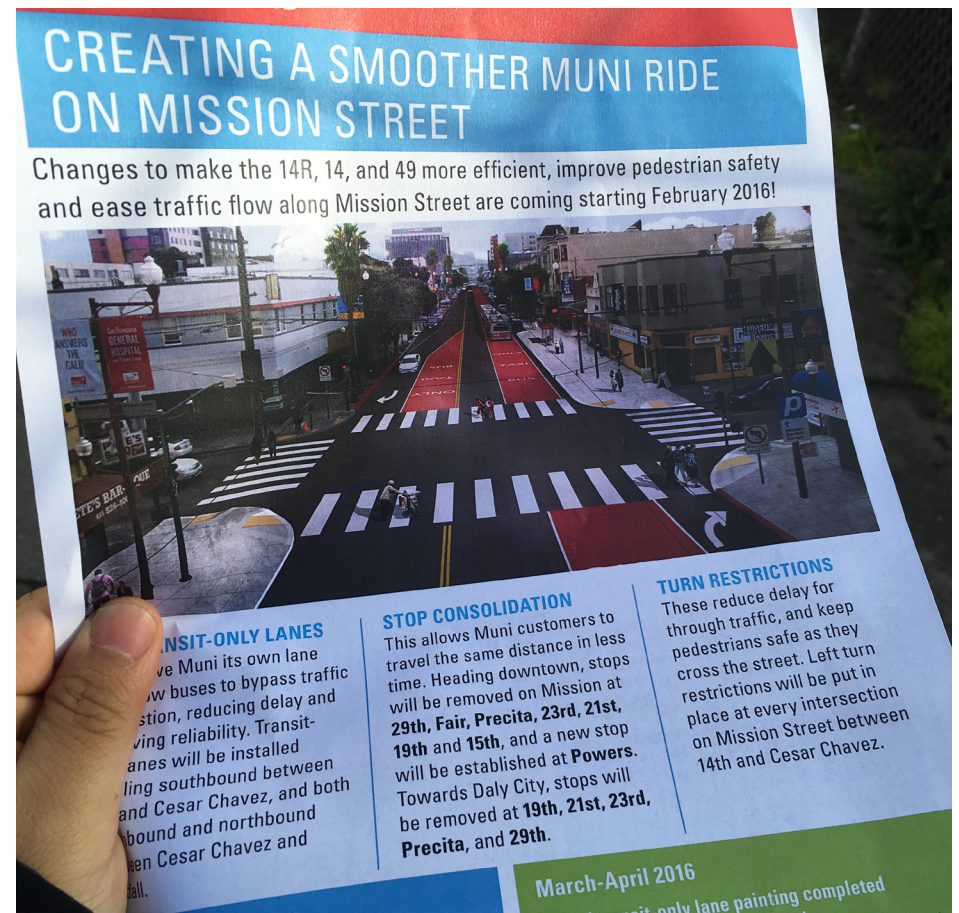
An education and outreach program was conducted prior to beginning automated enforcement with on-board cameras so drivers would be aware of new regulations and the consequences of parking or driving in the transit-only lanes (**Figure 4**).¹⁵ The TOLE pilot program found very few repeat offenders; typically, once a driver is given a citation for blocking the transit-only lane, it is very unlikely they will do so again.

Following an 18-month TOLE pilot project on a busy corridor, the San Francisco Municipal Transportation Authority (SFMTA) found that while bus travel times only decreased slightly, the variability of travel times decreased significantly.¹⁶

FIGURE 3 MUNI COACH WITH TOLE BUMPER STICKER



FIGURE 4 MISSION STREET TRANSIT ONLY LANES NEWSLETTERS FOR EDUCATION



¹⁰ California Assembly Bill No. 1041 (2011). http://www.leginfo.ca.gov/pub/11-12/bill/asm/ab_1001-1050/ab_1041_bill_20110926_chaptered.pdf

¹¹ Red Light Camera and Other Automated Enforcement, SFMTA. <https://www.sfmta.com/services/permits-citations/camera-enforcement>

¹² California Assembly Bill No. 1041 (2011). http://www.leginfo.ca.gov/pub/11-12/bill/asm/ab_1001-1050/ab_1041_bill_20110926_chaptered.pdf

¹³ San Francisco is a consolidated city-county jurisdiction.

¹⁴ Bus Lanes in Downtown Miami Final Report, Miami-Dade MPO, 2015.

¹⁵ "Laying out the Red Carpet for Muni's Rapid Transit Network," SFMTA, March 22, 2016. <https://www.sfmta.com/about-sfmta/blog/laying-out-red-carpet-muni%E2%80%99s-rapid-network>

¹⁶ Church Street Pilot Transit Lanes. SFMTA, 2015.

SECTION 2.2.3: TPB JURISDICTION AND PARTNER AGENCY ENFORCEMENT STRATEGIES

Currently, there are only a few miles of installed bus lanes in TPB jurisdictions, including new bus lanes on a short stretch of Georgia Avenue NW in the District of Columbia and the Crystal City/Potomac Yard Transitway in Alexandria and Arlington (Table 2). Several other corridors are under study, including 16th Street NW in the District of Columbia, VA 7 in Northern Virginia, and MD 586 (Veirs Mill Road) in Montgomery County (Table 1).

As part of the literature review, local agency interviews were conducted to identify issues and lessons-learned related to bus lane implementation. Key enforcement takeaways from agency interviews are summarized as follows:

- Interagency coordination throughout the planning, design, and operational phases is essential to the success of bus lane projects.
 - » The District Department of Transportation's (DDOT's) Georgia Avenue bus lanes and Crystal City Potomac Yard Transitway in Arlington and Alexandria provide two examples of how interagency coordination plays a critical role in implementing bus lanes. For both bus lanes, WMATA staff has been involved throughout planning, design, and implementation. For the Transitway, WMATA has worked very closely with Arlington County and the City of Alexandria on the branding of the Metroway and the development of the operations plan through regular meetings. Arlington County also coordinated closely with both the Virginia Department of Transportation (VDOT) and the Northern Virginia Transportation Commission (NVTC).
 - » Maryland Transit Administration (MTA) and Baltimore Department of Transportation set up a meeting with local enforcement agencies (Baltimore Police, MTA Police, and Baltimore Traffic Enforcement) to discuss enforcement of bus lanes in Baltimore. Key topics discussed included identifying which agencies were responsible for enforcing bus lane violations; pulling over non-compliant vehicles in the bus lanes; the types of vehicles allowed in the bus lanes; and the education campaign.
 - » Communication and coordination meetings tend to disappear after bus lane implementation, making it difficult to monitor issues and challenges with respect to the operation of bus lanes.

- Understanding legislative challenges up front and preparing for them prior to implementation is key to the success of bus lane projects.
 - » DDOT issued a District rulemaking to provide the District with the authority to enforce bus lanes.
 - » The City of Alexandria and Arlington County passed ordinances to allow for off-board fare collection, rush hour bus lanes (Arlington County) and the Transitway.
- Agencies in the planning stage of bus lanes often spend more time considering education and public outreach than enforcement or legislation.
- After bus lanes open, limited data is available on the performance of bus lanes, including the number of police citations or repeat offenders.

FIGURE 5 MEDIAN RUNNING PORTION OF THE CRYSTAL CITY POTOMAC YARD TRANSITWAY



TABLE 2 RECENTLY IMPLEMENTED TPB JURISDICTION AND PARTNER AGENCY BUS LANES - ENFORCEMENT STRATEGIES

TPB Jurisdictions	Current Bus Lanes	Enforcement Strategies
Washington, DC (DDOT)	Georgia Avenue bus lanes	<ul style="list-style-type: none"> • Two-week grace period for motorists between pavement marking implementation and full enforcement (ticketing) • \$200 penalty for violators • Metropolitan Police Department provided initial enhanced enforcement to issue warnings and tickets • Red paint pavement markings serve as an enforcement and education tool
City of Alexandria, VA	Crystal City Potomac Yard Transitway	<ul style="list-style-type: none"> • For the first few weeks after opening, police were present to enforce lanes and remind drivers that they are not allowed to be in the Transitway • Fine of \$200, as allowed by Virginia state law • City doesn't use photo enforcement; relies on police enforcement • The City doesn't have a specific program for enforcement, but they also do not experience significant enforcement issues due to the design of the Transitway (Figure 5 - median running dedicated bus lanes)
Arlington County, VA	Crystal City Potomac Yard Transitway	<ul style="list-style-type: none"> • 30-day "grace-period" on enforcement after opening • Fine of \$200, as allowed by Virginia state law • County does not use cameras for enforcement; relies on police enforcement • After the Transitway opened, the police issued several tickets to violators; however, the County does not have the total number of tickets • Police are concentrating efforts in the AM/PM rush hours and at lunch time • According to the police, the biggest problem on the Transitway is not motorists driving in it, it is Uber/Lyft/Taxi drivers stopping to pick up and drop off passengers (only Metroway buses, Arlington Transit buses, and authorized police, fire, and rescue vehicles are currently authorized to use the Transitway).
City of Baltimore, MD	Pratt Street and Lombard Street	<ul style="list-style-type: none"> • Initial meeting between MTA, Baltimore Police, MTA Police, and Baltimore Traffic Enforcement to discuss enforcement. • MTA Police can issue moving violations wherever MTA provides service. • As of February 2017, 113 enforcement tickets were issued to drivers for the violation of bus lane restrictions. • Coordination on enforcement between Baltimore Police and MTA Police continues beyond the initial coordination session.

SECTION 2.3: LEGISLATION

SECTION 2.3.1: VIOLATION TYPES

Although states and municipalities have varying regulations, there are typically two ways/categories in which bus lane violations are processed:

- **Infractions**, in which a police officer files charges directly against a vehicle operator, resulting in a court hearing, fines, driver's license penalties, or possibly jail time; and
- **Administrative or Civil Violations** (such as parking tickets), which are issued to the registered owner of a vehicle (not necessarily the person who parked it), resulting in fines, but not necessarily a court hearing. Administrative violations can be issued by government agents other than police officers, and typically require less evidence (and result in less paperwork) than infractions.

In New York City, bus lane moving violations issued by police officers remain infractions, and may result in both fines and points against a driver's license. In contrast, a bus lane violation captured on camera may result in a fine, but will not be included in a driver's operating record, or used for insurance purposes.¹⁷ It can be difficult for camera-based systems to meet evidence standards required for infractions, such as proof of the driver's identity.¹⁸

There are various types of camera-based enforcement of parking or moving violations, but New York City and San Francisco have the most robust, most explicit, on-board camera enforcement of violations in bus lanes in the United States. Each city required enabling legislation from their respective states to develop their bus lane camera enforcement program, and each city used an iterative policy and legislation development process that began with pilot/demonstration projects and developed into broader programs. Key elements of their respective enabling legislation included:

- Pilot/demonstration project sunset provision
- Legislative reporting requirements
- Warning periods before fines are issued for violations
- Identification of camera locations (on-board buses or stationary) and locations of corridors with camera enforcement
- Enforcement hours
- Violation types and fine amounts
- Enforcement processes and privacy protections

¹⁷ New York State Assembly Bill No. S05608 (2015). http://assembly.state.ny.us/leg/?default_fld=&leg_video=&bn=S05608&term=2015&Summary=Y&Actions=Y&Text=Y

¹⁸ Shared-Use Bus Priority Lanes on City Streets: Approaches to Access and Enforcement, Journal of Public Transportation, 2013.

FIGURE 6 BUS LANE CAMERA ENFORCEMENT: GENERAL LEGISLATIVE FACTORS TO CONSIDER

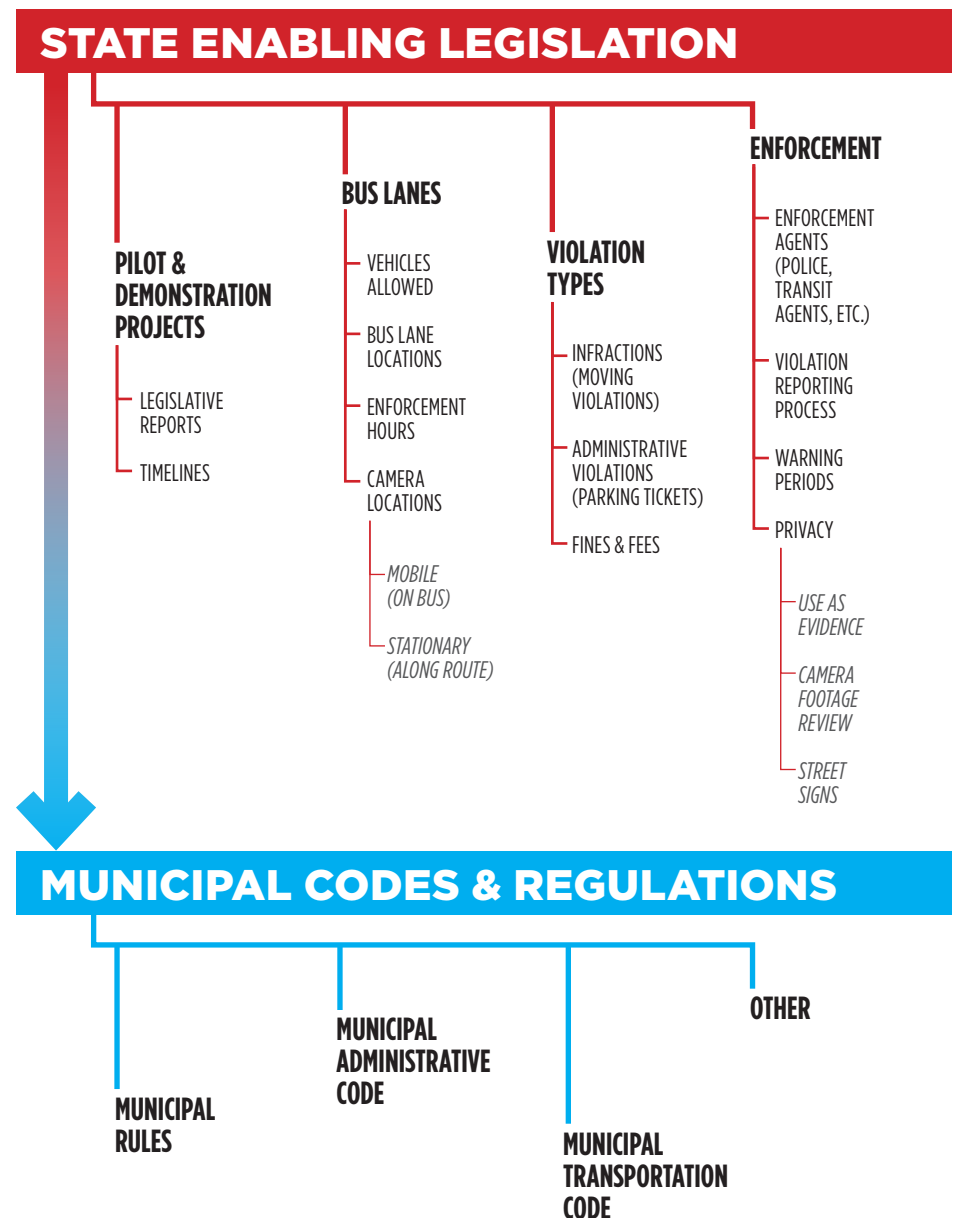


Figure 6 generally reflects bus lane camera-enforcement elements found in New York and California. Other states and municipalities (including those in the TPB region) may have different circumstances and requirements.

NEW YORK

New York's initial legislation (2010) granted NYCDOT and MTA New York City Transit the ability to install bus lane enforcement cameras on five specified SBS routes. As of 2012, NYCDOT had installed cameras at static locations on three bus routes, and MTA New York City Transit had installed on-board cameras (rear-facing on six buses) as a pilot study on one bus route. By 2015, the New York State Legislature and Governor extended the law for 10 years, allowing the city to use bus lane cameras on up to 15 additional routes. New York's enabling legislation also includes a maximum fine amount, as well as requirements for camera-related signage along corridors.¹⁹

CALIFORNIA

California's initial automated bus lane enforcement legislation (2007) established a TOLE pilot program on a pre-defined list of specific streets in San Francisco. In 2011, the state legislature extended the pilot project through 2015 for 25 miles of dedicated curbside transit lanes. In 2015, it made the TOLE program permanent. To enforce Transit-Only lanes, San Francisco uses forward facing cameras on buses. If a vehicle is stopped or parked within a transit-only lane, the bus camera takes a photograph of the vehicle's license plate and a citation is issued to the vehicle's owner.²⁰ San Francisco's legal ability to install cameras on city-owned public transit vehicles is enabled by changes made to the California Vehicles Code, as well as municipal regulations.²¹

SECTION 2.3.2: TPB JURISDICTION LEGISLATIVE STRATEGIES

TPB jurisdictions are subject to a variety of state and local laws and regulations. Virginia and Maryland have very different approaches to Home Rule (which impacts the ability of local governments to develop legislation independent of state enabling statutes). The District of Columbia – while technically entitled to home rule – is still subject to Congressional review. Both states and the District of Columbia have passed legislation enabling the use of camera-based enforcement of certain activities; none of them, however, have enabled camera-based enforcement of bus lanes.

VIRGINIA

The Commonwealth of Virginia has passed legislation enabling local governments to install video monitoring systems on school buses to record vehicles that fail to stop until schoolchildren have crossed the street. The enabling legislation includes provisions for violation processing, notification, and minimum recorded image requirements. Virginia also enables localities to use photo-monitoring to enforce traffic signals, although the number of intersections with photo-monitoring is limited by the number of residents. While Virginia enables localities to designate highway lanes within their jurisdiction as high-occupancy vehicle (HOV) lanes, it has not yet enabled camera-based enforcement for those lanes.

Both Arlington County and the City of Alexandria have established bus-only transitways within their jurisdictions. Unauthorized use of the transitways during designated hours results in a fine. Neither Arlington County nor the City of Alexandria use cameras to enforce their transitways, as this would likely require enabling legislation from the Virginia General Assembly.

MARYLAND

The State of Maryland has passed legislation enabling local law enforcement to issue citations for violations of state or local traffic laws or regulations recorded on cameras in several types of locations, including work zones. The Maryland General Assembly has also passed enabling legislation allowing local governments to work with law enforcement and school boards to place cameras on school buses, and to work with law enforcement agencies to use red light cameras at intersections.

DISTRICT OF COLUMBIA

The District of Columbia has passed legislation enabling automated camera-based enforcement for red light violations, as well as for vehicles illegally parked during street sweeping. Red-light cameras are attached to traffic lights, and street-sweeping cameras are attached to the street sweepers themselves. While the District of Columbia does allow local government to establish bus lanes, it has not yet explicitly enabled camera-based enforcement of those lanes.

¹⁹ Laws of New York, Vehicle and Traffic Law, § 1111-c.

²⁰ Red Light Camera and Other Automated Enforcement, SFMTA. <https://www.sfmta.com/services/permits-citations/camera-enforcement>

²¹ California Assembly Bill No. 1041 (2011). http://www.leginfo.ca.gov/pub/11-12/bill/asm/ab_1001-1050/ab_1041_bill_20110926_chaptered.pdf

SECTION 2.4: EDUCATION

This section provides a summary of best practices in educational/public outreach efforts based on the peer review findings. Effective messaging tactics and optimal target groups for different types of outreach for the local jurisdictions are also noted.

SECTION 2.4.1: EFFECTIVE MESSAGES AND TACTICS

SIGNAL THE EXCLUSIVITY OF A BUS LANE TO ROAD USERS THROUGH STRIPING, MARKING, OR SIGNS

As demonstrated in San Francisco and many other locations across the country, installing lane markings, colored lanes, or signs to indicate the existence of a bus lane is the simplest, most practical, and perhaps the most necessary form of public education during bus lane projects (**Figure 7**). This intervention effectively educates all road users simultaneously, including pedestrians, cyclists, taxi drivers, private vehicle drivers, and transit operators.

FIGURE 7 RED TRANSIT-ONLY LANE, CORNER OF 16TH AND MISSION STREETS (SAN FRANCISCO)



PROVIDE SIMPLE, CLEAR, AND INFORMATIVE PROJECT DETAILS THROUGH WEBSITES AND SOCIAL MEDIA

When promoting a bus lane project, the presence of easy-to-read, sufficiently detailed information on project details, frequently asked questions, upcoming meetings, and discussion forums on websites, blogs, and social media is crucial to the processes of educating the public, thereby improving compliance and bus lane efficiency. Moreover, the use of digital information allows for real-time updates on information that may shift as a plan progresses.

Seattle DOT's (SDOT's) online information efforts provide strong examples of best practices in public education. The use of clear maps, colorful visuals, and simplified frequently asked questions and fact sheets effectively translate complex transit improvement projects into accessible materials for the average user (**Figure 8**). In addition, through its website, SDOT offers insight into how these projects will affect transit riders, including specific stop or station upgrades, frequency changes, additional buses, and decreased travel times.

FIGURE 8 SEATTLE DOT MAP AND SCREENSHOT OF SOUTH LAKE UNION TRANSIT IMPROVEMENTS PAGE

Key Features

To make transit work better, in addition to adding transit lanes, turn restrictions and removal or restriction of some on-street parking is required at the following locations:

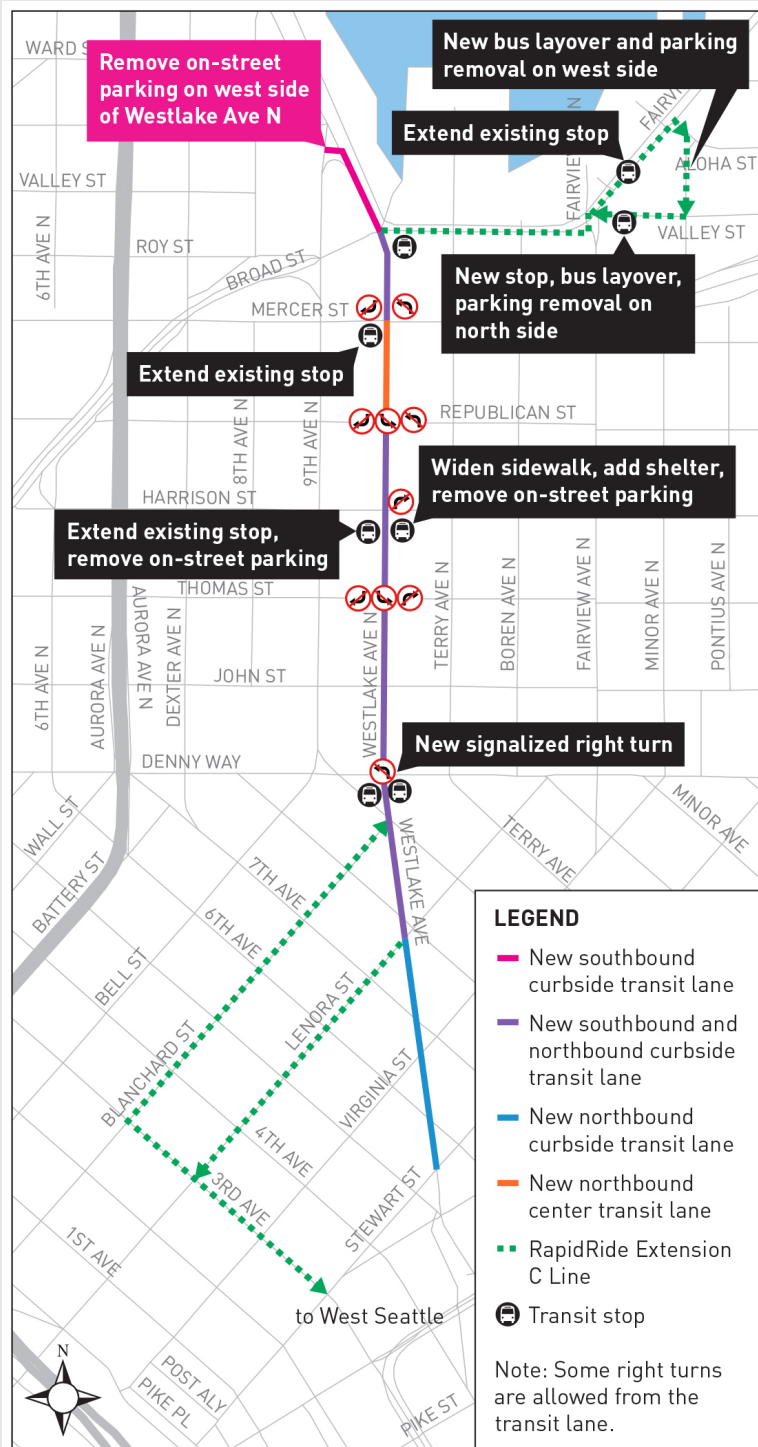
New curbside bus only lanes will operate 24/7 except for a small portion between Ninth Ave N and Valley St. In this location they will be operate between 6AM to 7PM on weekdays.

- Northbound Westlake Ave N at:
 - Denny Way—No left turn (6A-7P)
 - Thomas St—no right turn
 - Harrison St—No right turn
 - Republican St—No left turn
 - Mercer St—No left turn
- Southbound Westlake Ave N at:
 - Mercer St—No right turn
 - Republican St—No left or right turn
 - Thomas St—No left or right turn
- Near the Marriott Residence Inn and Fred Hutch
 - Minor Avenue N between Aloha Street and Valley Street—on west side remove on-street parking on west side, trim trees and install layover signs
 - Valley Street between Fairview and Minor—On north side install platform for passengers, repair road, remove on-street parking, trim trees, remove one tree and add layover signs

Benefits

More bus service means there is room for hundreds of more people.
BENEFIT: Increased mobility, affordable transportation options

Dedicated transit lanes allow the streetcar and buses to bypass traffic reducing delay and making for a smoother, more predictable ride.
BENEFIT: Faster, more reliable service



EARNED, PAID, AND PRODUCED MEDIA ALL HAVE A ROLE

Potential and current transit riders read the newspaper, listen to the radio, watch television, and go online. Media coverage can increase exposure, expanding ways to reach a larger audience and amplifying key messages. Agencies can attract extra attention to a project by purchasing advertisements or working with reporters to spread information. Press releases could be an effective tool in garnering media and public attention. In short, transit agencies can use media as another tool to provide answers to the public on such questions as:

- How will dedicated lanes change my commute?
- Will travel times by car or bus be shorter or longer?
- When are the lanes scheduled to open?

START EDUCATING AND MESSAGING EARLY, AND CONTINUE DURING AND AFTER IMPLEMENTATION

While exact outreach timing will depend on the project, transit providers should begin planning and implementing educational campaigns well before a bus lane is in place. Virtually all outreach tactics - information dissemination, direct mailing, and media, in particular - can prove to be useful tools leading up to and during implementation.

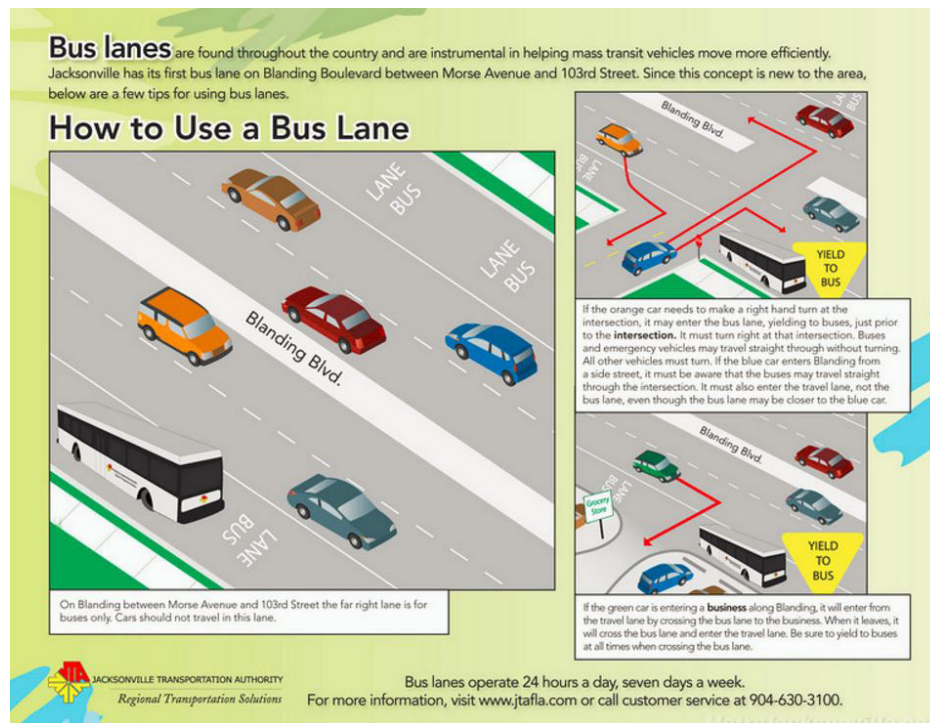
PRINT MATERIALS ARE IMPORTANT, TOO

Not all constituents have access to a computer; sometimes the best way to reach a transit rider is via print materials, which can be distributed in person, on a transit vehicle or sent via direct mail. The Chicago Transit Authority's (CTA) Loop Link brochure provided a concise, informative look at an important transit project for the city in an easy-to-understand, hard copy format (Figure 9). An effort was made to distribute materials to those utilizing parking garages in the downtown to educate them regarding the bus lanes. Figure 10 is another great example from the Jacksonville Transportation Authority to educate the public about bus lane rules and raise awareness. To reach and educate the largest number of people possible, transit providers should diversify the methods with which they reach out to riders, interest groups, and other constituencies.

FIGURE 9 CHICAGO TRANSIT AUTHORITY (CTA) LOOP LINK BROCHURE



FIGURE 10 EDUCATIONAL BUS LANE BROCHURE FROM THE JACKSONVILLE TRANSPORTATION AUTHORITY



SECTION 2.4.2: TARGETING EDUCATIONAL CAMPAIGNS AND IDENTIFYING PARTNER ORGANIZATIONS

TAILOR ENGAGEMENT METHODS TO FIT THE PROJECT. USING DATA AND PROFESSIONAL JUDGMENT, TARGET RELEVANT CONSTITUENCIES/POPULATIONS AND IDENTIFY PROJECT PARTNERS

Outreach efforts should be tailored and scaled to the needs of the project. With a dedicated bus lane, all road users - including pedestrians, bikers, drivers, and transit operators - will be affected. Agencies should target outreach toward residents, homeowner associations, community centers, major organizations, educational or religious institutions, store owners, and jurisdictional leaders within close proximity of the proposed or in-place right of way and bus stop station areas.

Prior to implementing public outreach, agencies should perform an identification assessment of likely affected populations using geographic information system (GIS) and other research methods. As noted in the Transit Cooperative Research Program's *Public Participation Strategies for Transit*, agencies can use a variety of data sources and consultation methods to accomplish this goal.²²

Depending on the project, agencies may wish to perform targeted outreach toward certain demographic groups, including seniors, persons with disabilities, transit-dependent populations, low-income residents, minorities, students, choice riders, and non-English speakers.

ALWAYS EDUCATE TRANSIT VEHICLE OPERATORS

Wherever bus lanes are implemented, transit vehicle operators will require education. When implementing such a project, agencies should update operator manuals and offer training prior to and during implementation to help transit vehicle operators avoid conflicts with other road users, take advantage of time-saving techniques such as off-board fare collection or all-door boarding (if applicable), and generally present an assessment of what transit vehicle operators can expect when a new project opens.²³

22 Transit Cooperative Research Program (TCRP) Synthesis 89: Public Participation Strategies for Transit. Transportation Research Board, 2011.

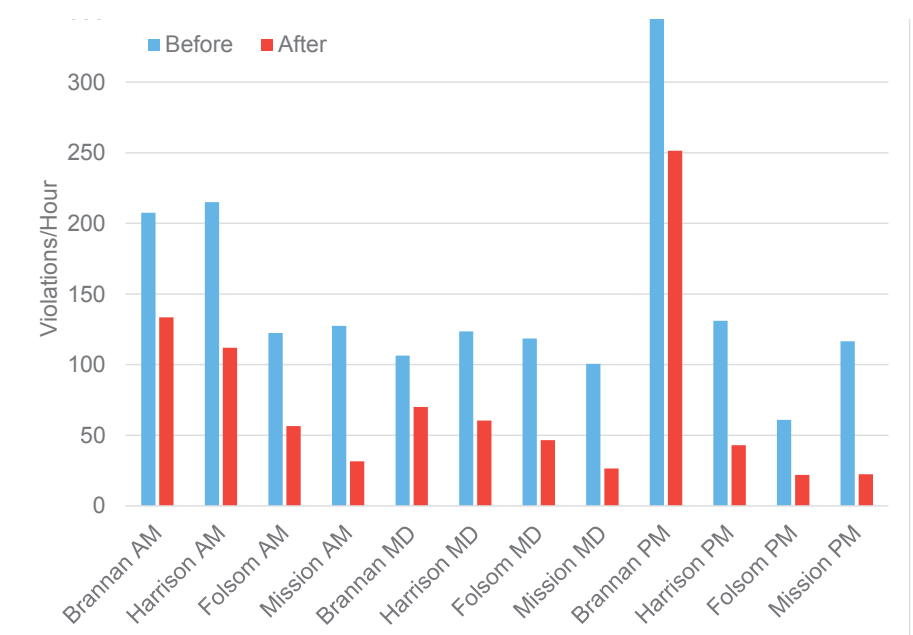
23 San Francisco's Transit-Only Lane Enforcement (TOLE) Pilot Program Evaluation. SFMTA, 2015.

SECTION 2.5: MONITORING

Enforcement, legislation, and outreach activities are all critical elements of implementing effective bus lanes. However, a successful bus lane also requires continuous monitoring after the bus lanes are installed. These monitoring actions should include the development of performance measures that are meaningful and measurable for evaluating the effectiveness of bus lanes as well as compliance and violation rates. Key measures to assess the efficacy of enforcement tactics on bus lanes include:

- Compliance** - The post-implementation evaluation should track the number of vehicles complying with the bus lane, relative to the number of vehicles driving illegally in the bus lanes, as well as the number of stationary vehicles in the bus lanes. Changes in the type of enforcement (e.g., from police to camera enforcement) should be monitored as well, to document the effect of enforcement strategies on adherence to bus lane rules. **Figure 11** shows an example from a recent study in San Francisco displaying the total number of violations before and after the red paint treatment on 3rd Street.²⁴
- Repeat offenders** - Initial non-compliance with bus lanes may be attributed to a lack of understanding regarding the purpose and/or function of the facilities. The post-implementation monitoring should assess the frequency of repeat offenders to determine the effectiveness of painted bus lanes, enforcement, educational campaigns, etc.
- Bus Travel Time Comparison** - The post-implementation monitoring should focus on the change in bus travel time to assess the effectiveness of bus lanes. This measure can also help agencies identify segments that require more targeted enforcement strategies to improve bus operations.

FIGURE 11 SAN FRANCISCO 3RD STREET TRANSIT-ONLY LANE BEFORE AND AFTER RED TREATMENT AND CORRESPONDING VIOLATIONS PER HOUR ALONG THE CORRIDOR



²⁴ Red Transit Lanes Final Evaluation Report, San Francisco Municipal Transportation Agency, February 10, 2017.

SECTION 3.0: IMPLEMENTATION PLAN

This section describes an overview of the strategic framework of needs and opportunities for use by TPB jurisdictions to effectively implement bus lanes. While the detailed implementation plan is available in a separate appendix, a brief summary for local jurisdictions in the TPB is provided here. As noted previously, this study focused primarily on the period following corridor selection and the completion of the planning process and the associated actions key to successful implementation and management of bus lanes. While the assessment and feasibility of bus lanes, which occurs earlier on in the planning process, was not within the scope of this study, this section prescribes a general framework for the planning process. For local agencies in the early planning stages of bus priority treatments it is recommended that agencies review the following documents:

- *Shared-Use Bus Priority Lanes on City Streets: Case Studies in Design and Management* (Agrawal et al., Journal of Public Transportation)
- *TCRP Report 183: A Guidebook on Transit-Supportive Roadway Strategies* (Ryus et al., Transportation Research Board)

The phases and associated recommendations for successful implementation of bus lane projects are summarized on this and the following page.

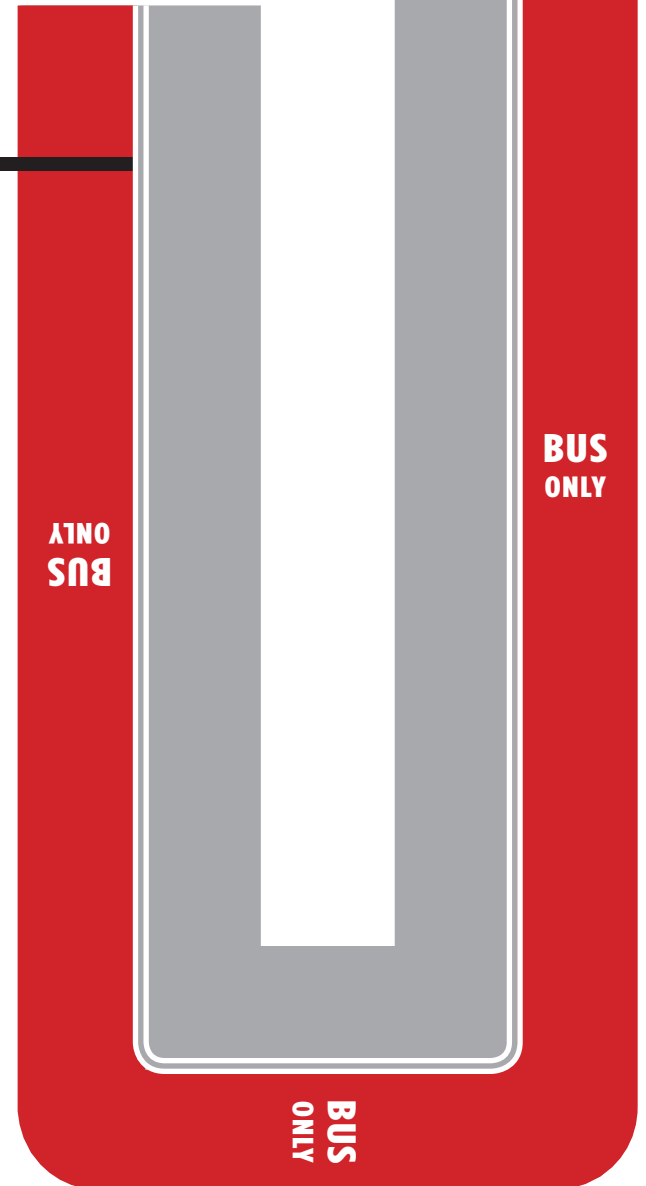


PHASE 1 PLANNING STAGE

The first phase towards effective bus lane implementation is to develop a corridor selection and planning process, and establish an interagency working group. This includes:

- Developing key performance measures for bus lane assessment that are consistent across the region
- Conducting a performance evaluation to determine ideal corridors that would benefit most from transit improvements
- Identifying key stakeholders that need to be most actively involved in the project's early engagement, as well as determining parties that should be updated periodically

START



BUS ONLY



PRIOR TO IMPLEMENTATION



BUS ONLY

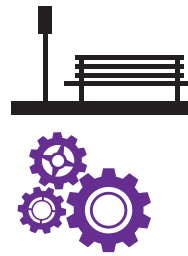
BUS ONLY

This phase includes actions prior to implementation after the planning process is completed:

- Developing an enforcement program with a focus on police enforcement and/or automated enforcement
- Reviewing laws currently governing use of public rights-of-way and types of enforcement permitted in order to understand and address legislative barriers in the implementation of bus lanes
- Establishing a strategic plan for public engagement to promote project support and identifying various interest groups and appropriate types of engagement



AFTER OPENING



After bus lanes are in operation, agencies should take the following steps:

- Continuing education and public outreach to inform target audiences and promote awareness
- Mobilizing targeted police enforcement for the first few weeks as part of the enforcement program
- Conducting performance monitoring to evaluate the efficiency of enforcement strategies (e.g., number of violations or assessment of repeat offenders).

BUS ONLY

FINISH



STAKEHOLDER COORDINATION

The engagement of various stakeholder groups will help build consensus to determine best ways to support the implementation process and provide assistance for the legislative and executive actions needed for successful implementation. Transit operators are often one of multiple agencies responsible for the design, operation, and enforcement of bus lanes. Identifying and engaging key stakeholders in a structured and deliberate manner early on, and throughout the process, is essential to implementing successful bus lanes. Stakeholder coordination is not only necessary in the planning, design, and construction phases, but also must continue through the operational phase of a project.

SECTION 4.0: BENEFIT-COST ANALYSIS

This section provides a high-level assessment of the benefits and costs associated with various bus lane enforcement strategies through benefit-cost analyses (BCA). BCAs look at the net present value of the benefits, and divide them by the net present value of costs. A benefit-cost ratio (BCR) greater than one (1) indicates that benefits exceed costs and that the investment is promising. A BCR below one (1) indicates that costs outweigh benefits, and that the project will need further study or innovative strategies to identify benefits that may not have been adequately quantified to justify the project.

Table 3 summarizes the cost elements included in the BCA; detailed information on BCA methodology is provided in a separate technical memorandum in the appendices to this document. Within this section “manual enforcement” refers to police enforcement of bus lanes.

TABLE 3 BCA COST ELEMENTS AND UNITS

Cost Element	Cost	Unit
Standard Bus Lane - White Pavement Striping (Capital Cost)	\$100,000	Per Mile
Standard Bus Lane - White Pavement Striping (Maintenance Cost)	\$10,000	Per Mile Per Year
Red Paint Bus Lane (Capital Cost)	\$5	Per Square Feet
	\$308,000*	Per Mile
Red Paint Bus Lane (Maintenance Cost)	\$10,000	Per Mile Per Year
Manual Enforcement (Police enforcement)	\$49.50	Per Hour
Bus-Mounted Camera Enforcement (Capital Cost)	\$9,500	Per Bus
Bus-Mounted Camera Enforcement (Maintenance Cost)	\$15	Per Bus Per Week
Stationary Camera Enforcement (Capital Cost)	\$64,945	Per Camera
Stationary Camera Enforcement (Maintenance Cost)	\$414	Per Camera Per Week

* Red paint needs to be re-applied every five (5) years

Table 4 summarizes the various bus lane strategies, along with their associated capital costs, annual capital cost for each enforcement type, and annual enforcement maintenance costs. The capital and enforcement costs are calculated based on the assumptions that each bus lane would operate for five (5) days a week during peak periods (6 hours per day) at a frequency of fifteen (15) buses per hour. Each one (1) mile bus lane is assumed to operate for fifty (50) weeks (approximately one year, excluding major holidays).



TABLE 4 STRATEGIES AND ASSOCIATED ESTIMATED COSTS

Implementation Strategies ¹	Bus Lane Capital Cost (\$)	Bus Lane Maintenance Cost (\$/year)	Enforcement Capital Cost (\$)	Enforcement Maintenance Cost (\$/year)
Standard Lane Treatment - No Enforcement	\$100,000	\$10,000	-	-
Standard Lane Treatment - Low Manual Enforcement	\$100,000	\$10,000	-	\$12,375
Standard Lane Treatment - Moderate Manual Enforcement	\$100,000	\$10,000	-	\$49,500
Standard Lane Treatment - Maximum Manual Enforcement	\$100,000	\$10,000	-	\$99,000
Standard Lane Treatment - Bus-Mounted Automated Enforcement	\$100,000	\$10,000	\$142,500	\$11,250
Standard Lane Treatment - Stationary Automated Enforcement ²	\$100,000	\$10,000	\$129,891	\$41,382
Red Paint Bus Lanes ³ - No Enforcement	\$308,000	\$10,000	-	-
Red Paint Bus Lanes ³ - Low Manual Enforcement	\$308,000	\$10,000	-	\$12,375
Red Paint Bus Lanes ³ - Moderate Manual Enforcement	\$308,000	\$10,000	-	\$49,500
Red Paint Bus Lanes ³ - Maximum Manual Enforcement	\$308,000	\$10,000	-	\$99,000
Red Paint Bus Lanes ³ - Bus-Mounted Automated Enforcement	\$308,000	\$10,000	\$142,500	\$11,250
Red Paint Bus Lanes ³ - Stationary Automated Enforcement ²	\$308,000	\$10,000	\$129,891	\$41,382

¹ Assumes one (1) year of implementation and operation along a one (1) mile corridor running with a frequency of fifteen (15) buses per hour

² Assumes two (2) enforcement locations per mile, and two (2) cameras per enforcement location

³ Red paint needs to be re-applied every five (5) years

For the benefit calculation, the analysis considered passenger travel time savings and fleet savings. Due to the limitations in data about the effects of enforcement, the travel time savings and fleet saving benefits associated with the twelve implementation strategies were quantified using methods outlined in the Transit Capacity and Quality of Service Manual (TCQSM). As noted above, detailed information on BCA methodology is provided in a separate technical memorandum.

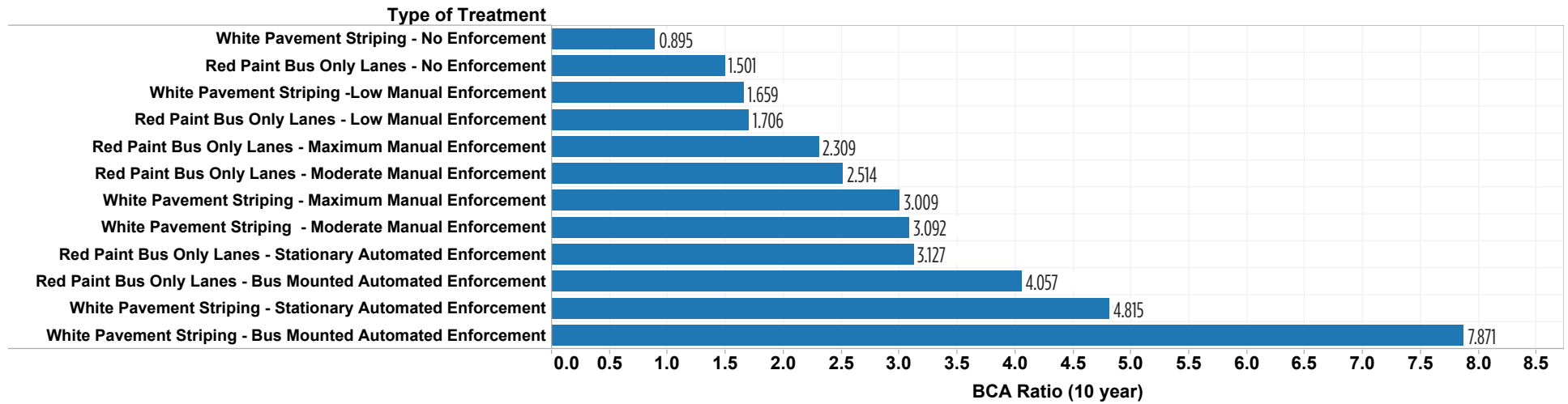
To capture the effects of multi-year costs and benefits, including the cost of re-applying red paint to bus lanes, a ten year benefit-cost ratio (BCR) was calculated.

Table 5 summarizes the BCR calculated for each implementation strategy. **Figure 12** provides a visual comparison of the findings. Results indicate that the strategies with no enforcement scenarios have the lowest benefit-cost ratios (with a BCR of 0.90), while the strategies with standard lane treatments and automated enforcement scenarios have the highest benefit-cost ratios (BCR of 7.87 and 4.82). Red paint bus lanes fall in the middle range of benefit-cost ratios due to the high cost of installing and maintaining red paint bus lanes. However, it is important to note that the analysis assumes agencies have adequate resources to provide a moderate to maximum level of manual enforcement. For agencies with limited resources, red paint treatment yields a higher BCR compared to the standard lane treatment under the no enforcement (1.50 vs. 0.90) and low manual enforcement scenarios (1.71 vs. 1.66) as red paint serves as both an educational and enforcement tool.

TABLE 5 IMPLEMENTATION ALTERNATIVES AND BENEFIT-COST RATIO

Implementation Alternative	Benefit-Cost Ratio (10 year)
Standard Lane Treatment - No Enforcement	0.90
Standard Lane Treatment - Low Manual Enforcement	1.66
Standard Lane Treatment - Moderate Manual Enforcement	3.09
Standard Lane Treatment - Maximum Manual Enforcement	3.01
Standard Lane Treatment - Bus-Mounted Automated Enforcement	7.87
Standard Lane Treatment - Stationary Automated Enforcement	4.82
Red Paint Bus Lanes - No Enforcement	1.50
Red Paint Bus Lanes - Low Manual Enforcement	1.71
Red Paint Bus Lanes - Moderate Manual Enforcement	2.51
Red Paint Bus Lanes - Maximum Manual Enforcement	2.31
Red Paint Bus Lanes - Bus-Mounted Automated Enforcement	4.06
Red Paint Bus Lanes - Stationary Automated Enforcement	3.13

FIGURE 12 BUS LANE STRATEGIES BCA RATIO (10-YEAR)



BCA Ratio (10 year) for each Type of Treatment.

Another interesting finding is that white pavement striping with moderate manual (police) enforcement yields a slightly higher benefit-cost ratio than white pavement striping with a maximum manual enforcement due to the high cost of manual enforcement (3.09 versus 3.01). Finally, 10 of the 12 strategies evaluated have benefit-cost ratios that exceed 2.0. These promising ratios indicate that a moderate to strong enforcement program can ensure the success of bus lanes with a return on investment in terms of travel time and fleet savings.



SECTION 5.0: STUDY SUMMARY

The TPB Bus Lane Enforcement Study was an iterative seven-part process, starting with a comprehensive literature review and agency interviews, building to a final summary of bus lane management best practices and an implementation plan for local jurisdictions (**Figure 13**).

FIGURE 13 TPB BUS LANE EDUCATION AND ENFORCEMENT – STUDY SUMMARY

Information Gathering	<ul style="list-style-type: none"> Literature Review and Agency Interviews (national) Memo: Bus lane enforcement and safety best practices
Local Application	<ul style="list-style-type: none"> Local Agency Interviews Memo: Effective local bus lane enforcement strategies
Legislative Strategies	<ul style="list-style-type: none"> Review of local and national bus lane enabling legislation Memo: Summary of findings of local recommendations
Educational Campaign	<ul style="list-style-type: none"> Transit education campaign case studies (national) Memo: Best practices for bus lane education campaigns
Implementation Plan	<ul style="list-style-type: none"> Review best practices from research and interviews Memo: Implementation framework for local bus lanes
Benefit-Cost Analysis	<ul style="list-style-type: none"> Develop a general process and a framework for assessing the benefits of bus lanes
Final Report	<ul style="list-style-type: none"> Summary of bus lane management best practices Implementation Plan Summary

The initial objective of this study was to identify best practices on bus lane management strategies related to enforcement, legislation, and education. However, interviews with national and local agencies highlighted the importance of stakeholder coordination at all phases of bus lane implementation. The interviews also revealed that agencies need to establish effective and lasting stakeholder engagement processes, as the management of bus lanes requires coordination and input from many constituents. In addition, since many bus lanes will cross jurisdictional boundaries in the region, stakeholder coordination becomes even more vital for TPB jurisdictions designing successful bus lanes.

The state of the practice indicated that some level of enforcement, either through police or automated enforcement, is required to limit bus lane violations and improve the effectiveness of bus lanes. Agencies or jurisdictions

currently operating bus lanes in the TPB region use police enforcement as part of the bus lane enforcement program. Police enforcement is generally found to be effective, however agencies need to consider the financial and human resources required to sustain a continuous police enforcement program. While police enforcement of bus lanes may be feasible for small corridors, the expansion of bus lanes can make continuous police enforcement of lanes impractical due to budget limitations. Automated enforcement can overcome financial barriers by automating the enforcement process through the use of cameras. However, examples from California and New York show that automated enforcement requires new enabling legislation and administration processes, and that final authorization may take several years. TPB jurisdictions interested in developing camera-based enforcement should begin the legislative process early, and conduct a robust education and outreach program to address potential public concerns over privacy issues.

Finally, education is a crucial piece of an effective bus lane management process. Identifying project partners early and targeting constituents with relevant messages, both during and after implementation, are found to be the most effective educational strategies. Furthermore, installing strong visual cues (e.g., lane striping, red paint, and/or signs) are recommended as a form of education, but also as part of the enforcement process.

APPENDICES

1. STATE OF PRACTICE: BUS LANE IMPLEMENTATION
2. LOCAL AGENCY INTERVIEWS
3. LEGISLATIVE STRATEGIES
4. EDUCATIONAL CAMPAIGN
5. BENEFIT-COST ANALYSIS

BUS LANE ENFORCEMENT STUDY

Prepared for the National Capital Region Transportation Planning Board

June 30, 2017

ABOUT THE TPB

The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 24 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

CREDITS

Project Manager: Richard Roisman

Contributing Editors: Richard Roisman and Arianna Koudounas (Transportation Planning Board); Ramona Burns (Washington Metropolitan Area Transit Authority); Burak Cesme, Kevin Lee, Jesus Cuellar, Meredyth Sanders, and Yolanda Takesian (Kittelson & Associates, Inc.); David Miller and Katie List (Foursquare Integrated Transportation Planning); and Kenna Williams (Sherry Matthews Advocacy Marketing).

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Transportation Planning Board

Metropolitan Washington Council of Governments
777 North Capitol Street NE, Suite 300
Washington, DC 20002

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