



A BUDDING MODEL:

Los Angeles's Flower Street Bus Lane

May 2021

Authors

Emma Huang, *Principal Transportation Planner, Office of Extraordinary Innovation, Los Angeles County Metropolitan Transportation Authority (LA Metro)*

Cassie Halls, *Senior Transportation Planner, Customer Experience, LA Metro*

Joshua Schank, *Chief Innovation Officer, LA Metro*

Acknowledgments

The authors would like to thank the following for their help and assistance on this work:
Chad Kim, Kang Hu, Dan Nguyen, Stephen Tu, Conan Cheung, Medford Auguste, James Shahamiri, LA Metro Service Planning and Analysis

Anthony Crump, Ayda Safaei, Jodi Feerst Litvak, LA Metro Community Relations

Anna Chen, Joseph Lemon, Steve Hymon, LA Metro Public Relations

Matthew Barrett, LA Metro Research and Records Information Management

Maryam Ershaghi, Doug Anderson, LA Metro Information and Technology Services

Kali Fogel, LA Metro Congestion Reduction

Eileen Hsu, LA Metro Office of Extraordinary Innovation

Susan Walker, Sergeant Randy Rangel, Sergeant Ian Ward, Metro System Security & Law Enforcement

Dan Mitchell, Los Angeles Department of Transportation

City of Los Angeles Mayor's Office

Madeleine Brozen, UCLA Lewis Center for Regional Policy Studies

Brian Taylor, UCLA Institute of Transportation Studies

Jessica Meaney, Investing in Place

About the Eno Center for Transportation

The Eno Center for Transportation is an independent, nonpartisan think tank whose vision is for an American transportation system that fosters economic vitality, advances social equity, and improves the quality of life for all. The mission of Eno is to shape public debate on critical multimodal transportation issues and build a network of innovative transportation professionals. As an organization, Eno values independence, collaboration, relevance, excellence, and entrepreneurialism. These core values are reflected in everything we do.

Table of **CONTENTS**

Executive Summary	1
1. Background	2
2. Introduction	3
2.1 Project Overview	3
2.2 Institutional Arrangements and Operational Details	5
2.3 Physical Design and Signage	6
2.4 Marketing and Communications.....	7
2.5 Enforcement.....	9
2.6 Legal and Regulatory Considerations	11
3. Performance Evaluation.....	11
4. Implications and Conclusion	14
Appendixes	17
Endnotes.....	21

Executive Summary

In June 2019, Los Angeles Metro (LA Metro), in partnership with the Los Angeles Department of Transportation (LADOT), installed a peak-hour bus lane in downtown Los Angeles. Although the 1.8-mile bus lane was deployed as a temporary strategy for addressing anticipated traffic delays due to rail station closures, it had an outsized effect.

The bus lane greatly improved mobility, accounting for more than 80 percent of people moving in the corridor or around 10,000 bus riders a day during the peak-hour period.¹ Person-throughput increased 37 percent compared to pre-traffic conditions with limited reduction of the capacity in general use lanes for private vehicles. Two-thirds of bus customers and two-thirds of operators reported time savings. This perceived time savings is consistent with observed travel times, which improved up to 30 percent throughout the corridor.

The Flower Street pilot demonstrated that a bus lane—when deployed as a tactical pilot—can gain widespread approval, and can greatly improve mobility in a heavily trafficked corridor by maximizing existing street space.

The pilot was enabled by unique institutional arrangements, innovative communications and marketing efforts, and a comprehensive enforcement strategy. This case study documents these arrangements and processes and provides an evaluation of the bus lane on travel time and corridor throughput. It relies on original data collection and analysis using cellular technology on buses, surveying of bus operators and customers, a literature review, and stakeholder interviews.

As transit agencies across the United States consider building and operating their own bus lanes, the Flower Street pilot provides important insights for them to consider:

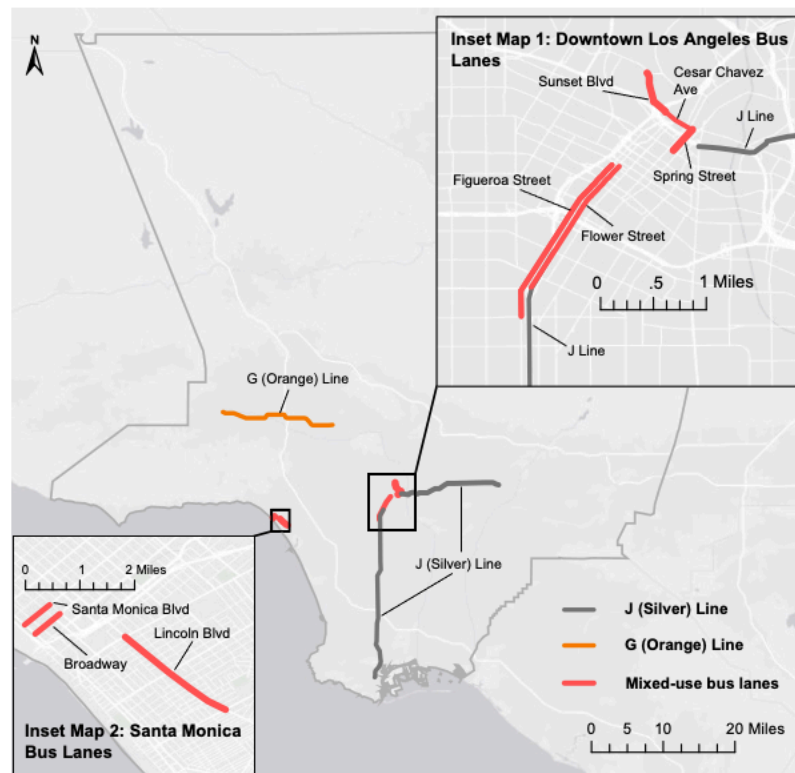
- 1) Strong interagency coordination and collaboration is critical to effective implementation of bus lanes;
- 2) Short segments of roadway can be an effective approach for bus lane implementation, particularly in high congestion and high ridership corridors;
- 3) Costs of design improvements should be balanced with enforcement since mixed-use bus lanes necessitate compliance from motorists to be effective;
- 4) Residents and businesses along the corridor should be directly engaged with a focus on shared goals;
- 5) A tactical approach to a bus lane allows for a unique public engagement strategy;
- 6) Measurable improvements to mobility in a corridor and the effect on customer experience is critically important.

Although the analysis conducted for this report predated the COVID-19 pandemic, it sets an important precedent for LA Metro’s ability to respond to the pandemic. The Flower Street bus lane utilized a tactical bus lane model that can be deployed quickly, used to mitigate congestion, and maintain consistent and reliable bus service for essential workers. With the installation of dedicated lanes, bus travel times become less variable and agencies are able to reduce the likelihood of bus bunching, which results in uneven passenger loads across buses and thus crowded waiting and onboard environments for riders.

1. Background

Los Angeles County has 107 bus lane miles, 27 of which are mixed-use lanes, which allow for right-turning vehicles and bikes to use the lane.² Most of these mixed-use bus lanes use reallocated space from curbside parking, often with peak period parking restrictions.³ The first bus lane was installed in the city in 1974 on Spring Street, and the most recently implemented bus lane is on Flower Street (See Figure 1 and Appendix A).

Figure 1: Mixed-Use Bus Lanes and Bus Rapid Transit in Los Angeles County



Map designed by Cassie Halls. Reflects bus lanes as of Spring 2020. Service Layer Credits: Esri, HERE, Garmin,(c) OpenStreetMap contributors, and the GIS user community

This case study focuses on the Flower Street bus lane. Another bus lane on Figueroa Street is used for comparison, as both are recent installations close to each other yet offer interesting counterpoints in terms of process and expense (Table 1).⁴ The Figueroa and Flower Street projects have an interdependent relationship, as they are a part of a larger downtown

circulation network of bus lanes and both benefited from the police enforcement instituted during the New Blue Improvement Project (discussed later in this case study).

Table 1: Description of Case Study Bus Lanes

Location	Year Opened	Length (Lane Miles)	Operating Hours	Capital Costs
Figueroa Street	Late 1990s	4.6	24/7	\$20 million
Flower Street	June 1, 2019	1.8	3-7 pm	\$75,000

The Flower Street bus lane emerged from momentum from both inside and outside LA Metro to improve bus service. The agency embarked on a major bus network redesign, first with 2018's NextGen Bus Study followed by the NextGen Bus Plan. Measure M, a no-sunset ballot measure that passed in 2016, earmarked \$450 million for three future bus rapid transit (BRT) corridors that will add an additional 75 bus lane miles to LA Metro's bus lane network.⁵ The Flower Street bus lane is singled out in this study as a new planning, public engagement, and implementation model that could be effective for future bus lane projects.

This case study reviews the unique institutional arrangements, operational details, communications and marketing efforts, and enforcement strategy that allowed the Flower Street bus lane to become realized. It measures the impact of the bus lane on bus travel times, corridor-level throughput, and customer and operator experience. Finally, the case study offers key recommendations based on lessons learned that can be applied to future practices in bus lane planning, implementation, and management. This case study relied on a literature review, stakeholder interviews, LA Metro customer and bus operator surveys, and original data collection and analysis utilizing cellular technology on buses for real-time location data.

2. Introduction

2.1 Project Overview

The Flower Street bus lane pilot project led by LA Metro in partnership with Los Angeles Department of Transportation (LADOT) was implemented on a temporary basis to address rail station closures in downtown Los Angeles. The bus lane was used to accommodate additional bus shuttle service along closed portions of the Blue and Expo lines in downtown (Figure 1).⁶

It also served as an opportunity for LA Metro to test a novel approach to improve mobility along a key bus corridor during the evening peak. Increasingly, U.S. cities are using bus lanes as "spot treatments," addressing specific congestion hotspots that affect large numbers of riders. This application of bus lanes is known as "tactical transit lanes" which borrows from a broader movement called "tactical urbanism" where low-cost and quick-build street improvements allow for immediate, temporary changes to the streetscape and can expedite longer-term improvements.⁷ The rail station closures were part of the New Blue Improvements project, a \$350 million investment in LA Metro's oldest rail line (renamed the

A Line after reopening). The nature of the repairs required two, four-month closures, as detailed in Table 2.

Table 2: Flower Street Project Timeline

January 26– May 29, 2019	Southern A Line segment closures
June 1, 2019	Flower Street Bus Lane opens
June 21, 2019 – August 23, 2019	Northern A Line segment closures
November 2, 2019	New Blue Northern segment completed

To accommodate the rail service closures, LA Metro deployed four different shuttle services which nearly doubled the bus throughput on the corridor from around 53 buses an hour up to 80 buses an hour during the New Blue repairs. These shuttles provided a bridge for commuters between 7th Street/Metro Center and LATTC/Ortho Institute stations, as well as express service for Blue Line commuters traveling between Long Beach, Compton, and downtown LA. Expo Line users were also affected and utilized these shuttles as the track is shared by the two rail lines in these three downtown stations. However, Expo line service was only interrupted from June 1 to August 23, 2019. LA Metro was able to fold the costs of enforcement of the bus lane into the larger capital project cost.

To reflect service changes along the study period, the analysis of the Flower Street bus lane is divided into three distinct time periods:

- *The **pre-pilot period*** from the month of May, when the bus lane was not operational, and when up to 53 buses an hour running in the Flower Street corridor.⁸
- *The **mid-pilot period*** from June, July and August, when both the Expo line and Blue line shuttles were running, and bus volumes were at their peak, with up to 80 buses an hour running in the Flower Street corridor.
- *The **post-pilot period*** from September through November, when the Expo line reopened and only Blue line shuttles were running, and bus volumes had decreased from the mid-pilot period. Around 70 buses an hour running in the Flower Street corridor. The bus lane was still operational and being enforced.

The motivation for the Flower Street bus lane pilot must also be contextualized by larger trends and projects. LA Metro was experiencing suffering bus service due to congestion and declines in ridership, which are driven in part by changes in demography, but also by decreases in bus performance levels and customer experience quality that comes with more congestion and slower average bus speeds.⁹ The NextGen Bus Study to redesign the entire Los Angeles County bus network was still in progress when the Flower Street bus lane opened. Additionally, three Measure M-funded BRT projects that were approaching LA Metro Board of Directors approval to begin the Environmental Impact Report (EIR) process. LA Metro leadership decided to close the Blue Line down completely rather than force riders to deal

with piecemeal construction, risking losing ridership. Therefore, it was imperative that LA Metro mitigate as many negative effects as possible of New Blue Improvements Project for the tens of thousands of transit users who were traveling in and out of downtown. These concerns, along with support from leaders at the city and within the agency, provided a unique policy window for experimentation with a new model for implementing transit priority projects to respond to immediate needs.¹⁰

The Flower Street bus lane operates in tandem with a bus lane on the northbound Figueroa Street, which runs parallel to Flower. The bus shuttles deployed for the rail station closures used Flower Street to travel south from 7th Street/Metro Center to the LATTC/Ortho Institute Station for Expo Line and to LATTC/Grand Station for the Blue Line (where Blue and Expo rail service continued) and looped back on Figueroa Street to carry northbound passengers.

The current iteration of the bus lane on Figueroa is a 24-hour lane that was installed as a part of a larger state-grant funded complete streets project called "MyFigueroa" or "MyFig" and includes a protected bike lane, bus bulb-outs, and pedestrian amenities. MyFig was completed in July 2018, but targeted enforcement of the bus lane did not begin until the Flower Street bus lane was implemented in June 2019.

MyFig did not use the same strategy of implementation as Flower Street and did not enjoy the same success. In fact, some residents and local businesses were initially concerned about the Flower Street bus lane because of negative perceptions of the MyFig project on local businesses.¹¹ That experience helped LA Metro's Service Planning team realize that asking for just what they needed, and nothing more, would be most beneficial. MyFig was a longer corridor (approximately four lane miles of 24/7 bus lanes) with substantial parking and traffic impacts. Flower Street operated only in the evening peak, just under 2 miles long, with minimal parking and traffic impacts.

Both Figueroa and Flower Street are part of a larger downtown circulation system used by a large proportion of routes with terminuses or stops in the Financial Business District (See Figure 1.) A variety of other high-frequency bus lines (from both LA Metro and other municipal operators) use Flower and Figueroa to travel on and off the Harbor Transitway and El Monte Busway.

2.2 Institutional Arrangements and Operational Details

While LA Metro operates bus service throughout Los Angeles County, it has no authority in managing the streets over which its buses run. Thus, strong collaboration with the city of Los Angeles, including the Mayor's Office and LADOT was critical to implementation. Given leadership priorities, both LA Metro and LADOT were committed to implement a bus lane pilot by the end of 2019. LA Metro made a commitment with LADOT to collaborate on dedicating street right-of-way, as it is within LADOT's jurisdiction to designate city streets

and highways for high occupancy vehicles such as buses, jitneys, taxicabs, carpools, as well as lanes for tolling (high occupancy toll lanes, or HOT lanes).¹²

Flower Street is a high ridership and high congestion corridor, and is a common one-way southbound route for LA Metro buses as well as other municipal operators. Therefore, LA Metro also coordinated with other transit agencies including the Orange County Transportation Authority (OCTA), Torrance Transit, Foothill Transit, and LADOT (for DASH and Commuter Express), to alert them of the coming changes. This unique opportunity for collaboration set the groundwork for more consistent inter-agency partnership. Following the implementation of the Flower Street bus lane, two working groups of various public entities, including Metro, the Mayor's Office, LADOT, and city councilmember staff to plan and deploy additional bus speed improvements.

The corridor serves many high-frequency routes, such as LA Metro's Silver Line (#910), which has five-minute headways during the peak period (that predated the pilot). The bus shuttle services instated during New Blue had six-minute headways during morning and evening rush hour. The Flower Street bus lane was implemented as an evening peak-period bus lane, only operating from 3-7pm during the high traffic period of the day, from Monday to Friday, to address what was expected to be a major pinch point for commuters traveling in and out of downtown.

The bus lane remained a right-hand turn lane for vehicular traffic, and bicyclists are allowed. No physical parking spaces were required to be removed for the project beyond the extension of no parking curb lane hours. One loading zone was removed for a business on the South end of the Flower Street bus lane. This fine-tuned street space modification, which produced minimal infrastructure changes, was a key element of the success of the bus lane.

2.3 Physical Design and Signage

The Flower Street and Figueroa Street bus lanes are concurrent flow, and in the right curb lane, delineated by a solid white line. In one section of Figueroa, the bus lanes are bi-directional, where the street turns from one-way to two-way. The bus lanes on Flower and Figueroa are 11-12 feet wide and are shared, as turning cars can temporarily use the lanes at the intersection, and bikes are allowed. All public transportation buses can use the lanes, as can emergency vehicles when responding to an emergency.¹³ LADOT parking officials, city police, and county sherriff vehicles can also use the lanes when on patrol.

All signage and striping were installed by LADOT and expensed to LA Metro. The semi-permanent striping, bus lane signage, and modified parking signage cost LA Metro a total \$75,000. Some existing infrastructure was also used for the bus lane, including an overhead gantry on Figueroa Street at Olympic and a variable message sign that LADOT placed at 7th and Pico that was programmed to read "Right Lane Bus Only, LAPD Enforced." There is also fixed post signs sited along the corridor, that designated the right-hand lane as bus only,

provides the hours, and designates bikes as allowed. There were semi-permanent markings on the pavement that read "BUS LANE," placed on every block of Flower Street between 7th and 28th Street.¹⁴

LA Metro considered including signal queue jumpers for buses to bypass traffic and enter the I-110 South Express Lanes/Harbor Transitway from Flower Street at 28th Street, but this ended up not being implemented because of safety concerns.¹⁵ In addition, LA Metro's Service Planning and Scheduling division explored whether traffic signal priority could be given to bus shuttles and other buses using the corridor. However, since there was light rail transit signal priority starting on Flower Street and Washington Boulevard, there were limited signal phasing opportunities to provide priority for both buses and light rail. The Figueroa Street bus lane had a signal queue jumper installed at 8th St. in 2016, but it was removed when the MyFig project was completed, due to bicyclists safety concerns since buses did not have enough clearance to queue jump at the intersection. Signal priority is given to Metro Express buses that utilize the Figueroa Street bus lane.¹⁶

2.4 Marketing and Communications

LA Metro's Community Relations team started strategizing the communication plan and tactics for the Flower Street bus lane beginning in January 2019. The team worked with the Los Angeles Mayor's Office and two Los Angeles City Council Districts within the project area, identified specific concerns for residents, businesses, and students—such as losing access to street parking and transparency around when vehicles would be towed—and developed a multi-pronged outreach strategy.¹⁷

Metro Community Relations team members attempted face-to-face outreach with every business and residence that fell within the areas of concern, they distributed a mailing to every registered business and residence in both districts, and also distributed two rounds of flier drops on vehicles parked on Flower Street. This way, they attempted to contact both residents and businessowners in the districts as well as people who routinely parked on the street.

The team complemented this grassroots approach with a grass tops approach using existing networks to identify key businesses who might have concerns about the project. These included the Figueroa Business Improvement District (BID), South Park BID, and the Central City Association. Additionally, the Los Angeles Trade Technical College (LATTTC) and a cluster of car dealerships within Council District 9 were identified as large stakeholders. Community Relations worked directly with all the groups to educate them about the project and discuss what potential mitigations for the bus lane could be. One specific dealership agreed to remove its loading zone for customers (which sat on Flower Street) temporarily to allow the bus lane.

In terms of messaging, Community Relations developed a two-page fact sheet and a mailer in English and Spanish that communicated the purpose of the bus lane in the context of the New

Blue Improvement Project. The emphasis was not on the bus lane, but on the larger effects of the service interruption and how the evening peak bus lane would improve mobility and bus service reliability. Additionally, the bus lane was framed as temporary, and provided minimal change to parking on the street. The materials stated that the "No Stopping/No Parking" curb lane hour change would "better reflect today's traffic conditions and ridership demands." Additionally, the flier points to the bus throughput increases because of the New Blue Improvements Project.¹⁸ Since the project did not go through an environmental process, the messaging was around education and information rather than asking for input and feedback.¹⁹

Community Relations primarily relied on direct outreach to avoid misinformation about the project, and kept council district staff informed regularly on feedback. The success of the Flower Street bus lane was driven in part by this direct-to-constituent approach and the keen insights offered by the Mayor's Office and Council Districts. Additionally, framing the project as temporary, and as a pop-up, influenced acceptance. Part of the philosophy behind a tactical approach is that the pilot bus lane can be a community engagement strategy in itself, because the community gets to see the bus lane in action rather than forming opinions and expressing fears about an abstract future project. Following the launch of the bus lane, Community Relations received no negative feedback on the project.

LA Metro's Digital Media Production team recognized that the project would be an excellent demonstration of bus lanes in action. They produced several videos highlighting the bus lane at work, including one viral video of a birds-eye-view of passenger movement in the bus lane versus those in the general lanes.²⁰ Part of the Flower Street bus lane's broad public approval was likely because LA Metro was responding to an already primed public. Reflecting on this experience, the team learned that it takes months of consistent, interesting and engaging messaging to socialize the public to become receptive to something like a bus lane and to gain supporters, which can then lead to a viral moment.

In addition to LA Metro's Communications team, community-based organizations such as Investing in Place had a pivotal role in laying the foundation for the need of bus lanes, and then expressing their support of the Flower Street bus lane widely. Beginning in September 2019 Investing in place created a campaign called Better Buses for LA, and captured the attention of many activists and interest groups by filming the bus lane when it first launched and sharing this footage with their social media channel and with other community members.²¹ In addition, over a dozen media stories focusing on the Flower Street project were published by a variety of news outlets including the Los Angeles Times, StreetsblogLA, Wired, LAist, and Curbed. Streetsfilms and TransitCenter, transit advocacy organizations based in New York, published a video and blog post highlighting the success of the project for national and international audiences and also awarded Metro's Digital Media Production team with the first ever Frequency Award for Best Communications.²²

2.5 Enforcement

Since 2017, LA Metro has had a multi-agency transit policing contract with the Los Angeles Police Department, Los Angeles Sheriff Department, and Long Beach Police Department. One of the most advantageous decisions in realizing the Flower Street bus lane was to build off this existing contract and fund the dedicated enforcement using New Blue Improvements Project resources. Additionally, LA Metro's System Security and Law Enforcement Department received very clear instruction from both the Mayor's Office and LA Metro leadership that successful enforcement of the bus lane was expected.

Strategically, LA Metro made it clear with their law enforcement partners that the goal of enforcement was to make the buses flow efficiently. Officers understood that the priority was to get the lane cleared from obstructions as quickly as possible. Thus, law enforcement decided to utilize a "pro-active enforcement approach" versus a "zero-tolerance approach" which allowed officers to exercise discretion for how to handle violations. Officers could issue a verbal warning, a written warning, a citation, a forced ejection, or a tow. This enforcement strategy was a relatively new process, as most bus lane enforcement in Los Angeles County had been in the form of contracted vehicle patrol where the primary directive is to ensure safety on the bus, not keep the lane clear.

This enforcement solution was considered the best option for the bus lane due to the existing institutional relationships and because peace officers are able to enforce both moving and parking violations. If LA Metro were to partner with LADOT for a dedicated team of parking enforcers to monitor the lane, only parking violations could have been cited. While LADOT retained authority to enforce parking violations on the Flower Street bus lane, since there was no dedicated unit assigned to Flower or Figueroa Street bus lanes, there were only two parking violations issued during the pilot period by LADOT parking officers. Most bus lanes in Los Angeles County are not enforced consistently, and at most they are enforced in "blitzes" or during specific events.

For the Flower and Figueroa Street bus lane enforcement, officers were asked to work in overtime shifts, dedicated to bus lane enforcement. This required LA Metro to pay overtime hourly rates, which drove up costs. These officers worked in shifts, in the field from 5am-9am and from 3pm-7pm. In the morning, LAPD would focus on Figueroa Street, since the Flower Street bus lane was not running, and in the afternoon peak they would loop between Flower and Figueroa Street, enforcing both continuously. Police also worked on the weekend, but as the Flower Street bus lane was only operating on weekdays, they focused only on Figueroa Street.

There were two types of police detail—stationary guards and police on motorcycles—that would provide security, wayfinding, and support LA Metro staff at major transit hubs along the corridors (7th St/Metro Center and LATTC/Ortho Institute). Police on motorcycles were particularly useful for bus lane enforcement, as they were able to weave through traffic,

communicate better with passersby, and more quickly circulate than police cars. They were also highly visible and could discourage motorists from driving in the lane. Table 3 provides counts of lane intrusions and moving and parking violations in the bus lanes. Officers did not start issuing citations until the third week of June, as the first few weeks were used to educate roadway users on the bus lane restrictions. The most common law enforcement strategy was warnings (verbal and written) followed by vehicle citation, forced ejection from the lane, and parking citations. Note that the below table includes data beyond the November 2019 time period of the study.

Table 3: Counts of Violations and Intrusions in the Flower and Figueroa Bus Lanes (June 2019-January 2020)

Vehicle Stops	13,540
Vehicle Citations	7,094
Warnings (Verbal)	6,155
Warnings (Written)	5,225
Parking Citations	677
Forced Ejections	3,728

While this active, dedicated enforcement was successful, its high costs suggest that this approach may not be scalable to other mixed-use bus lanes in Los Angeles County. Transit agencies faced with similar challenges have pursued automated bus lane enforcement (ABLE) technology as a solution and have found it is an effective strategy that offers the most benefits relative to cost.²³ Front facing cameras are put on buses that use automated licence plate reader (ALPR) technology or similar to identify vehicles that are parked/standing in bus lanes and take clear photographs of the license plate. This information allows law enforcement agencies to send civil citations to the registered owner of the vehicle. New York City and San Francisco Municipal Transit Authority have both piloted this technology and have seen positive results around faster bus speeds, decreased variability of bus travel times, and a decline of the proportion of tickets issued to high-frequency offenders. Using ALPR in Los Angeles would require enabling state legislation.

LA Metro paid LADOT at the start of the pilot to install temporary striping and signage that constitute more passive enforcement techniques. In addition to fixed-post signage, the bus lane utilized existing electronic signage, both on gantries and on variable message signs, provided in-kind by LADOT. For the period of the pilot these were the only passive enforcement techniques in place. The largest costs associated with the bus lane were from active enforcement of the lane by officers, which cost LA Metro approximately \$26,000 a day, or \$750,000 a month. For Flower and Figueroa enforcement to continue at this rate, LA Metro would pay \$9 million, or roughly \$4,000/per lane mile per day. Enforcing all 27 miles of shared-use bus lanes in the County would be approximately \$100,000 a day or \$36.5 million a year.

2.6 Legal and Regulatory Considerations

The Figueroa Street bus lane had to go through a traffic study and an environmental review, as the lane was a part of a larger street redesign project. These additional review and planning steps can add months or even years onto a project, and can even end a project if there is opposition or legal hurdles. For example, there was an appeal by a motorist organization that held up the planning process of the MyFig project²⁴. The project took 10 years to complete and \$20 million, in part because of the processes that the city legal and regulatory processes that the city had to adhere to.

In contrast, the Flower Street bus lane was framed as a pilot project, which allowed for fewer institutional and regulatory hurdles to implementation. There was no traffic study or environmental review process required.²⁵ Since the pilot provides real-time traffic data, after the end of the pilot (if the bus lane is made permanent) LA Metro would not need to conduct a traffic study.²⁶ The only requirement would be to conduct limited community outreach.²⁷ There is a slightly higher risk of the city being responsible for tort liability, however, since the city followed the California Manual of Uniform Traffic Control Devices (MUTCD) when designing the bus lane, it is unlikely that this would be a concern. Additionally, there have been no collisions on the bus lane since the implementation of the project, which suggests that the lane treatment did not reduce safety.²⁸

3. Performance Evaluation

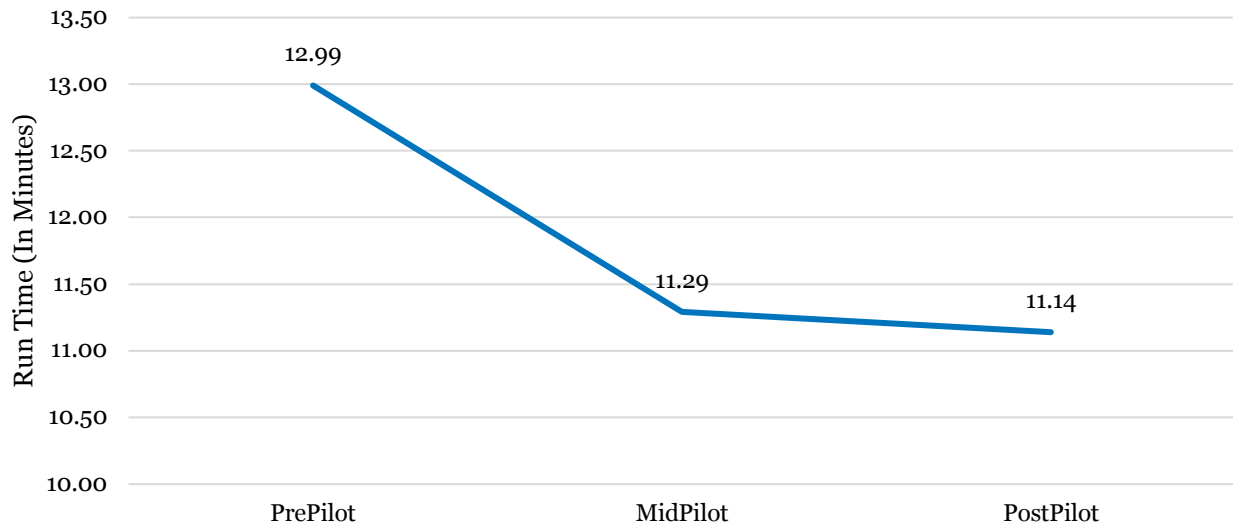
This evaluation focuses on four key performance metrics: bus and personal vehicle average travel times, person throughput, lane throughput, and customer and bus operator experience. (See the Appendix for details on data and methodology.)

The Flower Street bus lane improved throughput in the corridor, increasing person throughput by 37 percent compared to pre-pilot conditions. The lane was used by over 10,240 people a day during the evening peak period (during the mid-pilot period) and by over 8,960 people a day (during the post-pilot period). Over 80 percent of the people moving in the corridor traveled in the bus lane. This increase in person throughput is due to an increase of 51 percent in bus volumes during the mid-pilot period and a 32 percent increase during the post-pilot period.

Even with these volume increases, average travel times for buses decreased by 2 minutes or a 14 percent on average reduction in travel times. In certain segments of the corridor, improvements were even higher, up to a 32 percent reduction in travel time for buses. Bus speeds averaged around 11 mph during the mid- and post-pilot period (Figure 2), increasing by around 1 mph from pre-pilot averages.²⁹ This improvement is lower than expected largely because the vehicle throughput of buses increased by 51 percent during the mid-pilot period, and 32 percent by the post-pilot period.³⁰

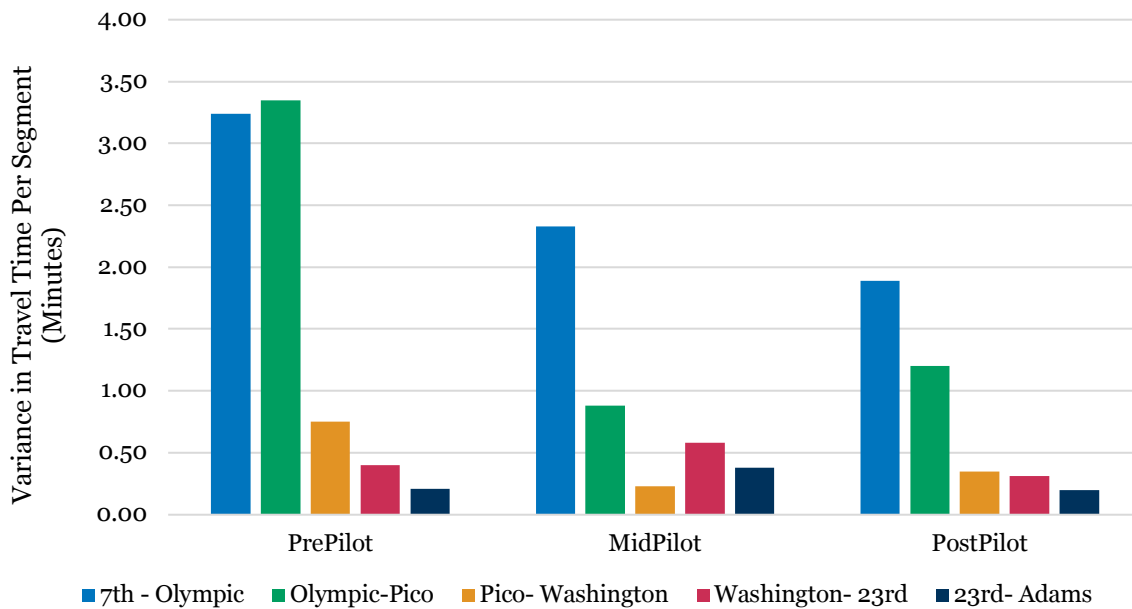
A significant effect on the performance on the bus lane was construction on Flower Street between Adams and 23rd Street. This construction is correlated with a 13 percent increase in delays at this short segment of the corridor (measured in minutes of travel time) from pre- to mid-pilot, but as construction stopped during the post-pilot period, these losses were recouped, and bus delays were reduced by three percent.

Figure 2: Average Travel Time on Flower Street Corridor



An even more compelling finding is that travel times also became more consistent during the mid- and post-pilot period (Figure 3). Variation in travel times reduced most significantly in congested segments of the bus lane around the intersections of 7th Street to Olympic Boulevard, and Olympic to Pico Boulevard. Heavy congestion within this segment contributed to higher variation in travel times than other segments, however, variation in travel time was cut in half from the pre- to post-pilot period.

Figure 3: Variation in Travel Time Per Segment in the Flower Street Bus Lane



At the same time, **there was limited reduction of the capacity in the general use lanes for private vehicles.** Bus speeds increased in the lane on average by 14 percent. General use lane speeds decreased by around 12 percent on average, or two miles per hour. This minor decrease in speed allowed for the hourly person throughput for both the general use lane and bus lane combined to increase by around 800 people an hour (from 2,176 to 2,988 people per hour).

The Flower Street bus lane saw a 51 percent increase in bus passengers traveling through the corridor between the pre- and mid-pilot period, and a 32 percent increase between the pre- and post-pilot period (Table 4). This translates to 10,240 bus passengers traveling through corridor during the four-hour peak time segment (3:00-7:00pm) during the mid-pilot period, an increase of 3,456 passengers from pre-pilot levels. Eighty-percent of those traveling on Flower Street traveled on the bus lane during the post-pilot period. This increase is attributed to the rail service closures and not new bus ridership, as many rail riders used the bus lane to travel between the 7th/Metro Center station and the LATTC/Ortho Institute station and LATTC/Grand Station in shuttles.

Table 4: Throughput During Three Implementation Periods (3:00-7:00pm)

Pre-Pilot Period (May)			
	Bus lane	General use lanes	Total Throughput (Daily peak hour period)
Pre-Pilot Period (May)			
Vehicle Throughput	212	1,209	1,421
Person Throughput	6,784	2,055	8,839
Mid-Pilot Period (June-August)			
Vehicle Throughput	320	1,077	1,397
Person Throughput	10,240	1,830	12,070
Post-Pilot Period (September-November)			
Vehicle Throughput	280	N/A*	N/A*
Person Throughput	8,960	N/A*	N/A*
<i>*LADOT was unable to provide these data due to staff resource constraints.</i>			

Lastly, **the Flower Street bus lane had an outsized effect on customer and bus operator experience by improving the reliability of the bus.** Based on responses from customer surveys, most riders felt that they saved five or more minutes, and that the bus was more reliable. Seventy percent of customers and 72 percent of operators reported time savings, and of these respondents, half of customers and operators reported up to five minutes of time savings, and half reported time savings of over five minutes (Table 5). Additionally, roughly 80 percent of customers and operators reported that the Flower Street bus lane improved the reliability of the bus, and more than 80 percent of respondents answered that the bus lane improved mobility in the corridor.

Table 5: Survey responses of customers and operators of the Flower St. Bus Lane

Survey group	Reported no change in travel	Reported time savings up to five minutes or more	Reported that the bus lane improved reliability	Reported that the bus lane improved mobility (agreed or strongly agreed)
Bus operators	17%	72%	83%	85%
Bus customers	22%	70%	78%	88%

**all numbers are rounded*

4. Implications and Conclusion

The Flower Street bus lane pilot project serves as a unique case study. Although it was deployed as a temporary strategy for addressing bus delays due to rail station closures, the bus lane had an outsized effect. The pilot was influenced by unique institutional arrangements, innovative communications and marketing efforts, and a comprehensive enforcement strategy. The pilot project demonstrated that a bus lane, when deployed as a

tactical pilot, can gain widespread approval, and can greatly improve mobility in a heavily trafficked corridor by optimizing existing street space.

The success and widespread support for the project generated enough political will to extend it five months beyond the conclusion of the Blue Line improvements.³¹ LA Metro's Board issued specific instructions to collect additional data with bus volumes back under normal operating conditions. In addition, using the Flower Street model LA Metro is deploying two additional bus lanes on 5th and 6th Street in downtown Los Angeles. Bus lanes, along with signal priority, are a part of a comprehensive Bus Speed and Reliability toolkit that Metro Community Relations and Service Planning departments are applying to bus corridors across Metro's service area.

As LA Metro and other transit agencies across the United States continue to plan and invest in bus lanes, it is important to analyze the impact of these investments and consider how to deploy and deliver these lanes most effectively. In this way, the Flower Street pilot provides important lessons for agencies to consider:

- 1. A bus lane can vastly improve mobility in a corridor and have an outsized effect on customer experience.** Surveys of bus riders and operators showed largely positive sentiments about the bus lane. While LA Metro data show the bus-lane brought an average time savings of about two minutes, survey results suggest that most riders believe their time savings to be five minutes or over. This suggests that customers overwhelmingly believe the bus lane improves their mobility in the corridor.
- 2. Implementing bus lanes necessitates strong interagency coordination and collaboration.** While LA Metro operates the largest bus fleet in Los Angeles County, the agency has limited authority in managing the streets over which its buses run. The transportation ecosystem in the Los Angeles region is governed by a complex array of agencies with specific jurisdictions and authorities. The leadership from the Los Angeles Mayor's Office, 2 Council Districts, and LADOT provided critical support for the project.
- 3. Targeting short segments of roadway can be an effective approach for bus lane implementation, particularly in high congestion and high ridership corridors.** Building short bus lanes, less than two miles, that are peak-hour can target specific congestion and ridership hot spots that maximize benefit while minimizing impact on existing traffic conditions.
- 4. Although design improvements are important, mixed-use bus lanes must be enforced to be successful.** Costs for a bus lane must be applied towards management of the lane, and not just toward capital infrastructure improvements. Unlike traditional BRT, the Flower Street bus lane was inexpensive to install, with the bulk of the costs spent on enforcement. Active boots-on-the-ground enforcement was key to the success of the lane, but the high costs of dedicated enforcement suggest that this approach may not be scalable to other mixed-use bus lanes in Los Angeles County. Alternative enforcement mechanisms, such as ALPR, should be considered.

- 5. Direct engagement with residents and businesses along the corridor, with a focus on shared goals, allows for myth-busting and strong project support.** A focus on the bus lane as providing a temporary mitigation to traffic impacts of the New Blue Improvement Project helped tether the goals of the pilot to shared goals of businesses and residents in the area. Additionally, community relations focused on multiple touchpoints with community members that allowed a direct flow of information from Metro to the public. This facilitated clear information sharing.
- 6. A tactical approach to a bus lane allows for a unique public engagement strategy.** Metro inverted its traditional planning process by deploying a temporary bus lane, and surveying users of the bus lane rather than conducting all public engagement upfront. The pilot bus lane ended up being a useful community engagement strategy in itself, and the surge of local and national attention in the bus lane confirmed the success of this approach.

Finally, this research analysis was completed prior to the COVID-19 pandemic. However, the findings are even more relevant as a result of this current health and economic crisis being experienced across the nation. LA Metro is facing major fiscal constraints and has had to reduce transit service as a result of the pandemic. Despite these cuts, the agency has been able to deploy additional bus lanes that follow the precedent set with the Flower Street bus lane, as they utilize a tactical bus lane model. These lanes are being deployed quickly to maintain consistent and reliable bus service for essential workers and other riders reliant on the bus. Other agencies are taking a similar approach to LA Metro by installing dedicated bus lanes, to help mitigate congestion as stay-at-home orders lift, and to reduce crowding onboard by maintaining consistent bus headways that effectively distribute demand. The best practices documented in this study should guide LA Metro, as well as other agencies effectively plan for, deploy, and manage mixed-use bus lanes.

Appendixes

Data and Methods

Bus and Personal Vehicle Travel Time

To measure bus speeds and run times—the time it takes for a bus to travel the length of the bus lane—we use high-resolution data that provide real-time location of buses accessed through Wi-Fi routers on buses. We sampled data from two bus lines that operated in the corridor, the Metro Silver Line (910/950) and Long Beach Express (860). We randomly selected one week a month from May through November (excluding weekends) and included only data from when the bus lane was operational (evening peak hours).³² We used these two bus lines as they ran frequently and had Wi-Fi routers installed on them.³³ Wi-Fi routers on Metro buses provided the geolocations of individual buses every 5 to 10 seconds along the route. These data were aggregated by the Information Technology department at LA Metro, by assigning individual data points to one of five bus stops along the corridor, if the data point fell within 10 feet of the bus stop. A total of 5,139 observations were collected over the study period. There were outliers in the data that were removed where bus speeds were calculated to be over 25 mph. These false readings are due to various issues, including misreads from routers, and it is important to consider that this is a limitation in this analysis due to this data inaccuracy. However, this is the best available data for the analysis.³⁴

The Wi-Fi router data allowed us to interpret when the bus was entering and leaving the corridor, as well as changes in the total travel time and bus speeds in the corridor before and after the bus lane was installed. Since LA Metro’s Scheduling and Service Planning team regularly uses different data to measure bus performance, we cross-validated our findings with data made available from this department and found roughly similar results. The Automated Vehicle Locator (AVL) data from LA Metro’s Advanced Transportation Management System provides travel times at the stop-level, but since these data were lower resolution and in a data format that was not conducive to fine-tuned analysis, we relied on the Wi-Fi data instead.³⁵ Lastly, the number of buses traveling per hour on the Flower Street bus lane was gathered through scheduling data available on Metro’s scheduling software interface, HASTUS. We also included buses that were running on the bus lane but were operated by other municipal providers in our total counts.

Person Throughput

We analyze the corridor by determining the change in person throughput before and after the Flower Street bus lane was implemented. We also examine differences in the lane throughput between the bus lane and the general use lanes on the Flower Street corridor. Person throughput is the measure of how many people traveled along the corridor during the peak hour period, across different travel modes. A lack of available pedestrian and bicycle data limited our focus to bus passengers and single-occupancy vehicle users. Total personal throughput is quantified by totaling bus passenger and single occupancy vehicle user

throughput. Lane throughput is measured as a ratio, that compares the peak-period person throughput between the bus lanes and general use lanes.

We measure bus ridership along the Flower Street bus lane, or passenger load, by sampling three Metro bus routes, two high-performing and one low-performing routes (the Long Beach Express 860, Silver Line 910/950, and the Disneyland Express 460, respectively) within the months of June through August 2019. This allows us to estimate the average passenger load for these routes, which was 32 riders per bus. These data were gathered through the Automated People Counter (APC) device located on Metro buses, which measure passenger load between bus stops.³⁶ APC data is also an imperfect measure and should be only used as an estimate of ridership. This average is then extrapolated out to the number of buses per hour traveling through the corridor. As each municipal bus operator gathers these data differently, we used the average load we measured from Metro buses and applied this to all municipal buses operating in the corridor, regardless of the operator. Corridor vehicular speed and occupancy data from roadway traffic loops were provided by LADOT. These data are only an estimate as traffic loops are not accurate where there is heavy traffic, and Flower Street experiences heavy traffic in the PM peak period when these readings are conducted. Due to the inaccuracies of these traffic loop readings, we cross-validated our findings with another data source, the iPEMs ClearGuide tool provided through Measure Up!, an arterial performance measurement program. ClearGuide utilizes location-based cellular data to determine traffic speeds and travel times, among other indicators. We sampled traffic speeds from May through November 2019 during the peak hour period to determine if delay had occurred due to the bus lane. One limitation of iPEMs ClearGuide is that it does not distinguish between bus travel and personal auto travel. As buses were traveling faster on the lane as a result of the pilot, this likely positively skews the travel speeds in the corridor. Lastly, we use a standard estimate of 1.7 people per vehicle to estimate the person throughput of vehicular traffic on the two general-use lanes on Flower Street.³⁷

Customer and Operator Experience

Short surveys were administered on tablets at various bus stops along the Flower Street corridor by the Metro Service Planning team to 1,685 bus customers in the post-pilot period to assess the Flower Street bus lane. 144 bus operators who primarily operate Line 910/950, from LA Metro Division 9 and 18, were also surveyed. These surveys provide qualitative data, including perceptions of how much time savings the bus lane afforded as well as how it impacted their trip.

Survey Type	Sample Size	Population	Deployment Date
Operator Survey	144	N/A	August 2019
Customer Survey	1,685	10,240	August 2019

Study Timeframe

To reflect service changes along the study period, the analysis of the Flower Street bus lane is divided into three distinct time periods:

- *The **pre-pilot period*** from the month of May, when the bus lane was not operational, and when up to 53 buses an hour running in the Flower Street corridor.³⁸
- *The **mid-pilot period*** from June, July and August, when both the Expo line and Blue line shuttles were running, and bus volumes were at their peak, with up to 80 buses an hour running in the Flower Street corridor.
- *The **post-pilot period*** from September through November, when the Expo line reopened and only Blue line shuttles were running, and bus volumes had decreased from the mid-pilot period. Around 70 buses an hour running in the Flower Street corridor. The bus lane was still operational and being enforced.

Appendix Table 1: Changes in Total Average Run Time Across Three Study Periods

Study Period	Mean Travel Time	Standard Deviation	Standard Error
Pre-pilot	12.99	5.58	0.54
Mid-pilot	11.29	4.32	0.20
Post-pilot	11.14	4.06	0.20

Data Limitations

The unique context of the Flower Street bus lane makes it particularly difficult to evaluate. Since the bus lane operated as a mitigation strategy for a major rail improvement project, there were large increases in bus throughput in the corridor that influence the evaluation. Additionally, it took a few weeks for car traffic to adjust to the new street conditions. Additionally, the bus lane was introduced in the summer, where traffic levels are normally lower downtown than the rest of the year as the University of Southern California, LATTC, and other downtown universities, were out of session. It is important to consider these unique conditions when evaluating the bus lane.

Appendix Table 2: Existing bus lanes and busways in Los Angeles County (as of 2019)

Name	Year Built	Municipality	Infrastructure	Hours	Total Lane Miles	Enforcement
Spring Street	1974	City of Los Angeles	Shared lane, one-way	24-hr	0.5	No dedicated unit / light enforcement
Harbor Transitway	1980's	City of Los Angeles, Carson	Exclusive guideway, bi-directional	24-hr	22	Red light cameras
Figueroa Street	1990's	City of Los Angeles	Shared lane, one-way	24-hr	4.6	Dedicated enforcement
Broadway Boulevard	2002	Santa Monica	Shared lane, one-way	24-hr	0.3	No dedicated unit/ light enforcement
Santa Monica Boulevard	2002	Santa Monica	Shared lane, one-way	24-hr	0.3	No dedicated unit/ light enforcement
Orange Line Busway	2005	City of Los Angeles	Exclusive guideway, bi-directional	24-hr	36	Red light cameras
Wilshire Boulevard	2008	City of Los Angeles, Beverly Hills	Shared lane, bi-directional	Peak-only (6-9 am, 4-6 pm)	15.4	No dedicated unit / light enforcement
El Monte Busway	2009	City of Los Angeles, Monterey Park, Rosemead, El Monte	Exclusive guideway, bi-directional	24-hr	22	Red light cameras
Cesar Chavez/ Sunset Boulevard	N/A	City of Los Angeles	Shared lane, bi-directional	Peak only, unidirectional (East bound 7-9 am, West bound 4-7pm), with enforcement during Dodgers games	2.4	Dedicated unit only on Dodgers game days
Lincoln Boulevard	2017	Santa Monica	Shared lane, bi-directional	Peak only (7-9am, 4-7pm)	2.4	No dedicated unit/ light enforcement
Flower Street	2019	City of Los Angeles	Shared lane, one-way	Evening peak-only (3-7pm)	1.8	Dedicated enforcement

Source: LA Metro; Personal Correspondence with LADOT staff; "Shared-Use Bus Priority Lanes on City Streets: Approaches to Access and Enforcement," Agrawal, Goldman, Hannaford, 2013

Appendix Table 3: Planned Mixed-Use Bus Lanes in Los Angeles County

Corridor	Projected Opening Year
North San Fernando Valley	2023-2025
Vermont Blvd.	2028-2030
North Hollywood to Pasadena	2022-2024

Source: LA Metro

Endnotes

- ¹ Based on mid-pilot period person throughput data.
- ² This is calculated in lane miles, so one mile of bi-directional bus lane mile is counted as two miles. Mixed-use lanes allow for right-turning vehicles and bikes to use the lane.
- ³ The rest of the 80 miles are fixed guideway bus lanes, specifically the Harbor Transitway, the El Monte Busway, and the Orange Line busway.
- ⁴ The MyFig Project included not just a bus lane but a protected bike lane, bus boarding islands, pedestrian improvements, and other amenities.
- ⁵ See Michael Manville, "Measure M: Lessons from a Successful Transportation Ballot Campaign," Eno, 2019.
- ⁶ These were renamed the A and E Line (for Blue and Expo line, respectively) during the study period.
- ⁷ See John Gahbauer and Juan Matute, "Best Practices in Implementing Tactical Transit Lanes," UCLA Institute of Transportation Studies, 2019.
- ⁸ May data is used for most of the analysis. Traffic loop data gathered by LADOT was not available for May and was only gathered in April.
- ⁹ Michael Manville, Brian D. Taylor, and Evelyn Blumenberg, "Falling Transit Ridership: California and Southern California," UCLA Institute of Transportation Studies, 2018.
- ¹⁰ A downtown forum hosted by the Institute of Transportation Studies at UCLA on March 1, 2019 brought together experts who had implemented pop-up bus lanes. Representatives from LA Metro's Service Planning division who attended the event cite this forum as further reinforcing their desire for moving ahead with the bus lane.
- ¹¹ Sean P. Thomas, "Finally, MyFigueroa Is Ready to Roll," Downtown Los Angeles News. August 27, 2018.
- ¹² Municipal Code section 80.36.8
- ¹³ LAMC 80.36.8 d
- ¹⁴ There were no physical barriers (such as bollards) or red painted lanes, as red pavement was not legal in California during the study period, and required a permit of experimentation from the Federal Highway Administration. LADOT submitted a request for interim approval in October 2019 to paint the Flower and Figueroa bus lanes red, beginning with Figueroa Street. *Source: Personal correspondence, Dan Mitchell, LADOT.*
- ¹⁵ LA Metro "Flower Street Bus Only Lane Pilot Project Fact Sheet" and personal correspondence
- ¹⁶ Signal priority is only given to buses that are behind schedule. This priority is given through providing an extended green or early green light for the bus.
- ¹⁷ Districts 9 and 14 (Councilmembers Curren D. Price and Jose Huizar, respectively).
- ¹⁸ LA Metro "Flower Street Bus Only Lane Pilot Project Fact Sheet"
- ¹⁹ The city of Los Angeles entered into a settlement agreement as a result of the Keep L.A. Moving litigation in 2017 regarding the Playa Del Rey road diet. The agreement, along with the LADOT Lane Reconfiguration Guidelines, outlines thresholds for "high volume" and "low volume" projects, based on street classification in the Mobility Plan 2035, that require different levels of traffic capacity analysis when proposing a lane reduction in the City. The "low volume" threshold requires basic outreach. The Flower Street bus lane fell under this category.
- ²⁰ The video garnered 314,000 media views and 779,000 impressions on Twitter; 10,000 views and 26,000 impressions on Instagram, and 11,000 views on Facebook.

-
- ²¹ This video, which was showcased on Twitter, gathered 76,000 views.
- ²² TransitCenter, "Bus Lane in Bloom: Flower Street and the Urgency of Speeding Up LA Bus Service," December 19, 2019; and TransitCenter, "Meet the Winners of TransitCenter's First Annual Frequency Awards," December 20, 2019.
- ²³ Examples include SFMTA's Transit-Only Lane Enforcement (TOLE) Program and New York City's Automated Bus Lane Enforcement system.
- ²⁴ Eddie Kim, "Shammas Group Withdraws Appeal on MyFigueroa Project," *DT News*, May 7, 2014.
- ²⁵ This bus lane would have been California Environmental Quality Act (CEQA) exempt regardless of being a pilot, due to the switch from mitigating for Level of Service impact to mitigating for VMT impact. A bus lane reduces VMT, which makes any bus lane exempt unless there are other environmental impacts to be mitigated for.
- ²⁶ While the bus lane has not become permanent as of publication, LA Metro staff has made this recommendation in a receive and file report and received no objection from the LA Metro board.
- ²⁷ This is not a CEQA requirement but a product of a lawsuit settlement from the Keep LA Moving litigation.
- ²⁸ Report pulled from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS) database. There was one bicyclist collision at Flower and 11th Street, where there is a construction site which might have impacted the traffic conditions and safety. However, this is in a stretch where the bus lane was actually removed to accommodate for the construction site.
- ²⁹ Cellular data feeds are not able to distinguish dwell times, so these are included in the speed estimates.
- ³⁰ A few of the bus stops along Flower Street were not optimally placed to allow the bus to catch the green light. This most likely contributed to bus delay. However, these stops were adjusted during the post-pilot period and with negligible changes in the bus performance between the mid- and post-pilot periods.
- ³¹ The Westside/Central Service Council (WSC) passed a motion to extend the bus lane as a pilot, and authored a letter to the Metro Board in support of this. Service Councils are appointed bodies that are specifically tasked with giving residents more opportunities for direct input into service issues and improving bus service.
- ³² We avoided weeks in our sampling that were likely to have atypical traffic volumes, such as weeks where a holiday fell on the weekend before or during the week
- ³³ These routers are on around 80percent of the LA Metro bus fleet, as of October 2019.
- ³⁴ Approximately 100 observations fell above the calculated 25 miles per hour out of the 5,139 gathered.
- ³⁵ The AVL is triggered at every door open/close event and records the run time and dwell time from the previous door open/close event.
- ³⁶ APCs measure passenger load through capturing boardings and alightings at each bus stop. The data is then processed to estimate passenger load between each stop.
- ³⁷ 1.7 is a national standard for private vehicle occupancy defined by the FHWA
- ³⁸ May data is used for most of the analysis. Traffic loop data gathered by LADOT was not available for May and was only gathered in April.

Eno

Center for Transportation
www.enotrans.org



@EnoTrans



/EnoCenterForTransportation



bit.ly/EnoLinkedIn



/EnoTransportation



@EnoTrans