

**Report on the
Value Pricing Pilot Program
Through April 2018**

U.S. Department of Transportation
Federal Highway Administration

EXECUTIVE SUMMARY

Congestion pricing works by shifting some rush hour highway travel to other transportation modes or off-peak periods and by encouraging solo drivers to carpool or forgo making a trip altogether. By removing a fraction (even as small as 5 percent) of the vehicles from a congested roadway, pricing enables the traffic to flow much more efficiently, allowing more vehicles to move through the same physical space.¹

Although drivers unfamiliar with the concept initially have questions and concerns, drivers who are more experienced with congestion pricing usually support it because it offers them a reliable trip time. Transit and ridesharing advocates also appreciate the ability of congestion pricing projects to generate revenue and the financial incentives that make alternatives to driving more attractive.

The U.S. Congress established the Congestion Pricing Pilot Program in 1991. It was subsequently renamed the Value Pricing Pilot Program (VPPP) under Section 1216(a) of the Transportation Equity Act for the 21st Century (TEA-21) in 1998 and continued through the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The VPPP purpose is to demonstrate whether, and to what extent, roadway congestion may decrease through the application of demand-based pricing strategies. Seeking to measure the impact of such policies on driver behavior, traffic volumes, transit ridership, air quality, and availability of funds for transportation programs, the original program included discretionary grants funding for demonstration projects. The program awarded approximately \$65 million in discretionary grant funds between 2008 and 2012, after which no additional discretionary grant funds were authorized. However, since 2012, the United States Department of Transportation (DOT) has retained the ability to grant States authority to enter into cooperative agreements for projects that require tolling authority under this program.

Although the Federal Highway Administration (FHWA) no longer actively solicits VPPP projects, States and local governments continue to explore value pricing and the potential of deploying tolling strategies with FHWA. The FHWA staff continues to provide significant technical assistance to all project partners for project development, implementation, and pre-implementation activities. The FHWA staff also oversees the development and distribution of quarterly reports detailing VPPP accomplishments.

Congestion pricing encompasses tolling and non-tolling strategies that can reduce peak period congestion by charging motorists new or higher fees for use of roads and parking during peak times to encourage drivers to shift to other travel modes, routes, or destinations; to travel at other times of the day; or to forgo making the trip altogether.

¹ *Congestion Pricing – A Primer: Overview*, U.S. Department of Transportation, Federal Highway Administration, October 2008, http://ops.fhwa.dot.gov/publications/fhwahop08039/cp_prim1_00.htm.

Key Findings

Through a comprehensive Congestion Pricing Program that includes the VPPP, as well as follow-on initiatives, such as the Congestion Reduction Demonstrations (CRD), Urban Partnership Agreements (UPA), and Express Lanes Demonstration programs, FHWA has now funded more than 135 congestion pricing projects and studies across 21 States and the District of Columbia. The VPPP-supported projects demonstrate the technical feasibility of congestion pricing and, where implemented, have influenced user decisions to change their travel behavior. The VPPP projects and studies have provided many valuable lessons, with several findings demonstrating the significant progress made in the past few years toward successful deployment of comprehensive congestion pricing strategies and programs, especially in congested urban areas:

- The VPPP helped to spark a rapid increase in priced managed lane deployments and the continued acceptance and deployment of this strategy in major metropolitan areas across the United States. During the late 1990s, only four priced managed lane facilities operated in the United States. Very few transportation professionals had experience with implementing and operating congestion pricing on managed lanes. However, as of April 2018, 47 corridors nationwide operate with priced managed lanes, with an additional 23 managed lane projects under construction. All VPPP projects with High-Occupancy Toll lanes have experienced a marked increase in new accounts/transponders, tolled trips, and gross revenues, all of which are indicative of the public's growing acceptance of pricing.
- Pricing can have a positive effect on transit ridership. Express buses using tolled lanes had faster speeds and shorter travel times. For example, the 95 Express in Miami, Florida, added express bus service for both Miami-Dade and Broward Counties, including 22 new articulated buses and 10 new express routes from Broward County to Downtown Miami. Average express bus ridership before the 95 Express Project was 1,746 passengers per day and, as of July 2017, average ridership increased 323 percent to 5,645 riders per day.
- The VPPP created interest and enabled deployment opportunities within congested urban areas for other demand-based pricing strategies, broadening the incorporation of non-driving transportation alternatives. The deployment of non-toll congestion pricing strategies—such as parking pricing, pay-as-you-drive insurance, car sharing, bike sharing, and dynamic ridesharing—has grown and experienced further successes. As an illustration, the goBerkeley Travel Demand Management (TDM) Program survey results showed an overall 3.1 percent reduction in automobile use, with 94 percent of participants reporting that they were walking more, 90 percent indicating that they had increased transit use, and 19 percent stating they were biking more. Among almost 500 Easy Pass program participants, 82 percent said they upped Alameda Contra-Costa Transit use because they had the pass, and nearly half said they deployed their pass at least twice a week. The carshare program included 15 businesses and over 60 participants. Results indicated that more than 10 percent of participants used carsharing as a new travel alternative.

- Efforts to integrate value pricing with parking have led to increased usage of previously underutilized parking spaces. Efficiently pricing parking spaces, as part of the SFpark pilot project in San Francisco, California, led to a gradual reduction of fully occupied blocks and the increasing occupancies for underutilized areas. Staff who led the LA Express Park project in Los Angeles, California, also observed a similar relationship in occupancy after the implementation of value pricing.
- Equity impacts have proven to be minimal, yet remain a concern to the public. In early 2018, the National Highway Cooperative Research Program (NCHRP) released research report 860: Assessing the Environmental Justice Effects of Toll Implementation or Rate Changes: Guidebook and Toolbox. The document shows the practitioner when and how to apply the tools in the toolbox that provide a framework to measure the impacts of tolling, as well as the means to engage low-income and minority population in the decision-making process.
- The VPPP has been a tremendous asset to partners in the transportation industry during the past two decades. Project partners often express their perspectives that priced managed lanes would not be as widespread without the program's influence. The program has enhanced the visibility of these projects, partly through its consistent involvement with industry forums, such as the Transportation Research Board (TRB), the American Association of State Highway and Transportation Officials (AASHTO), the International Bridge, Tunnel and Turnpike Association (IBTTA), and FHWA-sponsored workshops.

Moving Forward

The FHWA continues to regard congestion pricing as a critical congestion management tool. The FHWA anticipates that, in the future, connections between multiple demand-based pricing approaches will enhance the effectiveness of comprehensive and coordinated regional programs. Second-generation pricing approaches are likely to combine regionwide pricing strategies, such as vehicle miles traveled fees, cordon pricing, and regional pricing, along with a non-toll blueprint. The goals of these strategies are 1) mainstreaming demand-based pricing into the mindset of transportation professionals as a viable option, and 2) expanding public acceptance of demand-based pricing as one part of a suite of transportation choices. The FHWA will continue to use proven outreach strategies to educate and inform State and local agencies about demand-based pricing strategies, including tolling and non-tolling efforts.

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LIST OF ACRONYMS AND ABBREVIATIONS.

AASHTO – American Association of State Highway and Transportation Officials
AC Transit – Alameda-Contra Costa Transit District
AET – All Electronic Tolling
BART – Bay Area Rapid Transit
Caltrans – California Department of Transportation
CCTV – Closed-Circuit Television
CTRMA – Central Texas Regional Mobility Authority
ConOps – Concept of Operations
CRD – Congestion Reduction Demonstrations
CTDOT – Connecticut Department of Transportation
DDOT – District of Columbia Department of Transportation
EA – Environmental Assessment
FAST – Fixing America’s Surface Transportation Act
FY – Fiscal Year
FDOT – Florida Department of Transportation
FHWA – Federal Highway Administration
GHG – Greenhouse Gas
HOT – High-Occupancy Toll
HOV – High-Occupancy Vehicle
IBTTA – International Bridge, Tunnel, and Turnpike Association
ICPP – Integrated Congestion Pricing Plan
MIT – Massachusetts Institute of Technology
Metro – Los Angeles County Metropolitan Transit Authority
MAP-21 – Moving Ahead for Progress in the 21st Century Act
MnDOT – Minnesota Department of Transportation
MTC – Metropolitan Transportation Commission of the San Francisco Bay Area
NCHRP – National Cooperative Highway Research Program
NYCDOT – New York City Department of Transportation
NCTCOG – North Central Texas Council of Governments
OBD – On-Board Diagnostics
ODOT – Oregon Department of Transportation
OTREC – Oregon Transportation Research and Education Consortium
PAYD – Pay-As-You-Drive
P2P – Peer-to-Peer
PBOT – Portland Bureau of Transportation
RPP – Referral Partnership Program
RTR – Real-Time Ridesharing
SAFETEA-LU – Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy
for Users
SBCAG – Santa Barbara County Association of Governments
SCAG – Southern California Association of Governments
SFCTA – San Francisco County Transportation Authority
SFMTA – San Francisco Municipal Transportation Agency
SOV – Single-Occupancy Vehicle
TDM – Travel Demand Management

TEA-21 – Transportation Equity Act for the 21st Century
TRAC – University of Washington State Transportation Research Center
TRB – Transportation Research Board
TxDOT – Texas Department of Transportation
UBI – Usage-Based Insurance
UC – University of California
UPA – Urban Partnership Agreements
DOT – United States Department of Transportation
VHT – Vehicle Hours of Travel
VMT – Vehicle Miles Traveled
VTA – Valley Transportation Authority
VPPP – Value Pricing Pilot Program
WSDOT – Washington State Department of Transportation

Chapter 1. Introduction

Background

Congestion pricing works by shifting some rush hour highway travel to other transportation modes or off-peak periods and by encouraging solo drivers to carpool. By removing a fraction (even as small as 5 percent) of the vehicles from a congested roadway, pricing enables the system to flow much more efficiently, allowing more vehicles to move through the same physical space.²

Although drivers unfamiliar with the concept initially have questions and concerns, drivers who are more experienced with congestion pricing usually support it because it offers them a reliable trip time. Transit and ridesharing advocates also appreciate the ability of congestion pricing projects to generate revenue and the financial incentives that make alternatives to driving more attractive. [The U.S. Department of Transportation \(DOT\) report, *Beyond Traffic 2045*](#), cites congestion pricing as a potential policy option to “manage demand.”³ The report also states that “Expanding the use of tolling and congestion pricing could help to reduce congestion while generating revenues that could be used to finance the construction of new roadways and bridges or maintain existing facilities.”⁴

*“Expanding the use of tolling and congestion pricing could help to reduce congestion, while generating revenues that could be used to finance the construction of new roadways and bridges or maintain existing facilities.”
-Beyond Traffic 2045*

Through a comprehensive Congestion Pricing Program that includes the VPPP, as well as follow-on initiatives, FHWA has now funded more than 135 congestion pricing projects and studies across 21 States and the District of Columbia. This report represents findings from VPPP-funded projects, as well as extensive research on a variety of critical topics in congestion pricing. In the early development and application stages of the congestion pricing concept, multiple high-occupancy toll (HOT) lane projects encountered challenges and issues including equity, privacy, technology, and enforcement. Entities that are currently seeking to deploy congestion pricing strategies have benefitted not only from the research that DOT has conducted on these topics but also from sharing results across agencies and among industry partners. The FHWA provides critical support to States to help them implement strategies to manage congestion problems. More importantly, findings from deployed projects continue to

² Federal Highway Administration, *Congestion Pricing – A Primer: Overview*, FHWA-HOP-08-039 (Washington, DC: FHWA, October 2008). Available at: http://ops.fhwa.dot.gov/publications/fhwahop08039/cp_prim1_00.htm. Accessed 2/24/16.

³ U.S. Department of Transportation, *Beyond Traffic 2045, Trends and Choices*, 2015. Available at: https://www.transportation.gov/sites/dot.gov/files/docs/Draft_Beyond_Traffic_Framework.pdf

⁴ Ibid.

demonstrate that the application of innovative congestion pricing strategies can efficiently manage demand on congested urban facilities.

Because of successful deployments, there is growing consensus that congestion pricing is becoming a viable approach to reducing traffic congestion. Figure 1 depicts the evolution of managed lanes to priced managed lanes from the 1960s through today. In the early years of congestion pricing (1990s-early 2000s) in the United States, transportation agency staff that wished to explore such strategies faced skepticism or indifference within their agencies. Many innovative concepts incubated in the planning arena and took several years to develop into projects. Pilot program funding and support from the VPPP has helped significantly in the evolution from the bus and high-occupancy vehicle (HOV) lanes to priced managed lanes, as shown in Figure 1. The VPPP has also contributed considerably to the accelerating concept development into the implementation of actual congestion pricing projects, often the first of their type in the region. These innovative strategies catch the attention of decision-makers and create desire to deploy similar endeavors.

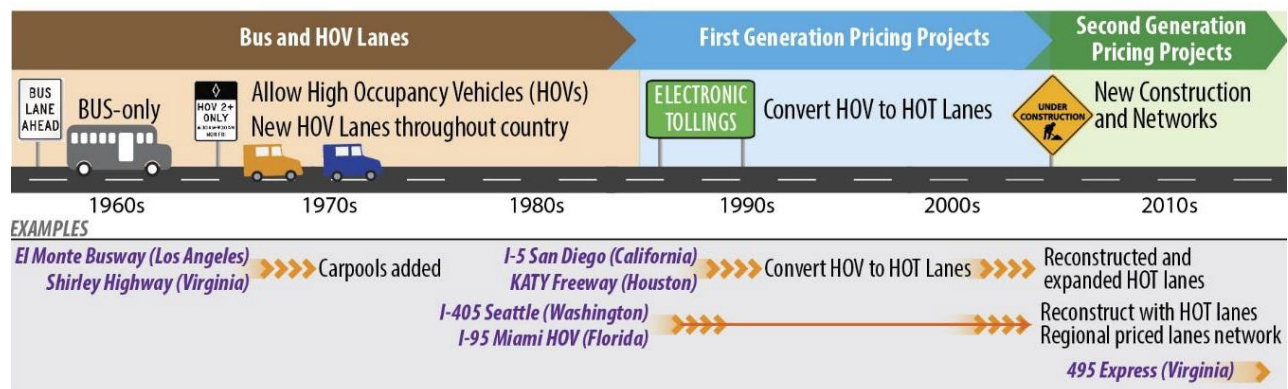


Figure 1. Timeline depicting the evolution of Managed Lanes from the 1960s through today. Pilot program funding and support from the VPPP has helped significantly in the evolution from bus HOV lanes to priced managed lanes ⁵

Figure 2 depicts the exponential growth of HOT lanes in the United States between the opening of the first projects in 1995 through 2017. The figure summarizes the deployment of HOT lanes only; however, all priced managed lane types, including express toll lanes, full facility tolling, and HOT lanes, have experienced a similarly rapid growth pattern.

⁵ Adapted from D. Ungemah, “HOT Lanes 2.0- An Entrepreneurial Approach to Highway Capacity,” Presentation Slides for National Road Pricing Conference in Houston, TX, June 2010.

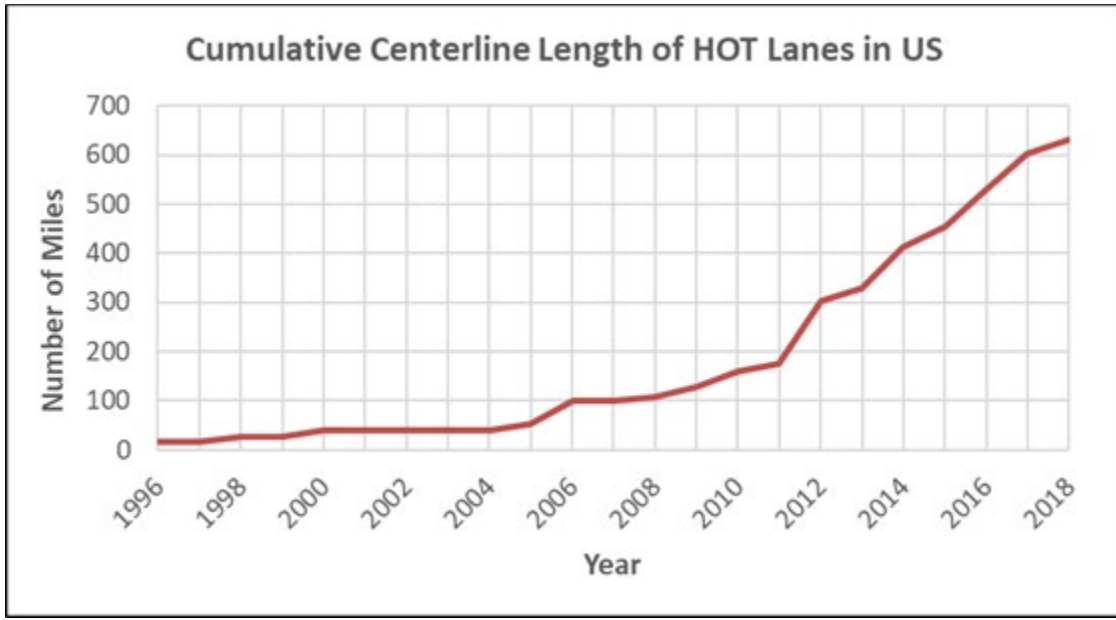


Figure 2: Growth in the cumulative length of HOT lanes in the United States.⁶

Report Organization

This report provides an update on the various VPPP-funded or toll authorized projects and studies and discusses FHWA’s recent outreach and technical assistance to advance congestion pricing beyond the current VPPP project locations. Finally, Appendix A provides a summary of the level of assistance each project received under the VPPP.

⁶ Texas A&M Transportation Institute, 2018. Data for 2018 only considers opened projects from January through April.

Chapter 2. The Value Pricing Pilot Program: Project Updates

The U.S. Congress established the Congestion Pricing Pilot Program in 1991. It was subsequently renamed the VPPP under Section 1216(a) of the Transportation Equity Act for the 21st Century (TEA-21) in 1998, and continued in Section 1604(a) Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), P.L. 109-59. The Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act did not make any additional funding available. However, FHWA retains the ability to enter into cooperative agreements for projects that require tolling authority under this program for their implementation.

Congress established the VPPP to demonstrate whether congestion pricing strategies could reduce roadway congestion. In addition, the VPPP has a goal to evaluate the magnitude of the impact of such strategies on driver behavior, traffic volumes, transit ridership, air quality, and availability of funds for transportation programs.⁷ The program has provided tolling authority and discretionary grants to State or local governments to facilitate the demonstration of congestion pricing applications and report on their effects. According to the statutory requirements of VPPP, FHWA may enter into cooperative agreements with up to 15 State or local governments or other public authorities to establish, maintain, and monitor value pricing pilot programs. Currently, there are 12 State-led programs and 2 city-led programs participating in the VPPP: California, Connecticut, Florida, Illinois, Maryland, Massachusetts, Minnesota, Nevada, Oregon, Texas, Virginia, Washington State, New York City, and the District of Columbia. Many of these programs have multiple projects.

The VPPP encourages the implementation and evaluation of value pricing pilot projects to manage congestion on highways through tolling and other pricing mechanisms. Although there is no longer a discretionary grant component, many States have gained experience with pricing strategies with the help of the VPPP, and States now can implement more extensive value pricing projects. The FHWA continues to support States and regions in their pricing initiatives by offering guidance and expertise in choosing the most promising and appropriate of the emerging strategies.

Congestion mitigation, environmental concerns, and limited funding for highway construction have led to increased interest by State, regional, and local transportation agencies in exploring the use of demand-based pricing as a strategy to manage congestion on oversubscribed roads.

The following section provides updates on projects currently under study. The projects are either now in progress or completed since 2016. The VPPP projects include tolling and non-tolling projects, with the majority of the non-tolling projects falling into one of four categories: parking pricing, priced vehicle sharing, dynamic ridesharing, and pay-as-you-drive (PAYD) pricing initiatives.

For information on other VPPP projects, refer to the VPPP Quarterly Report at http://www.ops.fhwa.dot.gov/congestionpricing/value_pricing/projects/index.htm

⁷ Section 1012(b)(5) was amended by the National Highway System Designation Act of 1995 (section 325(e) of Pub. L. 104-59) and section 1216(a) of the Transportation Equity Act for the 21st Century (TEA-21).

Table 1: Funded VPPP Projects by Status

State	Recipient	Project Name	Type	Funding Amount
<i>Projects and Studies in Progress</i>				
CA	Southern California Association of Governments	Cordon/Area Charging and Build-Out of Express Lanes in Southern California	Tolled	\$916,802
CA	San Francisco County Transportation Authority	BART Travel Incentives Pilot Project	Non-tolled	\$508,000
CA	City of San Diego	One-Way Electric Vehicle Carsharing	Non-tolled	\$440,653
DC	District Department of Transportation	Multimodal Dynamic Parking Pricing	Non-tolled	\$1,090,000
MA	Massachusetts Department of Transportation	Employer Benefit Design to Reduce Single-Occupant Vehicles	Non-tolled	\$743,872
NV	Nevada Department of Transportation	Lake Tahoe Market Based Parking Pricing	Non-tolled	\$290,455
WA	King County Metro Transit	Park and Ride Pricing in Multifamily Developments	Non-tolled	\$543,900
<i>Projects Completed Since the Previous Biennial Report in 2016</i>				
CA	San Francisco County Transportation Authority	Treasure Island Mobility Management Study	Tolled	\$480,000
CT	Connecticut Department of Transportation	Feasibility of Pricing on I-84	Tolled	\$644,000
CT	Connecticut Department of Transportation	Variable Pricing on the I-95 Corridor	Tolled	\$1,120,000
TX	North Central Texas Council of Governments	Influencing Travel Behavior, Sensitivity to Environmental Justice	Tolled	\$588,301
WA	Washington State Department of Transportation	SR 167 Express Toll Lanes Continuous Access Demonstration	Tolled	\$520,000
CA	San Francisco Municipal Transportation Agency	Residential Parking Management Project	Non-tolled	\$420,000
CA	City of Berkeley	Parking Pricing and TDM	Non-tolled	\$169,185
NY	New York City Department of Transportation	Drive Smart Mobile Technology Pilot Program	Non-tolled	\$1,000,000
NY	New York City Department of Transportation	PARK Smart	Non-tolled	\$950,000
OR	Oregon Department of Transportation	Getaround Peer-to-Peer Car Sharing Incentives	Non-tolled	\$1,725,000
<i>Operational Projects</i>				
CA	Santa Clara Valley Transportation Authority	SR 237 Express Lanes Continuous Access Extension	Tolled	\$1,600,000
CA	Alameda County Transportation Commission	I-680 SMART Carpool Lanes	Tolled	\$714,000
FL	Florida Department of Transportation	Priced Managed Lanes in Miami-Fort Lauderdale Region	Tolled	\$900,000
MN	Minnesota Department of Transportation	Interstate 35E MnPASS Managed Lanes Extension	Tolled	\$605,000
MN	Minnesota Department of Transportation	Priced Dynamic Shoulder Lanes	Tolled	\$5,000,000
MN	Minnesota Department of Transportation	HOT Lanes on I-394 in Minneapolis	Tolled	\$925,000
WA	Washington State Department of Transportation	SR 167 Express Toll Lanes	Tolled	1,680,000
WA	Washington State Department of Transportation	Variably Priced Tolls on SR 520 in Seattle	Tolled	\$10,000,000

Projects and Studies in Progress

Projects Involving Tolls

Cordon/Area Charging and Build-Out of Express Lanes in Southern California

The Express Travel Choices (Phase II) study examined the potential of implementing a cordon/areawide pricing pilot in major activity centers within the Los Angeles, California, region. Occurring in conjunction with build-out of the planned managed network of express/HOT lanes across southern California, the study aimed to integrate pricing into a comprehensive approach to congestion management through the development of a concept of operations (ConOps) for the southern California region. Project partners included the Southern California Association of Governments (SCAG), the California Department of Transportation (Caltrans), and the Los Angeles County Metropolitan Transportation Authority (Metro).

The study team for the express lane network completed the first iteration of the ConOps, which provides a blueprint for a regional express lane network that integrates individual express lane facilities into a regional system with consistent or compatible operating, design, and policy rules. The study also helped refine the recommendations for a regional express lane network for inclusion into the adopted SCAG 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS), approved April 7, 2016. Like all ConOps documents, the ConOps report is intended to be a “living document” that will be updated with the completion of new express lane projects, the emergence of new technologies, and other changing conditions that emerge. As such, the 2020 RTP/SCS will likely incorporate further ConOps updates. The study team also continues to analyze financial, economic, and environmental justice/equity components of the cordon project. Continued stakeholder engagement is underway with civic organizations, elected leadership, and partner agencies.

Following the successful Phase II project, the Phase III pre-implementation project developed a feasibility study and ConOps for a potential cordon pricing pilot program. Critical analysis areas included economic and environmental justice/equity components and opportunities for integrating new shared mobility/technology initiatives. The study team also conducted broad stakeholder outreach through community meetings/events, social media, billboards, and media engagement. Primary project goals include promoting a balanced transportation system by encouraging travelers to consider mobility options, increasing the use of transit and active transportation modes, improving quality of life by reducing congestion levels, and reducing vehicle miles traveled/vehicle hours traveled (VMT/VHT) and greenhouse gas (GHG) emissions.

The SCAG leads the pre-implementation study efforts in coordination with the City of Los Angeles and the City of Santa Monica, California. The VPPP funded the Phase III implementation study through the end of 2016 with the State of California and local sources contributing financial support for further efforts. Publication of results will occur in late 2018.

Projects Not Involving Tolls

BART Travel Incentives Pilot Project in San Francisco, California

Ridership on the San Francisco Bay Area Rapid Transit (BART) system increased rapidly in recent years due to population and employment growth. The growth resulted in transit system crowding during peak periods, especially in the corridor connecting San Francisco's Financial District with the East Bay cities via the underwater Transbay Tube.

The San Francisco Travel Smart Rewards Pilot Program, also known as BART Perks, was a 6-month test program that provided low-value cash incentives (via PayPal) to riders for voluntarily shifting their travel to the shoulder hours of the morning peak period. The primary project goal was for BART to provide an improved customer experience by reducing crowding on the system in the Transbay Tube. Participants enrolled in the program through a mobile-friendly Website. At sign-up, participants accepted a user agreement and were prompted to enter their Clipper (smart transit card) ID number.

About 17,800 participants enrolled, and approximately 2,600 of them were frequent weekday peak hour travelers. During the trial that ran from late August 2016 through February 2017, an average of 250 participants, or about 10 percent of those who previously traveled during the peak hour, shifted their ride to one of the shoulder hours. While this shift is modest relative to peak hour trips systemwide, BART Perks demonstrated that incentives could successfully change the departure times of peak period travelers. With a Federal Transit Administration grant, BART will conduct a more targeted, smaller-scale incentive program trial that builds on the lessons learned from BART Perks. The project will be completed in 2018.

One-Way Electric Vehicle Carsharing in San Diego, California

“Pricing Your Way to Operational Efficiency: One-Way Electric Vehicle Carsharing in San Diego” is a partnership of University of California (UC) Berkeley, car2go carsharing company, Caltrans, and FHWA. This project explored the travel behavior impact of a one-way, electric vehicle carsharing system and the effects of using pricing experiments to help incentivize consumers to redistribute vehicles in ways that would limit the need for staff to rebalance vehicles, thus enhancing efficiency and reducing congestion impacts. Having conducted three rounds of surveys to assess the impact of using pricing experiments on travel patterns, the project evaluated activity data to ascertain whether the tests resulted in notable vehicle distribution changes.

The research team tested two congestion pricing strategies as part of the study:

1. Provide incentives (e.g., future driving credits) to members if they drive vehicles with nearly-depleted batteries close to the central charging station. If members drove cars for at least 15 minutes and parked within a three-block radius of the central charging station, they would receive a credit for 10 minutes of driving, which travelers could redeem for their next trip. The rationale for establishing this incentive is that it would reduce the burden on the system's staff in retrieving and charging depleted vehicles.

2. Provide incentives (future driving credits) to members, if they drive vehicles out of two predetermined, overstocked areas regarding vehicle supply. Similarly, structured to the first incentive, if users drove vehicles out of the two set regions for at least 10 minutes, they would receive a 10-minute credit.

Responses from the member surveys indicated that:

- 72 percent of respondents had known about the first pricing strategy tested by the research team, and 16 percent had received driving credits from it.
- 82 percent of respondents indicated they would have taken advantage of the first incentive for 30 minutes of driver credits.
- 85 percent of those who received driving credits were satisfied or very satisfied.
- Only 7 percent of respondents were “definitely” willing to take advantage of the second incentive (i.e., moving vehicles from overstocked areas) at the rate of 10 minutes of driving credits for 10 minutes of driving. However, if 10 minutes of driving resulted in 30 minutes of driver credits, 65 percent indicated they would do so.
- In the final survey, 14 percent of respondents had received credit for the second incentive.
- Respondents favored driver credits over cash equivalents.

In addition, an activity data analysis led the research team to a series of findings about the impact of incentives on driver behavior. After the launch of the first incentive, a marked rise occurred in the number of trips to the central charging station, as compared to the pre-incentive baseline. However, the research team observed the increase for only a minority of car2go members. Comparatively, no detectable upturn occurred for the number of vehicles pursuing the second incentive.

Aside from the incentives, this pilot also demonstrated other benefits of one-way carsharing regarding driving behavior and vehicle ownership:

- 27 percent of respondents indicated a decrease in driving because of joining car2go, while only 12 percent stated they drove more.
- 34 percent of respondents reported walking more, versus only 9 percent who walked less.
- 59 percent used taxis less, with only 2 percent noting they used taxis more.

In 2016, four other cities with car2go (Calgary, Seattle, Vancouver, and Washington, District of Columbia) had surveyed members, providing a more comprehensive perspective on the San Diego observations pilot that included these findings:

- 2-5 percent of respondents sold a vehicle, and members per car2go vehicle sold overall 1-3 percent of their vehicles.
- 7-10 percent postponed a vehicle purchase, and a total of 4-9 vehicle acquisitions were suppressed per car2go vehicles.
- On average, each car2go household reduced its vehicle miles traveled (VMT) by 6-16 percent, and its greenhouse gas emissions by 4-18 percent.

The research results show that one-way, electric vehicle carsharing can bring significant benefits to cities regarding vehicle ownership, driving behavior, VMT and GHG reductions, and increased use of alternative transport modes. Carsharing systems can use pricing incentives to

reduce their staffing requirements and ensure adequate vehicle coverage. However, those rewards must have a sufficient structure to match member preferences. The study will be completed in 2018.

Multimodal Dynamic Parking Pricing in the District of Columbia

This project is evaluating the state-of-the-art and cost-effective parking management strategies deploying a mix of technologies and data analytics. The implementation of the pilot program occurred in the Chinatown/Penn Quarter area. Lessons learned from the pilot will help to shape eventual deployment throughout the District of Columbia (District). The goal of this pilot project is to increase on-street parking availability by deploying various pricing strategies and reducing the time drivers spend searching for a parking space by providing parking availability information in real-time. The parking management strategies will also apply to delivery vehicles and inter-city buses in the Chinatown/Penn Quarter.

This project has launched the pay-by-space initiative from “pay-and-display” for multi-space meter blocks. To facilitate that transition, the District of Columbia Department of Transportation (DDOT) demarcated all study area parking spaces using space number posts, developed outreach materials, and updated the system infrastructure. A robust public outreach and education program also occurred. The stakeholder outreach included a coordinated effort among the District of Columbia agencies to engage the public and discuss the changes with study area businesses and community groups. In November 2015, DDOT also collected data on existing conditions, such as average time to find an open parking spot, placard usage, double parking/illegal parking activity, and a customer survey. In addition, DDOT continued with the development of a blended “asset-lite” approach to predicting real-time parking space occupancy by incorporating sampled parking occupancy data from the portable closed-circuit television cameras deployed in the field along with limited sensor data, payment data, and citation data. The DDOT also started engaging app developers who could take the real-time parking availability information from a published application program interface and provide it to customers.

As of December 2016, DDOT validated and calibrated 500 installed, in-ground parking occupancy sensors to allow them to function within an urban environment. The installation process included working with sensor vendors to update the technology and adjust installed communication equipment to ensure data could be transmitted to the back office. With the installation of the sensors and initial data available, the project team developed price recommendations and identified locations for potential time-limit adjustments. The project team also coordinated with mobile application developers to ensure that a traveler information system was available before the price changes. The DDOT is currently evaluating the pilot and will provide a final report prior to the end of 2018.

Employer Benefit Design to Reduce Single-Occupant Vehicles in Kendall Square, Massachusetts

A research project examined and recommended design changes to employer-sponsored commuter benefit programs in Kendall Square in Cambridge, Massachusetts, to reduce single-occupancy vehicle commuting. The research provided an analysis of both current commuting behaviors for large employers in Cambridge as well as current incentives used in both local and national organizations to promote behavior change. The report presented a tool design to track

the impacts of individual and employer level commuter benefit changes, as well as a series of potential commuter incentives and their expected effects on mode share.

The report also made recommendations for the next phase of experimental trials, including strategies, such as offering incentives to Kendall Square employers. The study provides a focused discussion of potential strategies that the Massachusetts Institute of Technology (MIT) could employ as a large employer in the study area to promote single-occupant vehicle commuting alternatives.

The research findings suggest that by changing the commuting costs and providing both monetary and social incentives to employees, single-occupant vehicle commuting mode share can be reduced, even in high-transit, urban areas like Kendall Square. Introducing a combination of universal transit passes, parking cash-out schemes, daily parking rates, and commuter dashboards can improve transit, walking, and bicycling mode share for employers in Cambridge, Massachusetts.

As of December 2017, work continued with the analysis of the first year-over-year Access MIT results and the initial second year results (as the demand for parking permits and lot utilization has continued to decline by an estimated additional 5-10 percent, based on initial data). The research team also assisted the MIT administration in evaluating new program messaging, casual carpool matching, and parking administration tools that could enhance the MIT program.

The research team also continued to work with a major Boston-based healthcare provider to develop an evaluation plan for their latest commuting benefits changes and their impacts on the commuting behavior to a new 4,000 employee-sized facility. The healthcare provider has agreed to provide "before and after" data to include within the Massachusetts Department of Transportation (MassDOT) benefits pricing project evaluation, and an employee survey was developed and distributed for the site that will reveal specific relocated employees' behavior changes. The research team will fuse survey responses with additional "on the ground" parking and transit usage transaction data. Data collected from this facility will allow the research team to recommend future refinements to the provider's transportation benefit offerings. The study will conclude in 2018.

Lake Tahoe Market Based Pricing, Lake Tahoe, Nevada

The Tahoe Transportation District deployed peak-season pricing for a rural tourist destination parking facility. The pricing program also included enforcement of road-shoulder parking prohibitions and improvements to existing traveler information systems. Outside of the VPPP project, an improved shuttle service linked tourist destinations with remote parking and improved bicycle access (including an off-road trail and bicycle rental). The Tahoe Transportation District facilitated a kick-off meeting and site visit in October 2017 with the Technical Advisory Committee and their consultant team. The meeting focused on the development of an outline for the parking management plan. The Nevada Department of Transportation experienced some delays completing agreements between the agencies involved. In addition, the upgrades to the parking lots will not be completed until sometime in the fall. Implementation of the first phase of parking lot pay stations will occur in spring 2019.

Park and Ride Pricing in Multifamily Developments in King County, Washington

This project explored opportunities for priced park-and-ride spaces in multifamily developments located near high capacity transit services. King County Metro Transit developed a business model for this innovative source of park-and-ride parking and launched a pilot program in King County, Washington, to test the concept. Early project analyses led to a business model proposal with a private parking management company that assumes operations. King County Metro assists with regulatory compliance, site selection, and marketing of the program to both property owners and park-and-ride users.

Once the pilot project launched, Metro Transit provides marketing and incentives for new park-and-ride users and assistance to the parking management company with property recruitment. The marketing effort includes online ads and direct mailers to homes within a one-mile radius of participating parking lots. Metro Transit covers the permit costs for the first month of attending transit users, as a method to incentivize new users to try the program. Metro supervises new property recruitment to ensure the attractiveness of transit lots and to provide assistance with local regulations.

The pilot program launched in May 2017 for 12 original locations. The pilot steadily grew from 15 to 54 permit holders and increased to 15 sites. During the summer of 2017, roughly 10 percent of permit holders did not renew permits for the following month. However, the market stabilized between the fall and winter months of 2017 and 2018, with only one or two cancellations occurring per month. The most successful locations were southern and eastern King County for areas with high transit frequency and near-capacity park-and-ride lots.

As of March 2018, the program includes:

- 15 participating privately-owned parking lots
- 250 available parking stalls
- 54 active permits with prices that range from \$30.00 to \$175.00 per month

Metro Transit found the most significant challenge, so far, was the recruitment of additional property owners and transit users. Within the competitive King County real estate market, Metro found that property owners often prioritize the use of existing parking capacity to attract additional tenants, rather than leasing the spaces to individual customers. In addition, local regulatory and zoning restrictions acted as a deterrent and challenge to an effective shared, paid permit parking.

Moving forward, Metro will complete the 1-year pilot operations with a goal to increase the number of available properties and grow permit sales. During the evaluation of the pilot, Metro will assess overall program viability, potential as a self-sustaining operation, and capability of serving a large number of diverse sites located throughout the county. The initial results will help to support future property recruitment for neighborhoods with the highest demand for priced parking. Furthermore, marketing strategies will continue to adapt as Metro Transit learns more about new participant motivations. The study will be completed in 2018.

Projects Completed Since 2016

This section describes the projects completed since the previous biennial report in 2016.

Projects Involving Tolls

Treasure Island Mobility Management Study in San Francisco, California

The San Francisco County Transportation Authority (SFCTA) received VPPP funds for the Treasure Island Mobility Management Study, with a goal to advance the implementation of congestion pricing and other demand management programs. The Treasure Island Transportation Implementation Plan detailed a comprehensive set of transportation services that included: frequent ferry and bus service to San Francisco and Oakland, a free island circulator shuttle, a bicycle "library," and other cycling and pedestrian amenities. The plan also outlines demand management strategies that consist of a congestion fee for residents traveling between the island by private automobile during peak hours, required purchase of a pre-paid transit voucher for all residents in market-rate developments, and parking pricing for employee and visitor parking on the island. These transportation services and policies are to be implemented by a Treasure Island Mobility Management Agency (TIMMA); in April of 2014, the San Francisco Board of Supervisors (Board) approved the designation of the SFCTA as the TIMMA.

The TIMMA staff developed toll policy recommendations and had prepared a toll system ConOps. The toll policy recommendations developed as the Treasure Island Mobility Management Study (Study) pay particular attention to transportation affordability for current and future residents in below-market-rate housing on the island, in response to the Board and community input heard through three significant rounds of outreach.

The VPPP funds, along with other local and Federal funds, funded the successful completion of the initial planning and policy work as well as the Systems Engineering for the Congestion Pricing System. The scope of planning work supported by the study is complete. The Study includes the adopted Treasure Island toll policy and documents the supporting planning work, including travel demand modeling and financial analysis of alternative program scenarios, outreach, and development of preliminary cost estimates.

From October 2016 through December 2016, the Study team drafted a Memoranda of Understanding between SFCTA and the Treasure Island Development Authority and Treasure Island Community Development. The remainder of the scope of work funded by the VPPP funds is complete.

Feasibility of Pricing on I-84 in Hartford, Connecticut

The Interstate 84 (I-84) Viaduct is a 0.75-mile long section of elevated highway between the Sisson Avenue interchange and the Asylum and Capitol Avenue interchanges in Hartford, Connecticut. The project team evaluated value pricing with the purpose of relieving congestion on one of the most heavily traveled and congested corridors in Connecticut. Given the significant cost of replacing the I-84 Viaduct, toll revenue was a key factor considered when evaluating alternatives. The project team summarized performance measures related to traffic delay, toll diversion, and revenue generation to gauge and compare project benefits and impacts.

In addition, the project team used an I-84 study area simulation model to quantify and visualize the estimated congestion relief benefits of the various alternatives and the potential local network impacts.

The study also examined converting the existing HOV lanes along I-91 and I-84 to high occupancy toll HOT lanes where single-occupant vehicles would be allowed access to the current HOV lanes in exchange for paying a toll. The location of the study area extends from I-84 to Route 9 in West Hartford to the end of the I-84 HOV lanes in Vernon, and from the I-91 HOV lanes in Windsor to I-691 in Meriden. Parallel to this congestion pricing study, Connecticut Department of Transportation (CTDOT) initiated a major investment study of I-84 in Hartford to develop a set of preliminary alternatives for replacing the existing I-84 viaduct. During this congestion relief study, the I-84 Hartford project team developed two preliminary alternatives for use in the tolling technical evaluation.

Analysis of a potential conversion of the existing I-84 and I-91 HOT lanes showed the prospect of significant congestion benefits to both corridors, as single-occupant vehicles would now have the choice of fee-based use of the existing HOV lanes. By reducing volumes in the general-purpose lanes, travel speeds during the congested peak hours increased significantly. The western and southern termini of the I-84 and I-91 HOV lanes, respectively, if converted to HOT lanes, would need further study to evaluate physical changes required to mitigate operational concerns. (Any operational issues could cause more traffic that exits the HOT lane for the general-purpose lanes. Not addressing this potential issue could all but wipe out the benefits provided by the HOT lanes.)

The estimated annual net revenue is modest for each corridor since the analysis and toll rate selection focused on “filling up” the HOT lanes to the maximum extent possible while preserving the free flow speeds of the HOT lane. The estimated annual gross toll revenue would cover tolling operations and maintenance costs. Including the capital cost of tolling results in a net loss for the lanes (although slightly higher toll rates could offset the cost if needed, with the objective of making it revenue neutral or a somewhat positive stand-alone project).

Variable Pricing in I-95 Corridor from New York to New Haven, Connecticut

Connecticut studied congestion pricing strategies on two of its most clogged highways to evaluate options to reduce congestion. The CTDOT corridor congestion relief study evaluated I-95 and the Merritt Parkway (Route 15) from New Haven to the New York State line to determine whether a combination of pricing and traditional transportation system improvements could achieve a noticeable level of congestion relief. As part of the study, the project team collected the following data: traffic and travel time, a stated preference survey to estimate the value of time in the study corridors, and a detailed traffic modeling and toll revenue evaluation for a variety of configuration and pricing alternatives.

The project team conducted a preliminary analysis of several tolling alternatives, including tolled managed lanes on I-95 between New Haven and New York. The analysis assumed that the existing lanes on I-95 would remain toll-free and a managed lane alternative consisted of adding additional lanes to I-95 and tolling only this new capacity. The alternative generated a relatively small amount of revenue compared to the significant capital cost of implementing the unique

geometric requirements associated with managed lanes in the corridor. While managed lanes could provide congestion relief to the thoroughfare, the relatively small amount of revenue generation as compared to the cost of construction and toll revenue generated resulted in the dropping of the alternative from the final options.

The final set of alternatives considered in this study assumed all electronic tolling across all lanes of I-95 or both I-95 and Route 15 between New Haven and the New York border and included a scenario where I-95 would expand with an additional general purpose lane in each direction between Bridgeport and Stamford, which is the most congested stretch of I-95. Time of day congestion pricing would be required. For this study, the project team assumed off-peak toll rates as 30 percent lower than peak period toll rates.

Overall, the study found that the addition of an extra travel lane in each direction between the most congested portions of I-95 between Stamford and Bridgeport showed additional benefits when combined with localized selective interchange improvements. An extra lane addition with tolling on I-95 showed potential for dramatic improvements for the future year I-95 operations when compared to the No-Build scenario. The largest number of hours saved are estimated to occur under a widening of I-95 and a tolling of both I-95 and Route 15. The alternative estimates an annual savings of more than 12 million hours of travel time.

The findings demonstrated the potential for a significant reduction for the severe congestion experienced along I-95 between New Haven and New York using congestion pricing. The substantial revenue that could generate through tolling could also be used to support most (if not all) of the cost of widening I-95, depending on the actual magnitude and extent of the widening. Adding capacity and tolling all lanes not only provided congestion relief but also provided for substantially higher revenue at a lower cost to construct and implement.

Influencing Travel Behavior, Sensitivity to Environmental Justice in Texas

The Texas Department of Transportation (TxDOT) and North Central Texas Council of Governments (NCTCOG) completed a study to assess the effectiveness of various congestion pricing incentives for the IH-30/Tom Landry Highway. The incentives attempted to encourage alternatives to driving alone or driving during peak periods based on how travelers chose to use the managed lanes. (The research team used smartphones to track subscribers' managed lane use.) The study also included an equity assessment that explored the potential impacts that managed lanes could have on low-income travelers.

The Texas A&M Transportation Institute (TTI) finalized the "Traffic Thermostat" tool for use by transportation agencies in the Dallas/Fort Worth region. The purpose of the traffic thermostat was to help guide planners through a logical, step-wise process of examining potential changes to a managed lane or toll facility. The tool was generic, allowing for the application to any managed lane facility. The traffic thermostat can help planners evaluate the potential to implement various managed lane policies and incentives, according to defined goals and performance measures.

The NCTCOG recruited drivers to participate in the study. The research team monitored actual driver travel patterns to assess how priced facilities influence behaviors for all users, including

low-income populations. Examples of targeted travel behaviors include peak-period pricing, transit, park-and-ride lots, ridesharing, telecommuting, bicycling, and varied work schedules.

The NCTCOG and TTI finalized a baseline analysis that included the goals, objectives, and performance measures identification for traffic thermostat implementation. The region identified value pricing program incentives for travelers and completed a survey of interest in the possible incentives. Based on the survey results, the project team updated the traffic thermostat tool for the IH-30 Managed Lanes to incorporate the survey results.

The TTI and NCTCOG developed an example scenario for the traffic thermostat using baseline data and information from the former HOV lane on IH-30. The research team established acceptable performance thresholds of 50 mph and 5,700 persons per hour across the entire facility. The tool estimated speed and throughput values for selected operational fixes, using the calibrated speed-flow relationship from the regional travel demand model. After running the thermostat, the research team discovered a significant amount of calculation process uncertainty that became apparent after examining the dynamic nature of demand, diversity of user groups, ambiguity with exogenous factors (e.g., regional unemployment, fuel prices). However, using the traffic thermostat can show policymakers and others the inherent challenge of performance management for managed lane facilities.

SR 167 Express Toll Lanes Continuous Access Demonstration in Seattle, Washington

The Washington State Department of Transportation (WSDOT) developed a 230 lane-mile system of freeway HOV lanes in the Puget Sound region. The public sees the HOV lanes as a favorite and well-used enhancement to the freeway system. During the past decade, most HOV lanes in the area have seen too much demand, leading to lower speeds, travel unreliability, and failure to meet State and Federal performance goals. To remedy this, WSDOT tested HOT lanes on a pilot basis for the State Route (SR) 167 corridor and developed a dual-lane express toll lane facility on I-405. This project entailed a before-and-after evaluation for re-striping the SR 167 HOT lane system to allow near-continuous access, providing information and outreach to customers and the public, and performing a before-and-after assessment of the system.

The physical roadway changes to accommodate continuous access occurred in the late summer of 2014, and the system has been operating smoothly since. The WSDOT collaborated with the Washington State University Transportation Research Center program to undergo a before-and-after project evaluation. The final report and assessment are available from the WSDOT Website.

Projects Not Involving Tolls

Residential Parking Management Project in San Francisco, California

The San Francisco Municipal Transportation Agency (SFMTA) explored how it could evolve or change existing parking practices in San Francisco. The study assessed how pricing could manage parking in residential and mixed-use areas. As part of this study, occupancy and license plate surveys collected data for 42 two-mile routes within the study area. In addition, online household surveys gleaned information concerning residential travel patterns, commute modes, parking access, and use from November 21 through December 13, 2015.

The project team implemented a public outreach strategy that consisted of community open houses to share project findings and solicit community input. As a part of this project, San Francisco County Transportation Authority (SFCTA) contacted neighborhood and business leaders within select San Francisco neighborhoods to discuss the possibility of conducting a pilot parking management program. The project team evaluated several alternative scenarios for pricing 1-day flex permits and motorcycle permits.

The project team conducted 11 community workshops in May and June 2016 to test the acceptability of potential policy changes. The project team continued to work with the Dogpatch Neighborhood Association through spring 2016. Discussions at these meetings consisted of topics related to on-street parking management tools and changes to the Transportation Code changes to allow greater Referral Partnership Program flexibility. The project team facilitated community consensus building regarding parking management options.

Parking Pricing and TDM in the City of Berkeley and UC Berkeley, California

The VPPP provided funding to the city of Berkeley for the go-Berkeley pilot program. This project is now complete. University of California (UC) Berkeley had additional funding to help reduce drive-alone trips to campus through a parking scheme for monthly patrons and a program to incentivize employees to reduce parking without changing parking prices. The UC Berkeley efforts are ongoing.

The goBerkeley Pilot Program launched in Downtown Berkeley, the Elmwood, and Southside/Telegraph on July 2013 with three overarching goals: to support economic vitality, to reduce congestion and emissions, and to assess the feasibility of expanding the program beyond the 2-year pilot period. Coordinating between transportation demand management and parking management, the goBerkeley Pilot Program conducted visitor, resident, and employee surveys and collected transit usage and parking data before and during the pilot period. The program also tested automated parking data collection methods to ascertain the most accurate and cost-effective program design going forward.

The goBerkeley TDM Program aimed to decrease single-occupancy vehicle (SOV) use and increase the use of travel alternatives. The TDM program offered financial incentives for the pilot areas that consisted of:

- 1,000 free 6-month AC Transit “TravelChoice Berkeley” passes for residents.
- 1,000 free 1-year AC Transit Easy Passes for employees.
- Deeply discounted City CarShare fees (up to 90 percent off) for businesses and their employees.

The goBerkeley TDM Program survey results showed an overall 3.1 percent reduction in automobile use, with 94 percent of participants reporting that they were walking more, 90 percent reporting using transit more, and 19 percent reporting biking more. Among almost 500 Easy Pass program participants, 82 percent said they used Alameda-Contra Costa Transit District (AC Transit) more because they had the pass, and nearly half said they used their pass at least twice a week. The carshare program included 15 businesses and over 60 participants. Results indicated that more than 10 percent of participants used carsharing as a new travel alternative.

The goBerkeley Parking pilot assessed the long-term feasibility of demand-responsive parking management through adjusted parking rates and time limits at parking meters, parking lots, and parking garages. Analysis of the observed parking availability, meter transaction data, and community surveys indicated an overall improvement in parking availability and customer satisfaction. Results also showed a change in driver behavior and a shift in parking demand to metered areas with available parking. The analysis also indicated that vehicle-mounted cameras could reduce parking data collection costs and improve parking enforcement.

Considering environmental sustainability, the goBerkeley Pilot Program achieved its goal of reducing emissions resulting from SOV use and by managing parking. The preliminary analysis found that the goBerkeley program has reduced VMT by 1,649 miles per day.

As mentioned above, the VPPP program has provided additional funding to an existing city of Berkeley/UC Berkeley project designed in part to use priced daily parking to reduce drive-alone trips to campus. The project will enable a randomized controlled trial of a second-price-reverse auction for monthly parking patrons to give up their parking privileges on specific days when parking is in highest demand.

Another study conducted as part of the UC Berkeley effort to reduce parking demand explores a new kind of employee parking permit, the FlexPass, which incentivizes employees to reduce parking without significantly changing parking prices. Most employees of the UC Berkeley purchase a monthly parking permit with pre-tax dollars. The FlexPass is also a monthly pass that refunds money to the employee in proportion to the number of working days not parked each month. The study finds that unbundling a monthly employee-parking permit reduces parking by making employees mindful of daily parking usage.

The goBerkeley pilot project officially concluded in early 2017. The project successfully demonstrated that demand-responsive parking management could be used to improve parking availability and reduce vehicle miles traveled (VMT) in a mid-sized city. Based on the results of the pilot, the Berkeley City Council elected to continue goBerkeley as a permanent city program in mid-2015. Since then, staff has twice adjusted parking prices and time limits under program guidelines, in May 2016 and January 2017. The next program adjustment has a tentative schedule date of March 2018.

Building on the foundations of the original program, staff are preparing a new pilot project to test demand-responsive pricing in residential areas adjacent to commercial districts. This project, the Residential Shared Parking Pilot (RSPP), is funded by a Metropolitan Transportation Commission of the San Francisco Bay Area (MTC) Climate Initiatives Program grant and is designed to improve parking availability for the diversity of residential parking users, including residents, nearby employees, and visitors. The RSPP will begin its initial data collection phase next year.

Drive Smart Mobile Technology Pilot Program in New York, New York

Drive Smart was a New York City Department of Transportation (NYCDOT) consumer technology project that used data drawn from a car's onboard diagnostics port (OBD-II) to help

New York City drivers save money, save time, and drive more safely. Drive Smart provided a suite of services and mobile applications for drivers—provided by private sector partners—that incentivized safe driving and environmentally efficient travel choices. Participants were also encouraged to enroll in a usage-based insurance (UBI) program offered by a leading national insurer to receive incentives for avoiding driving and for driving during less congested times or on less congested routes. Enrollees also received feedback on their driving and their actual cost of car ownership and use. The NYCDOT used Drive Smart data to learn more about accidents to support the implementation of Vision Zero, New York City's street safety initiative.

In July 2015, NYCDOT launched a 1-year Drive Smart pilot program with 400 volunteer drivers. The NYCDOT procured 450 Drive Smart OBD-II devices for installation in vehicles from pilot participants, launched the program Web site, and conducted a full beta test with 25 test devices and drivers. The OBD-II devices transmitted second-by-second driving data to the Drive Smart server to power the range of driver feedback applications and the UBI product offered by the Drive Smart Technology Partners. The project team used the data to evaluate the effectiveness of Drive Smart toward helping drivers make different travel choices.

PARK Smart in New York, New York

The NYCDOT PARK Smart 2.0 program enabled community stakeholders to work with NYCDOT to address local curb management issues such as parking availability, cruising, double-parking, and truck deliveries on busy retail corridors. Working with local merchants and residents to develop a PARK Smart plan that included parking pricing strategies, curb regulation changes and parking technology, the program was successful in increasing curbside access for shoppers, residents, and commercial vehicles.

The NYCDOT began by conducting an analysis of PARK Smart in the Boerum Hill/Cobble Hill section of Brooklyn. Data showed that the program reduced parking occupancy while increasing turnover. The agency then began working with the Myrtle Avenue Brooklyn Partnership and Brooklyn Community Board 2 on a PARK Smart on the Myrtle Avenue corridor in Brooklyn's Fort Greene and Clinton Hill neighborhoods. The agency also reached out to an array of local community and business groups in Brooklyn, Manhattan, and Queens to discuss PARK Smart and identify additional future PARK Smart areas.

The NYCDOT began the development and implementation of a comprehensive data collection effort in over 40 neighborhood retail corridors to collect parking metrics and performance data to influence the “reprogramming of the curb” and to develop both pricing and regulatory structures that will improve the overall operability of the curb. The agency developed a larger framework for the development of a citywide parking management toolbox or “blueprint” for use toward influencing larger parking management policies and approaches. This program built upon the previous experiences in each of the past PARK Smart pilot areas, as well similar programs in peer cities.

PARK Smart was an innovative pilot program that developed a pricing and regulatory mechanism to allocate curb space for mixed vehicle classes by the time of day and block location. These “multi-function meters” and the associated curb regulations use a combination of pricing and regulations to influence driver behavior and meet parking demand. The meter

rates adjust based on observed travel demand patterns. In addition, NYCDOT experimented with new time and rate structures for the pilot blockfaces to determine their applicability at other locations throughout the city. The NYCDOT also developed new geospatial datasets and refined data collection techniques to improve its ability to measure blockface performance and activity.

The NYCDOT continues to talk to an array of local community and business groups in Brooklyn, Manhattan, Staten Island, and Queens to discuss innovative curb management strategies as well as approaches to improving curb operations.

Getaround Peer-to-Peer Car Sharing Incentives, Portland, Oregon

Portland-area partners evaluated the effects of peer-to-peer (P2P) car sharing and other incentives on people's travel behavior. Project partners consisted of Getaround Inc., the Oregon Department of Transportation (ODOT), the Portland Bureau of Transportation (PBOT), and the Oregon Transportation Research and Education Consortium (OTREC). The project team also evaluated factors related to usage-based insurance and peak usage pricing. To attain these goals, the project team recruited about 300 car owners and installed a Getaround CarKit™ device within vehicles to track the number of vehicle miles traveled.

The project partners assessed whether P2P car sharing reduced overall VMT by making the driving costs for both car owners and renters variable while creating a revenue stream for car owners and increasing access to jobs and activities for those without cars. The OTREC monitored the rental activity of owner and renter participants in the study, and Getaround monitored rental income activity for owners. The OTREC also surveyed renters about their rental experiences with Getaround, analyzed survey data, and reviewed rental activity of owner and renter participants.

Operational Projects

Projects Involving Tolls

The projects below were granted tolling authority under the VPPP, and they continue to report on the performance of their operating projects. Projects that have already been in operation for more than 10 years are no longer required to provide performance data. Some projects received funding to study congestion pricing under the VPPP but subsequently elected to pursue tolling under one of FHWA's other toll programs.

I-680 SMART Carpool Lanes in Alameda County, California

The Interstate 680 (I-680) corridor connects employees in Southern Alameda County and the Silicon Valley with homes in the Tri-Valley, East Contra Costa County, Solano County and the San Joaquin Valley. The I-680 Express Lane is the first in a planned 550-mile San Francisco Bay Area regional network of HOT lane projects, which allows carpools to travel free of charge and charges a toll for single occupancy vehicles to use the HOV lane excess capacity.

Assembly Bill 680 authorized the State to enter into agreements with private entities in 1989 that allowed tolling on the lanes. The I-680 SMART carpool lanes were deployed January 1, 2005. Federal value pricing funds provided backing for preliminary engineering and environmental

clearance to convert the southbound HOV lane that opened in 2002 to an Express Lane facility along a 12-mile segment of I-680 in Alameda County, California and a two-mile segment in Santa Clara County, California. In 2008, selected toll system integrator Electronic Transaction Consultants Corporation (ETCC) developed the design parameters and criteria for the dynamic pricing algorithm, as well as the system interface with participating and enforcement agencies and the communication network design.

The southbound I-680 Express Lane opened to traffic on September 20, 2010. The facility counted 234,000 total toll trips for the first quarter of 2018, representing an average of 3,700 daily toll trips for the quarter, which is the same number of trips compared to the same quarter last year. The Total Gross Revenue for the quarter was \$719,000. In terms of Express Lane benefits, the observed speeds in the Express Lane are faster than general purpose lane speeds throughout the day.

SR 237 Express Lanes Continuous Access Extension in Santa Clara County, California

The SR 237 Express Lanes (Phase 2) project was an extension of the existing first phase of the SR 237 Express Lanes project called SR 237/I-880 Express Connectors. The SR 237 Express Lanes (Phase 2) project involved the conversion of the remaining four miles of HOV lanes on SR 237 to Express Lane operations by providing solo drivers the option of paying a toll to use the Express Lanes during commute hours. Carpools with two or more occupants, motorcycles, transit buses and eligible hybrids continue to use the Express Connectors free of charge. The electronic tolls collection used the FasTrak transponder technology already in use throughout California. Tolls for single-occupant vehicles vary based on demand and adjust to maintain a free-flowing ride on the Express Lanes.

The SR 237 Express Lanes project has successfully operated since March 2012. The existing segment used VPPP funds for implementation, in addition to other sources. Since the beginning of operations, this express lane resulted in over 250,000 hours of total travel time savings for both the express lanes and adjacent general purpose lanes. Over 17 million customers used the express lanes, with about 18 percent consisting of toll-paying travelers. These travelers benefited from a more reliable and faster commute with travel time savings of up to 14 minutes per trip. The savings occurred despite a recent increase in traffic resulting from a stronger economy. Figure 3 shows a visual of the SR 237 Express Lanes.



Figure 3: SR 237 Express Lanes.⁸

The Santa Clara Valley Transportation Authority (VTA) received VPPP funds in 2012 to evaluate the potential of using different access approaches, such as continuous access with no painted buffer between the Express Lanes and general-purpose lanes. As part of this project, the project team removed one mile of existing striped buffer as a temporary pilot test. After 6 months of observation, VTA made the buffer removal a permanent change. This conversion extended the SR 237 express lanes about four miles to the west into the city of Sunnyvale. As part of this deployment, VTA studied more options for open and restricted buffer striping access arrangements. The analysis resulted in the selection of additional open access for separating express lanes from the general-purpose lanes. The SR 237 Express Lanes extension is currently under construction and has a scheduled opening date of 2019.

Priced Managed Lanes in Miami-Fort Lauderdale Region

The “Miami-Area Urban Partner” applied and received an Urban Partnership Agreement (UPA) grant in 2007 to implement a priced managed lanes project on Interstate 95. The Miami-Area Urban Partnership was comprised of the Florida Department of Transportation (FDOT), Miami-Dade/Broward County Metropolitan Planning Organizations (MPOs), Broward/Miami-Dade County Transit, Miami-Dade County Expressway Authority, and Florida’s Turnpike Enterprise. The project focus was primarily to address congestion in the Interstate 95 corridor and involved components commonly referred to as the four “T’s”:

- Tolling - Implemented congestion pricing or variable tolling demonstrations.
- Transit - Create or expand express bus services or bus rapid transit (BRT), which will benefit from the free flow traffic conditions generated by congestion pricing or variable tolling.
- Telecommuting - Secure agreements with major area employers to establish or expand telecommuting and flex scheduling programs.
- Technology - Utilize cutting-edge technological and operational approaches to improve system performance.

⁸ Santa Clara Valley Transportation Authority, 2015.

The 95 Express Project has two phases that span 21 miles across two counties and two FDOT Districts. The northbound section of Phase 1 began operations in December 2008 from State Road 836/Interstate 395 to the Golden Glades Interchange (I-95/SR 826/Florida's Turnpike Interchange). In conjunction with Phase 1 Northbound (NB) implementation, on-ramp traffic meters along northbound Interstate 95 started operation in February 2009. The southbound direction of Phase 1 consisted of the corresponding managed lane improvements that began operations in January 2010; its ramp metering was implemented later that year in April.

Phase 1 of 95 Express used the existing roadway cross-section and created an additional travel lane in each direction. The inside median width narrowed some travel lanes to a reduced diameter from 12 feet to 11 feet. The cross-section allows for two managed lanes (or express lanes), a one-foot buffer, and four general use lanes in both the northbound and southbound directions. The FDOT installed flexible delineators (otherwise called express lane markers) within the one-foot buffer for lane separation using five-foot spacing between each marker.

Phase 2 opened in October 2016, adding four more tolling points throughout the corridor. The lane distribution mirrors Phase 1, but widths remained at 12-feet. The buffer width is 2 feet with express lane markers at 10-foot spacing. The widening of bridges and the addition of auxiliary lanes occurred given the higher availability of public right-of-way. Figure 4 shows a visual of Phase 2 for the 95 Express.



Figure 4: 95 Express Phase 2 Extension.⁹

⁹ Texas A&M Transportation Institute, 2016.

The toll price changed dynamically based on demand and a goal to maintain a 45 mile per hour speed in the express lanes. Electronic toll collection occurred via SunPass® toll transponders. Changeable message signs (Toll Amount Dynamic Message Signs) notified motorists of the current toll for up to three destinations per direction, with an update approximately every 15 minutes. Registered vanpools, carpools with three or more occupants, hybrid vehicles, and transit, school, and over-the-road buses can use the lanes without paying a toll. Motorcycles can travel in the managed lanes without paying a toll; no registration required. SunPass® registrations increased from 7,100 to 9,100 since its inception, resulting in over 1.7 million toll-exempt trips in 2017.

Corridor speeds and volumes have increased since the opening of the 95 Express. Before implementation, average peak period speed in the HOV lane was 18-20 miles per hour. After implementation, average peak period speeds in the express lanes increased to 45-56 miles per hour, and the adjacent general purpose lanes (non-tolled lanes) speed increased from 15 to 41 miles per hour. Overall corridor throughput has also increased since the project's opening. For example, the average total corridor (express lanes plus general purpose lanes) volume for the northbound lanes after the first full month of operations was over 123,000 vehicles per day. Currently, vehicle throughput is almost 136,000 vehicles—a 10 percent increase. The FDOT provides information to drivers about the expected or typical toll charges based on the time of day. Toll rate information is provided monthly (based on the previous month of activity), allowing motorists to estimate their travel time departures and trip choices.

Transit improvements also occurred with the implementation of the 95 Express. The project added express bus service for both Miami-Dade Broward Counties, including 22 new articulated buses and 10 new express routes from Broward County to Downtown Miami. Average express bus ridership before the 95 Express Project was 1,746 per day. As of July 2017, average ridership increased 323 percent to 5,645 per day.

HOT Lanes on I-394 in Minneapolis, Minnesota

Minnesota implemented I-394 MnPASS, which converted the existing HOV lane into the State's first high occupancy toll HOT lane. The lanes, which are dynamically priced, remain free to HOVs and motorcyclists during peak hours and are free to all users in off-peak periods. The first phase of the project opened in May 2005.

The I-394 MnPASS project was the culmination of years of research and planning aimed toward the implementation of a value pricing demonstration project in Minnesota. Guiding this process was the I-394 Community Task Force, made up of local elected officials, citizens and community leaders. A comprehensive evaluation plan was implemented to thoroughly understand conditions and public attitudes before and during project operations. The project remains open to traffic.

Operational and performance data on I-394 MnPASS for the first quarter of calendar year 2018 revealed there were 361,993 total tolled trips for the quarter. On average, there are roughly 30,166 toll trips per week. Total Gross Revenue for the quarter was \$490,368 or about \$40,864 per week. The average cost for a toll trip on the facility is \$1.35.

Interstate 35E MnPASS Managed Lanes Extension in Minneapolis, Minnesota

The I-35E MnPASS Extension Study was a pre-implementation planning study aimed at developing and evaluating conceptual alternatives for extending MnPASS Express Lanes between Little Canada Road and CR 96 on I-35E. The Minnesota Department of Transportation (MnDOT) completed the study during the third quarter of 2015. The study resulted in the I-35E MnPASS Extension project moving forward into the pre-design and environmental assessment (EA) process. The MnDOT approved the EA in December 2015 and completed the project at the end of 2016. Funding from the VPPP provided MnDOT with the capability to evaluate the HOT lane extension. The MnPASS lanes through the I-35E/I-694 common area feature two of the innovative recommendations to come out of the study:

- Southbound – the existing inside general purpose lane will convert to a MnPASS lane during the morning peak period
- Northbound – there will be no MnPASS lane designation through this area, creating a gap in the northbound MnPASS lane in the corridor

An in-depth evaluation of this innovative approach will occur by the end of 2018. The land use and transit enhancement component of the study also developed recommendations for increasing transit and carpool use in the I-35E corridor, such as informal park-and-ride sites called “Gather and Go’s.” Many ideas and recommendations will have further evaluation for potential implementation by local governments, transit providers, and others as community and transit planning and development move forward in the corridor.

Priced Dynamic Shoulder Lanes in Minnesota

The Twin Cities Metropolitan Area, encompassing Minneapolis and St. Paul, converted narrow bus-only shoulder lanes along the northbound portion of Interstate 35W between 46th Street and downtown Minneapolis to wider priced dynamic shoulder lanes (PDSLs), and moved the lanes from the right-most to the left-most portion of the roadway to minimize conflict with entering vehicles. Buses and high-occupancy vehicles operate at no charge in the PDSLs with access allowed during peak times to single-occupant vehicles whose drivers are willing to pay the toll, with prices set to ensure free-flow travel. The PDSLs enable bus speeds to increase to 50 mph from the current bus-only shoulder lane speeds of 35 mph or less.

The PDSL links to the dynamically-priced high-occupancy toll lanes on Interstate I-35W, which was created by converting the existing high-occupancy vehicle lanes. The original HOV lanes extended from approximately I-494 to the Burnsville Parkway south of the Minnesota River. Through the Urban Partnership Agreement, these lanes were extended through the Crosstown Commons between I-494 and 46th Street. The result was a new 15-mile, dynamically-priced managed-lane corridor, enhancing the efficiency of bus and HOV trips and providing motorists a new option to experience a fast and reliable trip.

The facility now has 9 years of performance data. The northbound I-35W MnPASS Express Lanes operate from 6am to 10am during the morning rush hour and from 3p.m. to 7p.m. in the afternoon. Tolloed trips northbound in the morning and afternoon peak periods on the PDSL totaled 65,163 for the first quarter in 2018, an 8 percent increase from the previous quarter.

Revenue amounted to \$126,343 on average tolls of \$1.95 per trip. The southbound I-35W MnPASS Express Lanes operate 6 a.m. to 10 a.m. from 42nd Street to Highway 62 in the morning and the full stretch of road from 42nd Street to Cliff Road from 3 p.m. to 7 p.m. in the afternoon.

HOT Lanes on SR 167 in the Puget Sound Region

The Puget Sound Regional Council of Washington State estimates that, by 2030, 45 percent of the core freeway system in the Seattle metropolitan area will be congested. The SR 167 High-Occupancy Toll HOT Lanes Pilot Project converted the existing HOV lanes on SR 167 within King County/Seattle, Washington to HOT lanes, from southwest 15th Street in Auburn to I-405 in Renton without expansion of the existing freeway. This 4-year pilot project will evaluate the ability of the HOT lane concept to manage congestion and generate revenue. During the 4-year pilot, the facility's performance, socioeconomic impacts, and public interest/acceptance of the facility will be assessed on an annual basis. The project website is located at: <http://www.wsdot.wa.gov/Tolling/SR167HotLanes/default.htm>.

The SR 167 HOT lanes continue to operate smoothly and successfully, although performance on the lanes has recently deteriorated. The biggest change during the last few years was an extension of the system for five miles in the SB direction, which opened in December 2016. This change benefited the northern part of the corridor, but created challenges for the southern terminus. Bottlenecks outside the system back vehicles into the HOT lanes and reduce overall performance. The northbound terminus experienced similar challenges. The Washington State Department of Transportation (WSDOT) adjusted the algorithm and is evaluating additional refinements to improve operation.

Variably Priced Tolls on SR 520 in Seattle, Washington

The SR 520, a major access freeway into downtown Seattle from the east and from Seattle to eastside employment locations, experiences serious congestion between I-5 and I-405. The floating bridge carried twice as much traffic than it was originally designed to carry. While originally there was a toll to cross the bridge, it was eliminated many years ago. To address congestion, and the 40 percent of throughput capacity that the region estimated was lost on SR 520, King County, Puget Sound Regional Council, and WSDOT decided to re-introduce tolling on SR 520. The toll rates were set on the facility based upon demand to avoid the buildup of congestion and reduce demand on the bridge. Toll rates were on a fixed schedule, and tolling revenues were used to help finance the new bridge. The project deployed an all-electronic toll collection system, allowing tolls to be collected at freeway speeds by transponders, with supplemental automatic cameras reading license plates for vehicles without transponders.

The replacement bridge has been open to traffic for nearly 2 years, allowing for the completion of permanent toll location testing and for the Toll Division to accept the project. The WSDOT continues to monitor the facility and evaluate the impact of variable tolling. The original bridge is no longer in operation.

Chapter 3. Congestion Pricing Outreach and Technical Assistance Provided by the Federal Highway Administration

The following list summarizes outreach and technical assistance activities performed by the program.

Project Support and Technical Assistance. To enable effective and successful implementation of each VPPP project awarded, FHWA Congestion Pricing Program staff provides significant levels of support and technical assistance to VPPP awardees on an ongoing basis. Expertise includes coordinating with project partners, reviewing project materials, and collecting and posting quarterly reports. This effort ensures that VPPP successes and lessons learned are captured and documented, understood, and are available for sharing with other agencies.

Program Involvement with Professional Forums. The FHWA involvement in professional transportation organizations, such as the TRB Annual Meeting, has been an important link between public and private transportation professionals and DOT programs. With such a broad cross-section of transportation experts in attendance, TRB and the IBTTA are efficient means of getting the word out on current program results and sharing recent industry developments. The TRB and the IBTTA committees are effective in sharing common experiences, identifying research needs, and helping to plot the course for the congestion pricing industry into the future. Throughout the past two decades, FHWA has provided information at both TRB and IBTTA meetings to raise awareness of pricing success stories and pricing-related outreach materials.

Written Materials (Primers, White Papers, Guidance, and Flyers). The VPPP and other related FHWA programs have produced numerous informative documents for industry use. Since 2016, the following white papers have been prepared:

- *Congestion Pricing: Engaging Public Awareness on the True Cost of Driving* that highlights lessons learned from outreach efforts of LA Metro's I-10/I-110 Express Lanes and WSDOT's SR 520 tolling. A presentation of the white paper and a poster summarized the analysis for the 15th International Conference on Managed Lanes in Miami, Florida.
- *Impacts of Congestion Pricing on Low-Income Populations*, which studied tools and approaches used by agencies to examine income equity impacts of congestion pricing projects. The white paper documented the examples of LA Metro's environmental justice analysis for the I-10/I-110 ExpressLanes project and time of day tolling on the 183 North Mobility project in Texas. A virtual workshop will disseminate and discuss the findings.

Primers and other resources are available on the FHWA Congestion Pricing Web site:
<http://ops.fhwa.dot.gov/congestion/pricing/resources.htm> and
http://ops.fhwa.dot.gov/congestion/pricing/value_pricing/

Facilitated Peer Exchange. Many agencies benefit from FHWA-sponsored peer exchanges that include participation by congestion pricing experts. There is a great benefit in bringing together a broad array of technical specialists and key decision makers from the host agency for the opportunity to interact directly with the out-of-State expert. The local congestion pricing expert

may already have specific knowledge; however, it lends additional credibility to have the project manager from another State deliver the message. It also creates a focus and urgency to bringing many decision makers together to meet with the out-of-State expert. The FHWA sponsored a Managed Lanes and Automated Technologies Peer Exchange in 2017. The Peer Exchange consisted of expert practitioners at the State level that came together to gain a better understanding of the opportunities and challenges associated with implementing Automated Technologies on Managed Lane facilities. The workshop participants included WSDOT, Santa Clara Valley Transportation Authority (VTA), Contra Costa Transportation Authority, and Minnesota DOT as well as private sector participants.

Workshops. The VPPP continued to sponsor a workshop series. A series of three *Regional Congestion Pricing Workshops (RCPWs)* helped States and partner agencies develop, advance, promote, and enhance tolling and pricing programs and initiatives within metropolitan areas.¹⁰ The workshops featured experts from operating projects who shared lessons learned from their experiences establishing congestion pricing programs. The information shared was designed to help workshop participants plan, implement, and advance a congestion pricing project in their region. The workshops incorporated an interactive and knowledge sharing approach to encourage stakeholder engagement. A lessons learned report is available that focuses on the findings from three workshops held between March 2016 and May 2017 in Schaumburg, Illinois; Pittsburgh, Pennsylvania; and Portland, Oregon. It details cross-cutting issues impacting participating stakeholders identified during the workshops, summarizes critical developments achieved in the candidate regions since the Webinars, and concludes with a summary of key takeaways and next steps based on stakeholder inputs and workshop experiences.

Webinars. The FHWA sponsors a continuing series of Webinars that explore challenges in implementing congestion pricing. Webinars have proven to be one of the most effective and efficient means of delivering project results, research findings, and lessons learned to industry, with the Congestion Pricing Webinar series consistently attracting 200 to 300 participants per event. The FHWA often collaborates with TRB committees in identifying congestion pricing topics that are timely and of interest to practitioners. Webinars sponsored since 2016 included Managed Lanes System Study Best Practices; Best Practices in Enforcement of Managed Lane Facilities; Virtual Workshop on Environmental Justice Tools and Approaches; and NCHRP Research Report 860: Assessing the Environmental Justice Effects of Toll Implementation or Rate Changes: Guidebook and Toolbox. Interested parties can access recordings and presentations from these Webinars using the link in the callout box (seen to the right).

Recordings and presentations from past Congestion Pricing Webinars are available at <http://www.ops.fhwa.dot.gov/congestionpricing/webinars/index.htm>.

¹⁰ More information provided on the website: <https://ops.fhwa.dot.gov/publications/fhwahop18015/index.htm>

Chapter 4. Conclusion

Congestion Pricing strategies provide travelers in the corridor with more choices. Program results demonstrate that the application of congestion pricing strategies across the country has had a positive impact on localized congestion problems in major metropolitan areas, and it remains an important FHWA-recommended congestion management strategy for a growing number of States and regions.

The FHWA is now focusing on sharing and widely disseminating lessons learned. This comprehensive approach ensures that outreach efforts account for the wide variety of stakeholders, strategies, and approaches that have been used or are being used across all FHWA congestion pricing programs.

In the past few years, the rapid increase in priced managed lane deployments indicates that acceptance of this strategy continues to spread in major U.S. metropolitan areas. It is anticipated that eventually managed lanes will also be considered a “mainstream” strategy for regions in which they have been deployed, much like 2005-2010-era HOT lane conversions.

There is a significant opportunity for regions that have installed priced managed lanes to expand into other demand-based pricing strategies to further increase transportation alternatives uses, such as transit, carpools, and vanpools on a broader scale. The FHWA is also supporting research and information sharing on the use of other demand-based pricing strategies. Non-toll congestion pricing strategies such as parking pricing, pay-as-you-drive (PAYD) insurance, car sharing, bike sharing, dynamic ridesharing, and other strategies that turn the fixed costs of driving into variable costs, have experienced strong successes as well.

To better encompass this range of strategies, it may be helpful to UPDATE the terminology about priced facilities and begin using the more comprehensive term “demand-based pricing.” This change in terminology may also work to broaden the public appeal and acceptance of priced facility strategies, as history has shown that the public’s first reaction to “tolled lanes” is typically unfavorable and may even result in rejection.

The FHWA anticipates that, in the future, synergies among demand-based pricing approaches will enhance significantly the effectiveness of comprehensive and coordinated regional programs. Second-generation pricing approaches will likely combine regionwide pricing strategies, such as VMT fees, cordon pricing, and regional pricing, with non-toll strategies.

The VPPP has advanced congestion pricing over the past two decades. In the view of many project partners over that period, priced managed lanes would not be nearly as widespread without the Program’s influence. Program results demonstrate that the application of congestion pricing strategies across the country has successfully provided relief to localized congestion problems in major metropolitan areas.

The FHWA will continue its efforts to ensure widespread awareness of pricing as a strategy to manage roadway congestion. Through these efforts, FHWA will continue to equip State and local agencies with resources and guidance to help them understand and implement congestion pricing strategies. These real-world examples enable target audiences to understand that congestion pricing strategies can be successfully implemented in all different types of regions.

Appendix A. VPPP Projects Funded Since 2008

VPPP Projects Funded Since 2008

FISCAL YEAR	FUNDING RECIPIENTS	STATE	PROJECT	AMOUNT
2008	Caltrans/San Francisco Municipal Transportation Agency	CA	SFpark Urban Partnership	\$10,000,000
2008	MnDOT	MN	MN Innovative Choices for Congestion Relief UPA	\$5,000,000
2008	WSDOT/King county/Puget Sound	WA	Seattle/Lake Washington corridor Tolling and Transit UPA	\$10,000,000
2009	Caltrans/Valley Transportation Authority	CA	Implement roadway pricing on SR 237 Express Connectors	\$3,200,000
2009	Twin Cities Area	MN	Feasibility study on pricing innovative lane additions on Trunk Highway 77	\$540,000
2009	Twin Cities Area	MN	Pre-implementation study of priced managed lane on I-94	\$400,000
2009	Greater Buffalo Niagara Regional Authority	NY	Pre-implementation of study of GPS-based truck pricing system	\$717,000
2009	Puget Sound/Seattle Area	WA	Express Lanes system concept study	\$1,280,000
2010	Caltrans / Santa Clara County	CA	Strategies to manage traffic and parking.	\$2,358,000
2010	Caltrans / City of Berkeley	CA	Strategies to manage on-street parking and reduce congestion from circling vehicles.	\$1,800,000
2010	Caltrans / Santa Barbara County	CA	Testing of carpooling system that uses participation incentives.	\$158,400
2010	Florida DOT	FL	Initiative for a regional priced managed lane network that can serve as a model for other regions.	\$900,000
2010	Tampa-Hillsboro Expressway Authority	FL	Advancement of first regional network of bus toll lanes in the Tampa area.	\$800,000
2010	NCDOT and Charlotte MPO	NC	Advancement of first regional network of priced lanes in the Charlotte area.	\$400,000
2010	MnDOT	MN	Expansion of project to test incentive alternatives to monthly parking passes and discourage daily driving.	\$24,800
2010	Texas DOT	TX	Usage-based insurance pricing and additional incentives for efficient travel choices.	\$1,948,000
2010	Virginia DOT and Washington Council of Governments	VA	Public Acceptability of Road Use Pricing	\$320,000
2010	Washington DOT and King County	WA	Implementation of incentives as alternatives to parking.	\$1,024,000
2011	Caltrans/SCAG	CA	Express Travel Choices	\$1,080,000
2011	Caltrans/MTC	CA	Priced Electric-assist Bicycle Sharing in San Francisco	\$1,054,221
2011	Caltrans/SFCTA	CA	Parking Pricing and Regulations Study in San Francisco	\$480,000

FISCAL YEAR	FUNDING RECIPIENTS	STATE	PROJECT	AMOUNT
2011	Connecticut DOT	CT	I-84 Viaduct, Hartford, CT	\$644,000
2011	Connecticut DOT	CT	I-95 Corridor Full Facility Pricing: New York to New Haven CT	\$1,120,000
2011	Florida DOT/Florida Transportation Enterprise	FL	Integrated Congestion Pricing Plan (ICPP)	\$600,000
2011	Illinois State Toll Highway Authority	IL	Integrate and Finance Transit w/ Priced Managed Lanes	\$528,840
2011	Massachusetts	MA	Pay-As-You-Drive Insurance in Massachusetts	\$2,144,000
2011	Oregon	OR	Peer-to-Peer Ridesharing in Portland, Oregon	\$1,725,000
2011	Texas	TX	Integrating Transit Related Pricing Incentives in Support of Managed Lanes	\$160,000
2011	Texas/NCTCOG	TX	Influencing Travel Behavior and Considering Environmental Justice	\$588,301
2011	Texas/CTRMA	TX	183A Turnpike Pilot Downstream Impacts	\$1,220,424
2011	Virginia	VA	Dynamic Ridesharing with Financial Incentives in Northern VA	\$447,200
2011	Washington	WA	Parking Pricing for Delivery trucks in Seattle	\$446,000
2012	Caltrans/SFCTA	CA	Treasure Island Mobility Management study	\$480,000
2012	Caltrans/Contra Costa Transportation Authority	CA	Contra Costa I-80 tolled-corridor real-time ridesharing (RTR)	\$322,400
2012	Caltrans/San Diego Association of Governments	CA	San Diego pricing incentives for one-way electric car sharing	\$440,653
2012	Caltrans/SFMTC	CA	San Francisco Metropolitan Transportation Commission Regional Parking Pricing Analysis Tool	\$560,000
2012	Caltrans/SFMTA	CA	Parking Pricing Enhancement Study in San Francisco	\$420,000
2012	Caltrans/VTA	CA	SR 237 Express Lanes Extension in San Jose	\$1,600,000
2012	Caltrans/LADOT	CA	Performance parking system implementation in Los Angeles	\$600,272
2012	DDOT	DC	Multimodal, dynamic parking pricing in downtown Washington, DC	\$1,090,000
2012	FDOT/FTE	FL	Integrated Congestion Pricing Planning--Phase Three	\$400,000
2012	FDOT/MetroPlan Orlando	FL	Regional Congestion Pricing Study in Orlando	\$350,000
2012	IDOT	IL	Peer-to-Peer Car Sharing Pilot Project	\$715,118
2012	MassDOT	MA	Kendall Square Employer Transportation Benefit Pricing Trail	\$743,872
2012	MnDOT	MN	I-35E MnPass Managed Lane Extension Study	\$605,000
2012	NYCDOT	NY	DriveSmart New York City	\$1,000,000
2012	NYCDOT	NY	ParkSmart New York City	\$950,000
2012	TXDOT/CTRMA	TX	Austin-area real-time carpooling automated toll discounts	\$764,008

FISCAL YEAR	FUNDING RECIPIENTS	STATE	PROJECT	AMOUNT
2012	WSDOT/King County	WA	King County Park-and-Ride Pricing in Multi-Family Developments	\$543,900
2012	WSDOT	WA	Express Toll Lanes Continuous Access Demonstration	\$520,000
2015*	Southern California Association of Governments	CA	Analysis, public outreach and environmental assessment of cordon pricing in Westside Los Angeles	\$916,802
2015*	SFCTA for the San Francisco Bart Area Rapid Transit (BART) System	CA	Development of app for the Travel Smart Rewards Program to encourage travel/route shifts and reduce overcrowding at downtown BART stations during peak periods	\$508,000
2015*	City of Berkeley/Univ. of Calif. At Berkeley	CA	Parking pricing project to reduce drive-alone trips to campus	\$169,185
2015*	Lake Tahoe Transportation District	NV	Parking pricing to minimize car travel through the most congested areas around Lake Tahoe	\$290,455
2015*	Texas Transportation Institute	TX	Pay-as-you-drive (PAYD) insurance study	\$1,491,000
Total				\$68,588,851

*These projects were awarded in 2015 but were funded with FY2012 funds and excess funds recovered from completed projects. The FHWA repurposed approximately \$3 million of these excess funds. That is why the body of the report indicates that approximately \$65 million in funds have been awarded since 2008.

Appendix B. Annotated List of Technical Resources

- Federal Highway Administration, *Congestion Pricing – A Primer Overview*, FHWA-HOP-08-039 (Washington, DC: FHWA, 2008). Available at: http://ops.fhwa.dot.gov/publications/fhwahop08039/cp_prim1_00.htm.
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