



Memorandum

Date: October 20, 2018
To: Transportation Authority Board
From: Eric Cordoba – Deputy Director Capital Projects
Subject: 11/13/18 Board Meeting: Adopt the Final Freeway Corridor Management Study Phase 2 Report, Authorize the Executive Director to Amend Cooperative Agreement No. 04-2647 with the California Department of Transportation for the U.S. 101/I-280 Managed Lanes for an Additional \$152,000 in a Total Amount Not to Exceed \$227,000, and Approve a Prop K/Local Partnership Program Fund Exchange for the U.S. 101/I-280 Managed Lanes Project

<p>RECOMMENDATION <input type="checkbox"/> Information <input checked="" type="checkbox"/> Action</p> <ul style="list-style-type: none"> • Adopt the Final Freeway Corridor Management Study (FCMS) Phase 2 Report • Approve an Amendment to Cooperative Agreement No. 04-2647 with the California Department of Transportation for the U.S. 101/I-280 Managed Lanes project in the County of San Francisco and part of San Mateo County for an additional amount of \$152,000 and a Total Amount Not to Exceed of \$227,000 • Approve a Prop K/Local Partnership Program (LPP) Fund Exchange of up to \$4.1 million in Prop K funds for the U.S. 101/I-280 Managed Lanes Project <p>SUMMARY</p> <p>We last brought an update on our San Francisco managed lanes planning work in April 2018, focusing on potential physical and operational alternatives and their preliminary results. We have completed additional analysis as requested by the Board and are ready to present final results and recommendations. We are also requesting Board approval to amend an existing Cooperative Agreement with Caltrans to continue the current Project Initiation Document (PID) phase effort, as well as approval of a fund exchange with San Francisco Public Works (SFPW) of up to \$4.1 million in Prop K funds with Senate Bill 1 (SB 1) LPP program funds that we programmed to SFPW street resurfacing projects. The fund exchange would support future preliminary engineering and technical studies including robust traffic and equity analyses for the U.S. 101/I-280 Managed Lanes project. The exchange is an “up to” amount since Prop 6 is on the November 6 ballot and, if it passes, would repeal SB 1 revenues, including the state gas tax.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Fund Allocation <input checked="" type="checkbox"/> Fund Programming <input type="checkbox"/> Policy/Legislation <input checked="" type="checkbox"/> Plan/Study <input type="checkbox"/> Capital Project Oversight/Delivery <input type="checkbox"/> Budget/Finance <input checked="" type="checkbox"/> Contract/Agreement <input type="checkbox"/> Other: <hr/>
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DISCUSSION

Background.

The FCMS or Study is a high-level feasibility study and assessment of freeway management strategies for improving travel time and reliability for travelers on U.S. 101 and I-280 in San Francisco. The Study is focused on producing near and mid-term recommendations for implementation in the next five to ten years. The need for the Study was identified in the 2013 San Francisco Transportation Plan, which forecasts a continued increase in demand for travel by San Francisco residents, visitors, and workers to and from Downtown and the Eastern Neighborhoods and the Peninsula and South Bay. Introducing active management strategies to existing freeways can help move both current and future travelers in the corridor more reliably and efficiently. Recognizing this, the Board adopted the FCMS Phase 1 report in January of 2015. Phase 1 established the study's purpose and need and goals framework centering on the need for increased person-throughput and reliability, while utilizing the existing right of way and minimizing impacts to local communities. The Phase 1 report also identified a range of strategies for performance-based assessment in Phase 2.

Carpool lanes are already in operation on U.S. 101 from Morgan Hill to Redwood City, covering about 42 miles along the Peninsula, primarily in Santa Clara County. Caltrans and San Mateo County are currently in the environmental assessment phase of a project to extend managed lanes on U.S. 101 from Redwood City to the I-380/U.S. 101 interchange, approximately 14 miles. We are collaborating with the San Mateo City and County Association of Governments (C/CAG) and the San Mateo County Transportation Authority (SMCTA) to study managed lanes north of I-380 on U.S. 101 in San Mateo county and into San Francisco and have participated in the 3-county Caltrans corridor study for the U.S. 101 corridor from Santa Clara to San Francisco.

Alternatives.

A detailed description of the study alternatives initially presented at the April 2018 Board meeting, including physical description and potential operational policies is included as Attachment 1.

In summary, the four alternatives evaluated in a 2020 timeframe were:

- No Build, where the configuration of freeways remains as it is today. This serves as a point of comparison for the following three build scenarios.
- High Occupancy Vehicle (HOV) with a two-person minimum requirement (HOV2+).
- HOV with a three-person minimum requirement (HOV3+).
- Express Lane with a three-person minimum requirement to access the lane at no cost and a demand based, variable toll for others to access the lane (High Occupancy toll or HOT3+).

In response to concerns voiced by Board members in April 2018 and in pursuit of the City's Transit First policies, improvements and additions to Muni and SamTrans service were included in all build scenarios. Muni service includes an enhancement to the 8BX service to run all day and take advantage of the lanes within San Francisco, as well as the addition of the Hunters Point Express and Candlestick Express service, currently planned to come online as development in each neighborhood proceeds, serving both new and existing residents. Improved SamTrans service is based on the early findings of the in-progress U.S. 101 Express Bus Feasibility Study, and was modeled to include eight new express routes that serve both San Mateo County resident trips to San Francisco and San Francisco trips to job centers in San Mateo County.

Feasibility Analysis Results.

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Details of the analysis methodology and results are included in Attachment 1. A summary by alternative follows.

No Build Scenario

Under the No-Build scenario, congestion continues to get worse, with some bottlenecks resulting in an additional 2 to 5 minutes of travel time over existing conditions, doubling existing delays. Despite this, there remains no incentive to use transit or carpool in the corridor, as both buses and carpools remain subject to these increasing delays.

HOV2+ Scenario

In the HOV2+ Scenario, analysis results indicate that the carpool lane will be congested (especially when average 20% occupancy violation rates are included) between the U.S. 101/I-380 interchange and downtown San Francisco compared to the No-Build scenario. In the general purpose lanes, delays increase by about two to three minutes in both the morning and evening in all directions except northbound, where travel times decrease by about two minutes. Additionally, the Transportation Authority Board also expressed a preference to avoid use of the lanes by Transportation Network Companies or TNCs (e.g., Uber and Lyft) that included only a driver and one passenger, a situation that would be legal under this policy.

HOV3+ Scenario

In the HOV3+ Scenario, initial analysis results indicate that the carpool lane will be free flowing and well under capacity, saving travelers in those lanes between 4 and 9 minutes between the U.S. 101/I-380 interchange and downtown San Francisco compared to the No-Build scenario. The carpool lane provides an incentive to use transit and carpool, however with fewer 3+ person carpools forming under this scenario than there is lane capacity in the carpool lane, the remaining general purpose lanes remain significantly congested, moving fewer vehicles and people overall. In the general purpose lanes, delays increase by about 6 to 14 minutes in both the morning and evening in all directions except northbound, where travel times decrease by about two minutes.

HOT3+ Scenario

In the HOT3+ Scenario, analysis results indicate that the Express Lane will be free-flowing, saving travelers in those lanes between 4 and 9 minutes between the U.S. 101/I-380 interchange and downtown San Francisco compared to the No-Build scenario, and can be actively managed through adjustments to pricing to maintain vehicle throughput just below capacity. In the general purpose lanes, delays increase by about 2 to 4 minutes in the northbound direction in the evening and southbound direction in the morning, while saving general purpose lane users about 3 minutes in both the northbound direction in the morning and the southbound direction in the evening.

Additional Policy Considerations

In addition to the transportation performance results of this feasibility analysis, regional policy conversations and consistency of driver experience factors also point to the need to look more critically at an HOV2+ scenario. The two existing carpool facilities into and out of San Francisco, the Bay Bridge and Golden Gate Bridge, both require 3 person or more carpools today. Additionally, Caltrans and MTC are currently leading an effort to increase the carpool occupancy requirement on I-880, CA 237, and U.S. 101 in Alameda and Santa Clara counties to 3+ under an Express Lane Scenario, and San Mateo County's preferred alternative for implementation of Express Lanes on U.S. 101 as far north as I-380 is also 3+ occupancy. Adopting a different occupancy policy along a single

corridor or connected facility could create significant driver confusion, traffic operations, and occupancy enforcement difficulties.

Feasibility Study Recommendations.

HOT3+ is the recommended option for further analysis because it strikes the best balance among various factors (time savings incentives, opportunities to increase transit ridership and ridesharing, and the impact on the general purpose lanes) while advancing the goals of this study, and warrants more detailed evaluation in subsequent project phases. HOV3+ creates substantial additional congestion in the corridor, reduces person throughput, and HOV2+ is inconsistent with regional and corridor policy and will likely not achieve the outcomes calculated by this feasibility analysis in real-world conditions (for example, given some additional percentage of “cheaters” in the carpool lane). We recommend not advancing HOV2+ and HOV3+ scenarios for further study.

Outreach.

The study team has met with numerous community, advocacy, and business groups to introduce and hear feedback on the concept of a freeway management strategy in San Francisco, including the potential for Express Lanes. At this feasibility phase of the project, the outreach strategy was focused on educating stakeholders about the project and the concepts under evaluation while collecting questions and concerns that are important to community members. These included concerns about socio-economic equity, the potential for diversions and adequacy of transit options in the affected corridors. As a result of Board and community feedback, project staff propose to conduct more detailed equity analyses, multimodal traffic studies, and additional improvements to transit as priorities should the study move into subsequent phases of environmental review and design.

In addition to public outreach, in October, Transportation Authority staff and Board members together with staff and leaders from San Mateo county, participated in a study tour of a HOT lane facility in Los Angeles operated by Metro, Los Angeles County’s Congestion Management Agency. This was followed by a roundtable discussion on equity and pricing with Metro leadership and staff as well as a university researcher in the field. Metro staff were able to provide valuable information about the planning, development, and operation of a freeway management program, particularly including strategies and policies to address concerns of low-income travelers. Learnings from this visit will inform our proposed equity analysis in the next phase of work.

Caltrans Cooperative Agreement Amendment.

The Transportation Authority entered into a limited Cooperative agreement with Caltrans for up to \$75,000 in July 2018, for reimbursement of their services in the PID phase. The total cost of Caltrans services is \$227,000. At this time, we would like to amend this agreement for the full amount to reimburse Caltrans for their services during this phase of the project.

Cooperative Agreement No. 04-2647 defines the responsibilities for both the Transportation Authority and Caltrans for project development work required for the U.S. 101/I-280 Managed Lanes project. Government Code section 65086.5 authorized Caltrans to review and approve PIDs prepared by local agencies as reimbursed work. The culmination of this phase of work will be approval of the PID document namely a Project Study Report/Project Development Support (PSR/PDS) and hence approval to move into the environmental clearance phase. The Transportation Authority is responsible for preparation of the PSR/PDS and reimbursement to Caltrans for staff review time. Project costs will be shared between the Transportation Authority and the San Mateo County Transportation Authority (SMCTA). The SMCTA is covering the costs associated with the portion of

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the project that is in San Mateo county extending from the U.S. 101/I-380 interchange near San Francisco International Airport to the San Francisco county line.

The overall project budget for the current PID phase of work is \$1,450,000. We have secured full funding for this phase including \$200,000 from Prop K, \$500,000 in Congestion Management Agency (CMA) planning funds, and an additional \$750,000 in Measure A transportation sales tax funds provided through a funding agreement with SMCTA.

Prop K/Local Partnership Program Fund Exchange.

In December 2017 the Transportation Authority Board approved \$6 million in LPP Formulaic Program funds for SFPW's street resurfacing projects, but deferred action on a proposed fund exchange of \$4.1 million in Prop K funds for the US101/I-280 Managed Lanes project. As administrator of the Prop K sales tax program, we receive about \$2.1 million annually from the LPP Formulaic Program, which was established by SB 1 in 2017. This \$6 million covers the first three years of the LPP and programming is subject to approval by the California Transportation Commission (CTC).

Concurrent with seeking approval of the Project feasibility study, we are now seeking approval of the Prop K/LPP fund exchange to enable preliminary engineering and an equity analysis of the proposed Project. Given the uncertainty created by Prop 6, which would repeal the SB 1 revenues that fund the LPP, we have developed, together with SFPW three scenarios for the fund exchange described in Attachment 2. The amount available for the managed lanes project ranges from \$4.1 million to \$1.2 million depending on whether Prop 6 fails or if it passes, how much of the \$6 million SFPW will retain. If Prop 6 passes, we will seek Board approval to advance Prop K street resurfacing funds to ensure that the three street resurfacing projects SFPW plans to fund with the \$6 million in LPP funds are fully funded.

Next Steps.

As noted above, we have started development of the Caltrans scoping document (PID) and anticipate completing this phase of work by Spring of 2019. Subsequent phases of the project include development of a full program of management strategies, including increased transit service, low-income assistance programs, ride matching, hours of operation, and many other policies to be paired with any potential implementation of the physical components currently under investigation.

Should the Board approve the fund exchange described above, we will return to the Board in early 2019 to program and allocate the funds to the Project. We will also seek collaboration and matching contributions to next phase work from private employers, similar to San Mateo's approach. This funding will allow the project team to conduct the environmental document level traffic analysis for the range of alternatives resulting from the PID phase, as well as conduct a robust equity analysis to determine the extent of low-income traveler impacts and how these can be mitigated.

In addition, future phases of this project are anticipated to be very competitive for receiving funds from programs like the SB 1 Solutions for Congested Corridor Program, which names the U.S. 101/Caltrain corridor connecting Silicon Valley with San Francisco as one of five named "targeted" corridors in the enabling legislation, as well as Regional Measure 3 bridge tolls since the project is part of a regional network of Express Lanes prioritized by the Metropolitan Transportation Commission.

FINANCIAL IMPACT

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Budget for services identified in Cooperative Agreement No. 04-2647 will be provided for by Prop K sales tax funds appropriated in December 2017 through Resolution 18-25, federal CMA planning funds, and Measure A sales tax funds from SMCTA. Amounts corresponding to this year's anticipated expenditures are included in the Transportation Authority's proposed Fiscal Year 2017/18 Budget Amendment.

CAC POSITION

The CAC will consider this item at its October 24, 2018 meeting.

SUPPLEMENTAL MATERIALS

Attachment 1 – Alternatives Description and Analysis Result Details

Attachment 2 – Prop K/LPP Fund Swap Details

Attachment 3 – Freeway Corridor Management Study Phase 2 Draft Final Report

Attachment 1.

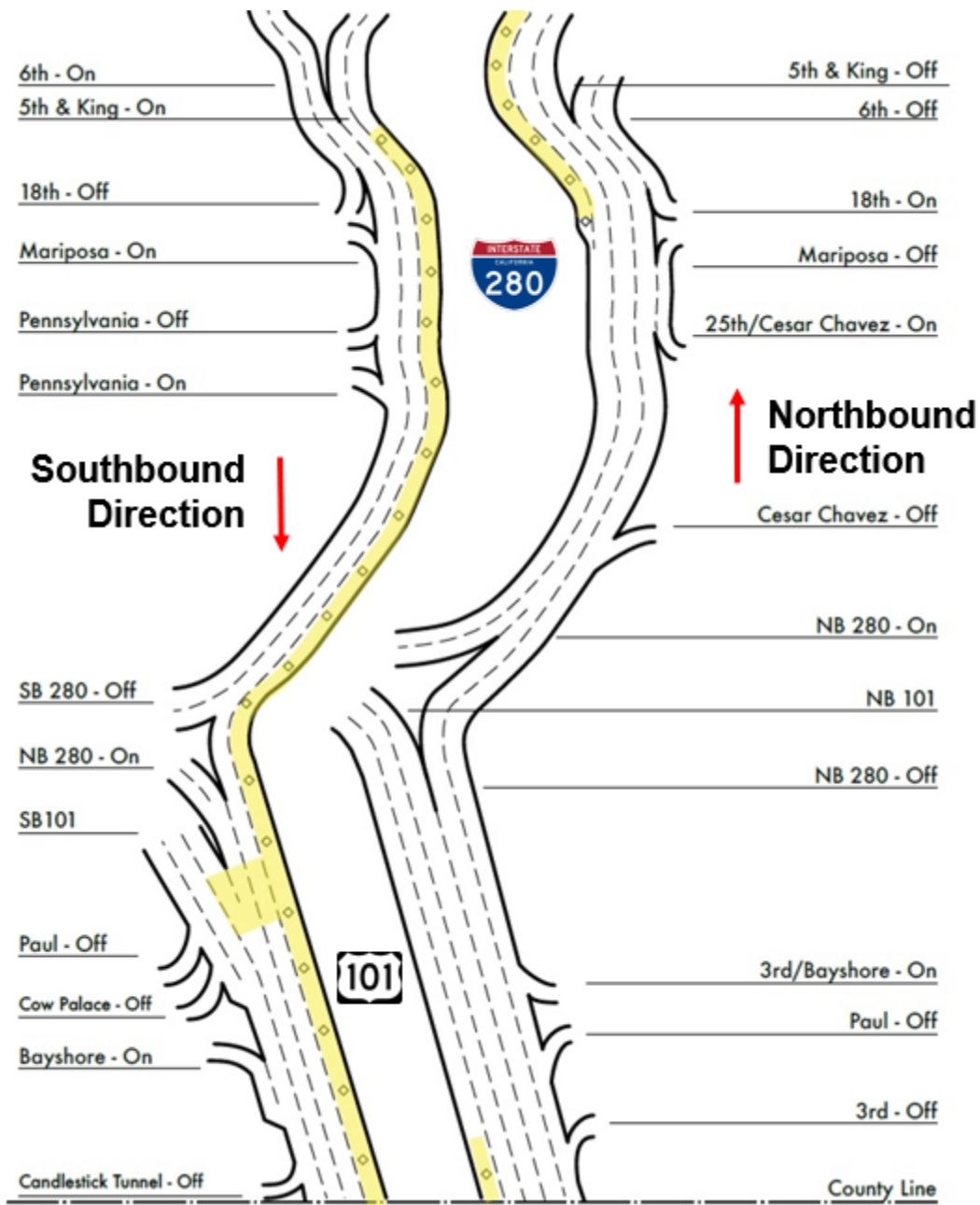
Alternatives:

The FCMS study is exploring options for dedicating a lane on portions of US 101 and I-280 for High-Occupancy Vehicles (carpools and transit). Consistent with other carpool lanes in the Bay Area, these lanes could have minimum occupancy requirements of either two or three persons. If deemed necessary, price management in the form of Express Lanes, also known as High Occupancy/Toll (HOT) lanes, could be used with either of these configurations. Express Lanes could provide the right tool to achieve a balance of traffic that gives buses, carpoolers, and other vehicles in the lane faster travel time and reliability without adding significant delay to the remaining general-purpose lanes. Express Lanes can give people a choice to get where they need to go faster and more reliably, with the price to enter for non-carpools determined by demand. Eligible carpools and buses would access the lane at no cost.

The FCMS study team collected information on operational and physical constraints on San Francisco's freeways and has determined that one potential feasible configuration could entail the features described below:

- Southbound, the existing configuration of the I-280 and US 101 freeways allows for the creation of a continuous lane by restriping the existing freeway. A carpool or Express Lane could operate along I-280 between the intersection of 5th and King Streets and US 101, continuing through the interchange to US 101 into San Mateo County, covering a distance of about five miles.
- Headed northbound, because I-280 exits from the right side of Northbound US 101, any carpool or Express lanes entering San Francisco from San Mateo county will likely end at or near the county line. However, the Study identified an opportunity to provide priority for Northbound carpools and buses for approximately one mile along the I-280 headed into South of Market, from about 18th Street to 5th Street.

Figure 1 includes a lane diagram figure illustrating this concept.



The operational scenarios considered with this physical alternative include:

- No Build, where the configuration of freeways remains as it is today. This serves as a point of comparison for the following three build scenarios.
- High Occupancy Vehicle (HOV) with a two-person minimum requirement (HOV2+).
- HOV with a three-person minimum requirement (HOV3+).
- Express Lane with a three-person minimum requirement to access the lane at no cost and a demand based, variable toll for others to access the lane (HOT3+).

Alternatives Evaluation:

The analysis was performed by determining the demand for travel across all modes and routes in each scenario in the Transportation Authority's travel demand model, SF-CHAMP, and then applying these

demands to a high-level, morning and evening peak hour traffic model. This analysis provided information about travel times and delays for both carpool/Express Lane users and non-users, estimates of the change in number of people moved through the corridor, and city/area-wide metrics like overall vehicle miles traveled and air quality impacts. The travel demand model does not take into account factors that may impact real world operation of a facility including potential violators, clean air vehicles, and variations in traffic volumes for special events.

Results of the operational analysis indicate technical feasibility of the proposed lane configuration (based on overall person throughput of the facility and level of delay to vehicles in general purpose lanes) under at least one of the three evaluated operational policies, and are summarized below and in Tables 1 and 2:

Under the No-Build scenario, congestion continues to get worse, with some bottlenecks resulting in an additional 2 to 5 minutes of travel time over existing conditions, doubling existing delays.

In all build scenarios for 2020, the model results show that the carpool or Express Lane will be free-flowing, saving travelers in those lanes between four and nine minutes between the I-380 interchange and down town San Francisco compared to the No-Build scenario. However, the impacts to the general purpose lanes and person throughput, or people moved in the corridor, would vary:

- HOV2+ increases delay to general purpose lane users by about two to three minutes in both the morning and evening in all directions except northbound, where travel times decrease by about two minutes. Person throughput at Harney and Mariposa Streets increases by between 600 to 1900 travelers, depending on direction and time of day, an increase of 13% to 43%.
- HOV3+ increases delay to general purpose lane users by about six to 14 minutes in both the morning and evening in all directions except Northbound, where travel times decrease by about two minutes. Person throughput at Harney and Mariposa Streets decreases in some times and directions as a result of significant new congestion, by between 500 and 1100 fewer travelers, or a reduction in 5% to 12%, while in other times person throughput increases by between 200 to 1600 travelers, an increase of 7% to 33%.
- HOT3+ increases delay to general purpose lane users by about two to four minutes in the northbound direction in the evening and southbound direction in the morning, while saving general purpose lane users about three minutes in the northbound direction in the morning and the southbound direction in the evening. Person throughput at Harney and Mariposa Streets increases by between 100 to 2200 travelers, depending on direction and time of day, an increase of 2% to 43%.

Table 1: Travel Time

Direction	Operational Scenario in 2020	AM Peak Hour		PM Peak Hour	
		GP Lane	Managed Lane	GP Lane	Managed Lane
Northbound I-380 to Downtown SF	No Build	24 minutes	-	20 minutes	-
	2-person carpool (HOV2+)	-2	-7	+3	-8
	3-person carpool (HOV3+)	-2	-7	+6	-9
	3-person carpool with option to buy into lane (HOT3+)	-3	-7	+2	-8
Southbound Downtown SF to I-380	No Build	17 minutes	-	15 minutes	-
	2-person carpool (HOV2+)	+2	-6	+2	-4
	3-person carpool (HOV3+)	+10	-6	+13	-4
	3-person carpool with option to buy into lane (HOT3+)	+4	-6	-3	-4

Table 2: Person Throughput

Segment	Screenline Location	Operational Scenario in 2020	AM	PM
US 101 NB	Between Harney Way off-ramp and Harney Way on-ramp (SF County Line)	2-person carpool (HOV2+)	+14%	+13%
		3-person carpool (HOV3+)	-12%	-9%
		3-person carpool with option to buy into lane (HOT3+)	+7%	+14%
US 101 SB	Between Bayshore Blvd on-ramp and Alana Way off-ramp (SF County Line)	2-person carpool (HOV2+)	+17%	+19%
		3-person carpool (HOV3+)	-5%	-8%
		3-person carpool with option to buy into lane (HOT3+)	+11%	+26%
I-280 NB	Between 18 th Street on-ramp and 6 th Street off-ramp	2-person carpool (HOV2+)	+40%	+18%
		3-person carpool (HOV3+)	+33%	+10%
		3-person carpool with option to buy into lane (HOT3+)	+24%	+8%
I-280 SB	Between 18 th Street off-ramp and 18 th Street on-ramp	2-person carpool (HOV2+)	+16%	+43%
		3-person carpool (HOV3+)	+7%	+19%
		3-person carpool with option to buy into lane (HOT3+)	+2%	+43%

Attachment 2. Prop K/Local Partnership Program (LPP) Fund Exchange

Table 1. Status of LPP Formulaic Programming for San Francisco Public Works' Street Resurfacing Projects as of October 18, 2018

Project Name	Programming Year	Status	Total LPP Amount	Cumulative LPP Amount
Parkmerced/Twin Peaks/Mt Davidson Manor Residential Street Resurfacing	FY17/18	Allocated	\$ 2,106,000	\$ 2,106,000
Alemany Blvd Pavement Renovation	FY18/19	Programmed ¹	\$ 1,750,000	\$ 3,856,000
Sunset and Parkside Residential Streets Pavement Renovation	FY19/20	Programmed	\$ 2,340,000 ²	\$ 6,196,000
Total			\$ 6,196,000	

¹ Allocation request is awaiting California Transportation Commission action at its December 5-6, 2018 meeting.

² Of the total amount, \$333,000 correspond to Cycle 1 funds that were reprogrammed from the Alemany Blvd Pavement Renovation project.

Table 2. Proposed Fund Exchange Scenarios¹

Scenario	SFPW Street Resurfacing LPP Funds	SFCTA US101/I280 Managed Lanes Prop K Funds ²	Notes
Scenario 1 Prop 6 fails, SB 1 revenues remain SFPW retains all LPP funds	\$6,196,000	\$4,100,000	
Scenario 2 Prop 6 passes, SB 1 revenues are repealed and SFPW retains first two years LPP funds	\$4,189,000 ³	\$2,500,000	Staff would seek amendment of the Street Resurfacing 5YPP to advance \$2.0 million to fully fund the Sunset/Parkside project.
Scenario 3 Prop 6 passes, SB 1 revenues are repealed and SFPW only retains first year LPP funds	\$2,106,000	\$1,200,000	Staff would seek amendment of the Street Resurfacing 5YPP to advance \$4.6 million to fully fund Alemany and Sunset/Parkside.

¹ Acronyms include: 5YPP – Prop K 5-Year Prioritization Program, LPP – Local Partnership Program, SB 1 – Senate Bill 1, SFCTA – San Francisco County Transportation Authority, and SFPW – San Francisco Public Works

² Should the Transportation Authority Board approve the fund exchange, we anticipate returning to the Board in January 2019 to amend the Prop K Strategic Plan and the Street Resurfacing 5YPP to program the Prop K funds to the US101/I280 Managed Lanes – Fund Exchange project, concurrent with seeking allocation of those funds.

³ This amount includes \$333,000 in Cycle 1 funds that are currently programmed to the Sunset/Parkside Pavement Renovation project.



FREEWAY CORRIDOR MANAGEMENT STUDY PHASE 2

DRAFT REPORT | OCTOBER 2018

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IMAGE

ACKNOWLEDGEMENTS

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PROJECT TEAM

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Executive Summary

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1. Introduction

Congestion on San Francisco’s freeways is bad and getting worse. The San Francisco County Transportation Authority’s latest congestion monitoring data identifies that average speeds on San Francisco’s most trafficked freeways, I-280 and US 101, have dropped each year since 2009. Delays and the lack of reliability inherent in travel on roadways that are at or over capacity results in lost time by all travelers that use the freeways, reduced business efficiency from slower deliveries, and environmental and livability impacts on surrounding neighborhoods from traffic diverted to local streets and increased pollution from stop and go traffic.

Looking ahead, travel is projected to continue to grow on major freeway corridors through 2040. Between San Francisco and San Mateo Counties alone, over 100,000 additional daily trips are forecast. Even if all of these trips were able to be accommodated by transit, which is unlikely, they would represent one full bus every two minutes between the two counties. Left unaddressed, congestion on the freeways and crowding on transit will continue to grow, exacerbating the delays, lack of reliability, and environmental impacts we see today.

1.1 PREVIOUS STUDIES

The 2013 Countywide Transportation Plan first identified the need for a comprehensive review of strategies to more effectively utilize San Francisco’s existing freeway infrastructure, and included a recommendation to set a vision for managing the city’s freeway network. Work

on this recommendation began in 2014, resulting in the adoption by the SFCTA board of the Freeway Corridor Management Study Phase 1 report in 2015. The Phase 1 report inventories potential strategies for increasing the efficiency and functionality of freeways to provide congestion relief along with proposing a set of goals by which these improvements should be evaluated. These goals are summarized below and detailed in Appendix A:

- **Move people efficiently:** We need to get more travelers to their destinations as quickly and reliably as possible in the existing freeway footprint.
- **Increase trip reliability:** More reliable travel times will help everyone, from parents picking up their children from school to commuters who need to get to work on time.
- **Enhance travel choices:** Better transit and incentives to carpool give commuters convenient new travel options.
- **Contribute to a regional network:** San Francisco’s freeway management strategies will be coordinated with similar projects in San Mateo and across the region.
- **Reduce emissions:** Moving more people in the same or fewer vehicles will help achieve our climate goals as our population grows.
- **Support community well-being:** We must ensure that any changes to freeway operations support equity and safety in nearby neighborhoods.

San Mateo County Transportation Authority

The San Mateo County Transportation Authority is currently seeking environmental clearance for a project that proposes to build an express lane in both directions on US-101 in San Mateo County. The express lanes would connect with existing carpool lanes which would be converted into express lanes themselves, creating new continuous express lanes that extend from I-380 in San Bruno to San Antonio Road in Mountain View.

See <http://www.dot.ca.gov/d4/101managedlanes/> for more details.

1.2 FREEWAY CORRIDOR MANAGEMENT STUDY PHASE 2

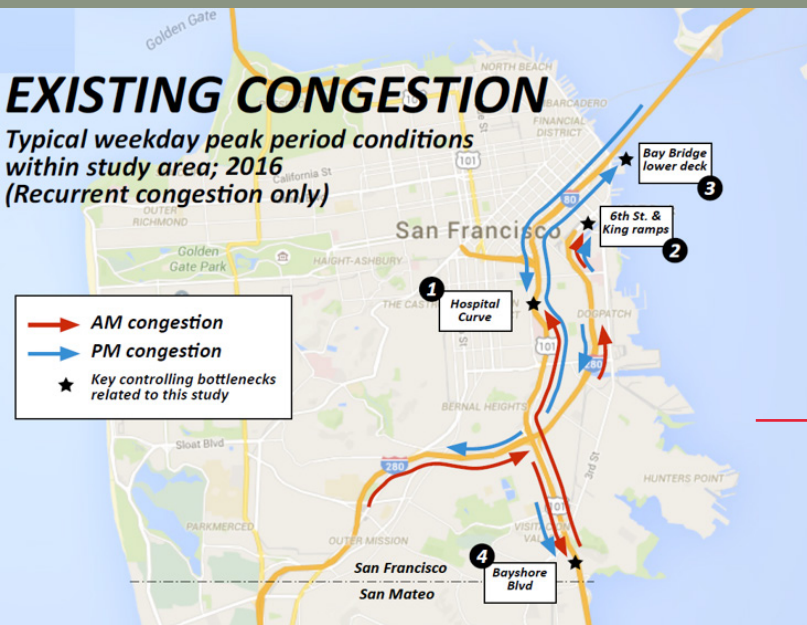
This study, the Freeway Corridor Management Study Phase 2, aims to identify low impact, short-term, quickly implementable improvements to travel that will help bridge the gap between today and the next ten to fifteen years, when major investments such as the electrification of Caltrain and its extension to the Salesforce Transit Center are expected to be complete. This study was led by the goals of the Phase 1 report, and focuses on strategies that move more people in the same or fewer number of vehicles, and within the same footprint of today's freeways.

Without any changes to the current operation of the freeways in San Francisco, buses and carpools will continue to be stuck in the same traffic as all other vehicles, providing travelers with no incentive to ride transit or carpool. San Francisco, along with Napa, are the only two counties in the nine-county Bay Area that do not provide any preferential treatment for transit or carpools on its freeways. Given this, of the strategies identified in Phase 1, the study team for Phase 2 (including project partners at the San Francisco Municipal Transit Agency, Caltrans, the San Mateo County Transportation Authority, and the San Mateo City/County Association of Governments) quickly focused on identifying and providing a feasibility-level analysis of options for extending managed lanes, broadly referred to as any lanes on a freeway set aside from general-purpose lanes, either by

occupancy requirements, pricing or access limitations (i.e. carpool or HOV and/or "Express" or HOT lanes), from their current planned endpoint near San Francisco International Airport to Downtown San Francisco.

This focus is also in alignment with state legislation (SB 1), and priorities established by the governor's office, which both identified US 101 as a high priority corridor for implementing multi-jurisdictional solutions to congestion.

The results of this study represent an early understanding and recommendation on the feasibility of managed lane projects that could be implemented in the near-term without significant new construction. Like all feasibility studies, this analysis is intended to provide a high-level investigation into the viability of proposed concepts. The level of detail generated at this stage is commensurate with the best data currently available and the understanding that more comprehensive and detailed multi-modal analyses need to be conducted in subsequent development phases of the project, including further alternative development and scoping, traffic analysis, environmental review, and final design. The intent at this stage is to develop conceptual alternatives that can achieve the project's goals, and to provide a preliminary assessment of their feasibility from both physical and operational perspectives.



2. Constraining the Problem

The project team conducted a review of the operational policies and physical geometry of the freeway network in order to identify opportunities to quickly address congestion with improvements that require minimal capital investment. See the figures below for existing congestion and bottlenecks within the study area in the year 2016 as well as projected congestion and bottlenecks in future year 2020.

US 101 quickly came to the forefront as the corridor of interest due to its significant congestion during peak periods and the potential interface with the San Mateo 101 express lanes project. Furthermore, the heavy congestion in both commute directions between Silicon Valley and San Francisco prompted a call from the Governor’s office for a continuous managed lane facility from San Jose to downtown San Francisco. In response to this call, the project team quickly evaluated but ultimately rejected a route that would allow a driver to bypass congestion from the end of the San Mateo Managed Lanes Project at I-380 all the way through San Francisco and on to the San Francisco-Oakland Bay Bridge. While the concept has obvious appeal, closer study quickly revealed several operational and geometric constraints that pointed to significant challenges to accomplish any proposed project of this kind on the US 101 north of the US 101/I-280 interchange. These included:

- Exits from both the right and left side of the facility that made it impossible to convert the existing left lane to a carpool or express lane.

- Only one of the existing lanes is continuous from the county line to the bridge.
- Existing supports for the northbound connector from I-280 to US 101 straddle the three-lane cross-section of US 101 at the interchange, meaning that widening that portion of the freeway would require reconstructing the entire connector.
- An additional physical constraint exists at the portion known as ‘Hospital Curve’. The freeway is cut into a slope and any spot widening would be extremely costly and likely involve significant impacts to adjacent neighborhoods and environmental resources.
- The Metropolitan Transportation Commission has jurisdiction over I-80 east of the Fifth Street off-ramp, so any potential project would need to be studied in close partnership with that agency to properly assess the regional traffic and environmental impacts.

Despite the strong need for congestion relief on US 101 north of the US 101/I-280 interchange, the factors above led the team to determine that this segment did not meet the standard for short-term, low-cost improvements that could be constructed at minimal cost. The question of how to bypass congestion on US 101 north of the US 101/I-280 interchange and on the approach to the Bay Bridge must still be addressed, and will be advanced in future studies including ConnectSF, San Francisco’s ongoing long-range transportation planning effort.

ConnectSF



ConnectSF is a multi-agency collaborative process to build an effective, equitable, and sustainable transportation system as part of the update to San Francisco’s long-range transportation plan. ConnectSF will define a 50-year vision of San Francisco’s future, including potential changes to the streets and freeways networks as well as transit corridors.

For more information, please visit <https://connectsf.org>.

Attention then turned to I-280 northbound from the interchange to its terminus at 5th and King Streets near AT&T Park and the Caltrain station. I-280 between the US 101/I-280 interchange is a newer freeway with lower traffic volumes than US 101, and has the potential to be restriped to provide a carpool or express lane without significant impacts on existing traffic. A project from the county line to 5th and King would be a solution focused on the Peninsula to San Francisco commute, which directly addresses the goals of this study.

In addition to the physical characteristics, the study team focused on understanding the current operations of both the US 101 and I-280 freeways - where and when is congestion present, what delay does it create, and what is its cause? These performance characteristics are described in full in the FCMS Existing Conditions Report, and summarized in the graphics above. This portion of the study included a review of traffic conditions in northern San Mateo county as well, resulting in coordination with the San Mateo County Transportation Authority and C/CAG to identify congestion and address ways to fill a gap between the end of San Mateo’s Managed Lane project at I-380 and the San Francisco/San Mateo county line.

Taken as a whole, the opportunities to advance the creation of a regional network by partnering with San Mateo county, along with the operational challenges and physical constraints of the freeways, resulted in a recommendation of the study team to advance a project with limits from I-380, up US 101 to the US 101/I-280 interchange and then east and north on I-280 to 5th and King.

Why Not Widening?

As opportunities to address congestion within the project limits took shape, the team began to outline the set of potential solutions for analysis in the Study. In line with existing San Francisco policy meant to discourage personal car use and protect San Francisco’s neighborhoods, designs that included significant expansion of freeway capacity were not advanced.

POLICY 3.1 OF THE TRANSPORTATION ELEMENT IN THE SAN FRANCISCO GENERAL PLAN READS:

“The existing capacity of the bridges, highways and freeways entering the city should not be increased for single-occupant vehicles, and should be reduced where possible. Changes, retrofits or replacements to existing bridges and highways should include dedicated priority for high-occupancy vehicles and transit, and all bridges should feature access for bicyclists and pedestrians.”

POLICY 3.2 READS:

“New elevated and surface freeways should bypass or terminate outside San Francisco, rather than pass through the city.”



IMAGE
of any of the policy explanations?

AND POLICY 18.3:

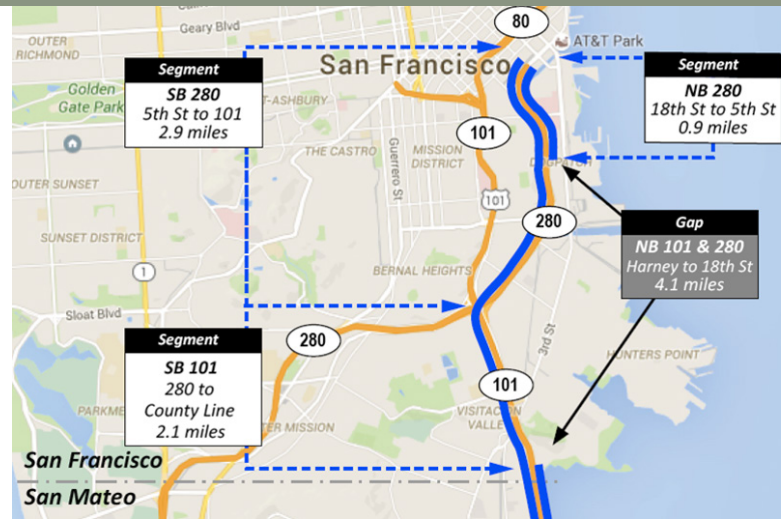
“The existing single-occupant vehicular capacity of the bridges, highways and freeways entering the city should not be increased and should be reduced if needed to increase the capacity for high-occupancy vehicles, transit and other alternative means of commuting, and for the safe and efficient movement of freight trucks. Changes, retrofits, or replacements to existing bridges and highways should include dedicated priority for high-occupancy vehicles and transit, and all bridges, where feasible, should feature access for bicyclists and pedestrians.”

3. Study Alternatives

To develop managed lane alternatives to evaluate through the identified goals and performance metrics, the study team reviewed the physical and operational characteristics of San Francisco’s freeways along with policy and legal constraints, as described in the previous section. As a result of this review, in addition to and in service of the study goals, a few key guidelines emerged for the purposes of this study:

- Potential for quick implementation:** The study team sought to develop alternatives that would not require extensive construction and could leverage the existing configuration of the freeways. This priority is also in line with San Francisco’s other adopted priorities to limit freeway construction and to prioritize investments in transit.
- Focus on travel to/from Downtown San Francisco & Eastern Neighborhoods:** Significant growth is expected in both downtown San Francisco and the City’s Eastern and Southeastern neighborhoods. By improving options on freeways that serve these growing areas, more travel choices can be made available.
- No expansion of freeway capacity:** San Francisco’s general plan calls for no freeway expansion in San Francisco, instead recommending the provision of bus and carpool priority lanes. Expansion of freeways also carries the potential for substantial negative impacts on neighborhoods adjacent to freeways, many of which are Communities of Concern.
- Increase in person throughput while minimizing impact on traffic:** The study team prioritized opportunities to provide travel time savings and reliability increases for transit and carpools while minimizing the impact on other vehicles. Primarily, this meant identifying freeway segments that are not critically congested today but may become so without intervention in the future, such as I-280 between US 101 and Downtown.

Using the study goals and the guidelines described above, the team focused on a single potential managed lane project configuration with three options for operational strategies. This alternative is detailed below.



3.1 PHYSICAL CONFIGURATION:

Southbound, the existing configuration of the I-280 and US 101 freeways allows for the creation of a continuous lane by restriping the existing freeway, or in other words, converting an existing general purpose lane into a managed lane. A carpool or Express Lane could operate along I-280 between the intersection of 5th and King Streets and US 101, continuing through the interchange to US 101 into San Mateo County, covering a distance of about five miles in San Francisco proper. This extension would be the northern end of a 65-mile managed lane from Morgan Hill south of San Jose to San Francisco.

Headed northbound, because I-280 exits from the right side of Northbound US 101, any carpool or Express lanes entering San Francisco from San Mateo county will likely end at or near the county line. However, the Study identified an opportunity to provide priority for Northbound carpools and buses for approximately one mile along the I-280 headed into South of Market, from about 18th Street to 5th Street.

3.2 OPERATIONAL CONFIGURATIONS:

The physical configuration of the lane described above could be implemented with a variety of operational policies, including both traditional carpool (HOV) and Express Lanes (HOT). When considering a traditional carpool policy, the lanes could have minimum occupancy requirements of either two or three persons, consistent with other carpool lanes in the Bay Area.

The study team also explored whether price management, in the form of Express Lanes, could be used with either of these configurations. Express Lanes could provide the right tool to achieve a balance of traffic that gives buses, carpools, and other vehicles in the lane faster travel time and reliability

without adding significant delay to the remaining general-purpose lanes. While eligible carpools and buses would access the lane at no cost, the price to enter for non-carpools would be determined by demand, thus ensuring that all available capacity in the lane would be used without becoming congested, and therefore keeping traffic in the lane moving at 45mph.

To test the feasibility of both carpool and Express Lane options, the study team developed operational alternatives around three themes, plus one no-build future scenario:

- No Build, where the configuration of freeways remains as it is today. This serves as a point of comparison for the following three build scenarios.
- High Occupancy Vehicle (HOV) with a two-person minimum requirement (HOV2+).
- HOV with a three-person minimum requirement (HOV3+).
- Express Lane with a three-person minimum requirement to access the lane at no cost and a demand based, variable toll for others to access the lane (HOT3+).

All three build alternatives included projected increases in transit service utilizing the lane, which were developed in coordination with Muni and SamTrans. These changes included both routing modifications for existing routes like the 8BX, implementation of planned routes like the Hunter’s Point and Candlestick Express services, and incorporation of the preliminary results of SamTrans’s 101 Express Bus study. The details of this analysis are described in the following section.

What are HOT/ Express Lanes, and who can use them?

Traditional high-occupancy vehicle (HOV) lanes require passenger vehicles to have a minimum number of passengers. “HOT” lanes is short for “high-occupancy toll” lanes. HOT lanes are HOV lanes that allow vehicles that don’t meet occupancy requirements to pay a toll to use the lane, while transit and carpools continue to use the lane for free. Variable pricing is used to manage the lane so that reliable performance is maintained at all times, and transit and carpools are prioritized over vehicles that might pay to use the lanes - if the lane is full of buses and carpools, then the system would not even allow other drivers to pay the toll to enter, restricting the lane only to high occupancy vehicles.

HOT lanes have been implemented around the Bay Area and throughout the United States, and have proven to be more efficient than traditional HOV lanes. While communities may call them by different names, such as Express Lanes, the basic operation is the same—HOT lanes encourage carpooling and other transit alternatives while offering vehicles that do not meet standard occupancy requirements another option.

4. Alternatives Analysis

The purpose of the study is to assess the overall performance of the proposed carpool or express lane alternatives to determine whether any of the options should be recommended to move forward in the planning and project development process. As a result, the analysis was a high-level assessment of future peak hour conditions to provide insight on the expected operations to establish overall feasibility of the alternatives. The level of detail and accuracy was commensurate with the data and forecasts available, and should be considered a precursor to more detailed studies (involving refined forecasts and microsimulation traffic analyses) that must be conducted during subsequent project development phases.

The physical configuration detailed above was analyzed at a high-level for performance across four potential operational policies in the near term (2020), as noted in the previous section:

- No Build, where the configuration of freeways remains as it is today. This serves as a point of comparison for the following three build scenarios.
- High Occupancy Vehicle (HOV) with a two-person minimum requirement (HOV2+).
- HOV with a three-person minimum requirement (HOV3+).
- Express Lane with a three-person minimum requirement to access the lane at no cost and a demand based, variable toll for others to access the lane (HOT3+).

In pursuit of the City’s Transit First policies, improvements and additions to Muni and SamTrans service were included in all build scenarios. Muni service includes an enhancement to the 8BX service to run all day and take advantage of the lanes within San Francisco, as well as the addition of the Hunters Point Express and Candlestick Express service, currently planned to come online as development in each neighborhood proceeds, serving both new and existing residents. Improved SamTrans service is based on the early findings of the in-progress US 101 Express Bus Feasibility Study, and was modeled to include eight new express routes that serve both San Mateo County resident trips to San Francisco and San Francisco trips to job centers in San Mateo County.

The analysis was performed by determining the demand for travel across all modes and routes in each scenario in the Transportation Authority’s travel demand model, SF-CHAMP, and then applying these demands to a high-level, morning and evening peak hour traffic model. This analysis provided information about travel times and delays for both carpool/Express Lane users and non-users, estimates of the change in number of people moved through the corridor, and city/area-wide metrics like overall vehicle miles traveled and air quality impacts. Appendix C contains additional details about the analysis methodology and approach.

What about private commuter shuttles?

Private commuter shuttles, taken together, would represent the Bay Area’s seventh largest transit agency by passengers served, and play a significant role in travel in the US 101 corridor. While SFMTA collects data about shuttle routes and stops within San Francisco, it is difficult to estimate what changes may occur to these networks in response to changes on the freeways. For the purpose of this analysis, the project staff rerouted private buses to the carpool or express lane where they would achieve time savings over their current routes and considered their presence in person throughput calculations, but otherwise did not evaluate any changes to ridership or frequency of any private shuttles.

IMAGE?

5. Analysis Results

5.1 FREEWAY OPERATIONS

Results of the operational analysis indicate technical feasibility of the proposed lane configuration (based on overall person throughput of the facility and level of delay to vehicles in general purpose lanes) under at least one of the three evaluated operational policies. In 2020, in all of the operational scenarios being considered (HOV2+, HOV3+, HOT3+), the analysis indicates that the Managed Lane will be uncongested and offer a time savings advantage compared to the general purpose lanes, and thus provide an incentive to rideshare or use transit. However, there are tradeoffs in how this incentive is achieved:

- In portions of the corridor where the Managed Lane is created by converting an existing lane, the magnitude to which general purpose lane users will experience increased delays will directly correspond to how many vehicles use the Managed Lane - the more vehicles being moved in the managed lane, the fewer vehicles remain to congest the general purpose lanes. The HOV3+ option has the lowest Managed Lane usage, and thus has the greatest increase in general purpose lane delay, up to an additional 13 minutes (in the southbound evening peak hour).

- The HOV2+ option has the highest use of the Managed Lane and thus the least effect on the general purpose lanes. However, the HOV2+ option has the least potential for growth in carpools as the current level of 2 person or more carpools on the corridor would fill the lane on opening day, and is also not compatible with San Mateo's US 101 Managed Lane's proposed operations requiring a 3 person or more occupancy. This could cause adverse operational impacts and enforcement challenges with going from 3+ to 2+.
- In some locations where a Managed Lane is created by utilizing the freeway shoulder and retaining the existing number of general purpose lanes (i.e. northbound 280 north of Mariposa), travel times in the general purpose lanes will decrease slightly as vehicles leave the general purpose lanes to utilize the managed lane.

Picking the best option amongst the operating policies is a balancing act, including weighing time savings incentives, opportunities to increase ridesharing, and the impact on the general purpose lanes. Based on this feasibility level analysis, the HOT3+ option strikes the best balance among these factors. Changes in travel time and person throughput for each scenario are detailed below, and projected congestion is shown in **Tables 1 and 2** on the next page.

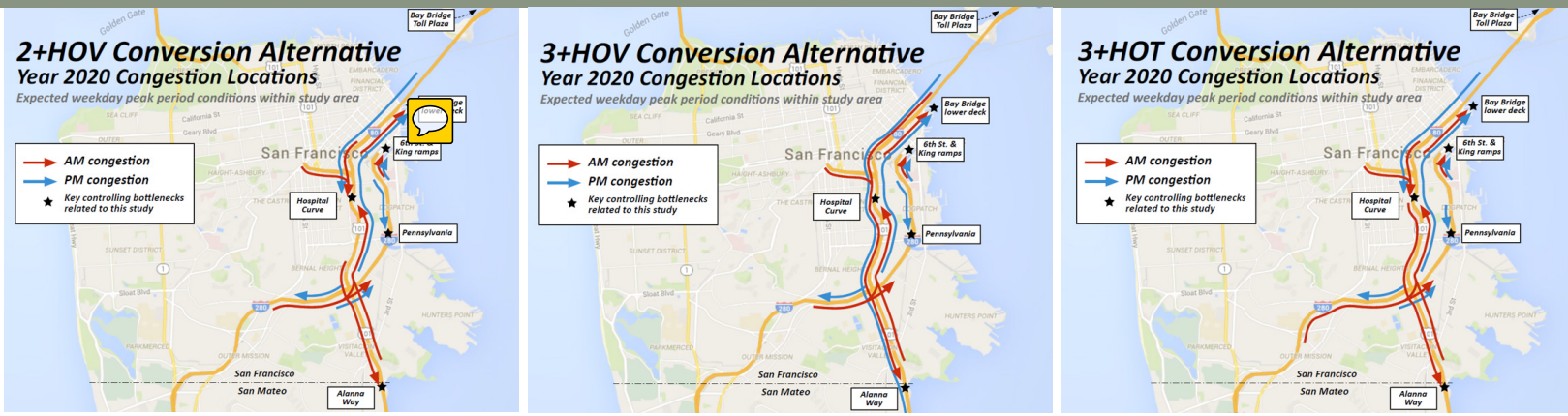


TABLE 1 - CHANGES IN TRAVEL TIME BY SCENARIO

DIRECTION	OPERATIONAL SCENARIO IN 2020	AM Peak Hour		PM Peak Hour	
		GP Lane	Managed Lane	GP Lane	Managed Lane
Northbound I-380 to Downtown SF	No Build	24 minutes	-	20 minutes	-
	2-person carpool (HOV2+)	-2	-7	+3	-8
	3-person carpool (HOV3+)	-2	-7	+6	-9
	3-person carpool with option to buy into lane (HOT3+)	-3	-7	+2	-8
Southbound Downtown SF to I-380	No Build	17 minutes	-	15 minutes	-
	2-person carpool (HOV2+)	+2	-6	+2	-4
	3-person carpool (HOV3+)	+10	-6	+13	-4
	3-person carpool with option to buy into lane (HOT3+)	+4	-6	-3	-4

TABLE 2 - CHANGES IN PERSON THROUGHPUT BY SCENARIO

SEGMENT	SCREENLINE LOCATION	OPERATIONAL SCENARIO IN 2020	AM	PM
US 101 NB	Between Harney Way off-ramp and Harney Way on-ramp (SF County Line)	2-person carpool (HOV2+)	+14%	+13%
		3-person carpool (HOV3+)	-12%	-9%
		3-person carpool with option to buy into lane (HOT3+)	+7%	+14%
US 101 SB	Between Bayshore Blvd on-ramp and Alana Way off-ramp (SF County Line)	2-person carpool (HOV2+)	+17%	+19%
		3-person carpool (HOV3+)	-5%	-8%
		3-person carpool with option to buy into lane (HOT3+)	+11%	+26%
I-280 NB	Between 18th Street on-ramp and 6th Street off-ramp	2-person carpool (HOV2+)	+40%	+18%
		3-person carpool (HOV3+)	+33%	+10%
		3-person carpool with option to buy into lane (HOT3+)	+24%	+8%
I-280 SB	Between 18th Street off-ramp and 18th Street on-ramp	2-person carpool (HOV2+)	+16%	+43%
		3-person carpool (HOV3+)	+7%	+19%
		3-person carpool with option to buy into lane (HOT3+)	+2%	+43%

5.2 LOCAL STREET INTERFACE

The analysis also conducted a sensitivity analysis on the potential for traffic to divert to local streets when faced with the slightly increased travel times found in this study. The study team initially identified local streets including Bayshore Boulevard, 3rd Street, Alemany Boulevard, Potrero Avenue, and Monterey Avenue as routes where special attention must be paid to potential increases in traffic as a result of the proposed alternatives, and ultimately developed an analysis that would test for increases in volumes on all local streets. The results of this analysis, conducted using SF-CHAMP, showed that under both the HOV2+ and HOT3+ scenarios, no additional traffic was anticipated on any of these or other corridors. Under the HOV3+ scenario, some potential diversions were identified, the largest of which are:

- Southbound Third Street: Up to 90 additional vehicles in the peak hour, with greatest increases in the blocks leading toward Cesar Chavez Street and in the Bayview between Evans Avenue and Oakdale Avenue
- Eastbound Cesar Chavez Street: About 60 more vehicles in the peak hour approaching I-280
- Southbound South Van Ness and Southbound Potrero Avenue: Both streets see about 30 more vehicles per hour in the Mission

As a result of the degradation in travel times and person throughput, along with the potential for local street diversions in the HOV3+ scenario, the study team does not recommend that this operational scenario advance to future phases of project development and evaluation.

5.3 OTHER PERFORMANCE FACTORS

Though the HOV2+ scenario initially appeared to be the most promising in a 2020 timeframe based on the results of the travel time and person throughput analyses, a more detailed investigation into the results provides reason to not advance this operational policy at this time. At numerous segments, the traffic analysis shows that the HOV2+ lane would be at capacity - 1,650 vehicles per hour - in 2020, assuming no “cheaters”, or vehicles with only one passenger, use the lane. Given that the average occupancy violation rate on Bay Area carpool lanes is approximately 20%, the study team has significant concern that an HOV2+ lane would ultimately not be able to provide the travel time savings shown in this analysis. The Transportation Authority board also expressed a preference to ensure that the lanes were not merely being used

by TNCs (e.g., Uber and Lyft) that included only a driver and one passenger, which were not reflected in the travel demand modeling work and would also have the potential to add additional vehicles to the lane.

Regional policy conversations and consistency of driver experience factors also point to the need to look more critically at an HOV2+ scenario. The two existing carpool facilities into and out of San Francisco, the Bay Bridge and Golden Gate Bridge, both require 3 person or more carpools today. Additionally, Caltrans and MTC are currently leading an effort to increase the carpool occupancy requirement on I-880, CA 237, and US 101 in Alameda and Santa Clara counties to 3+ under an Express Lane Scenario, and San Mateo County’s preferred alternative for implementation of Express Lanes on US 101 as far north as I-380 is also 3+ occupancy to travel at no cost. Adopting a different occupancy policy along a single corridor or connected facility would create significant driver confusion, traffic operations, and occupancy enforcement difficulties.

As a result of these additional factors, the study team does not recommend that the HOV2+ scenario advance to future phases of project development and evaluation as a preferred alternative.

5.4 CONCLUSIONS

After review of the evaluation of the three operational alternatives, the results indicate that a lane conversion alternative operating under either an HOT3+ could advance the goals of this study and warrant more detailed evaluation in subsequent study phases. HOV3+ creates substantial additional congestion in the corridor, reduces person throughput, and should not advance to further study as a preferred alternative. HOV2+ is inconsistent with regional and corridor policy and will likely not achieve the outcomes calculated by the travel demand model in real-world conditions, and should also not advance to further study as a preferred alternative.

IMAGE
of community outreach

IMAGE
of community outreach

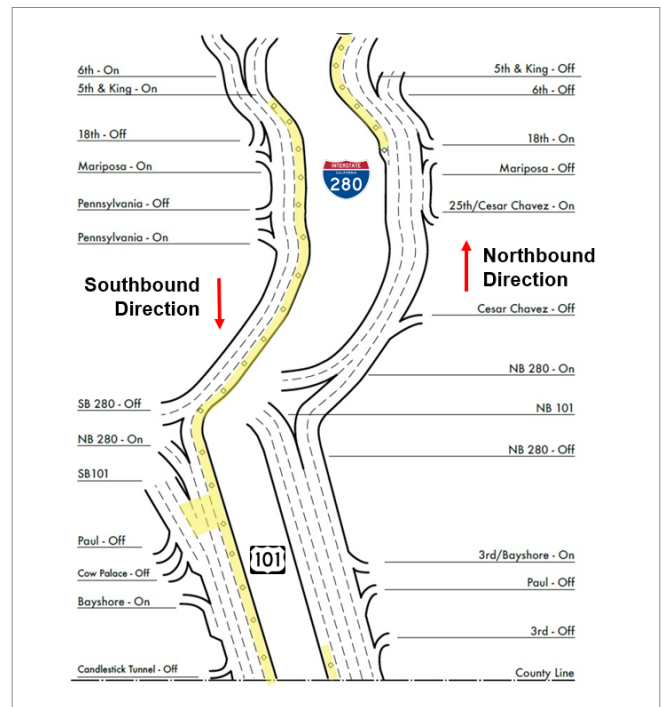
6. Outreach

The study team has met with numerous community, advocacy, and business groups to introduce and hear feedback on the concept of a freeway management strategy in San Francisco, including the potential for Express Lanes. Feedback from outreach conducted to date has been generally neutral to positive, with most participants agreeing with the need for and goals of the study. Many people had specific questions about the proposed physical configuration and some expressed early support or skepticism. Nearly all emphasized the importance of questions of equity and transparency: which travelers would benefit from this project, who would pay, and how would money generated from any Express Lane alternative be spent.

At this feasibility phase of the project, the outreach strategy was focused on educating stakeholders about the project and the concepts under evaluation while collecting questions and concerns that are important to community members. While the scope of this study limits the extent that each major theme can be addressed, project staff have committed to advancing more detailed analyses and conversations around equity in pricing, detailed multimodal traffic studies, and additional improvements to transit as priorities should the study move into subsequent phases of environmental review and design.

7. Recommendations & Next Steps

The study team recommends that the Transportation Authority advance project development and evaluation for a lane conversion, HOT3+ operational policy management strategy for the US 101 and I-280 freeways in San Francisco. A detailed physical configuration of this alternative is shown below.



Additional project development steps include a robust equity analysis rooted in both technical work and engagement that reflects the needs of the community, a detailed review of full-day multimodal traffic operations and performance on both the freeway and local streets (particularly in the vicinity of the touchdown location in San Francisco), the inclusion of other system and demand management strategies, and further consideration of strategies to maximize transit utilization of the Express Lane in conjunction with Muni, SamTrans, and others. Possible multimodal system and demand management strategies that could be considered in order to maximize the performance of both the managed lane itself as well as the entire corridor include:

- Adaptive Ramp Metering
- Interchange/Connector Metering
- Variable Speed Control (Enforceable)
- Enhanced Incident Detection (Cameras, Video, Detectors, etc.)
- Enhanced Incident Response (Freeway Service Patrol, Call Boxes, etc.)
- Enhanced CHP Enforcement
- Park & Ride Facilities, including Private Shuttles
- Traveler Information and Signage for Mode Shift (Transit), Shared Ride & Parking Availability
- Signal Coordination
- Transit Service Enhancements
- Bus-only Ramps and/or Lanes
- Transit Signal Priority
- Bike/Ped Connectivity (especially to Transit or Shared Rides)

From a project design and environmental review standpoint, the next phase of advancing the concept identified here would be for the Transportation Authority enter into a Cooperative Agreement with Caltrans to develop a Project Initiation Document (PID), required for any changes or improvements on the state highway system. A Project Study Report-Project Development Support (PSR-PDS) is the recommended project initiation document that will provide a key opportunity for Caltrans and regional and local agencies to achieve consensus on the purpose & need, scope, and schedule of the project and its environmental review. The purpose for using the PSR-PDS document is to

gain approval for project studies to move into the Project Approval and Environmental Document (PA&ED) phase.

[Further Steps Roadmap - PID/Env timeline graphic]

In addition to the PID document, successful implementation of a managed lane, particularly one created by the conversion of existing capacity, will involve significant interagency coordination on a variety of policies and legislative actions. For example:

- The status of the legal framework around conversion of a lane to an Express Lane will need to be confirmed and will potentially require changes to state legislation and/or the development of interagency agreements with FHWA (reference: connecticut doc?).
- Strategies to maximize the occupancy of vehicles in the corridor and encourage usage of the lane by transit and carpools to the fullest extent will need to be considered and developed. San Francisco, San Mateo, and Santa Clara Counties, with Caltrans, MTC, and CalSTA are currently beginning this process through the 101 Mobility Action Plan, which will develop recommendations for policies and programs to encourage carpooling and transit in the corridor in a future where a continuous managed lane is available.
- Evaluation of the impacts of any priced scenario on low-income commuters, and the development of programs to address these impacts, is critical to the project's success. The SFCTA is in process of developing a detailed investigation into the profile of drivers to, from, and within San Francisco to gain a better understanding about who might be impacted by projects such as Express Lanes.

Further study is recommended for these and other policy considerations in parallel with the Caltrans project development and environmental review process. Information developed and reviewed during this study will create an important foundation for subsequent studies and detailed understanding of the operations and impact of any managed lane in the corridor.