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Making Conservation a California Way of Life.

August 3, 2020

Mr. Mitch Weiss
Executive Director
California Transportation Commission
1120 N Street, MS-52
Sacramento, CA 95814

Dear Mr. Weiss:

The California Department of Transportation (Caltrans), in partnership with Shasta Regional Transportation Agency (SRTA), are pleased to submit the Fix 5 Cascade Gateway Project (F5CG) for consideration in the Senate Bill 1 (SB 1) Trade Corridors Enhancement Program (TCEP) 2020. Caltrans and SRTA are requesting $1,873,000 in SB1 TCEP 2020 funding, with $1,209,000 being requested from the State share and $664,000 from the regional share.

Plans Specifications & Estimate (PS&E) and Right-of-way (R/W), funds are requested for the F5CG Project. Upon completion of additional mixed-flow travel lanes, extension of auxiliary lanes between interchanges, incorporation of 10 ft. shoulders and new Intelligent Transportation Systems, the project will fill the final gap in six lanes on Interstate 5 (I-5) through the Redding Metropolitan Area. The F5CG Project will eliminate bottleneck congestion improving freight connectivity between three state route interchanges and addresses freight conflict zones/collision clusters.

Over the past two decades, Caltrans, SRTA and local agency partners have worked together to systematically plan, design, and construct 17.2 additional lane miles, totaling approximately $254 million, on mainline I-5 through Northern California and the Shasta Region. Furthermore, off system improvements on interchanges, parallel corridors, and east-west connections have been completed to further enhance mobility for freight and people.

We greatly appreciate the California Transportation Commission's consideration of the requested investment in this project, as it is a critical component of the transportation infrastructure for Northern California and the Shasta Region. We

believe the Project is a strong candidate for SB1 TCEP 2020 funding. The signatures below confirm support from Caltrans and SRTA including that all the information within the application and the Project Programming Request form is accurate.

Sincerely,

Dan Little — 7-16-20

DANIEL LITTLE
Executive Director
Shasta Regional Transportation Agency

Date

7/16/2020

DAVE MOORE
District 2 Director
California Department of Transportation

Date

TOKS OMISHAKIN
Director
California Department of Transportation

Date

Fact Sheet: Fix 5 Cascade Gateway

Caltrans District 2 & Shasta Regional Transportation Agency

Contact: **Dave Moore, Director** | Dave.moore@dot.ca.gov | 530-225-3477 |
Daniel Little, Executive Director | dlittle@srta.ca.gov | 530-262-6190 |

Project Location

Shasta | Redding | Interstate 5

Project Scope

Plans Specifications & Estimate and Right-of-Way funds are requested Fix 5 Cascade Gateway (F5CG) Project. When complete, the project will finalize a gap in six lanes on Interstate 5 (I-5) through the Redding Metropolitan Area, eliminating bottleneck congestion on mainline I-5, improving freight connectivity between three state route interchanges, and addressing three freight conflict zones/collision clusters. Project scope includes; additional north and southbound travel lanes, extension of auxiliary lanes between interchanges, installation of high-tension and concrete barriers, 10-ft shoulders, ITS elements, widen seven structures and increase clearance under SB I-5/State Route (SR) 273 overcrossing to meet current standard.

Project Cost

Total Project Cost:	$ 7,581,000	Total TCEP Request:	$ 1,873,000

Project Schedule

PA&ED:	PS&E:	RTL:	R/W:	Beg CON:	End CON:
07/20/2020	07/01/2021	08/08/2024	08/08/2024	02/04/2025	12/28/2028

Project Benefits

Increased flow, reliability, and connectivity where critical freight corridors intersect – The F5CG Project is located where the I-5, SR 299, and SR 44 freight corridors converge and share space – and exactly where I-5 bottlenecks (from six to four lanes) and where I-5 has the highest traffic volume over 465 miles between Eugene, Oregon and the I-5/SR 99 junction just north of Sacramento.

Reduced collisions, property damage, injuries, and fatalities – The F5CG Project will reduce property loss, injuries, and fatalities by addressing three separate freight conflict zones and collision clusters.

Realizes full benefit of adjacent I-5 investments – The F5CG Project is the capstone to decades of interagency coordination and investment on the I-5 corridor in the Shasta Region. Completing the final 2.3-mile gap in six-lanes on I-5 will leverage the performance benefits of $254 million invested over the last 15 years on mainline I-5.

Innovative solutions to community impacts – Scope of work includes design consideration for future contraflow/reversible lanes north of Redding to help manage traffic during frequent closures on I-5 due to weather, wildfires, accidents, and other events. During such closures, I-5 routinely backs up through Redding and blocks access to SR 299 and 44. Future contraflow/reversable lanes will add vehicle storage north of these interchanges, improve first-responder access, and facilitate evacuation if necessary due to wildfire or other threats.

TRADE CORRIDOR ENHANCEMENT PROGRAM
CYCLE 2 PROJECT APPLICATION

A. FACT SHEET

Fact Sheet: Fix 5 Cascade Gateway

Caltrans District 2 & Shasta Regional Transportation Agency

Contact: **Dave Moore, Director** | Dave.moore@dot.ca.gov | 530-225-3477 |
Daniel Little, Executive Director | dlittle@srta.ca.gov | 530-262-6190 |

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Project Benefits

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Innovative solutions to community impacts – Scope of work includes design consideration for future contraflow/reversible lanes north of Redding to help manage traffic during frequent closures on I-5 due to weather, wildfires, accidents, and other events. During such closures, I-5 routinely backs up through Redding and blocks access to SR 299 and 44. Future contraflow/reversable lanes will add vehicle storage north of these interchanges, improve first-responder access, and facilitate evacuation if necessary due to wildfire or other threats.

B. GENERAL INFORMATION

Project Overview

Plans Specifications & Estimate (PS&E) and Right-of-way (R/W), funds are requested for the Fix 5 Cascade Gateway (F5CG) Project. Upon completion, the project will fill the final gap in six lanes on Interstate 5 (I-5) through the Redding Metropolitan Statistical Area (MSA), thereby eliminating bottleneck congestion on mainline I-5, improving freight connectivity between three state route interchanges, and addressing three freight conflict zones/collision clusters. The bulk of improvements will occur over approximately 3 miles between the State Route (SR) 44, 299, and 273 interchanges (total project length is approximately 5.3 miles).

Consistent with Section 11 of the 2020 TCEP Guidelines, funding is requested for pre-construction, PS&E and R/W, components for improvements on the state- and federally-designed freight network to more efficiently accommodate the movement of freight and provide safer passage, including access to and from west coast ports.

Total project cost for pre-construction component: $7,581,000

TCEP requested amount: $1,873,000

Project Background, and Purpose and Need Statement

Background – The F5CG Project is located at the geographic center and transportation crossroads of the North State region. It also serves as the mid-point of the I-5 corridor, connecting west coast population centers, industry, and ports. In addition to providing critical north-south freight movement, this segment of I-5 serves two high-priority freight routes on the state highway system. SR 299 connects the I-5 corridor to California's North Coast and is the sole detour for I-5 freight. SR 44 connects the I-5 corridor to the State Route 395 corridor, Reno, and other key markets. SR 273 also intersects I-5 within the project area, providing access to local industrial areas and Downtown Redding.

The strategic importance of this segment of I-5 for regional, state, and national goods movement is reflected in the data. I-5 through the city of Redding is the highest volume, most congestion segment of the corridor for 313 miles to the north (Eugene, OR) and 152 miles to the south (I-5 and State Route 99 junction). Local and interregional traffic is increasing each year. According to the 2015 California Interregional Transportation Strategic Plan, travel on I-5 north of Sacramento is forecast to increase by 66.8% between 2010 and 2040 to over 8.8 million vehicle miles traveled – 37.5% of which will be freight traffic. Although there is one freight detour route exists on two-lane state routes through mountainous terrain and rural communities, there are no economical alternate routes to the I-5 corridor to help accommodate this growth.

Purpose and Need – The F5CG Project addresses the following needs:

- **I-5 has become functionally outdated** – The I-5 corridor was designed and constructed in the early 1960s for different conditions and travel demands. Current traffic and freight volumes on I-5, combined with the confluence of multiple state routes within a short span, has impacted peak hour travel speeds and created a three collision clusters. In

addition, the SR273 to I-5 overhead connector ramp structure provides less than minimum standard vertical clearance for freight vehicles on SB I-5. The F5CG Project modernizes the I-5 corridor to align with current travel patterns and the functional needs of freight and the traveling public.

- **Performance potential of recent adjacent I-5 freight corridor improvements are constrained** – The F5CG Project is the capstone in a decades-long regional commitment to I-5. Over $253 million in improvements have been recently completed (or are currently underway) on I-5 through the Redding metropolitan area. The F5CG Project fills the final 2.3-mile gap in six lanes on I-5 for 22 miles between the Shasta-Tehama county line and the city of Shasta Lake. As long as this bottleneck in throughput exists, the full performance of the greater freight corridor cannot be achieved, including throughput, velocity, and travel time reliability.
- **More frequent (and longer) I-5 closures are causing community impacts -** Since 2016, I-5 has closed 18-23 times per year for winter storms, accidents, wildfires, and other events. The duration of closures is also increasing. In 2017, I-5 was closed to all traffic for five consecutive days due to wildfires and was not cleared for all freight vehicles for an additional three days. The 111-mile detour route via SR 299 and SR 89 added an additional 53 miles to each vehicle trip through mountainous two-lane corridors and rural communities. Extensive lane restrictions were required over the next 12-18 months for cleanup, guardrail replacement, and atypical storm damage. During this and other such events, northbound I-5 backs up as much as 16 miles through the city of Redding. Freight vehicles spill over onto local streets and into communities that were not designed for heavy freight vehicles and traffic volumes, resulting in impacts to local economic productivity and public health and safety.

Project Scope

The F5CG Project focuses on increasing freight throughput with additional improvements necessary for safety and traffic management. Major components of the F5CG Project include:

- An additional northbound (NB) and southbound (SB) travel lane to fill the current 2.3-mile six-lane gap/bottleneck;
- Auxiliary lanes extended between interchanges;
- New 10-foot shoulders;
- Increased vertical clearance on SB I-5 under the SR273 / NB I-5 connector ramp structure;
- Widening of seven structures;
- Removal and replacement of non-standard median barrier with a combination of high-tension cable and concrete barriers;
- Installation of various Intelligent Transportation Systems ITS Elements
- Various minor improvements for enhanced traffic operations and safety, including design considerations for future contraflow/reversible lanes on southbound (SB) I-5 in order to better manage northbound (NB) I-5 back-ups, enhance emergency response, and facilitate evacuation during increasingly frequent closures related to wildfires, storms, accidents, and other events.

Project Benefits

Key benefits of the F5CG Project include:

- **Increased flow, reliability, and connectivity where critical freight corridors intersect** The F5CG Project is located where I-5, SR 299, and SR 44 freight corridors converge and share space – and exactly where I-5 bottlenecks (from six to four lanes) and where I-5 has the highest traffic volume over 465 miles between Eugene, Oregon and the I-5/SR 99 junction just north of Sacramento. Once F5CG Project construction is funded and completed, I-5 will meet forecast travel demand through the year 2040 by maintaining level-of-service (LOS) C and 60 mph speeds.

- **Safety** – I-5 is critical north-south intra- and interstate freight corridor without a reasonable alternative route for freight traffic. Several state routes that are critical to east-west freight traffic also converge on I-5 in the Shasta Region. When this freight traffic is mixed with growing local traffic demand and outdated transportation infrastructure, increased collisions, injuries, and fatalities are the result. Other contributing factors include changes in elevation, roadway geometrics that limit sight distance, inadequate acceleration/deceleration zones, and a large number of on- and off-ramps over a short distance. The F5CG Project will address three separate freight conflict zones and collision clusters in the project area. The number of relevant accidents (i.e. those related to merging, lane change, and stop-and-go) is forecast to be reduced by at least 25 percent (source: Caltrans Office of Traffic Investigations) by addressing weaving conflicts and speed differentials between vehicles and freight traffic entering and exiting mainline I-5. Additional detail is provided in Section E.

- **Realizes full benefit of adjacent I-5 investments** – As the capstone to decades of interagency coordination and investment on the I-5 corridor in the Shasta Region, the F5CG Project unlocks the full performance potential of the corridor. By completing the final gap in six-lanes on I-5 for 9.9 miles across the Redding metropolitan area, it leverages the benefit of $254 million invested over the last 15 years, including the Cottonwood Hill Truck Climbing Project, South Redding Six-Lane Project, and Redding-to-Anderson Six-Lane Project. These are described in detail in Exhibit and Table B.

- **Early design consideration for future implementation** – The scope of work includes design consideration for future contraflow/reversible lanes north of Redding to help manage traffic during frequent closures on I-5 due to weather, wildfires, accidents, and other events. During such closures, I-5 routinely backs up through Redding, thereby blocking direct access between I-5 and SRs 299 and 44. Future contraflow/reversible lanes will add vehicle storage north of these interchanges, improve first-responder access, facilitate evacuation if necessary due to wildfire or other threats, and eliminate or greatly reduce localized impacts of freight during closures, including impacts to regional mobility, reduced economic activity, and threats to public health and safety from increased exposure to freight emissions and collisions.

- **Provides targeted economic benefits –** The F5CG Project stimulates national, state, and regional economies by increasing productivity, reducing freight delivery times, and reducing the impacts of interregional freight on the local economy during frequent NB I-5 closures. More specifically, by eliminating a bottleneck on I-5; smoothing freight flow to/from State Route 44 and 299 freight corridors; and enhancing access to two Enterprise Zones (Downtown Redding and adjacent industrial area), the F5CG will reduce freight

travel times and increase the reliability of the freight network. In addition, the impacts of frequent NB I-5 closures and traffic back-ups on local businesses is mitigated by increasing vehicle storage capacity north of the Redding metropolitan area and by preserving access to I-5's designated detour route (State Route 299).

Project Location

The F5CG Project is located at the geographic center and transportation crossroads of California's sixteen-county North State Region. The east-west State Routes 299 and 44 corridors connect via I-5. From an interregional perspective, it is the midpoint to the longest contiguous transportation and trade corridor in the nation, connecting two international borders, the nation's west coast ports, and the 'Cascadia' and 'Northern California'.

Exhibit A – Project Location

Project Priority
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Project Corridor

- **National Significance** - The primary north-south interregional route on the West Coast, I-5 is 1,381 miles and stretches from San Ysidro, California on the Mexican border to Blaine, Washington, on the Canadian border. This freeway links a majority of metropolitan areas in the States of California, Oregon, and Washington. Additionally, once across the borders, I-5 connects to multiple roads in Canada and Mexico. As the primary west coast thoroughfare, I-5 serves many route purposes: international trade, defense highway, goods movement, commuter link, and access to major recreational opportunities.

- **State Significance** - In California I-5 covers 797 miles it is a main transportation facility and the backbone of the State's economy, running through the major cities of San Diego, Los Angeles, Stockton, Sacramento, and Redding. The agency that owns and operates the interstate system in California is Caltrans (FHWA has an oversight and management role). Caltrans is made up of twelve districts, and I-5 traverses seven of these districts (2, 3, 6, 7, 10, 11, and 12). I-5 through California's North State was completed in the 1960s. Local growth, increased through traffic, and a higher proportion of heavy freight trucks require more throughput than the original four-lane facility is able to provide.

  According to the Caltrans I-5 Transportation Concept Report (TCR), the I-5 corridor through the Shasta Region has the highest traffic volumes in the Sacramento Valley; largest population centers (including the only urban area); greatest traffic congestion; highest concentration of interchanges; and greatest potential for future growth. Traffic volumes are projected to nearly double between 2020 to 2040, resulting in reduced level of service, increased travel times, unreliable travel times, and peak hour speeds as low as 20 mph.

- **F5CG Project Significance** - The function of the F5CG Project in this segment of I-5 is to increase freight throughput and enhance traffic operations and safety in order to meet forecast demands, while addressing issues with traffic operations and safety.

  The F5CG Project is one, unsegmented project; however, for this cycle of TCEP, PS&E and R/W funds are requested to partner with State Transportation Improvement (STIP), Highway Infrastructure Program (HIP) and State Highway Operations and Protection Program (SHOPP) funds. Each source has independent utility. It is anticipated that construction will occur as a single unsegmented project but will have several fund sources, each with independent utility.

  As a standalone project, the F5CG Project offers independent utility/benefits and would still be a regional priority with or without the aforementioned improvements to the north and south. F5CG Project improvements are needed for safe and efficient east-west travel since freight and passenger vehicles use I-5 to transition between State Route 299 and 44. Additionally, the F5CG Project addresses critical operational and safety issues along

this 1.8-mile segment. Specifically, topography, roadway geometrics, and vehicle weaving, and speed differentials are addressed by adding auxiliary lanes, standard-width shoulders, enhanced wayfinding signage/pavement markings, and a 4' buffer between SB I-5 through lanes and the on- and off-ramps at the interchange with SR 44.

- **F5CG as the Regions Priority** - The I-5 corridor is the region's number 1 priority with a successful history of interagency commitment to meeting travel demand and maximizing safety and operations. As a result of this longstanding commitment, the F5CG Project is the last major phase of improvements on I-5 through the Redding urbanized area. It is the culmination of decades of interagency effort and investment required to plan, design, fund, and deliver a phased but unified set improvements along the I-5 corridor from the Shasta-Tehama county line to the city of Shasta Lake (approximately 22 miles).

Table A – Proposed Schedule

PROJECT SCHEDULE					
M000	ID Need	1/6/2015	M377	P & E to R.O.E.	6/20/2024
M010	Approve PID/PIF	2/14/2017	M378	Draft Struct. PS&E	5/8/2024
M015	Program Project	3/22/2018	M380	Final Struct. PS&E	8/8/2024
M020	Begin Envir	4/30/2019	M410	Right of Way Cert.	8/8/2024
M030	NOP	-	M430	Draft Contract Ready	8/15/2024
M035	NOI	-	M460	Ready to List	8/29/2024
M040	Begin Project	1/7/2019	M470	Allocate	10/24/2024
M120	Circ. Draft ED	4/30/2020	M480	Advertise	11/18/2024
M200	PA & ED	7/20/2020	M490	Bid Opening	1/7/2025
M221	Bridge Site Submit	11/8/2022	M495	Award	2/4/2025
M224	Right of Way Maps	3/23/2020	M500	Approve Contract	3/4/2025
M225	Reg. Right of Way	6/22/2020	M600	Accept Contract	12/28/2026
M275	General Plans	3/8/2023	M800	End Project	12/28/2028
M300	Draft P&E	4/25/2024	M900	Final Project Closeout	9/30/2030

- **Future planned improvements** are limited to the addition of contraflow/reversible lanes on SB I-5 to help manage traffic operations, enhance emergency access, and facilitate evacuations, when needed in response to weather, wildfire, accidents, and other events. As part of the F5CG Project planning process, consideration will be given for these improvements for implementation at a later time through TCEP or other source(s). As noted in the attached letters of support, Caltrans and regional partners are highly motivated, and will continue to work collaboratively, to implement the contraflow/reversible lanes due to the acute impacts of frequent I-5 closures on regional circulation, economic productivity, and public health and safety. As has been done for prior successful efforts, regional partners will work to make improvements shovel ready and apply for gap funding through future TCEP rounds and/or other applicable state and federal funding programs.

- **Previously completed complimentary projects** - The larger corridor spans approximately 22 miles from the Shasta-Tehama county line to Shasta Dam Boulevard/State Route 151. This corridor spans the entire three-city urbanized area in the Shasta Region where intra- and interregional travel demand combine to create congestion. Due to the project length and number of structures, the project was previously segmented into the phases, summarized below beginning at the south and working north:

    - I-5 Cottonwood Hill Truck Climbing Lane Project (Completed 2011)
    - I-5 Redding-to-Anderson Six Lane Project (In Construction)
    - I-5 South Redding Six-Lane Project (Completed 2012)

- Fix 5 Cascade Gateway Project (TCEP funding requested for PS&E and R/W component)
- I-5 SR273 junction to Shasta Dam Blvd/SR 151 Six Lane Project (Completed)

- **F5CG as a Capstone** - The F5CG Project is the final project to complete the corridor concept. TCEP funding is requested to complete PS&E and R/W elements for the entire remaining gap. It is anticipated that with future capital grant support, this entire gap can be addressed as one project.

  Without the F5CG Project, full realization of performance benefit of prior investments cannot be achieved. The F5CG Project is required to achieve an uninterrupted six-lane facility for 22 miles across the entire Redding MSA, from the Shasta-Tehama County Line through the city of Shasta Lake. Without F5CG, there will continue to be a bottleneck on I-5 at the confluence of State Route 299 and 44.

Corridor Plan

Exhibit B – Recent Mainline I-5 and Surrounding Network Improvements

Interstate 5 links most of the metropolitan areas in California, Oregon, and Washington. This section is a high emphasis route and principal arterial and is included in the following national networks: Strategic Highway and the Surface Transportation Assistance Act (STAA), as well as, the National Highway System (NHS). In 2007, federal legislation added I-5 as a "Corridor of the Future." This freeway is a key backbone route in District 2 and identified in the Interregional Transportation Strategic Plan as a Strategic Interregional Corridor of Economic Significance (the Sacramento Valley – Oregon Corridor). The corridor supports trade between Mexico and Canada, interregional goods movement, and is important

to the regional economy. Interstate 5 serves a mix of interregional traffic, as well as regional traffic, local traffic, and transit on this portion of the route. This route passes through the Redding area, including interchanges for connections to west-east SR 44 and SR 299.

Past and current projects along the I-5 corridor have been consistent with Caltrans I-5 TCR and the Shasta Regional Transportation Agency's (SRTA) Regional Transportation Plan (RTP). Over the years Caltrans along with regional and local partners have worked hand in hand, planning, designing, and building projects on the I-5 corridor to preserve the future and mobility in the north state that supports state and national economic activity. There is ongoing collaboration and partnership between the agencies and Caltrans to preserve, protect and enhance I-5 as not only the backbone of Northern California but as a state- and nation-wide freight and travel corridor.

Partnership projects on and surrounding the I-5 corridor are represented in exhibit B.

Cooperation with Caltrans

Summary of Recent Complementary Mainline I-5 Improvements			
	Project	**Cost**	**Local/Regional/State Share**
1	I-5 Redding to Anderson Six Lane Project (in construction)	$132,859,000	$24,000,000 Regional TCEP $19,311,567 STIP $50,044,600 SHOPP $39,177,833 STATE TCEP $325,000 Co-Op
2	I-5 South Redding (completed 2012)	$24,255,000	$1,419,000 RIP $336,000 IIP $22,500,000 CMIA
3	Dana to Downtown (completed 2013)	$78,943,000	$35,561,000 RIP $1,500,000 RIP TE $36,560,000 IIP
4	Cottonwood Hills Truck Climbing Lanes (completed 2011)	$18,203,000	$13,662,000 CMIA $4,541,000 IIP
TCEP = California Trade Corridor Enhancement Program STIP = State Transportation Improvement Program SHOPP = State Highway Operations and Protection Program			RIP = Regional Improvement Program IIP = Interregional Improvement Program CMIA = California Corridor Mobility Improvement Account

Table B – Summary of I-5 Improvements

Over the past decade, SRTA, Caltrans, and local agency partners have worked together to systematically plan, design, and construct 17.2 additional lane miles on mainline I-5 through the Redding Urbanized Area. Additional improvements have been completed on interchanges, parallel corridors, and east-west connections to further enhance mobility for freight and people. As illustrated in Exhibit B and summarized in Table B, the F5CG Project is the culmination and capstone to decades of local/regional/state commitment to maintaining a state of good repair on I-5 and enhancing its efficiency, safety, and reliability.

In addition to mainline I-5 improvements, the following recent improvements to the surrounding interregional network extend the benefits of the F5CG Project to surrounding regions and destinations.

Other efforts directly benefiting the F5CG project's performance and long-term resilience include:

- The Salmon Runner zero-emission intercity bus, which was awarded capital funds through California's Transit and Intercity Rail Program, will operate plug-in electric (or possibly hydrogen-fueled) coaches for 160 miles on I-5 to/from Sacramento, four round trips per day. This service will help manage mainline I-5 travel demand, reduce emissions, and provide alternative fuel infrastructure for freight vehicles on I-5. This effort supports the California Hydrogen Highway Network (Executive Order S-07-04) and is aligned with the West Coast Clean Transit Corridor Initiative Study, which aims for 27 charging stations (one over 50 miles) for the entire length of I-5 to serve both transit vehicles and freight trucks.

Relevant Non-I-5 Network Improvements		
Project (w/ map reference #)		Project Benefit
5	Deschutes Road Interchange/Roundabout (completed 2013)	New northbound off ramp from I-5 to Deschutes Road and new roundabout. Provides enhanced access to industrial land at project site.
6	State Route 299 Buckhorn Grade (completed 2016)	Provides enhanced operations, STAA access, and safety for trips beginning/ending west of I-5.
7	State Route 44 Stillwater Interchange (completed 2018)	Provides enhanced operations, STAA access, and safety for trips beginning/ending east of I-5.

Table C – Relevant non-I-5 Improvements

- Caltrans District 2's Vulnerability Assessment and Climate Adaptation Plan assessed the vulnerability of I-5, SR 299, SR 44, and other Caltrans assets to climate change. The plan identifies weather-related events that are likely occur with greater frequency and intensity in future years and longer-term climate change impacts. Based on these findings, a prioritized project list was developed to systematically address the most likely and most disruptive threats to transportation infrastructure and mobility.

- The ShastaReady Climate Adaptation Plan (currently underway) is funded through a Caltrans Adaptation Program grant and regional funds. The scope of work was developed collaborative with Caltrans District 2 to help ensure coordinated, multi-agency responsiveness to climate change events, such as the safe evacuation from wildfires that have impacted both property and lives in the North State in recent years.

The long history of partnership and successful outcomes demonstrate effective coordination with Caltrans over the last 15 plus years. The state-regional partnership is stronger than ever and will continue to be leveraged moving forward, as evidenced by the attached letter of support and commitment.

Advanced, Clean Air, and Innovative Technologies

As technology advances and new and innovative ideas come about the F5CG Project attempts to keep pace with installation of Closed-Circuit Television (CCTV) at the Hilltop Drive overcrossing, and construction of a fiber hub at PM R18.47. The primary uses for the CCTVs are to collect visual data to provide motorists visual verification of weather and traffic conditions to make informed travel decisions, and to provide Caltrans visual information to improve response to traffic and/or weather-related incidences on the highways. The fiber hub is a vault which houses fiber terminations and communications electronics that will provide high-speed and reliable communications for Intelligent Transportation Systems (ITS) elements within the Redding area. Also included are Changeable Message Signs (CMS) at the NB and SB lanes at Oasis Road and upgraded Highway Advisory Radio (HAR) at Hilltop Drive to meet current District 2 standards and technology practices

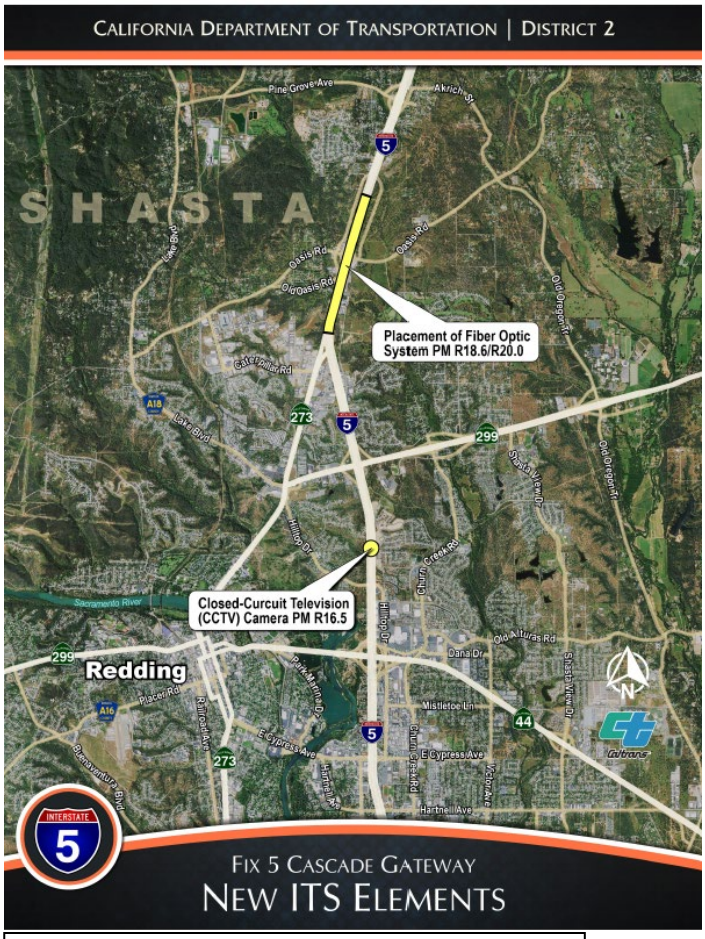


Exhibit C – New ITS Elements

Project Consideration for Reversible Lanes

Future contraflow/reversible lanes will be taken into consideration as part of the planning process as a means for increasing freight vehicle storage during frequent I-5 closure events. At key points, the median barrier would be designed to make SB lanes available for NB vehicle storage during I-5 closures. The design will also support emergency access and evacuations when needed. If selected for TCEP funding, the F5CG Project design will be ready for future implementation with minimal accommodations. It is anticipated that some or all of these improvements will be part of an upcoming application through the TCEP or other applicable grant programs.

Project Consistency with Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS)

I-5 is the longstanding top priority corridor for the Shasta Region. Having commenced construction on the Redding-to-Anderson 6-Lane Project, the F5CG project is now the current #1 project priority in the 2018 RTP/SCS. As the backbone transportation corridor for the region, I-5 level of service (LOS) affects all individuals and businesses in the region.

The F5CG Project is at the heart of the region's adopted policies, including the following:

- Goal #1: Optimize the use of existing interregional and regionally significant roadways to prolong functionality and maximize return on investment.
    - Objective 1.2: Increase the throughput of people and freight on interregional and regionally significant roadways.
- Goals #2: Strategically increase capacity on interregional and regionally significant roadways to keep people and freight moving effectively and efficiently.
    - Objective 2.2: Maintain adequate traffic capacity on the core interregional network.
        - Strategy A: Employ targeted capacity increasing projects to relieve traffic bottlenecks and improve travel time reliability.
- Goal #5: Strengthen regional economic competitiveness for long-term prosperity.
    - Objective 5.2: Resolve transportation-related barriers to increased economic activity and productivity.

Anticipated Impact of the Safer Affordable Fuel-Efficient Vehicles (SAFE) Rule on Project

There will be no anticipated impact of the SAFE Rule for the funding of the F5CG project.

Project Delivery Method

The F5CG Project is anticipated to use the design build method.

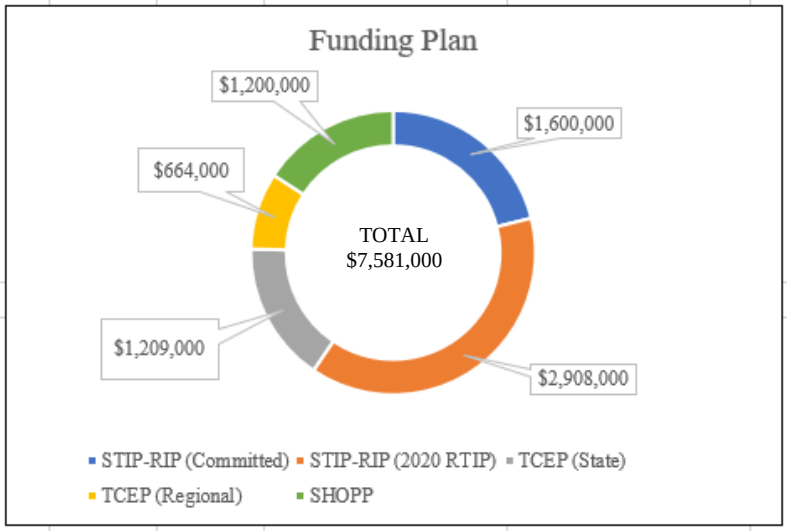
Scope of Work.

The F5CG Project will fill a 2.3-mile gap in six lanes on I-5 by adding a third mixed-flow lane in both directions. 10-ft inside and outside shoulders and auxiliary lanes will also be added. Six bridges will be widened, replacement of signs and guardrail and the installation of new ITS. Major work items are summarized in the Table C:

Table C – Scope of Work Itemized Elements

Scope of work Itemized Elements - Major Components	
Type of work	Location
Widening (Median)	SB PM R15.4 to R18.6
Widening (Median)	NB PM R16.5 to R18.6
Widening (Outside)	NB PM R18.6 to R19.2
Aux Lane	SB PM 15.8/R17.0
Aux Lane	NB PM R15.5/R17.0
Aux Lane	SB PM 18.7/R19.4
Aux Lane	NB PM R18.7/R19.3
Bridge Widening	East Redding Separation R15.43
Bridge Widening	NB I-5 to WB SR 44 Connector Undercrossing R15.56
Bridge Widening	I-5/SR299 Separation R17.13 (06-0129 R/L)
Bridge Widening	Twin View Blvd Undercrossing R18.07 (06-0143 R/L)
Bridge Widening (Outside)	Churn Creek R19.0
Overhead and guide signs	Various location
Midwest Guardrail System (type WB-31 and TL-2)	Various existing locations
ITS (Fiber Optic system)	PM R18.6 to R20.0
ITS (CCTV)	PM R16.15

Scope, Funding Plan, and Schedule for Each Contract



The F5CG project proposes to add a third mixed-flow through lane. Four-strand high tension cable barrier, concrete barrier, four auxiliary lanes will be constructed in the following locations: SB PM 15.8/R17.0, NB PM R15.5/R17.0, SB PM 18.7/R19.4 and NB PM R18.7/R19.3. Six bridges will be widened in the median and each will include the polyester overlay on the existing portions of the structures. One bridge will be widened to the outside and does not require the polyester overlay across the existing structure.

Funding Plan: Full PPR attached.

In partnership with local agencies, SRTA, and the CTC, Caltrans has successfully delivered several similar projects on time and under budget, including recent interstate widening projects immediately north and south of the project. The F5CG Project will follow the below Schedule for project delivery.

PROJECT SCHEDULE					
M000	ID Need	1/6/2015	M377	P & E to R.O.E.	6/20/2024
M010	Approve PID/PIF	2/14/2017	M378	Draft Struct. PS&E	5/8/2024
M015	Program Project	3/22/2018	M380	Final Struct. PS&E	8/8/2024
M020	Begin Envir	4/30/2019	M410	Right of Way Cert.	8/8/2024
M030	NOP	-	M430	Draft Contract Ready	8/15/2024
M035	NOI	-	M460	Ready to List	8/29/2024
M040	Begin Project	1/7/2019	M470	Allocate	10/24/2024
M120	Circ. Draft ED	4/30/2020	M480	Advertise	11/18/2024
M200	PA & ED	7/20/2020	M490	Bid Opening	1/7/2025
M221	Bridge Site Submit	11/8/2022	M495	Award	2/4/2025
M224	Right of Way Maps	3/23/2020	M500	Approve Contract	3/4/2025
M225	Reg. Right of Way	6/22/2020	M600	Accept Contract	12/28/2026
M275	General Plans	3/8/2023	M800	End Project	12/28/2028
M300	Draft P&E	4/25/2024	M900	Final Project Closeout	9/30/2030

C. SCREENING CRITERIA

Project Alignment with National Highway Freight Program (NHFP), California Freight Mobility Program (CFMP), and California Sustainable Freight Action Plan (CSFAP) Goals/Investment Themes

Multimodal Mobility		
CFMP	CSFAP	NHFP
The F5CG project strives to improve travel time reliability with the addition of a third lane and aux lanes and achieve a reduction in congestion with the elimination of weaving conflicts and improvements at identified collision clusters.	Key bottlenecks at will be eliminated with the addition of a third travel lane and auxiliary lane reducing congestion at specific interchanges and alleviating non-reoccurring congestion by addressing improvements in identified conflict clusters.	I-5 operation and economic competitiveness will increase with improvements to existing bottlenecks and congestion. Corridor Reliability, local productivity will be positively impacted due to these improvements.
Economic Prosperity		
CFMP	CSFAP	NHFP
Increased freight throughput, congestion reduction and operational improvements due to the F5CG project, improved system efficiency and productivity.	Elimination of merging conflicts and collision clusters provide the freight sector greater opportunity for economic competitiveness due to increased reliability of travel times and freight throughput.	Investments in operational improvements reduce travel time, increase reliability and eliminate merging conflicts, creating a more efficient freight system that strengthens the local, regional, and state economy.
Environmental Stewardship:		
CFMP	CSFAP	NHFP
Freight related environmental impacts will be minimal. Strategies and mitigation implemented support the reduction in any impacts of the F5CG project.	The investment in ITS elements with renewable energy resources help the system transition to near zero emission equipment. ITS elements are a means to manage and operate the system providing more resiliency.	The installation of a CCTV and the placement of fiber optic cable in the project expands the corridor's capacity for future innovative transportation technology integration.
Healthy Communities		
CFMP	CSFAP	NHFP
Project components of the F5CG project improve community health and wellbeing with reduced congestion and increased reliability that improve air quality and freight related noise for communities.	Regional freight pollution and impacts to communities will be limited. The reliable movement of freight and operational efficacies of the F5CG project will reduce health and quality of life impacts to communities.	The F5CG traverses through Urban (Redding) and rural (Shasta County) areas of the north state, improving safety, efficiency and resiliency of freight transportation with F5CG enhancements.
Safety and Resiliency		
CFMP	CSFAP	NHFP
By addressing merging conflict zones and collision cluster areas	F5CG will reduce freight related deaths and injuries through the	Safety, security, efficiency and resiliency of freight will be

the F5CG project looks to reduce freight related deaths & injuries.	elimination of known bottlenecks and improvements to collision cluster areas.	improved through innovative technologies the like CCTV and fiber ITS elements.
Asset Management		
CFMP	CSFAP	NHFP
Planning of the F5CG project aligns with state and federal asset management requirements. It strives to meet department policies and objectives in the State highway System Management Plan.	When finalized the F5CG project will improve the State-of-good-repair of this section of Interstate-5 in Northern California with pavement and operational improvements.	The F5CG project will improve the National Highway Freight Program road, I-5, State-of-good-repair weaving, collision and pavement and operational improvements.
Connectivity and Accessibility		
CFMP	CSFAP	NHFP
The improvements realized by the F5CG affect road freight, connections to ports for shipping freight and reliability of the system to air strips/airports for air freight.	Partnerships and collaboration with regional (SRTA) and local (Shasta County, City of Redding) agencies ensure projects like F5CG aim to achieve environmental, public health, transportation and economic objectives consistent with state goals.	With previous state plans (TCR) and multiple projects being planned, designed and constructed on I-5 multi-state planning has always been a tool utilized to ensure freight connectivity across California and the nation.
California Freight Mobility Plan Critical Freight Investment Themes		
Improve Port Access and Reliability: The F5CG Project completes a set of contiguous projects on the I-5 corridor. With the completion of this project the access and reliability to ports across California will be improved. The elimination of weaving conflicts at on and off ramps, operation improvements in identified collision clusters, and the reduction of congestion improves reliability and travel times for freight.		
Border Efficiency: Addition of general travel lanes, auxiliary lanes, improvements to weaving conflict zones and enhancements to identified collision clusters improves system efficiency, seamlessly integrates into existing roadway and community context, improves quality of life of surrounding communities and helps economic markets prosper.		
Interregional Freight Movement and Resiliency: The F5CG Project is vital to I-5 and its interregional freight travel reliability. With improvements to I-5 the reduction in congestion, injuries and accidents, and system efficiencies enable more vehicles and goods to move through the corridor. Boosting intra and interregional economic competitiveness with safer, more reliable and resilient freight systems and easier access to ports.		
Sustainability and Innovations: Application of ITS elements with renewable energy, technology will assist in the integration of future innovations in freight transportation and communication aid in the advancement of the economy, people, communities and the natural environment. These technologies and in particular the F5CG Project will help transform the I-5 corridor into a reliable, efficient and safe freight corridor.		

Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS)

F5CG Project Consistency with Regional Transportation Plan Goals and SCS				
GOAL	**OBJECTIVES**		**SCS**	**F5CG & RTP/SCS**
#1: Optimize the use of existing interregional and regionally significant roadways to prolong functionality and maximize return-on-investment.	**Objective 1.1** - **Proactively maintain** interregional and regionally significant roadways in a manner that balances cost and facility life-cycle. **Objective 1.2** - Increase the **throughput of people and freight** on interregional and regionally significant roadways.		**Transportation System Utilization & Mode Share** Average Daily VMT (Total) Average Daily SB 375 VMT (minus through trips) Miles of roadway at LOS 'D', 'E', and 'F'….	**X/X**
#2: Strategically increase capacity on interregional and regionally significant roadways to keep people and freight moving effectively and efficiently.	**Objective 2.1** - **Maximize funding available** for transportation and mobility improvements in the region **Objective 2.2** - **Maintain adequate traffic capacity** on the core interregional network		**Mobility/Accessibility** Number of Households within 1/2 mile of transit Number of Jobs within 1/2 mile of transit….	**X**
#5: Strengthen regional economic competitiveness for long-term prosperity.	**Objective 5.1** - Facilitate **sustainable economic development** programs and projects. **Objective 5.2** - **Resolve transportation-related barriers** to increased economic activity and productivity.		**Safety** Number of fatalities Number of injuries Number of bicycle and pedestrian collisions….	**X/X**
#7: Practice and promote environmental and natural resource stewardship.	**Objective 7.1** - Identify and **minimize the direct and indirect adverse impacts of transportation on the environment**, including but not limited to: climate change, air quality, healthy watersheds, agriculture and grazing lands, and essential wildlife habitat **Objective 7.2** - Lead the development of **resilient transportation systems and services** in the face of increasing environmental change and societal shifts in mobility		**Environment** Pounds CO2/year/capita - Passenger Vehicles Only (SB 375)[1] GHG Reductions (SB 375) per capita Prime agricultural lands saved from conversion (acres) Environmentally sensitive lands saved from conversion (acres)….	**X**

Final Adopted RTP can be found at: https://www.srta.ca.gov/300/2018-RTP

Environmental and Community Impacts

The F5CG project will have no effect on agriculture and forest resources, cultural resources, Tribal cultural resources, land use and planning, mineral resources, population and housing, and recreation. The project will have less than significant impacts on aesthetics, air quality, energy, geology and soils, hazards and hazardous materials, hydrology and water quality, greenhouse gas emissions, noise, transportation, public services, utilities and service systems, wildfire, and mandatory findings of significance. With incorporated mitigation measures to mitigate for impacts to the movement of native resident wildlife species within migratory wildlife corridors, the project would not have significant impacts to biological resources. Selected categories are briefly described below.

Aesthetics: The proposed work would require the removal of vegetated berms within the median of I-5 and while also widening the Churn Creek Bridge. The current extent of the earth berm is limited within the project limits. The visual impacts of adding another lane is minimal; the addition of the lanes, in areas with the earth berm would increase range-of-view. Once the berm is removed it potentially would reduce the feeling of constriction for small vehicles traveling next to commercial vehicles.

Air Quality: The Air Quality Report completed for the project concluded that construction impacts to air quality are temporary in duration and therefore would not result in long-term adverse conditions. During construction, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other construction-related activities.

Energy: Construction activities are expected to increase traffic congestion in the area, resulting in increases in fuel consumption from traffic during the delays. This consumption would be temporary and limited to the immediate area surrounding the construction site. The project does not include additional maintenance activities which would result in long-term indirect energy consumption by equipment required to operate and maintain in the roadway. The project is unlikely to increase indirect energy consumption.

Green House Gas Emissions: Potential opening year (2026), CO2 emissions associated with the built project are expected to increase slightly compared to the no-build alternative. In the horizon year (2046), CO2 emissions associated with the built project are expected to increase slightly compared to the no-build alternative. Under the future build conditions, CO2 emissions are expected to decrease compared to existing conditions most likely due to improvements in speeds and emission factors.

Geology and Soils: The topography within the project area is relatively level and there is no history of highway repairs due to landslides or subsidence within the project area, the soils are presumed to be relatively stable. The project location is subject to moderate seismic ground shaking from earthquakes. New structures and roadway could be subjected to moderate seismic ground shaking in the event of a strong earthquake, any such limitations can be overcome through proper planning, design, and/or construction.

D. EVALUATION CRITERIA

Freight System Factors

Throughput

The F5CG Project will increase I-5 freight throughput by filling a 2.3 mile gap in six-lanes. Based on lane capacity of 2,100 vehicles per hour at 60mph, the maximum throughput of the current four-lane facility is 8,400 vehicles per hour (2,100 x 4 lanes). As a result of the two additional travel lanes, the maximum throughput will increase to 12,600 vehicles per hour (2,100 x 6 lanes).

Total daily volume will increase over 28%, from 46,039 in 2015 to 59,147 in 2035 (2018 ShastaSIM travel demand model). Future modeled traffic volumes on I-5 at the State Route 299 interchange during the AM Peak Hour will increase by approximately 235 vehicles between 2015 (no project) and 2035 (with F5CG Project), indicating that induced travel is not a major contributor to this increase.

New auxiliary lanes will also be added on I-5 to connect SR 299 and SR 44 on/off ramps in both directions, and on NB I-5 between SR 299 and SR 273. These improvements will help maintain throughput during peak hour periods as well as facilitate east-west throughput on SR 299 and SR 44 freight corridors.

Velocity

The F5CG Project will maintain 60 mph travel speed on I-5 for NB and SB vehicles during peak AM and PM hours for at least the next 20 years (source: 2018 ShastaSIM travel demand model).

Reliability

Traffic congestion, as determined by modeled LOS, was used to assess the reliability of the corridor and how consistent travel times will be into the future with and without the project. It is forecast that mainline I-5, with and without the F5CG Project, will maintain LOS C or better during peak AM and PM hours. Current and future model runs through the year 2040 show LOS deteriorating to level D and E at on- and off-ramps to/from SR 299 and SR 44. Contributing factors include short on- and off-ramps, changes in elevation (i.e. uphill acceleration zones), and weave conflicts due to the close proximity of multiple on- and off-ramps and speed differentials with through traffic.

Based on these findings, the F5CG Project scope of work includes extending auxiliary lanes on I-5 between SR 299 and SR 44. These improvements provide additional space for acceleration/deceleration and merge movements.

Transportation System Factors

Safety

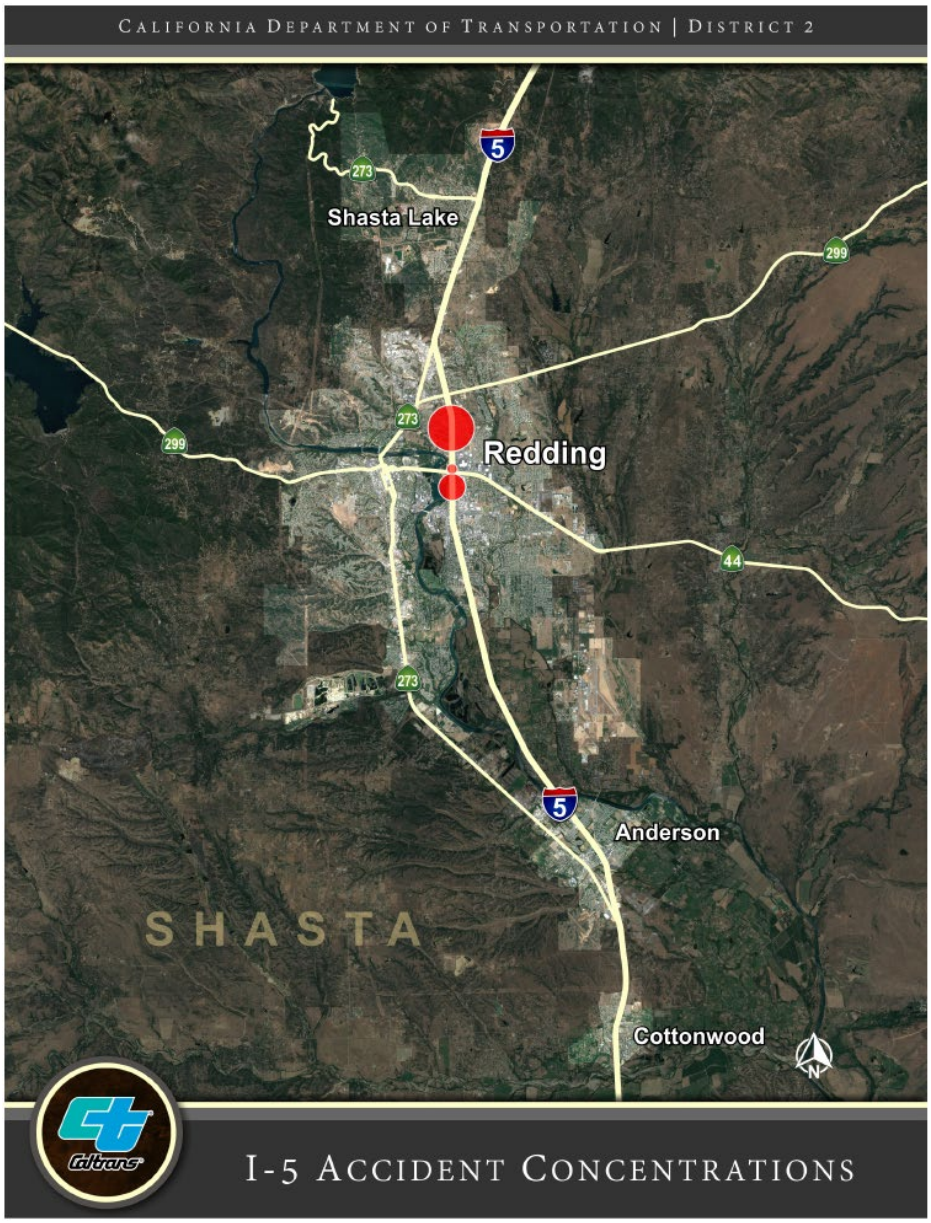


Exhibit E – I-5 Accident Concentrations

The F5CG Project is located at the confluence of I-5 and three state routes. Multiple entry and exit points over a short distance are combined with a reduction in travel lanes. This has led to a high number of collisions related to merging, changing lanes, and stop-and-go traffic. Increasing traffic volumes and intensifying congestion in this area have compounded these issues. Historic (10 year) and projected (20 year) collisions are provided below: Three collision clusters have been identified and their causes statistically evaluated. As shown in the following exhibits, the F5CG Project addresses the primary causes of collisions at each location. Looking into the future these impacts are expected to worsen considerably. Travel on I-5 north of Sacramento is forecast to increase by 66.8% between 2010 and 2040 to over 8.8 million vehicle miles traveled[1] – 37.5% of which will be freight traffic. The effect of future traffic demand combined with the growing number and severity of climate change-related events will hinder the region's economy and reverse decades of progress toward public health and safety goals. [1] *Source: 2015 California Interregional Transportation Strategic Plan.*

SUMMARY OF HISTORIC AND PROJECTED COLLISIONS AT THE NR6 PROJECT LOCATION (Source: Caltrans Office of Traffic Investigations)		
	HISTORIC (10 year)	
	All Vehicles	**Trucks**
Total Number of Collisions	364 total	84 total
	122 involving injury or fatality	16 involving injury or fatality
Relevant Collisions (i.e. those related to merging conflicts, lane changes, and stop-and-go traffic)	101 total	32 total
	31 involving injury or fatality	7 involving injury or fatality
	PROJECTED (20 year)	
	All Vehicles	**Trucks**
Total Projected Relevant Collisions	202 total	64 total
Number of Collisions Forecast To Be Reduced as a Result of the NR6 Project	51 collisions reduced	14 collisions reduced

Table D – History of Collisions

Congestion Reduction/Mitigation

The F5CG Project is located at the center of the north-south I-5 freight corridor, which links freight ports and intermodal facilities across the western states. I-5 also provides a critical link to SR 299 and SR 44, which connects to the Port of Humboldt to the west and to State Route 395, Reno, and destinations beyond to the east. Interregional demands, together with the local traffic of a growing urban area, combine to create congestion and daily vehicle hours of delay for all users. The F5CG will reduce vehicle hours of delay by increasing throughput where these facilities come together.

The F5CG Project also improves access to the region's largest concentration industrial freight trip generators located immediately to the west of the project. A small sample of freight generators include:

- Pepsi-Cola Bottling
- Miller Trucking Corporation
- SECO/Trimble GIS Equipment Manufacturing
- Amerigas Propane
- Redding Freightliner
- Peterson Caterpillar Equipment
- Fed-Ex Ground

- Ted Pella scientific equipment supplier
- Global-Flex stainless hosing manufacturing
- ProPacific Fresh Food Distribution

Freight from these – and dozens of other nearby local generators – access I-5 at three locations within the F5CG Project area, including the SR 273 interchange, Twin View Blvd interchange, and SR 299 interchanges. Proposed improvements ensure that freight vehicles may access these locations safely and efficiently via I-5 by increasing freight throughput and resolving merging conflicts with faster moving vehicles when entering/exiting I-5.

Key Transportation Bottleneck Relief

The F5CG Project eliminates the final north-south bottleneck where I-5 passes through the Redding urbanized area and doubles as SR 299/44 east-west connector for approximately 1.8 miles. Where I-5 is a 6-lane facility to the north and south, the F5CG Project area remains four-lanes. Topography, curves, and inadequate merging zones from two state routes increase congestion and cause more lengthy back-ups and lane restrictions when collisions occur.

Multi-Modal Strategy

The F5CG project will increase freight throughput between major West coast ports of Long Beach, Oakland (south) and Tacoma Washington, Humboldt, and Portland Oregon (north). The F5CG project has 11 railroad freight spurs located within approximately 1.5 miles of the I-5 corridor. F5CG will increase freight intermodality by increasing throughput, reliability, and access from truck freight to rail freight through operational efficiencies, additional travel lanes, and fixing structural limitations to freight vehicles (e.g. bridge clearances, etc.). Increased freight efficiency will also reduce air pollutants from diesel freight transportation.

To help mitigate the impact of local traffic on the I-5 corridor and to reduce associated collision, injuries, fatalities at interchanges, SRTA, Caltrans, and the city of Redding are partnering on active transportation projects for the two main east-west I-5 crossings. First, the State Route 299/Lake Boulevard active transportation improvement project will extent the Class I facilities to on either side of I-5. Second, a new Class I Northeast Crossing project has been funded to connect active transportation facilities from State Route 299/Lake Boulevard to the Dana-to-Downtown project, which travels under I-5 and parallels the State Route 299 Sacramento River Bridge to provide low-stress and safe active transportation option to driving

Interregional Benefits

The I-5 corridor spans the entire west coast of the continental United States and connects two international borders, Canada on the north and Mexico on the south. I-5 is a high emphasis route and part of the National Highway System (NHS) and the Interregional Road System (IRRS). It serves as the main north-south route in the western United States, connects all west coast maritime ports, and functions as a principal arterial for intra-regional travel. The F5CG Project provides freight connections between major ports of Los Angeles, Long Beach and, Oakland in California and Tacoma Washington, Humboldt and Portland intersect with the North States major east west freight connector of SR 299 and SR 44. The F5CG Project will proactively maintain interregional facilities and increase the throughput of people and freight on

interregional facilities, maximize funding available for transportation and mobility improvements, and maintain adequate traffic capacity on the core interregional network.

As the primary connector between California and the Northwest, I-5 is as good as its weakest link. Due to the lack of viable alternate/detour routes, I-5 in the Shasta Region has the potential to disrupt freight flows should the corridor not keep up with travel demand or critical structures fail.

Advanced Technology

The installation of a CCTV at the Hilltop Drive overcrossing provides additional monitoring and communication of transportation data and visualizations. The primary uses for the CCTVs are to collect visual data to provide motorists verification of weather and traffic incidents to make informed travel decisions. Monitoring information and image data will be utilized by the Caltrans District 2 Traffic Management Center to keep the I-5 corridor and surrounding roads running safely and efficiently. The fiber hub houses fiber terminations and communications electronics that will provide high-speed and reliable communications for ITS elements within the Redding area. ITS elements functioning through the fiber hub include CMS at the northbound and southbound lanes at Oasis Road the HAR at Hilltop Drive. Near term and future technologies can be accommodated through the installation of these ITS elements. Autonomous vehicles, vehicle communications such as vehicle to vehicle communication and big data collection can be achieved with these and additional future elements ensuring current project scope leads to a transformative future.

Community Impact Factors

Air Quality Impact

With proposed congestion relieving project components the F5CG Project will improve air quality and lower the amount of particulate matter and other associated air quality degenerative by-products of diesel emissions. This section of I-5 carries approximately 16% truck traffic; the F5CG project will reduce the amount of diesel related pollutants and improve overall air quality by operationally maintaining free flow on I-5 or a LOS of C or better.

Community Impact Mitigation

Since 2016, I-5 has closed 18-23 times per year for winter storms, accidents, wildfires, and other events. The duration of closures is also increasing. In 2018, I-5 was closed to all traffic for five consecutive days due to wildfires and was not cleared for all freight vehicles for an additional three days. The 111-mile detour route via SR 299 and SR 89 added an additional 53 miles to each vehicle trip through mountainous two-lane corridors and rural communities. Extensive lane restrictions were required over the next 12-18 months for cleanup, guardrail replacement, and atypical storm damage. During this and other such events, NB I-5 backs up as much as 16 miles through the city of Redding. Freight vehicles spill over onto local streets and into communities that were not designed for heavy freight vehicles and traffic volumes, resulting in impacts to local economic productivity and public health and safety. Air quality impacts are disproportionately felt by disadvantaged communities surrounding the I-5 corridor.

To address these community impacts, consideration will be given during the F5CG Project planning process for contraflow/reversable lanes on SB I-5 for NB freight vehicles when closures occur.

Economic/Jobs Growth

The Comprehensive Economic Development Strategy (CEDS) Report for the Shasta Region notes that several large truck freight firms and regional freight delivery companies have terminals in the Redding area due to its centralized location and access to interregional transportation corridors; however, the Shasta Region's ability to participate in the economy and create jobs is limited by distance to markets and above average freight costs when importing raw material and exporting finished products. The North State Transportation for Economic Development Study corroborated and quantified these impacts, noting that LOS and state of good repair on interregional transportation corridors is the lifeblood of the region's economy and provides the highest economic impact per dollar invested when compared to other mobility investments. Another opportunity presented by the F5CG Project is enhanced access to two adjacent Enterprise Zones located immediately south of the project in Downtown Redding and an industrial area immediately east of the project.

Other Factors

Project Contribution to Advancing State and Regional Plans

As described in Section D, the F5CG Project strives to meet many of the goals in the California Freight Mobility Plan and the California Sustainable Freight Action Plan as well as to advance the policies and priorities of the Interregional Transportation Strategic Plan (ITSP). With I-5 being a crucial freight route and the backbone of the north state the F5CG Project is the last of a group of projects to enhance the I-5 corridor. The F5CG Project will address weaving conflict zones at on and off ramps of major freeway interchanges. It will address the identifies collision clusters on the corridor and will install now ITS elements when completed. These project components delivered as a the F5CG Project will reduce congestion with the elimination of potential merging diverging conflicts. Improve reliability of travel times with a combination of eliminating or reducing non-reoccurring traffic/congestion due to accidents and the installation of the ITS elements, providing information not only to vital services but to the general public. The benefits of the F5CG Project meets goals both the California Freight Mobility Plan and the California Sustainable Freight Action Plan leading to a safer corridor, better quality of life for the communities, boosts economic competitiveness, and seeks to minimize any freight and project related impacts.

Project Readiness

As of June 2020, a DRAFT Mitigated Negative Declaration environmental document has been circulated for public review and comment. It is anticipated to have the environmental document completed and adopted July 20, 2020.

There are no anticipated agreements necessary between Caltrans and the Railroad, no freeway agreements, or agreements with Central Valley Regional Water Quality Control Board. There is an anticipated need for a Cooperative Agreement between Caltrans District 2 and the City of

Redding for proposed improvements to the vertical clearance under the I-5 structures at the Twin View Undercrossing.

Looking ahead, according to the proposed schedule, if TCEP funds are successfully awarded to the F5CG project, PS&E and R/W work will allow this project to continue to move forward. Caltrans and SRTA will continue to seek future construction programming from a multitude of Federal and State Sources, such as Federal Better Utilizing Investments to Leverage Development (BUILD) and Infrastructure for America (INFRA) discretionary grants, SB 1 TCEP programming, SHOPP and STIP.

North State Leveraging and Coordination of Funds (Past)			
	Agency/Project	Amount	Fund Type
1	SRTA, CT D2, Anderson/RASL	$132,859000	Regional TCEP STIP SHOPP State TCEP Co-Op
2	SRTA, CT D2/ I-5 South Redding	$24,255,000	RIP IIP CIMA
3	SRTA, CT D2/ Cottonwood Hills Climbing Lanes	$18,203,000	CMIA IIP
TCEP = Trade Corridor Enhancement Program IIP = Interregional Improvement Program SHOPP = State Highway Operations Protection Program RIP = Regional Improvement Program CIMA = Corridor Mobility Improvement Account		SRTA = Shasta Regional Transportation Agency CT D2 = Caltrans District 2 Anderson = City of Anderson	

Table E – Past Funding Coordination

Leveraging and Coordination of Funds

More than a decade of collaboration, partnership and coordination have contributed to the many projects in project development, construction and completed on I-5 in the north state. With every project, Caltrans, SRTA and several local agencies have coordinated and contributed many different funds to cobble together a complete funding picture. As displayed in Table E above you can see every project had numerous fund sources all aiming to complete the same goal. The track record of the agencies in the north state working together to preserve, protect and enhance I-5 continues today and will only grow in the future to produce transformative, and innovative projects while being good stewards of public funds.

As demonstrated in prior projects many different fund sources will be utilized from a number of north state agencies for the planning, project development and construction of the F5CG Project. See Table F.

North State Leveraging and Coordination of Funds (Current)			
	Agency	Amount	Fund Type
1	SRTA	$1.6M	Prior Committed STIP-RIP
2	SRTA	$2.908M	STIP-RIP
3	SRTA	$664K	TCEP – Regional
4	CT D2	$1.209M	TCEP - State
5	CT D2	$1.6M	SHOPP
STIP-RIP = State Transportation Improvement Program TCEP = Trade Corridor Enhancement Program SHOPP = State Highway Operations Protection Program		SRTA = Shasta Regional Transportation Agency CT D2 = Caltrans District 2	

Table F – Current Funding Coordination

Partnership

The longstanding partnership between Caltrans, SRTA, local jurisdictions, and the CTC has been effective and beneficial for all. Over two decades SRTA and local jurisdictions have partnered with Caltrans and the CTC on numerous projects with an investment of approximately $420 million to the State Highway System. To date SRTA has also programmed approximately $65 million of their regional money on the State Highway and has committed another $2.9 million of their STIP dollars in their 2020 Regional Transportation Improvement Program (RTIP), which was programmed into the 2020 STIP on March 20, 2020 by the CTC. The F5CG Project brings Caltrans District 2 in partnership with the SRTA together once again for a comprehensive project benefitting all regions, states, and countries that rely on I-5 for goods movement and economic growth.

Level of Support – Letters of support and prior support of this project

The F5CG Project has letters of support from the North State Super Region, Shasta County, City of Shasta Lake and Shasta Voices. Letters are attached.

Notice of Preparation

The F5CG Project is not a California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) level project, therefore a NOP does not apply.

Cost Effectiveness

Based on the California Benefit/Cost Cal-BC Sketch 71 model the F5CG Project (F5CG) has a benefit cost ratio of 3.3. F5CG has a net present value of $16.3 million, while also achieving savings in travel time, vehicle operation, accident cost and emission costs for a total of $23.4 million dollars over the next 20 years. This comes to an average annual savings of $1.2 million dollars. Details in table G, full Cal B/C model attached.

District: 2

PROJECT: fix-5 Cascade Gateway

EA: 02-0H320
PPNO: 3597

3

INVESTMENT ANALYSIS
SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$7.1
Life-Cycle Benefits (mil. $)	$23.4
Net Present Value (mil. $)	$16.3
Benefit / Cost Ratio:	3.3
Rate of Return on Investment:	24.1%
Payback Period:	4 years

ITEMIZED BENEFITS (mil. $)	Passenger Benefits	Freight Benefits	Total Over 20 Years	Average Annual
Travel Time Savings	$1.8	$0.0	$1.8	$0.1
Veh. Op. Cost Savings	$0.0	$0.0	$0.0	$0.0
Accident Cost Savings	$18.2	$3.5	$21.6	$1.1
Emission Cost Savings	$0.0	$0.0	$0.0	$0.0
TOTAL BENEFITS	$20.0	$3.5	$23.4	$1.2
Person-Hours of Time Saved			350,488	17,524

Should benefit-cost results include:		
1) Induced Travel? (y/n)	Y	Default = Y
2) Vehicle Operating Costs? (y/n)	Y	Default = Y
3) Accident Costs? (y/n)	Y	Default = Y
4) Vehicle Emissions? (y/n) includes value for CO_2e	Y	Default = Y

	Tons		Value (mil. $)	
EMISSIONS REDUCTION	Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
CO Emissions Saved	0	0	$0.0	$0.0
CO_2 Emissions Saved	0	0	$0.0	$0.0
NO_X Emissions Saved	0	0	$0.0	$0.0
PM_{10} Emissions Saved	0	0	$0.0	$0.0
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$0.0	$0.0
VOC Emissions Saved	0	0	$0.0	$0.0

Table G – Benefit/Cost Analysis Results

E. FUNDING ANDDELIVERABILITY

Project Cost Estimate

Funding and Deliverability – Project Cost Estimate		
Amount	**Source**	**Availability**
$1,600,000	STIP-RIP	Already Committed
$2,908,000	STIP-RIP	SRTA committed future STIP-RIP dollars to the F5CG project. 2020 STIP
$1,200,000	SHOPP	Caltrans D2 funds committed.
$1,209,000	Trade Corridor Enhancement Program – State Share	"Other" funding per TCEP guidelines available, $16,704,000
$664,000	Trade Corridor Enhancement Program – Regional Share	"Other" funding per TCEP guidelines available, $16,704,000

Table H – Project Cost Estimate

No federal discretionary funds are committed to this project. The F5CG project has applied for both the Federal Better Utilizing Investments to Leverage Development (BUILD) and Federal Infrastructure For Rebuilding America (INFRA) grant programs, but these programs have not yet committed funding to this project.

There are no uncommitted funds from the Solutions for Congested Corridors Program or the Local Partnership Program.

Caltrans District 2 is the nominator of this project and per TCEP Guidelines, section 6, "For projects nominated by Caltrans, no match will be required". The Caltrans nominated F5CG Project also details the partnership and collaboration of regional and local agencies to leverage and coordinate other funding for the project.

Potential Cost Overruns

Potential overruns that may occur will be addressed by the funding program of the scope item that has caused the overage through the STIP and/or SHOPP.

Project Delivery Plan

PROJECT SCHEDULE					
M000	ID Need	1/6/2015	M377	P & E to R.O.E.	6/20/2024
M010	Approve PID/PIF	2/14/2017	M378	Draft Struct. PS&E	5/8/2024
M015	Program Project	3/22/2018	M380	Final Struct. PS&E	8/8/2024
M020	Begin Envir	4/30/2019	M410	Right of Way Cert.	8/8/2024
M030	NOP	-	M430	Draft Contract Ready	8/15/2024
M035	NOI	-	M460	Ready to List	8/29/2024
M040	Begin Project	1/7/2019	M470	Allocate	10/24/2024
M120	Circ. Draft ED	4/30/2020	M480	Advertise	11/18/2024
M200	PA & ED	7/20/2020	M490	Bid Opening	1/7/2025
M221	Bridge Site Submit	11/8/2022	M495	Award	2/4/2025
M224	Right of Way Maps	3/23/2020	M500	Approve Contract	3/4/2025
M225	Reg. Right of Way	6/22/2020	M600	Accept Contract	12/28/2026
M275	General Plans	3/8/2023	M800	End Project	12/28/2028
M300	Draft P&E	4/25/2024	M900	Final Project Closeout	9/30/2030

Category	Title	Risk Statement	Strategy	Response Actions
Funding	Accelerate to Reduce Costs	If complete funding for the future phases is identified sooner than assumed, escalation costs could be reduced.	Enhance	Caltrans planning, D2 management, and SRTA are actively seeking additional funding sources and grants to develop the project.
Political/Legal	CARB	Outside entities may challenge the project environmental document and/or determination in court, leading to an injunction and requiring a higher level environmental document.	Mitigate	Environmental studies and content in the IS-MND address new SB743 requirements.
Organizational	Staff Changes	If the assigned staff leave Caltrans, PA&ED delivery could be delayed, forcing a higher-level CEQA document (EIR) to be developed at additional time and expense.	Mitigate	The work has been distributed in pieces over several team members for redundancy and timeliness.
Environmental	Impact Reliability	If environmental impacts are altered by a change in scope or construction methods, the necessary re-consultation would create rework to develop an ammended environmental document.	Mitigate	Ongoing communication between grant writers, management, and the PDT should protect the relevance of the environmental document being developed.
Environmental	CESA Determination	If CDFW does not concur with NMFS's biological opinion, they may withhold the CESA consistency determination, requiring additional work in the 1 Phase.	Accept	Environmental team will work with both agencies to request the language needed for CDFW CESA concurrence to be included in the Letter of Concurrence from NMFS.
Political/Legal	Public Opposition	If the general public or other agencies are strongly opposed to the project during DED circulation, there may not be sufficient time to adequately respond and still meet the PA&ED schedule.	Accept	Thorough technical stedies support the anticipated CEQA and NEPA findings. If public opposition occurs, the project sponsors will work with the public or regulatory entities to resolve
Environmental	Scope Refinements	If additional scope elements are described in various grant applications that bring funding to the project, the significance determinations may change which could require a new, higher-level document or recirculation of an amended document in the 1 Phase.	Avoid	By discussing the consequences of all proposals between environmental and regional planning staff, this risk can be avoided by eliminating proposals that would invalidate the current environmental document.
Geotechnical	Lack of drilling	If grant funding is received that requires a quick design, quick delivery may not be possible because of the time required to perform geotechnical drilling investigations prior to structures design.	Accept	Due to limited 0 phase funds, drilling work was not included during PA&ED. Look for opportunity to pick up this work at the end of the PA&ED phase if funds will allow.
Right of Way	Potholing	If late potholing reveals conflicts requiring relocation, PS&E delivery could be delayed, leading to a loss of grant funding.	Accept	If sufficient budget remains after PA&ED, potholing may be completed to reduce design risk during PS&E.
Geotechnical	Perform Drilling	PA&ED costs are under-running earlier projections. If sufficient funding remains after PA&ED, geotechnical drilling information could be obtained with current programming.	Exploit	If sufficient budget remains after PA&ED, geotechnical drilling will be completed to accelerate bridge design during PS&E.
Organizational	COVID-19	If COVID-19 infects enough staff, project development could be halted long enough to delay ultimate delivery.	Mitigate	Work Remotely, establish communication protocols, provide equipment and software to continue developing the project
Political/Legal	COVID-19 related change in CEQA Statute of	If project opponents want to sue under CEQA, they now have additional time to prepare court filings, increasing the liklihood of a lawsuit.	Accept	Ensure adequate public noticing and outreach occur during circulation of the DED. Ensure adequate follow up is carried out with any project opponents.
Project Management	Performance Measures	As new information arrives from surveys and other data sources, alterations in the number and type of assets could affect project performance measure commitments, possibly requiring a PCR to explain differences	Accept	As new information and data becomes available, continue to monitor scope of work and validate performance measure commitments.

Table I – Project Risk Assessment

F. COMMUNITY IMPACTS

Community Engagement

I-5 improvements, including the F5CG Project, have been the most publicized, scrutinized, and supported set of projects in the region. Community and stakeholder outreach for I-5 improvements have been occurring regularly since 2006 with the first 'Fix 5' effort. This process included:

- Presentations at city council meetings (11), county board meetings (4), and SRTA Board of Directors meetings (5);
- Presentations (7) to private sector business- and community-based organizations;
- Community surveying; and
- Interagency televised forum.

Additional outreach accompanied the preparation of numerous grant application for I-5 improvements over subsequent years, including:

- Transportation Investment Generating Economic Recovery (TIGER) (2009, 2011, 2012, 2014, 2015, 2016, and 2017)
- Fostering Advancements in Shipping and Transportation for the Long-term Achievement of National Efficiencies (FASTLANE) (2016 and 2017)
- TCEP (2018)
- BUILD (2019)
- INFRA (2020)

Each application required extensive communication/coordination with local agencies, community stakeholders, and the general public. Over 100 letters of support from a wide range of entities have been received for I-5 improvements.

Finally, as the longstanding highest-priority and highest volume corridor in the region, I-5 has been reviewed as part of the 2010, 2015, and 2018 RTP cycles.

Community Needs

The Shasta Region's urban area is comprised of three incorporated cities located in the Sacramento River valley along the I-5 corridor. This three-city area functions as one economy, requiring efficient and reliable transportation connections between communities for employment, commerce, education, and other trip purposes. In response to community-identified needs, regional efforts have focused on maintaining and enhancing I-5 to meet current and future travel demands, and to ensure a safe facility for all users.

Negative Impacts to Community

The F5CG Project is contained entirely within existing Caltrans right of way and with improvements being made wherever possible to the inside median. There are no known negative impacts to the community that cannot be effectively mitigated.

Disadvantaged communities stand to benefit from the F5CG Project as many of the region's areas with higher concentrations of disadvantaged households are located along the I-5 corridor and will benefit from improved access to employment, education, and community services predominately located in the Redding area.

Location in Disadvantaged/Low-Income Community

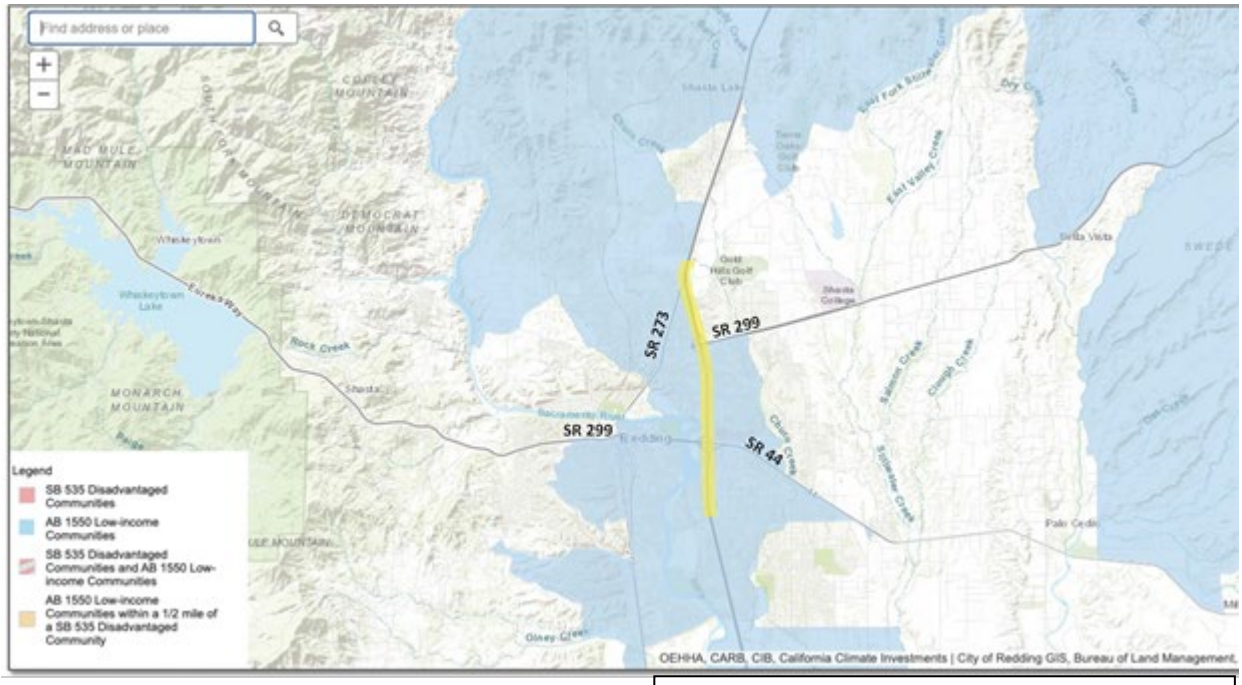


Exhibit E – AB1550 Map

The F5CG Project is surrounded by AB1550 Low-Income Communities.

Community Feedback

Public input received has consistently supported increased throughput and operational improvements along this valuable corridor. Each of the aforementioned grant applications included extensive letters of support representing a variety of public and private sector interests with no known opposition to any of the projects.

Given the dual nature of the corridor for regional and interregional travel and freight, one theme consistently heard from the public is the need for a shared cost financing plan because non-local interregional travel and freight are helping drive the need for improvements and the benefits of the improvements are enjoyed by these external user groups.

Effect of Public Participation
Community and stakeholder feedback on the F5CG Project included discussion of adverse impacts to rural communities along detour routes. During the increasingly frequent (and longer) I-5 closures, freight emissions, heavy duty freight traffic, and interstate-level volumes expose residents to harmful air pollutants and increase collisions resulting in property loss, injuries, and fatalities. Another related area of community feedback focused on the adverse impacts to intraregional mobility and economic productivity when these closures cause I-5 to back-up through the city of Redding and beyond. During these events, mainline I-5 and I-5 interchanges become gridlocked, effectively removing these critical facilities from the transportation network and causing severe congestion on local streets.

The proposed F5CG Project includes additional lanes and 10' shoulders to increase vehicle storage capacity. Innovative contraflow/reversible lanes on SB I-5 will also be considered to further expand storage capacity for NB vehicles during closures.

Continued Public Engagement
Draft designs will be circulated and presented (as appropriate based on COVID-19 pandemic guidance) to regional stakeholders and the general public for review and comment. Targeted outreach to identified disadvantaged communities located adjacent to the project near I-5 and Lake Blvd/SR 299 will be performed. Applicable input will be incorporated into the final project design, which will be made available online. As has been done successfully to date, project partners will coordinate with mass media outlets to maximize general public exposure to the project. Public presentations and project updates will continue to be provided at SRTA Board of Directors meetings, where public comment will also be received.

With the Shasta Region's urban area encompassing the three incorporated cities of Redding, Shasta Lake and Anderson this area functions as one economy. The F5CG Project will provide efficient and reliable transportation and freight connections between communities for employment, commerce, education, and goods movement. The F5CG Project is directly tied to community needs by providing additional jobs, improving freight throughput, reducing congestion at interchanges and eliminating identified collision clusters (Exhibit E & Table D). See Performance Indicators and Measures for jobs and throughput.

OTHER

Private Investments
There is no anticipated investment from the F5CG Project in private infrastructure. The project is solely in Caltrans Right-of-Way.

Rail Investments
Not applicable as there is no rail component associated with the F5CG Project.

APPENDIX—PERFORMANCE INDICATORS AND MEASURES

Measure	Metric	Project Type (All Freight)	Build	Future No Build	Change	Methodology	Data/Assumptions
Congestion Reduction	Daily vehicle hours of travel time reduction	Road, sea port, land port	Congestion reduction and delay are associated with collisions and climatic events which are increasing and significant but cannot be easily modeled.				
	Daily truck trips	Rail, sea port	N/A	N/A	N/A	N/A	N/A
	Daily truck miles traveled	Rail, sea port	N/A	N/A	N/A	N/A	N/A
	(Optional) other possible information for narrative discussion	All	See application narrative.				
Throughput	Change in annual truck volume that can be accommodated due to improvement	Road, land port, airport	7293 AADT	6875 AADT	Approx418 truck AADT	Use of CT traffic census truck data ‘14-’18.	Use of CT traffic census truck data ‘14-’18.
	Change in annual rail volume that can be accommodated due to improvement	Rail, sea port	N/A	N/A	N/A	N/A	N/A
	Change in annual cargo volume that can be accommodated due to improvement	Sea port, airport	N/A	N/A	N/A	N/A	N/A
	(Optional) other possible information for narrative discussion	All	See application narrative Maximum I-5 throughput increases by 4,200 per hour (2,100 per lane) - ample to cover future peak hour AM/PM forecasts.				
System Reliability	Truck travel time reliability index	National and State Highway System only (subcategory that falls under “Road” project type.	1.67	1.69	0.02	Extrapolating base FHWA TTTI to meet FHWA target with F5CG improvements	Extrapolating base FHWA TTTI to meet FHWA target with F5CG improvement
	Daily vehicle hours of travel time reduction	Road, sea port, land port	No quantifiable Vehicle Hours of Delay				

	(Optional) other possible information for narrative discussion	All	N/A	N/A	N/A	N/A	N/A

Measure	Metric	Project Type (All Freight)	Build	Future No Build	Change	Methodology	Data/Assumptions
Velocity	Travel time or total cargo transport time (including dwell time in logistics facility – port railyard, etc.) if applicable for project	All	N/A	N/A	N/A	N/A	N/A
	(Optional) Change in average peak period weekday speed for road facility	Road	N/A	N/A	N/A	N/A	N/A
	(Optional) Average peak period weekday speed for rail facility	All	N/A	N/A	N/A	N/A	N/A
	(Optional) other possible information for narrative discussion	All	See "velocity" section in application narrative.				
Air Quality and GHG	Particulate Matter (PM 2.5 PM 10)	All	.020/.079	.015/.058	.005/.021	Environmental Document Air Quality Analysis – US tons/day	Environmental Document Air Quality Analysis – US tons/day
	Carbon Dioxide (CO_2)		147.860	105.903	41.957		
	Volatile Organic Compounds (VOC)		N/A	N/A	N/A		
	Sulphur Dioxides (SO_x)		N/A	N/A	N/A		
	Carbon Monoxide (CO)		.170	.126	.044		
	Nitrogen Oxides (NO_x)		.084	.058	.026		

Measure	Metric	Project Type (All Freight)	Build	Future No Build	Change	Methodology	Data/Assumptions
Safety	Number of Fatalities (including actual report injury and fatality collisions for the last 5 full years)	Road, land port	.4	.6	0	Caltrans Traffic investigations TASAS Analysis	With the addition of 25% more capacity in additional lane and Aux lane a reduction of 25% in total numbers.
	Rate of Fatalities per 100 Million VMT		.312	.359	.047	Per calculations provided in guidelines	VMT provided through environmental document
	Number of Serious Injuries		97	129	39	Caltrans Traffic investigations TASAS Analysis	With the addition of 25% more capacity in additional lane and Aux lane a reduction of 25% in total numbers.
	Number of Serious Injuries per 100 Million VMT		14.8	15	.2	Per calculations provided in guidelines	VMT provided through environmental document
	Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries		N/A	N/A	N/A	N/A	Non-motorized travel is restricted on this stretch of the interstate.
	(Optional) other possible information for narrative discussion	All	See application narrative.				
Cost Effectiveness	Cost Benefit Ratio	All	3.3	0	3.3	Cal-BC-sketch	See attached Cal-BC
	(Optional) other possible information for narrative discussion	All	See application narrative.				

Economic Development	Jobs Created (Direct and Indirect)	All	82.5/1040	0	82.5/1040	CT 2018 Executive Fact Book	Support only/Full project
	(Optional) other possible information for narrative discussion	All	See application narrative.				

STATE HIGHWAY SYSTEM PROJECT IMPACT ASSESSMENT

APPENDIX III

CTC-0002 (NEW 9/2019)

I. APPLICANT INFORMATION

1. NOMINATING AGENCY

Caltrans D2/Shasta Regional Trans Agency

2. NAME OF PERSON SUBMITTING THE NOMINATION	3. TITLE
Dave Moore	Caltrans D2 Director
4. PHONE	**5. EMAIL**
530-225-3477	Dave.moore@dot.ca.gov

II. PROJECT INFORMATION

6. PROJECT TITLE

Fix 5 Cascade Gateway

7. PERCENT OF PROJECT AREA WITHIN STATE R/W	8. TOTAL CONSTRUCTION COST WITHIN STATE R/W
100	$0

9. ANTICIPATED ENVIRONMENTAL DOCUMENT FOR:

CEQA: Initial Study - Mitigated Negative Declaration **NEPA:** Categorical Exclusion

10. CHECK ALL OF THE FOLLOWING THAT APPLY:

- ☑ PROJECT IS NOT IN AND WILL NOT DISCHARGE INTO AN ENVIRONMENTALLY SENSITIVE AREA AND IS NOT EXPECTED TO NEED AN EIR/EIS
- ☑ PROJECT DOES NOT REQUIRE FHWA COORDINATION OR APPROVAL
- ☑ PROJECT DOES NOT REQUIRE RIGHT OF WAY DEDICATION FROM CALTRANS
- ☑ PROJECT DOES NOT REQUIRE CALTRANS STRUCTURE DESIGN APPROVAL FOR MODIFICATION TO A CALTRANS BRIDGE OR STRUCTURE.
- ☐ PROJECT DOES NOT REQUIRE DESIGN EXCEPTIONS TO MANDATORY DESIGN STANDARDS (*REF. HIGHWAY DESIGN MANUAL, DESIGN INFORMATION BULLETIN 78)*
- ☑ PROJECT DOES NOT REQUIRE ENCHROACHMENT EXCEPTIONS APPROVAL (*REF. ENCHROACHMENT PERMIT MANUAL, CH. 300)*

11. DESCRIBE THE SCOPE OF WORK TO BE DONE WITHIN STATE HIGHWAY RIGHT-OF-WAY

The Fix 5 Cascade Gateway Project is requesting funds for the Plans, Specifications and Estimate (1-Phase) and Right-of-Way Support and Capital (2 and 9-Phases respectively).

12. EXPECTED LEVEL OF CALTRANS INVOLVEMENT:

☐ **Cooperative Agreement Oversight Process:** *Cooperative Agreement oversight process reviews are generally used for projects with a construction cost within the State Right of Way greater than $1 Million.*

☐ **Encroachment Permits Oversight Process:** *Office of Encroachment Permits oversight process reviews are generally used for projects with a construction cost within the State Right of Way of $1 Million or less.*

III. CALTRANS PROJECT SUPPORT

SIGNATURE: _____ **DATE:** _____

PRINT NAME: _____

Deputy District Director Program Project Management

The above signature indicates, based on available information:

1. Caltrans supports the project;
2. The project is consistent with Caltrans's standards;
3. Durations and start and end dates to achieve the major milestones are reasonable;
4. The funding plan is reasonable.

IV. ATTACHMENTS

The Project Programming Request must be provided to Caltrans with this form. Additional information may be required by Caltrans, including, but, not limited to: (1) project level documents and (2) draft funding application(s).

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST (PPR)

PRG-0010 (REV 06/2020)

PPR ID
ePPR-D02-2020-0001 v0

Amendment (Existing Project) ☐ YES ☒ NO				Date	07/17/2020 10:40:23
Programs ☐ LPP-C ☐ LPP-F ☐ SCCP ☒ TCEP ☐ STIP ☐ Other					
District	EA	Project ID	PPNO	Nominating Agency	
02	0H920	0215000083	3597	Caltrans District 2	
County	Route	PM Back	PM Ahead	Co-Nominating Agency	
Shasta	5	R 14.800	R 20.000		
				MPO	Element
				SHASTA	Capital Outlay
Project Manager/Contact			Phone	Email Address	
Sean Shepard			530-225-3530	sean.shepard@dot.ca.gov	

Project Title

Fix 5 Cascade Gateway

Location (Project Limits), Description (Scope of Work)

Overcrossing. Description: Provide standard vertical clearance over I-5 at the NB 273/NB 5 connector ramp. Provide improved vertical clearance under four structures at I-5 at Twin View Blvd and SR 299 crossings. Add a third mixed-flow through lane. Install high tension cable barrier and concrete barrier in the median as determined by the median width. Construct four auxiliary lanes. Widen seven bridges. Upgrade bridge rails on both sides. Place overhead signs, guide signs and warning signs as recommended by Traffic Operations. Remove and replace existing guardrail and end treatments.

Component	Implementing Agency
PA&ED	Caltrans District 2
PS&E	Caltrans District 2
Right of Way	Caltrans District 2
Construction	Caltrans District 2

Legislative Districts					
Assembly:	1	Senate:	1	Congressional:	1

Project Milestone	Existing	Proposed
Project Study Report Approved	02/14/2017	
Begin Environmental (PA&ED) Phase		01/07/2019
Circulate Draft Environmental Document Document Type (ND/MND)/CE		04/30/2020
Draft Project Report		04/30/2020
End Environmental Phase (PA&ED Milestone)		07/20/2020
Begin Design (PS&E) Phase		07/01/2022
End Design Phase (Ready to List for Advertisement Milestone)		08/29/2024
Begin Right of Way Phase		07/01/2022
End Right of Way Phase (Right of Way Certification Milestone)		08/08/2024
Begin Construction Phase (Contract Award Milestone)		02/04/2025
End Construction Phase (Construction Contract Acceptance Milestone)		12/28/2026
Begin Closeout Phase		12/28/2028
End Closeout Phase (Closeout Report)		09/30/2030

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST (PPR)

PRG-0010 (REV 06/2020)

PPR ID
ePPR-D02-2020-0001 v0

Date 07/17/2020 10:40:23

Purpose and Need

Purpose: Improve operations on I-5 by reducing merging conflicts and congestions, upgrading signing and lighting, providing new ITS elements to improve safety and reduce collision concentrations; improve primary evacuation route for high fire severity zones; reduce adverse impacts of closures during winter storms; enhance reliability of the interstate and interregional goods movement; improve pavement quality to increase smoothness, reduce maintenance efforts, and minimize field maintenance exposure to traffic

Need: Existing facility has aged beyond its design life and no longer adequately meets transportation demands within the project limits. The existing pavement needs to be preserved and the existing lighting, signing and median barrier are non-standard. Additional Transportation Management System elements are needed to improve freeway operations during emergency events. The mainline flow of traffic is degraded by a speed differential resulting from an increase in merging trucks and other vehicles at several consecutive ramps. Recent fires and winter storms developed long backups, delays, and major detours through and around the project area, demonstrating the current lack of system resiliency. This four-lane section of freeway is the last remaining bottleneck on I-5 in Shasta County from the Tehama County line to Shasta Lake City, restricting freeway operations and inter-regional goods movement. All these factors reduce the safety and operational effectiveness of the facility.

NHS Improvements ☒ YES ☐ NO	Roadway Class 1	Reversible Lane Analysis ☒ YES ☐ NO

Inc. Sustainable Communities Strategy Goals ☒ YES ☐ NO Reduce Greenhouse Gas Emissions ☐ YES ☒ NO

Project Outputs

Category	Outputs	Unit	Total
Operational Improvement	Auxiliary lanes	Miles	5
TMS (Traffic Management Systems)	Closed circuit television cameras	EA	1
TMS (Traffic Management Systems)	Communications (fiber optics)	Miles	1.2
Bridge / Tunnel	Modified/Reconstructed bridges/tunnels	SQFT	119,522
Pavement (lane-miles)	Roadway lane miles	Miles	7.6
Pavement (lane-miles)	Mainline Shoulders construction	Miles	15.2

Date 07/17/2020 10:40:23

Additional Information

Performance Indicators and Measures: Economic Development: Jobs Created (Indirect): With Build = 1040, Without Build = 0, Change = 0

Performance Indicators and Measures						
Measure	**Required For**	**Indicator/Measure**	**Unit**	**Build**	**Future No Build**	**Change**
Congestion Reduction	TCEP	Daily Vehicle Hours of Travel Time Reduction	Hours	0	0	0
	TCEP	Daily Truck Trips	# of Trips	0	0	0
	TCEP	Daily Truck Miles Traveled	Miles	0	0	0
Throughput	TCEP	Change in Truck Volume That Can Be Accommodated	# of Trucks	7,293	6,875	418
	TCEP	Change in Rail Volume That Can Be Accommodated	# of Trailers	0	0	0
			# of Containers	0	0	0
	TCEP	Change in Cargo Volume That Can Be Accommodated	# of Tons	0	0	0
			# of Containers	0	0	0
System Reliability	TCEP	Truck Travel Time Reliability Index	Index	1.67	1.69	-0.02
	TCEP	Daily Vehicle Hours of Travel Time Reduction	Hours	0	0	0
Velocity	TCEP	Travel Time or Total Cargo Transport Time	Hours	0	0	0
Air Quality & GHG	LPPF, LPPC, SCCP, TCEP	Particulate Matter	PM 2.5 Tons	0.02	0.015	0.005
			PM 10 Tons	0.079	0.058	0.021
	LPPF, LPPC, SCCP, TCEP	Carbon Dioxide (CO2)	Tons	147.86	105.903	41.957
	LPPF, LPPC, SCCP, TCEP	Volatile Organic Compounds (VOC)	Tons	0	0	0
	LPPF, LPPC, SCCP, TCEP	Sulphur Dioxides (SOx)	Tons	0	0	0
	LPPF, LPPC, SCCP, TCEP	Carbon Monoxide (CO)	Tons	0.17	0.126	0.044
	LPPF, LPPC, SCCP, TCEP	Nitrogen Oxides (NOx)	Tons	0.084	0.058	0.026
Safety	LPPF, LPPC, SCCP, TCEP	Number of Non-Motorized Fatalities and Non-Motorized Serious Injuries	Number	0	0	0
	LPPF, LPPC, SCCP, TCEP	Number of Fatalities	Number	0.4	0.6	-0.2
	LPPF, LPPC, SCCP, TCEP	Fatalities per 100 Million VMT	Number	0.312	0.359	-0.047
	LPPF, LPPC, SCCP, TCEP	Number of Serious Injuries	Number	97	129	-32
	LPPF, LPPC, SCCP, TCEP	Number of Serious Injuries per 100 Million VMT	Number	14.8	15	-0.2
Economic Development	LPPF, LPPC, SCCP, TCEP	Jobs Created (Direct and Indirect)	Number	82.5	0	82.5
Cost Effectiveness	LPPF, LPPC, SCCP, TCEP	Cost Benefit Ratio	Ratio	3.3	0	3.3

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST (PPR)

PRG-0010 (REV 06/2020)

PPR ID
ePPR-D02-2020-0001 v0

District	County	Route	EA	Project ID	PPNO
02	Shasta	5	0H920	0215000083	3597

Project Title

Fix 5 Cascade Gateway

Existing Total Project Cost ($1,000s)									
Component	Prior	20-21	21-22	22-23	23-24	24-25	25-26+	Total	Implementing Agency
E&P (PA&ED)									Caltrans District 2
PS&E									Caltrans District 2
R/W SUP (CT)									Caltrans District 2
CON SUP (CT)									Caltrans District 2
R/W									Caltrans District 2
CON									Caltrans District 2
TOTAL									
Proposed Total Project Cost ($1,000s)									Notes
E&P (PA&ED)	1,600							1,600	
PS&E				5,162				5,162	
R/W SUP (CT)				77				77	
CON SUP (CT)									
R/W				742				742	
CON									
TOTAL	1,600			5,981				7,581	

Fund #1:	RIP - National Hwy System (Committed)								Program Code
Existing Funding ($1,000s)									
Component	Prior	20-21	21-22	22-23	23-24	24-25	25-26+	Total	Funding Agency
E&P (PA&ED)									Shasta Regional Transportation Agen
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									Notes
E&P (PA&ED)	1,600							1,600	
PS&E				2,227				2,227	
R/W SUP (CT)				50				50	
CON SUP (CT)									
R/W				631				631	
CON									
TOTAL	1,600			2,908				4,508	

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST (PPR)

PRG-0010 (REV 06/2020)

PPR ID
ePPR-D02-2020-0001 v0

Fund #2:	SHOPP - Road Maintenance and Rehabilitation Account (Committed)								Program Code
	Existing Funding ($1,000s)								
Component	Prior	20-21	21-22	22-23	23-24	24-25	25-26+	Total	Funding Agency
E&P (PA&ED)									Caltrans District 2
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
	Proposed Funding ($1,000s)								Notes
E&P (PA&ED)									
PS&E				1,200				1,200	
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL				1,200				1,200	

Fund #3:	State SB1 TCEP - Trade Corridors Enhancement Account (Uncommitted)								Program Code
	Existing Funding ($1,000s)								
Component	Prior	20-21	21-22	22-23	23-24	24-25	25-26+	Total	Funding Agency
E&P (PA&ED)									Caltrans HQ
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
	Proposed Funding ($1,000s)								Notes
E&P (PA&ED)									State Share
PS&E				1,071				1,071	
R/W SUP (CT)				27				27	
CON SUP (CT)									
R/W				111				111	
CON									
TOTAL				1,209				1,209	

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST (PPR)

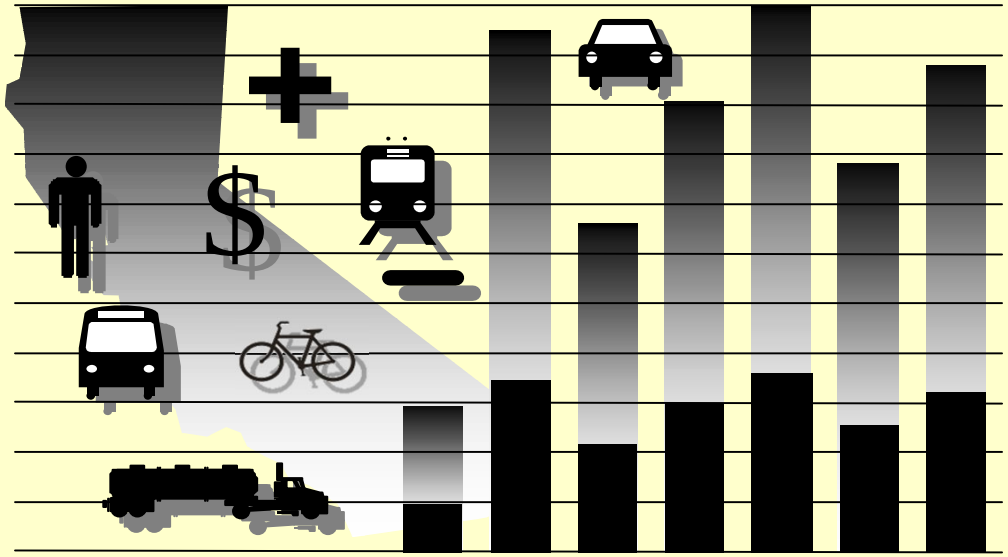
PRG-0010 (REV 06/2020)

PPR ID
ePPR-D02-2020-0001 v0

Fund #4:	State SB1 TCEP - Trade Corridors Enhancement Account (Uncommitted)								Program Code
Existing Funding ($1,000s)									
Component	Prior	20-21	21-22	22-23	23-24	24-25	25-26+	Total	Funding Agency
E&P (PA&ED)									Caltrans HQ
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									Notes
E&P (PA&ED)									TCEP - Regional Share
PS&E				664				664	
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL				664				664	

California Department Of Transportation

California Life-Cycle Benefit/Cost Analysis Model for 2020 INFRA Applications (Cal-B/C Sketch) Version 7.1



Office of Transportation Economics
Division of Transportation Planning

January 2020

For questions and comments, please contact:

Caltrans' Transportation Economics Branch Staff eab@dot.ca.gov

CALIFORNIA LIFE-CYCLE BENEFIT/COST ANALYSIS MODEL (CAL-B/C)

INTRODUCTION

This spreadsheet model provides a method for preparing a simple economic analysis of both highway and transit projects. Given certain input data for a project, the model calculates its life-cycle costs, life-cycle benefits, net present value, benefit/cost ratio, internal rate of return, and payback period. Annual benefits are also calculated.

The model is arranged by worksheets and contains the following information, data, and results:

Worksheets	Contents
Instructions	General model description and assumptions
1) Project Information	Project input data
2) Model Inputs	Highway speed, volume, accident data, and trips estimated by model
3) Results	Summary results of analysis
Travel Time	Calculation of travel time and induced demand impacts
Vehicle Operating Costs	Calculation of highway vehicle operating cost impacts
Accident Costs	Calculation of accident cost impacts
Emissions	Calculation of emission impacts
Final Calculations	Calculation of net present value, internal rate of return, and payback period
Parameters	Economic assumptions, lookup tables, and other model parameters

The model is designed so that the user generally needs to enter data only in the green boxes on the Project Information worksheet. The model estimates detailed highway speed, volume, and accident data for the user to review on the Model Inputs worksheet. Highway speeds are estimated from volumes using relationships found in the Highway Capacity Manual. Other adjustments are made for weaving and pavement conditions. An option is also available to conduct a simple queuing analysis. Accidents are estimated from statewide averages and recent data for the facility. If available, inputs from regional planning or traffic simulation models can be entered to override model calculations. Summary results are shown in Results worksheet.

The remaining worksheets are provided for the user to see, but model performs calculations automatically. Some projects (i.e., truck only lanes, bypasses, intersections, and connectors) require the user to enter two sets of highway data, since two roads are involved. The model calculates benefits for the first road before the user enters information about the second road. The user clicks a button and the model clears the Project Information worksheet to receive information on other road.

In the process of economic analysis, some generally accepted economic assumptions are necessary. These assumptions include: the real and nominal discount rates, unit user costs (e.g., value of time), consumption rates (e.g., fuel consumption and vehicle emissions), and accident rates. These assumptions are given in the Parameters worksheet and should not be changed by the user.

After reading the instructions in this worksheet, the user should proceed to the Project Information worksheet and input data for the specific project in the green boxes (light gray when printed). The model provides default values in the red boxes (medium gray when printed). These values can be changed by the user, if information specific to the project is available. The model calculates some values based on relationships or assumptions, with results shown in the blue boxes (dark gray when printed). These values can be changed by the user.

INSTRUCTIONS

The user can analyze most projects simply by entering limited data on the Project Information Sheet and getting results on the Results page. The Model Inputs page allows the user to enter more detailed data adjust estimated speeds, volumes, and accidents rates, and check the number of trips estimated for projects that affect vehicle occupancy.

The user should account for induced demand, if applicable, in the inputs provided since Cal-B/C does not estimate it automatically. Induced demand is an unintended effect that may occur if a project alleviates traffic congestion by increasing roadway capacity (e.g., building new roadways or adding lane miles). With induced demand, the roadway network experiences an increase in vehicle-miles traveled (VMT) because the added roadway capacity reduces travel delay or the "price" of travel, enticing motorists to drive more. If there is enough extra demand, congestion relief may be temporary as VMT increases. Cal-B/C users can account for the effects of induced demand by making sure the extra travel is included in the ADT for the Build scenario, located in cell H38 of the Project Information tab.

PROJECT DATA (Box 1A)

This section provides general information about the project and is used for highway, rail, and transit projects. At the top of the sheet, the user can enter information about the project, such as the project name, Caltrans district, and funding information.

Type of Project

1. Please select the appropriate type of highway, rail, or transit project from the pull-down menu. The menu appears if user clicks on the green box next to the project type.

   For a truck only lane, bypass or intersection project, model reminds user that information must be entered for both roads impacted by project. After entering information for the first road, the user clicks a button at bottom of the worksheet to prepare model for data on the bypass or intersecting road. The user may also enter information for connector projects involving two roads.

Project Location

2. Insert a 1, 2, or 3 for the appropriate region of California. This information is used to estimate peak traffic and emissions benefits.

Length of Construction Period

3. Insert the number of construction years before benefits begin. This must be a whole number (round to next higher integer).

One- or Two-Way Data

4. Indicate whether Highway Design and Traffic Data to be entered in Box 1B is for a single direction or both directions of highway.

Length of Peak Period(s)

5. Insert the number of peak period hours per typical day. The model provides a default of 5 hours (statewide average). Model estimates total % daily traffic occurring during peak period using a lookup table developed from Traffic Census data. Model does not distinguish between weekdays and weekends.

   To model a 24-hour HOV or HOT lane, enter 24 hours so peak is 100% of ADT. To model a ramp metering project, user should enter the number of hours per day that metering is operational.

HIGHWAY DESIGN AND TRAFFIC DATA (Box 1B)

Highway design and traffic data must be entered for highway projects. Enter data consistent with one- or two-way answer in Box 1A. Statewide default values are provided for some inputs.

Highway Design

6. **Roadway Type:** Indicate if the road is a freeway, expressway, or conventional highway in build and no build cases.
7. **Number of General Traffic Lanes:** Insert number of general purpose (not HOV or bus) lanes in both directions for build and no build cases. Enter data consistent with Box 1A.
8. **Number of HOV Lanes:** Insert number of HOV lanes in both directions for the build and no build cases. A value must be provided if an HOV restriction is entered on the next row.
9. **HOV Restriction:** If highway facility has/will have HOV lanes, enter the HOV restriction (e.g., 2 means 2 people per vehicle). Must be entered for an HOV project. Enter for a non-HOV project, if facility has HOV lanes. Changes in HOV restrictions are special project types and handled automatically by model.
10. **Exclusive ROW for Buses:** If bus project, indicate (with "Y" or "N") whether buses have exclusive right-of-way. This information is used to estimate emissions.
11. **Highway Free-Flow Speed:** Insert free-flow speed for build and no build cases. Model assumes build is same as no build, if not entered.
12. **Ramp Design Speed:** If auxiliary lane or off-ramp project, enter the design speed of the appropriate on- or off-ramp. This is used to estimate the speed of traffic affected by weaving.
13. **Highway Segment:** Insert segment length for build and no build cases. Model assumes build is same as no build, if not entered.
14. **Impacted Length:** The model estimates an area affected by the project. In most cases, this equals the segment length. For passing lane projects, the default affected area is 3 miles longer than the project area. For auxiliary lane and off-ramp projects, the default affected area is 1500 feet. For connectors and HOV drop ramps, default affected area is 3250 feet. User can change these lengths.

Average Daily Traffic (ADT)

15. **Current**: For most projects, insert current two-way ADT on facility. For operational improvements, enter only the one-way ADT applicable to the project. Enter data consistent with one-way or two-way answer in Box 1A.
16. **Forecast (Year 20)**: Insert projected ADT for 20 years after construction completion for build and no build cases. Make sure to account for induced demand, if applicable. The model assumes build is same as no build, if not entered.

    The model uses the current and forecasted ADT to estimate annual traffic for 20 years after construction, assuming a linear trend. User can change base (Year 1) forecasts.

Average Hourly HOV/HOT Lane Traffic

17. Insert hourly HOV/HOT volumes for build and no build cases in a typical peak hour.

Percent Traffic in Weave

18. For operational improvements, insert % traffic affected by weaving. Model suggests a % based on the type of project (2 right lanes for auxiliary lanes, 3 right lanes for off-ramps, 2.5% of all traffic for freeway connectors, and 4% of HOV traffic for HOV connectors and drop ramps). The user can change values for project conditions.

Percent Trucks

19. Insert estimated % of ADT comprised of trucks in build and no build cases. Model provides a default value (statewide average).

Truck Speed

20. If passing lane project, enter estimated speed (in MPH) for slow vehicles (trucks, recreational vehicles, etc.). Values must be entered for passing lane projects.

On-Ramp Volume

21. **Hourly Ramp Volume**: If auxiliary lane or on-ramp widening project, insert average hourly ramp volume to estimate traffic affected by weaving for auxiliary lanes and metering effectiveness for on-ramp widening. No entry needed for ramp metering projects.
22. **Metering Strategy**: If on-ramp widening project, enter 1, 2, or 3 for vehicles allowed per green signal. Enter "D" for dual metering. No entry should be made for ramp metering projects.

Queue Formation

23. **Arrival Rate**: For queuing and rail grade crossing projects, enter vehicles per hour contributing to queue. Arrival rate should be estimated only for time queue grows. Model estimates queue dissipation automatically.
24. **Departure Rate**: For queuing and rail crossing projects, enter vehicles per hour leaving queue.

Pavement Condition (for Pavement Rehab. Projects)

25. If pavement rehabilitation project, enter base (Year 1) International Roughness Index (IRI) for build and no build. Model will calculate Year 20 values using standard parameters unless entered by user.

Average Vehicle Occupancy (AVO)

26. Model provides default values. The figures change automatically, depending on presence of HOV lanes. Adjust if project-specific data are available.

HIGHWAY ACCIDENT DATA (Box 1C)

Statewide default values are provided for transit projects. The model uses information provided to calculate accident rates for each accident type in the Model Inputs worksheet.

Actual 3-Year Accident Data (from Table B)

27. Insert the total number of fatal, injury, and property damage only accidents on the segment over the 3 most recent years. For rail grade crossing projects, enter 10-year accident data from FRA WBAPS in fatal and injury rows and collision prediction in total accident row.

Statewide Basic Average Accident Rate

28. Insert statewide average accident rates per million vehicle-miles (or million vehicles, as appropriate) for build and no build highway rate groups. Include Base Rate and ADT Factor where applicable.
29. Insert statewide % of accidents that are fatal and injury accidents for road classifications similar to build and no build facilities.

    The model uses adjustment factors (the ratio of actual rates to statewide rates for existing facility) to estimate accident rates by accident type for the new road classification. Additional adjustments (accident savings) are made for highway TMS projects. Results are presented in the Model Inputs worksheet and can be changed by the user.

RAIL AND TRANSIT DATA (Box 1D)

This section is used for rail and transit projects only.

Annual Person-Trips

30. **Base (Year 1)**: Insert estimated annual transit person-trips for first year after construction completion in build and no build cases. For a transit TMS project, enter only person-trips on routes affected. If the routes are substantially different, the benefits analysis should be split into pieces.
31. **Forecast (Year 20)**: Insert forecasted annual transit person-trips for 20 years after construction completion in build and no build cases.

Percent Trips during Peak Period

32. Insert % annual person-trips that occur during peak period.

Percent New Trips from Parallel Highway

33. Insert % new transit person-trips originating on parallel highway.

Annual Vehicle-Miles

34. **Base (Year 1)**: Insert estimated annual vehicle-miles for first year after construction completion in build and no build cases. For passenger rail projects, multiply the number of train-miles by the average number of rail cars per train consist.
35. **Forecast (Year 20)**: Insert forecasted annual vehicle-miles for 20 years after construction completion in build and no build cases.

Average Vehicles per Train

36. If passenger rail project, insert the average number of rail cars per train consist. This is used to calculate emissions.

Reduction in Transit Accidents

37. If project affects transit/rail safety, insert estimated percent accident reduction due to project. Increases should be entered as negative %.

Average Transit Travel Time

38. **In-Vehicle**: Insert average in-vehicle transit travel time in minutes during peak and non-peak periods in build and no build cases. For TMS Projects, insert the average for all transit routes impacted. Model assumes build is same as no build for most projects. Signal priority and bus rapid transit projects reduce time. User can adjust build travel times.
39. **Out-of-Vehicle**: Insert average out-of-vehicle transit travel time in minutes during peak and non-peak periods. Model monetizes out-of-vehicle travel time at a higher value.

Highway Grade Crossing

40. **Annual Number of Trains**: Insert annual number of passenger and freight trains entering highway-rail crossing.
41. **Average Gate Down Time**: Insert average time per train that crossing gate is down for passenger and freight trains.

Transit Agency Costs (for Transit TMS Projects

42. **Annual Capital Expenditure**: If transit TMS project, insert annual agency capital expenditures for routes impacted by project. Model calculates cost reductions for expenditures in build case due to transit TMS. Agency cost savings are entered automatically as a negative cost in Box 1E.
43. **Annual Ops. and Maintenance Expenditure**: If transit TMS project, insert the annual average operating and maintenance costs for routes impacted by project. Model calculates cost reductions for expenditures in build case due to transit TMS. Agency cost savings are entered automatically as a negative cost in Box 1E.

PROJECT COSTS (Box 1E)

Net project costs should be entered in the years they are expected to occur. Costs should be entered for construction period and for twenty years after construction completion. Construction Year 1 is the first year that costs are incurred. All costs should be entered in thousands of dollars.

44. Insert project's initial costs in constant (Year 2016) dollars for project development, right-of-way, and construction. The number of construction years with costs should equal the length of the construction period (Box 1A, Input 5).
45. Insert estimated future incremental maintenance/operating and rehabilitation costs in constant (Year 2016) dollars. These figures should be entered in the years after the project opens.
46. Insert estimated mitigation costs (e.g., wetlands, community, and sound walls) in constant (Year 2016) dollars during construction and for 20 years after construction completion.
47. Model adds agency cost savings due to transit TMS automatically.
48. Insert any other costs not already included.

HIGHWAY SPEED AND VOLUME INPUTS (Box 2A)

This section allows user to review detailed speed and volume data estimated by the model. These values are estimated from the inputs provided in the Project Information sheet.

49. User may enter new speed and volume data for the highway in the green boxes to override model calculations, if detailed data are available from a travel demand or micro-simulation model. The model estimates speeds and volumes on highway for HOVs, non-HOVs, weaving vehicles, and trucks during the peak and non-peak periods in Year 1 and Year 20 in build and no build cases. Speeds are estimated using a BPR curve (or queuing analysis). Adjustments are made to speed and volumes to account for weaving, transit mode shifts, pavement condition, and TMS.
50. If TMS project and detailed simulation data are available, the highway results should be inputted in the green cells. Model will use the data in place of figures estimated by the model.

HIGHWAY ACCIDENT RATES (Box 2B)

User may adjust accident rates calculated by the model. User may also enter TASAS highway accident data for rail grade crossing projects in this box.

51. **No Build**: Fatality, injury and PDO accident rates for no build facility are estimated using inputs from Box 1C of the Project Information sheet. User may change these rates in green boxes.
52. **Highway Safety or Weaving Improvement**: Model assumes an overall safety improvement for off-ramp and ramp metering projects. User may adjust this percentage. For safety projects, user should enter collision reduction factor from HSIP Guidelines.
53. **Adjustment Factor**: User may change the ratios of facility accident rates to statewide averages used in calculating rates for the build facility. These factors are also adjusted by the collision reduction factor.
54. **Build Facility**: User may modify the fatality, injury, and PDO accident rates for build facility. Model estimates these accident rates using statewide average rates and the adjustment factors.

RAMP AND ARTERIAL INPUTS (Box 2C)

This section allows users to enter detailed arterial information for an arterial signal management project or detailed ramp and arterial data for a highway TMS project.

55. Detailed Information Available: Input "Y" if detailed arterial and/or ramp data are available. Model automatically selects "Y" if other data are inputted. User should enter detailed ramp and arterial data for TMS highway project if detailed highway data are entered in Box 2A.
56. Aggregate Segment Length: Input the total segment lengths for the ramps and arterials. These can be estimated from travel demand or micro-simulation model data as VMT/total trips.
57. User may enter speeds and volumes on ramps and arterials during peak and non-peak periods in Year 1 and Year 20 in build and no build cases. If arterial signal management project, user must enter arterial data. Benefits are estimated assuming all vehicles are automobiles.

ANNUAL PERSON-TRIPS (Box 2D)

This section is for information purposes only. It allows user to examine number trips estimated for projects that affect AVO (e.g., HOT lane and HOV conversions).

NEXT STEPS

58. For bypass, intersection, and connector projects, click button on Project Information page after data are verified for the first road. Enter data for the second road in Boxes 1B and 1C. As with the first road, detailed data may be verified on Model Inputs page. Model prompts user to save interim version of analysis before proceeding.
59. Summary results are available immediately in the Results worksheet.

District: 2

PROJECT: fix-5 Cascade Gateway

EA: 02-0H920
PPNO: 3597

1A PROJECT DATA

Type of Project		
Select project type from list	General Highway	
Project Location (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)	3	
Length of Construction Period	3	years
One- or Two-Way Data	2	enter 1 or 2
	Current	
Length of Peak Period(s) (up to 24 hrs)	4	hours

1B HIGHWAY DESIGN AND TRAFFIC DATA

Highway Design		No Build	Build
Roadway Type (Fwy, Exp, Conv Hwy)		F	F
Number of General Traffic Lanes		4	6
Number of HOV/HOT Lanes			
HOV Restriction (2 or 3)			
Exclusive ROW for Buses (y/n)		N	
Highway Free-Flow Speed		75	75
Ramp Design Speed (if aux. lane/off-ramp proj.)		35	35
Length (in miles)	Highway Segment	5.2	5.2
	Impacted Length	5.2	5.2

Average Daily Traffic			
	Current	60,000	
		No Build	Build
	Base (Year 1)	66,300	66,300
	Forecast (Year 20)	85,600	85,600
Average Hourly HOV/HOT Lane Traffic			0
Percent of Induced Trips in HOV (if HOT or 2-to-3 conv.)			100%
Percent Traffic in Weave			0.0%
Percent Trucks (include RVs, if applicable)		16%	16%
Truck Speed		60	

On-Ramp Volume	Peak	Non-Peak
Hourly Ramp Volume (if aux. lane/on-ramp proj.)	0	0
Metering Strategy (1, 2, 3, or D, if on-ramp proj.)		

Queue Formation (if queuing or grade crossing project)	Year 1	Year 20
Arrival Rate (in vehicles per hour)	0	0
Departure Rate (in vehicles per hour)	0	0

Pavement Condition (if pavement project)		No Build	Build
IRI (inches/mile)	Base (Year 1)		
	Forecast (Year 20)		

Average Vehicle Occupancy (AVO)		No Build	Build
General Traffic	Non-Peak	1.39	1.39
	Peak	1.15	1.15
High Occupancy Vehicle (if HOV/HOT lanes)		2.15	2.15

1C HIGHWAY ACCIDENT DATA

Actual 3-Year Accident Data (from Table B)	Count (No.)	Rate
Total Accidents (Tot)	141	0.41
Fatal Accidents (Fat)	0	0.000
Injury Accidents (Inj)	56	0.16
Property Damage Only (PDO) Accidents	85	0.25

Statewide Basic Average Accident Rate	No Build	Build
Rate Group	H63	H63
Accident Rate (per million vehicle-miles)	0.59	0.50
Percent Fatal Accidents (Pct Fat)	19.5%	14.8%
Percent Injury Accidents (Pct Inj)	0.5%	0.2%

1D RAIL AND TRANSIT DATA

Annual Person-Trips		No Build	Build
	Base (Year 1)		
	Forecast (Year 20)		
Percent Trips during Peak Period		40%	
Percent New Trips from Parallel Highway			100%

Annual Vehicle-Miles		No Build	Build
	Base (Year 1)		
	Forecast (Year 20)		
Average Vehicles/Train (if rail project)			

Reduction in Transit Accidents	
Percent Reduction (if safety project)	

Average Transit Travel Time		No Build	Build
In-Vehicle	Non-Peak (in minutes)		0.0
	Peak (in minutes)		0.0
Out-of-Vehicle	Non-Peak (in minutes)	0.0	0.0
	Peak (in minutes)	0.0	0.0

Highway Grade Crossing	Current	Year 1	Year 20
Annual Number of Trains		0	
Avg. Gate Down Time (in min.)		0.0	

Transit Agency Costs (if TMS project)	No Build	Build
Annual Capital Expenditure		$0
Annual Ops. and Maintenance Expenditure		$0

Model should be run for both roads for intersection or bypass highway projects, and may be run twice for connectors. Press button below to prepare model to enter data for second road. After data are entered, results reflect total project benefits.

Prepare Model for Second Road

Enter all project costs (in today's dollars) in columns 1 to 7. Costs during construction should be entered in the first eight rows. Project costs (including maintenance and operating costs) should be net of costs without project.

1E

PROJECT COSTS (enter costs in thousands of dollars)

Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
Year	DIRECT PROJECT COSTS					Mitigation	Transit Agency Cost Savings	TOTAL COSTS (in dollars)	
	INITIAL COSTS			SUBSEQUENT COSTS					
	Project Support	R / W	Construction	Maint./ Op.	Rehab.			Constant Dollars	Present Value
Construction Period									
1	$2,527							$2,527,000	$2,527,000
2	2,527							2,527,000	2,361,682
3	1,785	742						2,527,000	2,207,180
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
Project Open									
1								$0	$0
2								0	0
3								0	0
4								0	0
5								0	0
6								0	0
7								0	0
8								0	0
9								0	0
10								0	0
11								0	0
12								0	0
13								0	0
14								0	0
15								0	0
16								0	0
17								0	0
18								0	0
19								0	0
20								0	0
Total	$6,839	$742	$0	$0	$0	$0	$0	$7,581,000	$7,095,862

Present Value = Future Value (in Constant Dollars) / (1 + Real Discount Rate) ^ Year

2A

HIGHWAY SPEED AND VOLUME INPUTS

No Build

Year 1

Peak Period

	Calculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
HOV Volume	0		0	
Non-HOV Volume	18,267		18,267	
Weaving Volume	0		0	
Truck Volume	3,479		3,479	
HOV Speed	55.0		55.0	
Non-HOV Speed	74.7		74.7	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Non-Peak Period

Non-HOV Volume	37,425		37,425	
Weaving Volume	0		0	
Truck Volume	7,129		7,129	
Non-HOV Speed	75.0		75.0	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Year 20

Peak Period

HOV Volume	0		0	
Non-HOV Volume	23,585		23,585	
Weaving Volume	0		0	
Truck Volume	4,492		4,492	
HOV Speed	55.0		55.0	
Non-HOV Speed	71.2		71.2	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Non-Peak Period

Non-HOV Volume	48,319		48,319	
Weaving Volume	0		0	
Truck Volume	9,204		9,204	
Non-HOV Speed	75.0		75.0	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Build

Year 1

Peak Period

HOV Volume	0		0	
Non-HOV Volume	18,267		18,267	
Weaving Volume	0		0	
Truck Volume	3,479		3,479	
HOV Speed	55.0		55.0	
Non-HOV Speed	75.0		75.0	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Non-Peak Period

Non-HOV Volume	37,425		37,425	
Weaving Volume	0		0	
Truck Volume	7,129		7,129	
Non-HOV Speed	75.0		75.0	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Year 20

Peak Period

HOV Volume	0		0	
Non-HOV Volume	23,585		23,585	
Weaving Volume	0		0	
Truck Volume	4,492		4,492	
HOV Speed	55.0		55.0	
Non-HOV Speed	74.9		74.9	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Non-Peak Period

Non-HOV Volume	48,319		48,319	
Weaving Volume	0		0	
Truck Volume	9,204		9,204	
Non-HOV Speed	75.0		75.0	
Weaving Speed	55.0		55.0	
Truck Speed	60.0		60.0	

Model speed estimates based on Highway Capacity Manual, pavement research, and research on weaving impacts

2B

HIGHWAY ACCIDENT RATES

	Calculated by Model	Changed by User	Used for Proj. Eval.	Reason for Change
No Build				
Fatal Accidents	0.000		0.000	
Injury Accidents	0.16		0.16	
PDO Accidents	0.25		0.25	
Total Accidents	0.410			
Hwy Safety or Weaving Improvement		0%	collision reduction factor (per HSIP Guidelines)	
Adjustment Factor (Actual/Statewide Avg. Existing)				
Fatal Accidents	0.0000		0.0000	
Injury Accidents	54.2373		54.2373	
PDO Accidents	0.5297		0.5297	
Build				
Fatal Accidents	0.000		0.000	
Injury Accidents	0.05		0.05	
PDO Accidents	0.23		0.23	
Total Accidents	0.279			

2C

RAMP AND ARTERIAL INPUTS

(if detailed information is available for a TMS or an arterial signal management project)

Detailed Information Available? (y/n)	N	
Aggregate Segment Length (estimate as VMT/total volume)		
All Ramps		miles
Arterials		miles

	Entered by User	Used for Proj. Eval.	Source/Notes
No Build (Peak Period Only)			
Year 1			
Aggregate Ramp Volume		0	
Aggregate Arterial Volume		0	
Average Ramp Speed		5.0	
Average Arterial Speed		5.0	
Year 20			
Aggregate Ramp Volume		0	
Aggregate Arterial Volume		0	
Average Ramp Speed		5.0	
Average Arterial Speed		5.0	
Build (Peak Period Only)			
Year 1			
Aggregate Ramp Volume		0	
Aggregate Arterial Volume		0	
Average Ramp Speed		5.0	
Average Arterial Speed		5.0	
Year 20			
Aggregate Ramp Volume		0	
Aggregate Arterial Volume		0	
Average Ramp Speed		5.0	
Average Arterial Speed		5.0	

2D

ANNUAL PERSON-TRIPS

(for HOV and HOT lane projects that affect average vehicle occupancy)

	No Build	Build	Induced
Year 1			
Peak Period			
HOV Trips	0	0	
Non-HOV Trips	7,667,563	7,667,563	0
Truck Trips	1,269,990	1,269,990	0
Non-Peak Period			
Non-HOV Trips	18,987,586	18,987,586	0
Truck Trips	2,601,930	2,601,930	0
Total Trips	30,527,069	30,527,069	0
Year 20			
Peak Period			
HOV Trips	0	0	
Non-HOV Trips	9,899,599	9,899,599	0
Truck Trips	1,639,685	1,639,685	0
Non-Peak Period			
Non-HOV Trips	24,514,892	24,514,892	0
Truck Trips	3,359,355	3,359,355	0
Total Trips	39,413,531	39,413,531	0

District: 2

PROJECT: fix-5 Cascade Gateway

EA:	02-0H920
PPNO:	3597

3

INVESTMENT ANALYSIS

SUMMARY RESULTS

Life-Cycle Costs (mil. $)	$7.1
Life-Cycle Benefits (mil. $)	$23.4
Net Present Value (mil. $)	$16.3
Benefit / Cost Ratio:	3.3
Rate of Return on Investment:	24.1%
Payback Period:	4 years

ITEMIZED BENEFITS (mil. $)	Passenger Benefits	Freight Benefits	Total Over 20 Years	Average Annual
Travel Time Savings	$1.8	$0.0	$1.8	$0.1
Veh. Op. Cost Savings	$0.0	$0.0	$0.0	$0.0
Accident Cost Savings	$18.2	$3.5	$21.6	$1.1
Emission Cost Savings	$0.0	$0.0	$0.0	$0.0
TOTAL BENEFITS	$20.0	$3.5	$23.4	$1.2
Person-Hours of Time Saved			350,488	17,524

Should benefit-cost results include:

1) Induced Travel? (y/n)	Y	Default = Y
2) Vehicle Operating Costs? (y/n)	Y	Default = Y
3) Accident Costs? (y/n)	Y	Default = Y
4) Vehicle Emissions? (y/n) includes value for CO_2e	Y	Default = Y

	Tons		Value (mil. $)	
EMISSIONS REDUCTION	Total Over 20 Years	Average Annual	Total Over 20 Years	Average Annual
CO Emissions Saved	0	0	$0.0	$0.0
CO_2 Emissions Saved	0	0	$0.0	$0.0
NO_X Emissions Saved	0	0	$0.0	$0.0
PM_{10} Emissions Saved	0	0	$0.0	$0.0
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$0.0	$0.0
VOC Emissions Saved	0	0	$0.0	$0.0

C

SUMMARY OF TRAVEL TIME BENEFITS

Year	HIGHWAY								
	Peak HOV	Peak Non-HOV	Peak Weaving	Peak Truck	Peak Ramp	Peak Arterial	Non-Peak Non-HOV	Non-Peak Weaving	Non-Peak Truck
1	$0	$24,748	$0	$0	$0	$0	$0	$0	$0
20	$0	$114,474	$0	$0	$0	$0	$0	$0	$0
2	$0	$37,586	$0	$0	$0	$0	$0	$0	$0
3	$0	$49,104	$0	$0	$0	$0	$0	$0	$0
4	$0	$59,394	$0	$0	$0	$0	$0	$0	$0
5	$0	$68,540	$0	$0	$0	$0	$0	$0	$0
6	$0	$76,624	$0	$0	$0	$0	$0	$0	$0
7	$0	$83,724	$0	$0	$0	$0	$0	$0	$0
8	$0	$89,912	$0	$0	$0	$0	$0	$0	$0
9	$0	$95,257	$0	$0	$0	$0	$0	$0	$0
10	$0	$99,824	$0	$0	$0	$0	$0	$0	$0
11	$0	$103,675	$0	$0	$0	$0	$0	$0	$0
12	$0	$106,865	$0	$0	$0	$0	$0	$0	$0
13	$0	$109,451	$0	$0	$0	$0	$0	$0	$0
14	$0	$111,482	$0	$0	$0	$0	$0	$0	$0
15	$0	$113,005	$0	$0	$0	$0	$0	$0	$0
16	$0	$114,066	$0	$0	$0	$0	$0	$0	$0
17	$0	$114,706	$0	$0	$0	$0	$0	$0	$0
18	$0	$114,963	$0	$0	$0	$0	$0	$0	$0
19	$0	$114,874	$0	$0	$0	$0	$0	$0	$0
Total	**$0**	**$1,802,274**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

C

SUMMARY OF TRAVEL TIME BENEFITS (continued)

Year	TRANSIT				Present Value of Travel Time Benefits	Constant Dollars	Total Per-Hrs of Time Saved
	Peak In-Vehicle	Peak Out-of-Veh	Non-Peak In-Vehicle	Non-Peak Out-of-Veh			
1	$0	$0	$0	$0	$24,748	$30,317	2,135
20	$0	$0	$0	$0	$114,474	$507,165	35,716
2	$0	$0	$0	$0	$37,586	$49,268	3,470
3	$0	$0	$0	$0	$49,104	$68,872	4,850
4	$0	$0	$0	$0	$59,394	$89,134	6,277
5	$0	$0	$0	$0	$68,540	$110,060	7,751
6	$0	$0	$0	$0	$76,624	$131,655	9,271
7	$0	$0	$0	$0	$83,724	$153,923	10,840
8	$0	$0	$0	$0	$89,912	$176,871	12,456
9	$0	$0	$0	$0	$95,257	$200,502	14,120
10	$0	$0	$0	$0	$99,824	$224,824	15,833
11	$0	$0	$0	$0	$103,675	$249,840	17,594
12	$0	$0	$0	$0	$106,865	$275,556	19,405
13	$0	$0	$0	$0	$109,451	$301,978	21,266
14	$0	$0	$0	$0	$111,482	$329,112	23,177
15	$0	$0	$0	$0	$113,005	$356,962	25,138
16	$0	$0	$0	$0	$114,066	$385,535	27,150
17	$0	$0	$0	$0	$114,706	$414,836	29,214
18	$0	$0	$0	$0	$114,963	$444,870	31,329
19	$0	$0	$0	$0	$114,874	$475,645	33,496
Total	**$0**	**$0**	**$0**	**$0**	**$1,802,274**	**$4,976,925**	**350,488**

C

SUMMARY OF VEHICLE OPERATING COST BENEFITS

Year	HIGHWAY								TRANSIT		Present Value of Veh Op Cost Benefits	Constant Dollars
	Peak HOV	Peak Non-HOV	Peak Weaving	Peak Truck	Peak Arterial	Non-Peak Non-HOV	Non-Peak Weaving	Non-Peak Truck	Peak Period	Non-Peak Period		
1	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
20	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
2	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
3	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
4	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
5	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
6	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
7	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
8	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
9	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
10	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
11	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
14	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
15	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
16	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
18	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
19	$0	$0	$0	$0	$0	$0	$0	$0	-	-	$0	$0
Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**-**	**-**	**$0**	**$0**

C

SUMMARY OF ACCIDENT REDUCTION BENEFITS

Year	HIGHWAY								TRANSIT	Present Value of Accident Benefits	Constant Dollars
	Peak HOV	Peak Non-HOV	Peak Weaving	Peak Truck	Peak Arterial	Non-Peak Non-HOV	Non-Peak Weaving	Non-Peak Truck	All Periods		
1	$0	$472,621	$0	$90,023	$0	$968,297	$0	$184,438	$0	$1,715,379	$2,101,413
20	$0	$168,726	$0	$32,138	$0	$345,682	$0	$65,844	$0	$612,391	$2,713,137
2	$0	$448,469	$0	$85,423	$0	$918,815	$0	$175,012	$0	$1,627,720	$2,133,609
3	$0	$425,455	$0	$81,039	$0	$871,664	$0	$166,031	$0	$1,544,189	$2,165,805
4	$0	$403,532	$0	$76,863	$0	$826,749	$0	$157,476	$0	$1,464,621	$2,198,001
5	$0	$382,657	$0	$72,887	$0	$783,981	$0	$149,330	$0	$1,388,855	$2,230,197
6	$0	$362,786	$0	$69,102	$0	$743,270	$0	$141,575	$0	$1,316,733	$2,262,393
7	$0	$343,878	$0	$65,501	$0	$704,530	$0	$134,196	$0	$1,248,104	$2,294,589
8	$0	$325,890	$0	$62,074	$0	$667,678	$0	$127,177	$0	$1,182,819	$2,326,785
9	$0	$308,785	$0	$58,816	$0	$632,632	$0	$120,501	$0	$1,120,735	$2,358,981
10	$0	$292,523	$0	$55,719	$0	$599,315	$0	$114,155	$0	$1,061,711	$2,391,177
11	$0	$277,067	$0	$52,775	$0	$567,649	$0	$108,124	$0	$1,005,614	$2,423,373
12	$0	$262,381	$0	$49,977	$0	$537,561	$0	$102,393	$0	$952,312	$2,455,569
13	$0	$248,431	$0	$47,320	$0	$508,981	$0	$96,949	$0	$901,680	$2,487,765
14	$0	$235,183	$0	$44,797	$0	$481,839	$0	$91,779	$0	$853,598	$2,519,961
15	$0	$222,606	$0	$42,401	$0	$456,070	$0	$86,871	$0	$807,947	$2,552,157
16	$0	$210,667	$0	$40,127	$0	$431,611	$0	$82,212	$0	$764,617	$2,584,353
17	$0	$199,338	$0	$37,969	$0	$408,400	$0	$77,790	$0	$723,498	$2,616,549
18	$0	$188,590	$0	$35,922	$0	$386,379	$0	$73,596	$0	$684,486	$2,648,745
19	$0	$178,394	$0	$33,980	$0	$365,491	$0	$69,617	$0	$647,482	$2,680,941
Total	**$0**	**$5,957,980**	**$0**	**$1,134,853**	**$0**	**$12,206,593**	**$0**	**$2,325,065**	**$0**	**$21,624,492**	**$48,145,498**

C

SUMMARY OF EMISSION REDUCTION BENEFITS

Year	HIGHWAY								
	Peak HOV	Peak Non-HOV	Peak Weaving	Peak Truck	Peak Ramp	Peak Arterial	Non-Peak Non-HOV	Non-Peak Weaving	Non-Peak Truck
1	$0	$0	$0	$0	$0	$0	$0	$0	$0
20	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	$0	$0	$0	$0	$0	$0	$0	$0	$0
15	$0	$0	$0	$0	$0	$0	$0	$0	$0
16	$0	$0	$0	$0	$0	$0	$0	$0	$0
17	$0	$0	$0	$0	$0	$0	$0	$0	$0
18	$0	$0	$0	$0	$0	$0	$0	$0	$0
19	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

C

SUMMARY OF EMISSION REDUCTION BENEFITS (continued)

Year	TRANSIT				Present Value of Emission Benefits	Constant Dollars
	Peak Bus	Non-Peak Bus	Passenger Rail	Light Rail		
1	$0	$0	$0	$0	$0	$0
20	$0	$0	$0	$0	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0
4	$0	$0	$0	$0	$0	$0
5	$0	$0	$0	$0	$0	$0
6	$0	$0	$0	$0	$0	$0
7	$0	$0	$0	$0	$0	$0
8	$0	$0	$0	$0	$0	$0
9	$0	$0	$0	$0	$0	$0
10	$0	$0	$0	$0	$0	$0
11	$0	$0	$0	$0	$0	$0
12	$0	$0	$0	$0	$0	$0
13	$0	$0	$0	$0	$0	$0
14	$0	$0	$0	$0	$0	$0
15	$0	$0	$0	$0	$0	$0
16	$0	$0	$0	$0	$0	$0
17	$0	$0	$0	$0	$0	$0
18	$0	$0	$0	$0	$0	$0
19	$0	$0	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

C

SUMMARY OF EMISSION REDUCTION BENEFITS (continued)

Year	TONS EMISSIONS SAVED (tons/yr)						
	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
1	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**

C

SUMMARY OF EMISSION REDUCTION BENEFITS (continued)

Year	DOLLARS EMISSIONS SAVED (PV $/yr)					
	CO	CO_2	NO_X	PM_{10}	SO_X	VOC
1	$0	$0	$0	$0	$0	$0
20	$0	$0	$0	$0	$0	$0
2	$0	$0	$0	$0	$0	$0
3	$0	$0	$0	$0	$0	$0
4	$0	$0	$0	$0	$0	$0
5	$0	$0	$0	$0	$0	$0
6	$0	$0	$0	$0	$0	$0
7	$0	$0	$0	$0	$0	$0
8	$0	$0	$0	$0	$0	$0
9	$0	$0	$0	$0	$0	$0
10	$0	$0	$0	$0	$0	$0
11	$0	$0	$0	$0	$0	$0
12	$0	$0	$0	$0	$0	$0
13	$0	$0	$0	$0	$0	$0
14	$0	$0	$0	$0	$0	$0
15	$0	$0	$0	$0	$0	$0
16	$0	$0	$0	$0	$0	$0
17	$0	$0	$0	$0	$0	$0
18	$0	$0	$0	$0	$0	$0
19	$0	$0	$0	$0	$0	$0
Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

A

NET PRESENT VALUE CALCULATION

Year	PRESENT VALUE OF USER BENEFITS				PRESENT VALUE OF USER BENEFITS (road 2)			
	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions
Construction Period								
1								
2								
3								
4								
5								
6								
7								
8								
Project Open								
1	$24,748	$0	$1,715,379	$0				
2	$37,586	$0	$1,627,720	$0				
3	$49,104	$0	$1,544,189	$0				
4	$59,394	$0	$1,464,621	$0				
5	$68,540	$0	$1,388,855	$0				
6	$76,624	$0	$1,316,733	$0				
7	$83,724	$0	$1,248,104	$0				
8	$89,912	$0	$1,182,819	$0				
9	$95,257	$0	$1,120,735	$0				
10	$99,824	$0	$1,061,711	$0				
11	$103,675	$0	$1,005,614	$0				
12	$106,865	$0	$952,312	$0				
13	$109,451	$0	$901,680	$0				
14	$111,482	$0	$853,598	$0				
15	$113,005	$0	$807,947	$0				
16	$114,066	$0	$764,617	$0				
17	$114,706	$0	$723,498	$0				
18	$114,963	$0	$684,486	$0				
19	$114,874	$0	$647,482	$0				
20	$114,474	$0	$612,391	$0				
Total	$1,802,274	$0	$21,624,492	$0	$0	$0	$0	$0

350,488	Person-Hours of Time Saved		Person-Hours of Time Saved

tons	$ PV		tons	$ PV	
0	$0	CO Saved			CO Saved
0	$0	CO_2 Saved			CO_2 Saved
0	$0	NO_X Saved			NO_X Saved
0	$0	PM_{10} Saved			PM_{10} Saved
0		$PM_{2.5}$ Saved			$PM_{2.5}$ Saved
0	$0	SO_X Saved			SO_X Saved
0	$0	VOC Saved			VOC Saved

$0	$0	$3,459,919	$0				

PRESENT VALUE OF USER BENEFITS (road 3)				Present Value of Total User Benefits	Present Value of Total Project Costs	NET PRESENT VALUE
Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions			
				$0	$2,527,000	($2,527,000)
				$0	$2,361,682	($2,361,682)
				$0	$2,207,180	($2,207,180)
				$0	$0	$0
				$0	$0	$0
				$0	$0	$0
				$0	$0	$0
				$0	$0	$0
				$1,740,127	$0	$1,740,127
				$1,665,306	$0	$1,665,306
				$1,593,294	$0	$1,593,294
				$1,524,015	$0	$1,524,015
				$1,457,395	$0	$1,457,395
				$1,393,358	$0	$1,393,358
				$1,331,828	$0	$1,331,828
				$1,272,732	$0	$1,272,732
				$1,215,992	$0	$1,215,992
				$1,161,536	$0	$1,161,536
				$1,109,288	$0	$1,109,288
				$1,059,177	$0	$1,059,177
				$1,011,131	$0	$1,011,131
				$965,080	$0	$965,080
				$920,953	$0	$920,953
				$878,683	$0	$878,683
				$838,203	$0	$838,203
				$799,449	$0	$799,449
				$762,357	$0	$762,357
				$726,864	$0	$726,864
$0	$0	$0	$0	**$23,426,766**	**$7,095,862**	**$16,330,904**

	Person-Hours of Time Saved

tons	$ PV	
		CO Saved
		CO_2 Saved
		NO_X Saved
		PM_{10} Saved
		$PM_{2.5}$ Saved
		SO_X Saved
		VOC Saved

				Freight Benefits Only

B

INTERNAL RATE OF RETURN ON INVESTMENT AND PAYBACK PERIOD

Year	USER BENEFITS IN CONSTANT DOLLARS				USER BENEFITS IN CONSTANT DOLLARS (road 2)			
	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions
Construction Period								
1								
2								
3								
4								
5								
6								
7								
8								
Project Open								
1	$30,317	$0	$2,101,413	$0				
2	$49,268	$0	$2,133,609	$0				
3	$68,872	$0	$2,165,805	$0				
4	$89,134	$0	$2,198,001	$0				
5	$110,060	$0	$2,230,197	$0				
6	$131,655	$0	$2,262,393	$0				
7	$153,923	$0	$2,294,589	$0				
8	$176,871	$0	$2,326,785	$0				
9	$200,502	$0	$2,358,981	$0				
10	$224,824	$0	$2,391,177	$0				
11	$249,840	$0	$2,423,373	$0				
12	$275,556	$0	$2,455,569	$0				
13	$301,978	$0	$2,487,765	$0				
14	$329,112	$0	$2,519,961	$0				
15	$356,962	$0	$2,552,157	$0				
16	$385,535	$0	$2,584,353	$0				
17	$414,836	$0	$2,616,549	$0				
18	$444,870	$0	$2,648,745	$0				
19	$475,645	$0	$2,680,941	$0				
20	$507,165	$0	$2,713,137	$0				
Total	$4,976,925	$0	$48,145,498	$0	$0	$0	$0	$0

USER BENEFITS IN CONSTANT DOLLARS (road 3)				Total User Benefits in Constant Dollars	Total Project Costs in Constant Dollars	ANNUAL RETURNS ON INVESTMENT	CUMULATIVE RETURNS AFTER PROJ OPENS
Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions				
				$0	$2,527,000	($2,527,000)	
				$0	$2,527,000	($2,527,000)	
				$0	$2,527,000	($2,527,000)	
				$0	$0	$0	
				$0	$0	$0	
				$0	$0	$0	
				$0	$0	$0	
				$0	$0	$0	
				$2,131,730	$0	$2,131,730	$2,131,730
				$2,182,877	$0	$2,182,877	$4,314,607
				$2,234,677	$0	$2,234,677	$6,549,284
				$2,287,135	$0	$2,287,135	$8,836,419
				$2,340,257	$0	$2,340,257	$11,176,676
				$2,394,048	$0	$2,394,048	$13,570,724
				$2,448,512	$0	$2,448,512	$16,019,236
				$2,503,656	$0	$2,503,656	$18,522,892
				$2,559,483	$0	$2,559,483	$21,082,375
				$2,616,001	$0	$2,616,001	$23,698,376
				$2,673,213	$0	$2,673,213	$26,371,588
				$2,731,125	$0	$2,731,125	$29,102,714
				$2,789,743	$0	$2,789,743	$31,892,457
				$2,849,073	$0	$2,849,073	$34,741,530
				$2,909,119	$0	$2,909,119	$37,650,649
				$2,969,888	$0	$2,969,888	$40,620,536
				$3,031,384	$0	$3,031,384	$43,651,921
				$3,093,615	$0	$3,093,615	$46,745,536
				$3,156,586	$0	$3,156,586	$49,902,122
				$3,220,302	$0	$3,220,302	$53,122,423
$0	$0	$0	$0	**$53,122,423**	**$7,581,000**	**$45,541,423**	

Total Construction Costs **$7,581,000**

Years After Construction Begins	ANNUAL RETURNS ON INVESTMENT
1	($2,527,000)
2	($2,527,000)
3	($2,527,000)
4	$2,131,730
5	$2,182,877
6	$2,234,677
7	$2,287,135
8	$2,340,257
9	$2,394,048
10	$2,448,512
11	$2,503,656
12	$2,559,483
13	$2,616,001
14	$2,673,213
15	$2,731,125
16	$2,789,743
17	$2,849,073
18	$2,909,119
19	$2,969,888
20	$3,031,384
21	$3,093,615
22	$3,156,586
23	$3,220,302
24	$0
25	$0
26	$0
27	$0
28	$0

Internal Rate of Return **24.14%**

The INTERNAL RATE OF RETURN (IRR) is the discount rate at which benefits and costs break even (are equal). For a project with an IRR greater than the Discount Rate, benefits are greater than costs, and the project has a positive economic value. The IRR allows projects with different costs, different benefit flows, and different time periods to be compared.

Payback Period **4 years**

The PAYBACK PERIOD is the number of years it takes for the net benefits (benefits minus costs) to equal, or payback, the initial construction costs. For a project with a Payback Period longer than the life-cycle of the project, initial construction costs are not recovered. The Payback Period varies inversely with the Benefit-Cost Ratio: shorter Payback Period yields higher Benefit-Cost.

Parameters

This page contains all economic values and rate tables.
To update economic values automatically, change "Economic Update Factor."

General Economic Parameters

Year of Current Dollars for Model	2018	
Economic Update Factor (Using GDP Deflator)	1.00	1
Real Discount Rate	7.0%	2

Travel Time Parameters

	Value	Units	
Statewide Average Hourly Wage	$ 28.44	$/hr	3
Heavy and Light Truck Drivers			
Average Hourly Wage	$ 21.20	$/hr	3
Benefits and Costs	$ 11.08	$/hr	4
Value of Time			
Automobile	$ 14.20	$/hr/per	5
Truck	$ 32.30	$/hr/veh	5
Auto & Truck Composite	$ 19.70	$/hr/veh	6
Transit	$ 14.20	$/hr/per	5
Out-of-Vehicle Travel	2	times	5
Incident-Related Travel	3	times	7
Travel Time Uprater	0.0%	annual incr	

Vehicle Operating Cost Parameters

Average Fuel Price			
Automobile (regular unleaded)	$ 3.31	$/gal	8
Truck (diesel)	$ 3.44	$/gal	8
Sales and Fuel Taxes			
State Sales Tax (gasoline)	2.25%	%	9
State Sales Tax (diesel)	13.00%	%	9
Average Local Sales Tax	0.50%	%	9
Federal Fuel Excise Tax (gasoline)	$ 0.184	$/gal	9
Federal Fuel Excise Tax (diesel)	$ 0.244	$/gal	9
State Fuel Excise Tax (gasoline)	$ 0.417	$/gal	9
State Fuel Excise Tax (diesel)	$ 0.360	$/gal	9
Fuel Cost Per Gallon (Exclude Taxes)			
Automobile	$ 2.60	$/gal	
Truck	$ 2.45	$/gal	
Non-Fuel Cost Per Mile			
Automobile	$ 0.326	$/mi	10
Truck	$ 0.434	$/mi	11
Idling Speed for Op. Costs and Emissions	5	mph	

Accident Cost Parameters

Cost of a Fatality	$ 9,600,000	$/event	12
Cost of an Injury			
Level A (Severe)	$ 459,100	$/event	12
Level B (Moderate)	$ 125,000	$/event	12
Level C (Minor)	$ 63,900	$/event	12
Cost of Property Damage	$ 4,400	$/event	13
Cost of Highway Accident			
Fatal Accident	$ 11,100,000	$/accident	
Injury Accident	$ 154,600	$/accident	
PDO Accident	$ 14,000	$/accident	
Average Cost	$ 280,600	$/accident	
Statewide Highway Accident Rates			
Fatal Accident	0.006	per mil veh-mi	14
Injury Accident	0.29	per mil veh-mi	14
PDO Accident	0.55	per mil veh-mi	14
Non-Freeway	1.05	per mil veh-mi	15

Sources: 1) Office of Management and Budget (OMB), 2) Review of OMB and State Treasurer's Office data, 3) Bureau of Labor Statistics (BLS) OES, 4) BLS Employment Cost Index, 5) USDOT Department Guidance, 6) California Department of Transportation TSI and Traffic Operations, 7) IDAS model, 8) AAA Daily Fuel Gauge Report, 9) California Board of Equalization, 10) AAA Your Driving Costs, 11) American Transportation Research Institute, 12) USDOT VSL, 13) NHTSA, 14) TASAS summary 2013, 15) TASAS summary 2009

Highway Operations Parameters

	Value	Units	
Maximum V/C Ratio	1.56	-	16
Percent ADT in Peak Period	32.8%	%	
Percent ADT in Average Peak Hour	8.2%	%	
Annualization Factor	365	days/yr	

	Alpha	Beta	Capacity (vphpl)	Dep. Rate (vphpl)	
Freeway	0.20	10	2,000	1,800	16, 17
Expressway	0.20	10	2,000	1,800	16, 17
Conventional Highway	0.05	10	800	1,400	17
HOV Lanes	0.55	8	1,600		18

Non-HOV Lanes	Alpha	Beta	Capacity (vphpl)
No Build	0.20	10	2,000
Build	0.20	10	2,000

Sources: 16) Highway Capacity Manual, 17) NCHRP 387, 18) PeMS data

Active Transportation Parameters

General Travel Activity Characteristics Parameters	Value	Units	
Cycling Days per Year	365	days	
Walking Days per Year	365	days	
School Days per Year	180	days	
Vehicle Statistics			
Average Vehicle Speed	25	mph	
Average Vehicle Occupancy	1.25	persons / veh	*19*
Active Transportation User Characteristics			
Average Cycling Speed	11.80	mph	*20*
Average Walking Speed	3.00	mph	*21*
Number of Unlinked Cycling Trips per Day	1.93	trips	*19*
Number of Unlinked Pedestrian Trips per Day	2.38	trips	*19*
Diversion of Cyclists from Personal Vehicles	50%	assumption	
Diversion of Pedestrians from Personal Vehicles	50%	assumption	
Value of Travel Time			
Adults	$ 14.20	$/hr/per	
Children	$ 14.20	$/hr/per	
Cycling Journey Quality - Facility Preference Factors as Function of Distance by Facility Class			
Class I	0.57	-	*20*
Class II	0.49	-	*20*
Class III	0.92	-	*20*
Class IV	0.49	-	*20*
Note: Class IV assumed to be the same as Class II			
Walking Journey Quality Values per Mile by Amentity			
Street Lighting	$0.110	$/mi	*22*
Curb Level	$0.078	$/mi	*22*
Crowding	$0.055	$/mi	*22*
Pavement Evenness	$0.026	$/mi	*22*
Information Panels	$0.026	$/mi	*22*
Benches	$0.017	$/mi	*22*
Directional Signage	$0.017	$/mi	*22*
Health (Absenteeism Reduction)			
Average Absence of Employees	3.60	days/yr	*23*
Percentage Covered by Short-Term Sick Leave	95%	%	*24*
Percentage of Sick Days Reduced When Active at Least 30 Minutes per Day	6%	%	*25*
Health (Mortality Reduction)			
Percentage of Cyclists Aged 16-64	66.0%	%	*26*
Percentage of Pedestrians Aged 16-74	70.0%	%	*26*
Percentage Reduction in Mortality per 365 Annual Cycling Miles	4.5%	%	*27*
Percentage Reduction in Mortality per 365 Annual Walking Miles	9.0%	%	*27*
Morality Rate - All Causes (Aged 20-64)	266	#/100,000 people	*28*
Morality Rate - All Causes (Aged 20-74)	395	#/100,000 people	*28*

Sources: 19) 2000-2001 California Statewide Travel Survey, 20) Hood et al., 2011, 21) WHO HEAT Model, 2012, 22) Heuman et al., 2005, 23) CDC, 2007, 24) UK TAG, 2014, 25) WHO, 2003, 26) 2010-2012 California Household Transporation Survey, 27) WHO HEAT Model, 2016, 28) California Department of Health, 2010-2014 Death Rates, Table 5.2

Travel Demand Tables

Project Types

Highway Capacity Expansion			Please select a type of highway project
General Highway	TRUE	GenHwy	
HOV Lane Addition	FALSE	HOV	Enter HOV restriction in section 1B
HOT Lane Addition	FALSE	HOT	Include toll payers as HOVs & check AVOs
Passing Lane	FALSE	Passing	Enter a truck speed in section 1B
Intersection	FALSE	Intersect	Remember to run model for both roads
Truck Only Lane	FALSE	TruckLane	Remember to run macro for truck lane
Bypass	FALSE	Bypass	Remember to run model for both roads
Queuing	FALSE	Queuing	Add arrival rate & check departure rate in 1B
Pavement	FALSE	Pavement	Enter pavement condition in section 1B
Rail or Transit Cap Expansion			Please select a type of rail or transit project
Passenger Rail	FALSE	PassRail	Enter data in both sections 1B & 1E
Light-Rail (LRT)	FALSE	LRT	Enter data in both sections 1B & 1E
Bus	FALSE	Bus	Enter data in both sections 1B & 1E
Hwy-Rail Grade Crossing	FALSE	HwyRail	Put hwy design in 1B, safety in 1C & crossing in 1D
Hwy Operational Improvement			Please select a type of op. improvement
Auxiliary Lane	FALSE	AuxLane	Enter ramp design speed & on-ramp volume
Freeway Connector	FALSE	FreeConn	Check percent traffic in weave in section 1B
HOV Connector	FALSE	HOVConn	Check percent traffic in weave in section 1B
HOV Drop Ramp	FALSE	HOVDrop	Check percent traffic in weave in section 1B
Off-Ramp Widening	FALSE	OffRamp	Check percent traffic in weave in section 1B
On-Ramp Widening	FALSE	OnRamp	Enter on-ramp volume & metering strategy
HOV-2 to HOV-3 Conv	FALSE	HOV2to3	Check AVOs & trips in sections 1B & 2D
HOT Lane Conversion	FALSE	HOTConv	Check AVOs & trips in sections 1B & 2D
Transp Mgmt Systems (TMS)			Please select a type of TMS project
Ramp Metering	FALSE	RM	Enter model data, if avail, in sections 2A & 2C
Ramp Metering Signal Coord	FALSE	AM	Enter model data, if avail, in sections 2A & 2C
Incident Management	FALSE	IM	Enter model data, if avail, in sections 2A & 2C
Traveler Information	FALSE	TI	Enter model data, if avail, in sections 2A & 2C
Arterial Signal Management	FALSE	ASM	Complete only sections 1A, 1E & 2C
Transit Vehicle Location (AVL)	FALSE	AVL	Enter transit agency costs in section 1D
Transit Vehicle Signal Priority	FALSE	SigPriority	Check travel time in section 1D
Bus Rapid Transit (BRT)	FALSE	BRT	Enter free-flow bus lane speed in section 1B
TMS Lookup Code	NoAdj	TMSLookup	
User Modified Inputs	FALSE	UserAdjInputs	

DEMAND FOR TRAVEL IN PEAK PERIOD

(percent of total daily travel)

Number of Hours in Peak Period	Urban				Rural	
	So. California		No. California			
	Fwy/Exp	Other	Fwy/Exp	Other	Fwy/Exp	Other
1	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%
2	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%
3	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
4	32.8%	32.8%	32.8%	32.8%	32.8%	32.8%
5	40.3%	40.3%	40.3%	40.3%	40.3%	40.3%
6	47.4%	47.4%	47.4%	47.4%	47.4%	47.4%
7	54.2%	54.2%	54.2%	54.2%	54.2%	54.2%
8	60.8%	60.8%	60.8%	60.8%	60.8%	60.8%
9	67.1%	67.1%	67.1%	67.1%	67.1%	67.1%
10	73.4%	73.4%	73.4%	73.4%	73.4%	73.4%
11	79.0%	79.0%	79.0%	79.0%	79.0%	79.0%
12	84.3%	84.3%	84.3%	84.3%	84.3%	84.3%
13	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%
14	91.6%	91.6%	91.6%	91.6%	91.6%	91.6%
15	94.3%	94.3%	94.3%	94.3%	94.3%	94.3%
16	96.4%	96.4%	96.4%	96.4%	96.4%	96.4%
17	97.6%	97.6%	97.6%	97.6%	97.6%	97.6%
18	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%
19	99.1%	99.1%	99.1%	99.1%	99.1%	99.1%
20	99.4%	99.4%	99.4%	99.4%	99.4%	99.4%
21	99.7%	99.7%	99.7%	99.7%	99.7%	99.7%
22	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%
23	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%
24	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: California Department of Transportation, 2010-2012 California Household Travel Survey, Final Report Appendix, June 2013

AGE COHORTS FOR MORTALITY RISK REDUCTION

(percent of population)

Mode	Age Cohort	Urban		Rural
		South	North	
Cycling	Age 16-64	70.5%	73.4%	66.0%
Walking	Age 16-74	76.2%	80.7%	70.0%

AVERAGE DISTANCE PER ACTIVE TRANSPORTATION TRIP

(miles/trip)

Mode	Age Cohort	Urban		Rural
		South	North	
Cycling	Adults	1.83	1.85	2.91
	Children <16	0.88	1.03	1.66
Walking	Adults	0.52	0.66	0.29
	Children <16	0.46	0.58	0.42

TRIP PURPOSE FOR ACTIVE TRANSPORTATION TRIPS

(percent of trips)

Mode	Trip Purpose	Urban		Rural
		South	North	
Cycling	Commuting	8%	11%	7%
	Recreation	15%	13%	15%
	Other Destination	77%	76%	78%
Walking	Commuting	5%	9%	4%
	Recreation	10%	10%	15%
	Other Destination	85%	81%	81%

Source: California Department of Transportation, 2010-2012 California Household Travel Survey database, 2012

Operating Cost Tables

FUEL CONSUMPTION RATES

(gal/veh-mi)

Speed	Auto*	Truck
5	0.1024	0.2112
6	0.0971	0.2056
7	0.0919	0.2000
8	0.0867	0.1944
9	0.0815	0.1888
10	0.0763	0.1832
11	0.0727	0.1707
12	0.0691	0.1583
13	0.0656	0.1459
14	0.0620	0.1335
15	0.0584	0.1211
16	0.0560	0.1181
17	0.0536	0.1150
18	0.0513	0.1120
19	0.0489	0.1089
20	0.0465	0.1059
21	0.0449	0.1011
22	0.0433	0.0963
23	0.0417	0.0916
24	0.0401	0.0868
25	0.0384	0.0821
26	0.0374	0.0804
27	0.0363	0.0788
28	0.0352	0.0771
29	0.0341	0.0755
30	0.0330	0.0738
31	0.0323	0.0750
32	0.0316	0.0763
33	0.0310	0.0774
34	0.0303	0.0786
35	0.0296	0.0799
36	0.0292	0.0796
37	0.0288	0.0794
38	0.0284	0.0792
39	0.0280	0.0790
40	0.0276	0.0788
41	0.0274	0.0796
42	0.0272	0.0804
43	0.0270	0.0812
44	0.0268	0.0820
45	0.0266	0.0828
46	0.0266	0.0826
47	0.0266	0.0824
48	0.0266	0.0821
49	0.0266	0.0819
50	0.0266	0.0817
51	0.0268	0.0826
52	0.0270	0.0834
53	0.0272	0.0842
54	0.0274	0.0850
55	0.0275	0.0858
56	0.0279	0.0839
57	0.0283	0.0820
58	0.0286	0.0802
59	0.0290	0.0783
60	0.0293	0.0764
61	0.0300	0.0756
62	0.0306	0.0749
63	0.0312	0.0741
64	0.0319	0.0734
65	0.0325	0.0726
66	0.0331	0.0765
67	0.0337	0.0804
68	0.0343	0.0842
69	0.0350	0.0881
70	0.0356	0.0920

** Includes motorcycles & motorhomes*
Note: Five mph is best estimate for idling

Source: California Air Resources Board, EMFAC2014, 2016 & 2036 average

Accident Tables

HIGHWAY INJURY SEVERITY FREQUENCY
(percent of injuries)

Event	Urban	Suburban	Rural	Average
Severe Injury (A)	4.78%	4.78%	4.78%	4.78%
Other Visible Injury (B)	25.54%	25.54%	25.54%	25.54%
Complaint of Pain (C)	69.68%	69.68%	69.68%	69.68%

Source: 2013 SWITRS Annual Report, Table 8C

RATES FOR NON-HIGHWAY ACCIDENT EVENTS
(events/million veh-mi)

Event	Pass Train	Light Rail	Bus	Freight Rail
Fatality	0.0555	0.2480	0.0349	0.9917
Injury	0.2519	3.9469	3.6535	7.7862
All Accidents	0.2775	5.3817	2.6733	13.5424

Sources: USDOT,Transportation Statistics Annual Report, Table 2-33, 2003 to 2012 average
FRA, Office of Safety Analysis, Table 1.13, 2008 to 2017 YTD average.

NUMBER OF FATALITIES
(events/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	1.09	1.08	1.14	1.11

NUMBER OF INJURIES
(events/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	0.81	0.82	1.12	0.95
Injury Accident	1.44	1.43	1.50	1.44

NUMBER OF VEHICLES INVOLVED
(events/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	1.51	1.69	1.58	1.63
Injury Accident	1.82	2.10	1.59	1.99
PDO Accident	1.80	2.03	1.59	1.96

DISTRIBUTION OF ACCIDENT TYPES
(percent of accidents)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	1.18%	0.45%	1.92%	0.71%
Injury Accident	34.93%	33.09%	38.25%	33.98%
PDO Accident	63.89%	66.45%	59.83%	65.31%

Source: California Department of Transportation,TASAS Unit, 2010 to 2013 average

COST OF NON-HIGHWAY ACCIDENT EVENTS
($/event)

Event	Pass Train	Light Rail	Bus	Freight Rail
Fatality	$9,600,000	$9,600,000	$9,600,000	$9,600,000
Injury	$177,700	$177,700	$177,700	$177,700
Prop Damage	$78,800	$12,400	$3,800	$147,600

Sources: FTA, Transit Safety & Security Statistics, 2002 to 2011 average
FRA, Office of Safety Analysis, Table 3.16, 2014 to 2016 average.

COSTS OF NON-HIGHWAY ACCIDENTS
($/million veh-mi)

Value	Pass Train	Light Rail	Bus	Freight Rail
Cost	$599,400	$3,148,900	$994,400	$12,902,800

Source: Combination of above two tables

HIGHWAY-RAIL GRADE CROSSING INCIDENTS
(units in table)

Value	Incident	Fatality	Injury
Total Events	799	94	515
Avg per Incident		0.1176	0.6446
Cost per Event		$9,600,000	$177,700

Source: FRA, Office of Safety Analysis, 5.10 - Hwy/Rail Incidents Summary Table, California, Motor Vehicles, Public Crossings, Jan 2007 to Dec 2016

COST OF HIGHWAY ACCIDENTS
($/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	$10,600,000	$10,500,000	$11,100,000	$10,800,000
Injury Accident	$149,700	$149,900	$154,600	$150,400
PDO Accident	$15,800	$17,900	$14,000	$17,200
All Types	$187,500	$108,700	$280,600	$139,000

Source: Combination of above four tables

PASSING LANE ACCIDENT REDUCTION FACTORS
(rate with passing lane/rate without passing lane)

Minimum ADT	Fatality	Injury	PDO
0	25.0%	69.4%	92.6%
5,000	19.2%	80.3%	96.5%
10,000	84.0%	57.7%	97.8%

Source: Taylor and Jain, 1991

Emissions Tables

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2016

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	3.4104	81.98	0.2740	0.0028	0.0009	0.2826	0.0026
	5	3.6818	1213.16	0.3465	0.0133	0.0122	0.3386	0.0123
	6	3.5051	1148.57	0.3282	0.0123	0.0115	0.3105	0.0114
	7	3.3284	1083.98	0.3099	0.0113	0.0109	0.2824	0.0104
	8	3.1516	1019.40	0.2917	0.0103	0.0102	0.2543	0.0095
	9	2.9749	954.81	0.2734	0.0093	0.0096	0.2262	0.0086
	10	2.7982	890.22	0.2552	0.0083	0.0089	0.1982	0.0077
	11	2.7335	850.65	0.2497	0.0078	0.0085	0.1864	0.0072
	12	2.6688	811.08	0.2443	0.0072	0.0081	0.1747	0.0067
	13	2.6041	771.51	0.2389	0.0067	0.0077	0.1630	0.0062
	14	2.5395	731.95	0.2335	0.0062	0.0073	0.1512	0.0057
	15	2.4748	692.38	0.2281	0.0056	0.0070	0.1395	0.0052
	16	2.4099	664.13	0.2225	0.0053	0.0067	0.1314	0.0049
	17	2.3450	635.88	0.2168	0.0050	0.0064	0.1232	0.0046
	18	2.2801	607.62	0.2112	0.0047	0.0061	0.1150	0.0043
	19	2.2153	579.37	0.2056	0.0044	0.0058	0.1069	0.0040
	20	2.1504	551.12	0.1999	0.0040	0.0055	0.0987	0.0037
	21	2.0928	532.04	0.1948	0.0038	0.0053	0.0934	0.0035
	22	2.0353	512.95	0.1897	0.0036	0.0052	0.0881	0.0033
	23	1.9777	493.87	0.1846	0.0034	0.0050	0.0828	0.0031
	24	1.9202	474.78	0.1795	0.0032	0.0048	0.0775	0.0029
	25	1.8626	455.70	0.1744	0.0030	0.0046	0.0722	0.0027
	26	1.8252	442.81	0.1719	0.0028	0.0045	0.0693	0.0026
	27	1.7878	429.93	0.1693	0.0027	0.0043	0.0663	0.0025
	28	1.7504	417.04	0.1668	0.0026	0.0042	0.0633	0.0024
	29	1.7130	404.16	0.1643	0.0024	0.0041	0.0603	0.0023
	30	1.6756	391.27	0.1617	0.0023	0.0039	0.0573	0.0021
	31	1.6579	383.46	0.1613	0.0022	0.0039	0.0559	0.0021
	32	1.6402	375.65	0.1608	0.0022	0.0038	0.0544	0.0020
	33	1.6225	367.83	0.1603	0.0021	0.0037	0.0529	0.0019
	34	1.6048	360.02	0.1598	0.0020	0.0036	0.0515	0.0019
	35	1.5870	352.21	0.1593	0.0019	0.0035	0.0500	0.0018
	36	1.5734	347.40	0.1594	0.0019	0.0035	0.0491	0.0017
	37	1.5598	342.60	0.1594	0.0018	0.0034	0.0482	0.0017
	38	1.5462	337.79	0.1594	0.0018	0.0034	0.0474	0.0017
	39	1.5326	332.99	0.1594	0.0017	0.0033	0.0465	0.0016
	40	1.5190	328.18	0.1594	0.0017	0.0033	0.0456	0.0016
	41	1.5076	325.84	0.1598	0.0017	0.0033	0.0452	0.0015
	42	1.4963	323.50	0.1602	0.0016	0.0033	0.0449	0.0015
	43	1.4849	321.16	0.1607	0.0016	0.0032	0.0445	0.0015
	44	1.4736	318.82	0.1611	0.0016	0.0032	0.0441	0.0015
	45	1.4622	316.48	0.1615	0.0016	0.0032	0.0438	0.0015
	46	1.4550	316.61	0.1623	0.0016	0.0032	0.0438	0.0014
	47	1.4478	316.74	0.1631	0.0016	0.0032	0.0438	0.0014
	48	1.4405	316.87	0.1639	0.0016	0.0032	0.0437	0.0014
	49	1.4333	317.01	0.1647	0.0015	0.0032	0.0437	0.0014
	50	1.4261	317.14	0.1655	0.0015	0.0032	0.0437	0.0014
	51	1.4181	319.34	0.1663	0.0015	0.0032	0.0439	0.0014
	52	1.4101	321.54	0.1671	0.0015	0.0032	0.0442	0.0014
	53	1.4022	323.75	0.1678	0.0016	0.0033	0.0444	0.0014
	54	1.3942	325.95	0.1686	0.0016	0.0033	0.0446	0.0014
	55	1.3862	328.15	0.1694	0.0016	0.0033	0.0448	0.0014
	56	1.3680	332.21	0.1680	0.0016	0.0033	0.0448	0.0015
	57	1.3497	336.27	0.1666	0.0016	0.0034	0.0448	0.0015
	58	1.3315	340.33	0.1651	0.0016	0.0034	0.0448	0.0015
	59	1.3132	344.39	0.1637	0.0016	0.0035	0.0448	0.0015
	60	1.2950	348.45	0.1623	0.0016	0.0035	0.0448	0.0015
	61	1.3020	356.51	0.1640	0.0017	0.0036	0.0462	0.0015
	62	1.3089	364.56	0.1658	0.0017	0.0037	0.0477	0.0016
	63	1.3159	372.62	0.1675	0.0017	0.0037	0.0491	0.0016
	64	1.3229	380.68	0.1693	0.0018	0.0038	0.0505	0.0016
	65	1.3299	388.74	0.1710	0.0018	0.0039	0.0519	0.0017
	66	1.3750	397.41	0.1757	0.0018	0.0040	0.0544	0.0017
	67	1.4201	406.07	0.1804	0.0019	0.0041	0.0568	0.0017
	68	1.4653	414.74	0.1850	0.0019	0.0042	0.0592	0.0018
	69	1.5104	423.41	0.1897	0.0019	0.0043	0.0616	0.0018
	70	1.5555	432.08	0.1944	0.0020	0.0043	0.0640	0.0018

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2036

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	0.6940	45.66	0.0331	0.0014	0.0005	0.0462	0.0013
	5	1.0344	735.07	0.0699	0.0066	0.0074	0.1171	0.0061
	6	1.0041	696.96	0.0674	0.0061	0.0070	0.1088	0.0056
	7	0.9737	658.86	0.0650	0.0056	0.0066	0.1004	0.0052
	8	0.9434	620.76	0.0626	0.0051	0.0062	0.0920	0.0047
	9	0.9130	582.66	0.0601	0.0046	0.0058	0.0837	0.0043
	10	0.8827	544.56	0.0577	0.0041	0.0054	0.0753	0.0038
	11	0.8622	519.72	0.0564	0.0039	0.0052	0.0706	0.0036
	12	0.8416	494.88	0.0550	0.0036	0.0050	0.0659	0.0033
	13	0.8211	470.04	0.0537	0.0033	0.0047	0.0612	0.0030
	14	0.8006	445.20	0.0524	0.0030	0.0045	0.0565	0.0028
	15	0.7800	420.36	0.0510	0.0028	0.0042	0.0517	0.0025
	16	0.7621	403.50	0.0499	0.0026	0.0040	0.0486	0.0024
	17	0.7441	386.63	0.0489	0.0024	0.0039	0.0456	0.0022
	18	0.7261	369.76	0.0478	0.0023	0.0037	0.0425	0.0021
	19	0.7082	352.89	0.0467	0.0021	0.0035	0.0394	0.0019
	20	0.6902	336.02	0.0456	0.0019	0.0034	0.0363	0.0018
	21	0.6767	324.45	0.0448	0.0018	0.0032	0.0345	0.0017
	22	0.6632	312.87	0.0440	0.0017	0.0031	0.0327	0.0016
	23	0.6497	301.30	0.0431	0.0016	0.0030	0.0309	0.0015
	24	0.6362	289.73	0.0423	0.0015	0.0029	0.0291	0.0014
	25	0.6227	278.16	0.0415	0.0014	0.0028	0.0273	0.0013
	26	0.6110	270.26	0.0409	0.0014	0.0027	0.0261	0.0013
	27	0.5993	262.35	0.0402	0.0013	0.0026	0.0250	0.0012
	28	0.5877	254.45	0.0395	0.0012	0.0025	0.0238	0.0011
	29	0.5760	246.55	0.0389	0.0012	0.0025	0.0227	0.0011
	30	0.5643	238.64	0.0382	0.0011	0.0024	0.0215	0.0010
	31	0.5571	233.62	0.0380	0.0011	0.0023	0.0208	0.0010
	32	0.5500	228.61	0.0378	0.0010	0.0023	0.0201	0.0009
	33	0.5428	223.59	0.0376	0.0010	0.0022	0.0194	0.0009
	34	0.5356	218.57	0.0374	0.0010	0.0022	0.0187	0.0009
	35	0.5284	213.55	0.0372	0.0009	0.0021	0.0180	0.0008
	36	0.5216	210.51	0.0370	0.0009	0.0021	0.0176	0.0008
	37	0.5148	207.47	0.0368	0.0009	0.0021	0.0171	0.0008
	38	0.5079	204.43	0.0366	0.0008	0.0020	0.0167	0.0008
	39	0.5011	201.39	0.0364	0.0008	0.0020	0.0162	0.0008
	40	0.4943	198.35	0.0362	0.0008	0.0020	0.0158	0.0007
	41	0.4899	196.95	0.0362	0.0008	0.0020	0.0156	0.0007
	42	0.4855	195.54	0.0362	0.0008	0.0020	0.0155	0.0007
	43	0.4811	194.14	0.0363	0.0008	0.0019	0.0154	0.0007
	44	0.4768	192.74	0.0363	0.0007	0.0019	0.0152	0.0007
	45	0.4724	191.33	0.0363	0.0007	0.0019	0.0151	0.0007
	46	0.4679	191.33	0.0364	0.0007	0.0019	0.0150	0.0007
	47	0.4634	191.33	0.0364	0.0007	0.0019	0.0149	0.0007
	48	0.4589	191.33	0.0364	0.0007	0.0019	0.0149	0.0007
	49	0.4544	191.33	0.0364	0.0007	0.0019	0.0148	0.0007
	50	0.4500	191.32	0.0365	0.0007	0.0019	0.0147	0.0006
	51	0.4455	192.68	0.0365	0.0007	0.0019	0.0148	0.0007
	52	0.4410	194.05	0.0365	0.0007	0.0019	0.0148	0.0007
	53	0.4365	195.41	0.0365	0.0007	0.0020	0.0149	0.0007
	54	0.4320	196.77	0.0365	0.0007	0.0020	0.0150	0.0007
	55	0.4275	198.13	0.0365	0.0007	0.0020	0.0150	0.0007
	56	0.4226	200.79	0.0363	0.0007	0.0020	0.0152	0.0007
	57	0.4178	203.46	0.0362	0.0007	0.0020	0.0154	0.0007
	58	0.4130	206.12	0.0360	0.0007	0.0021	0.0156	0.0007
	59	0.4082	208.79	0.0359	0.0008	0.0021	0.0157	0.0007
	60	0.4034	211.45	0.0358	0.0008	0.0021	0.0159	0.0007
	61	0.4063	215.99	0.0367	0.0008	0.0022	0.0166	0.0007
	62	0.4093	220.54	0.0377	0.0008	0.0022	0.0173	0.0007
	63	0.4123	225.08	0.0387	0.0008	0.0023	0.0180	0.0008
	64	0.4152	229.62	0.0396	0.0008	0.0023	0.0188	0.0008
	65	0.4182	234.17	0.0406	0.0009	0.0023	0.0195	0.0008
	66	0.4203	238.62	0.0401	0.0009	0.0024	0.0197	0.0008
	67	0.4224	243.08	0.0396	0.0009	0.0024	0.0200	0.0008
	68	0.4246	247.54	0.0391	0.0009	0.0025	0.0203	0.0008
	69	0.4267	252.00	0.0386	0.0009	0.0025	0.0206	0.0008
	70	0.4288	256.46	0.0382	0.0009	0.0026	0.0209	0.0009

Emissions Tables

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2016

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	3.4104	81.98	0.2740	0.0028	0.0009	0.2826	0.0026
	5	3.6818	1213.16	0.3465	0.0133	0.0122	0.3386	0.0123
	6	3.5051	1148.57	0.3282	0.0123	0.0115	0.3105	0.0114
	7	3.3284	1083.98	0.3099	0.0113	0.0109	0.2824	0.0104
	8	3.1516	1019.40	0.2917	0.0103	0.0102	0.2543	0.0095
Truck	0	4.8572	39.19	1.7997	0.0015	0.2774	0.4175	0.0013
	5	5.1803	2187.60	7.9756	0.1137	0.0202	1.0547	0.1087
	6	4.9501	2147.78	7.8499	0.1140	0.0199	1.0224	0.1089
	7	4.7200	2107.96	7.7242	0.1143	0.0195	0.9901	0.1092
	8	4.4898	2068.13	7.5986	0.1146	0.0192	0.9579	0.1095
	9	4.2597	2028.31	7.4729	0.1148	0.0189	0.9256	0.1098
	10	4.0295	1988.49	7.3473	0.1151	0.0185	0.8934	0.1101
	11	3.7759	1843.50	6.7599	0.1061	0.0173	0.8082	0.1015
	12	3.5223	1698.51	6.1725	0.0972	0.0160	0.7230	0.0929
	13	3.2687	1553.51	5.5851	0.0882	0.0147	0.6378	0.0843
	14	3.0151	1408.52	4.9977	0.0792	0.0134	0.5525	0.0757
	15	2.7615	1263.53	4.4103	0.0703	0.0121	0.4673	0.0671
	16	2.6560	1263.49	4.4801	0.0705	0.0121	0.4442	0.0674
	17	2.5504	1263.44	4.5499	0.0708	0.0121	0.4210	0.0677
	18	2.4449	1263.40	4.6197	0.0711	0.0121	0.3979	0.0679
	19	2.3394	1263.35	4.6895	0.0713	0.0121	0.3747	0.0682
	20	2.2339	1263.31	4.7593	0.0716	0.0121	0.3516	0.0685
	21	2.1458	1237.01	4.6190	0.0677	0.0119	0.3310	0.0647
	22	2.0577	1210.72	4.4786	0.0637	0.0116	0.3105	0.0610
	23	1.9697	1184.43	4.3383	0.0598	0.0114	0.2900	0.0572
	24	1.8816	1158.13	4.1979	0.0559	0.0111	0.2695	0.0534
	25	1.7935	1131.84	4.0576	0.0520	0.0108	0.2489	0.0497
	26	1.7441	1138.52	4.0783	0.0519	0.0109	0.2424	0.0496
	27	1.6947	1145.20	4.0990	0.0518	0.0110	0.2358	0.0495
	28	1.6453	1151.87	4.1197	0.0517	0.0110	0.2293	0.0495
	29	1.5959	1158.55	4.1404	0.0517	0.0111	0.2227	0.0494
	30	1.5465	1165.23	4.1611	0.0516	0.0111	0.2162	0.0493
	31	1.5050	1199.22	4.2631	0.0526	0.0114	0.2128	0.0503
	32	1.4634	1233.21	4.3651	0.0537	0.0117	0.2095	0.0513
	33	1.4219	1267.20	4.4671	0.0547	0.0120	0.2061	0.0524
	34	1.3803	1301.19	4.5691	0.0558	0.0123	0.2028	0.0534
	35	1.3387	1335.18	4.6711	0.0568	0.0126	0.1994	0.0544
	36	1.3027	1331.17	4.6418	0.0575	0.0126	0.1934	0.0550
	37	1.2667	1327.17	4.6126	0.0581	0.0125	0.1873	0.0556
	38	1.2306	1323.16	4.5833	0.0587	0.0125	0.1812	0.0562
	39	1.1946	1319.16	4.5540	0.0593	0.0125	0.1751	0.0567
	40	1.1586	1315.15	4.5247	0.0599	0.0125	0.1690	0.0573
	41	1.1260	1312.39	4.5116	0.0598	0.0124	0.1638	0.0572
	42	1.0934	1309.62	4.4984	0.0597	0.0124	0.1585	0.0571
	43	1.0609	1306.85	4.4852	0.0596	0.0124	0.1533	0.0570
	44	1.0283	1304.08	4.4720	0.0594	0.0124	0.1480	0.0569
	45	0.9958	1301.32	4.4589	0.0593	0.0124	0.1428	0.0567
	46	0.9927	1264.42	4.3777	0.0582	0.0120	0.1381	0.0556
	47	0.9897	1227.52	4.2964	0.0570	0.0117	0.1334	0.0545
	48	0.9866	1190.62	4.2152	0.0559	0.0114	0.1287	0.0534
	49	0.9836	1153.73	4.1340	0.0547	0.0110	0.1240	0.0523
	50	0.9805	1116.83	4.0528	0.0535	0.0107	0.1193	0.0512
	51	0.9565	1133.04	4.1049	0.0565	0.0109	0.1190	0.0541
	52	0.9324	1149.25	4.1569	0.0595	0.0110	0.1188	0.0569
	53	0.9083	1165.46	4.2090	0.0625	0.0112	0.1185	0.0597
	54	0.8842	1181.67	4.2610	0.0654	0.0113	0.1182	0.0626
	55	0.8601	1197.87	4.3131	0.0684	0.0115	0.1179	0.0654
	56	0.8633	1184.58	4.2356	0.0702	0.0114	0.1175	0.0672
	57	0.8665	1171.29	4.1582	0.0721	0.0112	0.1170	0.0689
	58	0.8696	1158.00	4.0807	0.0739	0.0111	0.1166	0.0707
	59	0.8728	1144.71	4.0032	0.0757	0.0110	0.1162	0.0725
	60	0.8760	1131.42	3.9257	0.0776	0.0109	0.1157	0.0742
	61	0.8894	1131.74	3.9251	0.0750	0.0109	0.1151	0.0718
	62	0.9028	1132.07	3.9244	0.0725	0.0109	0.1145	0.0694
	63	0.9163	1132.39	3.9237	0.0700	0.0109	0.1139	0.0669
	64	0.9297	1132.72	3.9230	0.0674	0.0109	0.1133	0.0645
	65	0.9431	1133.04	3.9224	0.0649	0.0109	0.1127	0.0621
	66	0.9190	1151.08	3.9095	0.0614	0.0110	0.1098	0.0587
	67	0.8949	1169.12	3.8966	0.0579	0.0112	0.1070	0.0554
	68	0.8707	1187.17	3.8837	0.0544	0.0114	0.1042	0.0521
	69	0.8466	1205.21	3.8708	0.0509	0.0115	0.1014	0.0487
	70	0.8225	1223.25	3.8579	0.0475	0.0117	0.0986	0.0454

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2036

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	0.6940	45.66	0.0331	0.0014	0.0005	0.0462	0.0013
	5	1.0344	735.07	0.0699	0.0066	0.0074	0.1171	0.0061
	6	1.0041	696.96	0.0674	0.0061	0.0070	0.1088	0.0056
	7	0.9737	658.86	0.0650	0.0056	0.0066	0.1004	0.0052
	8	0.9434	620.76	0.0626	0.0051	0.0062	0.0920	0.0047
Truck	0	1.8187	31.73	3.5930	0.0006	0.0003	0.1107	0.0005
	5	4.6433	2312.07	10.1441	0.0129	0.0198	0.4427	0.0123
	6	4.3680	2256.43	9.6372	0.0124	0.0194	0.4211	0.0119
	7	4.0927	2200.78	9.1303	0.0120	0.0190	0.3996	0.0114
	8	3.8174	2145.13	8.6234	0.0115	0.0186	0.3780	0.0109
	9	3.5421	2089.48	8.1165	0.0110	0.0183	0.3564	0.0105
	10	3.2668	2033.84	7.6096	0.0105	0.0179	0.3349	0.0100
	11	2.9097	1905.69	6.8507	0.0103	0.0169	0.3092	0.0098
	12	2.5527	1777.54	6.0919	0.0100	0.0159	0.2835	0.0096
	13	2.1957	1649.39	5.3330	0.0098	0.0150	0.2578	0.0093
	14	1.8386	1521.24	4.5742	0.0096	0.0140	0.2322	0.0091
	15	1.4816	1393.10	3.8153	0.0093	0.0130	0.2065	0.0089
	16	1.3940	1385.68	3.6087	0.0089	0.0130	0.1945	0.0085
	17	1.3064	1378.26	3.4020	0.0085	0.0129	0.1824	0.0081
	18	1.2188	1370.84	3.1953	0.0081	0.0129	0.1704	0.0078
	19	1.1312	1363.42	2.9887	0.0077	0.0129	0.1583	0.0074
	20	1.0436	1356.00	2.7820	0.0073	0.0128	0.1463	0.0070
	21	0.9988	1325.74	2.5267	0.0072	0.0125	0.1372	0.0068
	22	0.9541	1295.48	2.2714	0.0070	0.0122	0.1282	0.0067
	23	0.9093	1265.22	2.0161	0.0068	0.0119	0.1192	0.0065
	24	0.8646	1234.96	1.7608	0.0066	0.0116	0.1101	0.0063
	25	0.8198	1204.71	1.5055	0.0065	0.0113	0.1011	0.0062
	26	0.7917	1207.23	1.4248	0.0063	0.0114	0.0973	0.0060
	27	0.7637	1209.75	1.3441	0.0061	0.0114	0.0936	0.0059
	28	0.7356	1212.27	1.2634	0.0060	0.0114	0.0898	0.0057
	29	0.7075	1214.80	1.1827	0.0058	0.0115	0.0861	0.0056
	30	0.6794	1217.32	1.1020	0.0056	0.0115	0.0823	0.0054
	31	0.6715	1233.43	1.0586	0.0055	0.0116	0.0796	0.0053
	32	0.6636	1249.54	1.0152	0.0054	0.0117	0.0769	0.0052
	33	0.6556	1265.65	0.9719	0.0054	0.0118	0.0742	0.0051
	34	0.6477	1281.76	0.9285	0.0053	0.0119	0.0715	0.0050
	35	0.6398	1297.87	0.8851	0.0052	0.0120	0.0688	0.0049
	36	0.6063	1289.71	0.8393	0.0051	0.0120	0.0653	0.0048
	37	0.5729	1281.55	0.7935	0.0050	0.0119	0.0619	0.0047
	38	0.5394	1273.38	0.7477	0.0049	0.0119	0.0584	0.0047
	39	0.5060	1265.22	0.7020	0.0048	0.0118	0.0549	0.0046
	40	0.4725	1257.05	0.6562	0.0047	0.0118	0.0515	0.0045
	41	0.4512	1253.52	0.6306	0.0047	0.0117	0.0493	0.0045
	42	0.4299	1249.98	0.6050	0.0046	0.0117	0.0471	0.0044
	43	0.4086	1246.45	0.5795	0.0046	0.0117	0.0450	0.0044
	44	0.3873	1242.91	0.5539	0.0046	0.0117	0.0428	0.0044
	45	0.3660	1239.37	0.5283	0.0045	0.0117	0.0406	0.0043
	46	0.3462	1218.01	0.5072	0.0045	0.0115	0.0385	0.0043
	47	0.3263	1196.64	0.4861	0.0045	0.0113	0.0364	0.0043
	48	0.3065	1175.28	0.4649	0.0045	0.0111	0.0343	0.0043
	49	0.2866	1153.91	0.4438	0.0044	0.0110	0.0322	0.0042
	50	0.2668	1132.54	0.4226	0.0044	0.0108	0.0301	0.0042
	51	0.2573	1134.57	0.4082	0.0044	0.0108	0.0288	0.0042
	52	0.2478	1136.59	0.3937	0.0043	0.0108	0.0275	0.0041
	53	0.2383	1138.62	0.3792	0.0043	0.0109	0.0262	0.0041
	54	0.2288	1140.64	0.3648	0.0042	0.0109	0.0250	0.0040
	55	0.2193	1142.66	0.3503	0.0042	0.0109	0.0237	0.0040
	56	0.2078	1127.35	0.3362	0.0041	0.0108	0.0227	0.0039
	57	0.1963	1112.03	0.3221	0.0040	0.0106	0.0217	0.0039
	58	0.1848	1096.71	0.3080	0.0040	0.0105	0.0207	0.0038
	59	0.1733	1081.40	0.2939	0.0039	0.0103	0.0197	0.0037
	60	0.1618	1066.08	0.2798	0.0038	0.0102	0.0188	0.0037
	61	0.1650	1070.20	0.2846	0.0039	0.0102	0.0192	0.0037
	62	0.1682	1074.31	0.2895	0.0040	0.0103	0.0196	0.0038
	63	0.1715	1078.43	0.2943	0.0040	0.0103	0.0200	0.0039
	64	0.1747	1082.54	0.2992	0.0041	0.0104	0.0204	0.0039
	65	0.1779	1086.66	0.3040	0.0041	0.0104	0.0208	0.0040
	66	0.1760	1103.78	0.3088	0.0042	0.0106	0.0212	0.0040
	67	0.1741	1120.90	0.3135	0.0042	0.0107	0.0216	0.0041
	68	0.1721	1138.02	0.3183	0.0043	0.0109	0.0220	0.0041
	69	0.1702	1155.14	0.3231	0.0043	0.0110	0.0224	0.0041
	70	0.1683	1172.25	0.3278	0.0044	0.0112	0.0228	0.0042

Emissions Tables

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2016

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	3.4104	81.98	0.2740	0.0028	0.0009	0.2826	0.0026
	5	3.6818	1213.16	0.3465	0.0133	0.0122	0.3386	0.0123
	6	3.5051	1148.57	0.3282	0.0123	0.0115	0.3105	0.0114
	7	3.3284	1083.98	0.3099	0.0113	0.0109	0.2824	0.0104
	8	3.1516	1019.40	0.2917	0.0103	0.0102	0.2543	0.0095
Bus	0	10.6824	82.09	2.0123	0.0012	0.0010	0.6855	0.0011
	5	19.5713	3427.66	22.0894	0.4156	0.0272	3.1109	0.3975
	6	18.6137	3345.92	21.1559	0.3970	0.0267	2.9232	0.3798
	7	17.6561	3264.17	20.2224	0.3785	0.0261	2.7356	0.3621
	8	16.6985	3182.43	19.2889	0.3600	0.0255	2.5480	0.3444
	9	15.7409	3100.68	18.3553	0.3415	0.0250	2.3604	0.3266
	10	14.7833	3018.94	17.4218	0.3230	0.0244	2.1728	0.3089
	11	13.9614	2881.27	16.5060	0.3034	0.0232	1.9877	0.2902
	12	13.1394	2743.60	15.5903	0.2838	0.0220	1.8026	0.2714
	13	12.3175	2605.93	14.6745	0.2642	0.0208	1.6175	0.2527
	14	11.4955	2468.25	13.7588	0.2446	0.0196	1.4324	0.2339
	15	10.6736	2330.58	12.8430	0.2250	0.0184	1.2473	0.2152
	16	10.6229	2266.47	12.7712	0.2193	0.0175	1.1680	0.2097
	17	10.5723	2202.36	12.6993	0.2136	0.0167	1.0886	0.2043
	18	10.5216	2138.25	12.6275	0.2079	0.0158	1.0093	0.1988
	19	10.4710	2074.14	12.5556	0.2022	0.0150	0.9300	0.1934
	20	10.4204	2010.03	12.4838	0.1965	0.0141	0.8506	0.1879
	21	8.8913	1886.19	11.1329	0.1690	0.0139	0.7311	0.1617
	22	7.3623	1762.35	9.7821	0.1416	0.0137	0.6115	0.1355
	23	5.8333	1638.51	8.4313	0.1142	0.0134	0.4920	0.1092
	24	4.3043	1514.66	7.0804	0.0868	0.0132	0.3724	0.0830
	25	2.7753	1390.82	5.7296	0.0594	0.0130	0.2529	0.0568
	26	2.7002	1372.44	5.6622	0.0576	0.0128	0.2422	0.0550
	27	2.6250	1354.06	5.5948	0.0558	0.0126	0.2315	0.0533
	28	2.5498	1335.67	5.5273	0.0539	0.0124	0.2208	0.0516
	29	2.4746	1317.29	5.4599	0.0521	0.0123	0.2102	0.0499
	30	2.3995	1298.91	5.3925	0.0503	0.0121	0.1995	0.0482
	31	2.3420	1282.69	5.3486	0.0492	0.0120	0.1915	0.0470
	32	2.2845	1266.48	5.3046	0.0480	0.0118	0.1836	0.0459
	33	2.2270	1250.27	5.2607	0.0469	0.0117	0.1757	0.0448
	34	2.1695	1234.05	5.2168	0.0457	0.0116	0.1678	0.0437
	35	2.1120	1217.84	5.1728	0.0445	0.0114	0.1598	0.0426
	36	2.0857	1213.36	5.0993	0.0437	0.0114	0.1557	0.0418
	37	2.0594	1208.88	5.0258	0.0429	0.0113	0.1516	0.0410
	38	2.0332	1204.40	4.9523	0.0421	0.0113	0.1475	0.0402
	39	2.0069	1199.92	4.8788	0.0413	0.0112	0.1434	0.0395
	40	1.9806	1195.43	4.8052	0.0405	0.0112	0.1393	0.0387
	41	1.9688	1187.57	4.7070	0.0397	0.0111	0.1362	0.0380
	42	1.9571	1179.70	4.6088	0.0389	0.0110	0.1330	0.0372
	43	1.9453	1171.83	4.5106	0.0382	0.0109	0.1298	0.0365
	44	1.9336	1163.96	4.4123	0.0374	0.0108	0.1267	0.0358
	45	1.9218	1156.09	4.3141	0.0367	0.0108	0.1235	0.0351
	46	1.8909	1152.61	4.2857	0.0369	0.0107	0.1221	0.0353
	47	1.8600	1149.13	4.2572	0.0371	0.0107	0.1208	0.0355
	48	1.8291	1145.65	4.2288	0.0373	0.0107	0.1194	0.0356
	49	1.7982	1142.17	4.2004	0.0375	0.0106	0.1180	0.0358
	50	1.7673	1138.69	4.1719	0.0377	0.0106	0.1166	0.0360
	51	1.7408	1137.05	4.2359	0.0389	0.0106	0.1169	0.0372
	52	1.7143	1135.42	4.2998	0.0402	0.0106	0.1172	0.0384
	53	1.6878	1133.78	4.3638	0.0414	0.0105	0.1175	0.0396
	54	1.6613	1132.15	4.4277	0.0427	0.0105	0.1178	0.0408
	55	1.6348	1130.51	4.4916	0.0440	0.0105	0.1181	0.0420
	56	1.6585	1135.25	4.5276	0.0451	0.0105	0.1215	0.0431
	57	1.6822	1139.98	4.5635	0.0463	0.0105	0.1249	0.0442
	58	1.7059	1144.71	4.5994	0.0474	0.0106	0.1283	0.0454
	59	1.7296	1149.45	4.6354	0.0486	0.0106	0.1317	0.0465
	60	1.7533	1154.18	4.6713	0.0497	0.0106	0.1351	0.0476
	61	1.7947	1155.82	4.5966	0.0489	0.0105	0.1380	0.0468
	62	1.8361	1157.45	4.5218	0.0481	0.0105	0.1409	0.0460
	63	1.8775	1159.09	4.4471	0.0473	0.0105	0.1439	0.0452
	64	1.9189	1160.73	4.3724	0.0465	0.0105	0.1468	0.0445
	65	1.9602	1162.37	4.2976	0.0457	0.0104	0.1497	0.0437
	66	2.1296	1155.48	4.0816	0.0427	0.0103	0.1552	0.0408
	67	2.2989	1148.59	3.8657	0.0396	0.0102	0.1606	0.0379
	68	2.4683	1141.70	3.6497	0.0366	0.0101	0.1660	0.0350
	69	2.6376	1134.81	3.4337	0.0336	0.0100	0.1715	0.0321
	70	2.8070	1127.92	3.2177	0.0306	0.0099	0.1769	0.0292

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2036

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	0.6940	45.66	0.0331	0.0014	0.0005	0.0462	0.0013
	5	1.0344	735.07	0.0699	0.0066	0.0074	0.1171	0.0061
	6	1.0041	696.96	0.0674	0.0061	0.0070	0.1088	0.0056
	7	0.9737	658.86	0.0650	0.0056	0.0066	0.1004	0.0052
	8	0.9434	620.76	0.0626	0.0051	0.0062	0.0920	0.0047
Bus	0	5.1788	80.98	2.5880	0.0012	0.0009	0.3524	0.0011
	5	9.8072	2999.55	5.2920	0.0368	0.0239	0.3870	0.0351
	6	9.1891	2922.57	5.0911	0.0348	0.0234	0.3644	0.0332
	7	8.5709	2845.60	4.8902	0.0329	0.0228	0.3417	0.0313
	8	7.9528	2768.62	4.6894	0.0309	0.0223	0.3191	0.0295
	9	7.3346	2691.64	4.4885	0.0289	0.0218	0.2964	0.0276
	10	6.7165	2614.67	4.2876	0.0270	0.0212	0.2738	0.0257
	11	6.1348	2484.67	3.9696	0.0252	0.0201	0.2512	0.0240
	12	5.5532	2354.67	3.6516	0.0234	0.0189	0.2286	0.0224
	13	4.9715	2224.67	3.3336	0.0217	0.0178	0.2060	0.0207
	14	4.3899	2094.67	3.0156	0.0199	0.0166	0.1833	0.0190
	15	3.8082	1964.68	2.6976	0.0182	0.0154	0.1607	0.0173
	16	3.6563	1904.74	2.5064	0.0180	0.0145	0.1489	0.0172
	17	3.5044	1844.81	2.3152	0.0179	0.0135	0.1370	0.0171
	18	3.3525	1784.88	2.1240	0.0178	0.0126	0.1251	0.0170
	19	3.2006	1724.95	1.9328	0.0176	0.0116	0.1133	0.0168
	20	3.0487	1665.02	1.7416	0.0175	0.0107	0.1014	0.0167
	21	2.5385	1582.49	1.6010	0.0148	0.0109	0.0929	0.0142
	22	2.0284	1499.96	1.4603	0.0122	0.0111	0.0843	0.0116
	23	1.5183	1417.43	1.3197	0.0095	0.0114	0.0758	0.0091
	24	1.0082	1334.89	1.1791	0.0068	0.0116	0.0673	0.0065
	25	0.4981	1252.36	1.0384	0.0041	0.0118	0.0587	0.0039
	26	0.4776	1237.58	0.9754	0.0040	0.0117	0.0559	0.0038
	27	0.4571	1222.81	0.9124	0.0039	0.0115	0.0531	0.0037
	28	0.4366	1208.03	0.8493	0.0038	0.0114	0.0503	0.0036
	29	0.4162	1193.25	0.7863	0.0037	0.0113	0.0474	0.0035
	30	0.3957	1178.47	0.7233	0.0036	0.0111	0.0446	0.0034
	31	0.3799	1165.30	0.6873	0.0035	0.0110	0.0424	0.0034
	32	0.3642	1152.13	0.6513	0.0035	0.0109	0.0401	0.0033
	33	0.3485	1138.97	0.6154	0.0034	0.0108	0.0379	0.0032
	34	0.3327	1125.80	0.5794	0.0033	0.0106	0.0356	0.0032
	35	0.3170	1112.63	0.5435	0.0033	0.0105	0.0334	0.0031
	36	0.3098	1109.21	0.5225	0.0032	0.0105	0.0319	0.0031
	37	0.3026	1105.78	0.5015	0.0032	0.0104	0.0305	0.0030
	38	0.2955	1102.35	0.4805	0.0031	0.0104	0.0290	0.0030
	39	0.2883	1098.92	0.4595	0.0031	0.0104	0.0276	0.0029
	40	0.2811	1095.50	0.4385	0.0030	0.0103	0.0262	0.0029
	41	0.2757	1088.64	0.4217	0.0030	0.0103	0.0249	0.0028
	42	0.2702	1081.79	0.4050	0.0029	0.0102	0.0237	0.0028
	43	0.2648	1074.94	0.3882	0.0029	0.0101	0.0224	0.0027
	44	0.2593	1068.09	0.3715	0.0028	0.0100	0.0212	0.0027
	45	0.2539	1061.24	0.3548	0.0027	0.0100	0.0199	0.0026
	46	0.2474	1059.07	0.3451	0.0027	0.0100	0.0193	0.0026
	47	0.2410	1056.90	0.3354	0.0027	0.0099	0.0187	0.0026
	48	0.2346	1054.73	0.3257	0.0027	0.0099	0.0181	0.0026
	49	0.2281	1052.56	0.3160	0.0027	0.0099	0.0175	0.0025
	50	0.2217	1050.39	0.3063	0.0027	0.0099	0.0169	0.0025
	51	0.2164	1048.76	0.3035	0.0027	0.0098	0.0165	0.0026
	52	0.2111	1047.14	0.3006	0.0027	0.0098	0.0161	0.0026
	53	0.2059	1045.51	0.2977	0.0028	0.0098	0.0157	0.0026
	54	0.2006	1043.88	0.2948	0.0028	0.0098	0.0152	0.0027
	55	0.1954	1042.25	0.2919	0.0028	0.0098	0.0148	0.0027
	56	0.1959	1045.09	0.2934	0.0029	0.0098	0.0148	0.0028
	57	0.1963	1047.93	0.2949	0.0029	0.0098	0.0149	0.0028
	58	0.1968	1050.76	0.2965	0.0030	0.0098	0.0149	0.0029
	59	0.1973	1053.60	0.2980	0.0031	0.0098	0.0149	0.0029
	60	0.1978	1056.44	0.2995	0.0031	0.0098	0.0149	0.0030
	61	0.2010	1057.33	0.2952	0.0031	0.0098	0.0151	0.0029
	62	0.2041	1058.23	0.2909	0.0030	0.0098	0.0153	0.0029
	63	0.2073	1059.13	0.2867	0.0030	0.0098	0.0154	0.0029
	64	0.2105	1060.03	0.2824	0.0030	0.0098	0.0156	0.0028
	65	0.2137	1060.93	0.2781	0.0029	0.0098	0.0158	0.0028
	66	0.2299	1055.18	0.2781	0.0029	0.0096	0.0162	0.0027
	67	0.2461	1049.43	0.2780	0.0028	0.0095	0.0166	0.0027
	68	0.2623	1043.68	0.2780	0.0028	0.0094	0.0170	0.0026
	69	0.2785	1037.93	0.2780	0.0027	0.0093	0.0174	0.0026
	70	0.2947	1032.18	0.2779	0.0027	0.0092	0.0178	0.0025

Source: California Air Resources Board, EMFAC 2014

Notes: 1) Zero mph corresponds to starts, 2) Other emissions factors include idling emissions and exclude diurnal and evaporative emissions, 3) Five mph is best estimate for idling

HEALTH COST OF TRANSPORTATION EMISSIONS

($/ton)

Area	Proj Loc	CO	CO_2e	NO_x	PM_{10}	SO_x	VOC
LA/South Coast	1	$0	$0.91	$8,600	$387,300	$50,100	$2,100
CA Urban Area	2	$0	$0.91	$8,600	$387,300	$50,100	$2,100
CA Rural Area	3	$0	$0.91	$8,600	$387,300	$50,100	$2,100

CO_2e Uprater 2% increase in value per year

Sources: McCubbin and Delucchi, 1996 for emissions other than CO2e
Interagency Working Group on Social Cost of Carbon, United States Government, 2016 for CO2e

PASSENGER TRAIN EMISSIONS FACTORS

(g/train-mile)

Mode	Year	CO	CO_2	NO_x	PM_{10}	SO_x	VOC	$PM_{2.5}$
Passenger Train	2002	45.67		583.58	62.02		19.73	
	2022	45.67		250.11	31.01		19.73	

LIGHT RAIL EMISSIONS FACTORS

(g/veh-mile)

Mode	Year	CO	CO_2	NO_x	PM_{10}	SO_x	VOC	$PM_{2.5}$
Light Rail	2002	0.14		1.13	0.17		0.06	
	2022	0.14		1.14	0.17		0.06	

FREIGHT LOCOMOTIVE EMISSIONS FACTORS

(g/gal)

Mode	Year	CO	CO_2	NO_x	PM_{10}	SO_x	VOC	$PM_{2.5}$
Freight Rail	2030		10,206	28.10	0.43			
	2030		10,206	28.10	0.43			

Freight Rail Fuel Efficiency 468 ton-miles/gal
Fuel Burned at Idle 4 gal/hr

Sources: California Air Resources Board
Association of American Railroads, The Environmental Benefits of Moving Freight by Rail, June 2017
California Environmental Protection Agency / Air Resources Board, Technology Assessment:
Freight Locomotives, November 2016

Pavement Adjustments (used only for pavement projects)

PAVEMENT DETERIORATION

(IRI in inches/mile)

	Year 20, By Loading		
Year 0	Light	Medium	Heavy
0	125	150	350
25	150	200	500
50	175	250	675
75	200	300	750
100	275	400	750
125	325	475	750
150	400	575	750
175	500	700	750
200	575	750	750
225	650	750	750
250	750	750	750
275	750	750	750
300	750	750	750
325	750	750	750
350	750	750	750
375	750	750	750
400	750	750	750
425	750	750	750
450	750	750	750

Source: Paterson, 1987

VEHICLE OPERATING SPEED

(percent adjustment)

IRI	Auto	Truck
0	1.000	1.025
25	1.000	1.025
50	1.000	1.025
75	1.000	1.025
100	1.000	1.025
125	1.000	1.025
150	1.000	1.013
175	1.000	1.000
200	1.000	0.980
225	1.000	0.949
250	1.000	0.919
275	0.991	0.890
300	0.981	0.862
325	0.971	0.834
350	0.961	0.808
375	0.952	0.782
400	0.942	0.758
425	0.932	0.734
450	0.923	0.709

Source: Botterill, 1996 and 1997

FUEL CONSUMPTION

(percent adjustment)

IRI	Auto	Truck
0	0.971	0.961
25	0.977	0.965
50	0.980	0.970
75	0.982	0.975
100	0.985	0.980
125	0.990	0.986
150	0.995	0.993
175	1.000	1.000
200	1.005	1.007
225	1.012	1.017
250	1.019	1.026
275	1.027	1.036
300	1.034	1.047
325	1.041	1.058
350	1.050	1.070
375	1.061	1.085
400	1.072	1.100
425	1.082	1.114
450	1.093	1.129

Source: Texas Transportation Institute, 1994

NON-FUEL COSTS

(percent adjustment)

IRI	Auto	Truck
0	1.000	1.000
25	1.000	1.000
50	1.000	1.000
75	1.000	1.000
100	1.000	1.000
125	1.000	1.000
150	1.017	1.018
175	1.034	1.038
200	1.052	1.058
225	1.070	1.078
250	1.088	1.097
275	1.105	1.117
300	1.123	1.137
325	1.141	1.156
350	1.159	1.176
375	1.176	1.196
400	1.194	1.216
425	1.212	1.235
450	1.230	1.255

Source: ARRB Research Board TR VOC Model

Weaving Adjustments (used only for freeway connector, HOV connector, and HOV drop ramp projects)

VEHICLE OPERATING SPEED
(percent adjustment)

Percent Weaving	Freeway Conn	HOV Project
0.000	1.000	1.000
0.002	0.982	0.988
0.004	0.964	0.976
0.006	0.945	0.964
0.008	0.927	0.952
0.010	0.909	0.939
0.012	0.891	0.927
0.014	0.873	0.915
0.016	0.855	0.903
0.018	0.836	0.891
0.020	0.789	0.879
0.022	0.747	0.867
0.024	0.706	0.855
0.026	0.664	0.842
0.028	0.623	0.817
0.030	0.581	0.789
0.032	0.540	0.761
0.034	0.498	0.734
0.036	0.476	0.706
0.038	0.473	0.678
0.040	0.471	0.650
0.042	0.468	0.623
0.044	0.466	0.595
0.046	0.463	0.567
0.048	0.460	0.540
0.050	0.458	0.512
0.052	0.455	0.484
0.054	0.453	0.476
0.056	0.453	0.474
0.058	0.453	0.473
0.060	0.453	0.471
0.062	0.453	0.469
0.064	0.453	0.467
0.066	0.453	0.466
0.068	0.453	0.464
0.070	0.453	0.462
0.072	0.453	0.460
0.074	0.453	0.459
0.076	0.453	0.457
0.078	0.453	0.455
0.080	0.453	0.453

Source: Fitzpatrick, Brewer, and Venglar, 2003

TMS Adjustments (used only for ramp metering, ramp metering signal coordination, incident management, traveler information projects, AVL, transit priority, and BRT projects)

PEAK PERIOD SPEED, VOLUME, AND NON-HIGHWAY BENEFITS
(percent adjustment)

TMS	Without		With		Non-Highway Benefits			Total
Strategy	Speed	Volume	Speed	Volume	TT	VOC	Em	Benefit
AMoth	1.02	0.95	1.02	0.95	-5.05	12.81	1.37	0.74
AMsev	1.53	0.94	1.53	0.94	1.21	1.38	-0.37	1.00
IMoth	0.88	1.18	0.98	0.96	0.51	0.15	0.06	0.74
IMsev	1.01	0.97	1.01	0.95	0.30	0.31	0.30	1.00
NoAdj	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00
ORoth	0.98	1.03	1.00	1.00	-0.07	-0.03	-0.07	0.00
ORsev	0.95	1.03	1.00	1.00	0.00	0.00	5.67	0.00
RMoth	1.00	1.00	1.03	0.97	-0.07	-0.03	-0.07	1.00
RMsev	1.00	1.00	1.05	0.97	0.00	0.00	5.67	1.00
TIoth	1.00	1.00	1.02	0.97	-0.11	-0.12	-0.35	1.00
TIsev	1.00	1.00	1.01	0.97	-0.39	-0.39	-0.35	1.00

Source: California Department of Transportation TMS Master Plan, 2003
29) Chaudhary and Messer, 2000

TRANSIT TRAVEL TIME AND AGENCY COST SAVINGS
(percent savings)

TMS Strategy	Travel Time	Agency Costs	
		Capital	O&M
Transit Vehicle Location (AVL)	15%	2%	8%
Transit Vehicle Signal Priority	10%	-	-
Bus Rapid Transit (BRT)	29%	-	-

Sources: FHWA ITS Deployment Analysis System (IDAS), California PATH

P.O. Box 492794, Redding, CA 96049
(530) 222-5251

July 8, 2020

Daniel S. Little, Executive Director
Shasta Regional Transportation Agency
1255 East Street, Suite 202
Redding, CA 96001

Subject: Fix 5 Cascade Gateway Project – Trade Corridor Enhancement Funding

Dear Mr. Little:

Our organization, Shasta VOICES, is a strong private-sector business group with 1,300 members and supporters who live and work in the Shasta County area, advocating for a stable and sustainable economic future in our community. We are pleased to support the Fix 5 Cascade Gateway Project application for pre-construction funding under the Trade Corridor Enhancement Program (TCEP).

If selected for TCEP funding, the Fix 5 Cascade Gateway Project will increase north-south freight throughput, safety, and operations on Interstate 5 (1-5) between State Route 299 and 44. East-west freight movement on State Route 299 and 44 will share the same benefits. Proposed improvements are the continuation of a larger legacy project on I-5 - one with a long history of coordinated local, regional, state, and federal investment. Building upon previously completed and currently underway improvements, the end result will be six contiguous travel lanes (three northbound and three southbound) spanning the entire Redding metropolitan area.

Key project benefits include:

- Long-term preservation of traffic operations and level of service on mainline I-5 to support goods movement, economic growth, and enhanced access to designated Opportunity Zones and industrial areas.
- Reduced collisions by providing freight trucks additional time to accelerate and merge with through traffic;
- Mitigates freight impacts on regional mobility, safety, health, and productivity by reducing back-ups on through urbanized areas during I-5 closures and lane restrictions.

This project would create a long-term, significant benefit to our community and those who travel through it on Interstate 5. There is support for this project locally and regionally by all sectors of construction, real estate, service and retail business, and especially people who need stable employment.

Please do not hesitate to contact us if we can do anything to further support this effort.

Sincerely,

Mary B. Machado
Executive Director, Shasta VOICES
(530) 222-5251; mary@shastavoices.com

CITY OF REDDING
CALIFORNIA

CITY OF REDDING
777 CYPRESS AVENUE, REDDING, CA 96001
P.O. BOX 496071, REDDING, CA 96049-6071

PUBLIC WORKS
ENGINEERING DIVISION
530.225.4170
530.245.7024

July 8, 2020

Daniel S. Little, Executive Director
Shasta Regional Transportation Agency
1255 East Street, Suite 202
Redding, CA 96001

Subject: Recommend TCEP Funding for the Fix 5 Cascade Gateway Project

Dear Mr. Little:

The City of Redding is pleased to support the Fix 5 Cascade Gateway Project application for funding through the Trade Corridor Enhancement Program (TCEP). If selected for TCEP funding, the Fix 5 Cascade Gateway Project will increase north-south freight throughput, safety, and operations on Interstate 5 (I-5) between State Route 299 and 44. East-west freight movement on State Route 299 and 44 will share the same benefits. These proposed improvements are the continuation of a larger legacy project on I-5 with a long history of coordinated local, regional, state, and federal investment. Building upon previously completed and currently underway improvements, the end result will be six contiguous travel lane (three northbound and three southbound) spanning the entire Redding metropolitan area.

Key project benefits include:

- Long-term preservation of traffic operations and level of service on mainline I-5 to support goods, movement, economic growth, and enhanced access to designated Opportunity Zones and industrial areas;
- Reduced collisions by providing freight trucks additional time to accelerate and merge with through traffic;
- Mitigates freight impacts on regional mobility, safety, health, and productivity by reducing back-ups on through urbanized areas during I-5 closures and lane restrictions.

The proposed project would complement already planned improvements in the City of Redding. The City is undergoing significant redevelopment in its core with new mixed-use projects downtown, redevelopment of the regional mall adjacent to I-5, and entirely new shopping centers on the southern edge of Redding along the I-5 frontage. With economic growth, comes a need to manage the associated additional traffic and transportation needs. The Fix 5 Cascade Gateway Project would provide a much needed solution to improve the safety and efficiency of traffic generated by this new development on Interstate 5 through the City.

Sincerely,

Chuck Aukland, P.E.
Director of Public Works

CA:mk
070820L-SRTA-TCEP_LOS

North State Super Region

1255 East Street, Suite 202, Redding, CA 96001
(530) 265-3202 nssr16@gmail.com
www.superregion.org
Mike Woodman, Chair

July 10, 2020

Daniel Little, Executive Director
1255 East Street, Suite 202
Redding, CA 96001

Subject: Recommend Trade Corridor Enhancement Program Funding for the Fix 5 Cascade Gateway Project

Dear Mr. Little:

The North State Super Region (NSSR) representing the collaborative partnership between the sixteen northern California Regional Transportation Planning Agencies is pleased to support the Fix 5 Cascade Gateway Project joint application between the Shasta Regional Transportation Agency and Caltrans District 2 for Trade Corridor Enhancement Program (TCEP) funding.

If selected for TCEP funding, the Fix 5 Cascade Gateway Project will increase north-south freight throughput, safety, and operations on Interstate 5 (I-5) between State Route 299 and 44. East-west freight movement on State Route 299 and 44 will share the same benefits. The proposed improvements are the continuation of a larger legacy project on I-5, one with a long history of coordinated local, regional, state, and federal investment. Building upon previously completed and currently underway improvements, the end result will be six contiguous travel lanes (three northbound and three southbound) spanning the entire Redding metropolitan area. The project will complete the final 2.3 mile gap in six lanes on I-5 and leverage the performance benefits of $254 million invested over the last 15 years on mainline I-5.

The scope of work for this project also includes design consideration for future contraflow/reversible lanes north of Redding to help manage traffic during frequent closures on I-5 due to weather, wildfires, accidents, and other events. During such closures, I-5 routinely back up through Redding and blocks access to State Route 299 and 44. Future contraflow/reversable lanes will add vehicle storage north of these interchanges, improve first responder access, and facilitate evacuation if necessary due to wildfire or other threats.

This portion of I-5 is included in the Sacramento - Oregon Strategic Interregional Corridor identified in the Caltrans 2015 Interregional Transportation Strategic Plan (ITSP). The ITSP identifies 11 Strategic Interregional Corridors that have been identified as the most significant interregional travel corridors in California.

Key project benefits include:

- Long-term preservation of traffic operations and level of service on mainline I-5 to support goods movement, economic growth, and enhanced access to designated Opportunity Zones and industrial areas.

- Reduced collisions by providing freight trucks additional time to accelerate and merge with through traffic.

- Mitigates freight impacts on regional mobility, safety, health, and productivity by reducing back-ups through urbanized areas during I-5 closures and lane restrictions.

The proposed improvements align with the unified goal of the NSSR to support transportation investments that improve the economy of the region, the efficiency of the movement of goods and people, and safety. Investment in this segment of I-5 will also enhance operations, connections for emergency response, and aid resiliency for the region.

Sincerely,

Mike Woodman, Deputy Executive Director
Nevada County Transportation Commission
Chair, North State Super Region

CITY OF SHASTA LAKE California

PO BOX 777 | 4477 Main Street
Shasta Lake, CA 96019
(530) 275-7400

www.cityofshastalake.org

July 9, 2020

Daniel S. Little, Executive Director
Shasta Regional Transportation Agency
1255 East Street, Suite 202
Redding, CA 96001

Subject: Recommend TCEP Funding for the Interstate 5 Fix 5 Cascade Gateway Project

Dear Mr. Little:

The City of Shasta Lake is pleased to support the Fix 5 Cascade Gateway Project application for funding under the Trade Corridor Enhancement Program (TCEP). If selected for TCEP funding, the Fix 5 Cascade Gateway Project will increase north-south freight throughput, safety, and operations on Interstate 5 (1-5) between State Route 299 and 44. East-west freight movement on State Route 299 and 44 will share the same benefits. Proposed improvements are the continuation of a larger legacy project on I-5 - one with a long history of coordinated local, regional, state, and federal investment. Building upon previously completed and currently underway improvements, the end result will be six contiguous travel lanes (three northbound and three southbound) spanning the entire Redding metropolitan area.

The project is the culmination of a larger legacy of enhancing freight and regional movement along I-5 in this critical corridor, funded primarily with state and regional funds. The project has a long history of coordinated local, regional, state, and federal investment to maximize corridor mobility.

Key project benefits include:

- Long-term preservation of traffic operations and level of service on mainline I-5 to support goods movement, economic growth, and enhanced access to designated Opportunity Zones and industrial areas.
- Reduced collisions by providing freight trucks additional time to accelerate and merge with through traffic;
- Mitigates freight impacts on regional mobility, safety, health, and productivity by reducing back-ups on through urbanized areas during I-5 closures and lane restrictions.

Sincerely,

John N. Duckett, Jr.
City Manager

cc: City Files – SRTA 2020

Shasta County

DEPARTMENT OF PUBLIC WORKS

1855 PLACER STREET
REDDING, CA 96001-1759
530.225.5661 530.225.5667 FAX
800.479.8022 California Relay Service at 700 or 800.735.2922

PATRICK J. MINTURN, DIRECTOR
C. TROY BARTOLOMEI, DEPUTY
ALFRED V. CATHEY, DEPUTY
KEN D. CRISTOBAL, DEPUTY

July 8, 2020

Daniel S. Little, Executive Director
Shasta Regional Transportation Agency
1255 East Street, Suite 202
Redding, CA 96001

Subject: Recommend TCEP Funding for the Interstate 5 Fix 5 Cascade Gateway Project

Dear Mr. Little:

If selected for TCEP funding, the Fix 5 Cascade Gateway Project will increase north-south freight throughput, safety, and operations on Interstate 5 (1-5) between State Route 299 and 44. East-west freight movement on State Route 299 and 44 will share the same benefits. Proposed improvements are the continuation of a larger legacy project on I-5 – one with a long history of coordinated local, regional, state, and federal investment. Building upon previously completed and currently underway improvements, the end result will be six contiguous travel lanes (three northbound and three southbound) spanning the entire Redding metropolitan area.

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- Long-term preservation of traffic operations and level of service on mainline I-5 to support goods movement, economic growth, and enhanced access to designated Opportunity Zones and industrial areas.
- Reduced collisions by providing freight trucks additional time to accelerate and merge with through traffic.
- Mitigates freight impacts on regional mobility, safety, health, and productivity by reducing back-ups on through urbanized areas during I-5 closures and lane restrictions.

Good luck on the grant application.

Sincerely,

Patrick J. Minturn, Director

PJM/ldr
Sent via Email