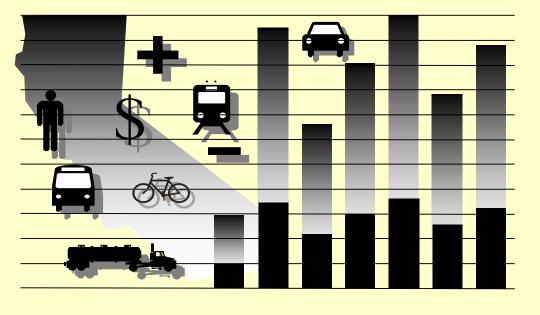


California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C Sketch) Version 7.2



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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:

<u>Worksheets</u>	<u>Contents</u>
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, <u>the user should proceed to the Project Information</u> <u>worksheet and input data for the specific project in the green boxes</u> (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 <u>blue boxes</u> (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 soft 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 oneor two-way answer in Box 1A. Statewide default values are provided for some inputs.

Highway Design

- 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.
- 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

 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

- 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 nonpeak 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.
- 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-ofway, 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:	6				EA:	06-0U88
PROJECT:	Commercial IC				PPNO:	694
1A	PROJECT DAT	4		HIGHWAY	ACCIDENT DATA	
Type of Project Select project		t traffic in weave in sectio way Connector	1B Actual 3-	Year Accident Data (from	Table B) Count (No.) Rate
Select project	Spe from ist Free	way Connector	Total (Accidents (Tot)	181	2.78
Project Location (er	ter 1 for So. Cal., 2 for No. Cal., or 3 fo	or rural) 3		al Accidents (Fat)	2	0.031
				ry Accidents (Inj)	35	0.54
Length of Con	struction Period 3	years		perty Damage Only (PDO) Ac		2.21
One- or Two-V	/ay Data 2	enter 1 or 2	Statewid	e Basic Average Accident	t Rate	
Length of Peak Per		hours	Charlowing	o Baolo / Horago / Ioolaoli	No Build	Build
			Rate G	Group	H 63	H 64
				ent Rate (per million vehicle-m		0.81
\frown				cent Fatal Accidents (Pct Fat)		0.5%
	HWAY DESIGN AND TR	AFFIC DATA	Per	cent Injury Accidents (Pct Inj)	32.9%	32.0%
Highway Design		No Build Build	┓┃ └───			
	(Fwy, Exp, Conv Hwy)	F F				
	neral Traffic Lanes	4 4	(1D)	RAIL AND	TRANSIT DATA	
Number of HO	V/HOT Lanes					
HOV Restriction	n (2 or 3)		Annual P	Person-Trips	No Build	Build
Exclusive ROV	V for Buses (y/n)	N		Base (Year 1)		
				Forecast (Year 2	0)	
Highway Free-	Flow Speed	70 70	Percent 7	Trips during Peak Period	40%	
Ramp Design	Speed (if aux. lane/off-ramp proj	.) 35 35	Percent I	New Trips from Parallel H	ighway	100%
Length (in mile	s) Highway Segment	3.5 3.5				
	Impacted Length	3.5 3.5	Annual V	ehicle-Miles	No Build	Build
				Base (Year 1)		
Average Daily Traff	ic			Forecast (Year 2)	0)	
	Current	59,433	Average	Vehicles/Train (if rail project)	
	Base (Year 1)	No Build Build 65,283 65,28	2 Poductio	n in Transit Accidents		
	Forecast (Year 20)	102.336 102.3		nt Reduction (if safety project)		
Average Hourly HO	V/HOT Lane Traffic	0				
	uced Trips in HOV (if HOT or 2-to		Average	Transit Travel Time	No Build	Build
Percent Traffic in W		2.5% 0.0%				0.0
Percent Trucks (incl		25% 25%		Peak (in minutes)		0.0
Truck Speed		55 55		-Vehicle Non-Peak (in mir		0.0
				Peak (in minutes		0.0
On-Ramp Volume		Peak Non-Pe	ak			
	olume (if aux. lane/on-ramp pro	.) 0 0	Highway	Grade Crossing	Current Year 1	Year 20
Metering Strat	egy (1, 2, 3, or D, if on-ramp pro	.)	Annua	I Number of Trains	0	
			Avg. C	Sate Down Time (in min.)	0.0	
	f queuing or grade crossing project)	Year 1 Year	<u>، المحمد المحم</u>			
	vehicles per hour)	0 0	Transit A	gency Costs (if TMS project) No Build	Build
Departure Rate	e (in vehicles per hour)	0 0		I Capital Expenditure		\$0
			Annua	I Ops. and Maintenance Expe	enditure	\$0
Pavement Conditio	n (if pavement project)	No Build Build				
IRI (inches/mil	e) Base (Year 1)					
(Forecast (Year 20)		Model should	d be run for both roads for i	intersection or bypass	hiahwav proiec
				twice for connectors. Press		
Average Vehicle O	cupancy (AVO)	No Build Build	data for seco	ond road. Atter data are en		
Average Vehicle Od General Traffic		No Build Build	data for seco	ond road. After data are en		lai piojeci beri
Average Vehicle Oo General Traffic		No Build Build 1.30 1.30 1.15 1.15		Prepare Model fo		lai project ben

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.

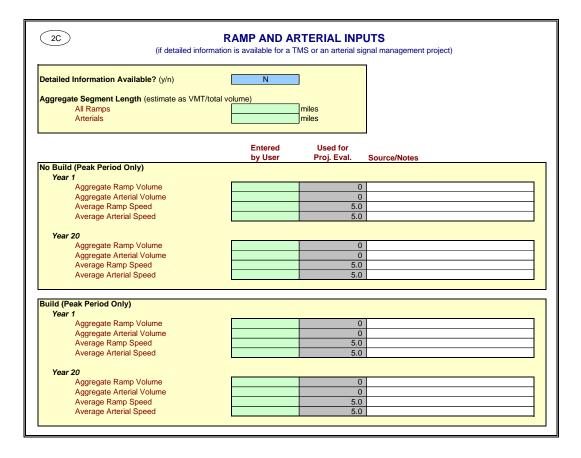
(1E)			PROJECT	COSTS (ente	er costs in t	housands	of dollars)		
Col. no.	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
		DIREC	T PROJECT CO	STS			Transit		
		INITIAL COSTS		SUBSEQUE	ENT COSTS		Agency	TOTAL COSTS	S (in dollars)
Year	Project			Maint./			Cost	Constant	Present
	Support	R/W	Construction	Op.	Rehab.	Mitigation	Savings	Dollars	Value
Constructio									
1	\$7,180	\$5,500	\$17,667					\$30,346,667	\$30,346,667
2			17,667					17,666,667	16,987,179
3			17,667					17,666,667	16,333,826
4								0	0
5								0	(
6								0	(
7								0	(
8								0	(
Project Op	en				-	1			
1				\$50				\$50,000	\$44,450
2				50				50,000	42,740
3				50				50,000	41,096
4				50				50,000	39,516
5				50				50,000	37,996
6				50				50,000	36,53
7				50				50,000	35,12
8				50				50,000	33,778
9				50				50,000	32,479
10				50				50,000	31,230
11				50				50,000	30,029
12				50				50,000	28,87
13				50				50,000	27,763
14				50				50,000	26,69
15				50				50,000	25,669
16				50				50,000	24,681
17				50				50,000	23,732
18				50				50,000	22,819
19				50				50,000	21,942
20	* =	•		50				50,000	21,098
Total	\$7,180	\$5,500	\$53,000	\$1,000	\$0	\$0	\$0	\$66,680,000	\$64,295,924

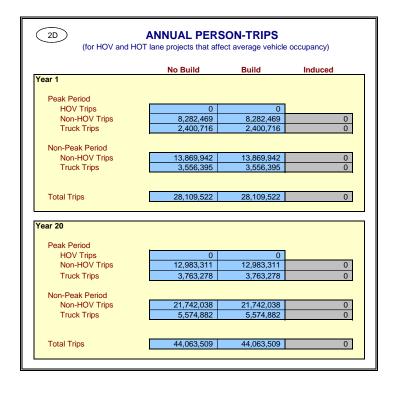
Present Value = <u>Future Value (in Constant Dollars)</u> (1 + Real Discount Rate) ^ Year

	Calculated by	Changed Used for Proj.	
	Model	by User Eval.	Reason for Change
Build <i>fear 1</i>			
Peak Period			
HOV Volume	0	0	
Non-HOV Volume	19,732	19,732	
Weaving Volume Truck Volume	0 6,577	6,577	
HOV Speed	55.0	55.0	
Non-HOV Speed	49.3	49.3	
Weaving Speed	55.0	55.0	
Truck Speed	49.3	49.3	
Non-Peak Period			
Non-HOV Volume	29,231	29,231	
Weaving Volume	0	0	
Truck Volume	9,744	9,744	
Non-HOV Speed Weaving Speed	49.4 55.0	49.4 55.0	
Truck Speed	49.4	49.4	
/ear 20			
Peak Period HOV Volume	0	0	
Non-HOV Volume	30,931	30,931	
Weaving Volume	0	0	
Truck Volume	10,310	10,310	
HOV Speed	55.0 38.9	55.0 38.9	
Non-HOV Speed Weaving Speed	55.0	55.0	
Truck Speed	38.9	38.9	
Non-Peak Period			
Non-HOV Volume	45,821	45,821	
Weaving Volume	0	0	
Truck Volume Non-HOV Speed	15,274 49.4	15,274 49.4	
Weaving Speed	55.0	55.0	
Truck Speed	49.4	49.4	
l ear 1			
Peak Period HOV Volume	0	0	
Non-HOV Volume	19,732	19,732	
Weaving Volume	0	0	
Truck Volume	6,577	6,577	
HOV Speed Non-HOV Speed	55.0	55.0	
	00.0	00.0	
	69.8 55.0	69.8	
Weaving Speed Truck Speed	69.8 55.0 55.0	69.8 55.0 55.0	
Weaving Speed Truck Speed	55.0	55.0	
Weaving Speed Truck Speed <u>Non-Peak Period</u>	55.0 55.0	55.0 55.0	
Weaving Speed Truck Speed <u>Non-Peak Period</u> Non-HOV Volume	55.0	55.0	
Weaving Speed Truck Speed <u>Non-Peak Period</u> Non-HOV Volume Weaving Volume Truck Volume	55.0 55.0 29,231 0 9,744	55.0 55.0 29,231 0 9,744	
Weaving Speed Truck Speed <u>Non-HOV Volume</u> Weaving Volume Truck Volume Non-HOV Speed	55.0 55.0 29,231 0 9,744 70.0	55.0 55.0 29,231 0 9,744 70.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed	55.0 55.0 29,231 0 9,744 70.0 55.0	29,231 0 9,744 70.0 55.0	
Weaving Speed Truck Speed <u>Non-HOV Volume</u> Weaving Volume Truck Volume Non-HOV Speed	55.0 55.0 29,231 0 9,744 70.0	55.0 55.0 29,231 0 9,744 70.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed	55.0 55.0 29,231 0 9,744 70.0 55.0	29,231 0 9,744 70.0 55.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed ear 20 Peak Period	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0	29,231 0 9,744 70.0 55.0 55.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Truck Speed Peak Period HOV Volume	55.0 55.0 29,231 0 9,744 70.0 55.0	29,231 29,231 0 9,744 70.0 55.0 55.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Peak Period HOV Volume Non-HOV Volume Non-HOV Volume Weaving Volume	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 30,931 0 0 30,931 0	55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 0 30,931 0 0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Truck Speed Peak Period HOV Volume Non-HOV Volume Weaving Volume Truck Volume	55.0 55.0 0 9,744 70.0 55.0 55.0 30,931 0 0 10,310	55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 30,931 0 10,310	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Peak Period HOV Volume Non-HOV Volume Weaving Volume Truck Volume HOV Speed	55.0 55.0 29,231 0 0 9,744 70.0 55.0 55.0 30,931 0 10,310 10,310 55.0	55.0 29,231 0 9,744 70.0 55.0 55.0 30,931 0 10,310 55.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Peak Period HOV Volume Non-HOV Volume Weaving Volume Weaving Volume HOV Speed Non-HOV Speed	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 30,931 0 10,310 55.0 55.1	55.0 29,231 0 9,744 70.0 55.0 55.0 0 30,931 0 10,310 55.0 55.1	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Peak Period HOV Volume Non-HOV Volume Weaving Volume Truck Volume HOV Speed Non-HOV Speed Non-HOV Speed Weaving Speed	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 0 30,931 0 10,310 55.0 55.1 55.1	55.0 29,231 0 9,744 70.0 55.0 55.0 55.0	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Non-HOV Speed Weaving Speed Truck Volume Kear 20 Peak Period HOV Volume Non-HOV Volume Weaving Volume Truck Volume HOV Speed Non-HOV Speed Non-HOV Speed Weaving Speed Truck Speed	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 30,931 0 10,310 55.0 55.1	55.0 29,231 0 9,744 70.0 55.0 55.0 0 30,931 0 10,310 55.0 55.1	
Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed Peak Period HOV Volume Non-HOV Volume Weaving Volume Truck Volume HOV Speed Non-HOV Speed Weaving Speed Truck Speed	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 0 30,931 0 10,310 55.0 55.1 55.0 55.0	55.0 29,231 0 9,744 70.0 55.0 55.0 0 30,931 0 10,310 55.0 55.0 55.0 55.0 55.0 55.0	
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Weaving Speed Truck Speed Non-HOV Volume Weaving Volume Truck Volume Non-HOV Speed Weaving Speed Truck Speed HOV Volume Non-HOV Volume HOV Volume HOV Speed Non-HOV Speed Non-HOV Speed Non-HOV Speed Non-HOV Speed Non-HOV Speed Non-HOV Volume	55.0 55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 0 30,931 0 10,310 55.0 55.1 55.0 55.0 55.0 55.0 45,821	55.0 29,231 0 9,744 70.0 55.0 55.0 55.0 0 0.0 0.0 55.0 0 0.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0 55.0	

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

2B	HI	IGHWAY AC	CCIDENT RAT	ES
	Calculated by	Changed	Used for Proj.	
	Model	by User	Eval.	Reason for Change
No Build	0.004		0.004	
Fatal Accidents	0.031		0.031	
Injury Accidents	0.54		0.54	
PDO Accidents	2.21		2.21	
Total Accidents	2.781			
Hwy Safety or Weaving Impro	ovement	0%	collision reduction	factor (per HSIP Guidelines)
Hwy Safety or Weaving Impro	_	0%	collision reduction	factor (per HSIP Guidelines)
	_	0%	collision reduction	factor (per HSIP Guidelines)
Adjustment Factor (Actual/Sta	atewide Avg. Existing)	0%	-	factor (per HSIP Guidelines)
Adjustment Factor (Actual/Sta Fatal Accidents	atewide Avg. Existing) 3.5054	0%	3.5054	factor (per HSIP Guidelines)
Adjustment Factor (Actual/Sta Fatal Accidents Injury Accidents PDO Accidents Build	atewide Avg. Existing) 3.5054 1.2992 2.6345	0%	3.5054 1.2992 2.6345	factor (per HSIP Guidelines)
Adjustment Factor (Actual/Sta Fatal Accidents Injury Accidents PDO Accidents Build Fatal Accidents	atewide Avg. Existing) 3.5054 1.2992 2.6345 0.014		3.5054 1.2992 2.6345 0.014	factor (per HSIP Guidelines)
Adjustment Factor (Actual/Sta Fatal Accidents Injury Accidents PDO Accidents Build Fatal Accidents Injury Accidents		0%	3.5054 1.2992 2.6345 0.014 0.34	factor (per HSIP Guidelines)
Adjustment Factor (Actual/Sta Fatal Accidents Injury Accidents PDO Accidents Build Fatal Accidents	atewide Avg. Existing) 3.5054 1.2992 2.6345 0.014		3.5054 1.2992 2.6345 0.014	factor (per HSIP Guidelines)





PROJECT: Commercial IC

EA:	
PPNO [.]	

06-0U880 6940

3		INVESTMENT ANALYSIS SUMMARY RESULTS				
			Passenger	Freight	Total Over	Average
Life-Cycle Costs (mil. \$)	\$64.3	ITEMIZED BENEFITS (mil. \$)	Benefits	Benefits	20 Years	Annual
Life-Cycle Benefits (mil. \$)	\$193.9	Travel Time Savings	\$103.0	\$31.0	\$134.0	\$6.7
Net Present Value (mil. \$)	\$129.6	Veh. Op. Cost Savings	-\$18.2	-\$3.3	-\$21.4	-\$1.1
		Accident Cost Savings	\$63.5	\$21.2	\$84.6	\$4.2
Benefit / Cost Ratio:	3.0	Emission Cost Savings	-\$1.8	-\$1.5	-\$3.3	-\$0.2
		TOTAL BENEFITS	\$146.5	\$47.4	\$193.9	\$9.7
Rate of Return on Investment:	16.4%	Densers Harris of Time Orned		Г	44.450.400	707.075
Payback Period:	6 years	Person-Hours of Time Saved			14,159,496	707,975
Should benefit-cost results inclu	ıde:		Tor	<u>15</u>	<u>Value (n</u>	<u>nil. \$)</u>
			Total Over	Average	Total Over	Average
1) Induced Travel? (y/n)	Y	EMISSIONS REDUCTION	20 Years	Annual	20 Years	Annual
	Default = Y	CO Emissions Saved	124	6	\$0.0	\$0.0
2) Vehicle Operating Costs? (y/n)	Y	CO ₂ Emissions Saved	-74,125	-3,706	-\$2.3	-\$0.1
	Default = Y	NO _x Emissions Saved	-42	-2	-\$0.5	-\$0.0
3) Accident Costs? (y/n)	Y	PM ₁₀ Emissions Saved	-6	0	-\$0.4	-\$0.0
	Default = Y	PM _{2.5} Emissions Saved	-6	0		
4) Vehicle Emissions? (y/n)	Y	SO _x Emissions Saved	-1	0	-\$0.0	-\$0.0
includes value for CO ₂ e	Default = Y	VOC Emissions Saved	-10	-1	-\$0.0	-\$0.0

					HIGHWAY				
Year	Peak	Peak	Peak	Peak	Peak	Peak	Non-Peak	Non-Peak	Non-Peak
	HOV	Non-HOV	Weaving	Truck	Ramp	Arterial	Non-HOV	Weaving	Truck
1	\$0	\$2,095,618	\$0	\$493,064	\$0	\$0	\$3,509,276	\$0	\$716,153
20	\$0	\$1,978,183	\$0	\$1,313,240	\$0	\$0	\$2,611,017	\$0	\$532,842
2	\$0	\$2,098,603	\$0	\$541,159	\$0	\$0	\$3,475,101	\$0	\$709,179
3	\$0	\$2,100,091	\$0	\$588,963	\$0	\$0	\$3,438,363	\$0	\$701,682
4	\$0	\$2,100,184	\$0	\$636,407	\$0	\$0	\$3,399,310	\$0	\$693,712
5	\$0	\$2,098,977	\$0	\$683,426	\$0	\$0	\$3,358,176	\$0	\$685,318
6	\$0	\$2,096,563	\$0	\$729,965	\$0	\$0	\$3,315,176	\$0	\$676,543
7	\$0	\$2,093,029	\$0	\$775,975	\$0	\$0	\$3,270,517	\$0	\$667,429
8	\$0	\$2,088,458	\$0	\$821,411	\$0	\$0	\$3,224,389	\$0	\$658,015
9	\$0	\$2,082,929	\$0	\$866,237	\$0	\$0	\$3,176,971	\$0	\$648,339
10	\$0	\$2,076,518	\$0	\$910,421	\$0	\$0	\$3,128,431	\$0	\$638,433
11	\$0	\$2,069,298	\$0	\$953,935	\$0	\$0	\$3,078,926	\$0	\$628,330
12	\$0	\$2,061,336	\$0	\$996,759	\$0	\$0	\$3,028,600	\$0	\$618,060
13	\$0	\$2,052,698	\$0	\$1,038,874	\$0	\$0	\$2,977,591	\$0	\$607,650
14	\$0	\$2,043,446	\$0	\$1,080,269	\$0	\$0	\$2,926,026	\$0	\$597,127
15	\$0	\$2,033,639	\$0	\$1,120,933	\$0	\$0	\$2,874,022	\$0	\$586,514
16	\$0	\$2,023,335	\$0	\$1,160,862	\$0	\$0	\$2,821,690	\$0	\$575,835
17	\$0	\$2,012,587	\$0	\$1,200,054	\$0	\$0	\$2,769,133	\$0	\$565,109
18	\$0	\$2,001,446	\$0	\$1,238,510	\$0	\$0	\$2,716,444	\$0	\$554,357
19	\$0	\$1,989,963	\$0	\$1,276,237	\$0	\$0	\$2,663,711	\$0	\$543,595
Total	\$0	\$41,196,900	\$0	\$18,426,700	\$0	\$0	\$61,762,871	\$0	\$12,604,221

		TRA	NSIT		Present		Total				
Veen	Basta	Deals	New Deale	New Deale	Value of	Ormetent	Per-Hrs				
Year	Peak	Peak	Non-Peak	Non-Peak	Travel Time	Constant	of Time				
	In-Vehicle	Out-of-Veh	In-Vehicle	Out-of-Veh	Benefits	Dollars	Saved				
1	\$0	\$0	\$0	\$0	\$6,814,112	\$7,664,949	505,205				
20	\$0	\$0	\$0	\$0	\$6,435,282	\$15,251,096	936,112				
2	\$0	\$0	\$0	\$0	\$6,824,042	\$7,983,163	524,272				
3	\$0	\$0	\$0	\$0	\$6,829,099	\$8,308,643	543,662				
4	\$0	\$0	\$0	\$0	\$6,829,613	\$8,641,640	563,388				
5	\$0	\$0	\$0	\$0	\$6,825,897	\$8,982,415	583,460				
6	\$0	\$0	\$0	\$0	\$6,818,248	\$9,331,243	603,892				
7	\$0	\$0	\$0	\$0	\$6,806,950	\$9,688,412	624,694				
8	\$0	\$0	\$0	\$0	\$6,792,273	\$10,054,224	645,882				
9	\$0	\$0	\$0	\$0	\$6,774,476	\$10,428,994	667,470				
10	\$0	\$0	\$0	\$0	\$6,753,803	\$10,813,056	689,471				
11	\$0	\$0	\$0	\$0	\$6,730,488	\$11,206,758	711,902				
12	\$0	\$0	\$0	\$0	\$6,704,754	\$11,610,465	734,779				
13	\$0	\$0	\$0	\$0	\$6,676,813	\$12,024,563	758,119				
14	\$0	\$0	\$0	\$0	\$6,646,867	\$12,449,457	781,940				
15	\$0	\$0	\$0	\$0	\$6,615,108	\$12,885,573	806,261				
16	\$0	\$0	\$0	\$0	\$6,581,722	\$13,333,361	831,103				
17	\$0	\$0	\$0	\$0	\$6,546,882	\$13,793,294	856,486				
18	\$0	\$0	\$0	\$0	\$6,510,757	\$14,265,871	882,432				
19	\$0	\$0	\$0	\$0	\$6,473,506	\$14,751,619	908,966				
		. -	. -	* -							
Total	\$0	\$0	\$0	\$0	\$133,990,692	\$223,468,795	14,159,496				

SUMMARY OF VEHICLE OPERATING COST BENEFITS

				HIGH		TRA	NSIT	Present Value of				
Year	Peak	Peak	Peak	Peak	Peak	Non-Peak	Non-Peak	Non-Peak	Peak	Non-Peak	Veh Op Cost	Constant
	HOV	Non-HOV	Weaving	Truck	Arterial	Non-HOV	Weaving	Truck	Period	Period	Benefits	Dollars
1	\$0	(\$498,833)	\$0	(\$69,917)	\$0	(\$791,749)	\$0	(\$103,575)	-	-	(\$1,464,074)	(\$1,646,885)
20	\$0	\$39,766	\$0	(\$88,035)	\$0	(\$589,088)	\$0	(\$77,063)	-	-	(\$714,420)	(\$1,693,117)
2	\$0	(\$493,975)	\$0	(\$65,686)	\$0	(\$784,039)	\$0	(\$102,566)	-	-	(\$1,446,266)	(\$1,691,926)
3	\$0	(\$448,023)	\$0	(\$64,991)	\$0	(\$775,750)	\$0	(\$101,482)	-	-	(\$1,390,247)	(\$1,691,448)
4	\$0	(\$408,420)	\$0	(\$59,044)	\$0	(\$766,939)	\$0	(\$100,329)	-	-	(\$1,334,732)	(\$1,688,862)
5	\$0	(\$369,381)	\$0	(\$58,329)	\$0	(\$757,659)	\$0	(\$99,115)	-	-	(\$1,284,484)	(\$1,690,294)
6	\$0	(\$330,992)	\$0	(\$54,195)	\$0	(\$747,957)	\$0	(\$97,846)	-	-	(\$1,230,990)	(\$1,684,695)
7	\$0	(\$326,533)	\$0	(\$53,465)	\$0	(\$737,881)	\$0	(\$96,528)	-	-	(\$1,214,407)	(\$1,728,480)
8	\$0	(\$289,189)	\$0	(\$49,416)	\$0	(\$727,474)	\$0	(\$95,166)	-	-	(\$1,161,246)	(\$1,718,928)
9	\$0	(\$236,551)	\$0	(\$61,674)	\$0	(\$716,776)	\$0	(\$93,767)	-	-	(\$1,108,767)	(\$1,706,896)
10	\$0	(\$201,172)	\$0	(\$60,731)	\$0	(\$705,825)	\$0	(\$92,334)	-	-	(\$1,060,063)	(\$1,697,195)
11	\$0	(\$187,569)	\$0	(\$72,353)	\$0	(\$694,655)	\$0	(\$90,873)	-	-	(\$1,045,450)	(\$1,740,752)
12	\$0	(\$153,752)	\$0	(\$71,171)	\$0	(\$683,301)	\$0	(\$89,388)	-	-	(\$997,612)	(\$1,727,541)
13	\$0	(\$105,814)	\$0	(\$82,141)	\$0	(\$671,793)	\$0	(\$87,882)	-	-	(\$947,630)	(\$1,706,628)
14	\$0	(\$89,127)	\$0	(\$80,719)	\$0	(\$660,159)	\$0	(\$86,360)	-	-	(\$916,365)	(\$1,716,334)
15	\$0	(\$58,362)	\$0	(\$91,030)	\$0	(\$648,426)	\$0	(\$84,826)	-	-	(\$882,643)	(\$1,719,301)
16	\$0	(\$57,299)	\$0	(\$89,372)	\$0	(\$636,619)	\$0	(\$83,281)	-	-	(\$866,571)	(\$1,755,515)
17	\$0	(\$32,802)	\$0	(\$99,025)	\$0	(\$624,761)	\$0	(\$81,730)	-	-	(\$838,318)	(\$1,766,209)
18	\$0	\$4,597	\$0	(\$94,365)	\$0	(\$612,874)	\$0	(\$80,175)		-	(\$782,817)	(\$1,715,248)
19	\$0	\$22,538	\$0	(\$92,533)	\$0	(\$600,976)	\$0	(\$78,618)	-	-	(\$749,590)	(\$1,708,142)
Total	\$0	(\$4,220,894)	\$0	(\$1,458,194)	\$0	(\$13,934,700)	\$0	(\$1,822,904)	-	-	(\$21,436,692)	(\$34,194,393)

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SUMMARY OF ACCIDENT REDUCTION BENEFITS

				HIGH	WAY				TRANSIT	Present Value of	
Year	Peak	Peak	Peak	Peak	Peak	Non-Peak	Non-Peak	Non-Peak	All	Accident	Constant
	HOV	Non-HOV	Weaving	Truck	Arterial	Non-HOV	Weaving	Truck	Periods	Benefits	Dollars
1	\$0	\$1,453,700	\$0	\$484,567	\$0	\$2,153,496	\$0	\$717,832	\$0	\$4,809,594	\$5,410,139
20	\$0	\$1,081,601	\$0	\$360,534	\$0	\$1,602,272	\$0	\$534,091	\$0	\$3,578,496	\$8,480,746
2	\$0	\$1,439,543	\$0	\$479,848	\$0	\$2,132,524	\$0	\$710,841	\$0	\$4,762,755	\$5,571,750
3	\$0	\$1,424,324	\$0	\$474,775	\$0	\$2,109,979	\$0	\$703,326	\$0	\$4,712,405	\$5,733,361
4	\$0	\$1,408,147	\$0	\$469,382	\$0	\$2,086,014	\$0	\$695,338	\$0	\$4,658,882	\$5,894,972
5	\$0	\$1,391,107	\$0	\$463,702	\$0	\$2,060,772	\$0	\$686,924	\$0	\$4,602,505	\$6,056,583
6	\$0	\$1,373,295	\$0	\$457,765	\$0	\$2,034,385	\$0	\$678,128	\$0	\$4,543,573	\$6,218,194
7	\$0	\$1,354,795	\$0	\$451,598	\$0	\$2,006,979	\$0	\$668,993	\$0	\$4,482,366	\$6,379,804
8	\$0	\$1,335,687	\$0	\$445,229	\$0	\$1,978,673	\$0	\$659,558	\$0	\$4,419,146	\$6,541,415
9	\$0	\$1,316,044	\$0	\$438,681	\$0	\$1,949,574	\$0	\$649,858	\$0	\$4,354,158	\$6,703,026
10	\$0	\$1,295,937	\$0	\$431,979	\$0	\$1,919,787	\$0	\$639,929	\$0	\$4,287,632	\$6,864,637
11	\$0	\$1,275,429	\$0	\$425,143	\$0	\$1,889,408	\$0	\$629,803	\$0	\$4,219,782	\$7,026,248
12	\$0	\$1,254,582	\$0	\$418,194	\$0	\$1,858,525	\$0	\$619,508	\$0	\$4,150,809	\$7,187,859
13	\$0	\$1,233,452	\$0	\$411,151	\$0	\$1,827,223	\$0	\$609,074	\$0	\$4,080,900	\$7,349,470
14	\$0	\$1,212,091	\$0	\$404,030	\$0	\$1,795,579	\$0	\$598,526	\$0	\$4,010,227	\$7,511,081
15	\$0	\$1,190,549	\$0	\$396,850	\$0	\$1,763,667	\$0	\$587,889	\$0	\$3,938,955	\$7,672,691
16	\$0	\$1,168,871	\$0	\$389,624	\$0	\$1,731,553	\$0	\$577,184	\$0	\$3,867,232	\$7,834,302
17	\$0	\$1,147,099	\$0	\$382,366	\$0	\$1,699,301	\$0	\$566,434	\$0	\$3,795,200	\$7,995,913
18	\$0	\$1,125,273	\$0	\$375,091	\$0	\$1,666,968	\$0	\$555,656	\$0	\$3,722,988	\$8,157,524
19	\$0	\$1,103,429	\$0	\$367,810	\$0	\$1,634,608	\$0	\$544,869	\$0	\$3,650,716	\$8,319,135
Total	\$0	\$25,584,955	\$0	\$8,528,318	\$0	\$37,901,286	\$0	\$12,633,762	\$0	\$84,648,321	\$138,908,850

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					HIGHWAY							
Year	Peak	Peak	Peak	Peak	Peak	Peak	Non-Peak	Non-Peak	Non-Peak			
	HOV	Non-HOV	Weaving	Truck	Ramp	Arterial	Non-HOV	Weaving	Truck			
1	\$0	(\$50,307)	\$0	(\$81,186)	\$0	\$0	(\$80,313)	\$0	(\$120,268)			
20	\$0	(\$12,856)	\$0	\$39,298	\$0	\$0	(\$46,649)	\$0	(\$38,908)			
2	\$0	(\$52,569)	\$0	(\$68,660)	\$0	\$0	(\$80,898)	\$0	(\$119,940)			
3	\$0	(\$48,883)	\$0	(\$68,353)	\$0	\$0	(\$81,423)	\$0	(\$119,524)			
4	\$0	(\$46,630)	\$0	(\$55,654)	\$0	\$0	(\$81,890)	\$0	(\$119,025)			
5	\$0	(\$42,970)	\$0	(\$55,248)	\$0	\$0	(\$82,301)	\$0	(\$118,449)			
6	\$0	(\$41,207)	\$0	(\$42,455)	\$0	\$0	(\$82,659)	\$0	(\$117,804)			
7	\$0	(\$41,422)	\$0	(\$41,994)	\$0	\$0	(\$82,966)	\$0	(\$117,093)			
8	\$0	(\$27,205)	\$0	\$2,359	\$0	\$0	(\$45,873)	\$0	(\$41,889)			
9	\$0	(\$26,057)	\$0	\$8,413	\$0	\$0	(\$46,061)	\$0	(\$41,725)			
10	\$0	(\$24,825)	\$0	\$8,308	\$0	\$0	(\$46,223)	\$0	(\$41,542)			
11	\$0	(\$25,133)	\$0	\$14,154	\$0	\$0	(\$46,361)	\$0	(\$41,341)			
12	\$0	(\$23,865)	\$0	\$13,985	\$0	\$0	(\$46,475)	\$0	(\$41,123)			
13	\$0	(\$22,770)	\$0	\$19,675	\$0	\$0	(\$46,567)	\$0	(\$40,890)			
14	\$0	(\$21,303)	\$0	\$19,436	\$0	\$0	(\$46,637)	\$0	(\$40,642)			
15	\$0	(\$20,044)	\$0	\$24,975	\$0	\$0	(\$46,686)	\$0	(\$40,380)			
16	\$0	(\$20,069)	\$0	\$24,662	\$0	\$0	(\$46,715)	\$0	(\$40,107)			
17	\$0	(\$18,790)	\$0	\$29,889	\$0	\$0	(\$46,726)	\$0	(\$39,822)			
18	\$0	(\$15,891)	\$0	\$34,926	\$0	\$0	(\$46,717)	\$0	(\$39,527)			
19	\$0	(\$14,271)	\$0	\$34,462	\$0	\$0	(\$46,692)	\$0	(\$39,222)			
•					· · ·				, , , , ,			
Total	\$0	(\$597,065)	\$0	(\$139,010)	\$0	\$0	(\$1,176,831)	\$0	(\$1,359,222)			



		TRA	Present			
X					Value of	• • •
Year	Peak	Non-Peak	Passenger	Light	Emission	Constant
	Bus	Bus	Rail	Rail	Benefits	Dollars
1	\$0	\$0	\$0	\$0	(\$332,075)	(\$373,539)
20	\$0	\$0	\$0	\$0	(\$59,115)	(\$140,097)
2	\$0	\$0	\$0	\$0	(\$322,068)	(\$376,774)
3	\$0	\$0	\$0	\$0	(\$318,183)	(\$387,118)
4	\$0	\$0	\$0	\$0	(\$303,198)	(\$383,642)
5	\$0	\$0	\$0	\$0	(\$298,968)	(\$393,422)
6	\$0	\$0	\$0	\$0	(\$284,124)	(\$388,844)
7	\$0	\$0	\$0	\$0	(\$283,475)	(\$403,474)
8	\$0	\$0	\$0	\$0	(\$112,608)	(\$166,687)
9	\$0	\$0	\$0	\$0	(\$105,430)	(\$162,304)
10	\$0	\$0	\$0	\$0	(\$104,282)	(\$166,960)
11	\$0	\$0	\$0	\$0	(\$98,681)	(\$164,311)
12	\$0	\$0	\$0	\$0	(\$97,478)	(\$168,801)
13	\$0	\$0	\$0	\$0	(\$90,551)	(\$163,078)
14	\$0	\$0	\$0	\$0	(\$89,145)	(\$166,967)
15	\$0	\$0	\$0	\$0	(\$82,135)	(\$159,991)
16	\$0	\$0	\$0	\$0	(\$82,230)	(\$166,582)
17	\$0	\$0	\$0	\$0	(\$75,449)	(\$158,959)
18	\$0	\$0	\$0	\$0	(\$67,210)	(\$147,265)
19	\$0	\$0	\$0	\$0	(\$65,722)	(\$149,766)
Tete	¢0	¢0	¢0	¢0.	(\$2.070.400)	(\$4 700 504)
Total	\$0	\$0	\$0	\$0	(\$3,272,128)	(\$4,788,581)

	TONS EMISSIONS SAVED								
Year			1	(tons/yr)					
. our	со	CO ₂	NO _X	PM ₁₀	SOx	voc	PM _{2.5}		
1	3	(5,134)	(8)	(0)	(0)	(1)	(0)		
20	8	(2,781)	3	(0)	(0)	(0)	(0)		
2	4	(5,116)	(8)	(0)	(0)	(1)	(0)		
3	5	(5,178)	(8)	(0)	(0)	(1)	(0)		
4	6	(5,054)	(8)	(0)	(0)	(1)	(0)		
5	7	(5,101)	(8)	(1)	(0)	(1)	(0)		
6	8	(4,952)	(8)	(1)	(0)	(1)	(1)		
7	8	(5,081)	(8)	(1)	(0)	(1)	(1)		
8	5	(3,002)	(1)	(0)	(0)	(0)	(0)		
9	5	(2,978)	(0)	(0)	(0)	(0)	(0)		
10	5	(3,008)	(0)	(0)	(0)	(0)	(0)		
11	6	(3,019)	0	(0)	(0)	(0)	(0)		
12	6	(3,045)	0	(0)	(0)	(0)	(0)		
13	6	(3,006)	1	(0)	(0)	(0)	(0)		
14	6	(3,019)	1	(0)	(0)	(0)	(0)		
15	7	(2,964)	1	(0)	(0)	(0)	(0)		
16	7	(3,027)	1	(0)	(0)	(0)	(0)		
17	7	(2,965)	2	(0)	(0)	(0)	(0)		
18	8	(2,850)	3	(0)	(0)	(0)	(0)		
19	8	(2,847)	3	(0)	(0)	(0)	(0)		
Total	124	(74,125)	(42)	(6)	(1)	(10)	(6)		



	DOLLARS EMISSIONS SAVED (PV \$/yr)								
Year	со	CO2	NO _x	PM ₁₀	SOx	VOC			
1	\$229	(\$184,046)	(\$99,701)	(\$45,110)	(\$2,556)	(\$890)			
20	\$264	(\$68,929)	\$20,153	(\$9,902)	(\$610)	(\$91)			
	ľ		· · ·	, · · / i		· · · · ·			
2	\$242	(\$179,884)	(\$94,797)	(\$44,320)	(\$2,443)	(\$866)			
3	\$283	(\$178,553)	(\$92,954)	(\$43,851)	(\$2,285)	(\$822)			
4	\$338	(\$170,920)	(\$87,186)	(\$42,494)	(\$2,173)	(\$762)			
5	\$376	(\$169,191)	(\$85,310)	(\$41,980)	(\$2,146)	(\$717)			
6	\$428	(\$161,096)	(\$79,655)	(\$41,107)	(\$2,034)	(\$660)			
7	\$422	(\$162,104)	(\$78,582)	(\$40,554)	(\$2,007)	(\$651)			
8	\$246	(\$93,928)	(\$7,061)	(\$10,517)	(\$1,123)	(\$224)			
9	\$256	(\$91,401)	(\$2,491)	(\$10,603)	(\$985)	(\$205)			
10	\$252	(\$90,539)	(\$2,392)	(\$10,441)	(\$970)	(\$193)			
11	\$262	(\$89,138)	\$1,883	(\$10,587)	(\$916)	(\$185)			
12	\$257	(\$88,159)	\$1,912	(\$10,414)	(\$901)	(\$174)			
13	\$266	(\$85,368)	\$6,056	(\$10,464)	(\$885)	(\$156)			
14	\$256	(\$84,079)	\$5,979	(\$10,283)	(\$870)	(\$149)			
15	\$259	(\$80,977)	\$9,857	(\$10,318)	(\$818)	(\$138)			
16	\$254	(\$81,092)	\$9,677	(\$10,130)	(\$803)	(\$135)			
17	\$256	(\$77,906)	\$13,335	(\$10,221)	(\$788)	(\$125)			
18	\$263	(\$73,440)	\$17,015	(\$10,164)	(\$773)	(\$111)			
19	\$252	(\$71,958)	\$16,711	(\$9,967)	(\$656)	(\$105)			
Total	\$5,660	(\$2,282,708)	(\$527,550)	(\$433,429)	(\$26,742)	(\$7,357)			

C

NET PRESENT VALUE CALCULATION

	PR	ESENT VALUE O	F USER BENEFI	rs	PI			TS
Year	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	Travel Time Savings	(roa Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions
Construc	tion Period				,			
1								
2								
3								
4								
5								
6								
7								
8								
Project O		(\$4,404,0=))	A (000 5-)	(\$222.6)				
1	\$6,814,112	(\$1,464,074)	\$4,809,594	(\$332,075)				
2	\$6,824,042	(\$1,446,266)	\$4,762,755	(\$322,068)				
3	\$6,829,099	(\$1,390,247)	\$4,712,405	(\$318,183)				
4	\$6,829,613	(\$1,334,732)	\$4,658,882	(\$303,198)				
5	\$6,825,897	(\$1,284,484)	\$4,602,505	(\$298,968)				
6 7	\$6,818,248	(\$1,230,990)	\$4,543,573	(\$284,124)				
8	\$6,806,950	(\$1,214,407)	\$4,482,366	(\$283,475)				
8 9	\$6,792,273 \$6,774,476	(\$1,161,246)	\$4,419,146 \$4,354,158	(\$112,608)				
9 10	\$6,753,803	(\$1,108,767) (\$1,060,063)	\$4,287,632	(\$105,430) (\$104,282)				
10	\$6,730,488	(\$1,080,083)	\$4,219,782	(\$104,282) (\$98,681)				
12	\$6,704,754	(\$997,612)	\$4,150,809	(\$97,478)				
13	\$6,676,813	(\$947,630)	\$4,080,900	(\$90,551)				
14	\$6,646,867	(\$916,365)	\$4,010,227	(\$89,145)				
15	\$6,615,108	(\$882,643)	\$3,938,955	(\$82,135)				
16	\$6,581,722	(\$866,571)	\$3,867,232	(\$82,230)				
17	\$6,546,882	(\$838,318)	\$3,795,200	(\$75,449)				
18	\$6,510,757	(\$782,817)	\$3,722,988	(\$67,210)				
19	\$6,473,506	(\$749,590)	\$3,650,716	(\$65,722)				
20	\$6,435,282	(\$714,420)	\$3,578,496	(\$59,115)				
Total	\$133,990,692	(\$21,436,692)	\$84,648,321	(\$3,272,128)	\$0	\$0	\$0	\$(
ſ	14.159.496	Person-Hours of T	ime Saved	1		Person-Hours of	Time Saved	
L	, ,	\$ PV		Ľ	tono	\$ PV		
Г	tons 124		CO Saved	ſ	tons	φΓν	CO Saved	
F	(74,125)	(\$2,282,708)					CO ₂ Saved	
-	,		-					
Ļ	(42)	(\$527,550)					NO _X Saved	
	(6)	(\$433,429)					PM ₁₀ Saved	
Γ	(6)		PM _{2.5} Saved				PM _{2.5} Saved	
ſ	(1)	(\$26,742)	SO _x Saved				SO _x Saved	
_	(10)		VOC Saved				VOC Saved	
г	\$31,030,922	(\$3,281,098)	\$21,162,080	(\$1,498,232)				

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P	RESENT VALUE (TS	Present	Present	
		ad 3)		Value	Value	
Travel	Vehicle		Vehicle	of Total	of Total	NET
Time	Op. Cost	Accident	Emission	User	Project	PRESENT
Savings	Savings	Reductions	Reductions	Benefits	Costs	VALUE
				Aa	* ***	
				\$0	\$30,346,667	(\$30,346,667)
				\$0	\$16,987,179	(\$16,987,179)
				\$0	\$16,333,826	(\$16,333,826)
				\$0	\$0	\$0
				\$0	\$0	\$0
				\$0	\$0	\$0
				\$0	\$0	\$0
				\$0	\$0	\$0
	1		1	¢0.007.550	¢44.450	¢0 702 407
				\$9,827,556	\$44,450	\$9,783,107
				\$9,818,463	\$42,740	\$9,775,723
				\$9,833,074	\$41,096	\$9,791,978
				\$9,850,565	\$39,516	\$9,811,049
				\$9,844,950	\$37,996	\$9,806,954
				\$9,846,707	\$36,535	\$9,810,172
				\$9,791,433	\$35,129	\$9,756,304
				\$9,937,565	\$33,778	\$9,903,787
				\$9,914,437	\$32,479	\$9,881,958
				\$9,877,090	\$31,230	\$9,845,860
				\$9,806,139	\$30,029	\$9,776,111
				\$9,760,473	\$28,874	\$9,731,600
				\$9,719,531	\$27,763	\$9,691,768
				\$9,651,584	\$26,695	\$9,624,889
				\$9,589,285	\$25,669	\$9,563,616
				\$9,500,153	\$24,681	\$9,475,471
				\$9,428,316	\$23,732	\$9,404,583
				\$9,383,718	\$22,819	\$9,360,899
				\$9,308,910	\$21,942	\$9,286,968
				\$9,240,244	\$21,098	\$9,219,146
\$0	\$0	\$0	\$0	\$193,930,193	\$64,295,924	\$129,634,270
	Person-Hours of	•		····	····	·····
40	¢ D\/					
tons	\$ PV	CO Saved				
		CO ₂ Saved				
		-				
		NO _X Saved				
		PM ₁₀ Saved				
		PM _{2.5} Saved				
		SO _x Saved				
		VOC Saved				
		1.00 00/00				
				Freight Benefits Only		
	*			5 ,		

INTERNAL RATE OF RETURN ON INVESTMENT AND PAYBACK PERIOD

	USE	R BENEFITS IN C	ONSTANT DOLL	ARS	USE	R BENEFITS IN C (roa	ONSTANT DOLL	ARS
Year	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions	Travel Time Savings	Vehicle Op. Cost Savings	Accident Reductions	Vehicle Emission Reductions
Construc	ction Period	g-			J	- Jan Star		
1								
2								
3								
4								
5								
6								
7								
8								
Project C	Open							
1	\$7,664,949	(\$1,646,885)	\$5,410,139	(\$373,539)				
2	\$7,983,163	(\$1,691,926)	\$5,571,750	(\$376,774)				
3	\$8,308,643	(\$1,691,448)	\$5,733,361	(\$387,118)				
4	\$8,641,640	(\$1,688,862)	\$5,894,972	(\$383,642)				
5	\$8,982,415	(\$1,690,294)	\$6,056,583	(\$393,422)				
6	\$9,331,243	(\$1,684,695)	\$6,218,194	(\$388,844)				
7	\$9,688,412	(\$1,728,480)	\$6,379,804	(\$403,474)				
8	\$10,054,224	(\$1,718,928)	\$6,541,415	(\$166,687)				
9	\$10,428,994	(\$1,706,896)	\$6,703,026	(\$162,304)				
10	\$10,813,056	(\$1,697,195)	\$6,864,637	(\$166,960)				
11	\$11,206,758	(\$1,740,752)	\$7,026,248	(\$164,311)				
12	\$11,610,465	(\$1,727,541)	\$7,187,859	(\$168,801)				
13	\$12,024,563	(\$1,706,628)	\$7,349,470	(\$163,078)				
14	\$12,449,457	(\$1,716,334)	\$7,511,081	(\$166,967)				
15	\$12,885,573	(\$1,719,301)	\$7,672,691	(\$159,991)				
16	\$13,333,361	(\$1,755,515)	\$7,834,302	(\$166,582)				
17	\$13,793,294	(\$1,766,209)	\$7,995,913	(\$158,959)				
18	\$14,265,871	(\$1,715,248)	\$8,157,524	(\$147,265)				
19	\$14,751,619	(\$1,708,142)	\$8,319,135	(\$149,766)				
20	\$15,251,096	(\$1,693,117)	\$8,480,746	(\$140,097)				
Total	\$223,468,795	(\$34,194,393)	\$138,908,850	(\$4,788,581)	\$0	\$0	\$0	\$C

В

USE		CONSTANT DOLL ad 3)	ARS	Total User	Total Project	ANNUAL	CUMULATIVE
Travel	Vehicle		Vehicle	Benefits in	Costs in	RETURNS	RETURNS
Time	Op. Cost	Accident	Emission	Constant	Constant	ON	AFTER
Savings	Savings	Reductions	Reductions	Dollars	Dollars	INVESTMENT	PROJ OPENS
ouvings	ouvings	Reductions	Reductions	Donars	Donars		TROUGHERO
				\$0	\$30,346,667	(\$30,346,667)	
				\$0	\$17,666,667	(\$17,666,667)	
				\$0	\$17,666,667	(\$17,666,667)	
				\$0	\$0	\$0	
				\$0	\$0	\$0	
				\$0	\$0	\$0	
				\$0	\$0	\$0	
				\$0	\$0	\$0	
				\$11,054,664	\$50,000	\$11,004,664	\$11,004,664
				\$11,486,213	\$50,000	\$11,436,213	\$22,440,877
				\$11,963,438	\$50,000	\$11,913,438	\$34,354,316
				\$12,464,107	\$50,000	\$12,414,107	\$46,768,423
				\$12,955,282	\$50,000	\$12,905,282	\$59,673,705
				\$13,475,898	\$50,000	\$13,425,898	\$73,099,603
				\$13,936,263	\$50,000	\$13,886,263	\$86,985,866
				\$14,710,024	\$50,000	\$14,660,024	\$101,645,890
				\$15,262,820	\$50,000	\$15,212,820	\$116,858,709
				\$15,813,539	\$50,000	\$15,763,539	\$132,622,249
				\$16,327,943	\$50,000	\$16,277,943	\$148,900,191
				\$16,901,982	\$50,000	\$16,851,982	\$165,752,173
				\$17,504,326	\$50,000	\$17,454,326	\$183,206,500
				\$18,077,236	\$50,000	\$18,027,236	\$201,233,736
				\$18,678,972	\$50,000	\$18,628,972	\$219,862,708
				\$19,245,566	\$50,000	\$19,195,566	\$239,058,274
				\$19,864,039	\$50,000	\$19,814,039	\$258,872,313
				\$20,560,883	\$50,000	\$20,510,883	\$279,383,196
				\$21,212,846	\$50,000	\$21,162,846	\$300,546,042
				\$21,898,628	\$50,000	\$21,848,628	\$322,394,671
	*~	* ^	**				1
\$0	\$0	\$0	\$0	\$323,394,671	\$66,680,000	\$256,714,671	

Total Construction Costs

\$65,680,000

Years	ANNUAL
After	RETURNS
Construction	ON
Begins	INVESTMENT
1	(\$30,346,667)
2	(\$17,666,667)
3	(\$17,666,667)
4	\$11,004,664
5	\$11,436,213
6	\$11,913,438
7	\$12,414,107
8	\$12,905,282
9	\$13,425,898
10	\$13,886,263
11	\$14,660,024
12	\$15,212,820
13	\$15,763,539
14	\$16,277,943
15	\$16,851,982
16	\$17,454,326
17	\$18,027,236
18	\$18,628,972
19	\$19,195,566
20	\$19,814,039
21	\$20,510,883
22	\$21,162,846
23	\$21,848,628
24	\$0
25	\$0
26	\$0
27	\$0
28	\$0





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.

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

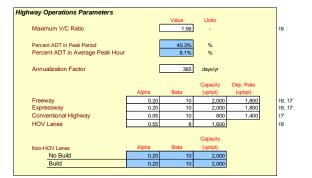
This page contains all economic values and rate tables.

To update economic values automatically, change "Economic Update Factor."

General Economic Parameters	
Year of Current Dollars for Model Economic Update Factor (Using GDP Deflator)	2016 1.00
Real Discount Rate	4.0%

vel Time Parameters				
		Value	Units	
Statewide Average Hourly Wage	\$	27.34	\$/hr	
Hannah Harts Tault Dataset				
Heavy and Light Truck Drivers		00.44	\$/hr	
Average Hourly Wage	\$	20.44	4	
Benefits and Costs	\$	10.97	\$/hr	
Value of Time				
Automobile	s	13.65	\$/hr/per	
Truck	\$	31.40	\$/hr/veh	
Auto & Truck Composite	s	18.95	\$/hr/veh	
Transit	ŝ	13.65	\$/hr/per	
Out-of-Vehicle Travel		2	times	
Incident-Related Travel		3	times	
Travel Time Uprater		0.0%	annual incr	
icle Operating Cost Parameters				
Average Fuel Price				
Automobile (regular unleaded)	\$	3.18	\$/gal	
Truck (diesel)	\$	3.00	\$/gal	
<u> </u>			- 5	
Sales and Fuel Taxes				
State Sales Tax (gasoline)		2.25%	%	
State Sales Tax (diesel)		7.50%	%	
Average Local Sales Tax		0.50%	%	
Federal Fuel Excise Tax (gasoline)	\$	0.184	\$/gal	
Federal Fuel Excise Tax (diesel)	\$	0.244	\$/gal	
State Fuel Excise Tax (gasoline)	s	0.278	\$/gal	
State Fuel Excise Tax (diesel)	\$	0.160	\$/gal	
Fuel Ocal Des Calles (Fuel als Taura)				
Fuel Cost Per Gallon (Exclude Taxes) Automobile	\$	2.65	\$/gal	
Truck	s S	2.65	\$/gal	
ITUCK	¢	2.40	\$/gai	
Non-Fuel Cost Per Mile				
Automobile	\$	0.313	\$/mi	
Truck	\$	0.429	\$/mi	
Idling Speed for Op. Costs and Emissions		5	mph	
ident Cost Parameters	_			
Cost of a Fatality	\$	9,800,000	\$/event	
Cost of an Injury				
Level A (Severe)	\$	466,400	\$/event	
Level B (Moderate)	\$	127,000	\$/event	
Level C (Minor)	\$	64,900	\$/event	
Cost of Property Damage	\$	2,700	\$/event	
Cost of Highway Accident				
Cost of Highway Accident	e .	11 300 000	\$/accident	
Fatal Accident		11,300,000	\$/accident \$/accident	
Fatal Accident Injury Accident	\$	154,200	\$/accident	
Fatal Accident				
Fatal Accident Injury Accident PDO Accident Average Cost	\$ \$	154,200 8,600	\$/accident \$/accident	
Fatal Accident Injury Accident PDO Accident Average Cost Statewide Highway Accident Rates	\$ \$	154,200 8,600 281,100	\$/accident \$/accident \$/accident	
Fatal Accident Inury Accident PDO Accident Average Cost Statewide Highway Accident Rates Fatal Accident	\$ \$	154,200 8,600 281,100 0.006	\$/accident \$/accident \$/accident per mil veh-mi	
Fatal Accident Injury Accident PDO Accident Average Cost Statewide Highway Accident Rates Fatal Accident Injury Accident	\$ \$	154,200 8,600 281,100 0.006 0.29	\$/accident \$/accident \$/accident per mil veh-mi per mil veh-mi	
Fatal Accident Inury Accident PDO Accident Average Cost Statewide Highway Accident Rates Fatal Accident	\$ \$	154,200 8,600 281,100 0.006 0.29 0.55	\$/accident \$/accident \$/accident per mil veh-mi	

Sources: 1) Office of Management and Budget (OMB), 2) Review of OMB and State Treasurer's Office data, 3) Burnau of Labor Satisfics (BLS) OES, 4) BLS Employment Cost Index, 9) USDOT Department Guidence, 0 (Caldinnia Department of Transportation TSI and Traffic Operations, 7) IDAS model, 8) AAA Daily Fuel Gauge Report, 9) California Beard of Equilation, 10) AAA Your Driving Costs: 11) American Transportation Research Institute, 12) USDOT VSL, 13) NHTSA, 14) TASAS summary 2013, 15) TASAS summary 2009



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

General Travel Activity Characteristics Parameters		Value	Units
Cycling Days per Year		365	davs
Walking Days per Year		365	days
School Days per Year		180	days
/ehicle Statistics			
Average Vehicle Speed		25	mph
Average Vehicle Occupancy		1.25	persons / veh
Active Transportation User Characteristics			
Average Cycling Speed		11.80	mph
Average Walking Speed			mph
Number of Unlinked Cycling Trips per Day			trips
Number of Unlinked Pedestrian Trips per Day			trips
Diversion of Cyclists from Personal Vehicles			assumption
Diversion of Pedestrians from Personal Vehicles		50%	assumption
Aduts		40.05	C
Children	\$		\$/hr/per \$/hr/per
Onlight	\$	13.65	wiii/per
Class I Class II		0.57	-
		0.49	-
Class III		0.49	-
Class III Class IV			-
Class III		0.92	-
Class III Class IV Note: Class IV assumed to be the same as Class II		0.92	- - -
Class III Class IV Note: Class IV assumed to be the same as Class II Valking Journey Quality Values per Mile by Amentity Street Lighting		0.92 0.49 \$0.110	
Class III Class IV Note: Class IV assumed to be the same as Class II Walking Journey Quality Values per Mile by Amentity Street Lighting Curb Level		0.92 0.49 \$0.110 \$0.078	\$/mi
Class III Class IV Note: Class IV asumed to be the same as Class II Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding		0.92 0.49 \$0.110 \$0.078 \$0.055	\$/mi \$/mi
Class III Class IV Class IV Vote: Class IV assumed to be the same as Class II Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness		0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026	\$/mi \$/mi \$/mi
Class III Class IV Class IV Class IV Street Lighting Curb Class IV asumed to be the same as Class II Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Pavels		0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026	\$/mi \$/mi \$/mi \$/mi
Class III Class IV Class IV Class IV Store Class IV assumed to be the same as Class II Note: Class IV assumed to be the same as Class II Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Parels Benches		0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026 \$0.026	\$/mi \$/mi \$/mi \$/mi \$/mi
Class III Class IV Class IV Class IV Class IV Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels		0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026	\$/mi \$/mi \$/mi \$/mi \$/mi
Class III Class II Class IV Note: Class IV Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels Benches Directional Signage Health (Absenteeism Reduction)		0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026 \$0.017 \$0.017	S/mi S/mi S/mi S/mi S/mi S/mi
Class III Class IV Cl		0.92 0.49 \$0.110 \$0.078 \$0.026 \$0.026 \$0.026 \$0.027 \$0.017 \$0.017 \$0.017	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi
Class III Class IV Class IV Class IV Class IV Values Vasumed to be the same as Class I Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels Benches Directional Signage Health (Absenteeism Reduction) Average Absence of Employees Percentage Covered by Short-Term Sick Leave		0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026 \$0.027 \$0.017 \$0.017 \$0.017	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr %
Class III Class IV Cl	y	0.92 0.49 \$0.110 \$0.078 \$0.026 \$0.026 \$0.026 \$0.027 \$0.017 \$0.017 \$0.017	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi
Class III Class IV Cl	y	0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026 \$0.027 \$0.017 \$0.017 \$0.017	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr %
Class II Class IV Cla	y	0.92 0.49 \$0.110 \$0.078 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.010 \$0.010	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr %
Class III Class IV Class IV Class IV Class IV Values Vasumed to be the same as Class I Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels Benches Directional Signage Health (Absenteeism Reduction) Average Absence of Employees Percentage Covered by Short-Term Sick Leave	y	0.92 0.49 \$0.110 \$0.078 \$0.055 \$0.026 \$0.026 \$0.027 \$0.017 \$0.017 \$0.017	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr %
Class III Class IV Note: Class IV assumed to be the same as Class II Waking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels Benches Directional Signage 4eath (Absence of Employees Percentage Covered by Short-Term Sick Leave Percentage of Sick Days Reduced When Active at Least 30 Minutes per Da 4eath (Mortality Reduction) Percentage of Cyclists Aged 16-64	v	0.92 0.49 \$0.110 \$0.078 \$0.025 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.047 \$0.010 \$0.010 \$0.010 \$0.010 \$0.010 \$0.010\$ \$0.000\$ \$0.000	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr % %
Class III Class IV Class IV Class IV Class IV Values Per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels Benches Directional Signage Percentage Covered by Short Term Sick Leave Percentage of Sick Days Reduced When Active at Least 30 Minutes per Da tealth (Mortality Reduction) Percentage of Dedestrians Aged 16-54 Percentage Of Pedestrians Aged 16-74 Percentage Of Pedestrians Aged 16-74 Percentage Chedestrian Aged 16-74 Percentage Chedestrian Aged 16-74 Percentage Reduction in Mortality per 365 Annual Cycling Miles	y	0.92 0.49 \$0.110 \$0.078 \$0.025 \$0.026 \$0.026 \$0.026 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.010 \$0.049	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr % % %
Class III Class IV Note: Class IV assumed to be the same as Class II Valking Journey Quality Values per Mile by Amentity Street Lighting Curb Level Crowdrug Pavement Evenness Information Panels Benches Directional Signage Average Absence of Employees Percentage Origic Days Reduced When Active at Least 30 Minutes per Da Iealth (Mortality Reduction) Apercentage of Ovelds Aged 16-54 Percentage of Pedestrians Aged 16-74	Y	0.92 0.49 \$0.110 \$0.078 \$0.025 \$0.026 \$0.026 \$0.027 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.017 \$0.010 \$0.010 \$0.010 \$0.010 \$0.020 \$0.000 \$0.000 \$0.000 \$0.000 \$0.000 \$0.000 \$0.000 \$0.000 \$0.000 \$0.00000 \$0.0000 \$0.0000 \$0.0000 \$0.00000 \$0.00000 \$0.00000 \$0.00000 \$0.00000 \$0.00000 \$0.00000 \$0.000000 \$0.0000000 \$0.00000000	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr % %
Class III Class IV Class IV Class IV Class IV Values Per Mile by Amentity Street Lighting Curb Level Crowding Pavement Evenness Information Panels Benches Directional Signage Percentage Covered by Short Term Sick Leave Percentage of Sick Days Reduced When Active at Least 30 Minutes per Da tealth (Mortality Reduction) Percentage of Dedestrians Aged 16-54 Percentage Of Pedestrians Aged 16-74 Percentage Of Pedestrians Aged 16-74 Percentage Chedestrian Aged 16-74 Percentage Chedestrian Aged 16-74 Percentage Reduction in Mortality per 365 Annual Cycling Miles	v	0.92 0.49 \$0.110 \$0.078 \$0.025 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.026 \$0.010 \$0.017	\$/mi \$/mi \$/mi \$/mi \$/mi \$/mi days/yr % % %

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

Project Types

Highway Capacity Expansion		
General Highway	FALSE	GenHwy
HOV Lane Addition	FALSE	HOV
HOT Lane Addition	FALSE	нот
Passing Lane	FALSE	Passing
Intersection	FALSE	Intersect
Truck Only Lane	FALSE	TruckLane
Bypass	FALSE	Bypass
Queuing	FALSE	Queuing
Pavement	FALSE	Pavement

Rail or Transit Cap Expansion

	Itali of Transic Cap Expansion		
	Passenger Rail	FALSE	PassRail
1	Light-Rail (LRT)	FALSE	LRT
1	Bus	FALSE	Bus
	Hwy-Rail Grade Crossing	FALSE	HwyRail

Hwy Operational Improvement

Auxiliary Lane	FALSE	AuxLane
Freeway Connector	TRUE	FreeConn
HOV Connector	FALSE	HOVConr
HOV Drop Ramp	FALSE	HOVDrop
Off-Ramp Widening	FALSE	OffRamp
On-Ramp Widening	FALSE	OnRamp
HOV-2 to HOV-3 Conv	FALSE	HOV2to3
HOT Lane Conversion	FALSE	HOTConv

Transp Mgmt Systems (TMS)

rianap wight bystems (rivib)		
Ramp Metering	FALSE	RM
Ramp Metering Signal Coord	FALSE	AM
Incident Management	FALSE	IM
Traveler Information	FALSE	ті
Arterial Signal Management	FALSE	ASM
Transit Vehicle Location (AVL)	FALSE	AVL
Transit Vehicle Signal Priority	FALSE	SigPriority
Bus Rapid Transit (BRT)	FALSE	BRT
TMS Lookup Code	NoAdj	TMSLooku
User Modified Inputs	FALSE	UserAdjInp

Remember to run model for both roads Add arrival rate & check departure rate in 1B Enter pavement condition in section 1B Please select a type of rail or transit project

Remember to run macro for truck lane

Please select a type of highway project

Enter HOV restriction in section 1B Include toll payers as HOVs & check AVOs Enter a truck speed in section 1B Remember to run model for both roads

Enter data in both sections 1B & 1E Enter data in both sections 1B & 1E Enter data in both sections 1B & 1E Put hwy design in 1B, safety in 1C & crossing in 1D

Please select a type of op. improvement Enter ramp design speed & on-ramp volume Check percent traffic in weave in section 1B Enter on-ramp volume & metering strategy Check AVOs & trips in sections 1B & 2D Check AVOs & trips in sections 1B & 2D

Please select a type of TMS project Enter model data, if avail, in sections 2A & 2C Enter model data, if avail, in sections 2A & 2C Enter model data, if avail, no sections 2.4.8.2.0 Enter model data, if avail, no sections 2.4.8.2.0 Enter model data, if avail, no sections 2.4.8.2.0 Complete only sections 1.4, 1E.8.2.0 Enter transit agency costs in section 1D Check travel time in section 1B Enter free-flow bus lane speed in section 1B

NoAdj TMSLookup FALSE UserAdjInputs

Travel Demand Tables

(percent of total daily travel)						
Number of		Ur	ban			
Hours in	So. Ca	lifornia	No. Ca	lifornia	Ru	iral
Peak Period	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%

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

	AGE COHORTS FOR MO (percent o	of population)		
Mode	Age Cohort	South	North	Rural
Cvcling	Age 16-64	70.5%	73.4%	66.0%

AVERAGE DISTANCE PER ACTIVE TRANSPORTATION TRIP (miles/trip)

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

TRIP PURPOSE FOR ACTIVE TRANSPORTATION TRIPS (percent of trips)

		Urban		
Mode	Trip Purpose	South	North	Rural
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

Speed	Auto*	Truc
5	0.1024	0.21
6	0.0971	0.205
7	0.0919	0.200
8	0.0867	0.194
9	0.0815	0.188
10	0.0763	0.18
11	0.0727	0.170
12	0.0691 0.0656	0.150
14	0.0620	0.13
15	0.0584	0.12
16	0.0560	0.118
17	0.0536	0.115
18	0.0513	0.112
19	0.0489	0.108
20	0.0465	0.105
21	0.0449	0.10
22	0.0433	0.09
23	0.0417	0.09
24	0.0401	0.08
26	0.0374	0.08
27	0.0363	0.07
28	0.0352	0.07
29	0.0341	0.07
30	0.0330	0.07
31	0.0323	0.07
32	0.0316	0.07
33	0.0310	0.07
34	0.0303	0.07
35	0.0296	0.07
36	0.0292	0.07
37	0.0288	0.07
38	0.0284	0.07
39 40	0.0280	0.07
40	0.0276	0.07
42	0.0274	0.08
43	0.0270	0.08
44	0.0268	0.08
45	0.0266	0.08
46	0.0266	0.08
47	0.0266	0.08
48	0.0266	0.08
49 50	0.0266	0.08
50	0.0266	0.08
52	0.0200	0.08
53	0.0272	0.08
54	0.0274	0.08
55	0.0275	0.08
56	0.0279	0.08
57	0.0283	0.08
58	0.0286	0.08
59 60	0.0290	0.07
61	0.0293	0.07
62	0.0300	0.07
63	0.0300	0.07
64	0.0319	0.07
65	0.0325	0.07
66	0.0331	0.07
67	0.0337	0.08
68 69	0.0343	0.08
69 70	0.0350	0.08

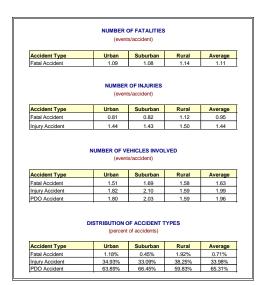
* Includes motorcycles & motorhomes Note: Five mph is best estimate for idling

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

Accident Tables

(percent of injuries)				
Event	Urban	Suburban	Rural	Average
Severe Injury (A)	4.78%	4.78%	4.78%	4.78%
	05 5 40/	25.54%	25.54%	25.54%
Other Visible Injury (B)	25.54%	25.54%	20.0470	

Source: 2013 SWITRS Annual Report, Table 8C



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

COST OF HIGHWAY ACCIDENTS (\$/accident)					
Accident Type	Urban	Suburban	Rural	Average	
Fatal Accident	\$10,800,000	\$10,700,000	\$11,300,000	\$11,000,000	
Injury Accident	\$148,800	\$148,600	\$154,200	\$149,300	
PDO Accident	\$9,700	\$11,000	\$8,600	\$10,600	
All Types	\$185,600	\$104,600	\$281,100	\$135,800	

Source: Combination of above four tables

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.

COST OF NON-HIGHWAY ACCIDENT EVENTS						
	(\$/event)					
Event	Pass Train	Light Rail	Bus	Freight Rail		
Fatality	\$9,800,000	\$9,800,000	\$9,800,000	\$9,800,000		
Injury	\$180,500	\$180,500	\$180,500	\$180,500		
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 N	ON-HIGHWAY ACC	IDENTS	
	(\$	S/million veh-mi)		
Value	Pass Train	Light Rail	Bus	Freight Rail

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		\$9,800,000	\$180,500					

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

	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%						

Source: Taylor and Jain, 1991

Emissions Tables

ode	Speed	CO	CO2	NOX	PM10	SOX	VOC	PM2.5
ito	0	2.7812	66.6818	0.2922	0.0022	0.0007	0.3837	0.0020
	5	2.4569	766.8891	0.1849	0.0119	0.0076	0.2149	0.0110
	6	2.3624	736.4937	0.1767	0.0110	0.0073	0.1979	0.0102
	7	2.2679	706.0983	0.1684	0.0101	0.0070	0.1809	0.0093
	8	2.1734	675.7028	0.1602	0.0092	0.0067	0.1639	0.0085
	9	2.0789	645.3074	0.1519	0.0084	0.0064	0.1469	0.0077
	10 11	1.9844	614.9120 593.4537	0.1436	0.0075	0.0061	0.1299	0.0069
	11	1.9452	571,9954	0.1380	0.0070	0.0059	0.1221	0.0064
	13	1.8667	550.5371	0.1352	0.0060	0.0054	0.1064	0.0055
	14	1.8275	529.0788	0.1323	0.0055	0.0052	0.0986	0.0051
	15	1,7883	507.6205	0.1295	0.0050	0.0050	0.0908	0.0046
	16	1.7449	490.1154	0.1262	0.0047	0.0048	0.0853	0.0044
	17	1.7015	472.6104	0.1230	0.0044	0.0047	0.0797	0.0041
	18	1.6580	455.1053	0.1197	0.0041	0.0045	0.0742	0.0038
	19	1.6146	437.6003	0.1165	0.0038	0.0043	0.0687	0.0035
	20 21	1.5712	420.0952	0.1132	0.0036	0.0042	0.0632	0.0033
	21 22	1.5324 1.4935	407.5672 395.0392	0.1102 0.1073	0.0034 0.0032	0.0040 0.0039	0.0598	0.0031 0.0029
	22	1.4935	395.0392	0.1073	0.0032	0.0039	0.0529	0.0029
	23	1.4347	369.9831	0.1043	0.0030	0.0038	0.0495	0.0028
	25	1.3770	357.4551	0.0984	0.0026	0.0035	0.0461	0.0024
	26	1.3526	349.3782	0.0970	0.0025	0.0035	0.0442	0.0023
	27	1.3282	341.3012	0.0957	0.0024	0.0034	0.0424	0.0022
	28	1.3037	333.2243	0.0943	0.0023	0.0033	0.0405	0.0021
	29	1.2793	325.1474	0.0929	0.0022	0.0032	0.0387	0.0020
	30	1.2549	317.0704	0.0916	0.0020	0.0031	0.0369	0.0019
	31	1.2403	312.8750	0.0911	0.0020	0.0031	0.0358	0.0018
	32	1.2258	308.6796	0.0907	0.0019	0.0031	0.0348	0.0018
	33 34	1.2112	304.4842 300.2888	0.0903	0.0018 0.0018	0.0030 0.0030	0.0337 0.0327	0.0017 0.0016
	34 35	1.1966	296.0934	0.0898	0.0018	0.0030	0.0327	0.0016
	36	1.1621	296.0934	0.0894	0.0017	0.0029	0.0310	0.0015
	37	1.1576	292.9105	0.0890	0.0016	0.0029	0.0303	0.0015
	38	1.1454	291.3191	0.0889	0.0016	0.0029	0.0297	0.0014
	39	1.1332	289.7276	0.0887	0.0015	0.0029	0.0291	0.0014
	40	1.1209	288.1362	0.0885	0.0015	0.0029	0.0284	0.0014
	41	1.1115	288.4709	0.0887	0.0015	0.0029	0.0282	0.0013
	42	1.1021	288.8057	0.0889	0.0014	0.0029	0.0280	0.0013
	43 44	1.0927 1.0833	289.1404 289.4751	0.0890	0.0014 0.0014	0.0029 0.0029	0.0278	0.0013
	44	1.0833	289.8098	0.0892	0.0014	0.0029	0.0273	0.0013
	46	1.0644	291.6375	0.0895	0.0014	0.0029	0.0273	0.0013
	47	1.0549	293.4651	0.0897	0.0014	0.0029	0.0271	0.0012
	48	1.0454	295.2927	0.0898	0.0013	0.0029	0.0270	0.0012
	49	1.0359	297.1204	0.0900	0.0013	0.0029	0.0269	0.0012
	50	1.0264	298.9480	0.0901	0.0013	0.0030	0.0268	0.0012
	51 52	1.0176 1.0088	301.2656 303.5831	0.0905	0.0013 0.0013	0.0030 0.0030	0.0269 0.0271	0.0012 0.0012
	52 53	1.0088	303.5831 305.9006	0.0908	0.0013	0.0030	0.0271	0.0012
	54	0.9911	308.2182	0.0915	0.0013	0.0030	0.0272	0.0012
	55	0.9822	310.5357	0.0919	0.0013	0.0031	0.0274	0.0012
	56	0.9679	312.2601	0.0915	0.0014	0.0031	0.0275	0.0013
	57	0.9535	313.9844	0.0912	0.0014	0.0031	0.0276	0.0013
	58 59	0.9391	315.7088	0.0908	0.0014	0.0031	0.0277	0.0013
	59 60	0.9248	317.4331 319.1575	0.0904	0.0014	0.0031	0.0278	0.0013
	60 61	0.9104	319.1575	0.0901	0.0014	0.0032	0.0279	0.0013
	61 62	0.9102	321.1627 323.1679	0.0908	0.0015	0.0032	0.0288	0.0013
	63	0.9096	325.1730	0.0922	0.0015	0.0032	0.0307	0.0014
	64	0.9093	327.1782	0.0929	0.0016	0.0032	0.0316	0.0014
	65	0.9090	329.1834	0.0936	0.0016	0.0033	0.0326	0.0015
	66 67	0.9328	332.1274 335.0713	0.0961	0.0016	0.0033	0.0340	0.0015
	67 68	0.9566	335.0713 338.0152	0.0986	0.0016	0.0033	0.0355	0.0015
	69	1.0041	338.0152	0.1011	0.0017	0.0033	0.0370	0.0015
	70	1.0279	343.9031	0.1062	0.0017	0.0034	0.0399	0.0016

		н	GHWAY EM M	ISSIONS F		/mi)		
Mode	Speed	со	CO2	NOX	PM10	SOX	VOC	PM2.5
Auto	0	1.6243	41.5134	0.1182	0.0008	0.0004	0.1038	0.0007
	5	1.0375	512.1914	0.0448	0.0042	0.0051	0.0871	0.0038
	6	1.0103	492.7973	0.0435	0.0039	0.0049	0.0810	0.003
	7	0.9831	473.4032	0.0422	0.0035	0.0047	0.0749	0.003
	8	0.9559	454.0092	0.0409	0.0032	0.0045	0.0688	0.0030
	9	0.9286	434.6151	0.0396	0.0029	0.0043	0.0627	0.002
	10	0.9014	415.2211 400.2645	0.0383	0.0026	0.0041	0.0566	0.0024
	12	0.8600	385.3079	0.0375	0.0024	0.0040	0.0331	0.002
	13	0.8392	370.3513	0.0358	0.0020	0.0037	0.0460	0.001
	14	0.8185	355.3947	0.0349	0.0019	0.0035	0.0424	0.001
	15	0.7977	340.4381	0.0341	0.0017	0.0034	0.0389	0.001
	16	0.7797	328.9303	0.0333	0.0016	0.0033	0.0365	0.001
	17	0.7616	317.4224	0.0326	0.0015	0.0031	0.0342	0.001
	18	0.7435	305.9146	0.0318	0.0014	0.0030	0.0318	0.001
	19 20	0.7254	294.4067 282.8989	0.0311	0.0013	0.0029	0.0295	0.001
	20 21	0.7073	282.8989 274.6096	0.0303	0.0012	0.0028	0.0272	0.001
	22	0.6802	266.3204	0.0293	0.0012	0.0027	0.0235	0.001
	23	0.6666	258.0312	0.0287	0.0010	0.0026	0.0231	0.001
	24	0.6530	249.7419	0.0282	0.0010	0.0025	0.0218	0.000
	25	0.6394	241.4527	0.0276	0.0009	0.0024	0.0204	0.000
	26	0.6287	235.9199	0.0273	0.0009	0.0023	0.0196	0.000
	27	0.6180	230.3871	0.0270	0.0008	0.0023	0.0188	0.000
	28	0.6072	224.8543	0.0266	0.0008	0.0022	0.0180	0.000
	29 30	0.5965	219.3215 213.7887	0.0263	0.0007	0.0022	0.0172	0.000
	30	0.5769	210.7272	0.0250	0.0007	0.0021	0.0158	0.000
	32	0.5681	207.6656	0.0254	0.0007	0.0021	0.0152	0.000
	33	0.5592	204.6041	0.0252	0.0006	0.0020	0.0147	0.000
	34	0.5504	201.5426	0.0249	0.0006	0.0020	0.0141	0.000
	35	0.5415	198.4811	0.0246	0.0006	0.0020	0.0135	0.000
	36	0.5339	197.2354	0.0244	0.0006	0.0020	0.0131	0.000
	37	0.5263	195.9898	0.0243	0.0006	0.0019	0.0128	0.000
	38 39	0.5188	194.7441 193.4985	0.0241	0.0005	0.0019	0.0124	0.000
	39 40	0.5112	193.4985	0.0239	0.0005	0.0019	0.0120	0.000
	41	0.4983	192 4698	0.0237	0.0005	0.0019	0.0116	0.000
	42	0.4930	192.6867	0.0237	0.0005	0.0019	0.0115	0.000
	43	0.4876	192.9036	0.0236	0.0005	0.0019	0.0114	0.000
	44	0.4823	193.1206	0.0236	0.0005	0.0019	0.0113	0.000
	45 46	0.4770	193.3375 194.4847	0.0235	0.0005	0.0019	0.0112	0.000
	40	0.4717	194.4047	0.0235	0.0005	0.0019	0.0112	0.000
	48	0.4604	196.7791	0.0234	0.0005	0.0019	0.0110	0.000
	49	0.4558	197.9263	0.0234	0.0005	0.0020	0.0109	0.000
	50	0.4506	199.0735	0.0234	0.0005	0.0020	0.0109	0.000
	51	0.4463	200.6160	0.0234	0.0005	0.0020	0.0110	0.000
	52	0.4420 0.4377	202.1586 203.7011	0.0235	0.0005	0.0020	0.0110 0.0111	0.000
	53 54	0.4377	203.7011 205.2437	0.0235	0.0005	0.0020	0.0111	0.000
	55	0.4334	205.2437 206.7862	0.0230	0.0005	0.0020	0.0112	0.000
	56	0.4253	208.1718	0.0238	0.0005	0.0021	0.0115	0.000
	57	0.4216	209.5573	0.0238	0.0005	0.0021	0.0116	0.000
	58 59	0.4179	210.9429	0.0239	0.0005	0.0021	0.0118	0.000
	59 60	0.4142	212.3284 213.7139	0.0240 0.0241	0.0005	0.0021	0.0120 0.0122	0.000
	61	0.4105	213.7139	0.0241	0.0005	0.0021	0.0122	0.000
	62	0.4103	214.9073	0.0245	0.0005	0.0021	0.0127	0.000
	63	0.4104	217.2939	0.0247	0.0005	0.0021	0.0135	0.000
	64	0.4103	218.4873	0.0249	0.0005	0.0022	0.0140	0.000
	65	0.4103	219.6806	0.0251	0.0006	0.0022	0.0144	0.000
	66 67	0.4137	220.9470 222.2134	0.0254	0.0006	0.0022	0.0147 0.0149	0.000
	68	0.4171	222.2134	0.0258	0.0006	0.0022	0.0149	0.000
	69	0.4238	224.7463	0.0260	0.0006	0.0022	0.0155	0.000
	70	0.4272	226.0127	0.0262	0.0006	0.0022	0.0157	0.000

Emissions Tables

Mode	Speed	CO	CO2	NOX	PM10	SOX	VOC	PM2.5	Mode	Speed	CO	CO2	NOX	PM10	SOX	VOC	P
Auto	0	2.7812	66.6818	0.2922	0.0022	0.0007	0.3837	0.0020	Auto	0	1.6243	41.5134	0.1182	0.0008	0.0004	0.1038	(
	5	2.4569	766.8891	0.1849	0.0119	0.0076	0.2149	0.0110		5	1.0375	512.1914	0.0448	0.0042	0.0051	0.0871	
	6	2.3624	736.4937	0.1767	0.0110	0.0073	0.1979	0.0102		6	1.0103	492.7973	0.0435	0.0039	0.0049	0.0810	
	7	2.2679	706.0983	0.1684	0.0101	0.0070	0.1809	0.0093		7	0.9831	473.4032	0.0422	0.0035	0.0047	0.0749	
	8	2.1734	675.7028	0.1602	0.0092	0.0067	0.1639	0.0085		8	0.9559	454.0092	0.0409	0.0032	0.0045	0.0688	
ruck	0	0.9305	9.0247	0.6741	0.0002	0.0002	0.0657	0.0002	Truck	0	0.5426	6.2184	0.8784	0.0001	0.0001	0.0216	
	5 6	3.6942 3.5195	2632.6795 2514.9122	8.9241 8.2937	0.1305 0.1206	0.0246 0.0235	1.0958 1.0078	0.1248 0.1153		5	2.2343 2.1544	2133.8128 2037.2309	7.8220 7.2086	0.0104 0.0103	0.0197	0.1694 0.1668	
	7	3.3449	2397.1449	7.6633	0.1208	0.0233	0.9199	0.1155		7	2.0745	1940.6489	6.5953	0.0103	0.0188	0.1668	
	8	3.1702	2279.3775	7.0329	0.1009	0.0212	0.8319	0.0965		8	1.9946	1844.0670	5.9819	0.0100	0.0169	0.1617	
	9	2.9956	2161.6102	6.4026	0.0910	0.0201	0.7440	0.0870		9	1.9147	1747.4850	5.3685	0.0099	0.0160	0.1591	
	10 11	2.8209 2.6205	2043.8428 1905.7080	5.7722 5.2310	0.0812 0.0737	0.0190	0.6560	0.0776		10 11	1.8348 1.6377	1650.9031 1541.7983	4.7551 4.2323	0.0097	0.0150 0.0141	0.1566	
	11	2.6205	1905.7080	4.6898	0.0737	0.0178	0.5864	0.0705		11	1.6377	1432.6935	4.2323	0.0095	0.0141	0.1456	
	13	2.2198	1629.4383	4.1485	0.0588	0.0153	0.4474	0.0562		13	1.2434	1323.5888	3.1868	0.0090	0.0123	0.1237	
	14	2.0195	1491.3035	3.6073	0.0514	0.0141	0.3778	0.0491		14	1.0462	1214.4840	2.6640	0.0087	0.0113	0.1128	
	15	1.8191	1353.1687	3.0661	0.0440	0.0129	0.3083	0.0420		15	0.8490	1105.3793	2.1412	0.0085	0.0104	0.1018	
	16 17	1.7210 1.6228	1328.7488 1304.3289	3.0671 3.0681	0.0432	0.0126	0.2863	0.0413		16 17	0.7673	1083.3925 1061.4058	2.1164 2.0917	0.0081	0.0102	0.0899	
	18	1.5246	1279.9090	3.0692	0.0424	0.0124	0.2424	0.0398		18	0.6039	1039.4190	2.0669	0.0073	0.0098	0.0661	
	19	1.4265	1255.4891	3.0702	0.0409	0.0120	0.2205	0.0391		19	0.5221	1017.4323	2.0422	0.0069	0.0096	0.0542	
	20	1.3283	1231.0692	3.0712	0.0401	0.0117	0.1986	0.0383		20	0.4404	995.4456	2.0174	0.0065	0.0094	0.0423	
	21 22	1.2704	1198.9333 1166.7975	3.0121	0.0388	0.0114	0.1880	0.0371		21 22	0.4190	964.9603 934.4750	1.9304	0.0064	0.0091	0.0397	
	22	1.2124	1134.6616	2.9531	0.0376	0.0111	0.1669	0.0359		22	0.3975	934.4750	1.8433	0.0062	0.0085	0.0370	
	24	1.0965	1102.5258	2.8350	0.0350	0.0105	0.1564	0.0335		24	0.3546	873.5044	1.6692	0.0059	0.0082	0.0317	
	25	1.0386	1070.3899	2.7759	0.0338	0.0102	0.1458	0.0323		25	0.3332	843.0192	1.5821	0.0058	0.0079	0.0290	
	26	1.0089	1057.3247	2.7566	0.0337	0.0100	0.1414	0.0322		26	0.3186	829.3296	1.5318	0.0057	0.0078	0.0275	
	27	0.9792	1044.2595	2.7373	0.0336	0.0099	0.1371	0.0321		27	0.3039	815.6399	1.4814	0.0056	0.0077	0.0259	
	28 29	0.9495 0.9198	1031.1942 1018.1290	2.7180 2.6988	0.0335 0.0334	0.0098 0.0097	0.1327 0.1283	0.0320 0.0319		28 29	0.2893 0.2747	801.9503 788.2607	1.4311 1.3808	0.0055 0.0054	0.0075 0.0074	0.0244 0.0228	
	29 30	0.8902	1018.1290	2.6988	0.0334	0.0097	0.1283	0.0319		29	0.2747	774.5711	1.3808	0.0054	0.0074	0.0228	
	31	0.8697	1009.5733	2.6973	0.0337	0.0095	0.1210	0.0322		31	0.2617	772.3339	1.2970	0.0054	0.0072	0.0204	
	32	0.8493	1014.0828	2.7152	0.0341	0.0095	0.1181	0.0326		32	0.2634	770.0966	1.2636	0.0055	0.0072	0.0195	
	33	0.8289	1018.5923	2.7331	0.0345	0.0096	0.1152	0.0330		33	0.2650	767.8594	1.2302	0.0056	0.0071	0.0186	
	34 35	0.8084 0.7880	1023.1018 1027.6114	2.7509 2.7688	0.0349 0.0353	0.0096	0.1123 0.1094	0.0333 0.0337		34 35	0.2667 0.2683	765.6222 763.3850	1.1968 1.1634	0.0056	0.0070	0.0177	
	35 36	0.7880	1027.6114 1026.1846	2.7688	0.0353	0.0096	0.1094	0.0337		35 36	0.2683	763.3850 758.7409	1.1634 1.1196	0.0057	0.0070	0.0168	
	36	0.7534	1026.1846	2.7253	0.0355	0.0096	0.1065	0.0340		30	0.2556	754.0968	1.0759	0.0059	0.0070	0.0162	
	38	0.7362	1023.3312	2.7036	0.0360	0.0095	0.1006	0.0342		38	0.2301	749.4527	1.0322	0.0064	0.0069	0.0150	
	39	0.7189	1021.9044	2.6818	0.0363	0.0095	0.0977	0.0347		39	0.2174	744.8086	0.9885	0.0066	0.0068	0.0143	
	40	0.7016	1020.4777	2.6601	0.0366	0.0095	0.0947	0.0350		40	0.2047	740.1645	0.9447	0.0068	0.0068	0.0137	
	41 42	0.6870	1013.9423	2.6305	0.0369	0.0095	0.0923	0.0353		41 42	0.1954	734.5862	0.9025	0.0072	0.0068	0.0134	
	42 43	0.6725	1007.4069	2.6010	0.0372	0.0094	0.0898	0.0356		42	0.1861	729.0080	0.8603	0.0075	0.0067	0.0131	
	43	0.6434	994.3362	2.5715	0.0378	0.0094	0.0873	0.0363		43	0.1768	717.8516	0.8182	0.0078	0.0067	0.0128	
	45	0.6288	987.8008	2.5124	0.0382	0.0093	0.0824	0.0366		45	0.1582	712.2733	0.7338	0.0085	0.0066	0.0122	
	46	0.6314	964.3856	2.4771	0.0378	0.0091	0.0810	0.0362		46	0.1501	701.7716	0.6947	0.0087	0.0065	0.0123	
	47	0.6340	940.9704	2.4418	0.0374	0.0089	0.0795	0.0358		47	0.1420	691.2700	0.6557	0.0089	0.0064	0.0123	
	48 49	0.6366	917.5552 894.1400	2.4065	0.0370	0.0087	0.0781	0.0354		48 49	0.1339	680.7683 670.2666	0.6166	0.0091	0.0064	0.0124 0.0124	
	49 50	0.6392	894.1400	2.3712	0.0366	0.0085	0.0766	0.0350		49	0.1258	659,7649	0.5776	0.0093	0.0063	0.0124	
	51	0.6220	892.7249	2.4040	0.0401	0.0085	0.0765	0.0340		51	0.1134	670.7116	0.5630	0.0104	0.0063	0.0123	
	52	0.6022	914.7250	2.4722	0.0441	0.0087	0.0779	0.0422		52	0.1091	681.6584	0.5874	0.0113	0.0064	0.0123	
	53	0.5824	936.7252	2.5404	0.0480	0.0089	0.0792	0.0459		53	0.1048	692.6052	0.6119	0.0122	0.0066	0.0122	
	54	0.5626	958.7253	2.6086	0.0520	0.0091	0.0805	0.0497		54	0.1005	703.5520	0.6364	0.0131	0.0067	0.0121	
	55 56	0.5428	980.7255 1009.3233	2.6768 2.7048	0.0559	0.0093	0.0819 0.0817	0.0535		55 56	0.0962	714.4987 730.3835	0.6609	0.0140 0.0153	0.0068	0.0120	
	56 57	0.5271	1009.3233	2.7048	0.0580	0.0096	0.0817	0.0555		56	0.0964	730.3835	0.7136	0.0153	0.0069	0.0124	
	58	0.4958	1066.5189	2.7610	0.0621	0.0101	0.0814	0.0594		58	0.0969	762.1530	0.8191	0.0178	0.0072	0.0120	
	59	0.4802	1095.1167	2.7891	0.0641	0.0104	0.0813	0.0613		59	0.0971	778.0378	0.8718	0.0191	0.0074	0.0134	
	60	0.4645	1123.7146	2.8172	0.0661	0.0106	0.0811	0.0633		60	0.0973	793.9225	0.9245	0.0204	0.0075	0.0137	
	61	0.4591	1143.6798	2.8456	0.0659	0.0108	0.0798	0.0631		61	0.1018	810.7058	1.0126	0.0218	0.0077	0.0144	
	62 63	0.4537 0.4483	1163.6450 1183.6103	2.8741 2.9025	0.0657	0.0110 0.0112	0.0785	0.0629		62 63	0.1064	827.4890 844.2722	1.1007 1.1888	0.0233	0.0078	0.0151 0.0157	
	64	0.4483	1203.5755	2.9025	0.0655	0.0112	0.0772	0.0627		64	0.1109	844.2722 861.0555	1.1888	0.0247	0.0080	0.0157	
	65	0.4374	1223.5407	2.9594	0.0651	0.0116	0.0745	0.0623		65	0.1200	877.8387	1.3650	0.0275	0.0083	0.0171	
	66	0.4579	1221.1740	2.9982	0.0648	0.0116	0.0762	0.0620		66	0.1280	880.4223	1.3757	0.0277	0.0083	0.0180	
	67	0.4784	1218.8073	3.0370	0.0646	0.0115	0.0778	0.0618		67	0.1361	883.0060	1.3865	0.0279	0.0084	0.0189	
	68	0.4989	1216.4406	3.0758	0.0643	0.0115	0.0795	0.0615		68	0.1442	885.5896	1.3972	0.0281	0.0084	0.0198	
	69	0.5193	1214.0739	3.1146	0.0641	0.0115	0.0811	0.0613		69	0.1522	888.1732	1.4080	0.0283	0.0084	0.0207	

Mode	Speed	со	CO2	NOX	PM10	SOX	VOC	PM2.5
Auto	0	1.6243	41.5134	0.1182	0.0008	0.0004	0.1038	0.00
	5	1.0375	512.1914	0.0448	0.0042	0.0051	0.0871	0.003
	6	1.0103	492.7973	0.0435	0.0039	0.0049	0.0810	0.003
	7	0.9831	473.4032	0.0422	0.0035	0.0047	0.0749	0.00
	8	0.9559	454.0092	0.0409	0.0032	0.0045	0.0688	0.00
Truck	0	0.5426	6.2184	0.8784	0.0001	0.0001	0.0216	0.00
	5 6	2.2343 2.1544	2133.8128 2037.2309	7.8220 7.2086	0.0104	0.0197 0.0188	0.1694 0.1668	0.00
	7	2.0745	1940.6489	6.5953	0.0103	0.0100	0.1643	0.00
	8	1.9946	1844.0670	5.9819	0.0100	0.0169	0.1617	0.00
	9	1.9147	1747.4850	5.3685	0.0099	0.0160	0.1591	0.00
	10	1.8348	1650.9031	4.7551	0.0097	0.0150	0.1566	0.00
	11 12	1.6377 1.4405	1541.7983 1432.6935	4.2323 3.7096	0.0095 0.0092	0.0141 0.0132	0.1456 0.1347	0.00
	12	1.2434	1323 5888	3.1868	0.0092	0.0132	0.1347	0.00
	14	1.0462	1214.4840	2.6640	0.0087	0.0113	0.1128	0.00
	15	0.8490	1105.3793	2.1412	0.0085	0.0104	0.1018	0.00
	16	0.7673	1083.3925	2.1164	0.0081	0.0102	0.0899	0.00
	17	0.6856	1061.4058	2.0917	0.0077	0.0100	0.0780	0.00
	18	0.6039	1039.4190	2.0669	0.0073	0.0098	0.0661	0.00
	19 20	0.5221 0.4404	1017.4323 995.4456	2.0422 2.0174	0.0069	0.0096	0.0542 0.0423	0.00
	20	0.4404	964.9603	1.9304	0.0063	0.0094	0.0423	0.00
	22	0.3975	934.4750	1.8433	0.0062	0.0088	0.0370	0.00
	23	0.3761	903.9897	1.7562	0.0061	0.0085	0.0344	0.00
	24	0.3546	873.5044	1.6692	0.0059	0.0082	0.0317	0.00
	25	0.3332	843.0192	1.5821	0.0058	0.0079	0.0290	0.00
	26	0.3186	829.3296	1.5318	0.0057	0.0078	0.0275	0.00
	27	0.3039	815.6399	1.4814	0.0056	0.0077	0.0259	0.00
	28	0.2893	801.9503 788.2607	1.4311	0.0055	0.0075	0.0244	0.00
	29 30	0.2747	788.2607	1.3808 1.3305	0.0054	0.0074	0.0228	0.00
	30	0.2601	772.3339	1.3305	0.0053	0.0073	0.0213	0.00
	32	0.2634	770.0966	1.2636	0.0055	0.0072	0.0195	0.00
	33	0.2650	767.8594	1.2302	0.0056	0.0071	0.0186	0.00
	34	0.2667	765.6222	1.1968	0.0056	0.0070	0.0177	0.00
	35	0.2683	763.3850	1.1634	0.0057	0.0070	0.0168	0.00
	36	0.2556	758.7409	1.1196	0.0059	0.0070	0.0162	0.00
	37	0.2429	754.0968	1.0759	0.0062	0.0069	0.0156	0.00
	38	0.2301	749.4527	1.0322	0.0064	0.0069	0.0150	0.00
	39 40	0.2174	744.8086	0.9885	0.0066	0.0068	0.0143	0.00
	40	0.2047	740.1645	0.9447	0.0068	0.0068	0.0137	0.00
	41	0.1861	729.0080	0.8603	0.0072	0.0068	0.0134	0.00
	43	0.1768	723.4298	0.8182	0.0078	0.0067	0.0128	0.00
	44	0.1675	717.8516	0.7760	0.0082	0.0066	0.0125	0.00
	45	0.1582	712.2733	0.7338	0.0085	0.0066	0.0122	0.00
	46	0.1501	701.7716	0.6947	0.0087	0.0065	0.0123	0.00
	47	0.1420	691.2700	0.6557	0.0089	0.0064	0.0123	0.00
	48	0.1339	680.7683	0.6166	0.0091	0.0064	0.0124	0.00
	49 50	0.1258	670.2666	0.5776	0.0093	0.0063	0.0124	0.00
	50	0.1177 0.1134	659.7649 670.7116	0.5385	0.0095	0.0062	0.0125	0.00
	52	0.1091	681.6584	0.5874	0.0104	0.0063	0.0124	0.00
	53	0.1048	692.6052	0.6119	0.0122	0.0066	0.0122	0.01
	54	0.1005	703.5520	0.6364	0.0131	0.0067	0.0121	0.01
	55	0.0962	714.4987	0.6609	0.0140	0.0068	0.0120	0.01
	56	0.0964	730.3835	0.7136	0.0153	0.0069	0.0124	0.01
	57	0.0966	746.2682	0.7663	0.0166	0.0071	0.0127	0.01
	58	0.0969	762.1530	0.8191	0.0178	0.0072	0.0130	0.01
	59 60	0.0971	778.0378	0.8718	0.0191	0.0074	0.0134	0.01
	60	0.0973	793.9225 810.7058	0.9245 1.0126	0.0204	0.0075	0.0137 0.0144	0.01
	62	0.1018	810.7058	1.1007	0.0218	0.0077	0.0144	0.02
	63	0.1109	844,2722	1.1888	0.0233	0.0078	0.0157	0.02
	64	0.1154	861.0555	1.2769	0.0247	0.0081	0.0157	0.02
	65	0.1200	877.8387	1.3650	0.0275	0.0083	0.0171	0.02
	66	0.1280	880.4223	1.3757	0.0277	0.0083	0.0180	0.02
	67	0.1361	883.0060	1.3865	0.0279	0.0084	0.0189	0.02
	68	0.1442	885.5896	1.3972	0.0281	0.0084	0.0198	0.02
	69	0.1522	888.1732	1.4080	0.0283	0.0084	0.0207	0.02
	70	0.1603	890.7569	1.4187	0.0285	0.0084	0.0216	0.02

Emissions Tables

				del Year 202	CTORS (g/n 20	ni)		
					-			
Mode	Speed	CO	CO2	NOX	PM10	SOX	VOC	PM2.
Auto	0	2.7812	66.6818	0.2922	0.0022	0.0007	0.3837	0.00
	5	2.4569	766.8891	0.1849	0.0119	0.0076	0.2149	0.01
	6	2.3624	736.4937	0.1767	0.0110	0.0073	0.1979	0.01
	7	2.2679	706.0983	0.1684	0.0101	0.0070	0.1809	0.0
	8	2.1734	675.7028	0.1602	0.0092	0.0067	0.1639	0.0
Bus	0	1.7052	12.7834	0.6062	0.0001	0.0001	0.0807	0.0
	5	20.7553	2860.2247	6.9105	0.0597	0.0186	0.4993	0.0
	6	20.2836	2782.8803	6.5264	0.0560	0.0182	0.4690	0.0
	7	19.8120	2705.5358	6.1422	0.0523	0.0177	0.4387	0.0
	8	19.3403 18.8686	2628.1913	5.7580	0.0486	0.0172	0.4084	0.0
	9 10	18.8686	2550.8469 2473.5024	5.3739 4.9897	0.0449	0.0167	0.3781 0.3478	0.0
	10	18.3970	24/3.5024 2387.8333	4.9897	0.0412	0.0162	0.3478	0.0
	11	18.2020	2387.8333	4.6778	0.0349	0.0155	0.2901	0.0
	12	17,9938	2302.1641 2216.4950	4.3659	0.0349	0.0147	0.2901	0.0
	14	17.8595	2130.8259	3.7420	0.0286	0.0132	0.2324	0.0
	15	17.7251	2045.1567	3.4300	0.0255	0.0125	0.2035	0.0
	15	19.5028	2043.1567	3.1042	0.0255	0.0125	0.1854	0.0
	17	21.2804	1982.5846	2.7783	0.0213	0.0103	0.1672	0.0
	18	23.0581	1951.2985	2.4524	0.0148	0.0092	0.1490	0.0
	19	24.8358	1920.0124	2.1265	0.0112	0.0081	0.1308	0.0
	20	26.6134	1888.7263	1.8007	0.0077	0.0070	0.1126	0.0
	21	22.0537	1802.6822	2.1964	0.0114	0.0082	0.1152	0.0
	22	17.4940	1716.6380	2.5921	0.0151	0.0095	0.1178	0.0
	23	12.9342	1630.5938	2.9878	0.0188	0.0107	0.1203	0.0
	24	8.3745	1544.5496	3.3835	0.0225	0.0119	0.1229	0.0
	25	3.8147	1458.5055	3.7792	0.0262	0.0131	0.1255	0.03
	26	3.7714	1430.8138	3.7304	0.0255	0.0128	0.1204	0.0
	27	3.7280	1403.1221	3.6817	0.0247	0.0126	0.1153	0.0
	28	3.6846	1375.4304	3.6330	0.0239	0.0123	0.1102	0.0
	29	3.6413	1347.7387	3.5842	0.0232	0.0120	0.1051	0.0
	30	3.5979	1320.0470	3.5355	0.0224	0.0118	0.1000	0.0
	31	3.5389	1302.9919	3.4890	0.0218	0.0116	0.0965	0.0
	32	3.4800	1285.9368	3.4425	0.0212	0.0115	0.0930	0.02
	33	3.4210	1268.8817	3.3960	0.0206	0.0114	0.0894	0.0
	34	3.3621	1251.8266	3.3495	0.0200	0.0112	0.0859	0.0
	35	3.3031	1234.7715	3.3030	0.0194	0.0111	0.0824	0.0
	36 37	3.3885	1237.8678	3.1905	0.0188	0.0111	0.0802	0.0
	37	3.4738 3.5592	1240.9642 1244.0606	3.0780 2.9655	0.0181	0.0111	0.0780	0.0
	39	3.6446	1244.0000	2.8529	0.0175	0.0111	0.0735	0.0
	40	3.7300	1247.1569	2.8329	0.0168	0.0111	0.0733	0.0
	40	3.7300	1258.8091	2.6699	0.0162	0.0112	0.0702	0.0
	41	3.8200	1258.8091	2.5995	0.0161	0.0112	0.0691	0.0
	42	3.8651	1207.3030	2.5995	0.0160	0.0113	0.0691	0.0
	44	3.9101	1284 4766	2.4585	0.0160	0.0114	0.0669	0.0
	45	3.9551	1293.0324	2.3880	0.0159	0.0115	0.0658	0.0
	46	3.8713	1292.4992	2.4237	0.0165	0.0115	0.0648	0.0
	47	3.7875	1291.9659	2.4595	0.0171	0.0115	0.0639	0.0
	48	3.7037	1291.4326	2.4952	0.0177	0.0115	0.0629	0.0
	49	3.6199	1290.8994	2.5309	0.0184	0.0115	0.0620	0.0
	50	3.5361	1290.3661	2.5666	0.0190	0.0115	0.0610	0.0
	51	3.3966	1282.7008	2.7690	0.0208	0.0115	0.0615	0.0
	52	3.2572	1275.0355	2.9713	0.0226	0.0114	0.0620	0.0
	53	3.1177	1267.3703	3.1736	0.0244	0.0114	0.0625	0.0
	54	2.9782	1259.7050	3.3759	0.0261	0.0114	0.0629	0.02
	55	2.8388	1252.0397	3.5783	0.0279	0.0113	0.0634	0.02
	56	2.9208	1268.5531	3.5566	0.0303	0.0114	0.0664	0.0
	57	3.0029	1285.0664	3.5349	0.0326	0.0116	0.0693	0.03
	58	3.0850	1301.5798	3.5132	0.0349	0.0117	0.0723	0.0
	59	3.1671	1318.0932	3.4915	0.0372	0.0118	0.0753	0.0
	60	3.2492	1334.6065	3.4698	0.0396	0.0119	0.0782	0.0
	61	3.1376	1357.3126	3.5254	0.0452	0.0122	0.0847	0.0
	62	3.0260	1380.0187	3.5809	0.0508	0.0124	0.0911	0.04
	63	2.9145	1402.7247	3.6365	0.0564	0.0126	0.0976	0.0
	64	2.8029	1425.4308	3.6920	0.0620	0.0129	0.1040	0.0
	65 66	2.6914	1448.1369	3.7475	0.0676	0.0131	0.1105	0.0
	66 67	2.7330 2.7747	1459.9054 1471.6740	3.4083 3.0692	0.0593 0.0510	0.0132 0.0133	0.1036 0.0968	0.0
	68	2.7747	1471.6740	2.7300	0.0510	0.0133	0.0968	0.04
	69	2.8163	1483.4425	2.7300	0.0427	0.0135	0.0899	0.0
	09	2.00/9	1490.2110	2.3908	0.0344	0.0130	0.0031	0.0

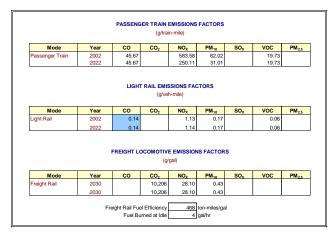
Mode	Speed	со	CO2	NOX	PM10	SOX	VOC	PM2.5
Auto	0	1.6243	41.5134	0.1182	0.0008	0.0004	0.1038	0.000
	5	1.0375	512.1914	0.0448	0.0042	0.0051	0.0871	0.003
	6	1.0103	492.7973	0.0435	0.0039	0.0049	0.0810	0.003
	7	0.9831	473.4032	0.0422	0.0035	0.0047	0.0749	0.003
	8	0.9559	454.0092	0.0409	0.0032	0.0045	0.0688	0.003
Bus	0	1.3037	10.4247	1.2376	0.0001	0.0001	0.0639	0.000
	5	23.9976	2501.4118	2.6218	0.0074	0.0141	0.1044	0.007
	6	23.4637	2424.4382	2.4492	0.0071	0.0136	0.0990	0.006
	7	22.9297 22.3957	2347.4646	2.2765	0.0068	0.0131	0.0936	0.006
	9	22.3957	2270.4910 2193.5175	2.1038	0.0064	0.0127	0.0881	0.006
	10	21.3278	2135.5175	1.7584	0.0058	0.0122	0.0773	0.005
	11	21.1073	2047.5775	1.6420	0.0055	0.0112	0.0736	0.005
	12	20.8868	1978.6110	1.5255	0.0052	0.0107	0.0699	0.005
	13	20.6662	1909.6446	1.4091	0.0050	0.0101	0.0662	0.004
	14	20.4457	1840.6782	1.2926	0.0047	0.0096	0.0625	0.004
	15	20.2252	1771.7118	1.1762	0.0045	0.0090	0.0588	0.004
	16	22.3237	1775.9215	1.0665	0.0043	0.0083	0.0594	0.004
	17	24.4222	1780.1312	0.9569	0.0041	0.0075	0.0601	0.003
	18	26.5207	1784.3409	0.8473	0.0039	0.0067	0.0607	0.003
	19	28.6192	1788.5505	0.7377	0.0037	0.0060	0.0613	0.003
	20	30.7177	1792.7602	0.6280	0.0035	0.0052	0.0620	0.003
	21	25.2049	1655.9515 1519.1428	0.7462	0.0034	0.0061	0.0542	0.003
	22	19.6922	1382,3341	0.8643	0.0034	0.0070	0.0388	0.003
	23	8.6666	1245.5254	1.1006	0.0033	0.0078	0.0388	0.003
	25	3.1538	1108,7167	1.2188	0.0032	0.0096	0.0234	0.003
	26	3.1149	1084.9049	1.1651	0.0032	0.0094	0.0234	0.003
	27	3.0759	1061.0931	1.1114	0.0032	0.0092	0.0216	0.003
	28	3.0370	1037.2814	1.0577	0.0031	0.0089	0.0207	0.003
	29	2.9981	1013.4696	1.0040	0.0031	0.0087	0.0199	0.002
	30	2.9591	989.6578	0.9503	0.0031	0.0085	0.0190	0.002
	31	2.9189	974.6062	0.9043	0.0031	0.0084	0.0184	0.002
	32	2.8788	959.5545	0.8584	0.0031	0.0083	0.0177	0.002
	33	2.8386	944.5029	0.8125	0.0031	0.0081	0.0171	0.002
	34	2.7984	929.4513	0.7666	0.0031	0.0080	0.0164	0.002
	35 36	2.7582	914.3996 917.8025	0.7207	0.0031	0.0079	0.0158	0.003
	36	2.8909 3.0237	917.8025 921.2055	0.6824	0.0032	0.0079 0.0079	0.0156 0.0155	0.003
	37	3.0237	921.2055 924.6084	0.6058	0.0032	0.0079	0.0155	0.003
	39	3,2892	928.0113	0.5676	0.0033	0.0078	0.0153	0.003
	40	3 4220	931 4142	0.5293	0.0033	0.0078	0.0150	0.003
	41	3.5398	941.3220	0.5092	0.0035	0.0079	0.0150	0.003
	42	3.6575	951.2298	0.4890	0.0036	0.0079	0.0150	0.003
	43	3.7753	961.1377	0.4689	0.0037	0.0080	0.0150	0.003
	44	3.8931	971.0455	0.4488	0.0038	0.0081	0.0150	0.003
	45	4.0108	980.9533	0.4287	0.0039	0.0081	0.0150	0.003
	46	3.9266	980.8062	0.4258	0.0042	0.0081	0.0148	0.004
	47	3.8424	980.6590	0.4230	0.0045	0.0082	0.0146	0.004
	48 49	3.7582 3.6739	980.5119 980.3647	0.4202	0.0047	0.0082 0.0082	0.0144	0.004
	49 50	3.5739	980.3647 980.2176	0.4173	0.0050	0.0082	0.0142	0.004
	50	3.5897	980.2176 975.8673	0.4145	0.0053	0.0082	0.0140	0.005
	52	3.4112	971.5171	0.45617	0.0065	0.0082	0.0139	0.000
	53	3.3220	967.1668	0.4852	0.0070	0.0082	0.0138	0.000
	54	3.2327	962.8166	0.5088	0.0076	0.0082	0.0137	0.007
	55	3.1435	958.4663	0.5324	0.0082	0.0082	0.0137	0.007
	56	3.2439	976.2456	0.5594	0.0089	0.0083	0.0141	0.008
	57	3.3442	994.0250	0.5864	0.0096	0.0084	0.0144	0.009
	58	3.4446	1011.8043	0.6133	0.0104	0.0086	0.0148	0.009
	59	3.5449	1029.5836	0.6403	0.0111	0.0087	0.0152	0.010
	60	3.6453	1047.3629	0.6673	0.0118	0.0088	0.0156	0.011
	61	3.3385	1067.0328	0.7561	0.0135	0.0091	0.0159	0.012
	62	3.0317	1086.7026	0.8449	0.0152	0.0094	0.0163	0.014
	63 64	2.7248 2.4180	1106.3724 1126.0422	0.9338	0.0169 0.0186	0.0097 0.0099	0.0166	0.016
	64 65	2.4180	1126.0422	1.0226	0.0186	0.0099	0.0169	0.017
	66	2.1112	1145.7121	1.0159	0.0203	0.0102	0.0173	0.015
	67	2.0966	1149.4634	0.9203	0.0184	0.0103	0.0172	0.017
	68	2.0673	1156.9661	0.8248	0.0104	0.0103	0.0170	0.013
	69	2.0527	1160.7175	0.7292	0.0145	0.0104	0.0168	0.012
	70	2.0380		0.6337	0.0107	0.0105	0.0167	0.010

Source: California Air Resources Board, EMFAC 2017

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

			(\$/1	ion)			
Area	Proj Loc	CO	CO ₂ e	NO _x	PM ₁₀	SOx	VOC
LA/South Coast	1	\$160	\$38	\$63,900	\$523,300	\$196,600	\$3,970
CA Urban Area	2	\$80	\$38	\$18,700	\$151,100	\$75,500	\$1,305
CA Rural Area	3	\$75	\$38	\$13,900	\$107,700	\$54,400	\$1,025

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



Sources: California Air Resources Board Association of American Railveads, 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)

PA		ETERIORA hches/mile)	TION
	Yea	r 20, By Loa	ding
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

(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

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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: Paterson, 1987

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)

Percent Freeway 0.000 1.000 0.000 1.000 0.002 0.982 0.004 0.964 0.005 0.942 0.006 0.945 0.006 0.942 0.010 0.909 0.012 0.891 0.014 0.853 0.016 0.853 0.018 0.836 0.022 0.747 0.024 0.706 0.022 0.623 0.032 0.551 0.032 0.541 0.034 0.498 0.035 0.473	HOV Project 1.000 0.988 0.976 0.964 0.952
0.000 1.000 0.002 0.982 0.004 0.964 0.006 0.945 0.006 0.945 0.006 0.947 0.010 0.909 0.012 0.891 0.014 0.873 0.020 0.789 0.022 0.747 0.026 0.664 0.028 0.623 0.028 0.624 0.028 0.624 0.024 0.769 0.025 0.654 0.036 0.476	1.000 0.988 0.976 0.964
0.002 0.982 0.004 0.964 0.006 0.945 0.008 0.927 0.010 0.909 0.014 0.873 0.016 0.885 0.018 0.836 0.022 0.789 0.022 0.789 0.026 0.664 0.026 0.653 0.030 0.581 0.034 0.498 0.034 0.498	0.988 0.976 0.964
0.004 0.984 0.006 0.945 0.008 0.927 0.010 0.909 0.012 0.891 0.014 0.873 0.016 0.855 0.018 0.836 0.022 0.747 0.026 0.664 0.026 0.653 0.030 0.581 0.032 0.540 0.034 0.489	0.976 0.964
0.006 0.945 0.008 0.927 0.010 0.909 0.012 0.891 0.014 0.873 0.016 0.855 0.018 0.836 0.020 0.789 0.022 0.747 0.026 0.664 0.028 0.623 0.030 0.581 0.034 0.498 0.034 0.476	0.964
0.008 0.927 0.010 0.909 0.012 0.891 0.014 0.873 0.016 0.855 0.018 0.836 0.022 0.789 0.024 0.766 0.025 0.664 0.026 0.664 0.030 0.581 0.032 0.540 0.034 0.498 0.035 0.476	
0.010 0.909 0.012 0.891 0.014 0.873 0.016 0.853 0.020 0.789 0.022 0.747 0.024 0.706 0.025 0.654 0.030 0.581 0.034 0.498 0.034 0.498	
0.012 0.891 0.014 0.873 0.016 0.855 0.018 0.836 0.022 0.747 0.024 0.706 0.026 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498	0.939
0.014 0.873 0.016 0.855 0.018 0.836 0.020 0.769 0.022 0.747 0.024 0.766 0.025 0.664 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.939
0.016 0.855 0.018 0.836 0.020 0.789 0.022 0.747 0.024 0.706 0.025 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.915
0.018 0.836 0.020 0.789 0.022 0.747 0.024 0.706 0.028 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.903
0.020 0.789 0.022 0.747 0.024 0.706 0.026 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.891
0.022 0.747 0.024 0.706 0.026 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.879
0.024 0.706 0.026 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.488 0.036 0.476	0.867
0.026 0.664 0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.855
0.028 0.623 0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.833
0.030 0.581 0.032 0.540 0.034 0.498 0.036 0.476	0.817
0.032 0.540 0.034 0.498 0.036 0.476	0.789
0.036 0.476	0.761
	0.734
0.000 0.170	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 0.080 0.453	0.455

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

			(perc	ent adjustme	ent)			
TMS	Wit	hout	w	ith	Non-	Highway Be	nefits	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
Tloth	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

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

	Travel	Agency Costs	
TMS Strategy	Time	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

Source: Fitzpatrick, Brewer, and Venglar, 2003