Appendix F

Health Risk Assessment

Screening Risk Assessment of Sample Selected Projects Included in the Southern California Association of Governments' Final 2012 Regional Transportation Plan

Executive Summary

To assist the Southern California Association of Governments (SCAG) in the analysis of environmental impacts resulting from construction and operation of freeway links proposed in the 2012 Regional Transportation Plan (RTP), Sierra Research conducted an assessment of changes in potential cancer risk impacts[1] designed to facilitate SCAG's regional analysis. In this study, we evaluated emissions and cancer risk impacts from eight operating freeway segments: two segments each in Los Angeles and San Bernardino Counties, and one located in each of the four other counties in SCAG's planning jurisdiction (Ventura, Orange, Riverside and Imperial Counties). Impacts have been determined for the five RTP planning scenarios listed below.

1. 2012 Existing Conditions
2. 2035 No Project Alternative
3. 2035 Preferred Plan (Alternative B)
4. 2035 2008 RTP Updated (Alternative A)
5. 2035 Envision 2 (Alternative C)

Because current emission forecasting models do not assume any improvement in motor vehicle emission control beyond the 2018 model year, the emission estimates and the resulting cancer risk estimates reported in this study are conservatively higher than those that would actually occur in the 2035 scenarios.

The findings of our analyses indicate that cancer risks resulting from vehicle operation on freeways will decline in future years under all future planning scenarios as compared with the 2012 Existing Conditions.

Introduction

The 2012 Regional Transportation Plan (RTP) developed by SCAG is a multimodal plan for expanding and enhancing transportation facilities in the SCAG region through 2035. Many of the facilities to be constructed are freeway widenings and extensions. Motor vehicles using streets and freeways are sources of toxic air contaminants, including

[1] Only cancer risks were quantitatively analyzed under this analysis. Non-cancer health risks were not addressed because the risks from air toxics emitted from motor vehicles are dominated by Diesel particulate matter (DPM) and certain organic gases; and carcinogenic risk from these compounds is considered by California air pollution control agencies to be more significant than other potential health risks from substances emitted from on-road mobile sources.

carcinogenic pollutants. To assist SCAG in preparing a programmatic environmental impact report for the RTP, Sierra Research conducted a quantitative, screening-level cancer risk assessment designed to help facilitate SCAG's regional analysis of potential changes in cancer risk in areas near freeway projects included in the 2012 RTP. The forecasting of toxic air pollutant emission rates in 2035 and beyond is speculative because improvements in vehicle emissions controls will continue to occur, but the magnitude of these improvements cannot be accurately predicted and therefore are not reflected in this analysis. Therefore, the results presented in this analysis contain significant uncertainties and are intended to be conservatively high.

Several simplifying assumptions were made under this assessment. First, the analysis focused only on quantifying increased cancer risks—acute and non-cancer chronic health risks and mortality risks were not considered, for reasons discussed further below. Additionally, cancer risk values represent risk based on 70 years of exposure. However, calendar year 2035 emission factor are assumed to persist for years within the 70-year period beyond 2035, since regulations mandating future emissions reductions do not call for any new restrictions beyond 2018. [2] If vehicle emission technology improvements continue, use of 2035 fleet emission factors to represent emissions beyond 2035 will produce conservatively higher average fleet emissions over the 70-year period than actually occur, and cancer risks for future scenarios will be conservatively over-predicted.

Selected Freeway Corridor Sample

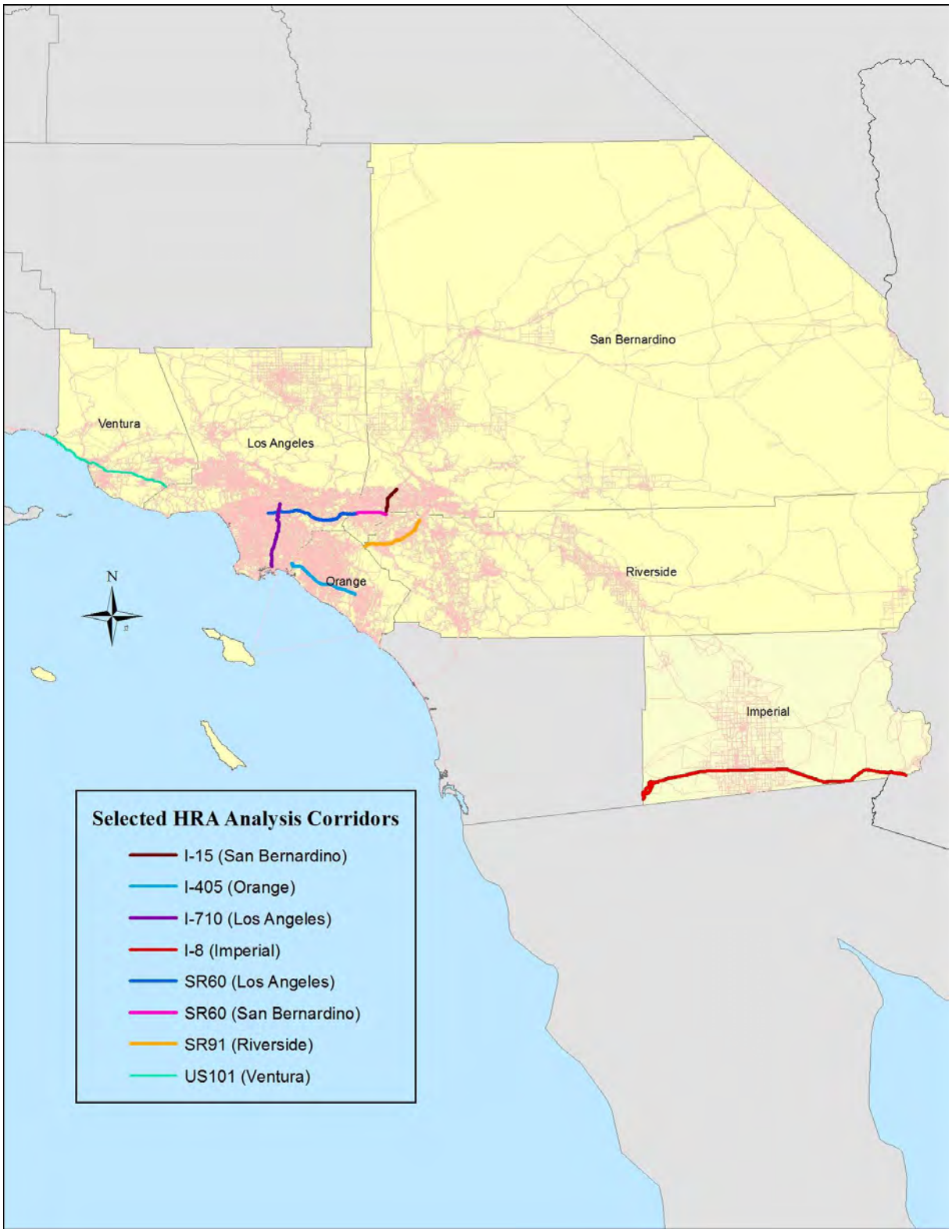
Selected Corridors – The analysis of cancer risks was based on a sample of freeway corridors selected by SCAG; operational traffic levels vary for each corridor under alternative planning scenarios in the RTP. One freeway corridor was selected for each of the six counties contained in the SCAG planning area, with two additional corridors selected by SCAG as areas of "heightened interest." The freeway corridors selected for analysis of operational emissions under different RTP alternatives are listed below (the latter two are the heightened interest corridors):

- I-405 in Orange County (Caltrans District 12);
- I-710 in Los Angeles County (Caltrans District 7);
- I-8 in Imperial County (Caltrans District 11);
- SR 60 in San Bernardino County (Caltrans District 8);
- SR 91 in Riverside County (Caltrans District 8);
- US 101 in Ventura County (Caltrans District 7);
- SR 60 in Los Angeles County (Caltrans District 7);
- I-15 in San Bernardino County (Caltrans District 8).

Figure 1 shows the location of each selected freeway corridor within the SCAG planning domain. These selected freeways generally represent major transportation corridors in

[2] Under CARB's current LEV-II regulations, new vehicle emission standards remain constant in 2018 and later years.

Figure 1
Location of Selected Freeway Corridors



each county and specifically include roadways with the highest total traffic (I-405) and highest heavy-duty Diesel truck traffic (I-710) in the planning area. (As discussed in greater detail later, on-road vehicle cancer risk is strongly dependent on the number of heavy-duty Diesel vehicles on the roadway.)

Modeling of "Highest Volume" Segments – Quantitative modeling of the entire length of each freeway corridor (some of which extend over 90 miles) was impractical and beyond the scope of this assessment. To focus on the "probable worst case" risks, the segment within each corridor that exhibited the highest daily total traffic volume (combined in both directions and including HOV lane traffic where appropriate) was identified from travel model link outputs supplied by SCAG. The highest-volume segments on each corridor were then quantitatively modeled for increased cancer risk. It was assumed that the location of the highest-volume segment along each corridor would not significantly change from one planning scenario to the next. The model outputs for the 2035 No Project Alternative scenario were used to identify the "highest volume" segments along each selected corridor for all scenarios. These highest volume segments in the projected baseline are areas where congestion management projects (such as the addition of HOV lanes) are likely to be undertaken under the various Plan alternatives, and therefore are likely to continue to carry relatively high volumes of traffic under the future planning scenarios.

The segments of each selected freeway corridor that were modeled based on this "maximum volume" approach are listed below.

- I-405 – in Seal Beach, east of the I-605 interchange (Orange County)
- I-710 – in Compton, north of the intersection with SR 91 (Los Angeles County)
- I-8 – just east of El Centro (Imperial County)
- SR 60 – in Ontario, west of the I-15 interchange (San Bernardino County)
- SR 91 – in Corona, east of the intersection with SR 71 (Riverside County)
- US 101 – in Thousand Oaks, east of SR 23 (Ventura County)
- SR 60 – near Diamond Bar (Los Angeles County)
- I-15 – in Ontario (San Bernardino County)

Emissions Analysis

Diesel- and gasoline-powered vehicle emissions contain many compounds that have been determined to be carcinogenic. Only a few compounds, however, are emitted in sufficient quantities to contribute to significant cancer risks in areas immediately downwind of roadway segments affected by the 2012 RTP.[3] Foremost among these compounds is Diesel exhaust particulate matter, based on its designation as a toxic air contaminant by the California Air Resources Board. The gaseous organic compounds that significantly contribute to cancer risk are as follows:

- 1,3 butadiene;

[3] Addendum to the Air Toxics Control Plan (March 2000), South Coast Air Quality Management District, March 2004, *http://www.aqmd.gov/hb/2004/040436a.html*

- Benzene;
- Formaldehyde; and
- Acetaldehyde.

Emission factors for these pollutants from operation of on-road vehicles were developed using the most recent emission factor model developed by the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB). On-road emission factors for Diesel exhaust particulate matter (DPM) and total organic gas (TOG) emissions were generated through use of the CARB EMFAC2007 model. A special toxics module[4] of EPA's MOBILE6.2 model was used to determine the fractions of individual cancer-causing toxic compounds listed above in TOG emissions, a capability not possessed by the EMFAC2007 model.[5] Table 1 lists these calculated toxic fractions of TOG by EMFAC vehicle class for each compound. DPM was calculated only for Diesel vehicle classes.

Table 1
Fractions of TOG for Specific Compounds by Vehicle Class

Vehicle Class	Benzene		Formaldehyde	Acetaldehyde	1,3 Butadiene
	Exhaust	Evap-Run			
LDA-NCAT	0.0185	0.0045	0.0290	0.0256	0.0124
LDA-CAT	0.0185	0.0045	0.0296	0.0330	0.0079
LDA-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
LDT1-NCAT	0.0185	0.0045	0.0290	0.0256	0.0124
LDT1-CAT	0.0185	0.0045	0.0296	0.0330	0.0079
LDT1-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
LDT2-NCAT	0.0185	0.0045	0.0290	0.0256	0.0124
LDT2-CAT	0.0185	0.0045	0.0296	0.0330	0.0079
LDT2-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
MDV-NCAT	0.0185	0.0045	0.0290	0.0256	0.0124
MDV-CAT	0.0185	0.0045	0.0296	0.0330	0.0079
MDV-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
LHDT1-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
LHDT1-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
LHDT1-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
LHDT2-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
LHDT2-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
LHDT2-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
MHDT-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
MHDT-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
MHDT-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
HHDT-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
HHDT-CAT	0.0350	0.0045	0.0296	0.0330	0.0039

[4] Technical Description of the Toxics Module for MOBILE6.2 and Guidance on Its Use for Inventory Preparation, U.S. Environmental Protection Agency, Report No. EPA420-R-02-029, November 2002.
[5] Use of the CT-EMFAC software package jointly develop by Caltrans and U.C. Davis was also evaluated. However, due to schedule constraints and input "speed profiles" required by CT-EMFAC that were not immediately available from the network modeling outputs, toxic speciation fractions were calculated using MOBILE6.2-based algorithms. The toxics speciation fractions in MOBILE6.2 are similar to those incorporated by EPA into its more recent MOVES2010a vehicle emissions model.

Table 1 Fractions of TOG for Specific Compounds by Vehicle Class					
Vehicle Class	Benzene		Formaldehyde	Acetaldehyde	1,3 Butadiene
	Exhaust	Evap-Run			
HHDT-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
LHV-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
LHV-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
LHV-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
SBUS-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
SBUS-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
SBUS-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
UB-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
UB-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
UB-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
MH-NCAT	0.0185	0.0045	0.0450	0.0286	0.0100
MH-CAT	0.0350	0.0045	0.0296	0.0330	0.0039
MH-DSL	0.0000	0.0000	0.0000	0.0000	0.0000
MCY-NCAT	0.0185	0.0045	0.0290	0.0256	0.0124
MCY-CAT	0.0185	0.0045	0.0290	0.0256	0.0124
MCY-DSL	0.0000	0.0000	0.0000	0.0000	0.0000

The results contained in Table 1 were calculated assuming California RFG III fuel for the gasoline-powered vehicles, as summarized in Table 2. The fractions shown in Table 1 were applied to the EMFAC2007 TOG estimates to quantify gasoline-based toxic emissions for each individual compound.

Table 2 Assumed Gasoline Fuel Properties Used in Developing Toxic Fractions of TOG		
Property	Value	Basis
Ethanol content (wt %)	10	California RFG III "flat" limit, 13 CCR § 2262
Oxygen content (wt %)	3.5	Based on 10% ethanol content
RVP (psi)	9.55	Average of summer and winter regular unleaded gasoline properties for Los Angeles, 2010/11
Benzene (vol %)	0.8	California RFG III "flat" limit, 13 CCR § 2262
Aromatic (vol %)	19.05	Average of summer and winter regular unleaded gasoline properties for Los Angeles, 2010/11

EMFAC and MOBILE6 are limited in forecasting vehicle emission factors into the future because regulations mandating future emissions reductions do not call for any new restrictions beyond 2018;[6] therefore, the actual emission factors associated with vehicle use in 2035 and beyond will probably be significantly less than the conservative values used in this analysis.

[6] See footnote 2.

On-road TOG and DPM emission factors for the evaluation of freeway link operations emissions were generated by running the EMFAC2007 emission factor model for the following three areas for calendar years 2012 and 2035:

- South Coast AQMD (covering Orange County and portions of Los Angeles, Riverside and San Bernardino counties);
- Imperial County APCD; and
- Ventura County APCD.

The model was configured to report average daily emissions and total vehicle miles traveled (VMT) for each on-road vehicle class and fuel type (gasoline and Diesel) in each of these three areas. Separate TOG gasoline and DPM Diesel emission factors (in grams per mile of vehicle travel) were then computed for each calendar year and area by dividing emissions by VMT (for each vehicle/fuel category). Since these emission factors were intended to be representative of travel on freeways that usually occurs after a vehicle is fully warmed-up, only "running" emission factors were computed. Evaporative running losses that occur while the engine is on were also included in the analysis. Starting and initial idling emissions were ignored since they do not occur on freeways. Similarly, evaporative emissions that occur while a vehicle is parked with its engine off (hot soak, diurnal breathing, and resting losses) were also excluded as not being representative of freeway-specific activities.

SCAG's travel demand modeling system produces estimates of roadway link volumes for light/medium-duty vehicles (e.g., passenger cars and trucks and light/medium commercial vehicles) and heavy-duty vehicles. Since 90-95% of the TOG toxic emissions come from light/medium-duty vehicles and similar percentages of DPM are emitted by heavy-duty vehicles, emission factors from the EMFAC runs (and MOBILE6 toxic fraction breakdowns) were compiled separately for light/medium duty vehicles (LMD) and heavy-duty vehicles (HD) for each county/area. This approach accounted for variations in the mix of heavy-duty vehicles across roadway links contained in SCAG's travel model outputs and the relative impacts of each compound on overall cancer risk. Table 3 shows how the EMFAC7 vehicle categories were matched with MOBILE6 categories to generate the toxic fractions shown in Table 1, and to travel demand model vehicle types for use in this analysis.

Table 4 summarizes the resulting fleet composite daily average DPM emission factors (in grams/mile) calculated for the highest volume segments of each selected freeway corridor for the 2035 Preferred Plan analysis scenario. Detailed link-specific data are provided in Table A-1, Appendix A. As noted in the second column in Table 4, the links of these selected freeway corridor segments include both mixed-use and HOV lanes for certain corridors, as well as truck-only lanes on the SR 60 segment in San Bernardino County (SR 60 SB). The source strength or emission rate of each segment per unit time (in pounds per day) is shown in the rightmost (shaded) column in Table 4. It was calculated as the product of the fleet composite emission factor (grams/mile) and the daily vehicle miles traveled (VMT/day) on each segment. (Daily VMT was computed simply as the product of the daily vehicle volume and the segment length.) As shown in Table 4, the

Table 3 Derivation of Toxic Emission Factors for EMFAC7 Vehicle Categories and Vehicle Types Designated in the HRA			
EMFAC7 Vehicle Class		MOBILE6 Vehicle Class	HRA Vehicle Type
LDA-CAT LDT1-CAT LDT2-CAT	SBUS-CAT MDV-CAT MH-CAT	LDGV and LDGT/oxcat	LMD
LDA-NCAT LDT1-NCAT LDT2-NCAT MDV-NCAT	SBUS-NCAT MCY-CAT MCY-NCAT MH-NCAT	LDGV and LDGT/noncat, MC	LMD
LHDT1-CAT LHDT2-CAT MHDT-CAT	HHDT-CAT LHV-CAT UB-CAT	HDGV/cat	HD
LHDT1-NCAT LHDT2-NCAT MHDT-NCAT	HHDT-NCAT LHV-NCAT UB-NCAT	HDGV/noncat	HD
LDA-DSL	MCY-DSL	LDDV	LMD
LDT1-DSL LDT2-DSL	MDV-DSL	LDDT	LMD
LHDT1-DSL LHDT2-DSL MHDT-DSL HHDT-DSL	LHV-DSL SBUS-DSL UB-DSL MH-DSL	HDDV	HD

Table 4 2035 Preferred Plan DPM Daily Average Emission Factors by Vehicle Type and Freeway Segment and Fleet Composite Source Strength				
			Fleet Composite	
Freeway Corridor	Link Type	Length (mi)	VMT/day	Qs (lb/day)
I-15	Mixed	5.903	565,137	10.76
I-405	Mixed	2.104	417,098	8.58
I-405	HOV	2.099	100,810	0.08
I-710	Mixed	2.684	382,313	8.31
I-8*	Mixed	3.009	76,436	5.12
SR 60 LA	Mixed	6.242	744,520	12.36
SR 60 LA	HOV	6.938	93,195	0.07
SR 60 SB	Truck	4.346	46,654	7.28
SR 60 SB	Mixed	4.543	563,914	13.40
SR 60 SB	HOV	3.880	63,230	0.05
SR 91	Mixed	4.106	689,417	14.20
SR 91	HOV	3.137	161,464	0.12
US 101*	Mixed	1.727	166,565	2.05

* EMFAC2007 reports area-wide emissions in tons per day to two decimal places. For these counties (Imperial and Ventura), DPM emissions from light- and medium-duty Diesel vehicles were reported as zero.

resulting fleet composite DPM source strengths vary by roughly a factor of seven across the mixed use lanes of the selected corridor segments.

The DPM emission factor (and source strength) is clearly affected by the fraction of heavy-duty Diesel vehicles on each segment; the HOV lane segments shown exhibit much lower DPM emission factors because of the absence of heavy-duty vehicles in those lanes, while the truck-only lane segment shows relatively high DPM emission factors.

Similar calculations were performed to determine daily fleet composite emission factors and resulting source strengths by modeling link for each of the gasoline toxic compounds. Table 5 presents the fleet composite source strengths by freeway corridor segment for each toxic species (including DPM) for the 2035 Preferred Plan scenario. Detailed link-level data are provided in Table A-2, Appendix A.

Emission source strengths were compiled for each link, for each of the five analysis scenarios for input to the dispersion modeling. However, only the 2035 Preferred Alternative data are shown.

Table 5
2035 Preferred Plan Toxic Pollutant Daily Source Strengths by Freeway Segment

Freeway Corridor	Link Type	Daily Average Source Strength (lb/day)				
		Benzene	Formaldehyde	Acetaldehyde	1,3 Butadiene	DPM
I-15	Mixed	1.22	1.38	1.41	0.45	10.76
I-405	Mixed	0.89	1.00	1.03	0.33	8.58
I-405	HOV	0.22	0.27	0.27	0.09	0.08
I-710	Mixed	0.82	0.91	0.93	0.30	8.31
I-8	Mixed	0.29	0.38	0.41	0.11	5.12
SR 60 LA	Mixed	1.61	1.82	1.87	0.60	12.36
SR 60 LA	HOV	0.21	0.25	0.25	0.08	0.07
SR 60 SB	Truck	0.07	0.03	0.04	0.00	7.28
SR 60 SB	Mixed	1.20	1.33	1.36	0.43	13.40
SR 60 SB	HOV	0.14	0.17	0.17	0.06	0.05
SR 91	Mixed	1.47	1.60	1.68	0.53	14.20
SR 91	HOV	0.36	0.46	0.44	0.14	0.12
US 101	Mixed	0.37	0.37	0.38	0.12	2.05

Table 6 contains the average daily vehicle volumes for each selected freeway corridor segment. More detailed link-level data are provided in Table A-3, Appendix A. Although the average daily volumes for each of the three 2035 plan alternatives tend to be higher than 2035 No Project volumes, the effect on emission factors is offset by the fact that much of the increase in volumes for these scenarios (over the 2035 No Project) is from light- and medium-duty vehicles. As shown more clearly later, light- and medium-duty vehicles have much less relative impact on overall cancer risk than heavy-duty Diesel vehicles.

The emission inputs to the dispersion modeling were then developed by dividing the calculated emissions for each source by the size of each roadway link, which was a function of the roadway length and the number of lanes.

Table 6 Average Daily Vehicle Volumes by Analysis Scenario and Freeway Segment						
		Average Daily Vehicle Volumes (vehicles/day, averaged over flow directions)				
Freeway Corridor	Link Type	2012 Existing	2035 No Project	2035 Preferred Plan	2035 with 2008 RTP Update	2035 Envision 2
I-15	Mixed	88,581	116,614	97,671	109,619	86,264
I-405	Mixed	193,528	214,640	198,329	214,169	213,722
I-405	HOV	30,203	31,935	48,027	28,018	53,717
I-710	Mixed	144,476	141,926	141,387	153,202	154,189
I-8	Mixed	16,939	27,225	25,523	26,770	22,709
SR 60 LA	Mixed	121,034	137,275	123,959	135,115	121,131
SR 60 LA	HOV	27,455	26,735	13,413	20,052	12,664
SR 60 SB	Truck	n/a	n/a	8,150	n/a-	6,391
SR 60 SB	Mixed	109,439	131,863	126,453	132,508	113,227
SR 60 SB	HOV	24,824	27,080	14,655	21,525	12,454
SR 91	Mixed	107,563	132,275	140,647	135,335	131,585
SR 91	HOV	41,706	35,474	44,081	42,436	42,357
US 101	Mixed	97,973	107,078	95,555	101,928	96,634

Dispersion Modeling and Quantification of Cancer Risk

The quantification of cancer risk impacts resulting from vehicle operation in the vicinity of each of the selected freeway corridors in the 2012 RTP was performed using an EPA-approved pollutant dispersion model in conformance with SCAQMD Diesel exhaust risk assessment procedures[7] and CARB/OEHHA guidance.[8]

The SCAQMD Diesel exhaust risk assessment procedures contain recommendations with respect to emission factor sources, dispersion models, meteorological databases, and modeling protocols. This guidance was followed as closely as possible, with two exceptions. First, the recommended emission factor source is the current version of the CARB EMFAC emission factor model, which at the time of the analysis was EMFAC2011-SG. However, because SCAG started its air quality/conformity analysis using EMFAC2007 prior to the public release of EMFAC2011-SG, SCAG has chosen to continue using EMFAC2007 for this analysis of vehicle emissions. Second, the dispersion model recommended by SCAQMD is the EPA Industrial Source Complex – Short Term, Version 3 (ISCST3). However, as of December 9, 2006, EPA's recommended ISCST3 model has been superseded by the American Meteorological Society/ Environmental Protection Agency Regulatory Model Improvement Committee-developed AERMOD modeling system. The current version of AERMOD, as available

[7] Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis, South Coast Air Quality Management District, August 2003, *http://www.aqmd.gov/ceqa/handbook/mobile_toxic/diesel_analysis.doc*.

[8] Air Toxic Hot Spots Program Risk Assessment Guidelines, California Office of Environmental Health Hazard Assessment, October 2003; *http://www.oehha.ca.gov/air/hot_spots/HRAguidefinal.html*; and Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk, CARB, October 2003; *http://www.arb.ca.gov/toxics/harp/docs/rmpolicy.PDF*

for download on the EPA website, is version 11103.[9] The meteorological databases recommended for use are those compiled by SCAQMD for calendar year 2005 through 2007 from 26 stations within the South Coast Air Basin.[10] The emissions characteristics of sources to be modeled, as recommended in the SCAQMD guidance, are specified in a risk assessment document prepared by the California Air Resources Board.[11]

The use of AERMOD for dispersion modeling in this study is also consistent with CARB's recommendations for performing HRAs at railyards.[12]

Meteorological data for each modeling analysis were obtained from SCAQMD monitoring sites. The monitoring sites selected for use with each segment studied are presented in Table 7.

Table 7
SCAQMD Meteorological Data Used for Each Freeway Segment Analysis

Freeway Segment	Meteorological Data Site	Nominal Distance from Met Site to Segment (miles)
I-15 (San Bernardino County)	Fontana	4
I-405 (Seal Beach)	Long Beach	8
I-710 (Compton)	Lynwood	3
I-8 (El Centro)	Indio	77
SR 60 LA (Diamond Bar)	Pomona	6
SR 60 SB (Ontario)	Upland	6
SR 91 (Corona)	La Habra	17
US 101 (Thousand Oaks)	Reseda	18

Except for the SR 91 segment, the nearest SCAQMD meteorological data collection site was selected for each freeway segment. Several meteorological datasets were considered for the SR 91 segment location near Corona. The La Habra met station was selected because that station is located in similar terrain and the winds there exhibit the channeling effect that is expected at the SR 91 segment location (see Appendix A, Figure A-1).

In most cases, the met data were collected within about 20 miles of the modeling location; however, for the I-8 segment near El Centro (Imperial County), the Indio met station is over 75 miles away. This met data site was used because it is the nearest and most representative SCAQMD met data site to El Centro. The local terrain and land-use characteristics make it reasonably representative of wind patterns and dispersion characteristics at the modeling location.

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[9] AERMOD modeling system, Version 11103, U.S. Environmental Protection Agency, April 2011, *http://www.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod*.
[10] AQMD Dispersion Model Application Meteorological Data, South Coast Air Quality Management District, *http://www.aqmd.gov/smog/metdata/AERMOD_Table1.html*
[11] Appendix VII: Risk Characterization Scenarios, Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, California Air Resources Board, October 2000, *http://www.arb.ca.gov/diesel/documents/rrpapp7.PDF*.
[12] CARB Health Risk Assessment Guidance for Rail Yard and Intermodal Facilities, California Air Resources Board, September 2006, *http://www.arb.ca.gov/railyard/hra/1107hra_guideline.pdf*

Each of the freeway segment links was modeled as a series of volume sources. Each directional link was modeled as a separate source. (Mixed use, HOV and truck-only links were also modeled as separate, parallel sources.) The effective widths of the operational freeway segments were increased by 3.0 meters on each side to account for initial plume dispersion as recommended by the CALINE4 manual.[13] Based on SJVAPCD guidance for modeling cancer risk from mobile sources, the release heights were set at 6 feet (1.83 meters) to represent the typical heights of emission release.

Receptor grids surrounding each freeway segment were designed to identify the highest exposed residential and workplace locations near each segment. Receptor grids of 100 meter spacing were designed to extend out 0.5 kilometers in all directions from the boundaries of each roadway segment. Aerial photo images generated by an Internet program[14] were then visually inspected to determine the locations of residences and workplaces surrounding each freeway segment, and these locations were manually plotted on the topographic map program images to determine the map coordinates of these residential and workplace structures. (Nearest workplace receptors were sited at the closest property boundary except on public lands. For public lands, the nearest structure was used.) These map coordinates were then added to the AERMOD input files as discrete receptor sites.

AERMOD produces output files containing modeled concentrations of each toxic compound at every receptor. These modeled concentrations were then used in CARB's Hotspots Analysis and Reporting Program (HARP) computer program (Version 1.4d, January 2011) to calculate cancer risk. The most recent health database[15] provided by CARB, reflecting the RELs adopted by OEHHA in December 2008, has been used. The toxicity values used to characterize cancer risk are summarized in Table 8.

Table 8
Toxicity Values Used to Characterize Cancer Risks

Toxic Air Contaminant	Inhalation Cancer Risk (per $\mu g/m^3$ per g/s)
Acetaldehyde	3.77×10^{-6}
Benzene	3.77×10^{-5}
1,3-Butadiene	2.26×10^{-4}
Formaldehyde	7.91×10^{-6}
Diesel particulate matter	4.15×10^{-4}

Source: CARB HARP Model, 70-year residential exposure, Derived OEHHA Method.

Because the HARP model was designed to use modeling output files from the ISCST3 model, rather than the current recommended guideline AERMOD model, the AERMOD

[13] CALINE4 – A Dispersion Model For Predicting Air Pollutant Concentrations Near Roadways, Report No. FHWA/CA/TL-84-15, California Department of Transportation, November 1984.
[14] *http://earth.google.com/*
[15] February 2011, available at *http://www.arb.ca.gov/toxics/harp/data.htm*.

results must be reformatted before they can be used in HARP. The HARP On-Ramp[16] is a tool provided by CARB that reformats output files from models other than ISCST3 so that they can be read by the HARP Risk Module. Version 1 of the On-Ramp tool was used to create files required by HARP to complete the screening health risk assessment. Residential cancer risk is expressed in units of increased cancer risk per 70-year exposure. Based on OEHHA guidance for workplace vs. residential exposure, the HARP model also produces cancer risk results based on workplace exposure. While residential risk assessment assumes 24 hour/day, 7 day/week, 52 week/year, 70-year exposure, HARP uses default workplace exposure assumptions of 8 hours per day and 245 days per year over a 40-year period.

Modeling Results

The HARP model reports maximum residential and workplace cancer risk at any receptor, referred to as the Maximum Exposed Individual (MEI). The cancer risks reported for each highway segment and planning scenario are for the MEI, even if no residence or workplace actually exists at the location of the MEI. This conservative assumption is designed to overestimate cancer risk. For the analysis of freeway segment operations, the cancer risk values reported by the model represent the chance of contracting cancer from exposure to freeway emissions if a person lived at the same location for a period of 70 years or worked at the same location for 40 years and if freeway emissions did not change over those periods. These risk values reflect only exposure to emissions from freeway traffic and do not include cancer risk due to other sources (discussed further below). The residential cancer risk values reported for the hypothetical location of the maximum exposed individual for each of the five planning scenarios and each of the eight freeway segments studied are presented in Table 9. Table 10 shows the change in modeled residential risk for each segment from the 2012 existing conditions.

Table 9
Maximum Cancer Risk Based on Residential Exposure to Vehicle Operation by Planning Scenario and Freeway Corridor

Planning Scenario	Maximum Cancer Risk over 70-Year Residential Exposure (in one million)							
	I-405 (Orange)	I-710 (Los Angeles)	I-8 (Imperial)	SR 60 (San Bernardino)	SR 91 (Riverside)	US 101 (Ventura)	SR 60 (Los Angeles)	I-15 (San Bernardino)
2012 Existing Conditions	1080	1040	503	1770	1960	372	1470	811
2035 No Project Alternative	442	734	385	735	943	201	562	368
2035 Preferred Plan	462	475	399	714	668	199	536	354
2035 2008 RTP Updated	442	421	401	618	674	196	476	405
2035 Envision 2	497	441	369	683	619	192	535	388

[16]Available at *http://www.arb.ca.gov/toxics/harp/downloads.htm*

Table 10 Change in Maximum Cancer Risk Based on Residential Exposure to Vehicle Operation by Planning Scenario and Freeway Corridor								
	Change in Maximum Cancer Risk over 70-Year Residential Exposure (in one million)							
Planning Scenario	I-405 (Orange)	I-710 (Los Angeles)	I-8 (Imperial)	SR 60 (San Bernardino)	SR 91 (Riverside)	US 101 (Ventura)	SR 60 (Los Angeles)	I-15 (San Bernardino)
2012 Existing Conditions	--	--	--	--	--	--	--	--
2035 No Project Alternative	-638	-306	-118	-1035	-1017	-171	-908	-443
2035 Preferred Plan	-618	-565	-104	-1056	-1292	-173	-934	-457
2035 2008 RTP Updated	-638	-619	-102	-1152	-1286	-176	-994	-406
2035 Envision 2	-583	-599	-134	-1087	-1341	-180	-935	-423

Table 11 presents a similar summary of maximum cancer risks based on workplace exposure along each modeled corridor. Table 12 shows the change in modeled workplace risk from the 2012 existing conditions for each alternative.

Table 11 Maximum Cancer Risk Based on Workplace Exposure to Vehicle Operation by Planning Scenario and Freeway Corridor								
	Maximum Cancer Risk over 40-Year Workplace Exposure (in one million)							
Planning Scenario	I-405 (Orange)	I-710 (Los Angeles)	I-8 (Imperial)	SR 60 (San Bernardino)	SR 91 (Riverside)	US 101 (Ventura)	SR 60 (Los Angeles)	I-15 (San Bernardino)
2012 Existing Conditions	163	158	76	269	297	56	223	123
2035 No Project Alternative	67	111	58	111	143	30	85	56
2035 Preferred Plan	70	72	60	108	101	30	81	54
2035 2008 RTP Updated	67	64	61	94	102	30	72	61
2035 Envision 2	75	67	56	104	94	29	81	59

As shown in Table 9 and Table 11, maximum residential and workplace risks due to vehicle operation on all freeway segments are much higher under existing (2012) conditions; the declines in cancer risk across all future scenarios and freeway segments (shown in Table 10 and Table 12) are the result of continued decreases in per-vehicle mile fleet emissions projected to occur over the next 23 years. As discussed earlier, this decrease occurs due to continued emission control technology improvements in new vehicles for which certification standards continue to tighten up through 2018. (The analysis assumed no further tightening of these vehicle standards beyond 2018 and is thus conservative or over-predictive if standards decline after 2018.)

Table 12 Change in Maximum Cancer Risk Based on Workplace Exposure to Vehicle Operation by Planning Scenario and Freeway Corridor								
	Change in Maximum Cancer Risk over 40-Year Workplace Exposure (in one million)							
Planning Scenario	I-405 (Orange)	I-710 (Los Angeles)	I-8 (Imperial)	SR 60 (San Bernardino)	SR 91 (Riverside)	US 101 (Ventura)	SR 60 (Los Angeles)	I-15 (San Bernardino)
2012 Existing Conditions	--	--	--	--	--	--	--	--
2035 No Project Alternative	-96	-47	-18	-158	-154	-26	-138	-67
2035 Preferred Plan	-93	-86	-16	-161	-196	-26	-142	-69
2035 2008 RTP Updated	-96	-94	-16	-175	-195	-27	-151	-62
2035 Envision 2	-88	-91	-20	-165	-203	-27	-142	-64

Comparing the risk values across the four future planning scenarios shows the Preferred Plan, 2008 RTP Updated, and Envision 2 alternatives generally exhibit the lowest risk. In one instance, the No Project case shows the lowest risk. Of the freeway corridors analyzed, SR 91 exhibits the highest residential cancer risk, followed by SR 60 (San Bernardino) and SR 60 (Los Angeles), as shown in Table 9. Not surprisingly, the segments modeled along these corridors exhibited the highest total vehicle and heavy-duty truck volumes and the highest source strengths (emission rates) among all of the segments analyzed.

By comparison, the average total cancer risk level to which residents of the South Coast Air Basin were exposed was approximately 1,200 in one million according to ambient monitoring results compiled by the South Coast Air Quality Management District under its on-going Multiple Air Toxics Exposure Study (MATES).[17] This total risk results from exposure to pollutants emitted by all sources: region-wide mobile, industrial, and commercial product use. The risks modeled under this assessment address only the contribution from on-road vehicle emissions on nearby freeways and represent one component of the total cancer risk experienced in the South Coast Air Basin.

Each modeled freeway segment and the spatial distributions of residential and workplace cancer risk due to vehicle traffic on that segment were plotted for each scenario and are shown in Appendix B.[18]

The maximum incremental residential and workplace risks identified from the modeling runs were typically found closest to the boundaries of the freeway segments. As shown in the figures in Appendix B, cancer risks decline dramatically with increasing distance from the edges of the freeway segments. Table 13 presents the distances from project

[17] Final Report, Multiple Air Toxics Exposure Study in the South Coast Air Basin, MATES-III, South Coast Air Quality Management District, September 2008.
http://www.aqmd.gov/prdas/matesIII/MATESIIIFinalReportSept2008.html

[18] Note that the curved shape of the risk profiles at the ends of the freeway segments is due to the fact that risk is being assessed only from emissions on the roadway segment shown. In reality, vehicle travel, emissions, and resulting cancer risks occur all along the freeway, beyond the ends of the modeled segments.

boundaries at which maximum residential cancer risks for the 2035 Preferred Alternative drop by 50% and 90%. The distance values were computed along axes that are perpendicular to segment centerlines near the midpoint of each freeway corridor.

Table 13
Approximate Distances at Which Cancer Risks for the Preferred Plan Alternative Are Reduced by 50% and 90% (feet)

Freeway Corridor	50% Reduction Distance	90% Reduction Distance
I-15 (San Bernardino County)	200	1,750
I-405 (Orange County)	390	1,980
I-710 (Los Angeles County)	470	2,500
I-8 (Imperial County)	410	1,500
SR 60 (San Bernardino County)	390	1,990
SR 91 (Riverside County)	460	2,410
SR 60 (Los Angeles County)	310	2,250
US 101 (Ventura County)	340	1,690

Other PM Health Effects

This risk assessment focuses on cancer risk due to exposure to DPM and organic TACs resulting from combustion and evaporative emissions from vehicle travel on the selected freeway segments. Ambient PM_{10} and $PM_{2.5}$, of which DPM is one component, have also been associated with other acute (short-term) and chronic (long-term) health effects, such as the worsening of heart and lung diseases. Elevated levels of ambient particulate matter have also been identified as one of many aggravating factors for childhood asthma.

Respirable particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) consist of particulate matter that is 10 microns or less in diameter and 2.5 microns or less in diameter, respectively. PM_{10} and $PM_{2.5}$ present in the atmosphere are produced mostly through combustion and secondary photochemical reactions and represent fractions of particulate matter that can be inhaled and cause adverse health effects. PM_{10} and $PM_{2.5}$ are a health concern, particularly at levels above the federal and state ambient air quality standards. $PM_{2.5}$ is thought to have greater effects on health because smaller particles are able to penetrate to the deepest parts of the lungs. Scientific studies have suggested links between fine particulate matter and numerous health problems, including asthma, bronchitis, and acute and chronic respiratory symptoms such as shortness of breath and painful breathing. Children are more susceptible to the health risks of $PM_{2.5}$ because their immune and respiratory systems are still developing. Very small particles of certain substances (e.g., sulfates and nitrates) can also directly cause lung damage or can contain absorbed gases (e.g., chlorides or ammonium) that may be injurious to health.

On-road vehicle traffic also produces particulate matter in the form of brake and tire wear and fugitive dust from paved road travel. This type of dust is comprised mainly of large

particles (diameter greater than 10 microns) that settle out rapidly and are more easily filtered by human breathing passages. All dust, however, includes some fraction of PM_{10} and $PM_{2.5}$ that can create localized health impacts (i.e., exceed an ambient air quality standard).

Ambient concentrations of PM_{10} and $PM_{2.5}$ are regulated directly through health-based ambient air quality standards. As with construction-related impacts, PM_{10} and $PM_{2.5}$ impacts will be addressed on a project-by-project basis, rather than in this programmatic EIR.

Health Effects Near Roadways

A review of air pollution studies by CARB indicates that residing close to freeways or busy roadways may result in adverse health effects beyond those typically found in urban areas. Several studies found an association between adverse non-cancer health effects (e.g., asthma) and living or attending school near heavily traveled urban roadways; however, these studies also found that the roadway and truck traffic densities were key factors affecting the strength of association with adverse health impacts. For urban roadways, the association of traffic-related emissions with adverse health impacts was generally strongest between 300 and 1,000 feet.

Proximity to freeways increases cancer risk and exposure to particulate matter. CARB reports that DPM represents about 70 percent of the potential cancer risk from vehicle travel on a typical urban freeway.[19] Table 14 presents a sample calculation of the contribution of each TAC to total cancer risk for a single freeway link. This calculation shows that cancer risk from Diesel exhaust particulate matter accounts for approximately 96% of the cancer risk on this link.

Table 14
Sample Calculation of Cancer Risk Due to DPM on I-15, Link 23477

	Cancer Risk, per ug/m^3	Emission Rate g/s	Cancer Risk	
			per µg/m^3 per g/s	Percent of Total
Acetaldehyde	3.77E-06	3.72E-03	1.40E-08	0.1%
Benzene	3.77E-05	2.92E-03	1.10E-07	1.0%
1,3-Butadiene	2.26E-04	1.09E-03	2.45E-07	2.3%
Formaldehyde	7.91E-06	3.59E-03	2.84E-08	0.3%
DPM	4.15E-04	2.48E-02	1.03E-05	96.3%
Total			1.07E-05	100%

Source: Cancer risk in units of per ug/m^3 from the HARP model, derived OEHHA method.

[19] Air Quality and Land Use Handbook, California Air Resources Board, April 2005. Available at *http://www.arb.ca.gov/ch/handbook.pdf*

As illustrated by the results presented in this report, the number and type of Diesel-fueled vehicles on a particular roadway segment are key in determining the potential cancer risks.

Consistent with the results summarized in Table 13, CARB reviewed studies that found measured air pollution concentrations from motor vehicles drop off dramatically between the source and 500 feet.[20] These studies were consistent with CARB air quality modeling and risk analyses performed for freeways. The estimated risk from DPM exposure was found to vary substantially due to meteorology: typical downwind areas had much higher risk than upwind areas. Freeways with low truck volumes had lower risks than those with higher truck volumes. CARB based its 500-foot buffer recommendation on a review of several studies and air dispersion modeling. CARB's modeling was based on year 2000 truck and automobile information that included higher DPM emissions rates. New vehicle standards, gasoline and Diesel fuel reformulation, and CARB-adopted Diesel Risk Reduction Measures have resulted in lower potential cancer risks near freeways. As shown by the reductions in cancer risk projected to occur between the 2012 baseline and the 2035 future scenarios, these risk reduction measures will continue to reduce toxic emissions from motor vehicles and resulting cancer risks.

Conclusions

Several conclusions can be drawn from this study, as outlined below.

- Incremental cancer risks from living or working near the freeway segments studied will decline dramatically between 2012 and 2035, primarily as a result of improvements in motor vehicle exhaust controls.

- Based on selected freeway corridors that were quantitatively modeled, the 2035 Preferred Plan, 2008 RTP Update, and Envision 2 alternatives exhibit lower projected residential and workplace cancer risks than the 2035 No Project alternative at five of the eight modeled freeway corridors (I-710, SR 60-LA, SR 60-SB, SR 91 and US 101).

- Among the remaining modeling locations (I-8, I-15, and I-405), risk estimated for any of the 2035 Plan alternatives (Preferred Plan, 2008 RTP Update, and Envision 2) is the same or higher, driven mainly by forecasted increases in heavy-duty truck volumes relative to the 2035 No Project alternative.

- Of the freeway corridors modeled, SR 91 in Riverside County, along the segment just east of its intersection with SR 71, exhibits the highest cancer risks based on residential exposure, ranging from 619 to 943 in a million for the 2035 alternatives considered.

[20] Ibid.

As seen from the modeled freeway segments, significant spatial variations occur in cancer risk values, both from one corridor to the next as well as with the distance from the freeway. It is beyond the scope of this assessment to quantitatively model cancer risk from on-road vehicle operation on every roadway encompassed in the 2012 RTP; however, the results from this study can be used to draw several conclusions across the entire SCAG planning domain.

As shown earlier in Table 14, cancer risk from DPM tends to overwhelm risk from several toxic organic species emitted from gasoline-powered vehicles. Therefore, even modest fractions of Diesel-powered vehicles on a given roadway can significantly increase the composite risk of the fleet. There are relatively small fractions of light- and medium-duty Diesel vehicles in today's fleet; over 95% of Diesel exhaust particulate emissions are emitted by heavy-duty vehicles.

Notwithstanding use of the arterial roadway system near points of freight origin and destination, most on-road heavy-duty truck travel occurs on freeways. Freeways also carry the largest volumes of total vehicle traffic. (Though not shown in the analysis, SCAG's travel model outputs show that the highest total vehicle and heavy-duty vehicle volumes on the arterial system are about three times lower than the highest respective volumes on freeways.) Assuming the impact of these volume differences on cancer risk is greater than differences resulting from receptor proximity and speed-dependent emission rates, the risk levels determined under this assessment (which focused exclusively on freeways) are higher than those occurring on the arterial roadway system.

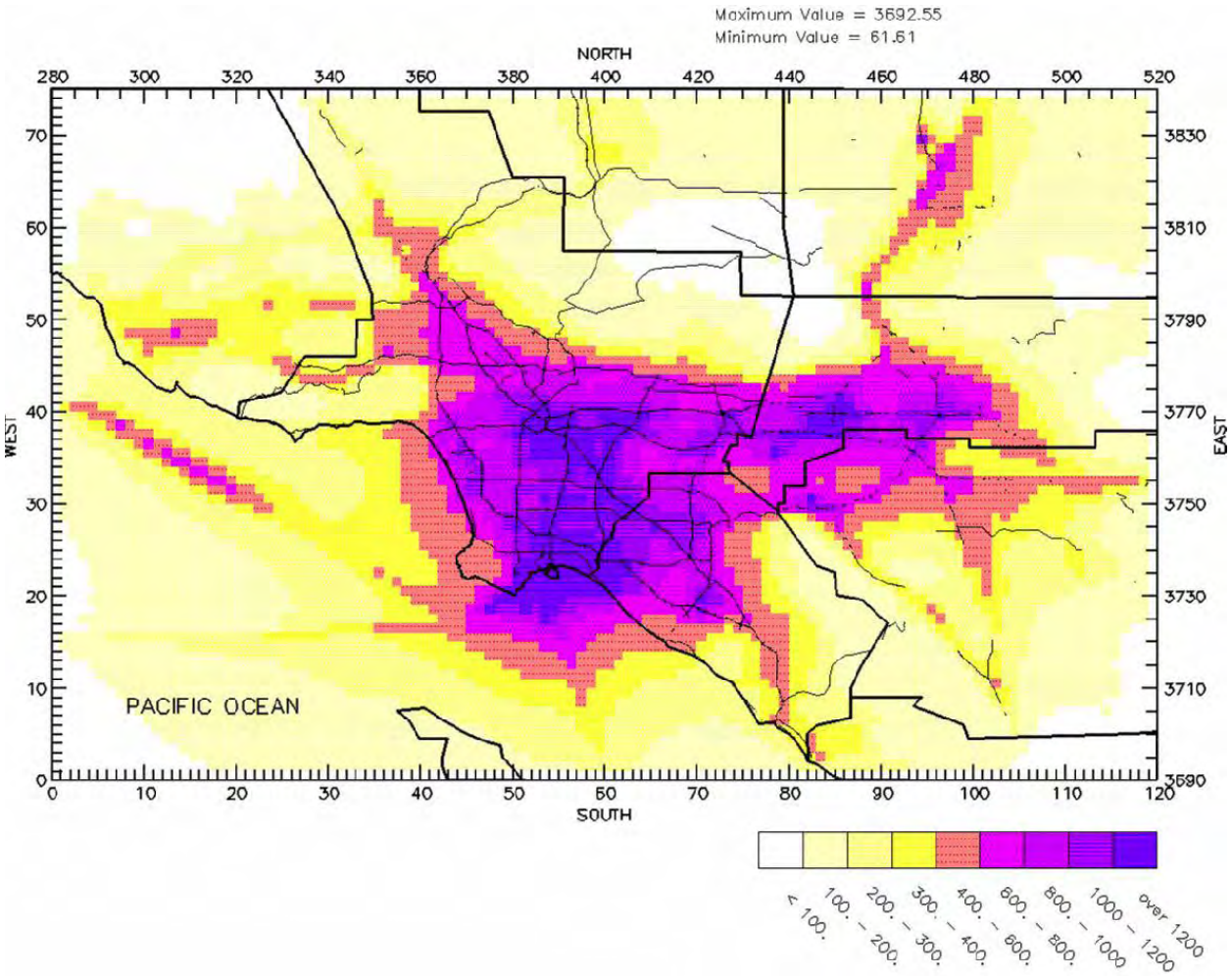
To the extent that the freeway corridors selected by SCAG for this assessment represent those in each county exhibiting the highest vehicle volumes and/or heavy-duty Diesel truck fractions and proximity to areas of long-term exposure (i.e., residences), the quantitative risk levels presented here are worst-case impacts for each county. For other freeways not directly modeled, increased cancer risks will vary from modeled levels primarily as a function of the heavy-duty vehicle fraction and the total vehicle volume on the roadway, and the distance to the roadway for which long-term exposures occur. Vehicle speed and time of day (atmospheric dispersion and mixing is more pronounced during daytime hours) variations also impact on-road vehicle-based cancer risk, but to a lesser extent. Other factors (e.g., the age distribution of the vehicle fleet) are also significant, but are typically not represented or available at the individual roadway level.

Finally, spatial variations in meteorology (primarily wind speeds and directional distributions) must also be considered when extrapolating the modeled results from the freeway corridors evaluated under this assessment to the entire planning region. Areas with generally lighter wind speeds and more pronounced directional orientation than those modeled under this analysis will, generally speaking, exhibit higher risks. (The opposite is true also.) Given the finite number of meteorological sites across the planning region for which detailed hourly measurements of a year or more exist, it is unknown how much the results of this analysis are affected by spatial variations in meteorology.

Published results from the SCAQMD's MATES-III Draft Study[17] provide the most robust picture of how total cancer risks vary across the planning region from all emission sources, not just on-road vehicles. Figure 2 below (re-printed from Figure ES-4 in the MATES-III study) presents a shaded density plot of total 70-year risk across the region in

calendar year 2005, based on a combination of ambient monitoring, emission inventory development, and toxic dispersion modeling analysis performed under MATES-III.

Figure 2
2005 MATES-III Model-Estimated Risk (per million)

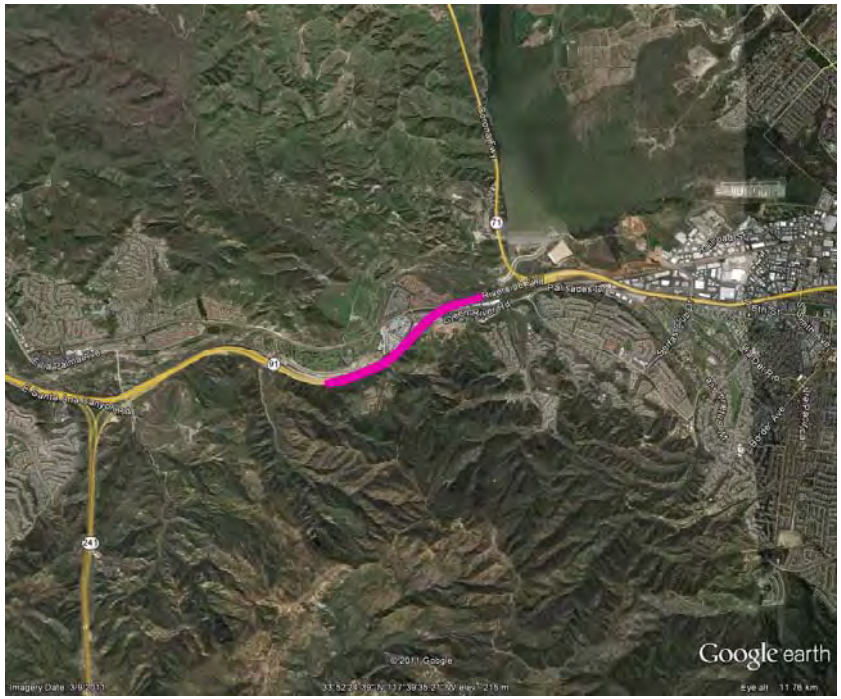


As shown in Figure 2, the highest modeled risk exists in southern Los Angeles County and the northwestern tip of Orange County. Other elevated areas included the eastern Basin near the communities of Colton, Inland Valley San Bernardino, and San Bernardino. Of note, the freeway corridors selected for modeling under the RTP risk assessment in these counties are located within the highest risk shaded areas (over 1,200 per million) in Figure 2. Thus with the exception of those in Ventura and Imperial Counties, the specific set of freeway corridors selected for analysis under the RTP risk assessment generally coincide with the higher cancer risk areas within the SCAG planning area identified under the MATES-III study.

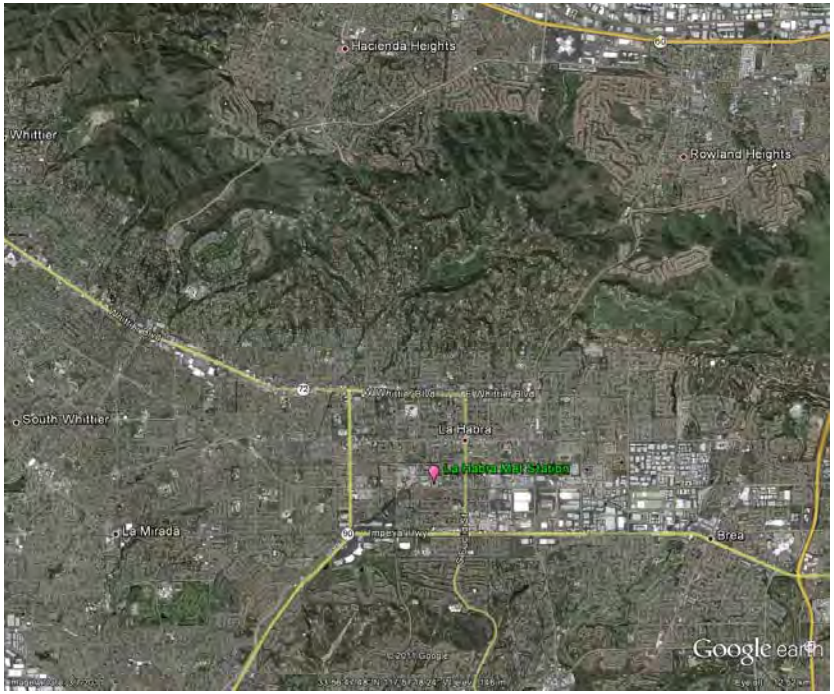
Appendix A

Detailed Link-Specific Traffic Data

Figure A-1
Terrain Surrounding SR 91 Freeway Segment and Representative Meteorological Monitoring Station



SR 91 Freeway Segment (Near Corona)



SCAQMD La Habra Meteorological Monitoring Station

Table A-1

2035 Preferred Alternative DPM Emission Factors by Vehicle Type and Modeling Link and Fleet Composite Source Strength

Freeway		Length	Light/Med. Duty		Heavy Duty		Fleet Composite			
Corridor	Link Type	(mi)	Daily Vol	EF (g/mi)	Daily Vol	EF (g/mi)	Daily Vol	All EF	VMT/day	Qs (lb/day)
I15	Mixed	0.845	99,838	3.45E-04	7,828	7.08E-02	107,666	5.47E-03	90,978	1.10
I15	Mixed	0.835	102,172	3.45E-04	8,465	7.08E-02	110,637	5.73E-03	92,394	1.17
I15	Mixed	0.334	106,920	3.45E-04	8,360	7.08E-02	115,280	5.45E-03	38,518	0.46
I15	Mixed	0.994	69,741	3.45E-04	7,178	7.08E-02	76,919	6.92E-03	76,499	1.17
I15	Mixed	0.366	109,739	3.45E-04	9,225	7.08E-02	118,964	5.81E-03	43,546	0.56
I15	Mixed	0.240	86,325	3.45E-04	10,115	7.08E-02	96,440	7.73E-03	23,149	0.39
I15	Mixed	0.671	68,774	3.45E-04	8,818	7.08E-02	77,592	8.35E-03	52,064	0.96
I15	Mixed	0.278	89,892	3.45E-04	12,958	7.08E-02	102,850	9.22E-03	28,592	0.58
I15	Mixed	0.170	70,259	3.45E-04	7,453	7.08E-02	77,712	7.10E-03	13,218	0.21
I15	Mixed	0.021	84,745	3.45E-04	22,220	7.08E-02	106,965	1.50E-02	2,247	0.07
I15	Mixed	0.581	74,040	3.45E-04	20,449	7.08E-02	94,489	1.56E-02	54,898	1.89
I15	Mixed	0.568	71,452	3.45E-04	14,875	7.08E-02	86,327	1.25E-02	49,034	1.35
I405	Mixed	1.088	169,473	3.45E-04	26,109	7.08E-02	195,582	9.75E-03	212,989	4.58
I405	Mixed	1.016	176,319	3.45E-04	24,456	7.08E-02	200,775	8.93E-03	204,109	4.02
I405	HOV	1.016	47,940	3.45E-04	-	7.08E-02	47,940	3.45E-04	48,768	0.04
I405	HOV	1.083	48,054	3.45E-04	-	7.08E-02	48,054	3.45E-04	52,042	0.04
I710	Mixed	0.328	120,673	3.45E-04	18,274	7.08E-02	138,947	9.61E-03	45,575	0.97
I710	Mixed	0.282	124,548	3.45E-04	18,497	7.08E-02	143,045	9.45E-03	40,339	0.84
I710	Mixed	0.393	126,682	3.45E-04	20,794	7.08E-02	147,476	1.03E-02	57,958	1.31
I710	Mixed	0.268	124,548	3.45E-04	18,497	7.08E-02	143,045	9.45E-03	38,336	0.80
I710	Mixed	0.442	130,257	3.45E-04	21,179	7.08E-02	151,436	1.02E-02	66,935	1.50
I710	Mixed	0.190	116,427	3.45E-04	17,764	7.08E-02	134,191	9.67E-03	25,496	0.54
I710	Mixed	0.515	120,557	3.45E-04	20,278	7.08E-02	140,835	1.05E-02	72,530	1.68
I710	Mixed	0.266	114,540	3.45E-04	17,583	7.08E-02	132,123	9.72E-03	35,145	0.75
I8	Mixed	0.455	22,432	0.00E+00	7,689	1.08E-01	30,121	2.75E-02	13,705	0.83
I8	Mixed	0.521	19,264	0.00E+00	7,049	1.08E-01	26,313	2.89E-02	13,709	0.87
I8	Mixed	0.474	21,310	0.00E+00	7,291	1.08E-01	28,601	2.75E-02	13,557	0.82
I8	Mixed	0.495	13,735	0.00E+00	7,054	1.08E-01	20,789	3.66E-02	10,291	0.83
I8	Mixed	0.527	15,664	0.00E+00	7,482	1.08E-01	23,146	3.48E-02	12,198	0.94
I8	Mixed	0.537	17,527	0.00E+00	6,638	1.08E-01	24,165	2.96E-02	12,977	0.85
SR60LA	Mixed	0.135	89,666	3.45E-04	10,529	7.08E-02	100,195	7.75E-03	13,526	0.23
SR60LA	Mixed	0.519	68,732	3.45E-04	8,570	7.08E-02	77,302	8.15E-03	40,134	0.72
SR60LA	Mixed	0.291	163,885	3.45E-04	15,689	7.08E-02	179,574	6.50E-03	52,257	0.75
SR60LA	Mixed	0.366	68,732	3.45E-04	8,570	7.08E-02	77,302	8.15E-03	28,303	0.51
SR60LA	Mixed	0.549	139,887	3.45E-04	14,904	7.08E-02	154,791	7.13E-03	84,981	1.34
SR60LA	Mixed	0.225	157,460	3.45E-04	14,311	7.08E-02	171,771	6.21E-03	38,655	0.53
SR60LA	Mixed	0.170	142,153	3.45E-04	13,765	7.08E-02	155,918	6.56E-03	26,506	0.38
SR60LA	Mixed	0.299	151,856	3.45E-04	15,223	7.08E-02	167,079	6.76E-03	49,957	0.74
SR60LA	Mixed	0.425	152,231	3.45E-04	14,177	7.08E-02	166,408	6.35E-03	70,724	0.99
SR60LA	Mixed	0.328	86,937	3.45E-04	13,001	7.08E-02	99,938	9.51E-03	32,780	0.69
SR60LA	Mixed	0.457	83,013	3.45E-04	12,876	7.08E-02	95,889	9.80E-03	43,821	0.95
SR60LA	Mixed	0.313	96,773	3.45E-04	11,791	7.08E-02	108,564	8.00E-03	33,981	0.60
SR60LA	Mixed	0.019	89,879	3.45E-04	13,094	7.08E-02	102,973	9.30E-03	1,957	0.04
SR60LA	Mixed	0.767	72,492	3.45E-04	10,075	7.08E-02	82,567	8.94E-03	63,330	1.25
SR60LA	Mixed	0.144	94,259	3.45E-04	11,643	7.08E-02	105,902	8.09E-03	15,250	0.27
SR60LA	Mixed	0.134	144,384	3.45E-04	14,081	7.08E-02	158,465	6.60E-03	21,238	0.31
SR60LA	Mixed	0.136	144,384	3.45E-04	14,081	7.08E-02	158,465	6.60E-03	21,555	0.31
SR60LA	Mixed	0.132	138,343	3.45E-04	13,765	7.08E-02	152,108	6.72E-03	20,082	0.30
SR60LA	Mixed	0.109	94,259	3.45E-04	10,638	7.08E-02	104,897	7.49E-03	11,434	0.19
SR60LA	Mixed	0.300	89,666	3.45E-04	11,722	7.08E-02	101,388	8.49E-03	30,416	0.57
SR60LA	Mixed	0.150	89,880	3.45E-04	12,170	7.08E-02	102,050	8.75E-03	15,308	0.30

Table A-1

2035 Preferred Alternative DPM Emission Factors by Vehicle Type and Modeling Link and Fleet Composite Source Strength

Freeway		Length	Light/Med. Duty		Heavy Duty		Fleet Composite			
Corridor	Link Type	(mi)	Daily Vol	EF (g/mi)	Daily Vol	EF (g/mi)	Daily Vol	All EF	VMT/day	Qs (lb/day)
SR60LA	Mixed	0.274	89,880	3.45E-04	13,489	7.08E-02	103,369	9.54E-03	28,324	0.60
SR60LA	HOV	0.686	10,213	3.45E-04	-	7.08E-02	10,213	3.45E-04	7,006	0.01
SR60LA	HOV	0.095	20,319	3.45E-04	-	7.08E-02	20,319	3.45E-04	1,930	0.00
SR60LA	HOV	0.253	17,606	3.45E-04	-	7.08E-02	17,606	3.45E-04	4,461	0.00
SR60LA	HOV	0.294	11,547	3.45E-04	-	7.08E-02	11,547	3.45E-04	3,395	0.00
SR60LA	HOV	0.170	17,606	3.45E-04	-	7.08E-02	17,606	3.45E-04	2,998	0.00
SR60LA	HOV	0.093	22,889	3.45E-04	-	7.08E-02	22,889	3.45E-04	2,129	0.00
SR60LA	HOV	1.233	11,547	3.45E-04	-	7.08E-02	11,547	3.45E-04	14,237	0.01
SR60LA	HOV	1.170	17,606	3.45E-04	-	7.08E-02	17,606	3.45E-04	20,632	0.02
SR60LA	HOV	0.671	9,576	3.45E-04	-	7.08E-02	9,576	3.45E-04	6,425	0.00
SR60LA	HOV	0.481	17,812	3.45E-04	-	7.08E-02	17,812	3.45E-04	8,568	0.01
SR60LA	HOV	0.020	21,417	3.45E-04	-	7.08E-02	21,417	3.45E-04	428	0.00
SR60LA	HOV	0.198	6,638	3.45E-04	-	7.08E-02	6,638	3.45E-04	1,314	0.00
SR60LA	HOV	0.347	11,176	3.45E-04	-	7.08E-02	11,176	3.45E-04	3,878	0.00
SR60LA	HOV	0.196	2,573	3.45E-04	-	7.08E-02	2,573	3.45E-04	504	0.00
SR60LA	HOV	0.150	370	3.45E-04	-	7.08E-02	370	3.45E-04	56	0.00
SR60LA	HOV	0.389	22,889	3.45E-04	-	7.08E-02	22,889	3.45E-04	8,905	0.01
SR60LA	HOV	0.094	11,547	3.45E-04	-	7.08E-02	11,547	3.45E-04	1,085	0.00
SR60LA	HOV	0.250	20,319	3.45E-04	-	7.08E-02	20,319	3.45E-04	5,080	0.00
SR60LA	HOV	0.148	1,098	3.45E-04	-	7.08E-02	1,098	3.45E-04	163	0.00
SR60SB	Truck	0.558	-	3.45E-04	11,779	7.08E-02	11,779	7.08E-02	6,573	1.03
SR60SB	Truck	0.039	-	3.45E-04	11,779	7.08E-02	11,779	7.08E-02	459	0.07
SR60SB	Truck	0.625	-	3.45E-04	11,042	7.08E-02	11,042	7.08E-02	6,901	1.08
SR60SB	Truck	0.421	-	3.45E-04	10,011	7.08E-02	10,011	7.08E-02	4,215	0.66
SR60SB	Truck	0.060	-	3.45E-04	1,029	7.08E-02	1,029	7.08E-02	62	0.01
SR60SB	Truck	0.039	-	3.45E-04	11,042	7.08E-02	11,042	7.08E-02	431	0.07
SR60SB	Truck	0.522	-	3.45E-04	11,042	7.08E-02	11,042	7.08E-02	5,764	0.90
SR60SB	Truck	0.555	-	3.45E-04	11,779	7.08E-02	11,779	7.08E-02	6,537	1.02
SR60SB	Truck	0.442	-	3.45E-04	11,413	7.08E-02	11,413	7.08E-02	5,045	0.79
SR60SB	Truck	0.045	-	3.45E-04	366	7.08E-02	366	7.08E-02	16	0.00
SR60SB	Truck	0.456	-	3.45E-04	10,940	7.08E-02	10,940	7.08E-02	4,989	0.78
SR60SB	Truck	0.042	-	3.45E-04	102	7.08E-02	102	7.08E-02	4	0.00
SR60SB	Truck	0.493	-	3.45E-04	11,445	7.08E-02	11,445	7.08E-02	5,642	0.88
SR60SB	Truck	0.049	-	3.45E-04	333	7.08E-02	333	7.08E-02	16	0.00
SR60SB	Mixed	0.195	113,097	3.45E-04	16,979	7.08E-02	130,076	9.54E-03	25,365	0.53
SR60SB	Mixed	0.713	100,842	3.45E-04	19,789	7.08E-02	120,631	1.19E-02	86,010	2.26
SR60SB	Mixed	0.695	104,264	3.45E-04	18,303	7.08E-02	122,567	1.09E-02	85,184	2.04
SR60SB	Mixed	0.051	107,303	3.45E-04	20,665	7.08E-02	127,968	1.17E-02	6,526	0.17
SR60SB	Mixed	0.289	108,363	3.45E-04	20,283	7.08E-02	128,646	1.15E-02	37,179	0.94
SR60SB	Mixed	0.028	116,327	3.45E-04	17,992	7.08E-02	134,319	9.78E-03	3,761	0.08
SR60SB	Mixed	0.562	98,657	3.45E-04	18,822	7.08E-02	117,479	1.16E-02	66,023	1.69
SR60SB	Mixed	0.397	112,095	3.45E-04	19,459	7.08E-02	131,554	1.08E-02	52,230	1.24
SR60SB	Mixed	0.386	101,917	3.45E-04	16,776	7.08E-02	118,693	1.03E-02	45,815	1.04
SR60SB	Mixed	0.229	109,913	3.45E-04	18,906	7.08E-02	128,819	1.07E-02	29,500	0.69
SR60SB	Mixed	0.327	101,792	3.45E-04	16,776	7.08E-02	118,568	1.03E-02	38,772	0.88
SR60SB	Mixed	0.314	107,303	3.45E-04	20,514	7.08E-02	127,817	1.17E-02	40,135	1.03
SR60SB	Mixed	0.081	109,912	3.45E-04	19,452	7.08E-02	129,364	1.09E-02	10,478	0.25
SR60SB	Mixed	0.276	116,327	3.45E-04	17,494	7.08E-02	133,821	9.55E-03	36,937	0.78
SR60SB	HOV	0.888	14,675	3.45E-04	-	7.08E-02	14,675	3.45E-04	13,031	0.01
SR60SB	HOV	0.289	10,941	3.45E-04	-	7.08E-02	10,941	3.45E-04	3,162	0.00
SR60SB	HOV	2.066	18,204	3.45E-04	-	7.08E-02	18,204	3.45E-04	37,609	0.03

Table A-1

2035 Preferred Alternative DPM Emission Factors by Vehicle Type and Modeling Link and Fleet Composite Source Strength

Freeway		Length	Light/Med. Duty		Heavy Duty		Fleet Composite			
Corridor	Link Type	(mi)	Daily Vol	EF (g/mi)	Daily Vol	EF (g/mi)	Daily Vol	All EF	VMT/day	Qs (lb/day)
SR60SB	HOV	0.637	14,799	3.45E-04	-	7.08E-02	14,799	3.45E-04	9,427	0.01
SR91	Mixed	0.461	146,273	3.45E-04	24,531	7.08E-02	170,804	1.05E-02	78,807	1.82
SR91	Mixed	0.438	145,428	3.45E-04	26,511	7.08E-02	171,939	1.12E-02	75,366	1.86
SR91	Mixed	0.555	143,070	3.45E-04	24,004	7.08E-02	167,074	1.05E-02	92,806	2.14
SR91	Mixed	0.553	145,429	3.45E-04	26,510	7.08E-02	171,939	1.12E-02	95,154	2.35
SR91	Mixed	0.733	155,009	3.45E-04	24,211	7.08E-02	179,220	9.86E-03	131,540	2.86
SR91	Mixed	0.761	161,798	3.45E-04	26,852	7.08E-02	188,650	1.04E-02	143,729	3.29
SR91	Mixed	0.021	55,656	3.45E-04	-	7.08E-02	55,656	3.45E-04	1,169	0.00
SR91	Mixed	0.293	157,162	3.45E-04	26,852	7.08E-02	184,014	1.06E-02	53,971	1.26
SR91	Mixed	0.271	57,962	3.45E-04	-	7.08E-02	57,962	3.45E-04	15,716	0.01
SR91	Mixed	0.020	57,962	3.45E-04	-	7.08E-02	57,962	3.45E-04	1,160	0.00
SR91	HOV	0.232	53,324	3.45E-04	-	7.08E-02	53,324	3.45E-04	12,371	0.01
SR91	HOV	0.519	52,612	3.45E-04	-	7.08E-02	52,612	3.45E-04	27,306	0.02
SR91	HOV	0.045	42,639	3.45E-04	-	7.08E-02	42,639	3.45E-04	1,919	0.00
SR91	HOV	0.046	10,685	3.45E-04	-	7.08E-02	10,685	3.45E-04	492	0.00
SR91	HOV	1.391	53,325	3.45E-04	-	7.08E-02	53,325	3.45E-04	74,175	0.06
SR91	HOV	0.046	41,146	3.45E-04	-	7.08E-02	41,146	3.45E-04	1,893	0.00
SR91	HOV	0.046	11,466	3.45E-04	-	7.08E-02	11,466	3.45E-04	527	0.00
SR91	HOV	0.235	52,612	3.45E-04	-	7.08E-02	52,612	3.45E-04	12,364	0.01
SR91	HOV	0.028	52,612	3.45E-04	-	7.08E-02	52,612	3.45E-04	1,473	0.00
SR91	HOV	0.037	52,612	3.45E-04	-	7.08E-02	52,612	3.45E-04	1,947	0.00
SR91	HOV	0.427	52,612	3.45E-04	-	7.08E-02	52,612	3.45E-04	22,465	0.02
SR91	HOV	0.085	53,325	3.45E-04	-	7.08E-02	53,325	3.45E-04	4,533	0.00
US101	Mixed	0.528	94,011	0.00E+00	11,544	4.60E-02	105,555	5.03E-03	55,746	0.62
US101	Mixed	0.190	90,645	0.00E+00	11,860	4.60E-02	102,505	5.32E-03	19,489	0.23
US101	Mixed	0.257	73,972	0.00E+00	11,151	4.60E-02	85,123	6.03E-03	21,878	0.29
US101	Mixed	0.372	70,383	0.00E+00	11,469	4.60E-02	81,852	6.45E-03	30,474	0.43
US101	Mixed	0.380	90,645	0.00E+00	11,860	4.60E-02	102,505	5.32E-03	38,978	0.46

Table A-2
2035 Preferred Alternative Toxic Pollutant Daily Source Strengths by Modeling Link

Freeway Corridor	Link Type	Daily Average Source Strength (lb/day)				
		Benzene	Formaldehyde	Acetaldehyde	1,3-Butadiene	DPM
I15	Mixed	1.98E-01	2.28E-01	2.33E-01	7.53E-02	1.10
I15	Mixed	2.01E-01	2.31E-01	2.36E-01	7.62E-02	1.17
I15	Mixed	8.39E-02	9.67E-02	9.88E-02	3.19E-02	0.46
I15	Mixed	1.66E-01	1.89E-01	1.93E-01	6.21E-02	1.17
I15	Mixed	9.47E-02	1.09E-01	1.11E-01	3.59E-02	0.56
I15	Mixed	4.99E-02	5.67E-02	5.80E-02	1.86E-02	0.39
I15	Mixed	1.12E-01	1.27E-01	1.29E-01	4.14E-02	0.96
I15	Mixed	6.13E-02	6.88E-02	7.04E-02	2.25E-02	0.58
I15	Mixed	2.86E-02	3.26E-02	3.33E-02	1.07E-02	0.21
I15	Mixed	4.69E-03	5.06E-03	5.19E-03	1.62E-03	0.07
I15	Mixed	1.14E-01	1.23E-01	1.26E-01	3.92E-02	1.89
I15	Mixed	1.04E-01	1.14E-01	1.17E-01	3.67E-02	1.35
I405	Mixed	4.55E-01	5.10E-01	5.22E-01	1.66E-01	4.58
I405	Mixed	4.38E-01	4.93E-01	5.04E-01	1.61E-01	4.02
I405	HOV	1.08E-01	1.29E-01	1.32E-01	4.32E-02	0.04
I405	HOV	1.16E-01	1.38E-01	1.41E-01	4.61E-02	0.04
I710	Mixed	9.75E-02	1.09E-01	1.12E-01	3.56E-02	0.97
I710	Mixed	8.63E-02	9.68E-02	9.91E-02	3.16E-02	0.84
I710	Mixed	1.24E-01	1.38E-01	1.41E-01	4.49E-02	1.31
I710	Mixed	8.20E-02	9.20E-02	9.42E-02	3.00E-02	0.80
I710	Mixed	1.43E-01	1.59E-01	1.63E-01	5.19E-02	1.50
I710	Mixed	5.45E-02	6.11E-02	6.25E-02	1.99E-02	0.54
I710	Mixed	1.55E-01	1.72E-01	1.76E-01	5.60E-02	1.68
I710	Mixed	7.51E-02	8.41E-02	8.61E-02	2.74E-02	0.75
I8	Mixed	5.36E-02	7.06E-02	7.62E-02	2.07E-02	0.83
I8	Mixed	5.28E-02	6.95E-02	7.50E-02	2.03E-02	0.87
I8	Mixed	5.30E-02	6.99E-02	7.54E-02	2.04E-02	0.82
I8	Mixed	3.64E-02	4.73E-02	5.10E-02	1.38E-02	0.83
I8	Mixed	4.40E-02	5.74E-02	6.19E-02	1.67E-02	0.94
I8	Mixed	4.96E-02	6.52E-02	7.03E-02	1.91E-02	0.85
SR60LA	Mixed	2.92E-02	3.31E-02	3.39E-02	1.09E-02	0.23
SR60LA	Mixed	8.64E-02	9.78E-02	1.00E-01	3.20E-02	0.72
SR60LA	Mixed	1.13E-01	1.30E-01	1.33E-01	4.27E-02	0.75
SR60LA	Mixed	6.09E-02	6.89E-02	7.05E-02	2.26E-02	0.51
SR60LA	Mixed	1.84E-01	2.09E-01	2.14E-01	6.88E-02	1.34
SR60LA	Mixed	8.39E-02	9.62E-02	9.84E-02	3.17E-02	0.53
SR60LA	Mixed	5.74E-02	6.57E-02	6.72E-02	2.16E-02	0.38
SR60LA	Mixed	1.08E-01	1.24E-01	1.26E-01	4.06E-02	0.74
SR60LA	Mixed	1.53E-01	1.76E-01	1.80E-01	5.79E-02	0.99
SR60LA	Mixed	7.01E-02	7.86E-02	8.05E-02	2.57E-02	0.69
SR60LA	Mixed	9.36E-02	1.05E-01	1.07E-01	3.42E-02	0.95
SR60LA	Mixed	7.32E-02	8.29E-02	8.48E-02	2.72E-02	0.60
SR60LA	Mixed	4.19E-03	4.70E-03	4.82E-03	1.54E-03	0.04
SR60LA	Mixed	1.36E-01	1.53E-01	1.57E-01	5.00E-02	1.25

Table A-2
2035 Preferred Alternative Toxic Pollutant Daily Source Strengths by Modeling Link

Freeway Corridor	Link Type	Daily Average Source Strength (lb/day)				
		Benzene	Formaldehyde	Acetaldehyde	1,3-Butadiene	DPM
SR60LA	Mixed	3.28E-02	3.72E-02	3.80E-02	1.22E-02	0.27
SR60LA	Mixed	4.60E-02	5.26E-02	5.38E-02	1.73E-02	0.31
SR60LA	Mixed	4.67E-02	5.34E-02	5.46E-02	1.76E-02	0.31
SR60LA	Mixed	4.35E-02	4.97E-02	5.08E-02	1.63E-02	0.30
SR60LA	Mixed	2.47E-02	2.81E-02	2.87E-02	9.21E-03	0.19
SR60LA	Mixed	6.54E-02	7.38E-02	7.55E-02	2.42E-02	0.57
SR60LA	Mixed	3.29E-02	3.70E-02	3.79E-02	1.21E-02	0.30
SR60LA	Mixed	6.06E-02	6.79E-02	6.95E-02	2.22E-02	0.60
SR60LA	HOV	1.56E-02	1.86E-02	1.89E-02	6.20E-03	0.01
SR60LA	HOV	4.29E-03	5.11E-03	5.22E-03	1.71E-03	0.00
SR60LA	HOV	9.92E-03	1.18E-02	1.21E-02	3.95E-03	0.00
SR60LA	HOV	7.55E-03	8.99E-03	9.17E-03	3.01E-03	0.00
SR60LA	HOV	6.67E-03	7.94E-03	8.10E-03	2.65E-03	0.00
SR60LA	HOV	4.74E-03	5.64E-03	5.75E-03	1.89E-03	0.00
SR60LA	HOV	3.17E-02	3.77E-02	3.85E-02	1.26E-02	0.01
SR60LA	HOV	4.59E-02	5.47E-02	5.57E-02	1.83E-02	0.02
SR60LA	HOV	1.43E-02	1.70E-02	1.74E-02	5.69E-03	0.00
SR60LA	HOV	1.91E-02	2.27E-02	2.32E-02	7.59E-03	0.01
SR60LA	HOV	9.53E-04	1.13E-03	1.16E-03	3.79E-04	0.00
SR60LA	HOV	2.92E-03	3.48E-03	3.55E-03	1.16E-03	0.00
SR60LA	HOV	8.63E-03	1.03E-02	1.05E-02	3.43E-03	0.00
SR60LA	HOV	1.12E-03	1.34E-03	1.36E-03	4.47E-04	0.00
SR60LA	HOV	1.23E-04	1.47E-04	1.50E-04	4.91E-05	0.00
SR60LA	HOV	1.98E-02	2.36E-02	2.41E-02	7.88E-03	0.01
SR60LA	HOV	2.41E-03	2.88E-03	2.93E-03	9.61E-04	0.00
SR60LA	HOV	1.13E-02	1.35E-02	1.37E-02	4.50E-03	0.00
SR60LA	HOV	3.61E-04	4.31E-04	4.39E-04	1.44E-04	0.00
SR60SB	Truck	1.03E-02	4.77E-03	5.32E-03	6.27E-04	1.03
SR60SB	Truck	7.22E-04	3.33E-04	3.72E-04	4.38E-05	0.07
SR60SB	Truck	1.08E-02	5.01E-03	5.59E-03	6.58E-04	1.08
SR60SB	Truck	6.63E-03	3.06E-03	3.41E-03	4.02E-04	0.66
SR60SB	Truck	9.71E-05	4.48E-05	5.00E-05	5.89E-06	0.01
SR60SB	Truck	6.77E-04	3.12E-04	3.49E-04	4.11E-05	0.07
SR60SB	Truck	9.06E-03	4.18E-03	4.67E-03	5.49E-04	0.90
SR60SB	Truck	1.03E-02	4.74E-03	5.29E-03	6.23E-04	1.02
SR60SB	Truck	7.93E-03	3.66E-03	4.09E-03	4.81E-04	0.79
SR60SB	Truck	2.59E-05	1.19E-05	1.33E-05	1.57E-06	0.00
SR60SB	Truck	7.84E-03	3.62E-03	4.04E-03	4.76E-04	0.78
SR60SB	Truck	6.73E-06	3.11E-06	3.47E-06	4.08E-07	0.00
SR60SB	Truck	8.87E-03	4.09E-03	4.57E-03	5.38E-04	0.88
SR60SB	Truck	2.57E-05	1.18E-05	1.32E-05	1.56E-06	0.00
SR60SB	Mixed	5.43E-02	6.08E-02	6.23E-02	1.98E-02	0.53
SR60SB	Mixed	1.82E-01	2.01E-01	2.06E-01	6.50E-02	2.26
SR60SB	Mixed	1.81E-01	2.01E-01	2.06E-01	6.54E-02	2.04

Table A-2
2035 Preferred Alternative Toxic Pollutant Daily Source Strengths by Modeling Link

Freeway Corridor	Link Type	Daily Average Source Strength (lb/day)				
		Benzene	Formaldehyde	Acetaldehyde	1,3-Butadiene	DPM
SR60SB	Mixed	1.38E-02	1.53E-02	1.56E-02	4.95E-03	0.17
SR60SB	Mixed	7.89E-02	8.72E-02	8.94E-02	2.83E-02	0.94
SR60SB	Mixed	8.04E-03	9.00E-03	9.21E-03	2.93E-03	0.08
SR60SB	Mixed	1.40E-01	1.55E-01	1.58E-01	5.01E-02	1.69
SR60SB	Mixed	1.11E-01	1.24E-01	1.27E-01	4.01E-02	1.24
SR60SB	Mixed	9.77E-02	1.09E-01	1.12E-01	3.55E-02	1.04
SR60SB	Mixed	6.28E-02	6.98E-02	7.15E-02	2.27E-02	0.69
SR60SB	Mixed	8.27E-02	9.22E-02	9.44E-02	3.00E-02	0.88
SR60SB	Mixed	8.51E-02	9.39E-02	9.63E-02	3.04E-02	1.03
SR60SB	Mixed	2.23E-02	2.47E-02	2.53E-02	8.03E-03	0.25
SR60SB	Mixed	7.90E-02	8.86E-02	9.07E-02	2.89E-02	0.78
SR60SB	HOV	2.90E-02	3.45E-02	3.52E-02	1.15E-02	0.01
SR60SB	HOV	7.03E-03	8.38E-03	8.54E-03	2.80E-03	0.00
SR60SB	HOV	8.37E-02	9.96E-02	1.02E-01	3.33E-02	0.03
SR60SB	HOV	2.10E-02	2.50E-02	2.55E-02	8.35E-03	0.01
SR91	Mixed	1.68E-01	1.87E-01	1.92E-01	6.08E-02	1.82
SR91	Mixed	1.60E-01	1.77E-01	1.82E-01	5.76E-02	1.86
SR91	Mixed	1.98E-01	2.20E-01	2.26E-01	7.16E-02	2.14
SR91	Mixed	2.02E-01	2.24E-01	2.29E-01	7.27E-02	2.35
SR91	Mixed	2.81E-01	3.14E-01	3.22E-01	1.02E-01	2.86
SR91	Mixed	3.06E-01	3.41E-01	3.50E-01	1.11E-01	3.29
SR91	Mixed	2.58E-03	3.10E-03	3.16E-03	1.03E-03	0.00
SR91	Mixed	1.15E-01	1.28E-01	1.31E-01	4.16E-02	1.26
SR91	Mixed	3.50E-02	3.07E-03	4.25E-02	1.39E-02	0.01
SR91	Mixed	2.58E-03	5.08E-03	3.13E-03	1.03E-03	0.00
SR91	HOV	2.75E-02	3.28E-02	3.34E-02	1.10E-02	0.01
SR91	HOV	6.07E-02	7.23E-02	7.38E-02	2.42E-02	0.02
SR91	HOV	4.27E-03	4.16E-02	5.18E-03	1.70E-03	0.00
SR91	HOV	1.09E-03	1.30E-03	1.33E-03	4.35E-04	0.00
SR91	HOV	1.65E-01	1.97E-01	2.00E-01	6.57E-02	0.06
SR91	HOV	4.21E-03	5.01E-03	5.11E-03	1.68E-03	0.00
SR91	HOV	1.17E-03	1.40E-03	1.43E-03	4.67E-04	0.00
SR91	HOV	2.75E-02	3.28E-02	3.34E-02	1.09E-02	0.01
SR91	HOV	3.28E-03	3.90E-03	3.98E-03	1.30E-03	0.00
SR91	HOV	4.33E-03	5.16E-03	5.26E-03	1.72E-03	0.00
SR91	HOV	5.00E-02	5.95E-02	6.07E-02	1.99E-02	0.02
SR91	HOV	1.01E-02	1.20E-02	1.22E-02	4.01E-03	0.00
US101	Mixed	1.23E-01	1.25E-01	1.27E-01	4.20E-02	0.62
US101	Mixed	4.30E-02	4.36E-02	4.41E-02	1.46E-02	0.23
US101	Mixed	4.81E-02	4.83E-02	4.89E-02	1.61E-02	0.29
US101	Mixed	6.69E-02	6.68E-02	6.77E-02	2.23E-02	0.43
US101	Mixed	8.59E-02	8.72E-02	8.82E-02	2.92E-02	0.46

Table A-3
Daily Vehicle Volumes by Analysis Scenario and Modeling Link

Freeway Corridor	Link Type	Daily Total Vehicle Volumes (vehicles/day)				
		2012 Existing	2035 No Project	2035 Preferred	2035 with 2008 RTP	2035 Envision 2
I15	Mixed	97,886	121,178	107,666	124,019	94,313
I15	Mixed	100,980	128,127	110,651	122,239	94,899
I15	Mixed	104,462	128,907	115,322	134,001	100,618
I15	Mixed	66,692	89,923	76,961	84,574	68,956
I15	Mixed	107,339	137,335	118,978	130,729	101,076
I15	Mixed	86,035	113,993	96,454	105,332	84,713
I15	Mixed	66,185	91,994	77,592	85,385	68,020
I15	Mixed	96,032	126,351	102,850	110,531	90,138
I15	Mixed	66,808	91,277	77,754	85,450	69,428
I15	Mixed	97,430	132,193	107,007	121,134	97,894
I15	Mixed	85,535	119,215	94,489	108,709	88,047
I15	Mixed	87,584	118,873	86,327	103,319	77,067
I405	Mixed	195,812	216,820	195,762	216,054	208,097
I405	Mixed	191,244	212,460	200,895	212,283	219,346
I405	HOV	29,162	33,779	48,000	32,758	51,783
I405	HOV	31,244	30,091	48,054	23,278	55,650
I710	Mixed	144,129	141,984	138,947	150,871	152,096
I710	Mixed	148,021	145,766	143,045	155,317	157,107
I710	Mixed	147,601	145,054	147,476	159,183	159,696
I710	Mixed	148,035	145,766	143,045	155,331	157,110
I710	Mixed	152,616	148,917	151,436	164,214	164,486
I710	Mixed	138,263	136,219	134,191	145,262	146,639
I710	Mixed	141,189	137,552	140,835	152,661	152,512
I710	Mixed	135,951	134,151	132,123	142,779	143,863
I8	Mixed	19,225	31,563	30,121	31,640	26,445
I8	Mixed	16,793	27,780	26,313	27,977	24,096
I8	Mixed	20,825	31,198	28,601	29,844	25,194
I8	Mixed	13,845	21,979	20,789	21,451	18,014
I8	Mixed	13,406	23,973	23,146	24,145	20,384
I8	Mixed	17,538	26,857	24,165	25,565	22,120
SR60LA	Mixed	88,825	107,403	100,195	105,119	95,131
SR60LA	Mixed	64,393	79,929	77,330	80,097	76,342
SR60LA	Mixed	179,505	197,255	179,576	190,976	179,452
SR60LA	Mixed	64,393	79,929	77,330	80,097	76,342
SR60LA	Mixed	155,098	169,959	154,793	165,431	154,518
SR60LA	Mixed	154,953	181,476	171,799	181,248	171,034
SR60LA	Mixed	146,500	162,815	155,920	162,047	155,004
SR60LA	Mixed	167,060	183,340	167,081	178,255	165,959
SR60LA	Mixed	159,199	173,965	166,410	175,654	165,354
SR60LA	Mixed	93,538	109,126	99,940	103,818	95,865
SR60LA	Mixed	89,411	105,880	95,889	99,979	90,251
SR60LA	Mixed	95,083	112,241	108,566	111,910	104,069

Table A-3
Daily Vehicle Volumes by Analysis Scenario and Modeling Link

Freeway Corridor	Link Type	Daily Total Vehicle Volumes (vehicles/day)				
		2012 Existing	2035 No Project	2035 Preferred	2035 with 2008 RTP	2035 Envision 2
SR60LA	Mixed	99,042	114,167	102,975	108,065	97,282
SR60LA	Mixed	75,275	83,243	82,569	86,033	82,295
SR60LA	Mixed	95,884	114,971	105,902	110,338	100,562
SR60LA	Mixed	154,953	168,011	158,493	167,281	157,199
SR60LA	Mixed	154,953	168,011	158,493	167,282	157,197
SR60LA	Mixed	140,539	159,223	152,136	158,447	150,340
SR60LA	Mixed			104,897		99,409
SR60LA	Mixed			101,388		95,797
SR60LA	Mixed			102,052		96,902
SR60LA	Mixed			103,371		98,567
SR60LA	HOV	13,447	13,184	10,213	15,647	9,291
SR60LA	HOV	38,172	34,871	20,321	29,659	20,337
SR60LA	HOV	32,210	31,281	17,634	28,040	16,657
SR60LA	HOV	18,462	22,768	11,547	17,233	9,002
SR60LA	HOV	32,210	31,281	17,634	28,040	16,657
SR60LA	HOV	38,172	34,871	22,891	33,198	23,425
SR60LA	HOV	18,462	22,768	11,547	17,233	9,002
SR60LA	HOV	32,210	31,281	17,634	28,040	16,658
SR60LA	HOV	18,575	14,140	9,576	14,945	9,337
SR60LA	HOV	18,462	22,768	17,812	25,556	15,879
SR60LA	HOV	38,172	34,871	21,419	31,642	21,323
SR60LA	HOV	18,462		6,638	8,909	7,204
SR60LA	HOV	38,172		11,176	16,646	8,675
SR60LA	HOV	18,462		2,573	3,539	3,086
SR60LA	HOV	38,172		370	588	327
SR60LA	HOV			22,891	33,198	23,425
SR60LA	HOV			11,547	17,233	9,002
SR60LA	HOV			20,321	29,659	20,337
SR60LA	HOV			1,098	1,984	984
SR60SB	Truck			11,779		9,485
SR60SB	Truck			11,779		9,485
SR60SB	Truck			11,042		8,411
SR60SB	Truck			10,011		8,110
SR60SB	Truck			1,029		300
SR60SB	Truck			11,042		8,411
SR60SB	Truck			11,042		8,411
SR60SB	Truck			11,779		9,485
SR60SB	Truck			11,413		9,396
SR60SB	Truck			366		89
SR60SB	Truck			10,940		8,290
SR60SB	Truck			102		121
SR60SB	Truck			11,445		8,728
SR60SB	Truck			333		757

Table A-3
Daily Vehicle Volumes by Analysis Scenario and Modeling Link

Freeway Corridor	Link Type	Daily Total Vehicle Volumes (vehicles/day)				
		2012 Existing	2035 No Project	2035 Preferred	2035 with 2008 RTP	2035 Envision 2
SR60SB	Mixed	110,678	138,525	130,076	136,823	117,494
SR60SB	Mixed	106,763	123,771	120,631	126,292	110,385
SR60SB	Mixed	107,229	130,865	122,567	128,839	112,045
SR60SB	Mixed	113,630	130,828	127,968	135,240	113,801
SR60SB	Mixed	110,644	129,165	128,646	135,282	114,809
SR60SB	Mixed	113,149	142,192	134,326	141,626	120,199
SR60SB	Mixed	104,605	123,261	117,479	124,157	105,442
SR60SB	Mixed	113,824	134,044	131,561	139,488	116,769
SR60SB	Mixed	104,806	130,148	118,693	126,172	106,292
SR60SB	Mixed	113,798	137,703	128,819	137,674	114,451
SR60SB	Mixed	104,707	129,987	118,568	125,996	106,213
SR60SB	Mixed			127,817		113,622
SR60SB	Mixed			129,364		114,583
SR60SB	Mixed			133,828		119,069
SR60SB	HOV	28,945	29,267	14,675	23,360	13,529
SR60SB	HOV	16,231	18,504	10,941	13,542	8,059
SR60SB	HOV	25,076	31,122	18,204	25,660	14,621
SR60SB	HOV	29,044	29,428	14,799	23,538	13,608
SR91	Mixed	140,086	177,139	170,948	167,021	159,889
SR91	Mixed	144,870	172,600	172,068	174,681	159,326
SR91	Mixed	136,661	167,542	167,218	162,484	157,105
SR91	Mixed	143,843	168,597	172,068	174,681	159,325
SR91	Mixed	141,203	186,609	179,454	175,044	168,338
SR91	Mixed	153,018	189,013	188,869	192,898	176,144
SR91	Mixed	11,654	26,203	55,656	34,282	53,193
SR91	Mixed	180,539	199,514	184,203	205,186	173,983
SR91	Mixed	11,877	17,767	57,992	33,534	54,272
SR91	Mixed	11,877	17,767	57,992	33,534	54,270
SR91	HOV	45,808	40,150	53,324	45,821	52,115
SR91	HOV	39,398	28,270	52,612	54,324	49,970
SR91	HOV	38,117	38,002	42,639	23,740	42,076
SR91	HOV	39,399		10,685	22,082	10,039
SR91	HOV	39,398		53,325	45,822	52,115
SR91	HOV	45,808		41,146	36,442	38,877
SR91	HOV	45,808		11,466	17,882	11,093
SR91	HOV	38,117		52,612	54,324	49,970
SR91	HOV	45,808		52,612	54,324	49,970
SR91	HOV	39,399		52,612	54,324	49,970
SR91	HOV			52,612	54,324	49,970
SR91	HOV			53,325	45,822	52,115

Table A-3
Daily Vehicle Volumes by Analysis Scenario and Modeling Link

Freeway Corridor	Link Type	Daily Total Vehicle Volumes (vehicles/day)				
		2012 Existing	2035 No Project	2035 Preferred	2035 with 2008 RTP	2035 Envision 2
US101	Mixed	107,942	118,325	105,580	112,871	106,583
US101	Mixed	106,766	117,190	102,573	110,214	102,748
US101	Mixed	84,932	92,172	85,127	89,642	87,747
US101	Mixed	83,460	90,514	81,920	86,697	83,345
US101	Mixed	106,766	117,190	102,573	110,215	102,748