Appendix B

Air Quality

Screening Risk Assessment of Sample Selected Projects Included in the Southern California Association of Governments' Draft 2008 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 Draft 2008 Regional Transportation Plan (RTP), Sierra Research conducted an exploratory probe of changes in cancer risk impacts[1] designed to help facilitate SCAG's regional analysis. In this study, we evaluated emissions and cancer risk impacts from six operating freeway segments, one located in each of the counties in SCAG's planning jurisdiction. Impacts were determined for the five RTP planning scenarios listed below:

1. 2008 Existing Conditions;
2. 2035 Baseline ;
3. 2035 Preferred Plan;
4. 2035 With 2004 Modified RTP; and
5. 2035 Envision.

Because current emission forecasting models do not assume any improvement in motor vehicle emission control beyond 2018, 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, but that impacts at maximum exposed residences will remain in excess of minimum accepted risk levels (i.e., 1-in-one million increased lifetime cancer risk).

Introduction

The draft 2008 Regional Transportation Plan (RTP) developed by the Southern California Association of Governments (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

[1] Only cancer risks were quantitatively analyzed under this analysis. Other potential health risks were not considered.

freeways are sources of carcinogenic pollutants. To assist SCAG in evaluating the environmental impacts of the Draft RTP, Sierra Research conducted an exploratory assessment designed to help facilitate SCAG's regional analysis of changes in cancer risk impacts in areas near projects included in the 2008 RTP. Because the forecasting of toxic pollutant emission rates in 2035 is speculative in that improvements in emission control will occur by this planning year but the magnitude of these improvements cannot be accurately predicted, the results presented in this analysis contain significant uncertainties and are intended to be conservatively high.

Selected Freeway Corridor Sample

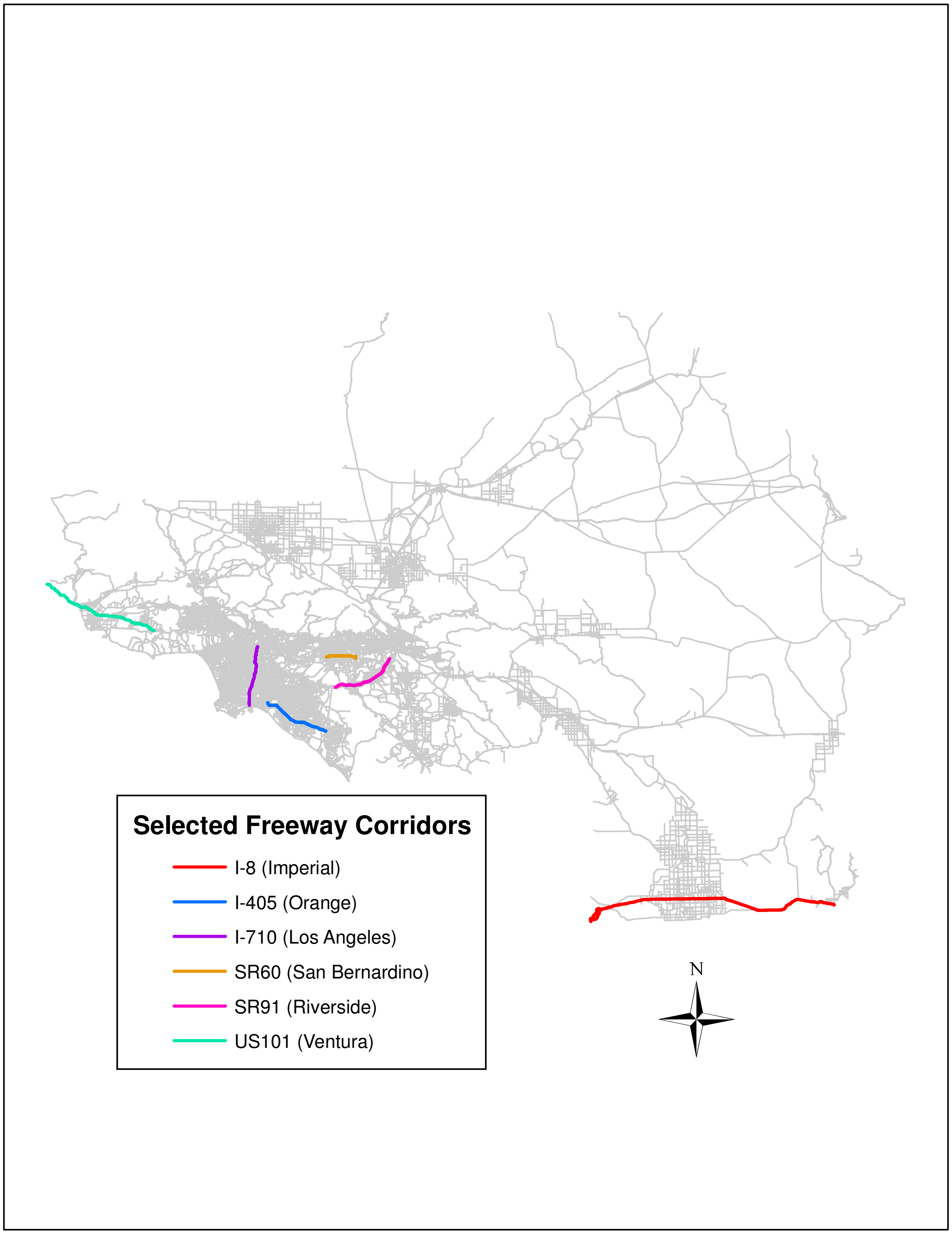
Selected Corridors – Because of time constraints, the analysis of cancer risks was limited to a sample of freeway corridors selected by SCAG staff for which operational traffic levels will vary under alternative planning scenarios in the RTP. One freeway corridor was selected for each of the six counties contained in the SCAG planning area. The following freeway corridors were selected by SCAG for analysis of operational emissions under different RTP alternatives:

- 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); and
- US 101 in Ventura County (Caltrans District 7).

Figure 1 shows the location of each selected freeway corridor within the SCAG planning domain. These selected freeways generally represent major transportation corridors in each county and specifically include roadways with the high total traffic (I-405) and 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 (which extend over 90 miles) was impractical and beyond the scope of the assessment. To focus on the "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 Baseline scenario were used to identify the "highest volume" segments along each selected corridor for all scenarios.

Figure 1
Location of Selected Freeway Corridors



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 – in 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); and
- US 101 – in Thousand Oaks, east of SR 23 (Ventura County).

Emission Analysis

Diesel- and gasoline-powered vehicle emissions contain many compounds that have been determined to be carcinogenic. Only a few compounds, however, are highly toxic and emitted in sufficient quantities to contribute to significant cumulative cancer risks in areas immediately downwind of roadway segments affected by the 2008 RTP.[2] Foremost among these compounds is Diesel exhaust particulate matter smaller than 10 microns in diameter (PM_{10}), which is used in cancer risk assessments as a surrogate for all of the carcinogenic constituents in Diesel exhaust emissions. For gasoline-powered vehicles, the compounds that significantly contribute to cancer risk are as follows:

- Benzene;
- 1,3 butadiene;
- 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 emissions (TOG) were generated through use of the CARB EMFAC2007 model. A special toxics module[3] of EPA's MOBILE6 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. These fractions were applied to the EMFAC2007 TOG estimates to quantify gasoline-based toxic emissions for each individual compound.

These models are limited in forecasting vehicle emission factors into the future because regulations mandating future emissions reductions do not call for any new restrictions

[2] "An Air Toxics Control Plan for the Next Ten Years, Final Draft," South Coast Air Quality Management District, March 2000, *http://www.aqmd.gov/aqmp/atcp.html*.
[3] "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.

beyond 2018[4]; therefore, the actual emissions generated by vehicle use in 2035 will probably be significantly less than the conservative values used in this analysis.

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 in both calendar years 2008 and 2035:

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

The model was configured to report annual 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 the appropriate vehicle/fuel categories). 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 (starting and initial idling emissions were ignored since they do not occur on freeways). Furthermore, evaporative emissions that occur while a vehicle is parked with its engine off (hot soak, diurnal breathing and resting losses) were also excluded in representing freeway-specific emission factors. (Evaporative running losses that occur while the engine is on were included in the analysis.)

SCAG's travel demand modeling system now produces separate estimates of roadway link volumes from 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 emanate from 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 1 shows the resulting LHD, HD and fleet composite daily average DPM emission factors (in grams/mile) calculated for the modeling links at the highest volume segments of each selected freeway corridor for the 2035 Baseline analysis scenario. As noted in the second column in Table 1, the links of these selected freeway corridor segments include both mixed-use and HOV lanes for certain corridors. As shown in the rightmost (shaded) column, the resulting fleet composite DPM emission factor (weighted by the volumes and emission factors of the LMD and HD sub-fleets) varies by roughly a factor of two across the mixed use lanes of the selected corridor sections.

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

Table 1 2035 Baseline DPM Emission Factors by Vehicle Type and Modeling Link							
Freeway Corridor	Link Type	Light/Med-Duty (LMD)		Heavy-Duty (HD)		Fleet Composite	
		Daily Vol	EF (g/mi)	Daily Vol	EF (g/mi)	Daily Vol	**EF (g/mi)**
I405	Mixed	188,542	3.80E-04	21,238	7.80E-02	209,780	**8.24E-03**
I405	Mixed	178,097	3.80E-04	20,859	7.80E-02	198,956	**8.52E-03**
I405	HOV	54,600	3.80E-04	0	7.80E-02	54,600	**3.80E-04**
I405	HOV	48,559	3.80E-04	0	7.80E-02	48,559	**3.80E-04**
I710	Mixed	113,099	3.80E-04	27,497	7.80E-02	140,596	**1.56E-02**
I710	Mixed	111,139	3.80E-04	29,945	7.80E-02	141,084	**1.69E-02**
I8	Mixed	22,708	n/a*	3,353	1.19E-01	26,061	**1.53E-02**
I8	Mixed	21,110	n/a*	3,673	1.19E-01	24,783	**1.76E-02**
SR60	Mixed	123,417	3.80E-04	30,193	7.80E-02	153,610	**1.56E-02**
SR60	Mixed	102,260	3.80E-04	28,471	7.80E-02	130,731	**1.73E-02**
SR60	HOV	24,904	3.80E-04	0	7.80E-02	24,904	**3.80E-04**
SR60	HOV	24,373	3.80E-04	0	7.80E-02	24,373	**3.80E-04**
SR91	Mixed	150,816	3.80E-04	27,805	7.80E-02	178,621	**1.25E-02**
SR91	Mixed	28,585	3.80E-04	399	7.80E-02	28,984	**1.45E-03**
SR91	Mixed	55,631	3.80E-04	589	7.80E-02	56,220	**1.19E-03**
SR91	Mixed	122,620	3.80E-04	22,793	7.80E-02	145,413	**1.26E-02**
US101	Mixed	104,364	n/a*	16,613	5.07E-02	120,977	**6.96E-03**
US101	Mixed	88,164	n/a*	16,875	5.07E-02	105,039	**8.15E-03**

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

The DPM emission factor is clearly affected by the fraction of heavy-duty Diesel vehicles on each link; the HOV lane links shown exhibit much lower DPM emission factors because of the absence of heavy-duty vehicles in those lanes.

Similar calculations were performed to determine daily fleet composite emission factors by modeling link for each of the gasoline toxic compounds. Table 2 presents the fleet composite emission factors for each toxic species (including DPM) for the 2035 Baseline scenario. Comparing the link-specific emission factors for each compound shows much greater variation from link to link for DPM than the gasoline vehicle-emitted compounds. (Although not shown, emission factors were compiled in this form for each of the five analysis scenarios.)

Table 3 contains the daily total vehicle volumes for the modeling links of each selected freeway corridor segment. Although the total volumes for each of the three 2035 plan alternatives tend to be higher than 2035 Baseline volumes, the effect on emission factors is muted by the fact that much of the increase in volumes for these scenarios (over the 2035 Baseline) 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.

Table 2
2035 Baseline Toxic Pollutant Daily Emission Factors (g/mi) by Modeling Link

Freeway Corridor	Link Type	Daily Average Emission Factor (g/mi)				
		Benzene	Formaldehyde	Acetaldehyde	1,3 Butadiene	DPM
I405	Mixed	1.57E-03	2.21E-03	9.08E-04	4.32E-04	8.24E-03
I405	Mixed	1.57E-03	2.26E-03	9.24E-04	4.35E-04	8.52E-03
I405	HOV	1.45E-03	1.01E-03	4.68E-04	3.65E-04	3.80E-04
I405	HOV	1.45E-03	1.01E-03	4.68E-04	3.65E-04	3.80E-04
I710	Mixed	1.67E-03	3.34E-03	1.32E-03	4.95E-04	1.56E-02
I710	Mixed	1.69E-03	3.54E-03	1.39E-03	5.06E-04	1.69E-02
I8	Mixed	3.38E-03	5.29E-03	2.10E-03	1.17E-03	1.53E-02
I8	Mixed	3.38E-03	5.69E-03	2.24E-03	1.18E-03	1.76E-02
SR60	Mixed	1.67E-03	3.35E-03	1.32E-03	4.96E-04	1.56E-02
SR60	Mixed	1.70E-03	3.61E-03	1.41E-03	5.10E-04	1.73E-02
SR60	HOV	1.45E-03	1.01E-03	4.68E-04	3.65E-04	3.80E-04
SR60	HOV	1.45E-03	1.01E-03	4.68E-04	3.65E-04	3.80E-04
SR91	Mixed	1.63E-03	2.86E-03	1.14E-03	4.69E-04	1.25E-02
SR91	Mixed	1.47E-03	1.17E-03	5.28E-04	3.74E-04	1.45E-03
SR91	Mixed	1.46E-03	1.13E-03	5.14E-04	3.72E-04	1.19E-03
SR91	Mixed	1.63E-03	2.88E-03	1.15E-03	4.69E-04	1.26E-02
US101	Mixed	1.54E-03	1.98E-03	8.13E-04	3.88E-04	6.96E-03
US101	Mixed	1.55E-03	2.16E-03	8.78E-04	3.96E-04	8.15E-03

Table 3
2035 Baseline Daily Vehicle Volumes by Analysis Scenario and Modeling Link

Freeway Corridor	Link Type	Daily Total Vehicle Volumes (vehicles/day)				
		2008 Existing	2035 Baseline	2035 Preferred Plan	2035 with 2004 RTP	2035 Envision
I405	Mixed	205,791	209,782	223,025	225,111	221,812
I405	Mixed	206,905	198,959	221,817	224,144	221,071
I405	HOV	22,549	54,599	44,428	45,766	44,659
I405	HOV	26,873	48,558	50,868	51,962	50,823
I710	Mixed	138,178	140,595	143,495	144,656	143,071
I710	Mixed	139,626	141,084	143,786	146,020	144,373
I8	Mixed	14,858	26,060	24,305	23,525	25,080
I8	Mixed	13,830	24,783	24,758	23,612	24,989
SR60	Mixed	125,014	153,607	146,310	159,416	146,519
SR60	Mixed	104,901	130,731	126,087	136,380	126,570
SR60	HOV	23,622	24,904	25,815	26,942	25,192
SR60	HOV	10,186	24,372	21,018	16,981	21,294
SR91	Mixed	159,260	178,620	183,125	158,459	181,276
SR91	Mixed	158,413	28,984	42,529	64,925	43,252
SR91	Mixed	31,764	56,221	60,303	62,639	60,142
SR91	Mixed	38,623	145,410	191,843	205,330	188,799
US101	Mixed	105,572	120,978	119,431	120,975	119,484
US101	Mixed	96,779	105,039	103,944	105,156	104,177

The daily fleet average emission factors for modeled freeway link shown earlier in Table 2 were then combined with relative cancer toxicity unit risk values (URV) for each species obtained from tabulated data published by the California Office of Environmental Health Hazard Assessment (OEHHA).[5] URVs represent the increased chance of contracting cancer over a 70-year exposure (assumed to be the average human lifetime) to 1.0 microgram per cubic meter ($\mu g/m^3$) of each species. By combining vehicle fleet emission factors with URVs, a "risk-weighted" emission factor, or simply "risk emission factor" (in units of g/mi per $\mu g/m^3$) was calculated for each individual species by link and analysis scenario.

Table 4 presents the URVs for the toxic pollutants considered and the calculation of risk emission factors for one of the links modeled in the analysis, the northbound mixed-use link of I-405 (the first link listed in the preceding tables). As noted, these calculations were performed for the 2035 Baseline analysis scenario. For each species, the risk emission factor is the product of the emission factor and the unit risk value.

Table 4
Fleet-wide Composite Risk Emission Factor for
for 2035 Baseline I-405 NB Mixed-Use Link

Pollutant	Emission Factor (g/mi)	Unit Risk Value (risk per $\mu g/m^3$)	Risk Emission Factor (g-risk/mi per $\mu g/m^3$)	Relative Weight (%)
Benzene	$1.57x10^{-3}$	$2.9x10^{-5}$	$4.54x10^{-8}$	1.7%
Formaldehyde	$2.21x10^{-3}$	$6.0x10^{-6}$	$1.33x10^{-8}$	0.5%
Acetaldehyde	$9.08x10^{-4}$	$2.7x10^{-6}$	$2.45x10^{-9}$	0.1%
1,3 Butadiene	$4.32x10^{-4}$	$1.7x10^{-4}$	$7.35x10^{-8}$	2.8%
Diesel Exh. PM (DPM)	$8.24x10^{-3}$	$3.0x10^{-4}$	$2.47x10^{-6}$	94.8%
Total			$2.61x10^{-6}$	100.0%

At the bottom of Table 4, a "composite" fleet-wide risk emission factor is calculated as the sum of the risk emission factors for each species. The rightmost column of Table 4 shows the relative weight or contribution of each species to increased cancer risk (on this modeling link). As eluded to earlier, the overall cancer risk is heavily dominated by DPM, comprising nearly 95% of the overall risk as reported in Table 4.

The calculations of a composite risk emission factor were performed for each modeled link under each analysis scenario. The use of these composite risk emission factors enabled the ensuring dispersion modeling to be conducted for a single "composite" pollutant, rather than have to run the model five times for each freeway segment and analysis scenario (one for each toxic species) and combining the risk results from each run.

[5] Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values, Table 1, OEHHA, November 2003, *http://www.arb.ca.gov/toxics/healthval/healthval.htm*.

Cancer Risk Dispersion Modeling

The quantification of changes in cancer risk impacts resulting from vehicle operation in the vicinity of each of the selected freeway corridors in the 2008 RTP was performed using an EPA-approved pollutant dispersion model in conformance with SCAQMD Diesel exhaust risk assessment procedures.[6] Guidance published by OEHHA was used in the design of the scope of analysis.[7]

Based on the OEHHA guidance, the analyses of health effect impacts were limited to evaluations of changes in cancer risks from the inhalation pathway. The OEHHA procedures state that "the potential cancer risk from inhalation exposure to diesel PM will outweigh the potential noncancer health impacts" and that "potential cancer risk from inhalation exposure to whole diesel exhaust will outweigh the multipathway cancer risk from the speciated compounds." As clarified in this reference, "the surrogate for whole diesel exhaust is diesel PM." On the basis of these statements, and because of time constraints, the assessments of risks associated with Diesel exhaust emissions from operation of freeway segments conducted here were limited to the cancer impacts from the inhalation route only. Because Diesel exhaust PM emissions contribute roughly 90% of airborne cancer exposure from on-road vehicle use, as confirmed by Table 4, the evaluation of changes in cancer risk impacts from exposure to the gasoline exhaust toxic pollutants was also limited to the inhalation pathway.

The SCAQMD Diesel exhaust risk assessment procedures contain recommendations with respect to emission factor sources, dispersion models, meteorological databases, and modeling protocols. The recommended emission factor source is the current version of the CARB EMFAC emission factor model (EMFAC2002), which was used in this analysis as discussed earlier. The dispersion model recommended is the EPA Industrial Source Complex – Short Term, Version 3 (ISCST3). The current version of this model, as available for download on the EPA website, is version 2035.[8] The meteorological databases recommended for use are those compiled by SCAQMD for calendar year 1981 from 35 stations within the South Coast Air Basin.[9] 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.[10]

---

[6] Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel Emissions, South Coast Air Quality Management District, December 2002, *http:/www/aqmd.gov/handbook/hra_guide.doc*.

[7] Appendix D: Risk Assessment Procedures to Evaluate Particulate Emissions from Diesel-Fueled Engines, 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/pdf/HRAfinalapps.pdf*.

[8] Industrial Source Complex – Short Term, Version 3, U.S. Environmental Protection Agency, February 2003, *http://www.epa.gov/scram001/tt22.htm#rec*.

[9] AQMD Dispersion Model Application Meteorological Data, South Coast Air Quality Management District, *http://www.aqmd.gov/metdata/*.

[10] 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*.

The SCAQMD and CARB guidance with respect to the dispersion model recommended for use in the assessment of cancer risks from freeway segments are not consistent. The SCAQMD guidance recommends using ISCST3 for all risk assessment modeling, while the CARB guidance recommends using CALINE4 modified to accept a full year of meteorological data. This modified version of the CALINE4 model takes much longer to run than ISCST. (A single run with a year of hourly meteorology data takes in excess of twelve hours.) Because of time limitations in completing the analysis, the ISCST3 model was used to assess downwind cancer impacts of operation of the selected freeways. (The comparable ISCST3 run time for the same analysis was only several minutes.)

Meteorological data for each modeling analysis were obtained from the SCAQMD monitoring site closest to each selected freeway segment. The monitoring sites closest to each segment studied are tabulated in Table 5.

Table 5
SCAQMD Meteorological Data Used for Each Freeway Segment Analysis

Freeway Segment	Meteorology Data Site
I-405 (Orange County)	Los Alamitos
I-710 (Los Angeles County)	Lynwood
I-8 (Imperial County)	Indio
SR 60 (San Bernardino County)	Upland
SR 91 (Riverside County)	Santa Ana Canyon
US 101 (Ventura County)	Malibu

Each of the freeway segment links was modeled as an area source. Each directional link was modeled as a separate source. (Mixed use and HOV links were also modeled as separate, parallel area 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.[11] The area source lengths were selected so that the aspect ratios of the sources did not exceed 10, as required by the ISCST3 model. The emission heights were set at 0.5 meters to represent the typical heights of emission release.

Receptor grids surrounding each freeway segment were designed to identify the highest exposed residential locations near each segment. Initial receptor grids of 100 meter spacing were designed to extend out 0.5 kilometers in all directions from the boundaries of each roadway segment. After the first dispersion modeling analyses were conducted, the results were plotted and compared to images from a topographic mapping program to determine the general locations of residences receiving the highest impacts. Aerial photo images generated by an Internet program[12] were then visually inspected to determine the

[11] CALINE4 – A Dispersion Model For Predicting Air Pollutant Concentrations Near Roadways, Report No. FHWA/CA/TL-84-15, California Department of Transportation, November 1984.
[12] *http://earth.google.com/*

exact locations of residences near the sites of the highest forecasted impacts, and these locations were manually plotted on the topographic map program images to determine the map coordinates of these residential structures. These map coordinates were then added to the ISCST3 input files as discrete receptor sites, and subsequent modeling runs were conducted to compute the changes in cancer risk impacts at these highest impacted residences.

Time adjustment factors were included in the model input files to account for the daily variability in emission rates. The time adjustment factors were based on the fractions of annual average daily traffic flows that were predicted by SCAG travel model outputs to occur during the am peak, midday, pm peak, and night periods. These calculations were performed separately for the LHD and HD traffic volumes to account for the variations in heavy-truck volume fractions that occur over the day (and the relative risk of HD vehicle DPM).

As discussed earlier, carcinogenic pollutant emissions for each modeling analysis were converted to equivalent units of cancer risk and distributed uniformly over each area source. The pre-conversion of pollutant mass emissions to equivalent "risk" emissions was performed to eliminate the processing time consumed by converting downwind pollutant concentrations forecast by the dispersion model into equivalent risk impacts. As a result, the dispersion model output was reported in units of increased cancer risk per 70-year exposure, expressed as the increased risk per million.

Modeling Results

Increased cancer risk estimates were generated by the dispersion modeling runs for the most exposed residences near the sample selected freeway segments. For the analysis of freeway segment operations, the cancer risk values reported by the model represent the increased chance of contracting cancer from exposure to freeway emissions if a person lived at the same location for a period of 70 years and if freeway emissions did not change over the 70 years from forecasted levels. The risk values reported at the maximum exposed residence by model runs for each of the five planning scenarios and each of the six freeway segments studied are presented in Table 6.

Table 6
Increased Cancer Risk at Maximum Exposed Residence from Vehicle Operation by Planning Scenario and Freeway Corridor

Planning Scenario	Increased Cancer Risk over 70-Year Exposure (per million)					
	I-405 (Orange)	I-710 (Los Angeles)	I-8 (Imperial)	SR 60 (San Bernardino)	SR 91 (Riverside)	US 101 (Ventura)
2008 Existing	915	563	85	174	479	160
2035 Baseline (No Plan)	225	206	27	57	120	55
2035 Preferred Plan	222	174	24	51	108	54
2035 Modified 2004 RTP	227	182	26	59	122	53

2035 Envision	223	175	25	50	109	54

As shown in Table 6, the risk values are much higher under existing (2008) conditions; the decline in risk values across all future scenarios and freeway segments is the result of continued decreases in per-vehicle fleet emissions projected to occur during that period. As discussed earlier, this decrease occurs from continued emission control technology improvements in new vehicles for which certification standards continue to tighten up to 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.)

Comparing the risk values across the four future planning scenarios shows the Preferred Plan alternative generally exhibits the lowest risk increase, although this varies by freeway corridor. Of those freeway corridors analyzed, I-405 exhibits the highest increased cancer risk, followed by I-710. Not surprisingly, the segments modeled along these corridors contained the highest total vehicle and heavy-duty truck volumes, respectively. Of note, the Preferred Plan alternative showed the lowest cancer risk value on I-405.

By comparison, the average increased cancer risk level to which residents of the South Coast Air Basin in 2000 were exposed was approximately 1,400 in one million.[13] This risk results from inhalation of pollutants emitted by all sources: region-wide mobile, industrial, and commercial product use.

Spatial distributions of increased cancer risk in areas surrounding each modeled freeway segment under each analysis scenario were plotted and are contained in Attachment 1.

The maximum exposed residences identified from the modeling runs were typically those found closest to the boundaries of the freeway segments. Analysis of modeling output data also revealed that cancer risks declined dramatically with increasing distance away from the boundaries of the designated project sites. The distances away from project boundaries at which estimated cancer risks drop by 50% and 90% are presented in Table 7. The distance values were computed along axes that are perpendicular to project centerlines near the midpoint of each project.

Table 7
Distances at Which Cancer Risks Drop by 50% and 90%

Freeway Corridor	50% Reduction Distance	90% Reduction Distance
I-405 (Orange County)	330 ft.	1,440 ft.
I-710 (Los Angeles County)	330 ft.	1,080 ft.
I-8 (Imperial County)	280 ft.	1,990 ft.
SR 60 (San Bernardino County)	415 ft.	1,090 ft.
SR 91 (Riverside County)	220 ft.	590 ft.
US 101 (Ventura County)	440 ft.	1,415 ft.

[13] Final Draft Air Toxics Control Plan for the Next Ten Years, South Coast Air Quality Management District, March 2000, *http://www.aqmd.gov/aqmp/atcp.html*.

Conclusions

The following conclusions can be drawn from this study:

- Increased cancer risks from living near the freeway segments studied will decline dramatically between 2008 and 2035, primarily as a result of improvements in motor vehicle exhaust controls.

- Based on selected freeway corridors that were quantitatively modeled, the Preferred Plan alternative generally exhibits the lowest increased cancer risk (although risk values for the Preferred Plan, Modified 2004 RTP and Envision alternatives are generally within the statistical precision of the analysis).

- Of the freeway corridors modeled, I-405 in Orange County, along the segment just east of its intersection with I-605 in Seal Beach exhibits the highest increased cancer risk, ranging from 222 in a million to 227 in a million for the 2035 alternatives considered.

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 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 2008 RTP. However, a series of explanatory factors can be used to gauge how the specific results from this study can be qualitatively extrapolated across the entire SCAG planning domain.

First, this analysis showed that unit cancer risk from Diesel exhaust particulate matter tends to overwhelm risk from several toxic organic species emitted from gasoline-powered vehicles. 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. Thus, the risk levels determined under this assessment (which focused exclusively on freeways) are likely to be significantly higher than those occurring on the arterial roadway system. With respect to the issue of proximity to the roadway, most of the freeway segments studied under this analysis abutted adjacent residential areas including I-405 in Seal Beach, the segment with the highest increased risk value of those modeled.

To the extent that the freeway corridors selected by SCAG for this assessment represent those in each county exhibiting 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 heavy-duty vehicle fraction and total vehicle volume on the roadway and 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) also significantly affect 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.

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
1	We encourage SCAG to fully embrace the opportunity it has in these Regional Plans and the accompanying EIR, to show further leadership by identifying a comprehensive and coordinated land use and transportation strategy to reduce emissions of greenhouse gasses ("GHG") that cause global warming, one of the most critical environmental challenges facing our communities.	The RTP PEIR includes an inventory of GHG, identifed mitigation measures, and compared alternatives in the PEIR. The mitigation measures seek to achieve the maximum feasible and cost-effective reductions in emissions.		On November 1, 2007, the Regional Council directed SCAG staff to prepare separate CEQA documents for the Regional Comprehensive Plan and Regional Transportation Plan.	See PEIR Chapters 3.2, Air Quality and 3.5, Energy.
2	Significant opportunities for reducing transportation related GHG emissions have been identified in the Climate Action Team Report to Governor Schwarzenegger and the Legislature (CalEPA March 2006) and the Climate Action Program at Caltrans. These documents identify two broad strategies: Measures to Improve Transportation Energy Efficiency and Smart Land Use and Intelligent Transportation. Smart land use stategies "encourage jobs/housing proximity, promote transit oriented development, and encourage high-density residential/commercial development along transit corridors."	Smart Land Use strategies are part of SCAG's existing Compass Blueprint Program. The 2008 RTP encourages utilization of new intelligent transportation system (ITS) technologies that measures system performance and offers its customers reliable “on-time” performance and real time information.			See PEIR Energy Chapter 3.5
3	...mainstream energy efficiency and GHG emissions reductions measures into land use and transportation decisions…the EIR should discuss how these strategies for reducing GHG emissions are included in the Regional Plans and whether they are being implemented and funded to the maximum extent feasible				See PEIR Energy Chapter 3.5
4	…the EIR should discuss whether the Transportation Plan maximizes the use of available funds for public transit, alternative fuel vehicles, carpool, vanpool, rideshare, pedestrian and bicycle projects (including Safe Routes to School programs), and other measures that reduce vehicle travel and/or GHG emissions.	In total, the 2008 RTP dedicates $2.2 billion to TDM investments (carpools and vanpools, public transit, nonmotorized modes, congestion pricing, and providing the public with reliable and timely traveler information.)			
5	adopt funding priorities that target spedning for transportation infrastructure to serve infill and mixed use development located near employment centers and provide incentives for such development	The 2008 RTP includes the following Goals: "Encourage land use and growth patterns that complement our transportation investments" and "Protect the environment, improve air quality and promote energy efficiency"			

Appendix B

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
6	evaluate and adopt policies to direct new residential development to areas that are accessible to employment centers and have access to high capacity public transit		Compass Blueprint		
7	implement feasible measures to reduce electricity use in the transportation sector (which is in large part generated from natural gas, thus producing GHG emissions) including replacing all traffic lights, street lights, and railroad crossing lights with LED technology				See PEIR Energy Chapter 3.5
8	include on-site generation using solar photovoltaic panels on building roofs or solar carports/parking lots where feasible				See PEIR Energy Chapter 3.5
9	convert county and municipal fleets to alternative fuel vehicles		The Clean Cities Coalition coordinates the activities of both private and public sector proponents of AFVs		
10	provide incentives for use of public transit				See PEIR Energy Chapter 3.5
11	expand public transit routes and increase frequency of operation	2008 RTP			
12	authorize construction of electric vehicle charging stations and alternative fueling stations			SCAG cannot authorize construction but includes development of alternative fuel infrastructure as mitigation	See PEIR Energy Chapter 3.5
13	require electrification of truck stops and warehouse and distribution facilities			SCAG cannot require, but included in the PEIR Energy Chapter as a recommended mitigation measure	See PEIR Energy Chapter 3.5
14	use parking pricing to reduce the number of vehicle trips	2008 RTP			
15	use congestion pricing to reduce vehicle travel in most congested urban areas	2008 RTP			
16	policies for sustainable airport development, management and airfield design to reduce air pollution and GHG emissions from operations, including cargo operations, ground support and access to and from airports. (see LAWA Sustainability Vision and Principles and Green LA Action Plan)				See PEIR Air Quality Chapter 3.2
17	consider feasible measures to reduce emissions of criteria pollutants (particulate matter and nitrous oxide) from diesel buses	2008 RTP			

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
18	A green construction policy that could require: -all off-road construction vehicles should be alternative fuel vehicles, or diesel powered vehicles with Tier 3 or better engines or retrofitted/repowered -to meet equivalent emissions standards as Tier 3 engines; -use the minimum feasible amount of GHG emitting construction materials; -use cement blended with the maximum feasible amount of flyash or other materials that reduce GHG emissions -use asphalt with light colored additives and chemical additives that increase reflectivity and therefore reduce contribution to the heat island effect -require recycling of construction debris to maximum extent feasible -incorporate planting of shade trees into construction projects where feasible	The 2008 RTP includes Tier 4 engines			See PEIR Air Quality Chapter 3.2
	FHWA List of Transportation Emission Reduction Strategies				
	Shared Ride Programs/Projects such as HOV lanes, vanpools, and regional rideshare				
19	Park-and-Ride facilities	2008 RTP	CTCs, Transit Operators, SCRRA		
20	High-Occupancy Vehicle lanes	2008 RTP	SCAG, Caltrans, CTCs		
21	Regional rideshare outreach/marketing	2008 RTP	SCAG, AQMD, CTCs, Cities, Employers		
22	Regional rideshare incentives	2008 RTP	SCAG, AQMD, CTCs, Cities, Employers		
23	Dynamic rideshare programs (real-time rideshare matching)		SCAG, AQMD, CTCs, Cities, Employers		
24	Encourage rideshared taxis		AQMD, CTCs, Employers	not within SCAG's authority	
25	Regional vanpool network		AQMD, CTCs, Employers	not within SCAG's authority	
26	Short-distance vanpools	2008 RTP	AQMD, CTCs, Employers		
27	**Bicycle and Pedestrain Programs/Projects**				
28	New bicycle paths, lanes, routes, or safety enhancements	2008 RTP	CTCs, Cities		
29	Bicycle parking	2008 RTP	CTCs		
30	Bikes on transit programs	2008 RTP	CTCs, Transit Operators, SCRRA		
31	Bicycle information (signage, maps, saftey events)	2008 RTP	CTCs, Transit Operators, SCRRA		
32	Bicycle share programs		AQMD, Employers	not within SCAG's authority	

Appendix B

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
33	Financial incentives to own bicycles		Counties, Cities	not within SCAG's authority	
34	Pedestrian connections/sidewalks	2008 RTP	State, Counties, Cities		
35	Enhancing the pedestrian environment (wider sidewalks, trees, crosswalk light fixtures, furniture, safety signals)	2008 RTP	State, Counties, Cities		
	Transit				
36	New transit routes/services	2008 RTP	CTCs, Metrolink		
37	More frequent service	2008 RTP	CTCs, Metrolink		
38	Longer service hours		CTCs, Metrolink	not within SCAG's authority	
39	More capacity on services (larger buses, additional railcars, enhanced seating capacity)	2008 RTP	CTCs, Metrolink		
40	Faster travel times/improved system performance		CTCs, Metrolink	not within SCAG's authority	
41	Passenger amenities (shelters, benches, etc.)	2008 RTP	CTCs, Metrolink		
42	Improved transit access (shuttle systems, improved bike and pedestrian access)	2008 RTP	Cities, Transit Providers, CTCs, Metrolink		
43	Transit information (signage, maps, kiosks, webpage, real-time text messaging)	2008 RTP	Cities, Transit Providers, CTCs, Metrolink		
44	Transit marketing and promotions		SCAG, Cities, Transit Providers, CTCs, Metrolink		
45	Reduced fares/free services		Transit Providers, CTCs, Metrolink	not within SCAG's authority	
46	Fare structure/convenience improvements		Transit Providers, CTCs, Metrolink	not within SCAG's authority	
47	Transit pass programs	2008 RTP	Transit Providers, CTCs, Metrolink, Employers	not within SCAG's authority	
48	"Try It" transit pass give-aways		Transit Providers, CTCs, Metrolink, Employers	not within SCAG's authority	
	Parking Management				
49	Parking pricing/fees (increase public parking fees, rate structures to encourage carpooling)		Counties, L.A. City, and Other Cities		See PEIR Energy Chapter 3.5
50	Parking supply limits		Cities	not within SCAG's authority	
51	Preferential parking for carpools/vanpools	2008 RTP	Cities	not within SCAG's authority	
52	Parking cash-out program	2008 RTP	AQMD, Employers		See PEIR Energy Chapter 3.5
	Pricing				
53	Road pricing (new tolls, increased tolls, HOT lanes)	2008 RTP	Caltrans	not within SCAG's authority	
54	Cordon pricing (charge entrance into high-use areas)		No	not within SCAG's authority	
55	Variable priced tolls		No		See PEIR Energy Chapter 3.5
56	Variable parking fees				See PEIR Energy Chapter 3.5
57	Pay-As-You-Drive Vehicle Insurance		No	not within SCAG's authority	
58	VMT -based registration fees		No	not within SCAG's authority	

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
59	Increase in gas tax		No	Infeasible - No clear demonstration of air quality emissions benefits.	
60	Employee tax credits		No	not within SCAG's authority	
61	**Employer-based TDM Programs**		AQMD, Employer	not within SCAG's authority	
62	**Non-employer-based TDM Programs (schools, airport parking, stadium parking)**		Cities,Schools	not within SCAG's authority	
	Integrated Land use-Transportation Planning				
63	Transit-oriented development programs	2008 RTP	SCAG, ARB, AQMD, Cities		
64	Programs/incentives to encourage better regional land use/transportation coordination	2008 RTP	SCAG, Cities, Transit Providers, CTCs		
65	Programs/incentives to improve community design	2008 RTP	SCAG, Cities, Transit Providers, CTCs		
66	Neighborhood Schools		Schools	not within SCAG's authority	
67	Incentives to live near work/transit/downtown		Counties, Cities	not within SCAG's authority	
	Vehicle Use Restrictions				
68	Auto-free zones (pedestrian malls, transit malls, car bans in DBD)		Cities	not within SCAG's authority	
69	Limit access to HOVs only (require minimum occupancy to enter activity centers)		No	not within SCAG's authority	
70	No drive days		SCAG, CTCs		
71	Other Options to Reduce Auto Ownership/Avoid Vehicle Trips		SCAG, AQMD, CTCs		
72	Carsharing programs (station cars, incentives for use of carsharing programs)		AQMD, Employers		
	Transportation System Management/Vehicle Driver Behavior-Oriented Strategies				
73	Traffic Signal Synchronization	2008 RTP	CTCs,Caltrans, Cities		
74	Signal retiming	2008 RTP	CTCs,Caltrans, Cities		
75	Advanced traffic signal controls	2008 RTP	CTCs,Caltrans, Cities		
	Roadway/Intersection Improvements				
76	One-way streets		CTCs,Caltrans, Cities	not within SCAG's authority	
77	Turn restrictions		CTCs,Caltrans, Cities	not within SCAG's authority	
78	Turning lanes		CTCs,Caltrans, Cities	not within SCAG's authority	
79	Roundabouts		CTCs,Caltrans, Cities	not within SCAG's authority	
80	Limit on-street parking		CTCs,Caltrans, Cities	not within SCAG's authority	
81	Intersection improvements		CTCs,Caltrans, Cities	not within SCAG's authority	
82	Bus pullouts	2008 RTP	CTCs,Caltrans, Cities		
	Incidient Management/Operations				
83	Incident management programs (monitoring, call number, roadside assistance vehicles)	2008 RTP	CTCs, CHP		
84	Ramp metering	2008 RTP	Caltrans, Counties, Cities		
85	Encourage use of underutilized capacity (reverse traffic lanes)		CTCs,Caltrans, Cities	not within SCAG's authority	

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
86	Allow use of road shoulders during peak periods/to get around incidents		CTCs,Caltrans, Cities	not within SCAG's authority	
	Traveler Information Systems				
87	Real-time traveler information systems (variable message signs, website, toll free number)	2008 RTP(counties & cities are doing on their own)	SCAG, CTCs,Caltrans, Cities		
88	Real-time parking information (availability updates, automated reservations and payment)	2008 RTP (counties & cities are doing on their own)	CTCs,Caltrans, Cities	not within SCAG's authority	
	Speed Control				
89	Lower speed limits		No	Infeasible - The California Vehicle Code Sections 22357 and 22358 mandates a methodology for setting speed limits for local areas. This measure is not feasible until the statute is changed.	
90	Increased speed enforcement		No	Infeasible - The California Vehicle Code Sections 22357 and 22358 mandates a methodology for setting speed limits for local areas. This measure is not feasible until the statute is changed.	
91	Driver training/educations (information about saving fuel with less vehicle stops/starts)				See PEIR Energy Chapter 3.5
92	Access management (limit access points, parallel access roads)		Caltrans, Cities	not within SCAG's authority	
	Shifting/Separating Freight Movements				
93	Shifting freight movement to off-peak periods	2008 RTP			
94	Truck-only lanes/routes	2008 RTP			
95	Truck restrictions		PierPass - A non-profit organization of marine terminal operators at the Ports of Los Angeles and Long Beach.	not within SCAG's authority	
96	Consolidated freight/package delivery			not within SCAG's authority	
97	Rail shuttles (inland distribution centers)	2008 RTP			
98	Container matching services (minimize empty containers)			not within SCAG's authority	

Appendix B

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
99	**Anti-idling restrictions**		ARB - On October 20 2005, the Air Resources Board approved a regulatory measure to reduce emissions of toxics and criteria pollutants by limiting idling of new heavy-duty diesel vehicles	not within SCAG's authority	
	Vehicle, Fuels, and Technology Strategies				
	Accelerated Vehicle Retirement/Fleet Renewal/Replacement				
100	Vehicle buy-back programs		ARB, AQMD	not within SCAG's authority	
101	Fleet renewal/clean vehicle program (replacements and purchases of cleaner fleets)	2008 RTP	ARB, AQMD		
	Heavy-Duty Diesel Vehicle Repowereing/Retrofits *(Carl Moyer programs)*				
102	Mandatory fleet retrofits	2008 RTP	EPA, ARB		
103	Government contracting requirements		ARB, AQMD, CTCs, Cities	not within SCAG's authority	
104	Voluntary programs with funding		EPA, ARB, AQMD	not within SCAG's authority	
	Idle Reduction Technologies				
105	Truck stop electrification		ARB	not within SCAG's authority	
106	Purchase of auxiliary power units		ARB	not within SCAG's authority	
	Purchases of Advanced Technology and Alternative Fuel Vehicles				
107	Cleaner diesel fuels		ARB, AQMD, CTCs, Transit Operators, Cities, Employers	not within SCAG's authority	
108	Purchases of alternative fuel vehicles (buses, other heavy-duty vehicles, light-duty vehicles)		ARB, AQMD, CTCs, Transit Operators, Cities, Employers, Clean Cities Program	not within SCAG's authority	
	Programs to Encourage Purchases of Advanced Technology/Alternative Fuel Vehicles				
109	General tax/financial incentives (tax credits for low emissions vehciles, vehicle emission fees, feebates)		ARB	not within SCAG's authority	
110	Specific target market programs with funding (CNG taxi program)		ARB	not within SCAG's authority	
111	HOV lane use allowed for advanced technology/alternative fuel vehicles		ARB, CA DMV	not within SCAG's authority	
112	Preferential/free parking for advanced technology/alternative fuel vehicles		Counties, Cities	not within SCAG's authority	
113	Government contracting requirements (requiring alt fuel/low emissions vehicles)		ARB, AQMD, CTCs, Cities	not within SCAG's authority	
	Inspection and Maintenance				
114	Basic or Enhanced I&M		ARB, AQMD	not within SCAG's authority	

Appendix B

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
115	Remote sensing (roadside pullovers)		ARB, AQMD	not within SCAG's authority	
116	Smoking vehicle programs		ARB, AQMD	not within SCAG's authority	
117	Heavy-duty vehicle inpections		ARB, AQMD	not within SCAG's authority	
	Road Dust Reduction Strategies				
118	Mitigation for unpaved roads (apply water, wet gravel, dust suppressant, vegetative matter)		SCAG, ARB, AQMD, CTCs, Counties, Cities		
119	Road paving		SCAG, ARB, AQMD, CTCs, Counties, Cities		
120	Street Sweeping		SCAG, ARB, AQMD, CTCs, Counties, Cities		
121	Transportation construction site mitigation efforts		SCAG, ARB, AQMD, CTCs, Counties, Cities		
	Non-Road Strategies				
122	Encourage Replacement/Repowering/Retrofits (scrappage, contracting requirements, voluntary programs)		SCAG, ARB, AQMD, CTCs, Counties, Cities		
123	Encourage /Implement Use of Alternative Fuels for Non-Road equipment (ultra-low sulfur, CNG)		SCAG, ARB, AQMD, CTCs, Counties, Cities		
124	Rail Electrification	2008 RTP	SCAG, CTCs,SCRRA		
	Encourage/Implement Operational Improvement and Anti-				
125	Rail infrastructure improvements (track geometry, concrete ties)		CTCs,SCRRA	not within SCAG's authority	
126	Rail operational strategeis (switcher yards, idle reduction)		SCAG, CTCs,SCRRA		
127	Marine vessel equipment modifications (hull design, increased atomization)		ARB, Ports of Los Angeles and Long Beach	not within SCAG's authority	
128	Marine vessel fleet operational strategies/practicies		SCAG, ARB, Ports of Los Angeles and Long Beach		
129	Airport operational strategies (HVAC, ground electrification)		SCAG, LAWA, Counties, Cities		
130	Contracting requirements limiting idling during construction		ARB		
	Examples of Technology Approaches/Options				
131	Heavy duty diesel engine retrofits		SCAG, ARB, AQMD, CTCs, Counties, Cities		
132	Locomotive engine modifications	2008 RTP	CTCs,SCRRA		
133	Railroad equipment modifications		CTCs, SCRRA	not within SCAG's authority	
134	Railroad alternative fuels		CTCs, SCRRA	not within SCAG's authority	
135	Marine vessel engine modifications		ARB, Ports of Los Angeles and Long Beach	not within SCAG's authority	
136	Marine vessel alternative fuels		ARB, Ports of Los Angeles and Long Beach	not within SCAG's authority	

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
137	Airport ground support equipment engine modifications/alternative fuels		SCAG, LAWA, Counties, Cities		
	Mitigation Measures from the California Attorney General's Office				
138	**Transportation**				
139	Coordinate controlled intersections so that traffic passes more efficiently through congested areas. Where traffic signals or street lights are installed, require the use of Light Emitting Diode (LED) technology.		CTCs,Caltrans, Cities		See PEIR Transportation Chapter 3.14
140	Set specific limits on idling time for commercial vehicles, including delivery and construction vehicles.		ARB - On October 20 2005, the Air Resources Board approved a		See PEIR Transportation Chapter 3.14
141	Promote ride sharing programs e.g., by designating a certain percentage of parking spaces for high-occupancy vehicles, providing larger parking spaces to accommodate vans used for ride-sharing, and designating adequate passenger loading and unloading and waiting areas.		SCAG, AQMD, CTCs, Cities, Employers		See PEIR Transportation Chapter 3.14
142	Create car-sharing programs. Accommodations for such programs include providing parking spaces for the car-share vehicles at convenient locations accessible by public transportation.		SCAG, AQMD, CTCs, Cities, Employers		See PEIR Transportation Chapter 3.14
143	Require clean alternative fuels and electric vehicles.		ARB AQMD, CTCs, Cities, Employers	SCAG cannot require but included a mitigation measure to support alternative fuel infrastructure	See PEIR Energy Chapter 3.5
144	Develop the necessary infrastructure to encourage the use of alternative fuel vehicles (e.g., electric vehicle charging facilities and conveniently located alternative fueling stations).		ARB, AQMD, CTCs, Cities	SCAG cannot require but included a mitigation measure to support alternative fuel infrastructure	See PEIR Energy Chapter 3.5
145	Increase the cost of driving and parking private vehicles by imposing tolls, parking fees, and residential parking permit limits.		Counties, L.A. City, and Other Cities	SCAG cannot increase the cost of driving but included a measure to discuss these concepts	See PEIR Energy Chapter 3.5
146	Develop transportation policies that give funding preference to public transit.	The 2008 RTP includes the following Goals: "Encourage land use and growth patterns that complement our transportation investments" and "Protect the environment, improve air quality and promote energy efficiency"	SCAG, ARB, AQMD, CTCs, Counties, Cities		
147	Design a regional transportation center where public transportation of various modes intersects.		CTCs, Counties, Cities	not within SCAG's authority	

Appendix B

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
148	Encourage the use of public transit systems by enhancing safety and cleanliness on vehicles and in and around stations.		SCAG, ARB, AQMD, CTCs, Counties, Cities		See PEIR Transportation Chapter 3.14
149	Assess transportation impact fees on new development in order to facilitate and increase public transit service.		AQMD, Counties, Cities	not within SCAG's authority	
150	Provide shuttle service to public transit.		AQMD, Counties, Cities, Employers		See PEIR Transportation Chapter 3.14
151	Offer public transit incentives.		SCAG, ARB, AQMD, CTCs, Counties, Cities, Employers		See PEIR Transportation Chapter 3.14
152	Incorporate bicycle lanes into street systems in regional transportation plans, new subdivisions, and large developments.		SCAG, CTCs, Counties, Cities		See PEIR Transportation Chapter 3.14
153	Create bicycle lanes and walking paths directed to the location of schools and other logical points of destination and provide adequate bicycle parking.		SCAG, CTCs, Counties, Cities		See PEIR Transportation Chapter 3.14
154	Require commercial projects to include facilities on-site to encourage employees to bicycle or walk to work.		Counties, Cities		See PEIR Transportation Chapter 3.14
155	Provide public education and publicity about public transportation services.		SCAG, CTCs, Counties, Cities		See PEIR Transportation Chapter 3.14
	Energy Efficiency and Renewable Energy				
156	Require energy efficient design for buildings. This may include strengthening local building codes for new construction and renovation to require a higher level of energy efficiency.			SCAG cannot require, rather can encourage lead agencies to pursue energy efficient design for buildings.	See PEIR Energy Chapter 3.5
157	Adopt a “Green Building Program” to promote green building standards.				See PEIR Energy Chapter 3.5
158	Fund and schedule energy efficiency “tune-ups” of existing buildings by checking, repairing, and readjusting heating, ventilation, air conditioning, lighting, hot water equipment, insulation and weatherization.(Facilitating or funding the improvement of energy efficiency in existing buildings could offset in part the global warming impacts of new development.)			SCAG can provide information regarding energy efficiency tune ups to member cities but cannot fund or schedule them.	See PEIR Energy Chapter 3.5
159	Provide individualized energy management services for large energy users.				See PEIR Energy Chapter 3.5
160	Require the use of energy efficient appliances and office equipment.				See PEIR Energy Chapter 3.5
161	Fund incentives and technical assistance for lighting efficiency.				See PEIR Energy Chapter 3.5

Appendix B

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
162	Require that projects use efficient lighting. (Fluorescent lighting uses approximately 75% less energy than incandescent lighting to deliver the same amount of light.)				See PEIR Energy Chapter 3.5
163	Require measures that reduce the amount of water sent to the sewer system. (Reduction in water volume sent to the sewer system means less water has to be treated and pumped to the end user, thereby saving energy.)				See PEIR Energy Chapter 3.5
164	Incorporate on-site renewable energy production (through, e.g., participation in the California Energy Commission's New Solar Homes Partnership). Require project proponents to install solar panels, water reuse systems, and/or other systems to capture energy sources that would otherwise be wasted.				See PEIR Energy Chapter 3.5
165	Streamline permitting and provide public information to facilitate accelerated construction of solar and wind power.				See PEIR Energy Chapter 3.5
166	Fund incentives to encourage the use of energy efficient equipment and vehicles.				See PEIR Energy Chapter 3.5
167	Provide public education and publicity about energy efficiency programs and incentives.				See PEIR Energy Chapter 3.5
	Land Use Measures				
168	Encourage mixed-use, infill, and higher density development to reduce vehicle trips, promote alternatives to individual vehicle travel and promote efficient delivery of services and goods. Infill development generates fewer vehicle miles traveled (VMT) per capita and reduced emissions of greenhouse gases, and denser development is associated with increased public transit use. For example, a city or county could promote "smart" development by reducing developer fees or granting property tax credits for qualifying projects.	2008 RTP			See PEIR Energy Chapter 3.5
169	Discourage "leapfrog" development. Enact ordinances and programs to limit sprawl.	2008 RTP			
170	Incorporate public transit into project design.		Compass Blueprint		
171	Require measures that take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.				See PEIR Energy Chapter 3.5
172	Preserve and create open space and parks. Preserve existing trees and require the planting of replacement trees for those removed in construction.	2008 RTP			
173	Impose measures to address the "urban heat island" effect by, e.g., requiring lightcolored and reflective roofing materials and paint; light-colored roads and parking lots; shade trees in parking lots; and shade trees on the south and west sides of new or renovated buildings.				See PEIR Energy Chapter 3.5

NOP Comments Regarding Measures to Reduce the Greenhouse Gas Emissions of the Proposed 2008 RTP

#	Comment	Included in the 2008 RTP	Being Implemented in the SCAG Region (including implementing agency, where available)	Outside the authority of SCAG/infeasible*	Identified as a Mitigation Measure in the PEIR
174	Facilitate "brownfield" development. (Brownfields are more likely to be located near existing public transportation and jobs.)	2008 RTP			
175	Require pedestrian-only streets and plazas within developments, and destinations that may be reached conveniently by public transportation, walking, or bicycling.				See PEIR Energy Chapter 3.5
	Solid Waste Measures				
176	Require projects to reuse and recycle construction and demolition waste.				See PEIR Public Services Chapter 3.12
177	Implement or expand city or county-wide recycling and composting programs for residents and businesses.				See PEIR Public Services Chapter 3.12
178	Increase areas served by recycling programs				See PEIR Public Services Chapter 3.12
179	Extend the types of recycling services offered (e.g., to include food and green waste recycling).				See PEIR Public Services Chapter 3.12
180	Establish methane recovery in local landfills and wastewater treatment plants to generate electricity.				See PEIR Public Services Chapter 3.12
181	Provide public education and publicity about recycling services.				See PEIR Public Services Chapter 3.12
182	**Carbon Offsets:** In some instances, a lead agency may find that measures that will directly reduce a project's emissions are insufficient. A lead agency may consider whether carbon offsets would be appropriate. The project proponent could, for example, fund off-site projects (e.g., alternative energy projects) that will reduce carbon emissions, or could purchase "credits" from another entity that will fund such projects. The lead agency should ensure that any mitigation taking the form of carbon offsets is specifically identified and that such mitigation will in fact occur.				See PEIR Energy Chapter 3.5

Source: Letter from Edmund G. Brown Jr., Attorney General. RE: Comments on the Notice of Preparation for Draft Environmental Impact Report for the 2008 Regional Transportation Plan and 2008 Regional Comprehensive Plan (SCH Number 2007061126). October 19, 2007.

* See CEQA 15126.4 (mitigation measures) and 21061.1 (feasible): **Mitigation measures** must be fully enforceable through permit conditions, agreements, or other legally-binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design. **Feasible** means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.

Air Quality Greenhouse Gas Emission Calculation Methodology

Construction Emissions

Carbon dioxide (CO_2) emissions were obtained from the URBEMIS2007 emissions inventory model. URBEMIS2007 uses emission factors obtained from the California Air Resources Board's (ARB's) OFFROAD2007 model to calculate construction equipment emissions. URBEMIS2007 estimates equipment emissions based on the size of the proposed project. Residential project sizes were estimated based on the yearly incremental growth of households per county. Nonresidential projects were input into URBEMIS2007 as commercial land use in square feet. The amount of square footage was estimated based on the yearly incremental growth of employees per county. Employees were converted to square feet using a conversion factor of 750 square feet per employees. A five-percent redevelopment factor was included for all counties except Los Angeles County, which had a ten-percent redevelopment factor. Equipment assumptions and phasing were based on UREBMIS2007 default options. URBEMIS2007 has a limitation based on project size and does not proportionally adjust the fleet mix for large projects. It was assumed that the average project size would be 100 dwelling units or 250,000 square feet of commercial development. This average project size was modeled in URBEMIS2007 and the results were multiplied by the number of average-sized projects expected in each county.

URBEMIS2007 does not estimate methane (CH_4) emissions. CH_4 emissions were calculated using a reactive organic compound to CH_4 ratio of 0.0902, which was derived directly from the ARB's OFFROAD2007 model. Neither URBEMIS2007 nor OFFROAD2007 provides construction equipment nitrous oxide (N_2O) emission factors. Other models that have been developed to inventory GHG emissions, such as Clean Air and Climate Protection Software, Sustainable Communities Model, I-PLAC^{3}S, EMFAC2007, and Climate Action Registry Reporting On-Line Tool, focus on regional energy use and transportation and do not provide construction equipment N_2O emission factors. As such, N_2O emissions from construction equipment were not estimated.

Mobile Emissions

Mobile source CO_2 emissions were modeled using EMFAC2007. The N_2O and CH_4 emission rates were calculated as a ratio of daily countywide vehicle miles traveled (VMT) to daily countywide emissions. EMFAC2007 provides nitrogen oxide emissions but not N_2O emissions. N_2O emissions were calculated using an N_2O to NO_X conversion ratio of 0.048.[1] EMFAC2007 calculates CH_4 emissions based on a reactive organic gas to CH_4 conversion ratio of approximately 0.08. This ratio was used to obtain CH_4 emissions from the EMFAC2007 modeling conducted by SCAG. The N_2O and CH_4 emission rates were multiplied by the existing and future VMT to obtain GHG emissions.

Energy Use Associated with Standard Electricity Generation

GHG emissions for electricity generation were indirectly calculated as a function of electricity use. The electricity use rate for each county was based on the existing electricity consumption for residential and non-residential uses obtained from the California Energy Commission (CEC).[2] Existing dwelling units and employees in each county were used to obtain an electricity usage

[1] California Air Resources Board, *N2O Emission Factors - Estimates of Nitrous Oxide Emissions from Motor Vehicles and the Effects of Catalyst Composition and Aging, Table 8.2, June 2005.*

[2] California Energy Commission, California Electricity Consumption by County in 2005. Retrieved October 23, 2007 from http://www.energy.ca.gov/electricity/electricity_by_county_2005.html

rate per dwelling unit and employee.[3] Then, the electricity usage rate was multiplied by the correlating dwelling units and employees for each of the analyzed alternatives to obtain the total electricity use in kilowatt-hours (kWh) for each county. The emission rates for CO_2 of 8.1E-01 pounds per kWh, CH_4 of 6.7E-06 pounds per kWh, and N_2O of 3.7E-06 pounds per kWh were obtained from the California Climate Action Registry.[4]

Natural Gas Consumption

Existing natural gas use was obtained from the CEC, which provides data by utility planning area and not by county.[5] Therefore, a natural gas use rate applicable to the entire SCAG region was developed **to** forecast future natural gas consumption. Existing dwelling units and employees in each county were used to obtain a natural gas usage rate per dwelling unit and employee.[6] The natural gas use rate was multiplied by the correlating numbers for each of the analyzed alternatives to obtain the total natural gas use in standard cubic feet per year each county. The emission rates for CO_2 of 8.1E-01 grams per standard cubic feet, CH_4 of 6.7E-06 grams per standard cubic feet, and N_2O of 3.7E-06 grams per standard cubic feet were obtained from the California Climate Action Registry.[7]

Detailed calculations are on-file and available for review at SCAG offices, 818 W. 7th Street, Los Angeles, California, and copies may be obtained by contacting Jessica Kirchner at SCAG (213-236-1800).

[3] According to the latest CEC Energy Demand Forecast (2008-2018), the statewide electricity demand per capita is expected to remain constant between 2008 and 2018. Therefore, the electricity use rate was assumed to be constant for each of the analyzed years.

[4] California Climate Action Registry, *General Reporting Protocol*, March 2007.

[5] California Energy Commission, (September 2005) California Energy Demand 2006-2016 Staff Energy Demand Forecast 2005, CEC-400-2005-034-SF-ED2.

[6] According to the latest CEC Energy Demand Forecast (2008-2018), the statewide per capita consumption shows a steady decline between 2008 and 2018. The forecast for the 2008 RTP PEIR assumed a constant the natural gas use rate for each of the analyzed years, which results in a conservative estimate of future use.

[7] California Climate Action Registry, *General Reporting Protocol*, March 2007.