Appendix E
Criteria Pollutants Modeling

Emissions of Criteria Pollutants

The primary operational emissions associated with the proposed program are CO, PM10, and ozone precursors (ROG and NO_X) emitted as vehicle exhaust. The effects of project specific emissions of criteria pollutants (CO, PM10, and ozone precursors) were evaluated through the conformity process and modeling conducted using the ARB's EMFAC2007 (version 2.3) emission rate program and traffic data provided by the project traffic engineers.

The EMFAC2007 (version 2.3) Model

Emissions of criteria pollutants (CO, PM10, and ozone precursors) were evaluated using the ARB's EMFAC2007 (version 2.3) emission rate program and vehicle activity data. The EMission FACtors (EMFAC) model calculates emission rates from all motor vehicles, such as passenger cars to heavy-duty trucks, operating on highways, freeways and local roads in California. It can estimate emission rates of 1965 and newer vehicles, and provides emission rates for gasoline, diesel or electricity powered vehicles. The EMFAC2007 emissions inventory estimates are made for over one hundred different technology groups and are reported for ten broad vehicle classes segregated by usage and weight.

Emission inventories associated with the proposed project are estimated by applying emission rate data from EMFAC2007 model to vehicle activity data. EMFAC2007 can analyze up to 45 model years for each vehicle class within each calendar year; for 24 hourly periods; for each month of the year; and for each district, basin, county, and subcounty in California. EMFAC2007 estimates emission factors and emission inventories for the following primary pollutants:

- **Hydrocarbons.** Hydrocarbons can be expressed as TOG (total organic gases), ROG (reactive organic gases), THC (total hydrocarbon), or CH_4 (methane). The THC class includes compounds with hydrogen and carbon atoms only; carbonyls and halogens are not included in the class. The TOG class includes all organic gases emitted into the atmosphere. The ROG class is same as EPA's VOC (volatile organic compounds) definition and does not contain compounds exempt from regulation.

- **Carbon monoxide (CO).**

- **Nitrogen oxides (NOx).**

- **Carbon dioxide (CO2).**

- **Particulate matter (PM).** PM estimates are provided for total suspended particulate, particulate matter 10 microns or less in diameter (PM10), and particulate matter 2.5 microns or less in diameter (PM2.5).

- **Fuel consumption.** Although, this is not a pollutant, fuel consumption is calculated based on the emissions of CO, CO2, and THC using the carbon balance equation.

- **Oxides of sulfur (SOx).** Emissions of oxides of sulfur are a function of the sulfur content of fuel. The model calculates these emissions by multiplying the fuel consumption by the weight fraction of sulfur in a gallon of fuel.

- **Lead (Pb).** Lead emissions are also a function of the lead content in fuel. Hence, the model calculates lead by multiplying the fuel consumption by the number of grams of lead per gallon.

Modeling Procedures

Roadway and Traffic Conditions

Modeled traffic volumes and operating conditions were obtained from traffic data prepared by the project traffic engineers, DKS Associates (Story pers. comm.). Emissions of ozone precursors (ROG and NO_X), CO, and PM10 for were modeled for existing year (2005), 2030 No project, 2030 Project Alternative, 2030 Alternative A, and 2030 Alternative B conditions. Traffic data used in the model included peak hour vehicle miles traveled (VMT) and average speed. The data used for emissions modeling is summarized in Table 1.

Table 1. Traffic Inputs for EMFAC2007 Modeling

Scenario	Average speed	Daily VMT
Existing	28	213,937
2030 No Project	28	334,567
2030 Project Alternative	28	334,636
2030 Alternative A	28	340,370
2030 Alternative B	28	334,636

Source: DKS Associates 2007.

Vehicle Emission Rates. Vehicle emission rates were determined using the ARB's EMFAC2007 (version 2.3) emission rate program. Traffic speeds were calculated from traffic data provided by the project traffic engineers, DKS Associates (Story pers. comm.). The program assumed Monterey County regional traffic data operating during the winter months for CO and summer for ozone precursors and PM10, as CO concentrations are typically higher during the colder winter months, and ozone concentrations are typically higher during the warmer summer months. A mean January temperature of 43 degrees Fahrenheit, mean September temperature of 72 degrees Fahrenheit, and humidity of 30% were assumed.

Reference

Story, Joseph A. Principal. DKS Associates, Oakland, CA. February, 2007 – email to Rich Walter, Jones & Stokes.