Air Quality Conformity

TTP220
G.C. Sciara
4/30/12
Pollutants of Concern

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO₂)
- Ozone (O₃)
  - Volatile Organic Compounds (VOC)
  - Oxides of Nitrogen (NOₓ)
- Oxides of Sulfur (SOₓ)
- Fine Particulates (PM₁₀, PM₂.₅)
- Lead (Pb)
- Toxic Air Contaminants
U.S. Sources of Carbon Monoxide

EPA, 1997
Ozone = \((\text{VOCs} + \text{NO}_x + \text{heat} + \text{sun})\)

- Formed in atmosphere by photochemical reactions
- Colorless and odorless at low concentrations
- Strong lung, throat, and eye irritant
- Decreases lung function
- Increases respiratory problems, asthma, hospitalization, and contributes to heart disease
- Contributes to 80,000 premature deaths/year in CA
U.S. Sources of Oxides of Nitrogen

- Fuel Combustion - Electric Utility: 26%
- Fuel Combustion - Industrial: 14%
- Non-Road Engines and Vehicles: 30%
- On-Road Vehicles: 19%
- Fuel Combustion - Other: 6%
- All Other: 5%

EPA, 1997
U.S. Sources of VOCs
Non-methane Hydrocarbons (NMHCs)

- On-Road Vehicles: 27%
- Non-Road Engines and Vehicles: 13%
- Storage and Transport: 7%
- Solvent Utilization: 34%
- All Other: 11%

EPA, 1997
## NAAQS

### National Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Primary Std.</th>
<th>Averaging Times</th>
<th>Secondary Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>9 ppm (10 mg/m³)</td>
<td>8-hour&lt;sup&gt;1&lt;/sup&gt;</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>35 ppm (40 mg/m³)</td>
<td>1-hour&lt;sup&gt;1&lt;/sup&gt;</td>
<td>None</td>
</tr>
<tr>
<td>Lead</td>
<td>1.5 µg/m³</td>
<td>Quarterly Average</td>
<td>Same as Primary</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>0.053 ppm (100 µg/m³)</td>
<td>Annual (Arithmetic Mean)</td>
<td>Same as Primary</td>
</tr>
<tr>
<td>Particulate Matter (PM&lt;sub&gt;10&lt;/sub&gt;)</td>
<td>50 µg/m³</td>
<td>Annual&lt;sup&gt;2&lt;/sup&gt; (Arith. Mean)</td>
<td>Same as Primary</td>
</tr>
<tr>
<td></td>
<td>150 µg/m³</td>
<td>24-hour&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Particulate Matter (PM&lt;sub&gt;2.5&lt;/sub&gt;)</td>
<td>15.0 µg/m³</td>
<td>Annual&lt;sup&gt;2&lt;/sup&gt; (Arith. Mean)</td>
<td>Same as Primary</td>
</tr>
<tr>
<td></td>
<td>65 µg/m³</td>
<td>24-hour&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Ozone</td>
<td>0.08 ppm</td>
<td>8-hour&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Same as Primary</td>
</tr>
<tr>
<td>Sulfur Oxides</td>
<td>0.03 ppm</td>
<td>Annual (Arith. Mean)</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>0.14 ppm</td>
<td>24-hour&lt;sup&gt;1&lt;/sup&gt;</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>------</td>
<td>3-hour&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0.5 ppm (1300 µg/m³)</td>
</tr>
</tbody>
</table>

Source: http://www.epa.gov/air/criteria.html
Pollutants for Which a Regional Emissions Analysis Is Required*

<table>
<thead>
<tr>
<th>Area Designation</th>
<th>Pollutant Precursor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone Areas</td>
<td>VOC, NOx</td>
</tr>
<tr>
<td>CO Areas</td>
<td>CO</td>
</tr>
<tr>
<td>PM10 Areas</td>
<td>PM10, VOC, NOx</td>
</tr>
<tr>
<td>PM2.5 Areas</td>
<td>PM2.5, NOx, VOC, SOx, Ammonia</td>
</tr>
<tr>
<td>NO2 Areas</td>
<td>NOx</td>
</tr>
</tbody>
</table>

Intergovernmentalism in U.S. Transport

Federal

State

Regional

Local

$ with strings attached

Proposed projects

State System

Regional System

Local System
What Is Transportation Conformity?

Transportation Conformity Reference Guide
Revised 2010

Transportation conformity is a way to ensure that Federal funding and approval are given to those transportation activities that are consistent with air quality goals. It ensures that these transportation activities do not worsen air quality or interfere with the "purpose" of the SIP, which is to meet the NAAQS. Meeting the NAAQS often requires emissions reductions from mobile sources.

Source: http://www fhwa dot gov/environment/conformity/ref_guid/index htm
Subject to Conformity?

Where:
• AQ non-attainment areas
• AQ maintenance areas

What:
• Long Range Plan (LRP / RTP / MTP)
• Short-term Transp. Improvement Program (TIP)
• Projects with FHWA, FTA funding
SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations and federal controls. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel regulations and limits on emissions from consumer products. State law makes ARB the lead agency for all purposes related to the SIP. Local air districts and other agencies, such as the Bureau of Automotive Repair and the Department of Pesticide Regulation, prepare SIP elements and submit them to ARB for review and approval. ARB forwards SIP revisions to the U.S. Environmental Protection Agency (U.S. EPA) for approval and publication in the Federal Register. The Code of Federal Regulations Title 40, Chapter I, Part 52, Subpart F, Section 52.220 lists all of the items which are included in the California SIP. At any one time, several California submittals are pending U.S. EPA approval.

Source: [http://www.arb.ca.gov/planning/sip/background.htm](http://www.arb.ca.gov/planning/sip/background.htm) (2009)
**Table 3-1 Example County Emission Budget Calculation for 2010**

(tons per average annual day)

<table>
<thead>
<tr>
<th></th>
<th>PM10</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions Baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline EMFAC2002</td>
<td>1.5</td>
<td>30.1</td>
</tr>
<tr>
<td>I/M Improvements/Expansion</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Reentrained road dust (paved)</td>
<td>13.7</td>
<td>--</td>
</tr>
<tr>
<td>Reentrained road dust (unpaved)</td>
<td>0.9</td>
<td>--</td>
</tr>
<tr>
<td>Road Construction Dust</td>
<td>4.6</td>
<td>--</td>
</tr>
<tr>
<td>Adjusted Baseline</td>
<td>20.7</td>
<td>29.5</td>
</tr>
<tr>
<td><strong>Control Measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Commitmentsreesome</td>
<td>0.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Local Commitments</td>
<td>4.6</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Conformity Emission Budgets</strong></td>
<td>16.2</td>
<td>27.0</td>
</tr>
</tbody>
</table>

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*The State and Local commitments are for emissions reductions basin-wide. To support the development of transportation conformity budgets, ARB and District staff estimated the county-level emission benefits of the commitments. All data is rounded to the nearest tenth.*
Section 93.124(e) of the federal conformity rule indicates that nonattainment areas with more than one MPO may establish motor vehicle emission budgets for each MPO in the implementation plan. As a result, County-level emission budgets are provided in this plan. The budgets are derived starting with projections from ARB's EMFAC2002 on-road mobile source emission factor model. These are adjusted to account for any baseline emission reductions not included in the model and any emissions that the model does not project (e.g., road dust). Finally, the County-level emission reductions from local and State control measures², as committed to in this plan are subtracted from the adjusted baseline to arrive at the conformity budgets.
Exhibit 3-1
Transportation Control Measures

i. programs for improved public transit;
ii. restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high-occupancy vehicles (HOV);
iii. employer-based transportation management plans, including incentives;
iv. trip-reduction ordinances;
v. traffic flow improvement programs that achieve emissions reductions;
vi. fringe and transportation corridor parking facilities serving multiple-occupancy vehicle programs or transit service;
vii. programs to limit or restrict vehicle use in downtown areas or other areas of emissions concentration particularly during periods of peak use;
viii. programs for the provision of all forms of high-occupancy, shared-ride services;
ix. programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place;
x. programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas;
xii. programs to limit or restrict portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place;
xii. programs to control extended idling of vehicles;
xii. programs to reduce motor vehicle emissions which are caused by extreme cold-start conditions;
xiii. employer-sponsored programs to permit flexible work schedules;
xiv. programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity;
xv. programs for new construction and major reconstruction of paths, tracks, or areas solely for use by pedestrian or other non-motorized means of transportation when economically feasible and in the public interest. For purposes of this clause, the Administrator shall also consult with the Secretary of the Interior; and
xvi. programs to encourage the voluntary removal from use and the marketplace of pre-1980 model year light duty vehicles and pre-1980 model light duty trucks. *

*Note: Excluded from CMAQ Funding under Title 23 U.S.C. Section 149

Types of Projects That May Advance During a Conformity Lapse

During a conformity lapse, only the following six types of transportation projects may proceed for purposes of funding and implementation:

1. TCMs in Approved SIPs;
2. Non-Regionally Significant Non-federal Projects;
3. Regionally Significant Non-federal Projects - only if the project was approved by all necessary non-federal entities before the lapse. (See Approval of a Regionally Significant Non-Federal Project by a Non-Federal Entity later in this Chapter.)
4. Project phases (i.e., design, right-of-way acquisition, or construction) that received funding commitments or an equivalent approval or authorization prior to the conformity lapse.
5. Exempt Projects - identified under 40 CFR §93.126 and 40 CFR §93.127; and,
6. Traffic Synchronization Projects - however, these projects must be included in subsequent regional conformity analysis of MPO’s transportation plan/TIP under 40 CFR §93.128.

Table 2. - Exempt Projects

SAFETY
Railroad/highway crossing.
Hazard elimination program.
Safer non-Federal aid system roads.
Shoulder improvements.
Increasing sight distance.
Safety improvement program.
Traffic control devices and operating assistance other than signalization projects.
Railroad/highway crossing warning devices.
Guardrails, median barriers, crash cushions.
Pavement resurfacing and/or rehabilitation.
Pavement marking demonstration.
Fencing.
Skid treatments.
Safety roadside rest areas.
Adding medians.
Truck climbing lanes outside the urbanized area.
Lighting improvements.
Widening narrow pavements or reconstructing bridges (no additional travel lanes).
Emergency truck pullovers.

MASS TRANSIT
Operating assistance to transit agencies.
Purchase of support vehicles.
Rehabilitation of transit vehicles.
Purchase of office, shop, and operating equipment for existing facilities.
Purchase of operating equipment for vehicles (e.g., radios, fare boxes, lifts, etc.).
Construction or renovation of power, signal, and communications systems.
Construction of small passenger shelters and information kiosks.
Reconstruction or renovation of transit buildings and structures (e.g., rail or bus buildings, storage and maintenance facilities, stations, terminals, and ancillary structures).
Rehabilitation or reconstruction of track structures, track, and track bed in existing rights-of-way.
Purchase of new buses and rail cars to replace existing vehicles or for minor expansions of the fleet.
Construction of new bus or rail storage/maintenance facilities categorically excluded in 23 CFR part 771.

Table 2. - Exempt Projects

**AIR QUALITY**
Continuation of ride-sharing and van-pooling promotion activities at current levels.
Bicycle and pedestrian facilities.

**OTHER**
Specific activities which do not involve or lead directly to construction, such as:
Planning and technical studies.
Grants for training and research programs.
Planning activities conducted pursuant to titles 23 and 49 U.S.C.
Federal aid systems revisions.
Engineering to assess social, economic, and environmental effects of the proposed action or alternatives to that action.
Noise attenuation.
Emergency or hardship advance land acquisitions (23 CFR §710.503).
Acquisition of scenic easements.
Plantings, landscaping, etc.
Sign removal.
Directional and informational signs.
Transportation enhancement activities (except rehabilitation and operation of historic transportation buildings, structures, or facilities).
Repair of damage caused by natural disasters, civil unrest, or terrorist acts, except projects involving substantial functional, locational or capacity changes.

*(Note: In PM-10 -nonattainment or maintenance areas, such projects are exempt only if they are in compliance with control measures in the applicable implementation plan.)*

Transportation Conformity

Due to litigation in other parts of the country, the Federal Highway Administration has become sensitive to the issue of applying the most current vehicle fleet information to a region’s transportation conformity analysis. The current SIP’s fleet information is about 10 years old. The Sacramento Area Council of Governments (SACOG) is the agency responsible for demonstrating transportation conformity in our region. SACOG estimates that applying the most recent fleet data to our existing models would result in a conformity lapse.

The state Air Resources Board, SACOG, U.S.EPA and FHWA have negotiated approval to use the 1994 vehicle fleet data through December 31, 2002. After that time, conformity findings can be made only if the new fleet data is used. This means that the transportation plans and transportation improvement programs now in place for our region, as well as 21 other air districts in the state, cannot be changed until the region has a new clean air plan. The Sacramento region, unlike others in the state, is not required to update the SIP before the 8-hour ozone plans are due in 2006. However, since a conformity lapse began October 4, 2004, an expedited process to prepare a plan is underway.

Source: http://www.airquality.org/cleanairplan/index.shtml#transpconf
April 7, 2006

Mr. Gene K. Fong, Division Administrator
U.S. Federal Highway Administration
980 Ninth Street, Suite 400
Sacramento, CA 95814-2724

Mr. Leslie Rogers, Regional Administrator
Federal Transit Administration, Region IX
201 Mission St, Suite 2110
San Francisco, CA 94105

Ms. Lisa Hans, Chief
Mobile Sources Section
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

Ms. Jody Jones, District Director
Colusa District 03
P.O. Box 911
Marysville, CA 95901

Re: Transmittal of the Air Quality Conformity Determinations on the 2006 Metropolitan Transportation Plan (MTP) and 2006/08 Metropolitan Transportation Improvement Program (MTIP) for the Sacramento Ozone (ROG and NOx) Nonattainment Area, Carbon Monoxide (CO) Maintenance Area, and Particulate Matter (PM-10) Moderate Nonattainment Area.

Dear Messrs. Fong and Rogers and Mes. Hans and Jones:

The following air quality conformity determinations on the 2006 MTP (Attachment A), and the 2006/08 MTIP (Attachment B) for the Sacramento Ozone (ROG and NOx) Nonattainment Area, Carbon Monoxide (CO) Maintenance Area, and Particulate Matter (PM-10) Moderate Nonattainment Area are hereby transmitted to you for your review and approval. The SACOG Board of Directors approved the attached conformity determinations at its March 16, 2006, meeting.

The attached air quality conformity determinations have been prepared in accordance with the conformity requirements as published in the federal register on August 13, 1997, and in accordance with USDOT's January 2, 2002, guidance, Revised Guidance for Implementing the March 1999 Circuit Court Decision Affecting Transportation Conformity (93.169).

Source: http://www.sacog.org/publications/Air%20Quality%20Conformity%20Determinations,%202006%20MTP%20and%202006-08%20MTIP.pdf
The 2006 MTP, which was adopted March 16, 2006, will be in effect until the MTP2030 is adopted in 2007. It restores many projects that could not be implemented while the region was in an air quality conformity lapse.
LEVEL 2: EMISSIONS ESTIMATES

Travel-Demand Estimation Model

Vehicle Miles of Travel and Average Speeds

\[\text{Travel-Demand Estimation Model} \times \text{MOBILE Model} = \text{On-Road Mobile Emissions Estimates}\]

MOBILE Model

Emissions Rates by Speed and Vehicle Type

On-Road Mobile Emissions Estimates

Volatile Organic Compounds, Carbon Monoxide, Nitrogen Oxides, and Primary Particulate Matter

Uses:
National Regulatory Strategies
SIP Control Strategies/Rate of Progress
Transportation Conformity
Transportation Control Measure Effectiveness
National Environmental Policy Act/Evaluation of Major Capital Investments

LEVEL 3: AIR-QUALITY ESTIMATES

Travel-Demand Estimation Model
Vehicle Miles of Travel and Average Speeds

MOBILE Model
Emissions Rates by Speed and Vehicle Type

On-Road Mobile Emission Estimates
Volatile Organic Compounds, Carbon Monoxide, Nitrogen Oxides, and Primary Particulate Matter

Speciation Model

Biogenics
Non-Road Mobile
Area Source
Stationary Source
Meteorology Input Data

Dispersion Model
Air-Quality Model Emissions by Grid and Time of Day

Carbon Monoxide Concentrations
Ozone and Particulate Concentration Levels by Time and Location

Uses:
SIP Demonstration of Attainment
National Environmental Policy Act/Evaluation of Major Capital Investments
CO, O₃, and Particulate-Centention Evaluation

LEVEL 4: HEALTH IMPACTS ESTIMATES

On-Road Mobile Emissions Estimates
- Volatile Organic Compounds, Carbon Monoxide, Nitrogen Oxides, and Primary Particulate Matter
  - Biogenics
  - Non-Road Mobile
  - Area Source
  - Stationery Source
  - Meteorology Input Data

Dispersion Model
- Air-Quality Model Emissions by Grid and Time of Day
  - Exposure/Response Model
    - Distribution of Sensitivity to Exposure
      - Exposure Model
        - Population Characteristics by Exposure and Time
          - Health Impacts

Carbon Monoxide Concentrations
- Ozone and Particulate Concentration Levels by Time and Location

Uses: Assessment of health impacts

Overview of Carbon Monoxide SIP Emissions Modeling

Source: http://www.epa.gov/otaq/models/mobile6/trng5day/sldday1.pdf
1.2.1 MOBILE 6 Input Parameters

- Calendar year
- Month (January, July)
- Hourly Temperature
- Altitude (high, low)
- Weekend/weekday
- Fuel characteristics (Reid vapor pressure, sulfur content, oxygenate content, etc.)
- Humidity and solar load
- Registration (age) distribution by vehicle class
- Annual mileage accumulation by vehicle class
- Diesel sales fractions by vehicle class and model year
- Average speed distribution by hour and roadway
- Distribution of vehicle miles traveled by roadway type
- Engine starts per day by vehicle class and distribution by hour
- Engine start soak time distribution by hour
- Trip end distribution by hour
- Average trip length distribution
- Hot soak duration
- Distribution of vehicle miles traveled by vehicle class
- Full, partial, and multiple diurnal distribution by hour
- Inspection and maintenance (I/M) program description
- Anti-tampering inspection program description
- Stage II refueling emissions inspection program description
- Natural gas vehicle fractions
- HC species output
- Particle size cutoff
- Emission factors for PM and HAPs
- Output format specifications and selections
# Mobile Source Emissions

### Table 1
Basic categories of mobile source emissions

<table>
<thead>
<tr>
<th>Categories</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running exhaust</td>
<td>Tailpipe emissions under hot stabilized conditions</td>
</tr>
<tr>
<td>Starts</td>
<td>Incremental tailpipe emissions associated with starting a vehicle</td>
</tr>
<tr>
<td>Hot soaks</td>
<td>Evaporative emissions resulting from engine compartment heating after the vehicle (and cooling system) are shut off</td>
</tr>
<tr>
<td>Diurnals</td>
<td>Evaporative emissions resulting from increasing fuel vapor pressure as the ambient temperature increases (plastic and rubber components off gassing also contribute). Modern vehicles have an activated carbon canister that is intended to capture/control evaporative emissions. There are two sub categories: (a) &quot;partial day&quot; or &quot;controlled&quot; where the carbon canister has not been saturated and (b) &quot;multi-day&quot; or &quot;uncontrolled&quot; diurnals where a portion of the vehicle fleet is assumed to have sat long enough that the carbon canister has become saturated.</td>
</tr>
<tr>
<td>Resting loss</td>
<td>Evaporative emissions, similar to diurnals, resulting from temperature drops (i.e., fuel vapor pressure is declining). Resting losses are subdivided into partial day and multi day categories using the same logic as diurnals</td>
</tr>
<tr>
<td>Running loss</td>
<td>Evaporative hydrocarbons emitted when a vehicle is in operation</td>
</tr>
</tbody>
</table>

Source: Niemeier, Zheng, Kear, 2004