Developing Regulatory Approaches for Traffic-related Air Pollution Hot Spots

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Assessment and Mitigation of Roadway Air Pollution Impacts on Sensitive Uses: Background

- State and National air quality standards concern limited pollutants
- Regional monitoring does not capture intra-urban variation in exposure
- Regulations limit tailpipe emissions per mile but not vehicle intensity
- Local agencies do not regulate air quality land use conflicts related to high volume roadways

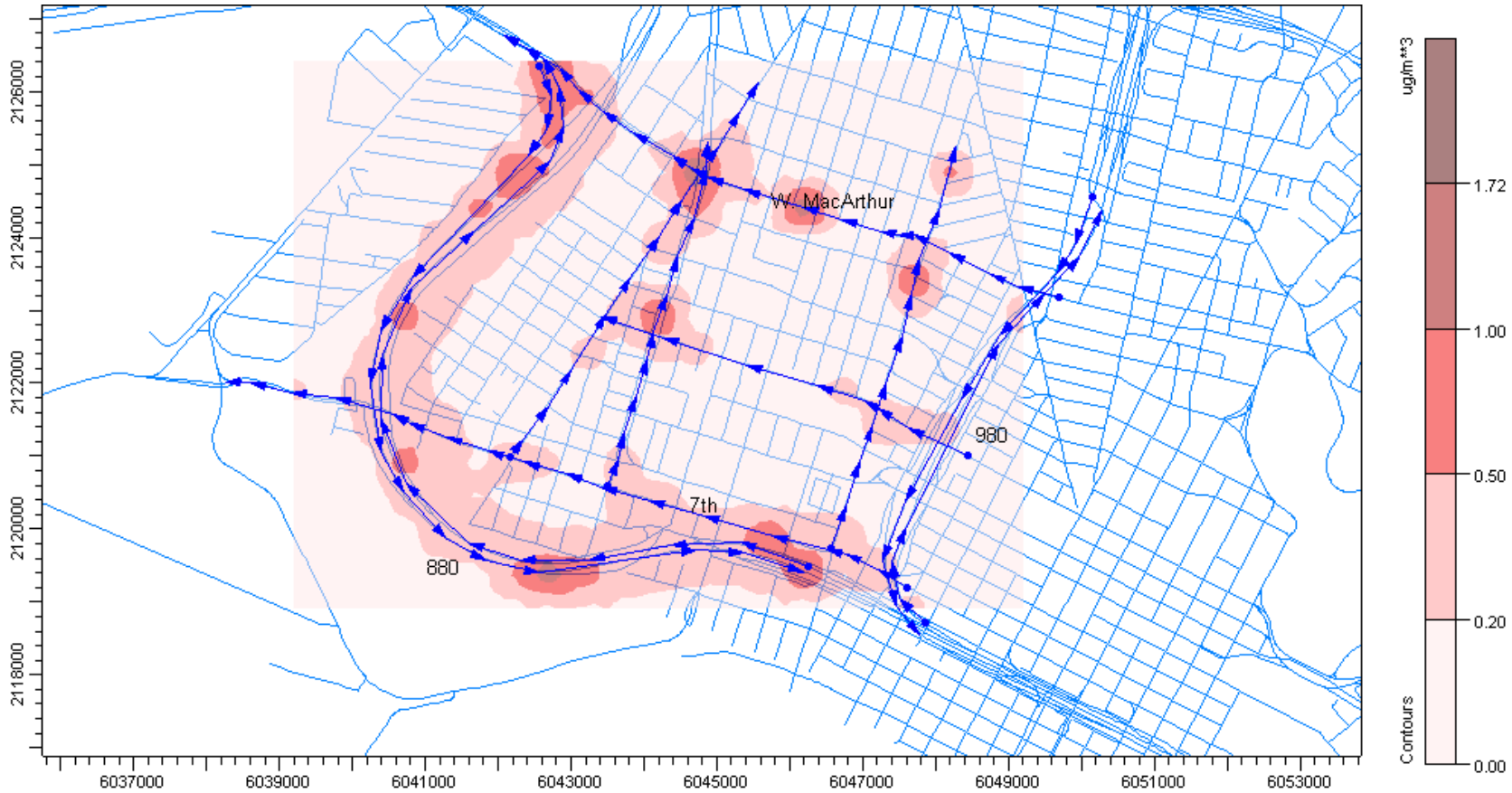
Living near busy roadways Adversely Impacts Lungs and Causes Respiratory Disease

- In Oakland California, school children at schools in proximity to high volume roadways experienced more asthma and bronchitis symptoms.
- In San Diego, children with asthma living with 550 feet of high traffic flows were more likely than those residing near lower traffic flows to have more medical care visits for asthma.
- In Southern California, School Children living within 75 m of a major road was associated with an increased risk of lifetime asthma, prevalent asthma, and wheeze.
- In 12 southern California communities, children who lived with 500 meters of a freeway had reduced growth in lung capacity relate to those living greater than 1500 feet from the freeway.
- In a study of German adults, residence within 200 meters of a major road predicted coronary artery calcification. Residence within 150 meters of a major road predicted manifest coronary heart disease.

Available Health Effects Assessment Methods For Air Quality Assessment

- Dose response functions can associate area-level air quality exposures with health effects
- Air quality dispersion models and other techniques can assess roadway related air quality exposure based on:
  - Vehicle Flow, Speed
  - Emissions
  - Meteorology
  - Relationship between Facilities and Sensitive Receptors

Spatial Extent of Vehicle $PM_{2.5}$ All Vehicle Sources using CAL3QHCR—West Oakland, CA



Estimating Mortality Impacts From Exposure to $PM_{2.5}$ based on CARB CR Functions

$$\text{Mortality} = R_0 \bullet [exp^{(-\beta * \Delta PM2.5 - 1)}] \bullet P$$

- R_0 = Baseline Mortality Rate
- β = Coefficient Derived from Relative Risk
- P = Affected Population

Health Benefits of Reducing PM 2.5 Exposure in California (CARB, 2002)

Health Benefits of Reducing Ambient $PM_{2.5}$ to Natural Background Levels for California

Health Outcome	Estimated Benefits of Exposure Reduction
Mortality from Long Term Exposures in people over	9391premature deaths /year
Mortality from Short Term Exposures in all ages	4014premature deaths /year
Chronic Bronchitis	11,414 cases /year
COPD Hospitalizations	1241 hospitalizations /year
Pneumonia Hospitalizations	1791 hospitalizations /year
Cardiovascular Hospitalizations	3180 hospitalizations /year
Asthma Hospitalizations	950 hospitalizations /year
Acute Bronchitis in ages 8-12	32,923 cases/year
Asthma Attacks	344,532 cases/year
Work Loss Days	2,923,535

Current Regulatory Approach in San Francisco Under CEQA

- Identify Areas with Potential Conflicts
- Establish an PM 2.5 based Action Level for Mitigation
- Conduct Site Specific Air Quality Assessment
- Require Design and Ventilation Standards to Preserve Indoor Air Quality

Proposed San Francisco Legislation ARTICLE 38, SF HEALTH CODE

- Roadway Exposure Zone Map
- Project Modeling (0.2 ug/m3 roadway PM 2.5
- Engineered Ventilation/ Filtration Mitigation (80% reduction total PM 2.5)
- Notification to buyer and informational plaque

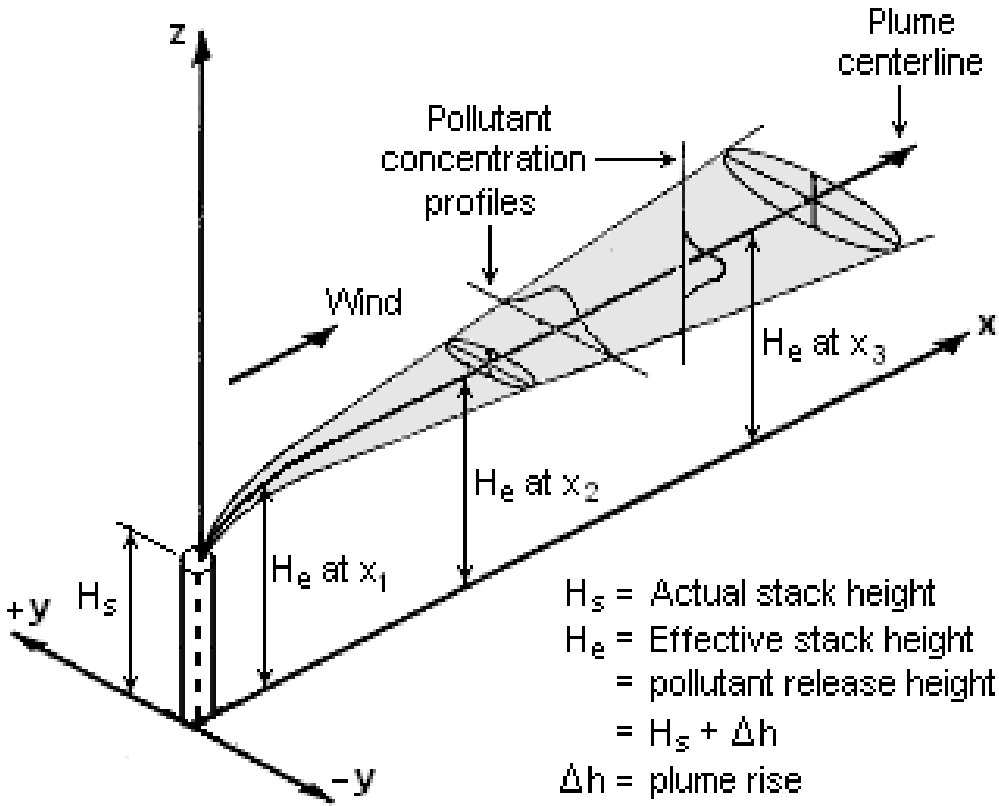
Air Quality Modeling: Data Needs

- Traffic Count and Type (SF CHAMP)
- Emissions: EMFAC 2007
- Models: Dispersion and Canyon
- Meteorology: Mission Bay, Sewage Treatment Plant or Fort Funston

EMFAC 2007-Emissions

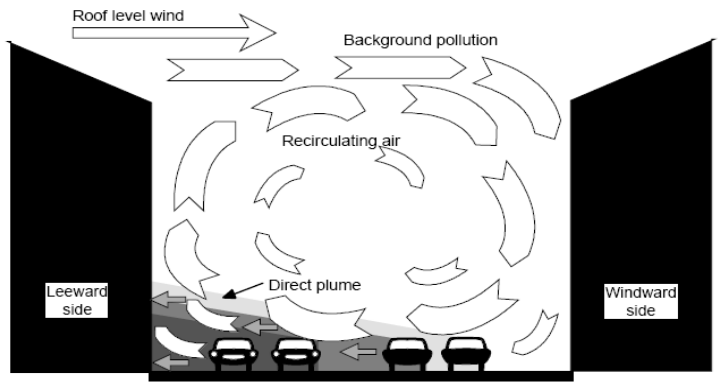
- Title : Poderlocal
- Version : Emfac2007 V2.3 Nov 1 2006
- Run Date : 2007/10/30 10:13:51
- Scen Year: 2007 -- All model years in the range 1965 to 2007 selected
- Season : Winter
- Area : San Francisco
- ********** **********
- Year: 2007 -- Model Years 1965 to 2007 Inclusive -- Winter
- Emfac2007 Emission Factors: V2.3 Nov 1 2006
- County Average San Francisco County Average
- Table 1: Running Exhaust Emissions (grams/mile)
- Pollutant Name: PM2.5 Temperature: 50F Relative Humidity: 50%
- Speed
- MPH LDA LDT MDT HDT UBUS MCY ALL
- 25 0.011 0.018 0.024 0.275 0.276 0.026 0.027

Gaussian Dispersion Modeling CAL3QHCR (PM) and Caline 4 (NO2)

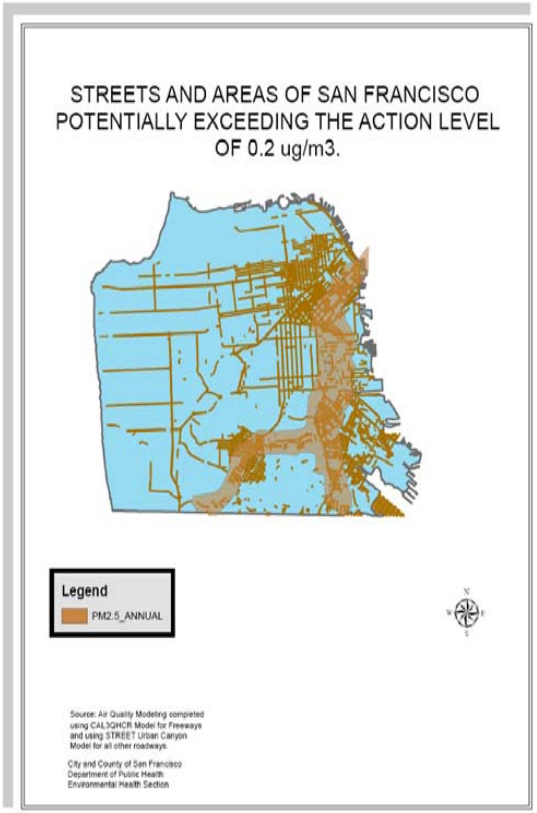


Urban Canyon Modeling

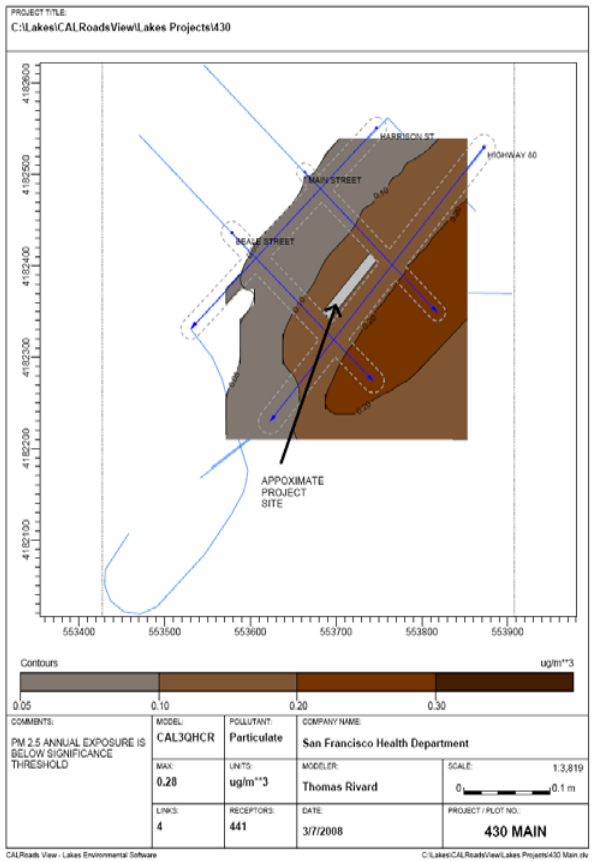
- San Francisco has urban canyons which trap vehicle emissions
- Roadway Exposure map uses Street-SRI Canyon Model (Johnson, 1973). OSPM planned in the future.
- Analysis of route traveled each day will permit exposure calculations

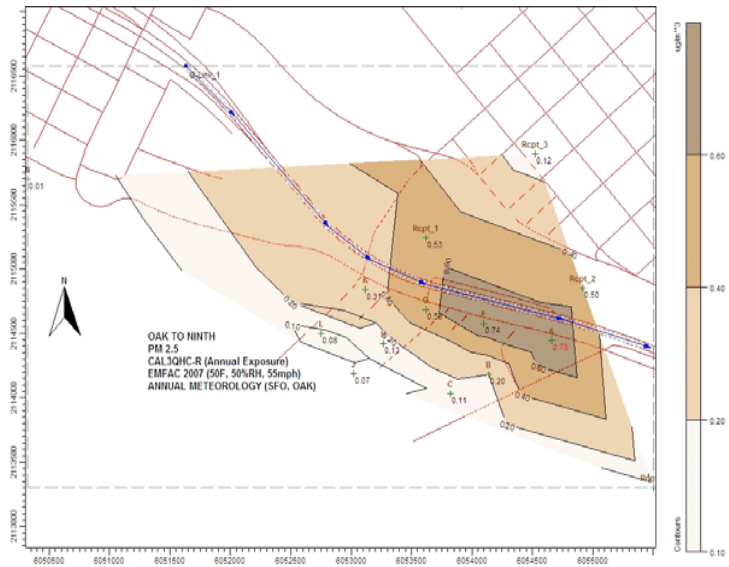


Roadway Exposure Zone Map and Hot Spot Identification - PM 2.5



Local Project Analyses





Design and Mitigation to Prevent Hot Spot Health Effects

- Relocate project away from traffic
- Relocate traffic, especially truck routes
- Design project to minimize use of automobile
- Locate air intakes away from traffic
- Provide filtration

Filtration and recirculation

- MERV 13 Filtration of all intake air
- Recirculation of air MERV 13 filtration
- Pressurization of dwelling units to prevent infiltration.
- Strategic location of intake air

Decentralize Air Filtration

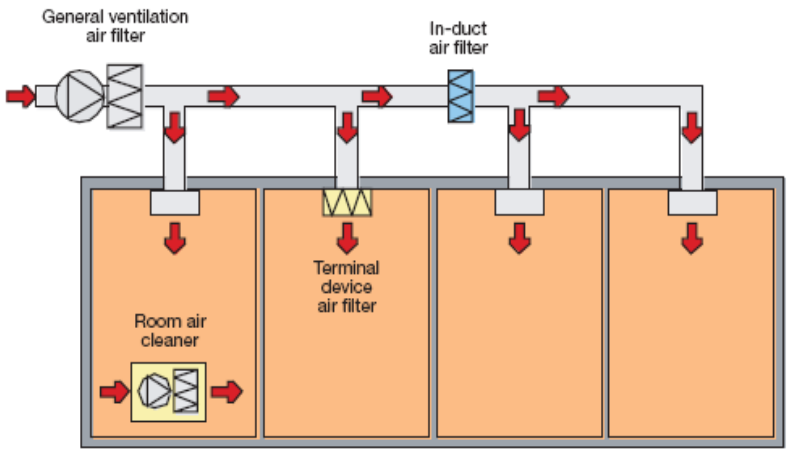
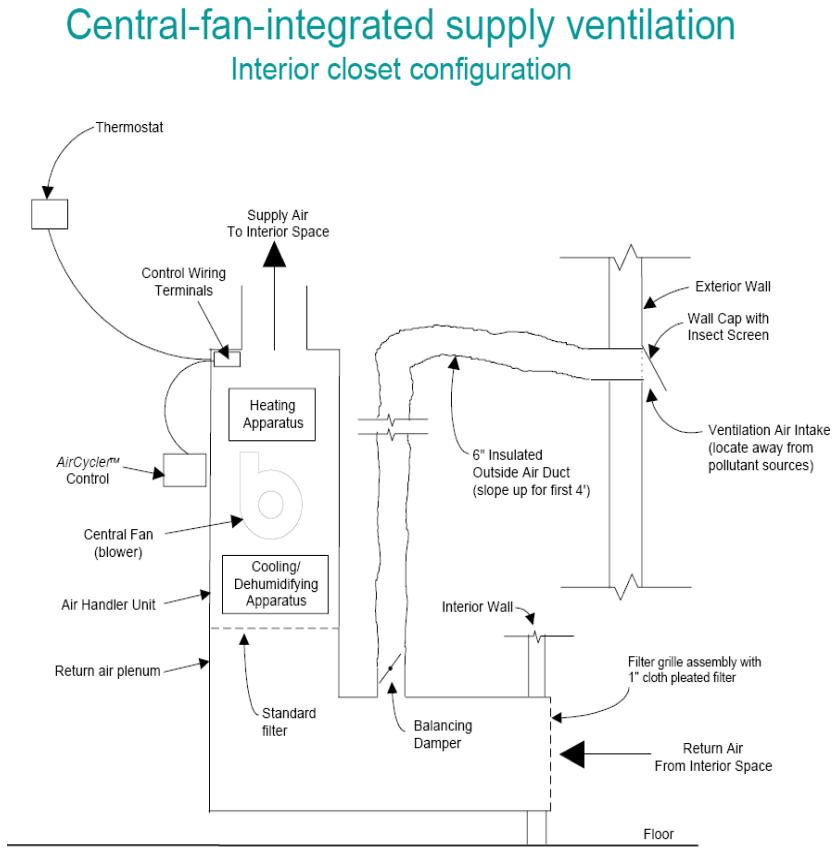


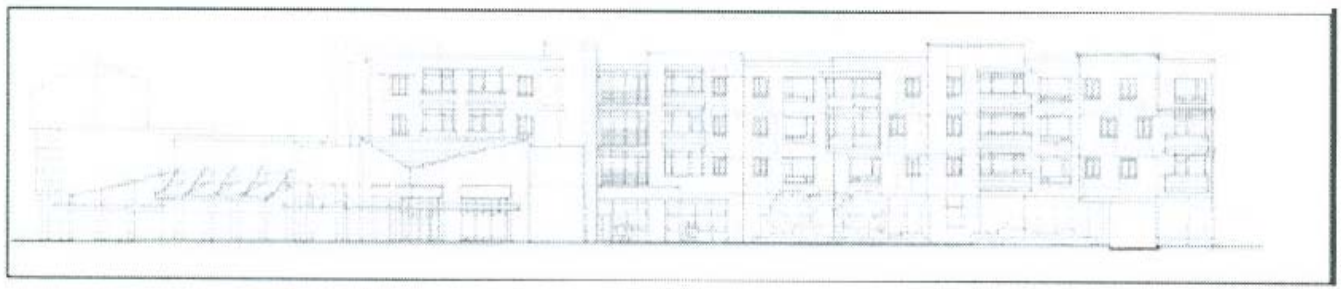
Figure 17. Decentralised air filtration.

Interior Closet Central Fan



55 Unit, 4 story, Affordable Senior Housing

Jack London Gateway Phase 2
Senior Housing and Retail Expansion



Installation and Maintenance Costs

- $40-70K, or about $1000 per unit (Guttman and Blaevoet, 2007)
- $4-11 per month filter cost and replacement depending upon size of dwelling (Fisk, 2001)
- Electricity for continuous operation of HVAC fan $6/month (Fisk, 2001

Value of a Precautionary Approach

- Effective compliance with California Building Code, Section 1207, Noise Transmission without Z-ducts
- Compliance with Planning Mandates to Protect Public Health
- Children's Health and Development
- Medical and hospitalization costs
- Environmental Justice