Appendices

Appendix FEIR-A

Draft EIR Comment Letters

STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH
STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

June 14, 2016

RECEIVED
CITY OF LOS ANGELES
JUN 20 2016
ENVIRONMENTAL
UNIT

Alejandro Huerta
City of Los Angeles
200 N. Spring Street, Room 750
Los Angeles, CA 90012

Subject: Landmark Apartments Project
SCH#: 2014031014

Dear Alejandro Huerta:

The State Clearinghouse submitted the above named Draft EIR to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on June 13, 2016, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

Document Details Report
State Clearinghouse Data Base

SCH# **2014031014**
Project Title Landmark Apartments Project
Lead Agency Los Angeles, City of

Type **EIR** Draft EIR

Description Douglas Emmett Management, LLC, would consist a 34-story residential building containing up to 376 multi family dwelling units and an approximate 18,000 sf privately maintained, publicly accessible open space area on a 2.8 acre site in the West Los Angeles Community of the City of Los Angeles. The project site currently includes a 42,900 sf supermarket building, which would be demolished under the project; a 364,791- sf office building; and a four level subterranean parking structure spanning the entire project site. The project proposes the partial demolition and reconstruction of a portion of the four level subterranean parking structure. In total, the project would remove approximately 42,900 sf of existing floor area and construct approximately 360,291 sf of new floor area, for an increase of 317,391 sf of net new floor area.

Lead Agency Contact

Name Alejandro Huerta
Agency City of Los Angeles
Phone (213) 978-1454 ***Fax***
email
Address 200 N. Spring Street, Room 750
City Los Angeles ***State*** CA ***Zip*** 90012

Project Location

County Los Angeles
City Los Angeles, City of
Region
Lat / Long 34° 02' 54" N / 118° 27' 43" W
Cross Streets Wilshire Blvd. between Stoner Ave. ahd Granville Ave
Parcel No. 4263-008-062
Township 1S ***Range*** 16W ***Section*** ***Base***

Proximity to:

Highways I-405, I-10, SR-2
Airports
Railways
Waterways
Schools Brockton ES, Emerson MS, University HS
Land Use Retail and Office/[Q]C2 2 CDO (Qualified Commercial, Height District 2, Community Design Overlay)/General Commercial

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Project Issues Aesthetic/Visual; Air Quality; Drainage/Absorption; Flood Plain/Flooding; Geologic/Seismic; Noise; Public Services; Recreation/Parks; Schools/Universities; Sewer Capacity; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Traffic/Circulation; Water Quality; Water Supply; Growth Inducing; Landuse; Cumulative Effects; Other Issues

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Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 5; Department of Parks and Recreation; Department of Water Resources; Office of Emergency Services, California; California Highway Patrol; Caltrans, District 7; Regional Water Quality Control Board, Region 4; Native American Heritage Commission

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Date Received 04/28/2016 ***Start of Review*** 04/28/2016 ***End of Review*** 06/13/2016

Note: Blanks in data fields result from insufficient information provided by lead agency.

DEPARTMENT OF TRANSPORTATION
DISTRICT 7-OFFICE OF TRANSPORTATION PLANNING
100 S. MAIN STREET, MS 16
LOS ANGELES, CA 90012
PHONE (213) 897-9140
FAX (213) 897-1337
www.dot.ca.gov

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Governor's Office of Planning & Research
JUN 13 2016
STATE CLEARINGHOUSE
clear 6/13/16

June 13, 2016

Mr. Alejandro Huerta
City of Los Angeles
Department of City Planning
200 North Spring Street, Room 750
Los Angeles, CA 90012

RE: Landmark Apartments Project
Draft Environmental Impact Report
SCH #2014031014, IGR #160455-FL
Vic. LA/ 405/ PM 31.73

Dear Mr. Huerta:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced project. The proposed project includes construction of a 34 story residential building containing up to 376 multi-family dwelling units and an approximately 18,000-square foot, privately maintained, publicly accessible open space area on a 2.8-acre site in the West Los Angeles Community of the City of Los Angeles.

The project proposes to demolish and reconstruct a portion of the four-level subterranean parking structures, the existing contains 1,321 parking spaces, so 365 existing parking spaces would be removed and 166 new spaces would be constructed, for a total of 1,122 parking spaces on-site. Currently, the project site is occupied by 42,900-square foot, single-story supermarket building, which would be demolished under the project; a 364,791-square foot, 17-story office building, which would remain under the project.

In view of SB 743, the Governor's Office of Planning and Research (OPR) is working to develop an alternative to LOS for evaluating transportation impacts pursuant to CEQA. Once the Office of Planning and Research (OPR) provides new guidance, Caltrans hopes to collaborate with the City to adopt methods of traffic analysis and new thresholds that are mutually acceptable.

In the meantime, Caltrans asks for verification of the existing Level of Service (LOS) information throughout the report using Performance Measurement System (PeMS) to reflect the correct data, and recommends that Density and Speed be included in the calculation rather than V/C, as it is not a sufficient method to determine the LOS.

Caltrans acknowledges the Project's objectives to encourage pedestrian activities, enhance walkability, and provide adequate on-site vehicle and bicycle parking, and a sustainable development consistent with the principles of smart growth.

Caltrans continues to strive to improve its standards and processes to provide flexibility while maintaining the safety and integrity of the State's transportation system. It is our goal to implement strategies that are in keeping with our mission statement, which is to "*provide a safe, sustainable, integrated, and efficient transportation system to enhance California's economy and livability.*"

Good geometric and traffic engineering design to accommodate bicyclists and pedestrians are critical at every on and off ramp and freeway terminus intersection with local streets. Caltrans will work with the City to look for every opportunity to develop projects that improve safety and connectivity for pedestrians and bicyclists. Opportunities for improvements may exist on State facilities such as: freeway termini, on/off-ramp intersections, overcrossings, under crossings, tunnels, bridges, on both conventional state highways and freeways.

With regard to public transit, we recommend planning for gradual continual improvement of transit stops, bus bays, or other facilities, to accommodate traffic flow, especially on streets that are State Route locations or are near freeway intersections.

As a reminder, storm water run-off is a sensitive issue for Los Angeles and Ventura counties. Please be mindful of your need to discharge clean run-off water and it is not permitted to discharge onto State highway facilities.

Any work to be performed within the State Right-of-way will need an Encroachment Permit and any transportation of heavy construction equipment and/or materials which requires the use of oversized-transport vehicles on State highways will require a Caltrans transportation permit. We recommend that large size truck trips be limited to off-peak commute periods. For information on the Permit process, please contact Caltrans District 7 Office of Permit at (213) 897-3631.

If you have any questions or concerns regarding these comments and/or wish to schedule a meeting, please feel free to contact me at (213) 897 – 9140 or project coordinator Frances Lee at (213) 897-0673 or electronically at frances.lee@dot.ca.gov.

Sincerely,

Dianna Watson

DIANNA WATSON
Branch Chief, Community Planning & LD IGR Review

cc: Scott Morgan, State Clearinghouse

From: **Lee, Frances M@DOT** <frances.lee@dot.ca.gov>
Date: Mon, Jun 13, 2016 at 1:31 PM
Subject: Landmark Apartments Project DEIR - Comment Letter
To: "alejandro.huerta@lacity.org" <alejandro.huerta@lacity.org>

Good Afternoon, Mr. Huerta,

The original comment letter for the above-mentioned project has been sent to your attention today.

Please find an attached PDF copy of the signed letter. Thank you.

Best Regards,

Frances Lee

Associate Transportation Planner

Caltrans District 7, Division of Planning - LD-IGR Branch

100 South Main Street, MS#16, Los Angeles, CA 90012

Phone: 213-897-0673 | Fax: 213-897-1337

E-Mail: Frances.Lee@dot.ca.gov

DEPARTMENT OF TRANSPORTATION
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Serious drought.
Help save water!

June 13, 2016

Mr. Alejandro Huerta
City of Los Angeles
Department of City Planning
200 North Spring Street, Room 750
Los Angeles, CA 90012

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SCH #2014031014, IGR #160455-FL
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Sincerely,

Dianna Watson

DIANNA WATSON
Branch Chief, Community Planning & LD IGR Review

cc: Scott Morgan, State Clearinghouse

ROBERT F. DORAME
POB 490, Bellflower, CA 90707
562-761-6417 gtongva@verizon.net
Message 562-925-7989

June 7, 2016

Alejandro A. Huerta
Major Projects & Environmental Analysis
Department of City Planning
City Hall, City of Los Angeles
200 North Spring Street, Room 750
Los Angeles, CA 90012

Re: Landmark Apartments Project 1222 Granville Ave., LA, CA 90025

Dear Mr. Huerta:

Thank you for contacting me regarding this development project that will fill the area between Wilshire Blvd., Stoner Ave. and Granville in West Los Angeles. I have personal connection to this specific location, having lived on Granville for much of my childhood and college years so I know the area very well.

I worked on protecting the site from the early 80s and through the 90s due to other large development projects that would have impacted the site and destroyed the springs at University High School that flow in an underground river from the Beverly Hills area, to the best of our knowledge. The springs also come up near Stoner Park.

Another landmark from the time of native occupation was "the hole", a part of natural waterway was destroyed by development at Wilshire and Goshen, the north east corner. "The ravine" was a waterway which ran along Federal Avenue to the springs behind the Army Reserve building.

1. The largest Gabrielino Tongva village site in this region, Kuruvungna (LAN382), extends west approximately ¾ miles to the intersection of Wesley and Wilshire, north to the intersection of Vandergrift and Macarthur, east 3/4th mile to Bonsall and Constitution and ½ mile to Stoner and Iowa. Midden and other artifacts have been found outside of this perimeter but the heart of the village was more or less established within these boundaries.

2. Kuruvungna was inhabited by this tribe more than a thousand years prior to the Spanish/Mexican occupation.

3. Human remains were unearthed across the street from the proposed project in 1976 and again in 2014 in two separate locations to the south.

Due to these facts, all mitigation measures including native monitoring of all planned soil disturbances must be employed to insure human remains or any other cultural materials that are linked to prehistoric or historic native habitation are identified and protected.

You are welcome to contact me if you have any questions about this information and I will be happy to speak with you.

In addition, I am very concerned about this site and would also appreciate the opportunity to be part of the native monitoring if this project is approved.

Sincerely

Robert Dorame
Gabrielino Tongva Indians of CA

From: **Hannah Bentley** <bentley@blumcollins.com>
Date: Mon, Jun 13, 2016 at 10:12 AM
Subject: Comments on Landmark Apartments Project
To: "alejandro.huerta@lacity.org" <alejandro.huerta@lacity.org>
Cc: Craig Collins <collins@blumcollins.com>, Troy Platt <platt@blumcollins.com>

Dear Mr. Huerta
On behalf of SoCal Environmental Justice Alliance we are submitting the attached comments (with attachments) on the Landmark Apartments project. Please confirm your receipt of this email.
Thank you,
Hannah Bentley
--
Hannah Bentley APC
Contract Attorney
Blum Collins LLP
Bentley@blumcollins.com
Phone 213-572-0400, ext. 207

BLUM | COLLINS LLP

Aon Center
707 Wilshire Boulevard
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Los Angeles, California
90017

213.572.0400 phone
213.572.0401 fax

June 13, 2016

Alejandro A. Huerta
Major Projects & Environmental Analysis
Department of City Planning
City Hall, City of Los Angeles
200 N. Spring Street, Room 750
Los Angeles, CA 90012
alejandro.huerta@lacity.org

Via Email & U.S. Mail

Re: *California Environmental Quality Act Comments on Academy Square, L.A. Case No. ENV-2013-3747-EIR; State Clearinghouse No. 2014031014*

Dear Mr. Huerta and the City of Los Angeles:

On behalf of the SoCal Environmental Justice Alliance, this is to comment under the California Environmental Quality Act ("CEQA") upon the above-captioned Landmark Apartments Draft Environmental Impact Report ("DEIR"). Landmark Apartments would be a 34-story residential tower with an 18,000-square-foot, privately maintained, publicly accessible open space area on a 2.8-acre site in the West Los Angeles Community Plan Area of the City of Los Angeles ("the Project"). The site is zoned [Q]C2-2-CDO and would need a Vesting Zone Change to (T)(Q)C-2-CDO. Our comments on the Project and the DEIR generally follow in the order in which matters appear in the DEIR, except with regard to your Baseline Discussion, which has to go first.

<u>Baseline Discussion</u>

For your baseline, for most of the DEIR, you rely on the case of *North County Advocates v. City of Carlsbad* (2015) 241 Cal. App. 4th 94 to justify your assumption that the supermarket was a going concern when in fact it wasn't. Thus, in your Traffic Appendix, your consultant writes, "The traffic counts were reviewed and adjusted accordingly assuming the supermarket to be open and fully operational." Traffic Appendix at 18. The traffic counts were, in other words, totally hypothetical.

We have at least three problems with your reliance on the *North County* case. The first is that that case was wrongly decided and contrary to the California Supreme Court's precedent in *Communities for a Better Environment v. South Coast Air Quality*

Management District (2010) 48 Cal. 4th 310 ("*CBE*"). In *CBE*, the California Supreme Court rejected the South Coast Air Quality Management District's use of a hypothetical baseline of the air emissions that were permitted versus those that had actually been emitted from a refinery. The refinery at issue in that case, ConocoPhillips, argued that it had vested rights to emit at the levels in its permits; the Supreme Court disagreed, but wrote:

> Even if environmental review were to indicate that the project's adverse effects could be mitigated only by a condition requiring ConocoPhillips to reduce or limit its use of an individual boiler below the previously permitted level, but ConocoPhillips's vested rights precluded imposition of that condition, CEQA would still demand an analysis of the project's true effects. That a particular mitigation measure may be infeasible or precluded, as by the applicant's vested rights, is not a justification for not performing environmental review; it does not excuse the agency from following the dictates of CEQA and realistically analyzing the project's effects.

48 Cal. 4th at 324-325. Thus, even if the Applicant here has a vested right to lease to a grocery store – a proposed project that was never its intent – proper analysis had to be done, and was not here.[1]

The *North County* Court of Appeal relied upon one of its own decisions, *Cherry Valley Pass Acres & Neighbors v. City of Beaumont* (2010) 190 Cal.App.4th 316, to upend the Supreme Court's settled precedent in *CBE.* This is inappropriate.

The second problem with your reliance on *North County* is that there, unlike here, the applicant was proposing to develop the store in question according to its past use. The proposed Project in this case is not a grocery store: it is a massive apartment building.

The third problem is that in *North County*, the applicant was using hypothetical traffic counts: as the opinion states, quoting the EIR, "'Trip generation rates and estimates for the vacant Robinson's-May building were estimated using those identified in the San Diego Association of Government's (SANDAG's) *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region* (SANDAG 2002) for a 'Super Regional Shopping Center' land use.'" Here, by contrast, the Applicant had *actual* traffic counts, which it then added to with a hypothetical number (which we apparently don't have the source of). This is inappropriate.

Accordingly, you should have used the existing traffic counts collected by the traffic engineer, without supplementing them, and those counts should have informed your air quality, traffic, and noise analyses.

---

[1] Also, even if the traffic counts were justified under *North County*, a premise we dispute, the air quality analysis should have used the existing conditions baseline rather than the hypothetical baseline which the Supreme Court plainly stated was not appropriate in *CBE.*

Project Description

You note that pursuant to Ordinance No. 159,060 the "Q" condition of the Project Site restricts buildings to 17 stories above grade. The Project is limited to a 6:1 Floor Area Ratio ("FAR"); it would have a 5.9:1 FAR.

You assert that the Project Objectives include providing an "iconic, highly visible" Project, enhancing walkability and encouraging pedestrian activity along Wilshire Boulevard.

You indicate that the Applicant wishes to develop a maximum of 376 units consisting of studio, 1 bedroom and 2 bedroom units. At least 16 of the units would be designated for Very Low Income residents. Very Low Income ("VLI") is 50% of the median family income for the area, subject to adjustments for areas with unusually high or low incomes. We suspect the area would result in an adjustment for high incomes such that the affordable housing component would not be appreciable.

Regarding the Sustainability Features of the Project you indicate that it will have Energy Star labeled products and appliances including dishwashers "where appropriate." To mitigate the impacts of the Project, including its Greenhouse Gas ("GHG") impacts, this should be a requirement.

Also you indicate that the Project would have 10% "certified" wood. Under which certification program are you committing to? You indicate the plumbing will be "water efficient." To what standard? Similarly, you assert that it will use energy efficient equipment. Again, to what standard? You state there will be permeable pavement "where possible." Where would it not be possible? The Project should be designed to *make* it possible.

Environmental Setting

You indicate that there are several high rise structures located in the vicinity of the Project Site including a 334 foot above grade office building directly north of the Project and 3 residential buildings across Stoner Avenue at 281, 168 and 165 feet. A residential tower at 380 feet would dwarf these.

Regarding Cumulative Impacts, you cite to Guidelines section 15130(a)(3) to the effect that a project's contribution is less than cumulatively considerable if it is required to fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact. Section 15130(a)(3) goes on to state that "The lead agency shall identify facts and analysis supporting its conclusion that the contribution will be rendered less than cumulatively considerable." Thus, there has to be some proof that the funds paid will actually mitigate the cumulative impact.

In your Cumulative Projects list you have a footnote that subsequent to the development of the list a project was reduced or withdrawn. However, the footnote does not relate to any of the 26 projects listed.

Light, Glare and Shading

In Section IV.A.2 of the DEIR you try to assert that S.B. 743 adding Pub. Resources Code Section 21099 regarding "aesthetics and parking impacts" relates to shading. We disagree. Shading is concerned with the Project's effects on other areas, not views *of* the Project itself. Thus, we do not believe the Los Angeles CEQA Thresholds Guide has been preempted, and the Project will have a significant impact as to which you must impose all feasible mitigation measures, including those that would modify the Project.

Air Quality

At IV.B-16 to -17, you discuss the South Coast Air Quality Management District's ("SCAQMD's") Multiple Air Toxics Exposure Study ("MATES") III, and assert that it was the most recent study available for the area. This is not true. MATES IV was and is available, and is included as Attachment B hereto. As the Attachment notes, the calculated risk is 2.5 times higher with the new methodology used.

At IV.B-22 you indicate you are using the past supermarket use to define baseline levels of air emissions compared to Project emissions. This is inappropriate. To the extent you have tried to remedy this in an Appendix to the DEIR this contravenes the Supreme Court's guidance in *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* (2007) 40 Cal. 4th 412, that the key aspects of your analysis should not be buried in appendices.

At IV.B-31-32 you have set out thresholds that are not the same as those identified in CEQA Guidelines Appendix G. The public should not be put to the task of comparing your thresholds to those you should have used.

You've omitted analysis regarding the acute effects of Toxic Air Contaminants ("TACs") and focused solely on cancer risk, though we note you do not address what are the present and future cancer risks to the adjacent residents. For that matter, you don't assess cancer risk either, other than to say exposure will not last for 70 years. *See* IV.B-35.

At Table IV.B-7 you assert that emissions would be negative because you are using the former supermarket operation as a baseline. *See also* page IV.B-40. You say you also analyze Project emissions versus a static condition in Table IV.B-9, but that omits mobile emissions which would be the major source of criteria pollutants at the site.

At IV.B-42 you say there are no TACs to worry about, but you are building housing on a site that is less than 500 feet from a roadway that serves more than 100,000 vehicles per day, contrary to the recommendations in the California Air Resources Board's ("CARB's") Air Quality and Land Use Handbook, attached as Attachment C. As such, you should have addressed the cumulative risk to adjacent residents from the diesel particulate matter ("DPM") from construction along with their other exposures.

You assert in the DEIR that "CO is the preferred benchmark pollutant for assessing local air quality impacts from post-construction motor vehicle operations." We disagree. Under SCAQMD's thresholds, CO thresholds are almost never exceeded. Motor vehicles and trucks can be a significant source of particulate matter and NO_x, which is an ozone precursor.

Regarding cumulative impacts, you rely on SCAQMD guidance to the effect that only projects with individually significant impacts are cumulatively significant. We believe this violates CEQA, is not based on substantial evidence, and represents a failure to proceed by law.

This approach is contrary to the very definition of what a cumulative impact is. Public Resources Code § 20183(b)(2) defines cumulative impacts to mean "that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." In other words, inherent in a cumulative impacts analysis is whether an impact is significant when *combined* with the effects of other past, present, and future projects. This is borne out by the Guidelines. Guidelines § 15130(a)(1) provides "As defined in Section 15355, a cumulative impact consists of an impact which is created *as a result of the combination* of the project evaluated in the EIR together with other projects causing related impacts." (emphasis supplied). Guidelines § 15064(h)(1) provides:

> When assessing whether a cumulative effect requires an EIR, the lead agency shall consider whether the cumulative impact is significant and whether the effects of the project are cumulatively considerable. An EIR must be prepared *if the cumulative impact may be significant and the project's incremental effect, though individually limited, is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.*

Guidelines § 15064(h)(1) (emphasis supplied).

Guidelines § 15065(a)(3) requires a mandatory finding of significance when "The project has possible environmental effects that are individually limited but cumulatively considerable," and provides the same definition of "cumulatively considerable."

Finally, Guidelines § 15355 defines cumulative impacts and states:

> *"Cumulative impacts" refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.*

> (a) The individual effects may be changes resulting from a single project or a number of separate projects.
> (b) The cumulative impact from several projects is the change in the environment which results from the *incremental impact* of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. *Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.*

Guidelines § 15355 (emphasis supplied). *See also* Gordon & Herson, "Demystifying CEQA's Cumulative Impact Analysis Requirements: Guidance for Defensible EIR Evaluation," *Cal. Env't'l L. Reporter,* 379, 381 (Sept. 2011) (Vol. 2011, Issue 9) ("Critically, a proposed project's incremental effects may be 'cumulatively considerable' even when its individual effects are limited. (citations). *In other words, CEQA does not excuse an EIR from evaluating cumulative impacts simply because the project-specific analysis determined its impacts would be 'less than significant.'*" In short, your cumulative impacts analysis is wholly without a basis in substantial evidence and represents a failure to proceed by law.

Geology and Soils

You concede that the closest active fault to the Project Site is only 940 feet away. You contend that additional studies are not required because the fault is more than 500 feet away. We believe this is not based on substantial evidence.

Greenhouse Gas Emissions

Under Table IV.C-4, Existing GHG Emissions, you compare the emissions of the Project to the prior supermarket use. We believe this is an abuse of discretion for the reasons stated earlier.

You have also amortized your construction emissions. We believe this is contrary to the mandates of A.B. 32 and Executive Order B-30-15, which require reduced emissions in the near term. Also, SCAQMD has never adopted guidance for other agencies to do this – you are apparently relying upon its own rule for stationary sources, which is not applicable to the Project.

At Table IV.C-5, you show mobile sources as reduced from the "No Action Taken" project by 16.5%. Since your "No Action Taken" scenario considers standards that were already in place when CARB prepared the Supplemental Functional Equivalent Document, including Pavley I and the California Low Carbon Fuel Standard, and since the Project does not implement any mobile source reduction measures, we do not understand the source of the difference. Please explain. Again, it is our position that under *Vineyard* this information should have been included in the DEIR.

Regarding Energy Sources, you state that you have taken a 15% reduction in energy use from systems covered by Title 24 and lighting. IV.C-41. Since you are using CalEEMod version 2013.2.2 to calculate your results we would expect that the CALGreen Code requirements were already factored in. Without taking that 15% reduction you would have an increase over the "No Action Taken" scenario, or that is what we must conclude based on the Table and your statement in the text. The same is true as to water sources. Again, we believe CalEEMod takes into account the CALGreen Code requirements.

You say Guidelines Section 15064(h)(3) allows a lead agency to make a finding of less than significant for GHG emissions if a project complies with regulatory programs meant to reduce GHG emissions. We disagree. Guidelines Section 15064.4(b), which specifically addresses GHG emissions, provides that a lead agency must consider that *as a factor, among other factors* included therein. Moreover, the Guideline makes clear that a project can still have significant impacts even if it complies with regulatory programs.

For all of the above reasons, your GHG analysis and your conclusion that the emissions are less than significant are not based on substantial evidence.

Land Use

There is an inherent conflict in your Land Use analysis in that you contend both that the Project is meant to be an "iconic, highly visible" high-rise development, and at the same time that "While the Project would increase the density, scale, and height of development on the Project Site, these changes would not be out of character of the surrounding area." We disagree that this is not a change in use, and join with other members of the community in protesting the increasing density of development.

We disagree with your conclusion that the Land Use impacts are not significant. As you note, you have to change existing zoning for the Project to allow its construction over 17 stories above grade. This is a significant impact to the surrounding neighborhood and allows density which local residents have good grounds for opposing.

Noise

At IV.H-24 you state that noise for construction equipment was assessed based on "usage factors" – that is, the assumption that would not be used on full power. We don't believe this represents a worst-case analysis. Even under these assumptions you concede the impacts would be significant to R2, R3, and R4. And this was before you calculated the noise from truck trips on Stoner and Granville. We believe you should have calculated the truck trips in with the other construction noise for the sensitive receptors (i.e., the 4.9 dBA increase should have been applied to R4 for the noise on Stoner, and the 12.8 dBA should have been included for R2 and R3 on Granville). While the impacts are already significant, they would thus be more significant, and your obligation to mitigate them would thus be increased.

As a mitigation measure you indicate that a "temporary and impermeable" sound barrier shall be erected along the eastern, western and southern portions of the Project Site, designed to provide a minimum of 10 dBA noise reduction at ground level. As you note, this will be largely ineffective for sensitive receptors who are not themselves at ground level, such as the Barrington Plaza residents. And we also wish to note that the sound barriers will not be effective even at ground level to reduce sound levels by 10 dBA unless they are 15 feet high and *surround* the site, without any gates for entering trucks or workers. *See* Attachment A, from the Federal Highway Administration.

You also propose to locate noisy equipment away from the sensitive receptors, which isn't really possible given the configuration of the site and the location of the receptors.

Public Services

Police Protection. You note that the present officer-to-resident ratio in the West Los Angeles Community service area 1.02 per 1,000 residents, whereas the citywide ratio is 2.61 to 1,000. The ratio of crimes per officer is also disproportionate, at 33.6 versus a citywide average of 19.0. Finally, at 7.2 minutes, the average response time is higher than both the citywide average (5.9 minutes), and the set city response time (7.0 minutes). Despite these realities, you conclude that the Project will not have a significant impact individually *or cumulatively* on the need for police services.

Your thresholds are made up – you state that they are (1) whether the Project would generate a demand for additional police protection services that would *substantially* exceed the capabilities of the LAPD to serve the Project Site, and (2) whether the Project would cause a *substantial* increase in emergency response times *as a result of increased traffic congestion attributable to the Project.* The italicized words are not properly in the thresholds. The response times are already greater than the threshold of 7 minutes. *Any* increase is significant, particularly cumulatively with other projects.

With respect to officer-to-resident ratios, you assert that with the Project they would "remain" at 1.02. This is only due to rounding: specifically, the Project alone would lead to a change from 1.024 to 1.020.

You concede there is a significant impact so that mitigation is required, but your mitigation is inadequate: you only ask the Applicant to consult with the LAPD Crime Prevention Unit. Obviously, increased funding is necessary.

Fire Protection. Concerning cumulative impacts you have not addressed whether there is sufficient water pressure in the current infrastructure to meet the LAFD's requirements for the Project with cumulative projects.

Parks. You attempt to assert that the Project's privately maintained open space would qualify as parkland. It does not. You claim that payment of the City's Dwelling Unit Construction Tax and compliance with the City's Quimby Ordinance will mitigate this impact (which is also cumulative with other projects in the area)[2] to a less than significant level. Unless the City's Ordinance requires the payment of Quimby fees, and those fees go to the development of parkland in the area, we do not believe the impacts are mitigated.

Transportation and Traffic

You state that the Project is in the West Los Angeles Transportation Improvement and Mitigation Specific Plan ("WLA TIMP") area but that the Plan exempts multi-family projects from payment of fees; therefore you cannot rely on the payment of fees as mitigation for cumulative impacts. The TIMP also requires that projects generating more than 100 PM peak hour vehicle trips execute a Covenant with the City to implement a Transportation Demand Management Program. You should have executed such a Covenant since the Project, when properly assessed, generates more than 100 PM peak hour trips.

You only assessed 6 intersections for your Traffic Study, and only three street segments, all quite close to the Project site, without the recognition that intersections further away could be impacted cumulatively with other Projects. Also, you did not assess the Project with other projects and ambient growth beyond 2017, and the Project will not be built by 2017. A minor assessment in an Appendix does not comply with *Vineyard.*

Under the LA City CEQA Guide you should have assessed "neighborhood intrusion" impacts for both Granville and Stoner Avenues.

Also as to construction you assert there will be "minor trenching" on Granville and Stoner. They are both, apparently, one lane in each direction and this will have significant impacts which you have not assessed.

At IV.J-40 in Table IV.J-4 you projected a 15% reduction for transit/walk-ins for both the office building and the new apartment building. We think this is an overestimate not based on substantial evidence in the record.

At IV.J-44 you indicate there will be a *reduction* in trips in the PM peak and only 77 new trips for the AM peak. This obviously is compared to the grocery store use which we disagree should have been factored in.

Your analysis without the supermarket use indicates there will be significant impacts at the intersection of Barrington and Wilshire and on the street segments of Stoner and Granville. These should be acknowledged and mitigation should be adopted.

---

2 As you note, the development of the cumulative projects along with this one will exacerbate the Community Plan area's deficiency in parkland. The Community Plan's statement that parkland is essential is not just a "goal."

Alternatives Analysis

You've rejected any analysis of an alternative site because you claim that any alternative site would have the same shading and noise impacts if it accomplished the project objectives. This is not necessarily the case. There may be some sites where shading and noise impacts were to office buildings and not residences, meaning that impacts would not be significant. Your record should include a map of sites along Wilshire delineated by office versus residential use.

With regard to Alternative 2 you indicate that making the Project 26 rather than 34 stories would preclude an affordable housing component, and that it would no longer be an "iconic, highly visible" Project. We don't see why; this seems rather an overstatement.

Concerning Alternative 3, you assert that it would not be a high quality mixed use development to accommodate different incomes. We don't see why not. And you assert the Project would not encourage pedestrian activity on Wilshire. Again, why not? The fact that there is no open space does not mean that pedestrians won't transit the site.

Regarding Alternative 4, you assert that it would not meet the goal of being a mixed use development. This hardly matters when there are apartment buildings adjacent. We again disagree that pedestrians would not use Wilshire in the absence of open space.

Please advise us when a Final EIR will be available and when the City will be reviewing this Project, and how (via the Planning Commission or the City Council or both), at collins@blumcollins.com and bentley@blumcollins.com. Thank you for your consideration.

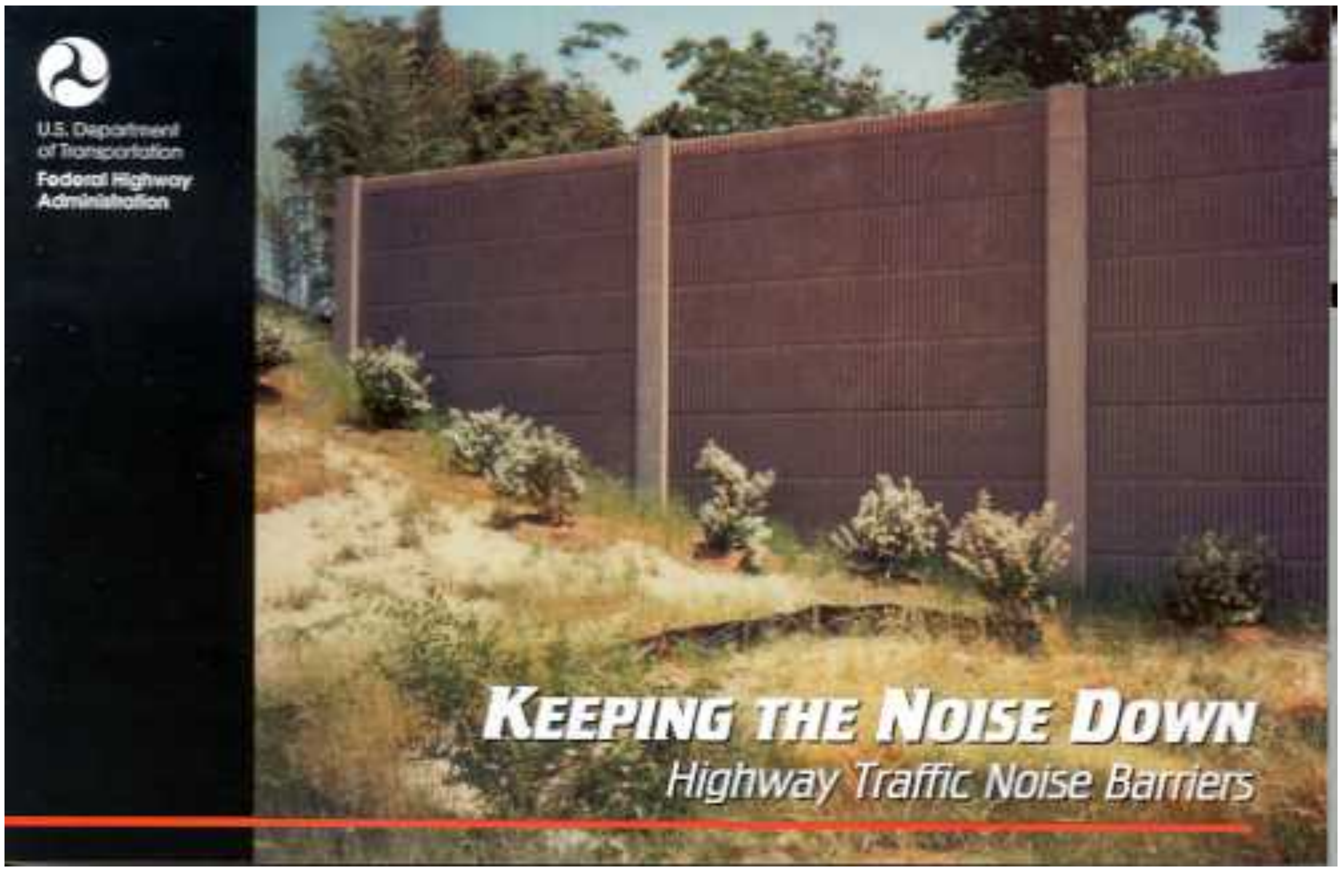
Sincerely,

Craig M. Collins
Blum Collins LLP

Attachments: A-C

Attachment A

Noise Barrier Design - Visual Quality



Highway Traffic Noise Barriers at a Glance

Highway traffic noise barriers:

- can reduce the loudness of traffic noise by as much as half;
- do not completely block all traffic noise;
- can be effective, regardless of the material used;
- must be tall and long with no openings;
- are most effective within 61 meters (200 feet) of a highway (usually the first row of homes);
- must be designed to be visually appealing;
- must be designed to preserve aesthetic values and scenic vistas;
- do not increase noise levels perceptibly on the opposite side of a highway; and
- substantially reduce noise levels for people living next to highways.

Keeping the Noise Down

A sound occurs when an ear senses pressure variations or vibrations in the air. Noise is unwanted sound. The brain relates a subjective element to a sound, and an individual reaction is formed. Numerous studies have indicated that the most pervasive sources of noise in our environment today are those associated with transportation. Highway traffic noise tends to be a dominant noise source in our urban, as well as rural, environment.

What are Noise Barriers?

Noise barriers are solid obstructions built between the highway and the homes along a highway. They do not *completely* block all noise they only reduce overall noise levels. Effective noise barriers typically reduce noise levels by 5 to 10 decibels (dB), cutting the loudness of traffic noise by as much as one half. For example, a barrier which achieves a 10-dB reduction can reduce the sound level of a typical tractor trailer pass-by to that of an automobile. Barriers can be formed from earth mounds or "berms" along the road, from high, vertical walls, or from a combination of earth berms and walls. Earth berms have a very natural appearance and are usually attractive. They also reduce noise by approximately 3 dB more than vertical walls of the same height. However, earth berms can require a lot of land to construct, especially if they are very tall. Walls require less space, but they are usually limited to eight meters (25 feet) in height for structural and aesthetic reasons.

When Are Noise Barriers Required?

Noise barriers are not always required at locations where an absolute threshold is met. There is no "number standard" which requires the construction of a noise barrier. Federal requirements for noise barriers may be found in Title 23 of the U.S. Code of Federal Regulations, Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise."

The Federal Highway Administration noise regulations apply only to projects where a State transportation department has requested Federal funding for participation in the improvements. The State transportation department must determine if there will be traffic noise impacts, when a project is proposed for (1) the construction of a highway on new location or (2) the reconstruction of an existing highway to either significantly change the horizontal or vertical alignment or increase the number of through-traffic lanes. If the State transportation department identifies potential impacts, it must implement abatement measures, possibly including the construction of noise barriers, where reasonable and feasible.

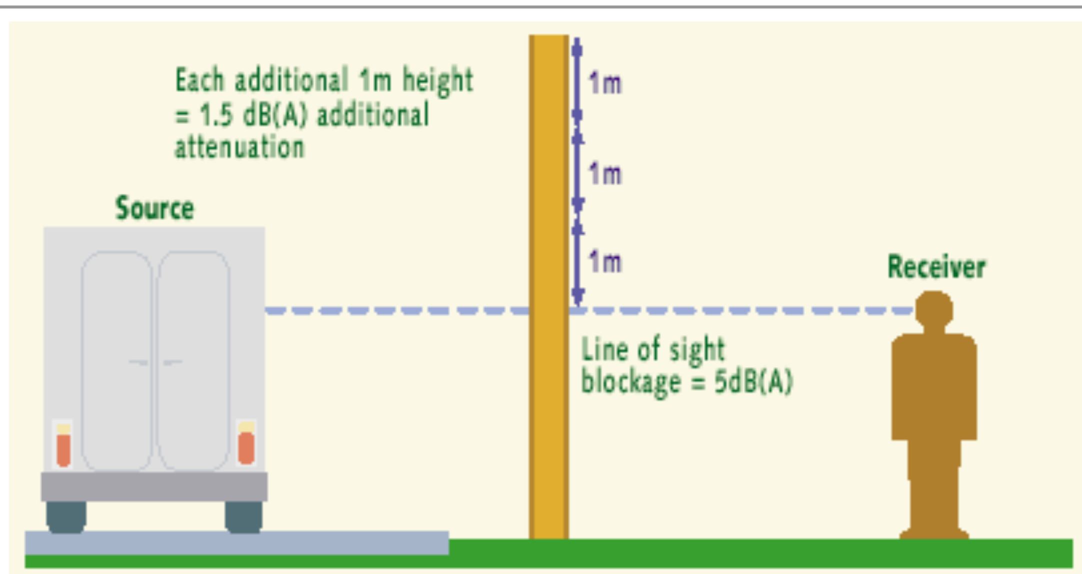
Federal law and Federal Highway Administration regulations do not require State transportation departments to build noise barriers along existing highways where no other highway improvements are planned. They may voluntarily do so, but they are solely responsible for making this decision.

How Is a Noise Barrier Funded?

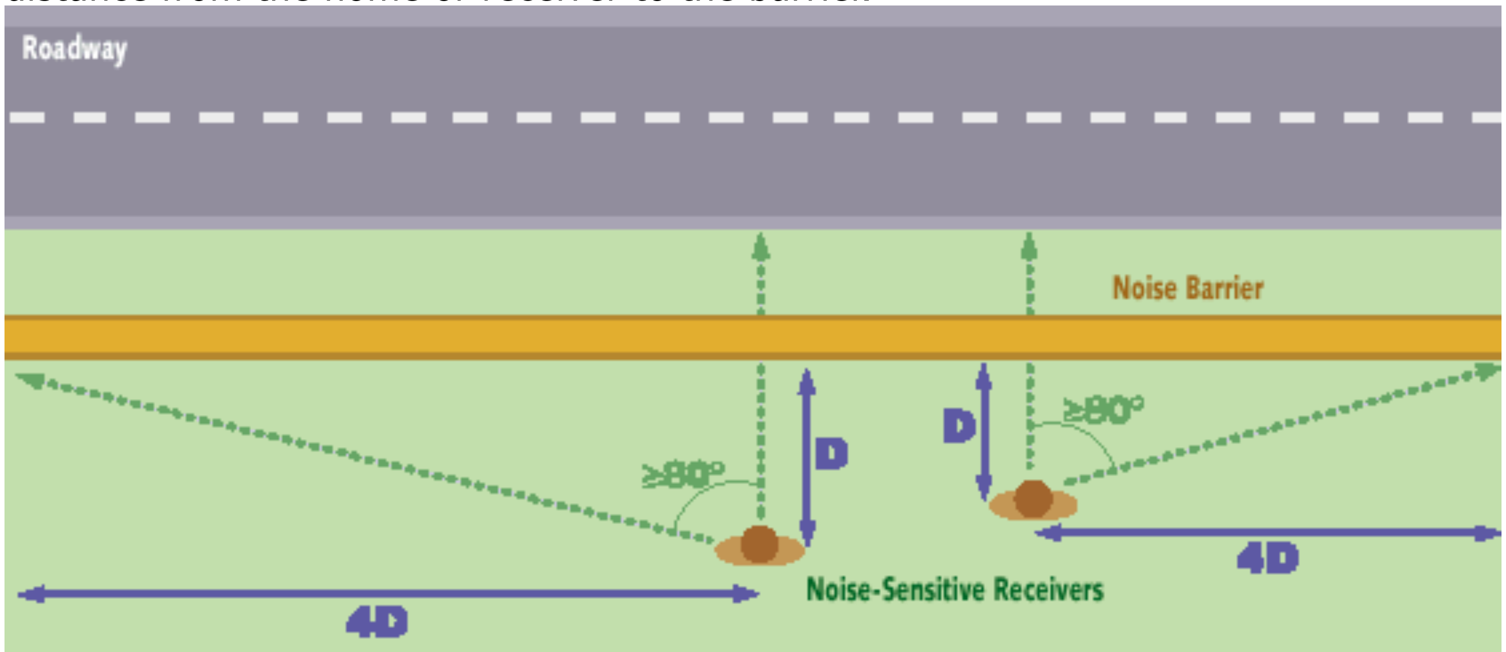
There are no special or separate Federal funds for highway traffic noise abatement. State transportation departments include the costs of noise barriers in their proposed Federal-aid highway projects. The Federal share is the same as that for the highway system on which the project is located. Noise barriers are sometimes constructed without using Federal funds - for example, using only State, local, or private funds. The costs of noise barriers are sometimes shared by governmental agencies and individual homeowners.

How Does a Noise Barrier Work?

Noise barriers reduce the sound which enters a community from a busy highway by either absorbing the sound, transmitting it, reflecting it back across the highway, or forcing it to take a longer path over and around the barrier. A noise barrier must be tall enough and long enough to block the view of a highway from the area that is to be protected, the "receiver." Noise barriers provide very little benefit for homes on a hillside overlooking a highway or for buildings which rise above the barrier. A noise barrier can achieve a 5 dB noise level reduction, when it is tall enough to break the line-of-sight from the highway to the home or receiver. After it breaks the line-of-sight, it can achieve approximately 1.5dB of additional noise level reduction for each meter of barrier height.



To effectively reduce the noise coming around its ends, a barrier should be at least eight times as long as the distance from the home or receiver to the barrier.



Openings in noise barriers for driveway connections or intersecting streets destroy their effectiveness. In some areas, homes are scattered too far apart to permit noise barriers to be built at a reasonable cost. Noise barriers are normally most effective in reducing noise for areas that are within approximately 61meters (200 feet) of a highway (usually the first row of homes).

What Type of Material Is Best for a Noise Barrier?

Noise barriers can be constructed from earth, concrete, masonry, wood, metal, and other materials. To effectively reduce sound transmission through the barrier, the material chosen must be rigid and sufficiently dense (at least 20 kilograms/square meter). All noise barrier material types are equally effective, acoustically, if they have this density.

There are no Federal requirements specifying the materials to be used in the construction of highway traffic noise barriers. Individual State departments of transportation select the materials when building these barriers. The selection is normally made based on factors, such as aesthetics, durability, maintenance, cost, and the desires of the public.

How Do People React to Noise Barriers?

Overall, public reaction to highway noise barriers appears to be positive. However, specific reactions vary widely. Residents adjacent to barriers say that conversations in households are easier, sleeping conditions are better, the environment is more relaxing, windows are opened more often, and yards are used more in the summer. Residents also perceive indirect benefits, such as increased privacy, cleaner air, improved views and a sense of ruralness, and healthier lawns and shrubs.
Negative reactions from residents have included a restriction of view, a feeling of confinement, a loss of air circulation, a loss of sunlight and lighting, and poor maintenance of the barrier. Motorists have sometimes complained of a loss of view or scenic vistas and a feeling of being "walled in" when traveling adjacent to barriers.

Are Residents' Views Considered?

A major consideration in the design of a noise barrier is its visual impact on the surrounding area. A tall barrier near a one-story, single family, detached residential area can have a negative visual effect. One solution to addressing the size relationship in visual quality is to provide staggered horizontal elements to a noise barrier to reduce the visual impact by planting landscaping in the foreground. Native plantings are preferable.

The visual character of noise barriers in relationship to their environmental setting should be carefully considered. In general, it is desirable to locate a noise barrier approximately four times its height from residences and to provide landscaping near the barrier to avoid visual dominance.
Noise barriers should reflect the character of their surroundings as much as possible. It is always desirable to preserve aesthetic views and scenic vistas, to the extent possible.

Are Motorists' Views Considered?

The psychological effect of noise barriers on the passing motorist should be a part of barrier design and construction. Noise barriers in dense, urban settings should be designed differently than barriers in more open suburban or rural areas, and they should be designed to avoid monotony for the motorist. At normal roadway speeds, motorists tend to notice noise barriers overall form, color, and surface texture. A primary objective of noise barrier design should be to avoid a tunnel effect for the motorist. This can be accomplished by varying the forms, materials, and surface treatments.

Graffiti on noise barriers can be a potential problem. One solution is to use materials that can be readily washed or repainted. Landscaping and plantings near barriers can also be used to discourage graffiti, as well as to add visual quality.

Does Construction of a Noise Barrier Increase Noise Levels on the Opposite Side of the Highway?

Residents adjacent to a highway sometimes feel that their noise levels have increased substantially, because of the construction of a noise barrier on the opposite side of the highway. However, field studies have shown that this is not true. If all the noise striking a noise barrier were reflected back to the other side of a highway, the increase would be theoretically limited to 3 dB. In practice, not all of the acoustical energy is reflected back to the other side. Some of the energy goes over the barrier, some is reflected to points other than the homes on the opposite side, some is scattered by ground coverings (for example, grass and shrubs), and some is blocked by the vehicles on the highway. Additionally, some of the reflected energy is lost due to the longer path that it must travel. Measurements made to quantify this reflective increase have never shown an increase of greater than 1-2 dB an increase that is not perceptible to the average human ear.

Does Construction of Noise Barriers on "Both" Sides of a Highway Increase Noise Levels?

Multiple reflections of noise between two parallel plane surfaces, such as noise barriers or retaining walls on both sides of a highway, can theoretically reduce the effectiveness of individual barriers. However, studies of this issue have found no problems associated with this type of reflective noise. Any measured increases in noise levels have been less than can be perceived by normal human hearing, that is, less than 3 dB. Studies have suggested that to avoid a reduction in the performance of parallel reflective noise barriers, the width-to-height ratio of the roadway section to the barriers should be at least 10:1. The width is the distance between the barriers, and the height is the average height of the barriers above the roadway. This means that two parallel barriers 3 meters (10 feet) tall should be at least 30 meters (100 feet) apart to avoid any reduction in effectiveness. These studies have also shown that any reduction in performance can be eliminated through the use of sound absorptive noise barriers.

Can Trees Be Planted to Act as Noise Barriers?

Vegetation, if it is high enough, wide enough, and dense enough that it cannot be seen over or through, can decrease highway traffic noise. A wide strip of trees with very thick undergrowth can lower noise levels. 30 meters of dense vegetation can reduce noise by five decibels. However, it is not feasible to plant enough trees and other vegetation along a highway to achieve such a reduction. Trees and other vegetation can be planted for psychological relief but not to physically lessen noise levels.

In Summary

Most residents near a barrier seem to feel that highway noise barriers effectively reduce traffic noise and that the benefits of barriers far outweigh the disadvantages of barriers. While noise barriers do not eliminate all highway traffic noise, they do reduce it substantially and improve the quality of life for people who live adjacent to busy highways.

For More Information . . .

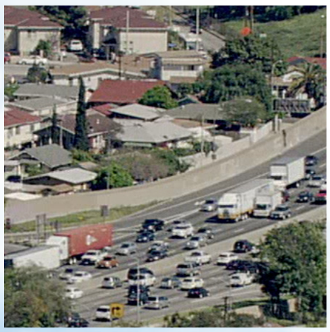
For more information on Keeping the Noise Down: Highway Traffic Noise Barriers, write to us at our e-mail address: environment@fhwa.dot.gov.
Or send your questions to our mailing address:
Federal Highway Administration (HEPN)
400 Seventh St., SW
Washington, DC 20590

Attachment B

FINAL REPORT

Multiple Air Toxics Exposure Study in the South Coast Air Basin

MATES-IV



MAY 2015

South Coast AQMD

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1-800-CUT-SMOG • www.aqmd.gov

Cleaning the air that we breathe…

Multiple Air Toxics Exposure Study in the South Coast Air Basin

MATES IV

FINAL REPORT

May 2015

South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
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EXECUTIVE SUMMARY

Executive Summary

The Multiple Air Toxics Exposure Study IV (MATES IV) is a monitoring and evaluation study conducted in the South Coast Air Basin (Basin). The study is a follow up to previous air toxics studies in the Basin and is part of the South Coast Air Quality Management District (SCAQMD) Governing Board Environmental Justice Initiative.

The MATES IV Study consists of several elements. These include a monitoring program, an updated emissions inventory of toxic air contaminants, and a modeling effort to characterize risk across the Basin. The study focuses on the carcinogenic risk from exposure to air toxics. It does not estimate mortality or other health effects from particulate exposures. The latter analyses are conducted as part of the updates to Air Quality Management Plans and are not included here.

A network of 10 fixed sites was used to monitor toxic air contaminants once every six days for one year. The locations of the sites were generally the same as in the MATES II and MATES III Studies to allow for comparisons over time. The one exception is the West Long Beach site, which was about 0.8 mile northwest of the location used in MATES III. The locations of the sites are shown in Figure ES-1.

As noted above, the study also includes computer modeling to estimate air toxic levels throughout the Basin. This allows estimates of air toxic risks in all areas of the Basin, as it is not feasible to conduct monitoring in all areas.

To provide technical guidance in the design of the study, a Technical Advisory Group was formed. The panel of experts from academia, environmental groups, industry, and public agencies provided valuable insight on the study design.

In the monitoring program, over 30 air pollutants were measured. These are listed in Table ES-1. These included both gaseous and particulate air toxics.

Table ES-1 Substances Measured in MATES IV

Acetaldehyde	Dichloroethane	Organic Carbon (OC)
Acetone	Elemental Carbon (EC)	PAHs
Arsenic	Ethyl Benzene	Perchloroethylene
Benzene	Formaldehyde	$PM_{2.5}$
Black Carbon (BC)	Hexavalent Chromium	PM_{10}
1,3-Butadiene	Lead	Selenium
Cadmium	Manganese	Styrene
Carbon Tetrachloride	Methylene Chloride	Toluene
Chloroform	Methyl ethyl ketone	Trichloroethylene
Copper	MTBE	Ultrafine Particles (UFP)
Dibromoethane	Naphthalene	Vinyl Chloride
Dichlorobenzene	Nickel	Xylene
		Zinc

The monitored and modeled concentrations of air toxics were then used to estimate the carcinogenic risks from ambient levels. Annual average concentrations were used to estimate a lifetime risk from exposure to these levels, consistent with guidelines established by the Office of Environmental Health Hazard Assessment (OEHHA) of the California Environmental Protection Agency (CalEPA). After release of the draft MATES IV Report, OEHHA adopted revised methodology to estimate carcinogenic risk. To provide a consistency with the draft report and previous MATES reports, we continue to present the risk results using the previous method. We also provide the estimates of risk based on the new methodology.

Key results of the study are presented below.

Fixed Site Monitoring

The levels of air toxics continued to decline compared to previous MATES studies. The most dramatic reduction is in the level of diesel particulate, which showed 70% reduction in average level measured at the 10 monitoring sites compared to MATES III. The carcinogenic risk from air toxics in the Basin, based on the average concentrations at the 10 monitoring sites, is 65% lower than the monitored average in MATES III. This risk refers to the expected number of additional cancers in a population of one million individuals if they were exposed to these levels over a 70-year lifetime. About 90% of the risk is attributed to emissions associated with mobile sources, with the remainder attributed to toxics emitted from stationary sources, which include large industrial operations such as refineries and metal processing facilities, as well as smaller businesses such as gas stations and chrome plating. The average risks from the annual average levels of air toxics calculated from the fixed monitoring sites data are shown in Figure ES-2 along with the key pollutant contributors to overall risk.

The air toxics risk at the fixed sites ranged from 320 to 480 per million. The risk by site is depicted in Figure ES-3. The results indicate that diesel particulate is the major contributor to air toxics risk, accounting on average for about 68% of the total. This compares to about 84% in MATES III. In Figure ES-4 the relative effect of using the updated calculation methodology is shown by monitoring site. On average, the calculated risk is about 2.5 times higher with the revised methodology.[1] We note that this is not a change in exposure levels and that the relative risks compared to MATES III are not changed.

Modeling

Regional air quality modeling is used to determine ambient air toxic concentrations throughout the Basin due to air toxic emissions from all sources. The model simulated concentrations of toxic compounds are translated into air toxic health risks based upon compound potency risk factors. This analysis complements the techniques used to assess concentration and risk from the data acquired at the fixed monitoring sites.

As in MATES III, MATES IV employed the Comprehensive Air Quality Model with Extensions (CAMx), enhanced with a reactive tracer modeling capability (RTRAC), as the dispersion and

[1] In the October, 2014 Draft MATES IV Report, the increase in risk estimates was given as a 2.7 fold increase. This was based on using the 90th percentile of breathing rate distribution. In anticipation of CARB guidance for risk management, we have used the 80th percentile of the breathing rate distribution for ages greater than 2 years. This resulted in a 2.45 fold change in the estimate of risk.

chemistry modeling platform used to simulate annual impacts of both gas and particulate toxic compounds in the Basin. The version of the RTRAC in CAMx used in the modeling simulations includes an air toxics chemistry module that is used to treat the formation and destruction of reactive air toxic compounds.

Modeling was conducted on a domain that encompassed the Basin and the coastal shipping lanes using a 2 km by 2 km grid size. A projected emissions inventory for 2012 based on the 2012 AQMP emissions inventory, which included detailed source profiles of air toxic sources, provided the mobile and stationary source inputs for the MATES IV simulations. Although the actual measurements and modeling for MATES IV spanned July 1, 2012, to June 30, 2013, for simplicity, the MATES IV modeling utilized the 2012 emissions inventory.

The results of the regional modeling estimates of risk are depicted in Figure ES-5. As shown, the areas of higher risk include those near the ports, Central Los Angeles, and along transportation corridors.

For comparison purposes, Table ES-2 shows the estimated population weighted risk across the Basin for the MATES III and MATES IV periods. The population weighted risk was about 57% lower compared to the MATES III period (2005).

Table ES-2 Modeled Air Toxics Risk Comparisons Using the CAMx Model

	MATES IV	MATES III	Change
Population weighted risk (per million)	367	853	-57%

Applying the revised OEHHA methodology to the modeled air toxics levels, the MATES IV estimated population weighted risk is 897 per million, an increase of about 2.5 times higher. Again we note that this is not a change in exposure levels, and that the relative risks compared to MATES III are not changed.

Figure ES-6 depicts the 2005 to 2012 change in estimated air toxics risk for each model grid cell estimated from the CAMx simulations. Overall, air toxics risk was reduced to varying levels across the Basin, with the largest improvements in the highest risk areas.

Noncancer Assessment

To assess the potential for noncancer health risks, the monitored average levels were compared to the chronic reference exposure levels (RELs) established by OEHHA. The chronic REL is the air concentration at or below which adverse noncancer health effects would not be expected in the general population with exposure for at least a significant fraction of a lifetime. The measured concentrations of air toxics were all below the established chronic RELs.

Caveats and Uncertainty

One source of uncertainty is that currently there is no technique to directly measure diesel particulates, the major contributor to risk in this study, so indirect estimates based on components of diesel exhaust must be used. The method chosen to estimate diesel particulate is to adjust measured EC levels by the ratio of emissions of EC and diesel from the emissions inventory estimates. This approach was reviewed by the Technical Advisory Group, and it is staff's judgment that this is an appropriate method to estimate the ambient levels of diesel particulate matter. During the MATES III Study, this method gave average estimates that were very similar to those estimated using a Chemical Mass Balance method. Additional detail is provided in Chapter 2.

There are also uncertainties in the risk potency values used to estimate lifetime risk of cancer. This study used the unit risks for cancer potency established by OEHHA and the annual average concentration measured or modeled to calculate risk. This methodology has long been used to estimate the relative risks from exposure to air toxics in California and is useful as a yardstick to compare potential risks from varied sources and emissions and to assess any changes in risks over time that may be associated with changing air quality.

The estimates of health risks are based on the state of current knowledge, and the process has undergone extensive scientific and public review. However, there is uncertainty associated with the processes of risk assessment. This uncertainty stems from the lack of data in many areas necessitating the use of assumptions. The assumptions are consistent with current scientific knowledge, but are often designed to be conservative and on the side of health protection in order to avoid underestimation of public health risks. However, community and environmental justice advocates have often commented that risks are underestimated due to unquantified effects of toxic pollutants.

As noted in the OEHHA risk assessment guidelines, sources of uncertainty, which may either overestimate or underestimate risk, include: (1) extrapolation of toxicity data in animals to humans; (2) uncertainty in the estimation of emissions; (3) uncertainty in the air dispersion models; and (4) uncertainty in the exposure estimates. Uncertainty may be defined as what is not currently known and may be reduced with further scientific studies. In addition to uncertainty, there is a natural range or variability in the human population in such properties as height, weight, and susceptibility to chemical toxicants.

Thus, the risk estimates should not be interpreted as actual rates of disease in the exposed population, but rather as estimates of potential risk, based on current knowledge and a number of assumptions. However, a consistent approach to risk assessment is useful to compare different sources, different substances, and different time frames in order to prioritize public health concerns.

Updates to Cancer Risk Estimation Methods

Staff notes that OEHHA has adopted updated methods for estimating cancer risks.[2] The new method includes utilizing higher estimates of cancer potency during early life exposures. There

[2] California Environmental Protection Agency Office of Environmental Health Hazard Assessment, Air Toxics Hot

are also differences in the assumptions on breathing rates and length of residential exposures. Staff has calculated unit risk factors with the updated methodology to show the effect of applying the methodology. These calculated unit risk factors are shown in Appendix I. While the previous method is used to compare results with past studies, staff also presents the estimates using the updated methods. These are shown in Figure ES-7 for the regional modeled air toxics levels. Thus, while air toxic emissions, ambient levels, and resulting exposures have dropped significantly over the past several years, the updated OEHHA methods estimate that the risks from a certain level of air toxic exposure are significantly higher than previously assumed.

Conclusion

Compared to previous studies of air toxics in the Basin, this study found decreasing air toxics exposure, with the estimated Basin-wide population-weighted risk down by about 57% from the analysis done for the MATES III time period. The ambient air toxics data from the 10 fixed monitoring locations also demonstrated a similar reduction in air toxic levels and risks.

Policy Implications

While there has been substantial improvement in air quality regarding air toxics emissions and exposures, in staff's view the risks are still unacceptably high, especially near sources of toxic emissions such as the ports and transportation corridors. In addition, when updates to risk calculation methods are incorporated, the risks are substantially higher than previously estimated. Diesel particulate, while also substantially reduced from past MATES studies, continues to dominate the overall cancer risk from air toxics.

The results from this study continue to support a continued focus on the reduction of toxic emissions, particularly from diesel engines.

Spots Program Risk Assessment Guidelines. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February, 2014

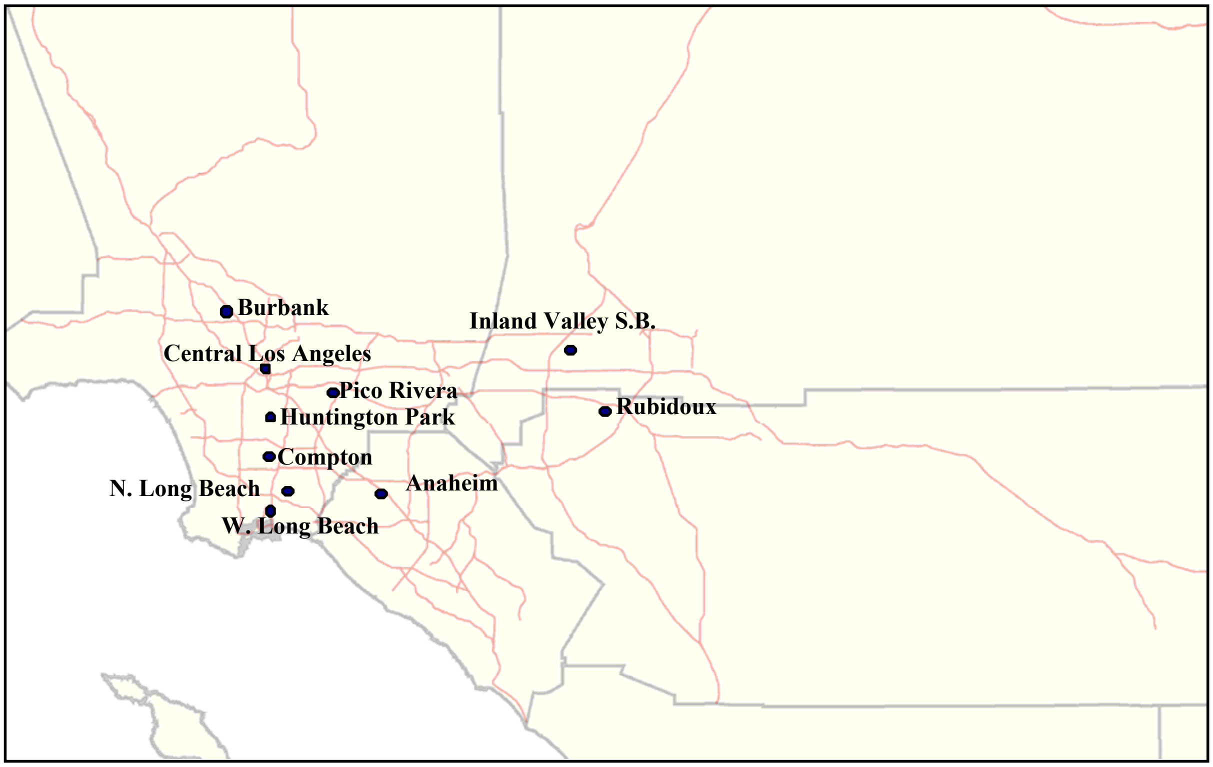


Figure ES-1 Map of MATES IV Monitoring Sites

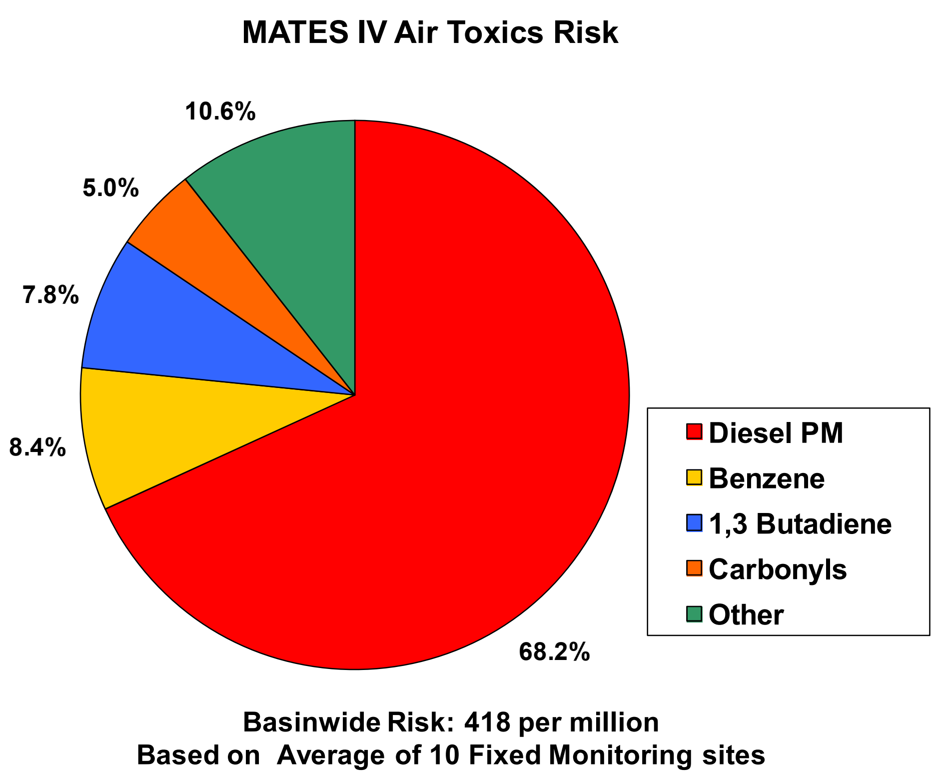


Figure ES-2 Average Risk from Monitoring Sites

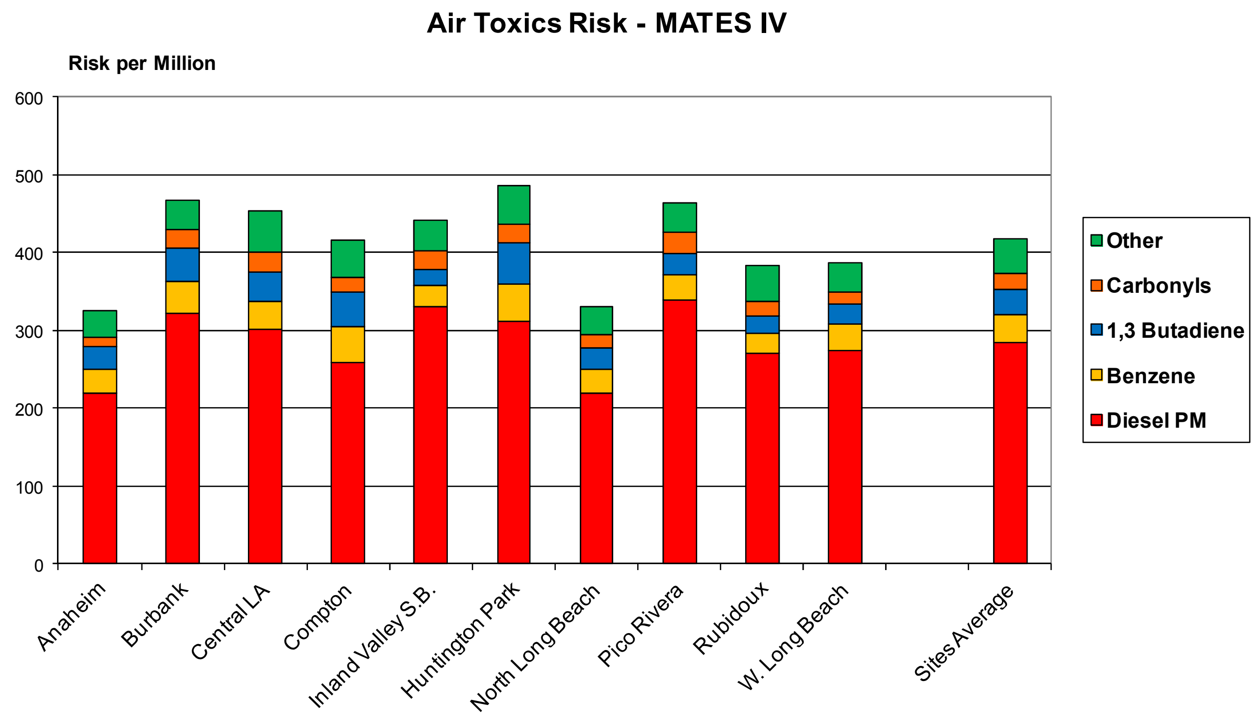


Figure ES-3.

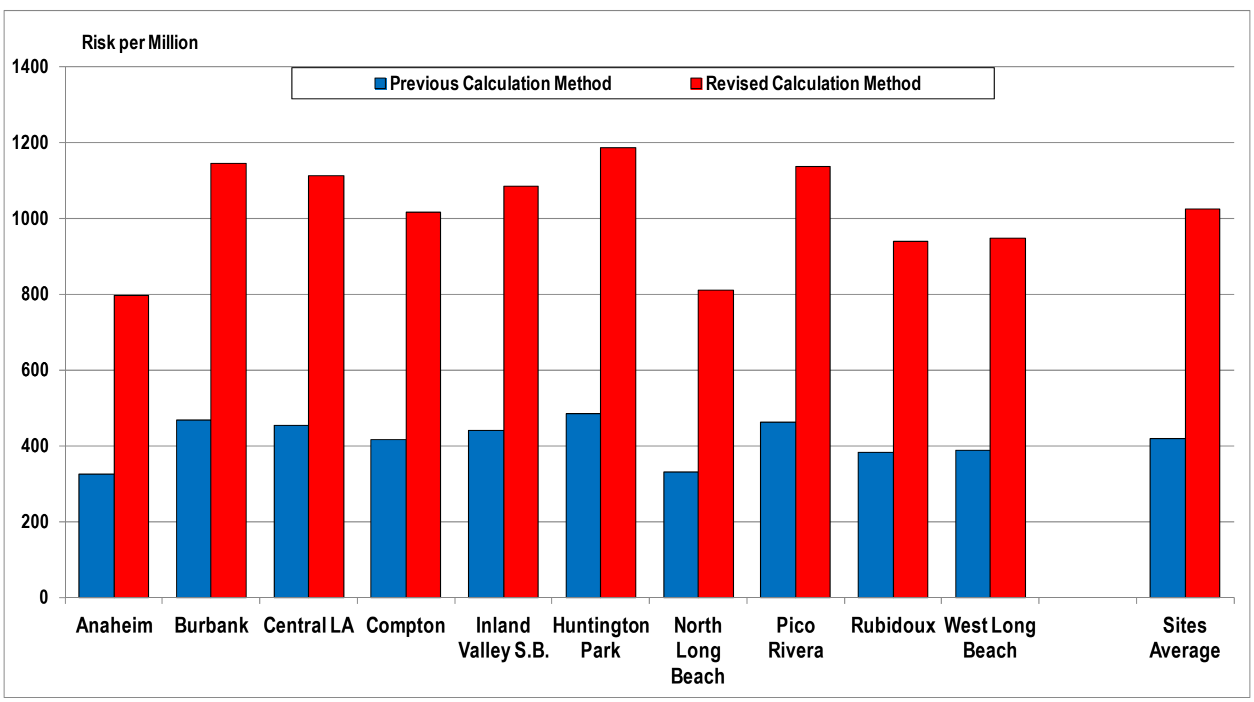


Figure ES-4. MATES IV Cancer Risk Results Comparison Between Previous and Updated OEHHA Risk Calculation Methodologies

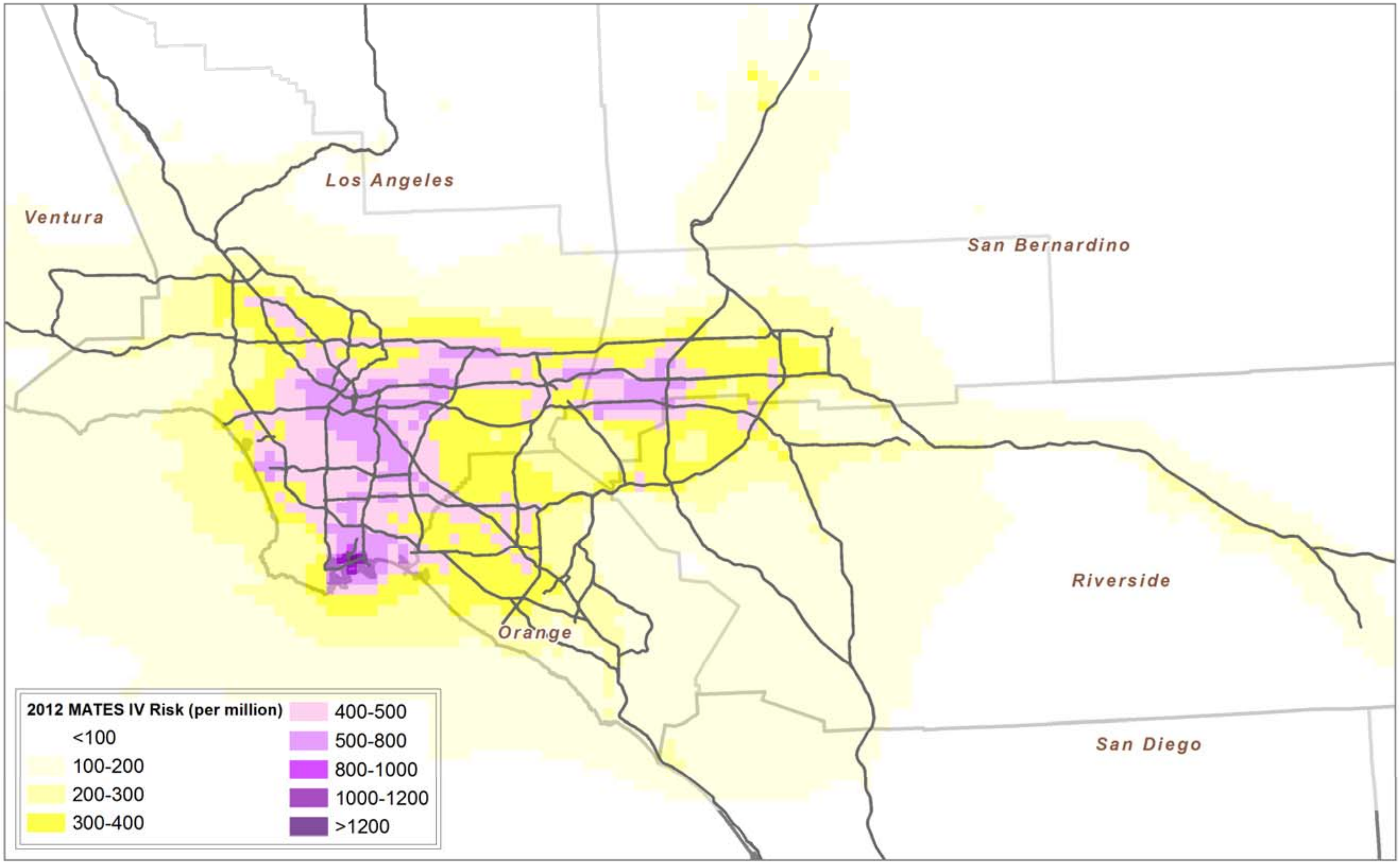


Figure ES-5
MATES IV Modeled Air Toxics Risk Estimates

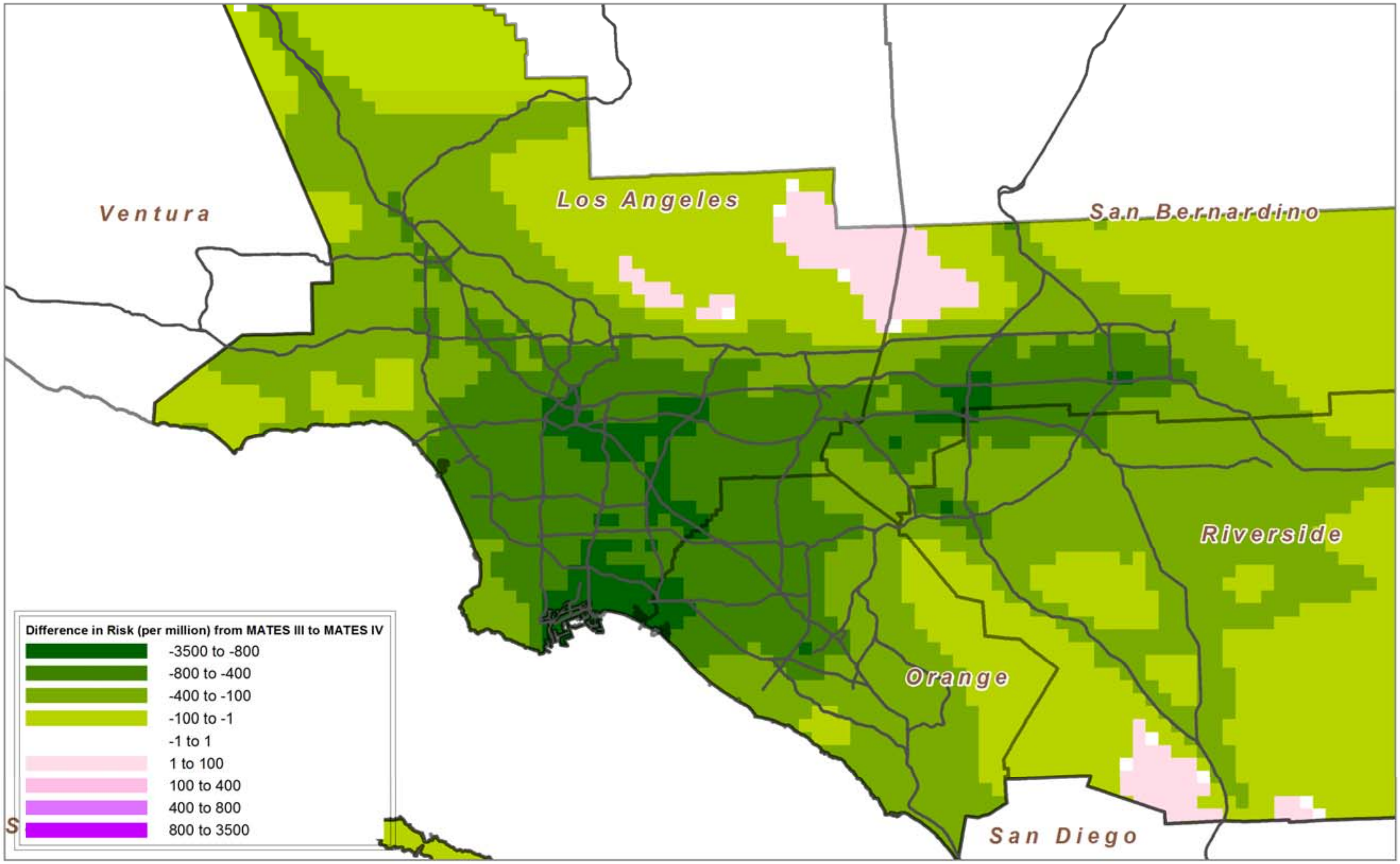


Figure ES-6
Change in Air Toxics Estimated Risk (per million) from 2005 to 2012

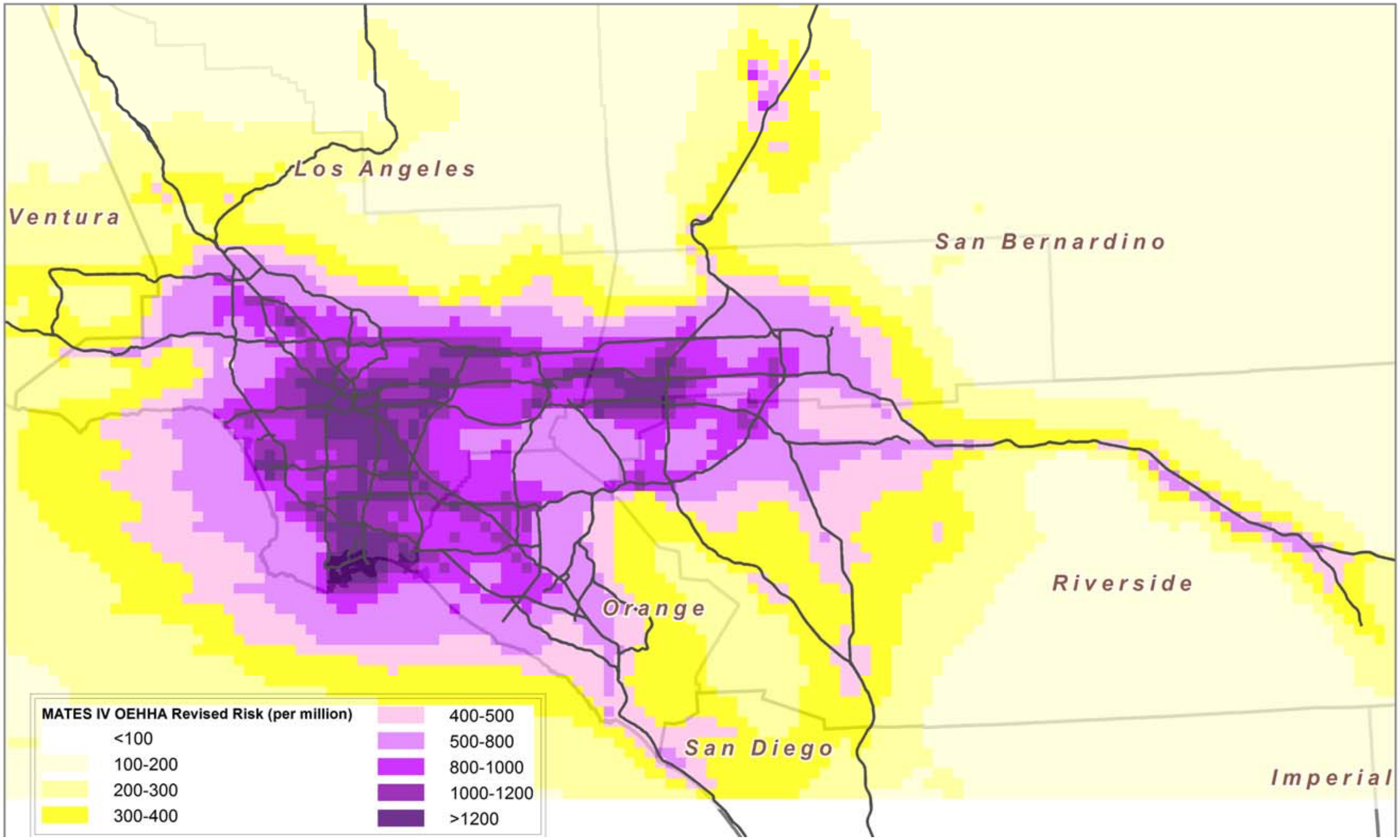


Figure ES-7
MATES IV Modeled Air Toxics Risks Estimates Using Updated OEHHA Methodology

CHAPTER 1
INTRODUCTION

Chapter 1. Introduction

1.1 Background

The South Coast Air Basin (Basin), a highly urbanized area, is home to over 17 million people who own and operate about 11 million motor vehicles and contains some of the highest concentrations of industrial and commercial operations in the country. It also has some of the worst air quality in the U.S. In 1986, SCAQMD conducted the first MATES study to determine the Basin-wide risks associated with major airborne carcinogens. At the time, the state of technology was such that only 10 known air toxic compounds could be analyzed. In 1998, a second MATES study (MATES II) represented one of the most comprehensive air toxics measurement programs conducted in an urban environment. MATES II included a monitoring program of 40 known air toxic compounds, an updated emissions inventory of toxic air contaminants, and a modeling effort to characterize health risks from hazardous air pollutants. A third study, MATES III, was conducted in the 2004-2006 timeframe. It consisted of a two-year monitoring program as well as updates to the air toxics emissions inventory and a regional modeling analysis of exposures to air toxics in the Basin.

Since these studies were first conducted, numerous emissions control programs have been implemented at the national, state, and local levels; and toxics emissions have been declining. However, at the community level, there remains heightened awareness of toxic air contaminant exposures. There are also environmental justice concerns that programs designed to reduce emissions may not be effective in reducing risks from toxic air contaminants in certain areas, particularly in communities with lower income or multiple sources of air toxics.

This report presents the results of the fourth air toxics monitoring and exposure study conducted by the SCAQMD (MATES IV). It consists of a one-year monitoring study, an updated air toxic emissions inventory, as well as updates to monitored and modeled exposures and risk estimated from air toxics. The objective is to update the characterization of ambient air toxic concentrations and potential exposures to air toxics in the Basin.

This study, as the previous MATES studies, focuses on the carcinogenic risks from exposures to air toxics. It does not include an analysis of noncancer mortality from exposure to particulates. An analysis of mortality and other health effects from exposure to particulates was conducted as part of the periodic updates to the Air Quality Management Plans.

The results of this effort can be used to determine spatial patterns of exposure to hazardous air pollutants in the Basin, assess the effectiveness of current air toxic control measures, provide long-term trends of air toxic levels, and help to develop appropriate control strategies for reducing exposures to toxics associated with significant public health risks.

There are three main components to the study, as listed below:

- Air Toxics Monitoring and Analyses
- Air Toxics Emissions Inventory Updates
- Air Toxic Modeling and Risk Assessments

In addition to air toxics, the monitoring portion of the study included continuous measurements of black carbon and ultrafine particles. These components are further described in the chapters that follow.

1.2 Estimates of Risks

A health risk assessment evaluates the potential health impacts from exposures to substances released from a facility or found in the air. These assessments provide estimates of potential long-term cancer and noncancer health risks. The assessments do not collect information on specific individuals but are estimates of potential effects in the population at large.

Potential health risks were estimated using methodology consistent with the procedures recommended in the 2003 OEHHA "Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments" (Guidance Manual). As discussed in the Guidance Manual, the risk assessment process generally consists of four parts; namely hazard identification, exposure assessment, dose response assessment, and risk characterization. The risk assessment steps, as applied in this study, are briefly summarized below.

Hazard Identification

Hazard identification involves determination of whether a hazard exists; and, if so, if the substance of concern is a potential human carcinogen or is associated with other types of adverse health effects in humans. For this study, the list of air toxics in the OEHHA Guidelines was used in conjunction with information on ambient levels of air toxics from previous studies, as well as input from the Technical Advisory Group, to determine which substances on which to focus for this assessment. This list is provided in Appendix I.

Exposure Assessment

The purpose of an exposure assessment is to estimate the extent of public exposure for a substance. This can involve quantification of emissions from a source, modeling of environmental transport and fate, and estimation of exposure levels over some period of time. In this study, annual averages of the air toxics of concern were estimated in two ways. For the fixed site monitoring station data, annual averages were calculated and used as an estimate of exposure. For the modeling analysis, emissions over the Basin were estimated and allocated to 2 kilometer by 2 kilometer geographic grids, and a regional dispersion model was used to estimate the annual average concentrations in each grid cell.

Dose Response Assessment

The dose response assessment characterizes the relationship between exposure to a substance and the incidence of an adverse health effect in an exposed population. For estimating cancer risk, the dose-response is expressed in terms of a potency slope that is used to calculate the probability of cancer associated with a given exposure. These cancer potency factors are expressed as the 95^{th} statistical upper confidence limit of the slope of the dose response curve assuming a continuous lifetime exposure to a substance at a dose of one milligram per kilogram of body weight. For effects other than cancer, dose-response data are used to develop acute and chronic reference exposure levels (RELs). The RELs are defined as the concentrations at or below which no adverse noncancer health effects would be found in the general population. The acute RELs are designed to be protective for infrequent one-hour exposures. The chronic RELs are designed to be protective for continuous exposure for at least a significant fraction of a lifetime.

For this study, the dose-response estimates developed by OEHHA are used to estimate the potential for adverse health effects. Note that these estimates sometimes differ from those developed by the U.S. EPA. For example, OEHHA has developed a cancer potency factor for diesel exhaust, whereas the U.S. EPA has elected not to do so. The U.S. EPA does state, however, that diesel exhaust is likely to be carcinogenic to humans and has adopted regulations designed to reduce diesel exhaust exposure. While some of the potency estimates OEHHA has developed for other air toxics produce different estimates of risks than those that would be calculated using the U.S. EPA values, the risk from diesel exhaust calculated using OEHHA's cancer potency factor is the dominant contributor to the estimated air toxics cancer risk in this study.

Risk Characterization

In this step, the estimated concentration of a substance is combined with the potency factors and RELs to determine the potential for health effects. In this study, the estimated or measured annual average levels for potential carcinogens are multiplied by the potency factor expressed as unit risks. The unit risk is the probability associated with a lifetime exposure to a level of one microgram per cubic meter of air of a given substance. The unit risk factors developed by OEHHA and used in this study are listed in Appendix I.

The potential cancer risk for a given substance is expressed as the incremental number of potential cancer cases that could be developed per million people, assuming that the population is exposed to the substance at a constant annual average concentration over a presumed 70-year lifetime. These risks are usually presented in chances per million. For example, if the cancer risks were estimated to be 100 per million, the probability of an individual developing cancer due to a lifetime of exposure would be one hundred in a million, or one in ten thousand. In other words, this predicts an additional 100 cases of cancer in a population of a million people over a 70-year lifetime.

Perspectives of Risk

To provide perspective, it is often helpful to compare the risks estimated from assessments of environmental exposures to the overall rates of health effects in the general population. For example, it is often estimated that the incidence of cancer over a lifetime in the U.S. population is in the range of 1 in 4 to 1 in 3. This translates into a risk of about 300,000 in a million. It has also been estimated that the bulk of cancers from known risk factors are associated with lifestyle factors such as tobacco use, diet, and being overweight. One such study, the Harvard Report on Cancer Prevention, estimated that of all cancers associated with known risk factors, about 30% were related to tobacco, about 30% were related to diet and obesity, and about 2% were associated with environmental pollution related exposures.

Source of Uncertainty

The estimates of health risks are based on the state of current knowledge, and the process has undergone extensive scientific and public review. However, there is uncertainty associated with the processes of risk assessment. This uncertainty stems from the lack of data in many areas, thus necessitating the use of certain assumptions. The assumptions are consistent with current scientific knowledge, but are often designed to be conservative and on the side of health protection in order to avoid potential underestimation of public health risks.

As noted in the OEHHA guidelines, sources of uncertainty, which may either overestimate or underestimate risk, include: (1) extrapolation of toxicity data from animal studies to humans, (2) uncertainty in the estimation of emissions, (3) uncertainty in the air dispersion models, and (4) uncertainty in the exposure estimates. Uncertainty may be defined as what is not currently known and may be reduced with further scientific studies. In addition to uncertainty, there is a natural range or variability in the human population in such properties as height, weight, age, and susceptibility to chemical toxicants.

Thus, the risk estimates should not be interpreted as actual rates of disease in the exposed population, but rather as estimates of potential risk, based on current knowledge and a number of assumptions. However, a consistent approach to risk assessment is useful in comparing different sources and different substances in order to prioritize public health concerns.

1.3 Updates to Cancer Risk Estimation Methods

After the release of the draft MATES IV Report, OEHHA adopted revised methodology to estimate carcinogenic risk. To provide a consistency with the draft report and previous MATES reports, we continue to present the risk results using the previous method as described above. We also provide the estimates of risk based on the new methodology to show the difference between the two methodologies.

The new OEHHA method for estimating cancer risks includes utilizing higher estimates of cancer potency during early life exposures. There are also differences in the assumptions on breathing rates and length of residential exposures. Staff has calculated unit risk factors with the updated methodology to show the effect of applying the methodology. These calculated unit risk factors are shown in Appendix I. While the previous method is used to compare results with past studies, staff also presents the estimates using the updated methods. Thus, while air toxic emissions, ambient levels, and resulting exposures and risks have dropped significantly over the past several years, the updated OEHHA methods estimate that the risks from a certain level of air toxic exposure are significantly higher than previously assumed.

1.4 References

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, 2003.

Harvard Report on Cancer Prevention Volume 1: Causes of Human Cancer
Cancer Causes & Control, Volume 7 Supplement November 1996

CHAPTER 2
AIR TOXICS MONITORING AND ANALYSES

Chapter 2. Air Toxics Monitoring and Analyses

2.1 Substances Monitored

The chemical compounds (Table 2-1) monitored in MATES IV include the toxics posing the most significant contributors to health risks as found in previous studies in the Basin. Additional measurements include organic carbon, elemental carbon, and total carbon, as well as particulate matter (PM), including $PM_{2.5}$. Acrolein was initially considered to be included. However, there was no suitable method available for routine analyses at the time the study began. Other compounds are also reported, since they are additionally captured in both the sampling and analytical protocols.

Table 2-1 Substances Monitored in MATES IV

Acetaldehyde	Dichloroethane	Organic Carbon (OC)
Acetone	Elemental Carbon (EC)	PAHs
Arsenic	Ethyl Benzene	Perchloroethylene
Benzene	Formaldehyde	$PM_{2.5}$
Black Carbon (BC)	Hexavalent Chromium	PM_{10}
1,3-Butadiene	Lead	Selenium
Cadmium	Manganese	Styrene
Carbon Tetrachloride	Methylene Chloride	Toluene
Chloroform	Methyl ethyl ketone	Trichloroethylene
Copper	MTBE	Ultrafine Particles (UFP)
Dibromoethane	Naphthalene	Vinyl Chloride
Dichlorobenzene	Nickel	Xylene
		Zinc

These substances are the same as measured in MATES III with the addition of black carbon and ultrafine particles.

2.2 Monitoring Sites

The monitoring sites are generally identical to those used in the MATES II and III Studies, other than for the West Long Beach site. These sites were originally selected to measure numerous air toxic compounds at different locations in the Basin in order to establish a baseline of existing air toxic ambient concentrations, as well as risk data, and to assist in the assessment of modeling performance accuracy. The West Long Beach site for the MATES IV Study is about 0.8 mile northwest of the MATES III site, as the previous site was no longer available. A comparison of levels for several monitored substances for the two West Long Beach sites from previous periods is show in Appendix V. The concentrations were generally comparable and well correlated between the two sites. Maintaining the same or similar locations across the MATES studies is critical for assessing long-term air toxic trends.

The locations for the 10 fixed sites reflect key locations within the Basin and are geographically dispersed. Fixed site locations include areas varying in land-use types to obtain a good spatial representation of the Basin, including expected areas of possible elevated toxics levels (e.g.

industrial and commercial) and those areas that are not directly near source emissions (neighborhoods). The sites also reflect resource constraints and the leveraging of existing monitoring programs and the availability of specialized equipment. The sites used in MATES IV are shown in Figure 2-1.

The 10 sites were originally selected with the input from the MATES II Technical Review Group and the Environmental Justice Task Force, and precise locations are listed in Table 2-2. Five were selected to provide continuity with the CARB long-term trend sites (Los Angeles, Burbank, Long Beach, Rubidoux and Inland Valley San Bernardino). The Pico Rivera site was selected because monitoring equipment was available from the EPA-sponsored PAMS Program. Anaheim was chosen for geographic equity, such that at least one site existed in each of the four counties. West Long Beach, Compton, and Huntington Park were sites selected to examine environmental justice concerns. Because the fixed site locations are based on EPA guidelines for "neighborhood scale" monitoring, each of these sites may also be representative of adjacent communities.

Table 2-2 Mates IV Site Locations

Site	**Address**
Anaheim	1630 Pampas Ln
Burbank	228 W. Palm Ave.
Compton	720 N. Bullis Rd.
Inland Valley San Bernardino	14360 Arrow Highway
Huntington Park	6301 S. Santa Fe Ave.
North Long Beach	3648 N. Long Beach Blvd.
Central Los Angeles	1630 N. Main St.
Pico Rivera	3713 B-San Gabriel River Parkway
Rubidoux	5888 Mission Blvd.
West Long Beach	2425 Webster Ave.

At each site, sampling equipment included particulate samplers, VOC canisters, and carbonyl samplers, as well as equipment to measure key meteorological parameters.

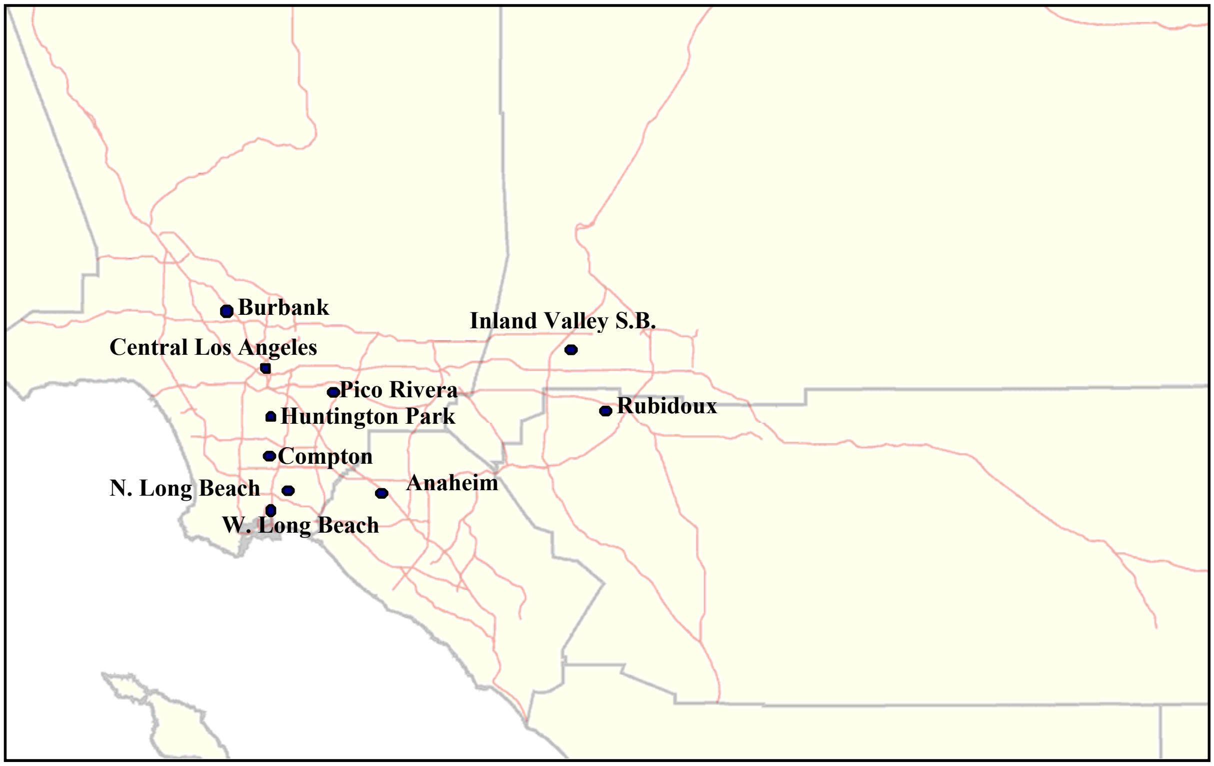


Figure 2-1 Location of MATES IV Monitoring Locations

2.2.1 Local Scale Monitoring

In addition to the 10 fixed sites, mobile monitoring platforms were deployed that focused on local scale studies at locations for short time periods.

Programs such as MATES are designed to monitor and characterize toxic emissions over the entire Basin. However, ambient monitoring is necessarily conducted at a limited number of locations, and modeling is limited to a spatial resolution of 2 km. Communities located very near industrial sources or large mobile source facilities (such as marine ports, railyards and commercial airports) can be affected by higher air contaminant levels than can be captured in the typical MATES analysis. Near-road monitoring studies and dispersion modeling results for point sources indicate that exposure can vary greatly over distances much shorter than 2 km. The local-scale monitoring program of MATES IV aims to characterize the impacts of large sources on nearby communities by utilizing portable platforms designed to sample for a period of several weeks at selected locations with an emphasis on diesel particulate matter (DPM) and ultrafine particle (UFP) emissions. The studies are designed to assess gradients in ambient pollutant levels within communities as well as provide a comparison to the fixed MATES monitoring sites. The communities chosen for sampling were chosen based on proximity to potential sources as well as environmental justice concerns.

A unique set of rapidly deployable mobile air toxics monitoring platforms using the latest technologies for continuous measurements were utilized. Continuous data, combined with continuous meteorological data, is extremely valuable in determining source locations, emission profiles, and exposure variability.

The platforms were equipped with a DustTrak DRX (TSI, Inc.) that measures the mass concentrations of different size fractions of PM continuously. UFP measurements are achieved with a Condensation Particle Counter (CPC, model 3781; TSI, Inc.), which monitors number concentrations of particles down to 6 nm in size and up to concentrations of 500,000 particles per cubic centimeter (#/cm^3). A portable Aethalometer (AE22; Magee, Inc.) for real-time measurements of BC was also installed as an indicator of DPM.

The monitoring sites and results are summarized in Chapter 5.

2.3 Ambient Sampling Schedule

The MATES IV project conducted air toxics monitoring at 10 locations over a one-year period. Sampling for MATES IV followed a one-in-six day, 24-hour integrated-sampling schedule, matching the U.S EPA sampling schedule. As noted previously, black carbon (BC) and ultrafine particles (UFP, particles smaller than 0.1 µm in size) are measured in addition to the air toxics. These measurements are conducted with continuous sampling methods as described below.

All data will be submitted to the U.S. EPA's Air Quality System (AQS) after review and validation. Sampling occurred from July 2012 through June 2013.

2.4 Monitoring and Laboratory Analysis

For MATES IV, meteorological equipment and sampling equipment for canisters, PM_{10} and $PM_{2.5}$ filters, and carbonyl cartridges from the existing air monitoring network were used to the extent possible. The SCAQMD laboratory provided the analytical equipment and conducted the routine analysis. The analytical methods to measure the ambient species are briefly described below and in Table 2-3. Detailed protocols are described in Appendix III.

Table 2-3 Sampling and Analysis Methods for MATES IV

Species	Sampling	Laboratory Analysis
Volatile Organic Compounds (VOCs)	Summa Polished/ Silica-Lined Canisters	Gas chromatograph – Mass spectrometer (GC-MS) with automated pre-concentration and cryo-focusing
Carbonyls	DNPH Cartridge	Solvent recovery and subsequent analysis via high performance liquid chromatography (HPLC)
Hexavalent Chromium	Cellulose Fiber Filters	Treatment with buffer solution to maintain proper pH and then subsequent analysis via ion chromatograph (IC)
Elemental and Organic Carbon	PM Filters	Section of PM filter removed and analyzed on a laser corrected carbon analyzer
TSP Metals	PM Filters	ICPMS
Black Carbon	Continuous	Aethalometer
UFP	Continuous	Condensation Particle Counters

Volatile Organic Compounds

Volatile organic compounds (VOCs) are measured from air samples collected in either summa polished or silica-lined six-liter canisters using an automated canister sampler to fill at a constant rate over a 24-hour time period, depending upon the site. The filled canisters are brought back to the laboratory for analysis within 48 hours of the sample being collected. VOCs are identified and measured using gas chromatograph mass spectrometry (GC-MS). The SCAQMD currently has two GC-MS instruments running U.S. EPA's TO-14 and TO-15 methods. These instruments are equipped with automated canister pre-concentrators attached to the GC to enable continuous analysis.

Carbonyl Compounds
Carbonyl compounds are sampled by drawing air continuously through a DNPH (2,4-Dinitrophenylhedrazine) cartridge. The carbonyl compounds undergo derivatization with DNPH, and the derivatives are analyzed using High Performance Liquid Chromatography (HPLC) in accordance with U.S. EPA Method TO-11.

PAHS
Naphthalene and other polycyclic aromatic hydrocarbons (PAHs), components of both mobile source and stationary source emissions, were measured at selected monitoring sites. PAHs were measured at three of the MATES IV monitoring stations: Central Los Angeles, North Long Beach, and Rubidoux. Samples were collected and analyzed under the EPA NATTS Program. The Central Los Angeles and Rubidoux sites are part of the NATTS network, and the Long Beach site was added for a period of one year coinciding with the MATES IV monitoring.

Hexavalent Chromium
Hexavalent chromium (Chrome VI) is analyzed using ion chromatography (IC). Sample collection involves drawing air at a prescribed rate for 24 hours through a cellulose fiber filter. The filter is treated with sodium bicarbonate to prevent conversion of Chrome VI to Chrome III. Chrome VI is extracted from the filter by sonication and subsequently analyzed using IC.

Particulate Matter
Total suspended particulates (TSP), particulates less than 10 microns (PM_{10}) and particulates less than 2.5 microns ($PM_{2.5}$) are collected separately over a 24-hour period using size selective inlets according to U.S. EPA's Federal Reference Methods (40CFR50).

Metals in TSP samples are determined using ICPMS, and metals in $PM_{2.5}$ samples are determined by Energy Dispersive X-Ray Fluorescence Spectrometry. Identification of ions within the PM samples is performed by IC.

Carbon analysis is conducted by taking a small circular disk from sampled PM_{10} or $PM_{2.5}$ filters. The small circular disk is placed into a carbon analyzer which utilizes thermal optical transmittance method (IMPROVE method) to measure the OC and EC content of the filter.

BC and UFP
BC measurements were carried out using Aethalometers. Briefly, this instrument utilizes the light-absorbing properties of BC which is related to the particulate BC mass concentration.

UFP number concentration data were collected continuously (i.e. one-min. time resolution) using water-based Condensation Particle Counters. This instrument provides the total number concentration of particles above 7 nm in real-time.

Additional details of the methods are in Appendix III.

Results for the BC and UFP monitoring are summarized in Chapter 5.

Diesel Particulate Matter
For MATES II, diesel PM was estimated using ambient measurements of EC combined with Basin-wide EC emissions inventories to determine the contribution of diesel emissions to ambient PM levels. For MATES III, several methodologies to assess the levels of diesel PM were explored. These methods included the following:

- Using ambient EC levels as in MATES II
- Using ambient EC and the ratio of $PM_{2.5}$, EC, and diesel PM emissions from the 2005 emissions inventory
- Using the EPA Chemical Mass Balance model (CMB) to apportion source emissions to $PM_{2.5}$

Based on the results of these analyses, the CMB and the ratio of EC to diesel PM from the emissions inventory were used to estimate ambient levels of diesel PM in MATES III. The overall Basin average was nearly the same for these methods. Given this close correspondence, the method based on the ratio of EC to diesel PM emissions, updated with the most recent emissions inventory, was used for the MATES IV diesel PM estimates.

2.5 Quality Assurance and Quality Control (QA/QC)

The SCAQMD is one of the four Primary Quality Assurance Organizations (PQAO) responsible for air monitoring in California, and is committed to achieving the highest possible data quality level in the MATES and several other environmental monitoring programs. The Quality Management Plan (QMP), which is the foundation document for ensuring high quality and defensible data (approved in 2009) presents SCAQMD quality system and describes the organizational structure, functional responsibilities of management and staff, lines of authority, and general methodology for assessing all activities conducted in support of air monitoring and analysis, air quality assessment and other environmental measurement activities conducted by the agency.

The quality goals and QA requirements for the particle and gaseous pollutants measured during MATES are found in various Quality Assurance Project Plan (QAPP) documents as outlined in the following paragraphs. These QAPPs also describe the responsibilities within the organization for carrying out each program and meeting specific QA/QC objectives. They address the Data Quality Objectives (DQOs) of accuracy, bias, comparability, completeness, detectability and representativeness, list the Method Quality Objectives (MQOs) of precision, bias, completeness, sensitivity and, where applicable, flow rate accuracy for the analytes of interest. They document the Standard Operating Procedures (SOPs) and Operational Assistance Guides (OAGs) which are directions for specific performing measurement activities. Finally, they list the required QA/QC requirement for each activity and provide instructions for data review, QA oversight, and corrective actions.

The quality goals and QA requirements (with the exception of siting) for monitoring ambient levels of volatile organic compounds (VOCs), carbonyls, hexavalent chromium , and polycyclic aromatic hydrocarbons (PAHs) were adopted from the U.S. EPA National Air Toxics Trends Stations (NATTS) Program. These requirements can be found in the SCAQMD NATTS QAPP, which was last revised in 2013 and is currently under review by the U.S. EPA Region 9.

The quality goals and QA requirements (with the exception of siting) for monitoring the main components of fine particulate matter ($PM_{2.5}$) including Organic and Elemental Carbon (OC/EC), Anions and Cations, and trace metals were adopted from the U.S. EPA Chemical Speciation Network (CSN) program. These requirements can be found in the SCAQMD $PM_{2.5}$ Speciation QAPP, which was last revised in 2013 and was approved by the U.S. EPA Region 9 in 2014.

The quality goals and QA requirements (with the exception of siting) for monitoring fine and coarse PM ($PM_{2.5}$ and PM_{10} FRM) were adopted from the U.S. EPA Criteria Pollutant Monitoring Program. These requirements can be found in the SCAQMD Criteria Pollutant Monitoring Program QAPP, which was last revised in 2012 and approved by the U.S. EPA Region 9 in 2013.

The quality goals and QA requirements (with the exception of siting) for monitoring ultrafine particles (UFPs) and black carbon (BC) can be found in the SCAQMD Special Monitoring Program QAPP, which also describes the protocols and procedures followed by SCAQMD for monitoring other "non-criteria" pollutants and performing short-term measurement studies similar to those conducted during MATES IV (see Chapter 5 for details). The current version of this QAPP was last revised in 2013 and is currently awaiting approval by the U.S. EPA Region 9.

The SCAQMD objectives, procedures, documentation, and data review techniques assure the MATES program will produce data that are accurate, precise, reliable and legally defensible. The technical procedures for QA/QC include annual system audits on all equipment in the laboratory and at all MATES sampling sites. Quality control procedures also include proper record keeping, standard checks, routine calibrations of the sampling and analytical equipment, and collecting collocated samples at regular intervals.

2.6 Findings

The findings are presented in terms of the annual average concentrations of air toxics measured at each site as well as Basin-wide, and then by the estimated cancer risks resulting from exposures to these average concentrations. Air toxic levels are also compared to levels found in the MATES II and the MATES III Studies to assess trends in levels of air toxics in the Basin. In the following charts, the error bars denote the 95% confidence interval of the average. In general, concentrations of most toxics substantially decreased compared to levels measured previously.

2.6.1 Volatile Organic Compounds (VOCs)

Figures 2-2 and 2-3 present levels for benzene and 1,3-butadiene, which are emitted predominantly from gasoline-powered mobile sources. Benzene shows a continuing reduction in annual average levels. These decreases are likely reflective of reduced emissions from vehicle fleet turnover to newer vehicles and use of reformulated gasoline. 1,3-butadiene shows a similar annual level compared to MATES III. This may in part be due to challenges of measuring low levels of this substance and its high reactivity.

Levels of the chlorinated solvents perchloroethylene and methylene chloride are shown in Figures 2-4 and 2-5. Perchloroethylene shows a continuing reduction in levels, likely a result of a number of air quality rules leading to the gradual phase-out of its use as an industrial and dry cleaning solvent in the South Coast. Methylene chloride shows similar levels on average, with some sites showing increased averages. These levels likely reflect the use as a solvent and may be influenced by specific activities near the monitoring locations.

Formaldehyde and acetaldehyde concentrations are shown in Figures 2-6 and 2-7. There was a reduction in the average levels compared to the MATES II and MATES III Studies. Formaldehyde is emitted from mobile sources and is also formed as a secondary pollutant through chemical reactions in the atmosphere.

2.6.2 Metals

Levels of several air toxic and other metals are shown in Figures 2-8 to 2-12.

The air toxics arsenic and cadmium levels are shown in Figures 2-8 and 2-9. Both metals show declines, but for cadmium this may be more affected by improved analysis techniques allowing for lower reporting levels for MATES IV compared to previous studies.

Figures 2-10 and 2-11 show the levels of two more air toxics, lead and nickel. Lead concentrations were reduced compared to MATES II and III, and the values are well below the Ambient Air Quality Standard for lead of 150 ng/m^3. Nickel concentrations also decreased Basin-wide and at most sites.

Hexavalent chromium concentrations are shown in Figure 2-12. It should be noted that as found in previous studies, localized increases in hexavalent chromium can occur near facilities using hexavalent chromium-containing materials, such as metal platers, facilities using chromium containing paints, or cement manufacturing plants. The monitoring locations in this study, however, are focused on regional levels of air toxics. Thus, localized areas of increased exposure may not be picked up in the monitoring. The annual averages at the monitoring locations were substantially lower than the previous MATES studies. This may be due in part to better sampling and analysis methods with lower blank sample levels as well as ongoing emissions reductions (see discussion below).

For the MATES III Study, the Rubidoux site showed an increase in average hexavalent chromium levels which were eventually traced to cement plants in the area. This led to the adoption of amendments to SCAQMD rules for cement facilities addressing hexavalent chromium emissions. The levels from MATES IV reflect these rule changes as well as reduced activity at the cement plants with hexavalent chromium levels greatly reduced and now comparable to those of other sites.

In previous studies, it was recognized that there can be a measurable value for hexavalent chromium in unsampled (blank) filters. To determine the extent of this, trip blanks were periodically taken and the average values are also shown in Figure 2-12. Note that the blank values have been substantially reduced with improvements in the measurement methodologies. These include more sensitive instrumentation, and a rigorous washing of the collection filters before use. When estimating risk from exposure to hexavalent chromium, the average blank value is subtracted from the site averages.

2.6.3 Elemental Carbon

Elemental carbon (EC) was measured in $PM_{2.5}$ samples as well as the PM_{10} samples. The results are shown in Figures 2-13 and 2-14. Both showed significant reductions in average levels compared to previous studies. PM_{10} EC was lower by about 25% compared to the MATES III levels, and $PM_{2.5}$ EC was lower by 35%. These reductions are likely due to reduced emissions from mobile sources, including diesel fueled vehicles, as a result of various rules limiting emissions.

2.6.4 Diesel PM

In the MATES II Study, EC was used as a surrogate for diesel particulate levels, as staff determined that this was the best method available during the MATES II Study. For the MATES III Study, staff also used the Chemical Mass Balance (CMB) source apportionment technique to estimate the contribution from diesel, as well as from other major source categories, to the measured particulate levels. The CMB model was utilized based on the recommendation of the MATES III Technical Advisory Group.

To compare the different methods to estimate diesel particulate levels, the method used in MATES II, which was based on the emissions ratios of diesel particulate and elemental carbon from a study conducted in the South Coast in the 1980's, and a method based on the ratio of $PM_{2.5}$ emissions from the 2005 emissions inventory were also calculated. For MATES II, the $PM_{2.5}$ elemental carbon levels were multiplied by 1.04 to estimate diesel particulate. For MATES III, the 2005 inventory resulted in a ratio of diesel particulate to elemental carbon emissions of 1.95. The CMB model used in MATES III used several measured species of $PM_{2.5}$ compared to $PM_{2.5}$ emissions source profiles to estimate the contribution of these sources to ambient $PM_{2.5}$ levels.

The MATES III estimates using the ratio and CMB methods were compared and are shown in Table 2-4.

As shown in the table, both the CMB model and the updated $PM_{2.5}$ emissions ratio method gave comparable estimates of the overall average for DPM.

Table 2-4 MATES III Estimates of Average Diesel PM, μg/m3

Estimation Method	MATES III Year One	MATES III Year Two
MATES II method: PM_{10} EC x 1.04	2.18	2.14
2005 Inventory: $PM_{2.5}$ EC x 1.95	3.37	3.70
CMB	2.87 – 3.13	3.52 – 3.84

Given the comparability found in MATES III, the expense of the CMB analysis, and in consultation with the MATES IV Technical Advisory Group, DPM in the MATES IV Study was estimated using the ratio of the emissions of diesel particulate to elemental carbon in the $PM_{2.5}$ fraction (updated for the 2012 emissions inventory) multiplied by the ambient levels of $PM_{2.5}$ EC to give an estimate of ambient DPM. The complete 2012 emissions estimates are provided in Appendix VIII and the total emissions and resulting ratio are shown in Table 2-5.

Table 2-5 2012 Emissions of Diesel PM and EC, lbs./day

$PM_{2.5}$ Diesel PM	$PM_{2.5}$ EC	DPM/EC Ratio
18,867	23,163	0.815

To compare the estimated diesel PM levels from MATES IV and MATES III, the emissions ratio method was applied to the $PM_{2.5}$ EC levels. These estimates are shown in Figure 2-15. Since there were changes in both the $PM_{2.5}$ EC as well as the emissions inventory ratio of EC to DPM, the reductions in diesel PM ambient concentration estimates are larger than the declines in EC levels. The concentrations of diesel PM were thus about 70% lower in MATES IV compared to MATES III. This difference is consistent with that of the emissions inventory, which showed a decline in diesel $PM_{2.5}$ emissions of about 66% from the 2005 inventory to the 2012 inventory. Additional discussion of this approach is in Appendix XI.

2.6.5 Naphthalene and Other PAH Compounds

Limited measurements of naphthalene and other PAHs (polycyclic aromatic hydrocarbons) were taken at three sites, as shown in Figure 2-16.

Naphthalene levels were on average much higher than that of other PAHs, in line with previous observations in the Basin. For the three sites, Central Los Angeles showed the highest average levels of naphthalene. A similar pattern for the sum of the other PAHs was found. Figure 2-16 also shows the comparison with MATES III data indicating that levels were generally lower during the MATES IV time frame. The levels of naphthalene, for example, were lower in MATES IV by about 25% at the Central Los Angeles site and lower by about 46% at the Rubidoux site.

2.7 Cancer Risk Estimates

There are inherent uncertainties in risk assessment, as discussed in the Introduction of this report and in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines (August 2003)[1]. Despite these uncertainties, risk assessment remains the most useful tool to estimate the potential health risks due to low level environmental exposures. This tool is also useful as a yardstick to measure progress in attaining healthful air quality.

In the MATES II and III Studies, cancer risks were estimated for exposure to the measured ambient levels of air toxics. The estimates assume that a lifetime exposure (70 years) occurs at these levels, consistent with guidance on risk assessment established by OEHHA. We use the same methodology to estimate risks from the levels of toxics measured during MATES IV.

Figures 2-17 and 2-18 show the estimated cancer risks for the toxics measured at each site for the MATES IV Study. Included for the three sites where measurements were taken are the risks

[1] California Environmental Protection Agency Office of Environmental Health Hazard Assessment, Air Toxics Hot Spots Program Risk Assessment Guidelines. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

from naphthalene and other PAHs for which there are adopted cancer potency values. The sites average includes the PAHs using the three-site average value. Note that the PAHs are relatively small contributors to the overall average risk. The average level of naphthalene, the largest contributor, was 104 ng/m^3 across the three sites. This equates to a 70-year risk of about three in one million.

Average risks are dramatically reduced from previous studies. The average risk is about 420 per million. This compares to about 1,400 per million in the MATES II Study, and about 1,200 per million in the MATES III Study. As shown in the charts, diesel particulate has been and still is the major contributor to air toxics risk, and the bulk of the reductions in risks can be attributed to lower levels of ambient diesel particulate. It should be noted that different methods were used to estimate diesel particulate levels in the MATES II Study, so the results are not strictly comparable. However, based on the discussion above, the MATES II Study method may have underestimated the levels of diesel particulate.

On average, diesel particulate contributes about 68% of the total air toxics risk. This is a lower portion of the overall risk compared to the MATES III estimate of about 84%.

2.7.1 Updates to Cancer Risk Estimation Methods

Staff notes that after the Draft MATES IV Report was released, OEHHA updated the methods for estimating cancer risks.[2] The revised method includes utilizing higher estimates of cancer potency during early life exposures. There are also differences in the assumptions on breathing rates and length of residential exposures. When combined together, staff estimates that risks for the same inhalation exposure level are about 2.5 times higher using the proposed updated methods.[3] This would be reflected in the average lifetime air toxics risk estimated from the monitoring sites data going from 418 per million to 1023 per million. The previous method is used to compare results with past studies throughout this report. However, whether the previous method or the updated method is applied, the same relative changes in risks would result when compared to previous MATES study measurements.

A comparison of risks using the updated methodology for the 10 monitoring sites is shown in Figure 2-19.

[2] California Environmental Protection Agency Office of Environmental Health Hazard Assessment, Air Toxics Hot Spots Program Risk Assessment Guidelines. The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, February, 2014

[3] In the October, 2014 Draft MATES IV Report, the increased in risk estimates was given as a 2.7 fold increase. This was based on using the 90th percentile of breathing rate distribution. In anticipation of CARB guidance for risk management, we have used the 80th percentile of the breathing rate distribution for ages greater than 2 years. This resulted in a 2.45 fold change in the estimate of risk.

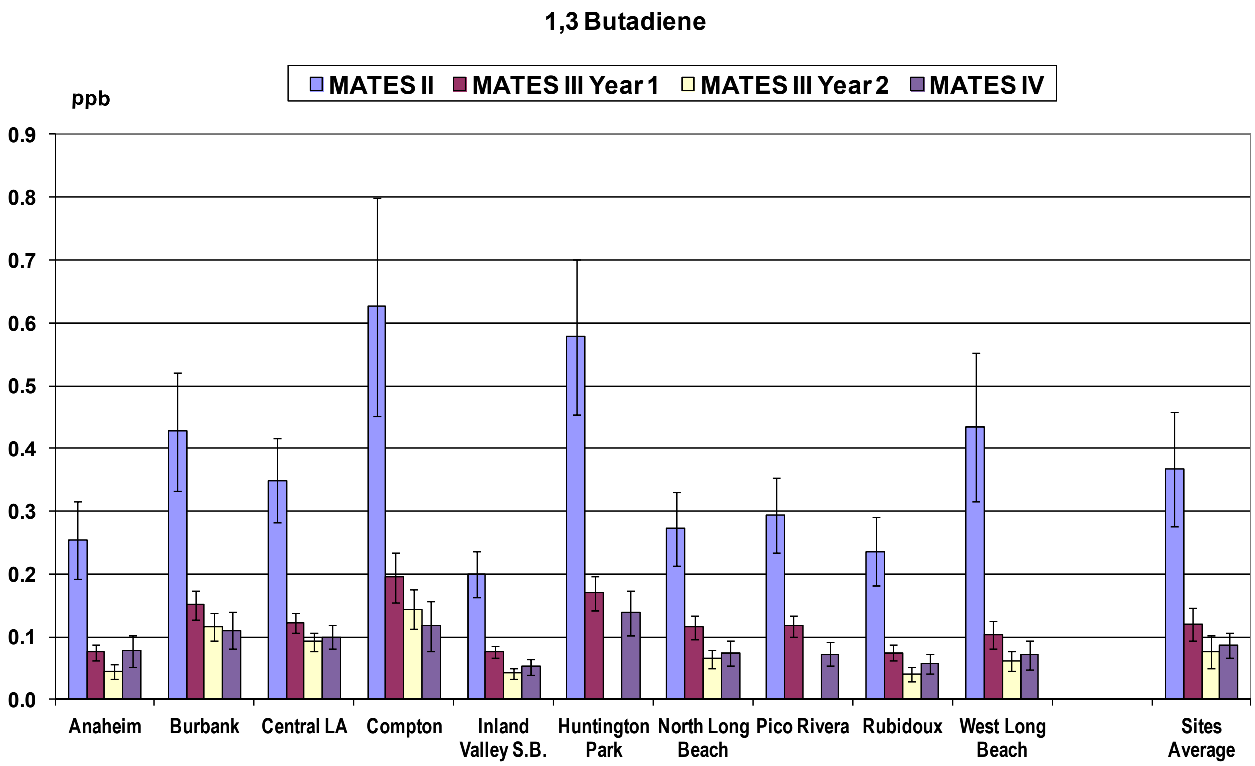


Figure 2-2 Average Concentrations of 1,3-Butadiene

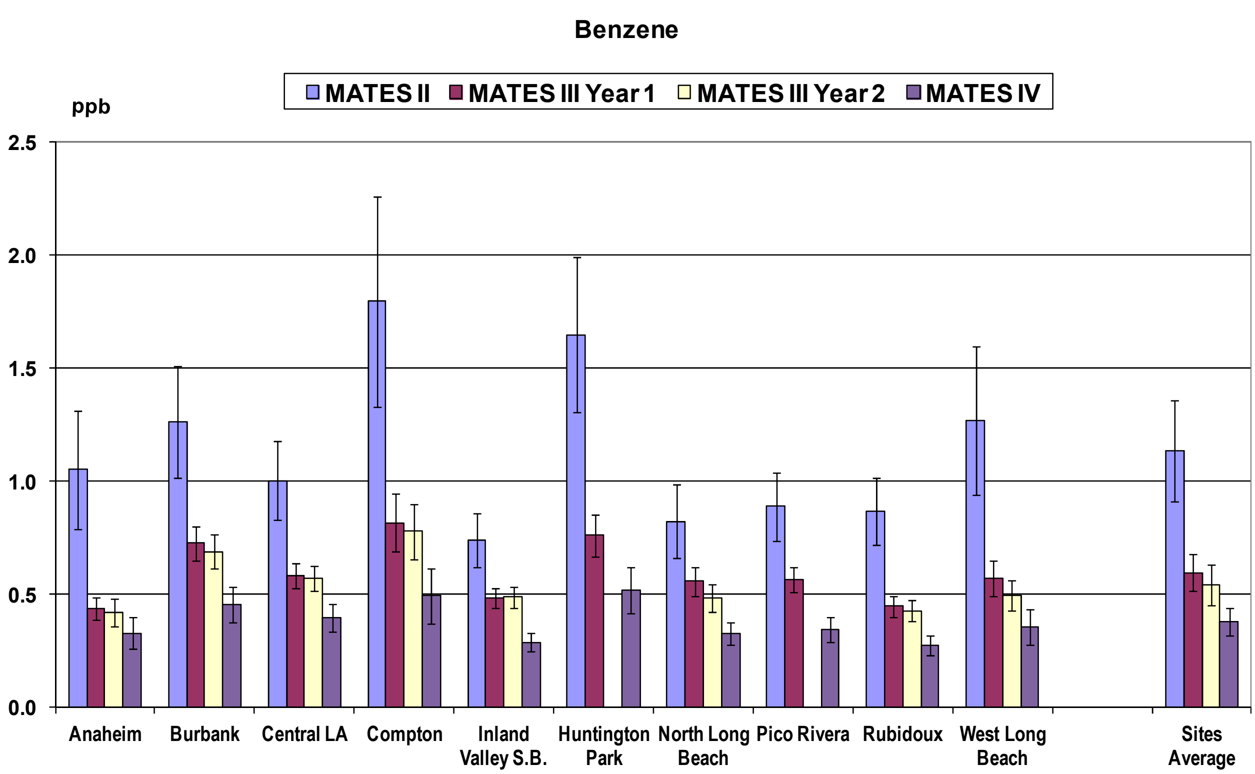


Figure 2-3 Average Concentrations of Benzene

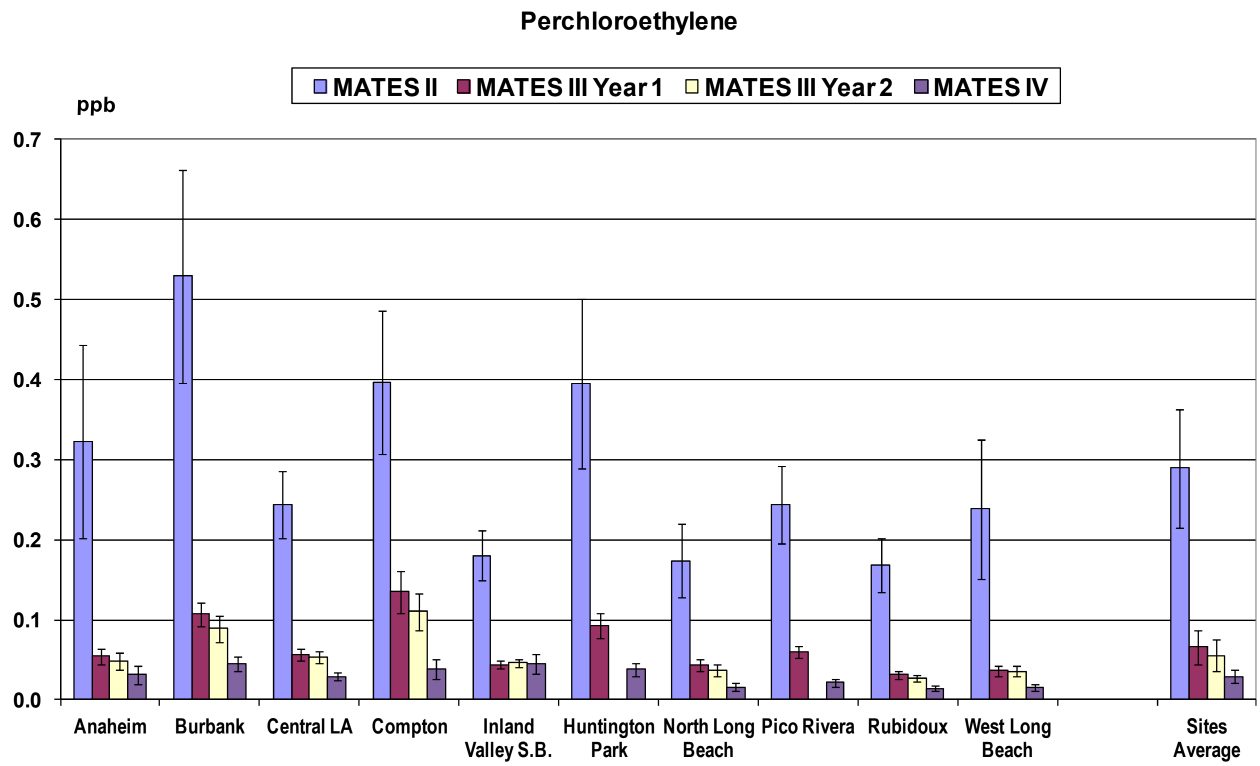


Figure 2-4 Average Concentrations of Perchloroethylene

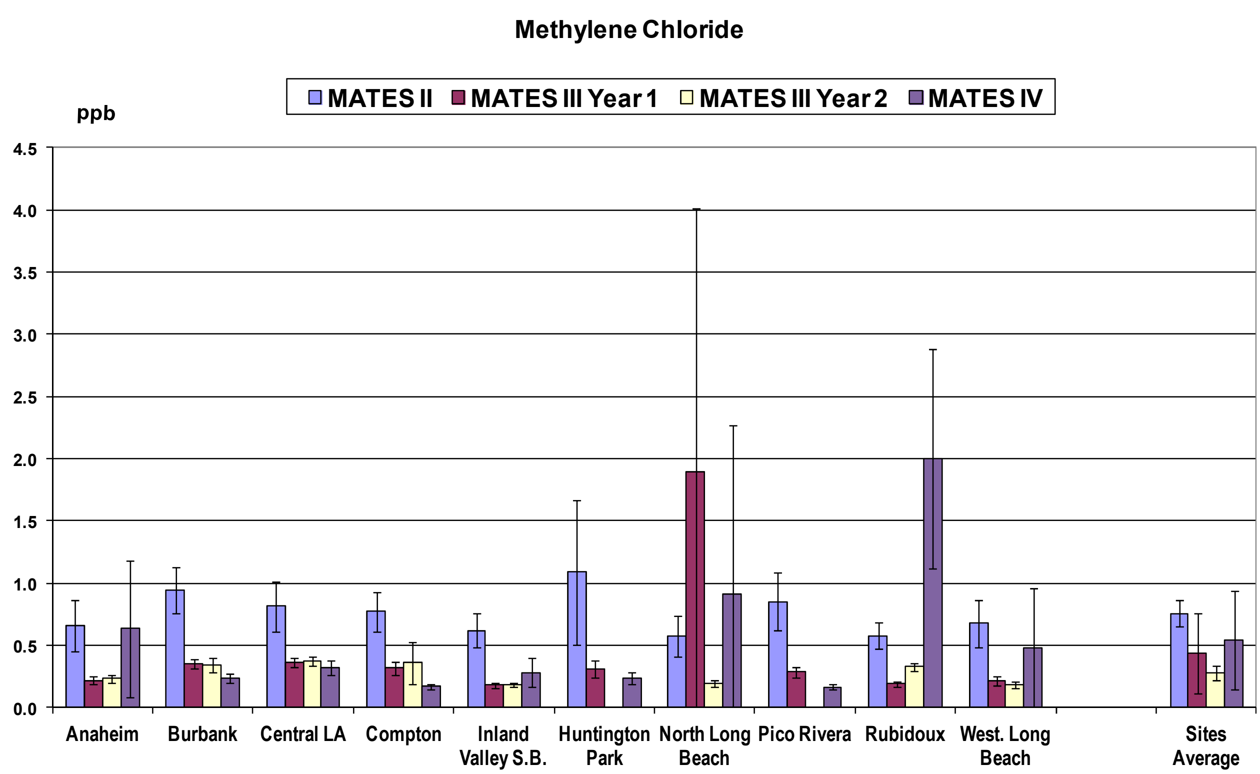


Figure 2-5 Average Concentrations of Methylene Chloride

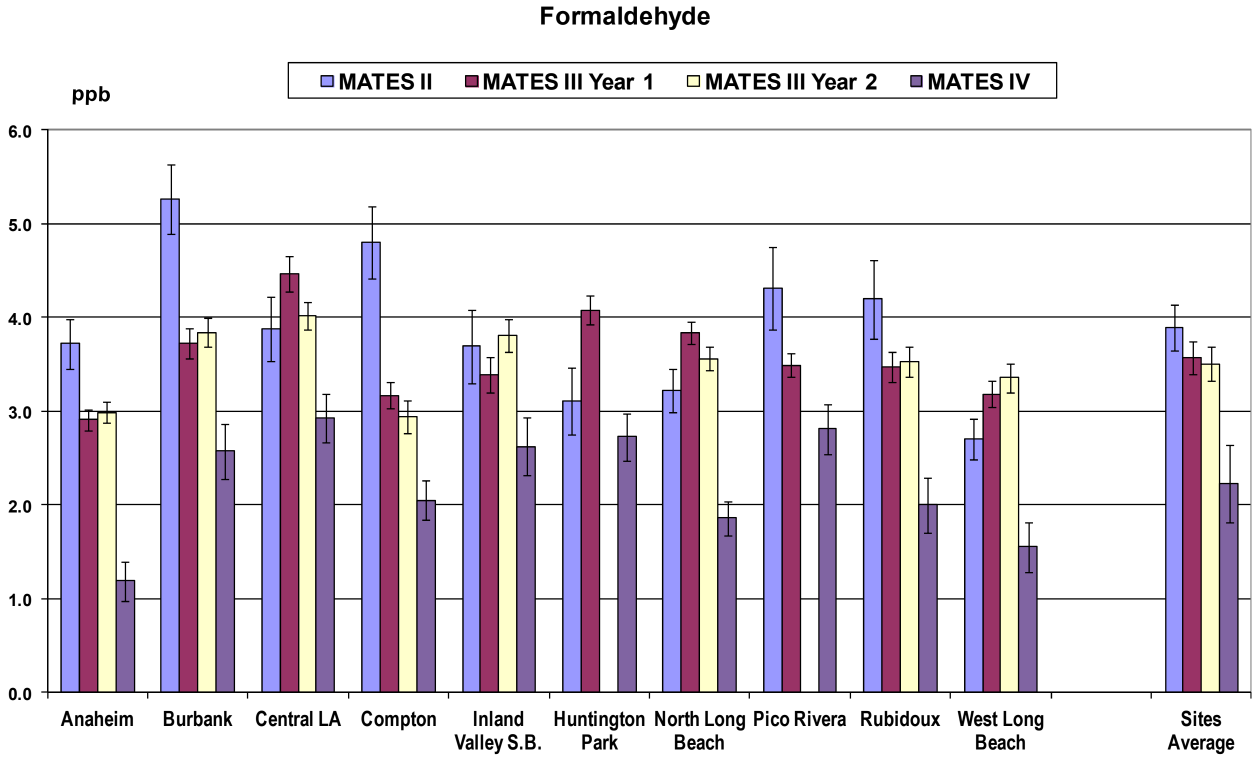


Figure 2-6 Average Concentrations of Formaldehyde

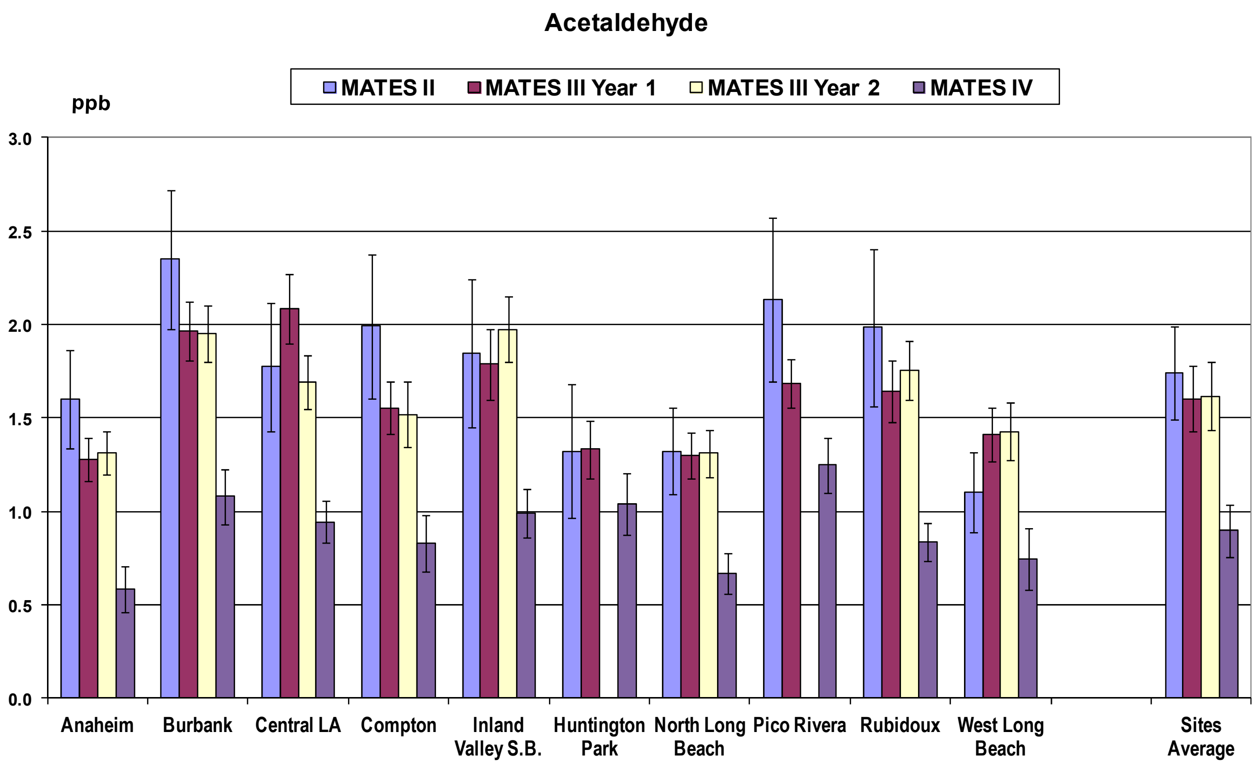


Figure 2-7 Average Concentrations of Acetaldehyde

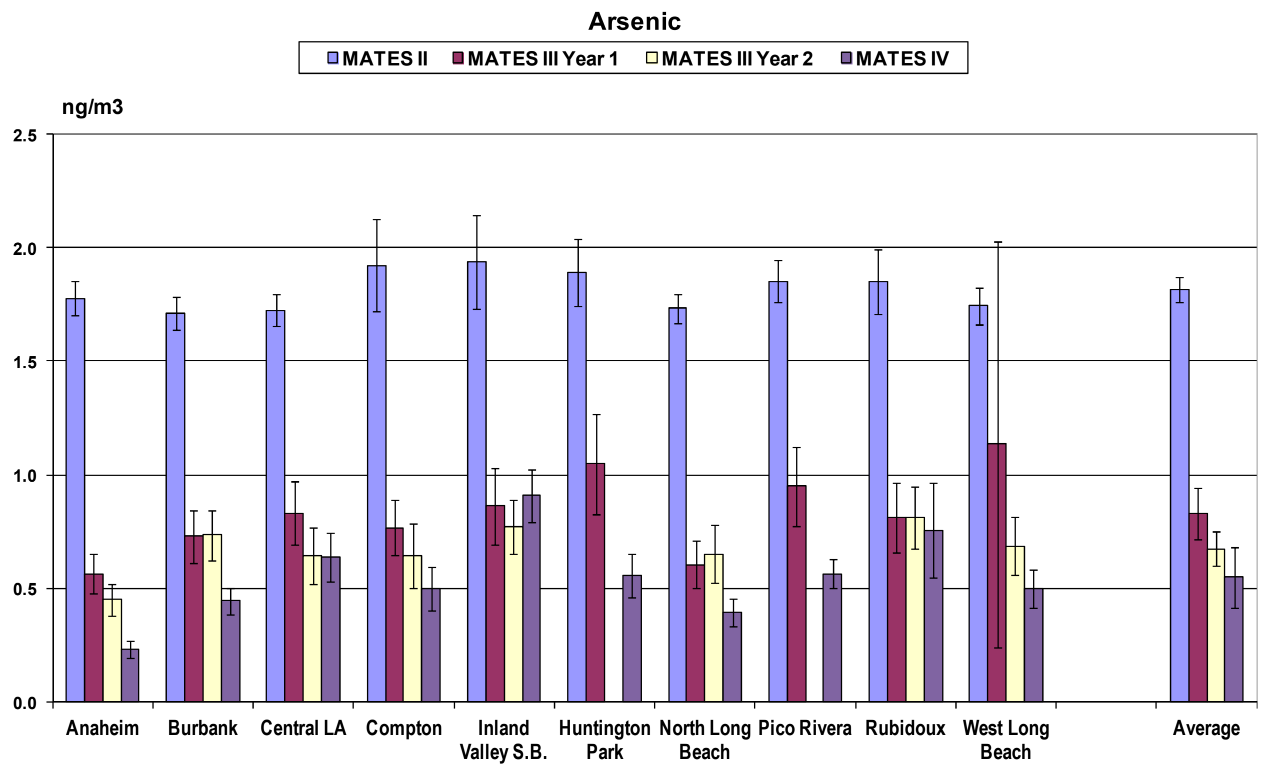


Figure 2-8 Average Concentrations of Arsenic in Total Suspended Particulate (TSP)

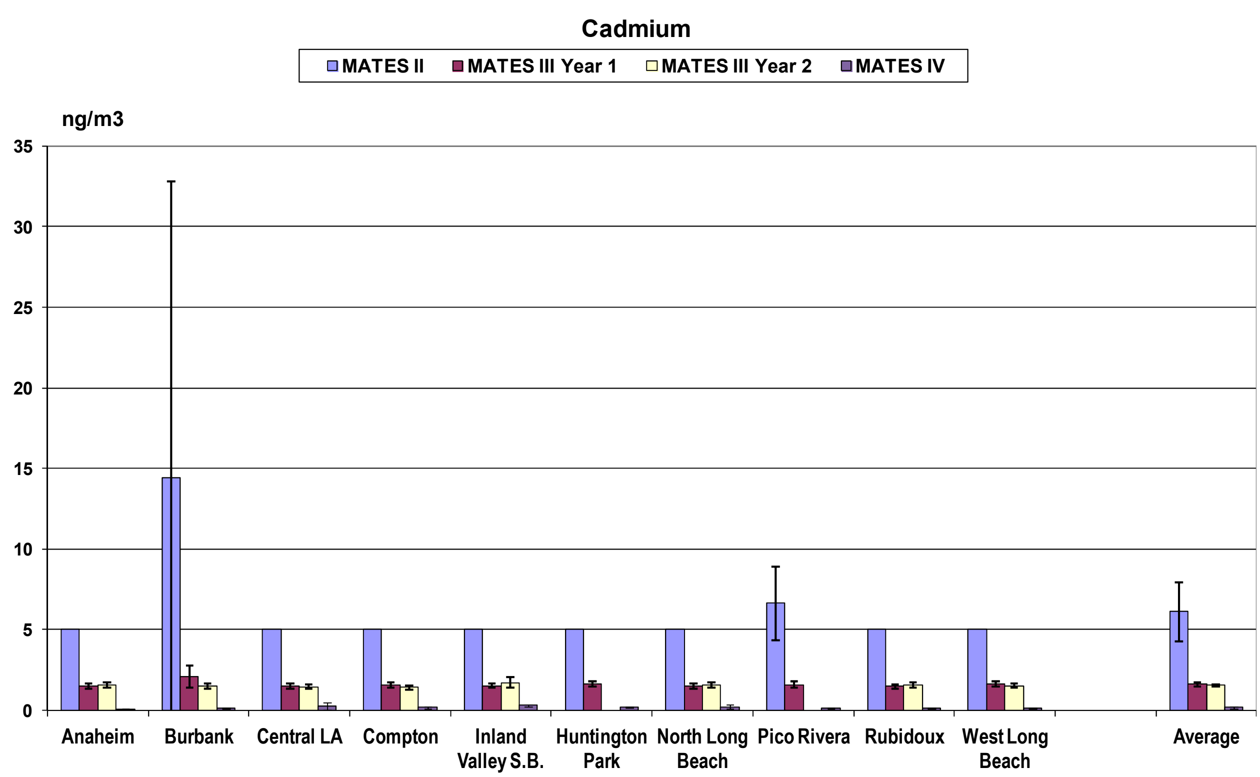


Figure 2-9 Average Concentrations of Cadmium in Total Suspended Particulate (TSP)

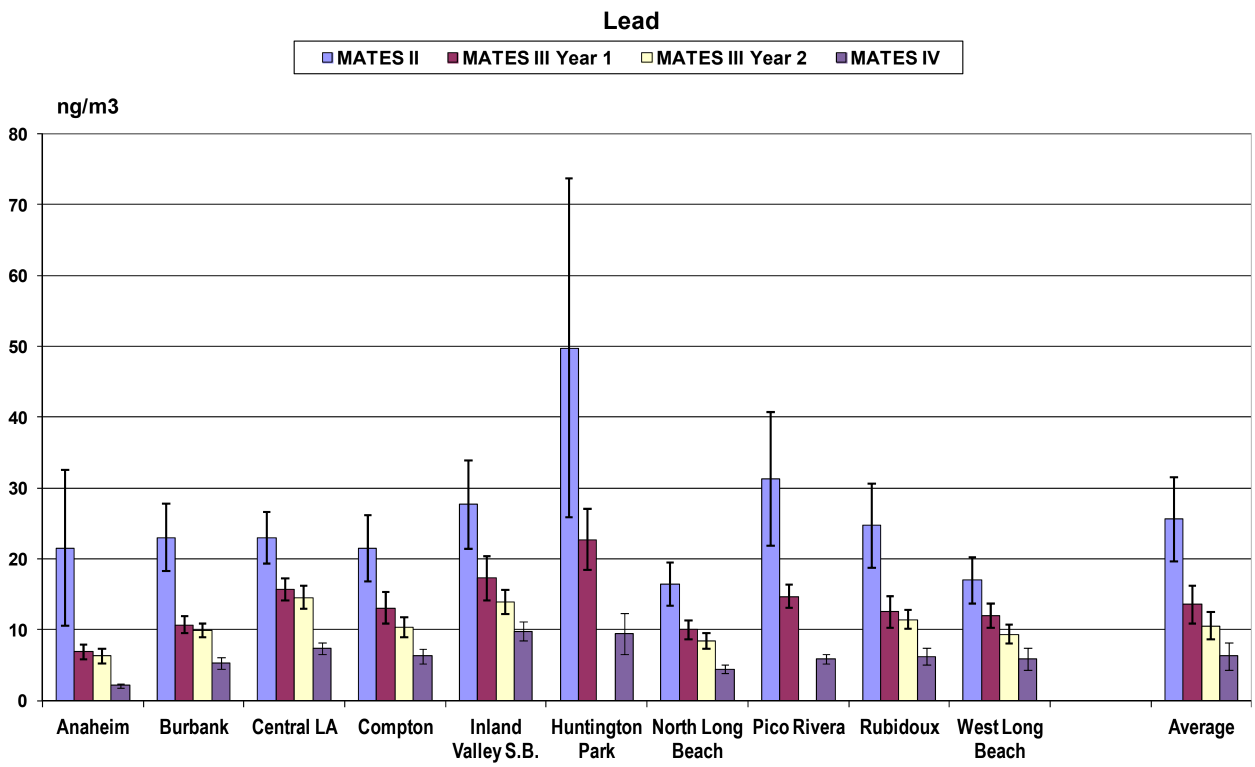


Figure 2-10 Average Concentrations of Lead in Total Suspended Particulate (TSP)

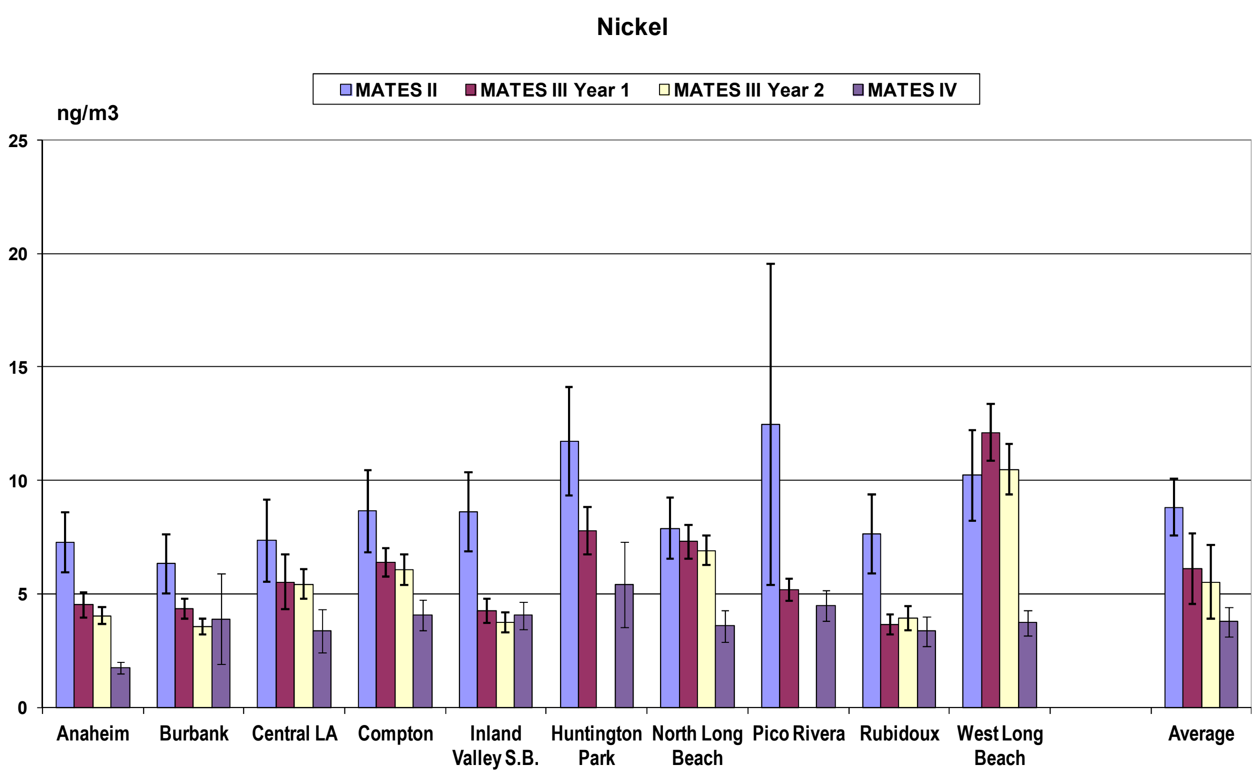


Figure 2-11 Average Concentrations of Nickel in Total Suspended Particulate (TSP)

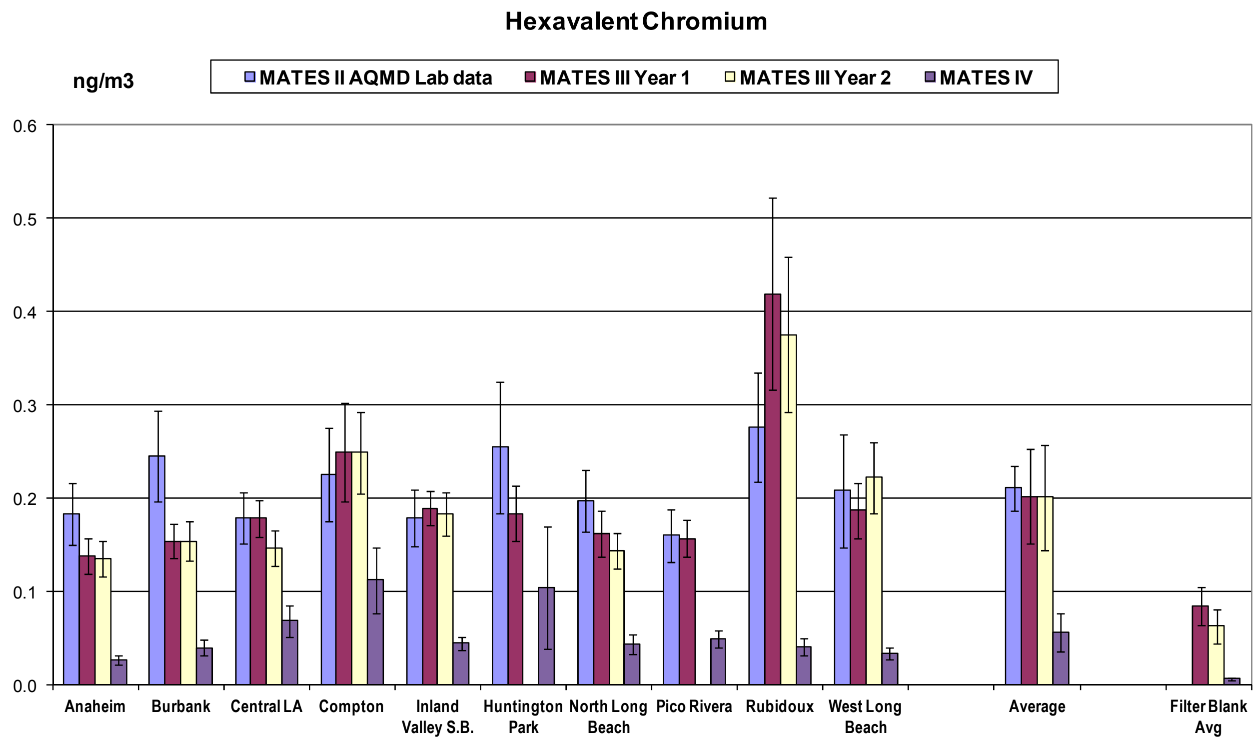


Figure 2-12 Average Concentrations of Hexavalent Chromium in Total Suspended Particulate (TSP)

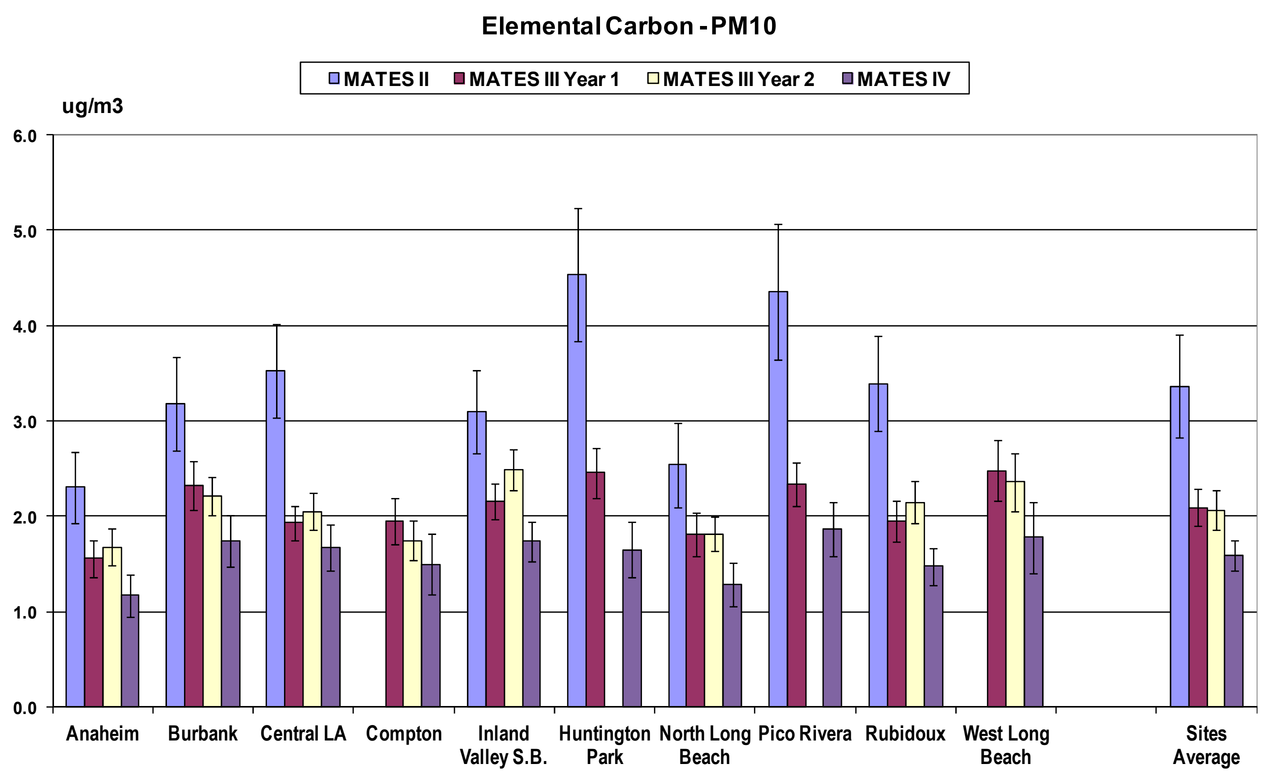


Figure 2-13 Average Concentrations of PM_{10} Elemental Carbon (EC)

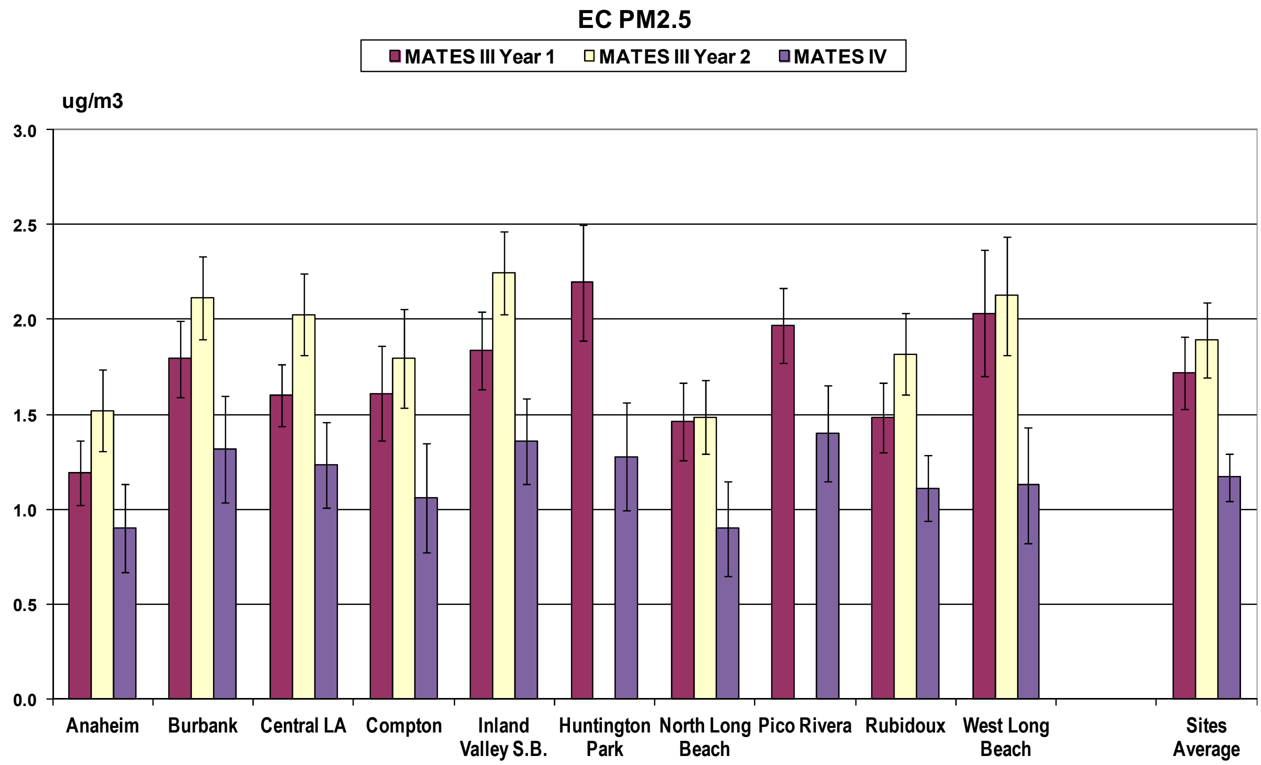


Figure 2-14 Average Concentrations of $PM_{2.5}$ Elemental Carbon (EC)

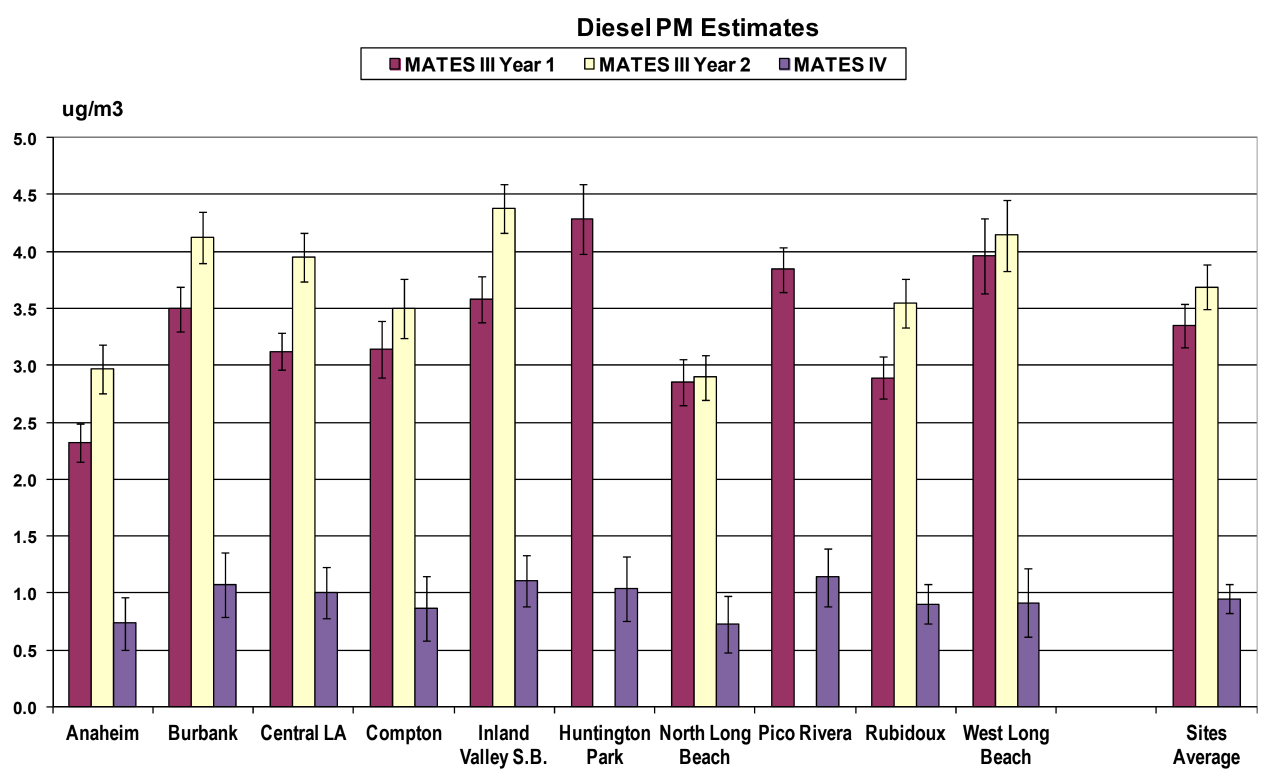
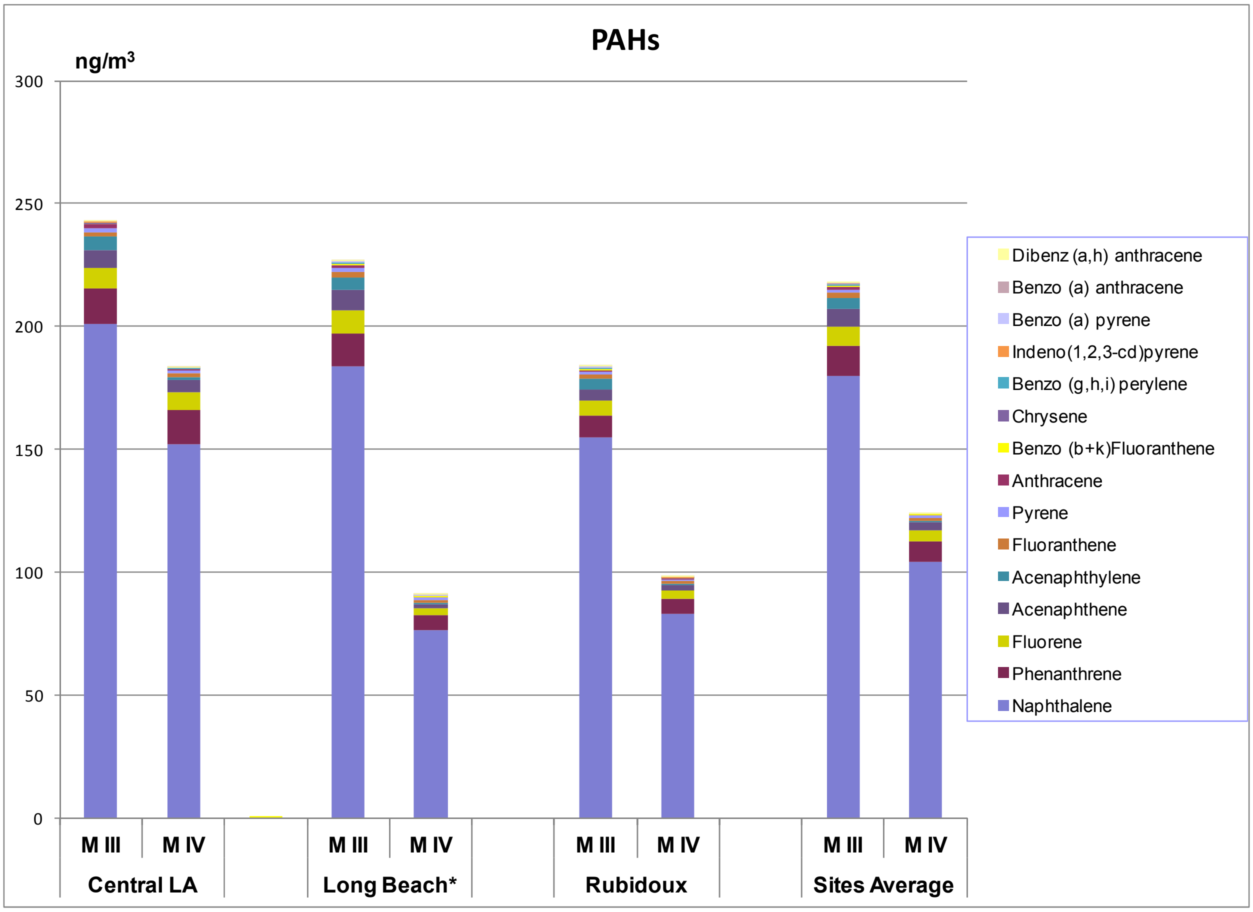


Figure 2-15 Average Concentrations for Diesel PM Based on Emissions Ratio Method



* MATES III site was at West Long Beach, and MATES IV site was at North Long Beach

Figure 2-16 Average Concentration of PAHs for MATES III and MATES IV

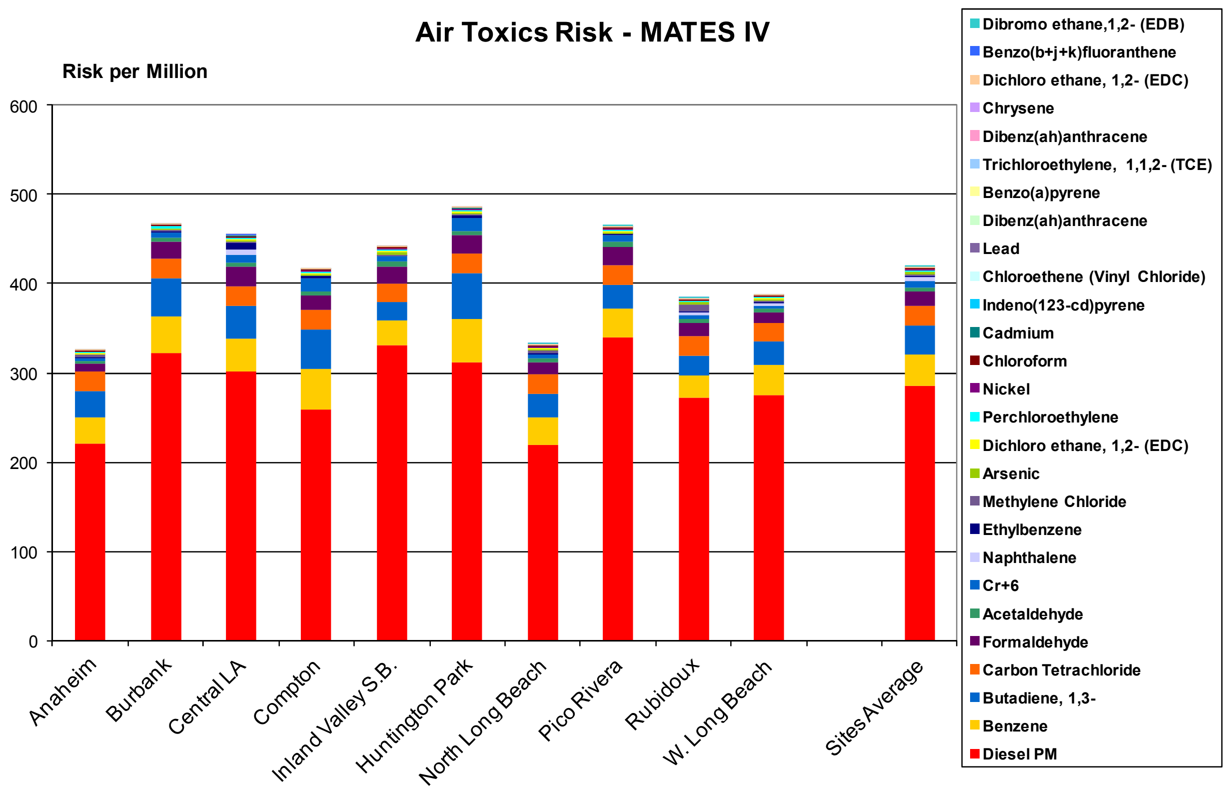


Figure 2-17 Estimated 70-Year Risk from MATES IV Monitoring Data

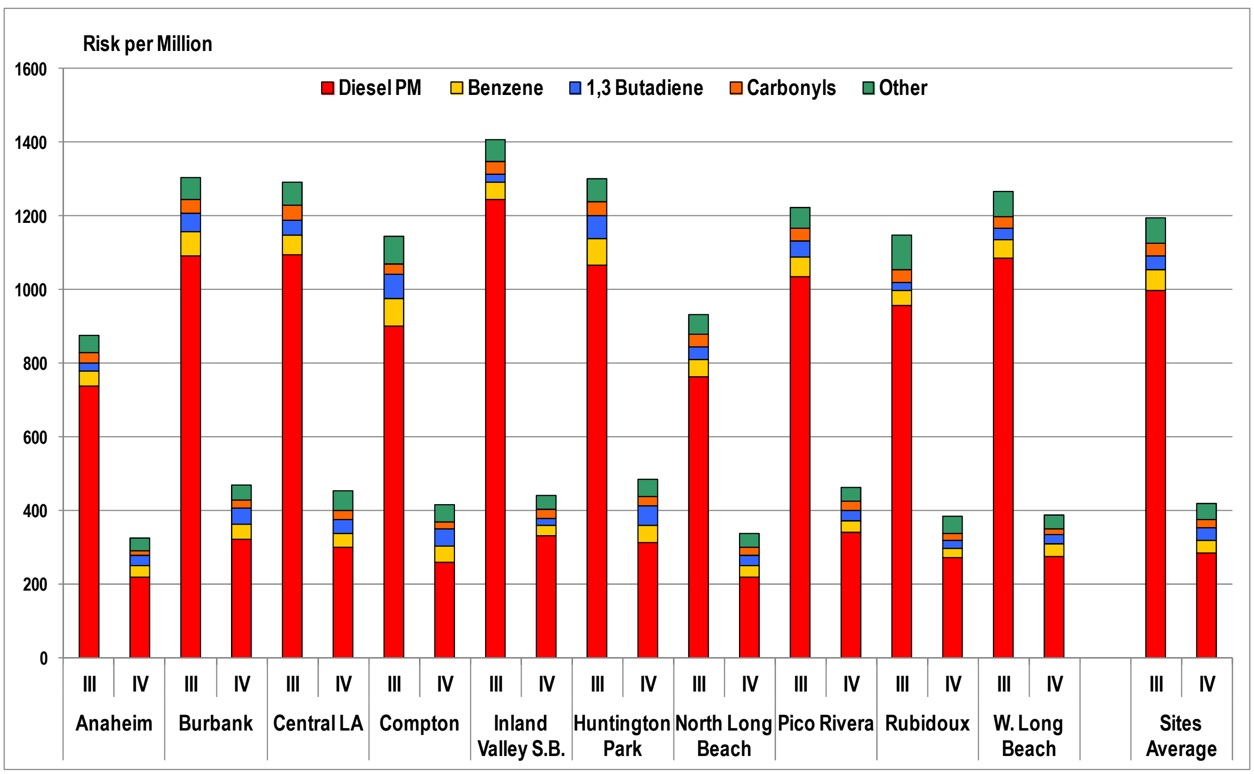


Figure 2-18 Comparison of Estimated 70-Year Risk from MATES III & IV Monitoring Data

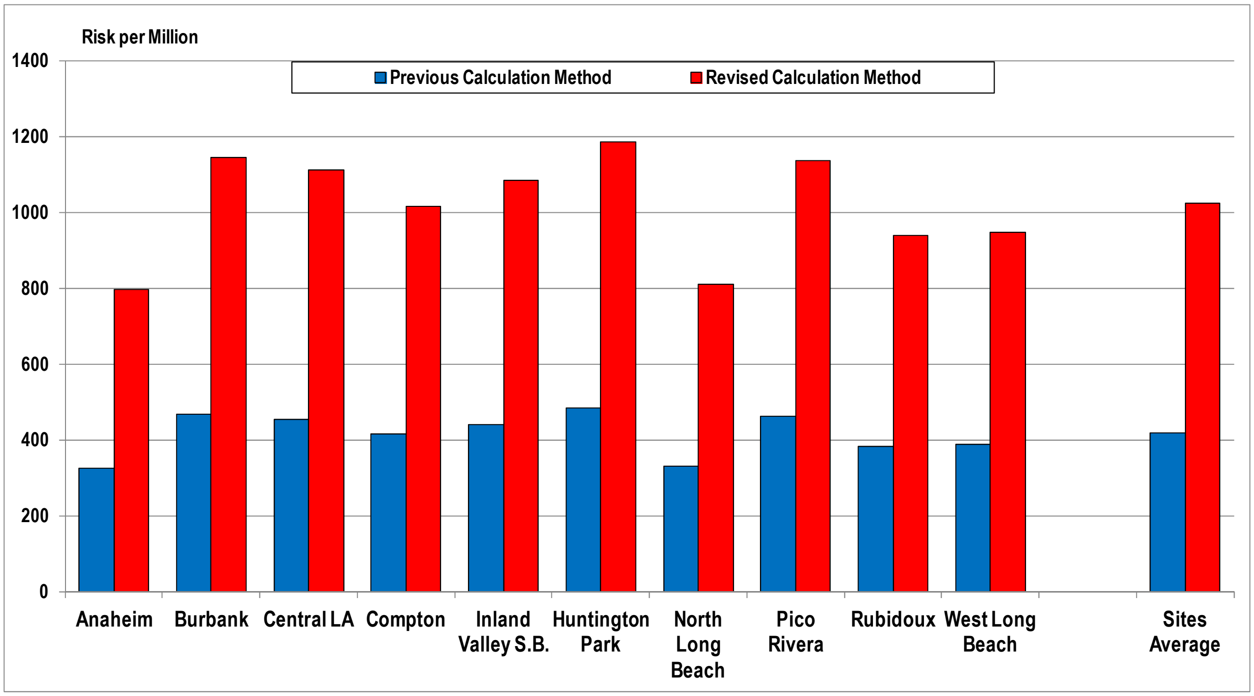


Figure 2-19. Comparison of Previous and Updated OEHHA Risk Calculation Methodologies

CHAPTER 3

DEVELOPMENT OF THE TOXICS EMISSIONS INVENTORY

Chapter 3. Development of the Toxics Emissions Inventory

3.1 Introduction

An emissions inventory of air pollutants and their sources is essential to identify the major contributors of air contaminants and to develop strategies to improve air quality. The information necessary to develop a detailed emissions inventory for the Basin is obtained from SCAQMD data sources as well as other government agencies including California Air Resources Board (CARB), California Department of Transportation (Caltrans), and Southern California Association of Governments (SCAG).

Each of these agencies is responsible for collecting data (e.g., industry growth factors, socio-economic projections, travel activity levels, emission factors, emission speciation profiles, etc.) and developing methodologies (e.g., model and demographic forecast improvements) that are needed to generate a comprehensive emissions inventory. SCAQMD is solely responsible for developing the point source inventory, and the area source inventory is developed jointly by SCAQMD and CARB. CARB is the primary agency responsible for developing the emissions inventory for all mobile sources and provides on-road and off-road inventories from their EMFAC and OFF-ROAD Models, respectively. SCAG is the primary agency for projecting population and economic activity growth in the Basin. Caltrans provides SCAG with highway network, traffic counts, and road capacity data. SCAG incorporates these data into their Travel Demand Model for estimating and projecting vehicle miles traveled (VMT) and speed. CARB's on-road inventory also relies on SCAG's VMT estimates.

3.2 Overview

The toxic emissions inventory for MATES IV consists of four components: (1) point sources; (2) area sources; (3) on-road mobile sources; and (4) off-road (or other) mobile sources. Point source emissions are from facilities having one or more pieces of equipment registered and permitted with the SCAQMD with emissions above certain threshold levels. Area sources represent numerous small sources of emissions that can collectively have significant emissions (e.g., dry cleaners, retail gasoline stations, auto body shops, residential heating, etc.). On-road mobile sources include cars, trucks, buses, and motorcycles. All mobile sources not included in the on-road mobile source inventory are considered as "off-road" mobile sources, which include aircraft, ships, commercial boats, trains, recreational vehicles, construction and industrial equipment, etc.

The 2012 Air Quality Management Plan (AQMP)[1] is the basis for the toxics emissions inventory developed for MATES IV. The 2012 inventory used for the MATES IV modeling analysis is projected from the 2008 baseline emissions inventory in the 2012 AQMP. A "top-down" approach is used to develop the toxics inventory; that is, toxic emissions are calculated by applying the latest CARB speciation profiles[2] to the hydrocarbon and particulate matter emissions. Speciation profiles provide estimates of the emission's chemical composition. CARB maintains and updates the chemical composition and size fractions of particulate matter (PM) and the chemical composition and reactive fractions of total organic gases (TOG) for a variety of emission source categories. The source type (e.g., equipment and fuel) is used to identify the appropriate speciation profile.

A top-down approach is preferable for a regional modeling risk analysis, for the following reasons:

- Speciating the VOC and PM inventory affords consistency with the 2012 AQMP;
- The photochemistry algorithms in the MATES IV modeling system require the complete speciation of the VOC emissions to ensure their correct application;
- The computer programs used to grow and control the VOC and PM emissions into the future for the 2012 AQMP can also be used for projecting the toxic emissions in MATES IV. Thus, the future cancer risk reductions resulting from the 2012 AQMP can be estimated.

3.3 Point Sources

A 2008 point source emissions inventory based on the emissions data reported by the point source facilities in the 2008 Annual Emissions Reporting (AER) Program is the basis for the 2012 inventory used for MATES IV modeling analysis. This program applies to facilities emitting four tons or more of VOC, NOx, SOx, or PM or emitting more than 100 tons of CO per year. Facilities subject to the AER Program calculate and report their emissions primarily based on their throughput data (e.g., fuel usage, material usage), appropriate emissions factors or source tests, and control efficiency, if applicable). Under the 2008 AER Program, approximately 1,800 facilities reported their annual emissions to the SCAQMD. Emissions from smaller industrial facilities not subject to the AER Program, which represent a small fraction of the overall stationary source inventory, are included as part of the area source inventory (see Section 3.4).

In order to prepare the point source inventory, emissions data for each facility are categorized based on U.S. EPA's Source Classification Codes (SCCs) for each emission source category. Since the AER collects emissions data on an aggregate basis (i.e., equipment and processes with the same emissions factor are grouped and reported together), facility's equipment permit data are used in conjunction with the reported data to assign the appropriate SCCs and develop the inventory at the SCC level. For modeling purposes, facility location specified in latitude/longitude coordinates is translated into the modeling coordinate system. The business operation activity profile is also recorded so that the annual emissions can be distributed temporally throughout the day, week, and year.

Toxic emissions are calculated by applying the latest CARB speciation profiles[2] to the hydrocarbon and particulate matter emissions. The SCC is used to identify the appropriate speciation profile for the source. The 2012 emissions used for MATES IV are based on the 2012 AQMP projections using 2008 as the base year.

3.4 Area Sources

The area source emissions developed for the 2012 AQMP, projected from 2008 to the year of interest (2012) are used for MATES IV. SCAQMD and CARB shared the responsibility for developing the 2008 area source emissions inventory for approximately 350 area source categories. Specifically, SCAQMD developed the area source inventory for about 93 categories, and CARB developed the remaining area source categories (of which 239 categories are associated with consumer products, architectural coatings, and degreasing). For each area source category, a specific methodology is used for estimating emissions. Emissions are spatially allocated to 2 km by 2 km grids using spatial surrogates. Some commonly used spatial surrogates are listed in Table 3-1. As with the point source inventory, toxic emissions are calculated by applying the latest CARB speciation profiles to the hydrocarbon and particulate matter emissions.

3.5 On-Road Mobile Sources

On-road emissions are estimated by combining emission factors with vehicular activity. The 2012 on-road emissions were based on 2012 AQMP projections from the 2008 base year. For the 2012 AQMP, CARB's EMFAC2011 emission factors[3] were used and link-based traffic volumes and speeds were obtained from the SCAG regional transportation modeling. The Direct Travel Impact Model (DTIM) was used to link emission factors and transportation modeling results and generate hourly gridded emissions of criteria pollutants (i.e., TOG, NOx, PM, CO, and SOx). The DTIM emissions are adjusted based on the EMFAC2011 values. Toxic emissions are calculated by applying the latest CARB speciation profiles for mobile sources to the hydrocarbon and particulate matter emissions. A flow chart illustrating this process is provided in Figure 3-1. Some of the key steps in the process are discussed in more detail below.

EMFAC stands for EMission FACtor. In its current form, it is a suite of computer models that estimates the on-road emissions of hydrocarbons (HC), CO, NOx, PM, lead (Pb), SO_2, and CO_2 for calendar years 1970 to 2040. EMFAC considers 1965 and newer vehicles powered by gasoline, diesel, or electricity and reports for 13 broad vehicle classes as shown in Table 3-2. Over 100 different technology groups are accounted for within each class (e.g., catalyst, non-catalyst, three-way catalyst, carbureted, multiport fuel injection, LEV, TLEV, SULEV, etc.).

EMFAC currently considers the following county-specific information when calculating emissions:

- Ambient air temperature (denoted by T in Figure 3-1);
- Relative humidity (denoted by RH in Figure 3-1);
- Vehicle population;
- Fleet composition;
- Fleet growth rates;
- Mileage accrual rates;
- Vehicle age distribution;
- Distribution of VMT by speed;
- Smog check regulations;
- Fuel properties; and
- Altitude.

Selected on-road activity information for the four counties in the Basin is summarized in Table 3-3. Four of the top seven counties in California in terms of vehicle population, VMT, and trips are in the Basin.

One of the outputs of EMFAC summarizes HC, CO, NOx, PM, lead, SO_2, and CO_2 emission rates for a given calendar year for each vehicle class and for each county/air basin specified. Processing continues with the DTIM modeling system, which prepares gridded hourly on-road emissions for photochemical grid modeling.

The DTIM processing system consists of three Fortran program modules: CONVIRS4, IRS4, and DTIM4. The main function of CONVIRS4 is to re-format the emission rate file output from EMFAC into a form compatible with IRS4. IRS4 creates fleet average emission rates by ambient air temperature, relative humidity, and vehicle speed.

The DTIM4 module prepares gridded, hourly on-road emissions of HC, CO, NO_X, PM, lead, SO_2, and CO_2 link by link in the transportation network. SCAG's Travel Demand Model provides the following for each link in the transportation network: the number of vehicles, their average speed, and time on the link. Separate files containing hourly gridded temperature (T in Figure 3-1) and relative humidity (RH in Figure 3-1) are provided as input to DTIM4. Knowing the air temperature and relative humidity representative of the link and the average vehicle speed on the link, DTIM4 looks up the fleet average emission rate in the file prepared by IRS4, and multiplies these by the number of vehicles and the average time on the link.

Finally, CARB speciation profiles are used to speciate the on-road HC and PM emissions into its toxic components.

3.6 Off-Road Mobile Sources

The 2008 off-road emissions developed for the 2012 AQMP were projected to 2012 for MATES IV. For the 2012 AQMP, CARB's OFF-ROAD model[4] was used to estimate emissions for all off-road categories (100+ source categories) except commercial ships, aircraft, locomotive, and recreational vehicles. This model incorporates various aspects of off-road elements, such as the effects of various adopted regulations, technology types, and seasonal conditions on emissions. The model combines population, activity, horsepower, load factors, and emission factors to yield the annual equipment emissions by county, air basin, or state. Spatial and temporal features are incorporated to estimate seasonal emissions. Ship emissions were developed by CARB for the 2012 AQMP. Aircraft emissions for the 2012 AQMP were developed by SCAQMD. Emissions are spatially allocated to 2 km by 2 km grids using spatial surrogates while aircraft emissions are allocated to the airports. Toxic emissions are calculated by applying the latest CARB speciation profiles for off-road mobile sources to the hydrocarbon and particulate matter emissions.

3.7 Summary of Toxic Emissions

Table 3-4 presents the emissions of selected compounds apportioned by the on-road, off-road, point, and area source categories. Chemicals that are considered potential or known human carcinogens are denoted with a check mark. Toxic emissions by major source categories are provided in Appendix VIII.

Species and source apportionment are shown in Table 3-5 and Figure 3-2, respectively. In those illustrations, the emissions of the carcinogenic pollutants in Table 3-4 are weighted by the ratio of their cancer potency to the cancer potency of diesel particulate matter (DPM). Thus, emissions from species less potent than DPM (e.g, benzene, perchloroethylene, etc.) are weighted less, while emissions from species more potent than DPM (e.g., hexavalent chromium, arsenic, etc.) are weighed more. DPM has a weighting factor of one.

As shown in Table 3-5, DPM emissions account for 80% of the overall cancer risk. The other significant compounds (i.e., contributions >1%) are hexavalent chromium, 1,3-butadiene, benzene, formaldehyde, and arsenic. On-road and off-road mobile sources contribute nearly 92% of the weighted carcinogenic risks and stationary (i.e., point and area) sources contribute about 8% of the risk (Figure 3-2).

Carcinogenic emissions have been continuously decreasing. The 2005 MATES III carcinogenic emissions inventory decreased by 11% from the corresponding 1998 MATES II inventory. A more dramatic 65% emissions decrease was noted from MATES III to MATES IV (2005 to 2012 inventory years), as shown in Figure 3-3. Carcinogenic emissions from area, point, off-road and on-road source categories decreased by 78%, 21%, 74% and 49%, respectively.

3.8 Selected Emissions and Air Quality Changes Since MATES III

Table 3-6 compares emissions and measured air quality changes since MATES III for selected toxics. The air quality change is comparing measured annual average ambient concentrations from 2005 and 2012 from eight sites with complete data. Emissions have decreased, and air quality has improved since MATES III.

Several caveats are appropriate when comparing the changes in inventory emissions and ambient measurements. For example, weather and dispersion of pollutants can influence the relationship between emissions and ambient concentrations. Also, the inventory is a regional estimate of total emissions throughout the Basin, whereas ambient measurements are from the eight fixed monitoring locations where there may be influences from local sources. Another difference is that secondary formation and degradation of substances in the atmosphere are not accounted for in the emissions comparisons, but are captured in the ambient measurements. Nonetheless, comparing emissions estimates with air quality measurements can provide information on whether expected emissions changes are reflected in actual ambient measurements, can be used to help calibrate emissions estimates, and may suggest where emissions inventory methods can be improved.

3.9 References

1. A copy of the 2012 AQMP can be viewed or downloaded at the following SCAQMD link: http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan
2. CARB speciation profiles can be viewed or downloaded from the following CARB link: http://www.arb.ca.gov/ei/speciate/speciate.htm.
3. EMFAC2011 model and its documentation can be obtained at the following CARB link: http://www.arb.ca.gov/msei/modeling.htm.

4. The OFF-ROAD Model and its documentation can be obtained at the following CARB link: http://www.arb.ca.gov/msei/offroad/offroad.htm.

Table 3-1. Commonly Used Spatial Surrogates.

Population	Total employment
VMT	Industrial employment
Length of rail per grid cell	Retail employment
Locations of unpaved rural roads	Single dwelling units
Total housing	Rural land cover – forest
Agricultural land cover	Rural land cover – range land
National forest > 5000 ft	

Source: http://eos.arb.ca.gov/eos/projects/surrogates/

Table 3-2. Broad Vehicle Classes Considered by EMFAC.

Vehicle Class	Weight (lbs)	Vehicle Class	Weight (lbs)
Passenger cars	All	Heavy-Heavy-Duty Truck	33,001 – 60,000
Light Truck I	0 – 3,750	Motorcycle	All
Light Truck II	3,751 – 5,750	Urban Diesel Bus	All
Medium-Duty Truck	5,751 – 8,500	School Bus	All
Light-Heavy-Duty Truck I	8,501 – 10,000	Other bus	All
Light-Heavy-Duty Truck II	10,001 – 14,000	Motor Homes	All
Medium-Heavy-Duty Truck	14,001 – 33,000		

Source: Adopted from the User's Guide for EMFAC2011.

Table 3-3. Vehicle Activity Information for the Counties in the Basin.

County	Vehicle Population	VMT/day	Trips/day	Miles per Vehicle-Day
Los Angeles	6,278,704	217,899,000	40,271355	34.71
Orange	2,157,423	75,785,000	13,906,711	35.21
Riverside	1,342,704	45,651,000	8,704550	34.00
San Bernardino	988,717	38,912,000	6,372,705	39.36

Source: EMFAC2011 and SCAG 2012 RTP

Table 3-4. 2012 Annual Average Day Toxic Emissions for the South Coast Air Basin.

	Pollutant	Emissions (lbs/day)				
		On-road	Off-road	Point	Area	Total
√	Acetaldehyde*	2066.9	3083.1	108.1	1378.7	6636.9
	Acetone**	1796.1	2342.3	379.8	20569.3	25087.4
√	Benzene	5336.3	4477.1	711.8	1506.5	12031.7
√	1,3-Butadiene	1002.5	1028.7	435.2	107.2	2573.6
√	Carbon tetrachloride	0.0	0.0	6.6	0.1	6.7
√	Chloroform	0.0	0.0	12.7	0.8	13.5
√	1,1 Dichloroethane	0.0	0.0	0.3	65.3	65.5
√	1,4 Dioxane	0.0	0.0	0.1	0.0	0.1
√	Ethylene dibromide	0.0	0.0	0.1	0.0	0.1
√	Ethylene dichloride	0.0	0.0	53.8	11.4	65.2
√	Ethylene oxide	0.0	0.0	4.9	0.0	4.9
√	Formaldehyde*	5159.8	7530.0	1678.2	4517.8	18885.8
	Methyl ethyl ketone*	335.1	423.2	870.8	5425.6	7054.7
√	Methylene chloride	0.0	0.0	26.2	9874.3	9900.5
√	MTBE	0.0	1.1	0.1	0.0	1.2
√	Naphthalene	264.0	194.8	16.7	220.4	695.9
√	p-Dichlorobenzene	0.0	0.0	70.3	2945.1	3015.5
√	Perchloroethylene	0.0	0.0	805.0	5865.4	6670.4
√	Propylene oxide	0.0	0.0	0.5	0.2	0.7
	Styrene	271.2	174.2	1222.3	12.5	1680.1
	Toluene	15823.6	9233.1	4956.1	24497.6	54510.4
√	Trichloroethylene	0.0	0.0	735.3	886.1	1621.5
√	Vinyl chloride	0.0	0.0	37.9	128.6	166.5
√	Arsenic	0.4	0.0	18.6	5.3	24.3
√	Cadmium	0.3	0.3	5.0	3.0	8.6
	Chromium	44.0	3.7	34.5	24.8	107.0
√	Diesel particulate	10798.7	9180.9	411.8	80.6	20472.0
	Elemental carbon***	8873.4	6211.5	3286.8	11107.6	29479.3
√	Hexavalent chromium	2.2	0.5	0.4	0.0	3.1
√	Lead	4.8	8.7	30.9	73.1	117.5
√	Nickel	24.6	9.2	44.1	16.5	94.4
	Organic carbon	11675.2	7865.6	197.3	45202.9	64940.9
	Selenium	0.9	0.1	23.9	2.7	27.5
	Silicon**	2473.0	140.4	2498.8	87588.5	92700.7

√ Denotes potential or known human carcinogen.
* Primarily emitted emissions. These materials are also formed in the atmosphere as a result of photochemical reactions.
** Acetone and silicon are not toxic compounds. Their emissions are included here because they were measured in the sampling program.
*** Includes elemental carbon from all sources (including diesel particulate).

Table 3-5. Cancer Potency Weighted Species Apportionment for 2012 Emissions.

Toxic	Contribution (%)	Toxic	Contribution (%)
Diesel particulate	79.61	Methylene chloride	0.12
Hexavalent chromium	5.66	Trichloroethylene	0.04
1,3-butadiene	5.46	Lead	0.02
Benzene	4.25	Ethylene dichloride	0.02
Formaldehyde	1.40	Ethylene oxide	<0.01
Arsenic	1.03	Carbon tetrachloride	<0.01
Perchloroethylene	0.50	1,1-Dichloroethane	<0.01
Cadmium	0.46	Chloroform	<0.001
p-dichlorobenzene	0.43	Ethylene dibromide	<0.0001
Nickel	0.30	Propylene oxide	<0.0001
Naphthalene	0.30	1,3-Dioxane	<0.00001
Acetaldehyde	0.23	MTBE	<0.00001
Vinyl chloride	0.16		

Table 3-6. Selected Emissions and Air Quality Changes Since MATES III.

Toxic Gases	Change in Emissions	Change in Air Quality	Toxic Particulates	Change in Emissions	Change in Air Quality
Acetaldehyde	-53%	-56%	Arsenic	-43%	-35%
Benzene	-47%	-38%	Cadmium	-39%	-91%
1,3-butadiene	-50%	-18%	Elemental carbon	-24%	-35%
Formaldehyde	-46%	-49%	EC ($PM_{2.5}$)	-19%	-47%
Methylene chloride*	-29%	+44%	Hex. chromium**	+11%	-78%
Perchloroethylene	-37%	-50%	Lead	-42%	-56%
Trichloroethylene	+33%	-33%	Nickel	+6%	-45%

* Measured concentrations at the Rubidoux site increased significantly since 2009.
** High measured concentrations in MATES III due to nearby sources influencing the Rubidoux site. The emissions from these sources have since been controlled.

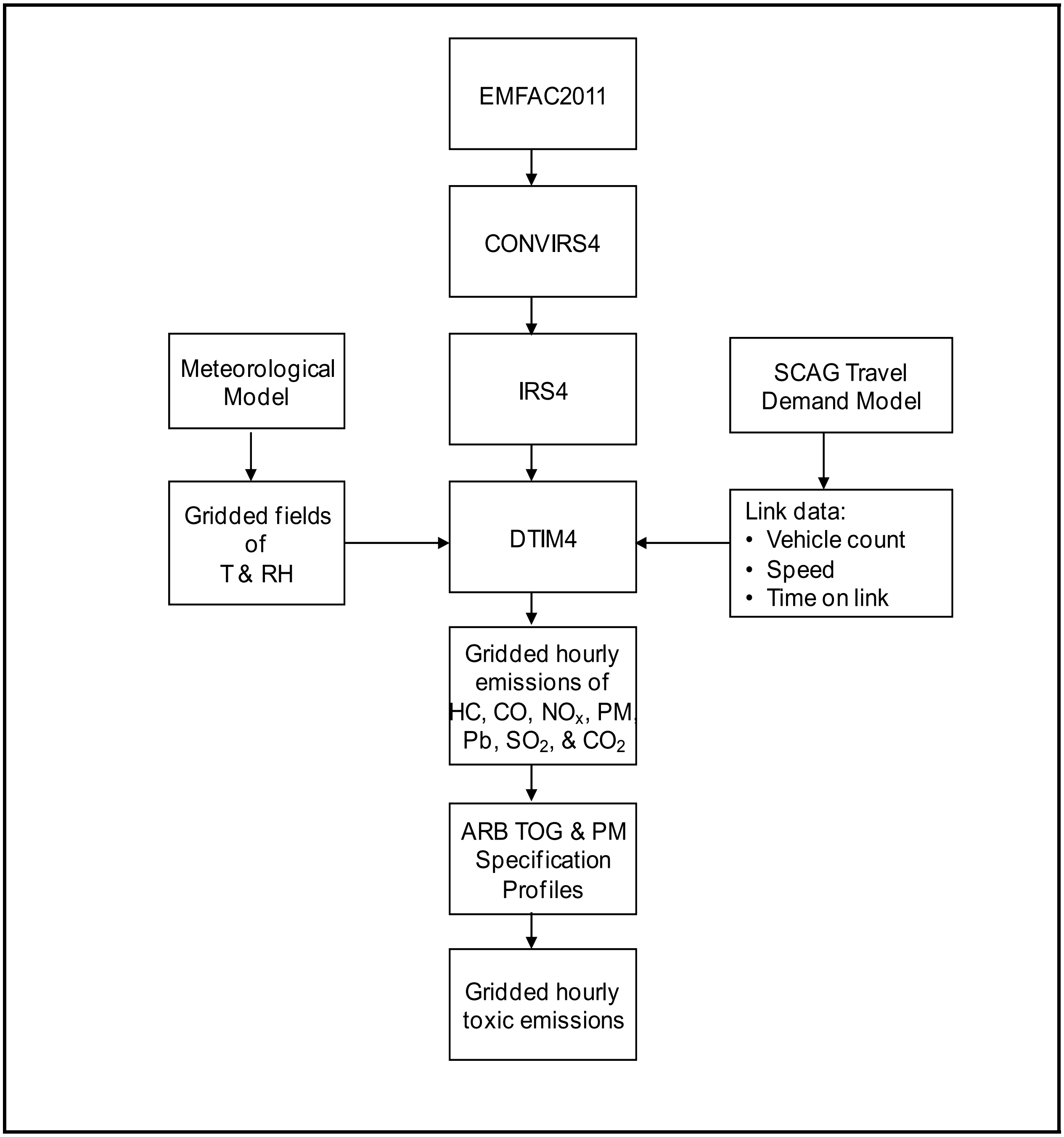


Figure 3-1. Flow Diagram for On-Road Emissions Processing.

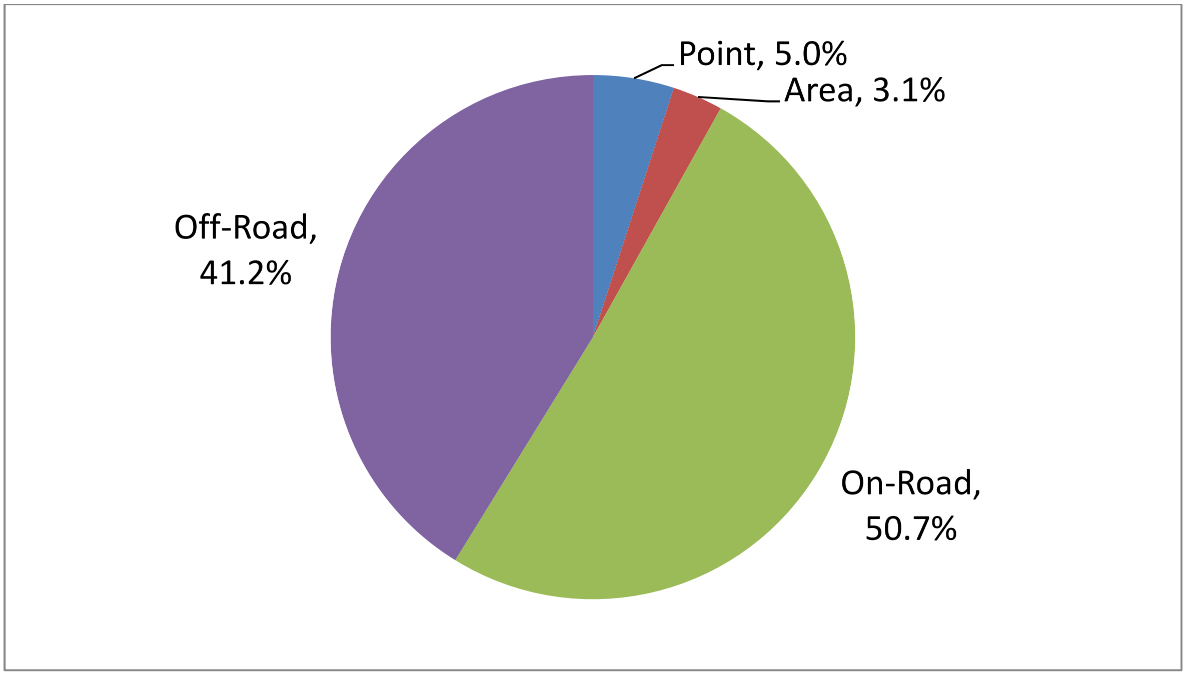
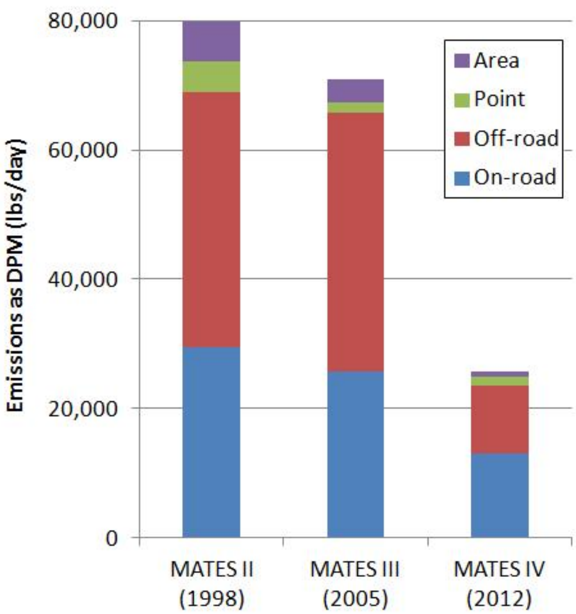


Figure 3-2. Cancer Potency Weighted Source Apportionment for 2012 Emissions.



Category	Change from MATES III (%)	Change from MATES II (%)
Area	-77.5	-87.0
Point	-20.8	-72.8
Off-road	-73.5	-73.2
On-road	-49.4	-55.7

Figure 3-3. Cancer Potency Weighted Emission Comparison of MATES II, MATES III and MATES IV.

CHAPTER 4
REGIONAL MODELING AND EVALUATION

Chapter 4. Regional Modeling and Evaluation

4.1 Background

Regional air quality modeling is used to estimate community exposure to air toxics as a function of both time and geography due to known toxic emissions sources. The model simulated concentrations of toxic compounds are translated into a spatial pattern of health risk based upon compound potency risk factors. The regional modeling provides a mechanism to predict the dispersion of emissions from a variety of source categories as well as individual sources to estimate risk throughout the modeling area. This analysis complements and is compared to the techniques used to assess concentration and risk from the data acquired at the fixed monitoring sites.

Since MATES II, the SCAQMD has used regional air quality models in air toxic risk analyses. In the MATES II analysis, the Urban Airshed Model with TOX (UAMTOX) chemistry was used to simulate the transport and accumulation of toxic compounds throughout the Basin. UAMTOX was simulated for a protracted 2 km by 2 km grid domain that overlaid the Basin.

Subsequent to MATES II, the SCAQMD transitioned to more technologically advanced tools that utilize updated chemistry modules, improved dispersion algorithms, and mass consistent meteorological data. In the 2007 AQMP and the subsequent MATES III analysis, the dispersion platform moved from UAM to CAMx and the diagnostic wind meteorological model was replaced by the Mesoscale Model version 5 (MM5, Grell et al 1994) prognostic model. CAMx, coupled with the MM5 input, using the "one atmosphere" gaseous and particulate chemistry, was used to simulate both episodic ozone and annual concentrations of $PM_{2.5}$ and air toxic pollutants. The modeling was performed based on the UTM coordinate systems.

In the 2012 AQMP, the SCAQMD transitioned from MM5 to a new mesoscale meteorological model, Weather Research Forecast (WRF; Skamarock 2008) and adopted a statewide Lambert Conformal coordinate system. Both CAMx and Community Multiscale Air Quality (CMAQ) models were used for air quality simulations. Within the South Coast Air Basin (SCAB), both models performed similarly. For MATES IV, the CAMx RTRAC with WRF was used to model air toxic concentrations of both particulate matter and gaseous species.

MATES IV Modeling was conducted over a domain that encompassed the Basin and the coastal shipping lanes located in the Southern California Bight portions of the Basin using a grid size of 2 km by 2 km. Compared to MATES III, the domain extends further eastward to include the Coachella Valley. Figure 4-1 depicts the MATES IV modeling domain. The unshaded portion of the grid area represents the extension of the domain beyond that used for MATES III. A projected emissions inventory for 2012 based on the 2012 AQMP emissions inventory for 2008, which included detailed source profiles of air toxic sources, provided the mobile and stationary source input for the MATES IV CAMx RTRAC simulations. Although the actual measurements and modeling for MATES IV spanned July 1, 2012, through June 30, 2013, for simplicity the MATES IV modeling used the 2012 emissions inventory.

Grid-based, hourly meteorological fields generated from WRF provided the wind patterns and atmospheric parameters for the simulations.

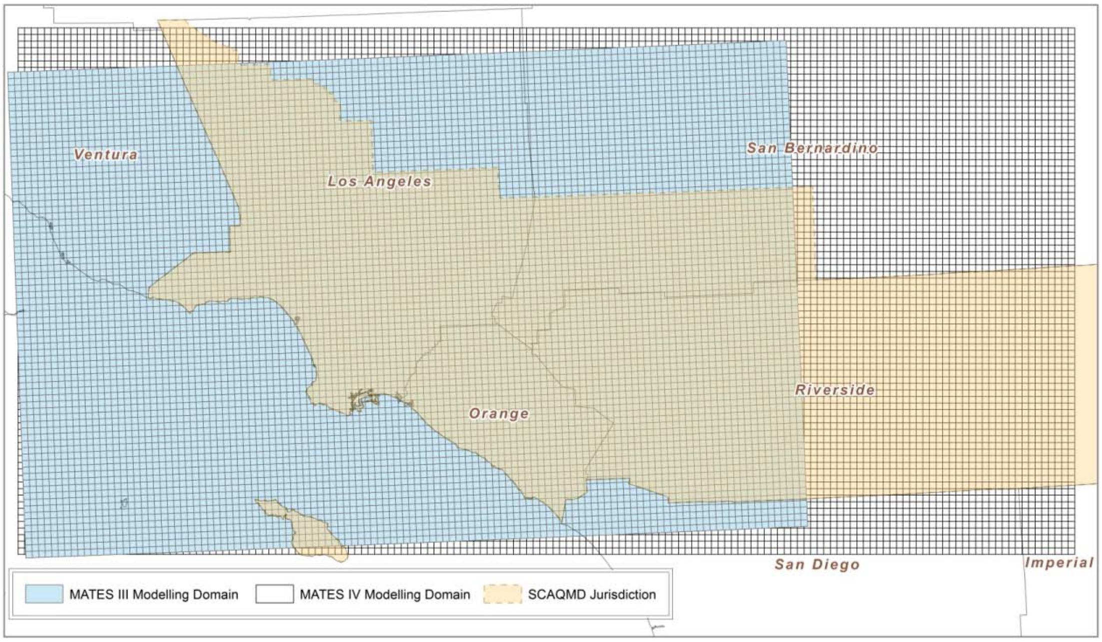


Figure 4-1.
MATES IV Modeling Domain. Shaded area highlights the grid extension to the MATES III modeling domain.

4.2 MATES III vs. MATES IV: Key Modeling Assumptions

The MATES IV regional modeling analyses relied on the CAMx RTRAC model to simulate annual impacts of both gaseous and aerosol toxic compounds in the Basin. In the 2000 MATES II analysis, the Urban Airshed Model with TOX (UAMTOX) chemistry was used to simulate the advection and accumulation of toxic compound emissions throughout the Basin. UAMTOX was simulated for a 2 km by 2 km grid domain that overlaid the Basin. The analysis relied on the 1997-1998 emissions projection from the 1997 AQMP, and meteorological data fields for 1997-1998 were generated by objective analysis using a diagnostic wind model. These tools were consistent with those used in both the 1997 and 2003 AQMP attainment demonstrations.

MATES III employed CAMx RTRAC, which is identical to the modeling tool used in the current study. The meteorological data was generated using Mesoscale Meteorological model 5 (MM5), which was considered state-of-the-art at the time; however, MM5 was subsequently replaced by WRF as the most advanced and commonly used meteorological model.

The transition to CAMx and MM5 was made based on suggestions from peer review for the 2003 AQMP modeling efforts. A concern arising from the peer review was the need for better state-of-the-science tools that utilize updated chemistry modules, improved dispersion algorithms, and mass consistent meteorological data. The recommendations were implemented for the 2007 AQMP where the dispersion platform moved from UAM to CAMx and the diagnostic wind meteorological model was replaced by the MM5 prognostic model. CAMx, coupled with MM5 input using the "one atmosphere" gaseous and particulate chemistry was used to simulate both episodic ozone and annual concentrations of $PM_{2.5}$.

MM5 simulated April 1998 through March 1999 and all days in 2005, which provided the dispersion profile for the CAMx simulations. As for emissions, an updated version of the 2007 AQMP inventory for model year 2005 was used. This included detailed source profiles of air toxics and mobile and stationary sources for CAMx RTRAC simulations. An additional back-cast of the 2007 AQMP emissions inventory was generated for 1998 to re-simulate the MATES II in a framework identical to the MATES III, which enabled a direct comparison of risk assessments of the two previous MATES studies.

The CAMx-MM5 modeling platform from MATES III was updated to the CAMx-WRF coupled system in MATES IV. The WRF, state-of-the-science meteorological modeling tool offers a variety of user options to cover atmospheric boundary layer parameterizations, turbulent diffusion, cumulus parameterizations, land surface-atmosphere interactions, etc., which can be customized to model specific geographical and climatological situations. The SCAQMD performed extensive sensitivity tests and further development to improve the WRF performance for the South Coast Basin, in which geographical and climatological characteristics impose great challenges in predicting the complex meteorological structures associated with air quality episodes. CAMx with RTRAC algorithms was employed as a chemical transport platform, given the importance of tracking chemically active toxic elements individually to assess the contribution of each source category. The RTRAC algorithm provides a flexible approach for tracking the emissions, dispersion, chemistry, and deposition of multiple gases and particles that are not otherwise included in the model's chemistry mechanisms.

Table 4-1 summarizes the major differences in the air toxics modeling between the MATES IV and MATES III analyses.

Table 4-1
Summary Comparison of Key Modeling Considerations Between
MATES IV and MATES III

Parameter	MATES IV	MATES III
Meteorological Modeling Year	July 2012 - June 2013	2005
Model Platform / Chemistry	CAMx RTRAC (5.30)	CAMx RTRAC (4.40)
Meteorology Model /Vertical Layers	WRF with30 layers/ CAMx: 16 layers	MM5 with 29 layers/ CAMx: 8 layers
On-Road Truck Emissions	Caltrans/SCAG Truck Model	Caltrans/SCAG Truck Model
Shipping Emissions Stack Height	Emissions spread through layers 1 and 2	Emissions spread through layers 1 and 2
Emissions Inventory	2012 Projection from 2008 (2012 AQMP)	2005 Projection from 2002 (2007 AQMP)
Mobile Emissions	EMFAC2011	EMFAC2007

4.3 Modeling Results

CAMx RTRAC regional modeling was conducted using WRF meteorological data and projected emissions data for 2012 to simulate annual average concentrations of 19 key compounds measured as part of the MATES IV monitoring program from July 1, 2012, to June 30, 2013. Simulated annual average concentration plots for the four toxic compounds that contributed the greatest risk throughout the domain (diesel particulate, benzene, 1,3-butadiene and formaldehyde) are depicted in Figures 4-2 through 4-5.

Figure 4-2 depicts the projected annual average concentration distribution of $PM_{2.5}$ diesel particulates in the Basin. The highest concentration (2.9 $\mu g/m^3$) was simulated to occur around the Ports of Los Angeles and Long Beach. In general, the distribution of diesel particulates is aligned with the transportation corridors including freeways, major arterials and rail right-of-ways. The peak diesel concentration is much lower than the previous MATES studies, due, in a large part, to emission reductions from ocean-going vessels at near coastal waters and at ports. Figures 4-3 and 4-4 provide the distributions of benzene and 1,3-butadiene respectively whereby the toxic compounds are almost uniformly distributed throughout the Basin, reflecting patterns of light-duty fuel consumption. As expected, the higher benzene concentrations appear in an area where refineries are located. However, benzene concentrations there are not significantly elevated relative to other areas. The modeled peak concentration of 0.5 ppb is comparable with measured values of 0.53 ppb at Huntington Park and 0.4 ppb at Los Angeles.

The ambient concentrations of formaldehyde in the SCAB are due to direct emissions, primarily from combustion sources, and secondary formation from anthropogenic and biogenic VOCs.

The formaldehyde concentrations shown in Figure 4-5 depict a spatial distribution indicative of its sources, with measurable concentrations in the heavily-traveled western and central Basin, with additional elevated levels in the downwind areas of the Basin that are impacted by higher levels of photochemistry and ozone formation. Due to continued reduction of primary combustion source emissions, the formaldehyde concentrations are dominated by secondary formation. The peak formaldehyde concentrations are now in the areas with high biogenic emissions.

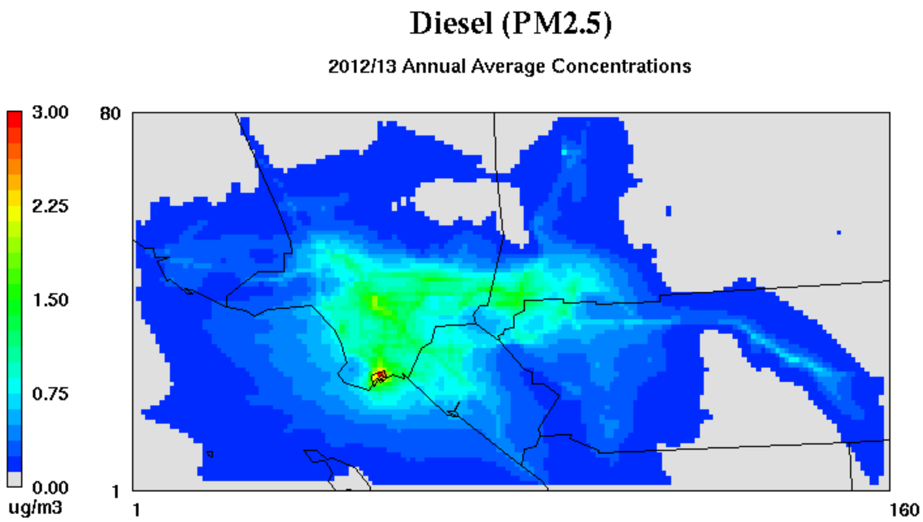


Figure 4-2
Annual Average Concentration Pattern for Diesel $PM_{2.5}$

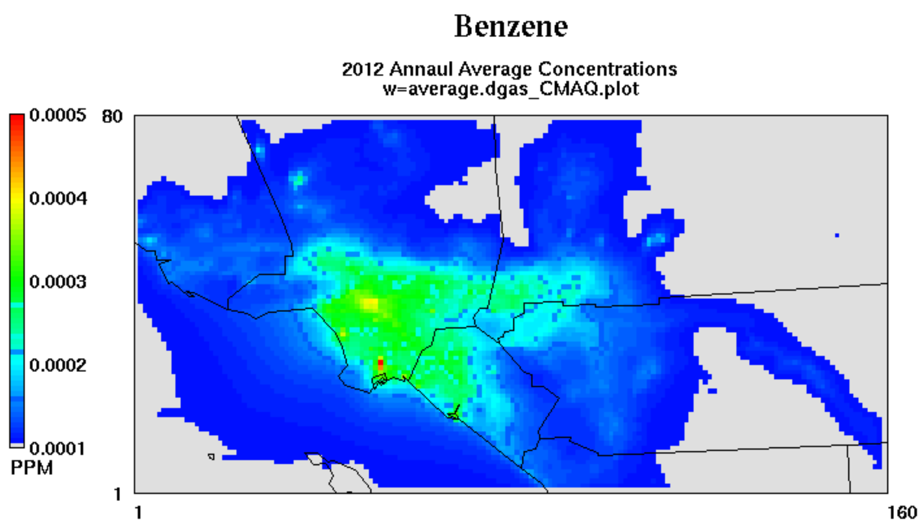


Figure 4-3
Annual Average Concentration Pattern for Benzene

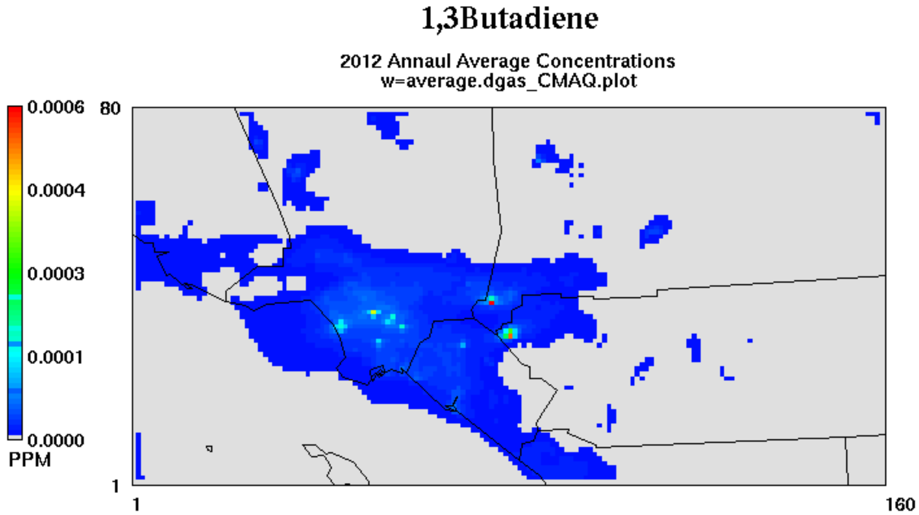


Figure 4-4
Annual Average Concentration Pattern for 1,3-Butadiene

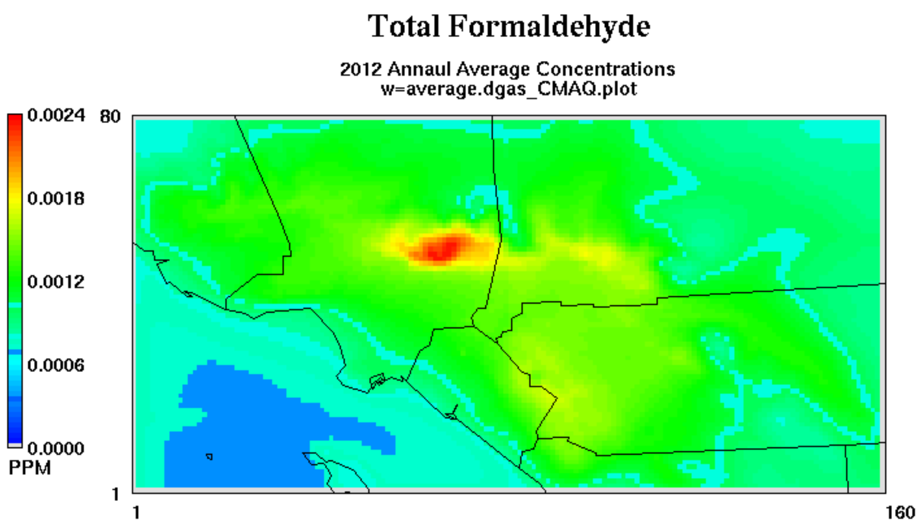


Figure 4-5
Annual Average Concentration Pattern for Total Formaldehyde

Table 4-2 provides a summary of the model performance relative to actual measured annual average concentrations. For this comparison, the monitored data for the 10 stations are combined to provide an estimate of average Basin-wide conditions for the 2012-2013 sampling period. CAMx RTRAC simulated concentrations at the monitoring sites were derived using the inverse distance-squared weighted surrounding nine-cell average. Since direct measurements of $PM_{2.5}$ diesel are not possible, no direct comparisons can be made with simulated annual average concentrations. However, if the factor of 0.82 derived from the emissions inventory is used (See Chapter 2), the estimated 10-site average diesel $PM_{2.5}$ concentration would be 0.96 μg/m^3 compared to the modeled average concentration of 1.23 μg/m^3. Naphthalene was measured only at Long Beach, Central Los Angeles, and Rubidoux. For the rest of the species, each of the four counties within the SCAQMD is represented by at least one station.

Table 4-2

Measured and Simulated Annual Average Concentrations During 2012-2013 MATES IV

Compound	Units	2012-2013MATES IV	
		Measured Annual Average	Simulated Annual Average
$EC_{2.5}$	μg/m^3	1.17	1.41
EC_{10}	μg/m^3	1.58	1.70
Cr 6 (TSP)	ng/m^3	0.05	0.19
As (TSP)	ng/m^3	0.56	1.61
Cd (TSP)	ng/m^3	0.16	0.55
Ni (TSP)	ng/m^3	3.76	6.30
Pb (TSP)	ng/m^3	6.23	5.41
Benzene	ppb	0.38	0.29
Perchloroethylene	ppb	0.03	0.08
p-Dichlorobenzene	ppb	0.02	0.05
Methylene Chloride	ppb	0.42	0.25
Trichloroethylene	ppb	0.02	0.04
1,3-Butadiene	ppb	0.11	0.05
Formaldehyde	ppb	2.25	1.90
Acetaldehyde	ppb	0.90	0.96
Naphthalene	ppb	0.02*	0.01

* Three station average

For 2012-2013, the model simulated concentrations of particulate matter species, such as $EC_{2.5}$, EC_{10}, and TSP metals were biased high. The model performed better for gaseous species. Concentrations of perchloroethylene, p-dichloroebenzene, trichloroethylene have become so low such that the typical ambient concentrations are often below the detection limits of the measurements. Thus, model performances for those species are difficult to ascertain. Note that given their low concentrations, their respective contributions to the overall toxic cancer risk are less than one percent. For 1,3-butadiene, due to its highly reactive nature, large uncertainties exist in speciation profiles, measurements and decay parameters used in the modeling ; thus, good model performance for 1,3-butadiene is not typically expected. Information on speciation profiles for naphthalene is very limited. Both MATES III and MATES IV showed very low ambient concentrations of naphthalene and, hence, very low cancer risk contributions. Benzene, formaldehyde, and acetaldehyde showed good agreement between model simulations and measurements. Modeled and observed concentrations of methylene chloride compared very well except for the Rubidoux site. This site experienced a dramatic increase in the average monitored methylene chloride concentrations since 2009, primarily due to a handful of days exhibiting elevated levels. Prior to 2009, the annual average concentration of methylene chloride had been in the range of 0.2-0.3 ppb. From 2009 onward, the measured annual average concentrations have been in the range of 1.4-2.4 ppb. The sources of this increase have not yet been determined and are being investigated. Based on experience and past MATES studies, it is likely a source or sources nearby the monitoring location. However, even at these elevated levels, methylene chloride has a negligible contribution to the overall air toxics cancer risk (~2 in a million).

Simulated annual average concentrations of $EC_{2.5}$ and EC_{10} were used to assess the overall model performance for the 2012-2013 MATES IV period. Tables 4-3a and 4-3b summarize the 2012-2013 MATES IV $EC_{2.5}$ and EC_{10} model performance, respectively.

EPA guidance (U.S. EPA, 2006) recommends evaluating particulate modeling performance using measures of prediction bias and error. Prediction Accuracy (PA), measured as the percentage difference between the mean annual observed and simulated $EC_{2.5}$ concentrations is another tool used in the performance evaluation. PA goals of ±20% for ozone and ±30% for individual components of $PM_{2.5}$ or PM_{10} have been used to assess simulation performance in previous modeling attainment demonstrations. In general, PM_{10} showed better agreement than $PM_{2.5}$. PA indicated that PM_{10} prediction meets the EPA performance criteria at nine out of 10 stations, while $PM_{2.5}$ meets only at five stations. Still, PM_{10} as well as $PM_{2.5}$ showed high bias in Long Beach.

Similar to the prior studies, including MATES III and 2012 AQMP, the CAMx model shows a tendency of high bias near the coastal area and low bias in the inland area. The areas showing the high bias (i.e. model overprediction) are Long Beach, Compton and Los Angeles; and the areas with underpredictions are Burbank and Rubidoux. A detailed discussion of the model performance is presented in Appendix IX).

Table 4-3a
MATES IV 2012-2013 $EC_{2.5}$ Model Performance

Location	Observed (μg/m³)	*Modeled (μg/m³)	Prediction Accuracy	Mean Bias (μg/m³)	Mean Error (μg/m³)	Normal-ized Mean Bias	Normal-ized Mean Error
Anaheim	0.90	1.10	22	0.20	0.56	1.08	1.24
Burbank	1.32	1.19	-9	-0.12	0.64	0.43	0.73
Compton	1.06	1.48	39	0.42	0.76	1.52	1.64
Inland Valley San Bernardino	1.38	1.13	-18	-0.25	0.46	-0.03	0.31
Huntington Park	1.30	1.70	31	0.40	0.67	0.85	0.93
Long Beach	0.91	1.45	59	0.53	0.80	2.18	2.27
Central L.A.	1.23	1.81	47	0.58	0.70	0.91	0.96
Pico Rivera	1.39	1.30	-6	-0.09	0.48	0.26	0.52
Rubidoux	1.11	0.98	-12	-0.13	0.40	0.12	0.44
West Long Beach	1.13	1.88	67	0.75	1.00	2.10	2.17
All Stations	1.17	1.40	20	0.23	0.65	0.95	1.13

* Included only sampling days

Table 4-3b
MATES IV 2012-2013 EC_{10} Model Performance

Location	Observed ($\mu g/m^3$)	*Modeled ($\mu g/m^3$)	Prediction Accuracy	Mean Bias ($\mu g/m^3$)	Mean Error ($\mu g/m^3$)	Normal-ized Mean Bias	Normal-ized Mean Error
Anaheim	1.17	1.39	18	0.22	0.49	0.44	0.54
Burbank	1.74	1.43	-18	-0.31	0.60	-0.03	0.34
Compton	1.50	1.81	21	0.32	0.66	0.58	0.68
Inland Valley San Bernardino	1.74	1.42	-18	-0.32	0.47	-0.08	0.27
Huntington Park	1.65	1.98	20	0.33	0.54	0.36	0.43
Long Beach	1.29	1.72	34	0.44	0.59	0.61	0.68
Central L.A.	1.67	2.17	30	0.50	0.61	0.46	0.51
Pico Rivera	1.87	1.69	-10	-0.18	0.44	-0.02	0.24
Rubidoux	1.48	1.26	-14	-0.22	0.44	-0.06	0.29
West Long Beach	1.78	2.15	21	0.37	0.86	0.53	0.69
All Stations	1.58	1.69	7	0.11	0.57	0.28	0.47

* Included sampling days only

4.4 Estimation of Cancer Risk

Figure 4-6 depicts the 2012-2013 MATES IV distribution of risk estimated from the predicted annual average concentrations of the key toxic compounds. Risk is calculated for each grid cell as follows:

$$\text{Risk}_{i,j} = \Sigma\ \text{Concentration}_{i,j,k} \text{ X Risk Factor}_{i,j,k}$$

Where $_{i,j}$ is the grid cell (easting, northing) and k is the toxic compound.

The grid cell having the maximum simulated cancer risk of 1,057 in a million was located in the Ports of Los Angeles and Long Beach. In addition to the cluster of cells around the port area with high risk, a second cluster of high-risk area is centered around a railyard southeast of downtown Los Angeles. In general, as in the past studies, the higher-risk areas tend to be along transportation corridors.

Figure 4-7 provides the CAMx RTRAC simulated air toxics risk for the 2005 MATES III period, and Figure 4-8 depicts the changes in risk from 2005 to 2012-2013. The greatest decrease in risk occurred in the port area, reflecting the emission reductions from shipping and port operations. Overall, air toxics risk improved significantly, consistent with air toxic emissions reductions that occurred over the period.

The 2012-2013 Basin average population-weighted risk summed for all the toxic components yielded a cancer risk of 367 in a million. The average risk included all populated land cells that reside within the Basin portion of the modeling domain. The MATES III Basin average risk was 853 per million. Thus, between the MATES III and MATES IV periods, the simulated risk decreased by 57%. The 57% reduction in Basin risk can be attributed to several factors, most notably, changes in diesel emissions between 2005 and 2012. While weather profiles between the two monitoring periods varied, no appreciable difference was observed in the meteorological dispersion potential.

Regional risk from nondiesel sources (Figure 4-9) is also uniformly distributed throughout the Basin with values typically around 100 in one million, with only a few selected cells showing values in excess of 200.

Figure 4-10 provides a close-up plot of risk in the Ports area. Table 4-4 provides a summary risk estimated for the Basin, for the Ports area, and for the Basin excluding the Ports area. For this assessment, the Ports area includes the populated cells roughly bounded by the Interstate 405 to the north, San Pedro to the west, Balboa Harbor to the east, and Pt. Fermin to the south. The 2012-2013 average population-weighted air toxics risk in the Ports area (as defined above) was 480 in one million. The Basin average population-weighted air toxics risk, excluding the grid cells in the Ports area, was 359 in one million. It is important to note that the downwind impacts resulting from Port area activities are still reflected in the toxics risk estimates for the grid cells categorized as "Basin minus Ports." Similarly, the MATES III simulations for 2005 indicated that the Ports area air toxics risk was 1,415 in one million; and the Basin, minus the Ports area, was 816 in one million. Overall, the Ports area experienced an approximate 66% decrease in risk, while the average population-weighted risk in other areas of the Basin decreased by about 56%.

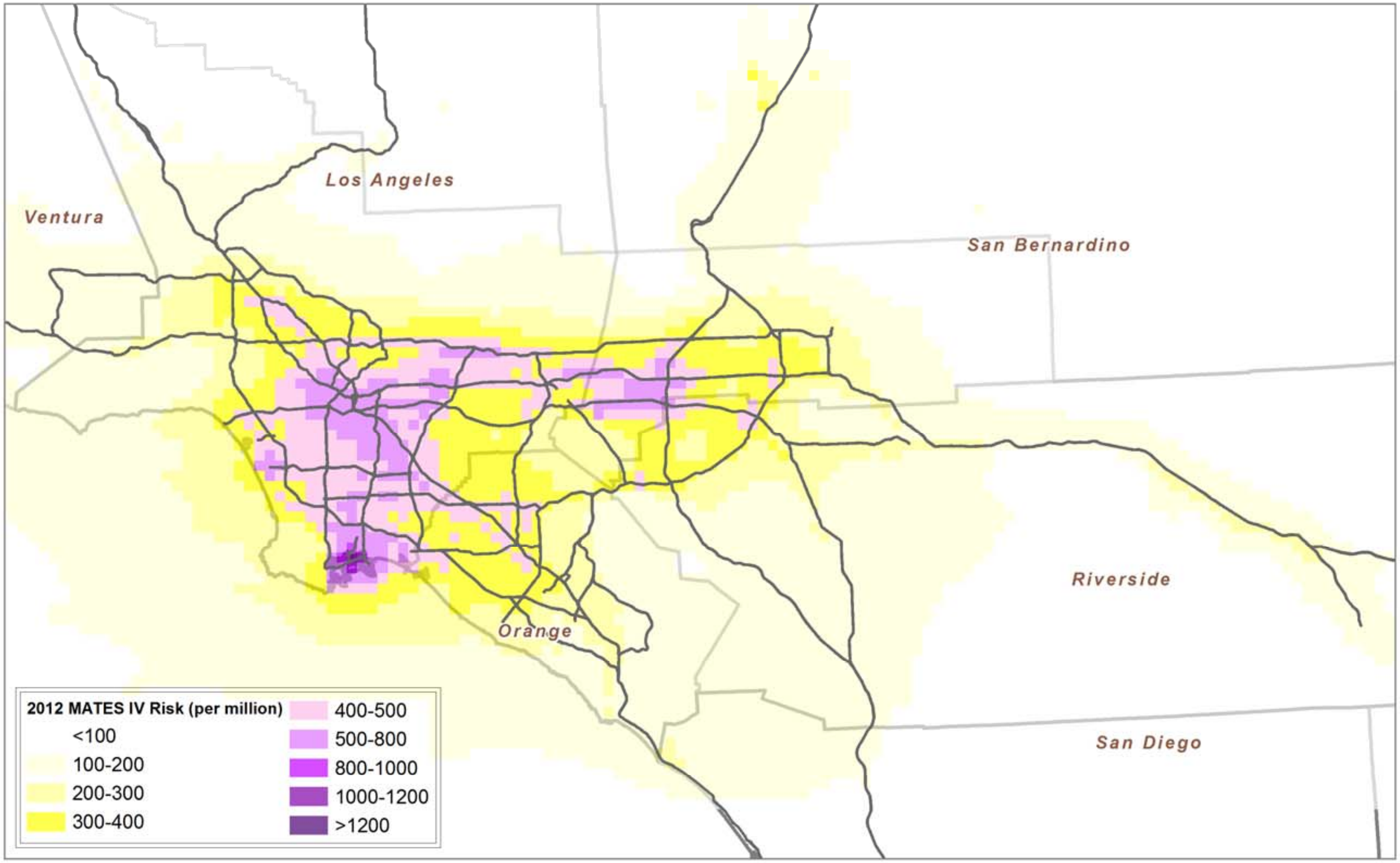


Figure 4-6
2012-2013 MATES IV CAMx RTRAC Simulated Air Toxic Cancer Risk

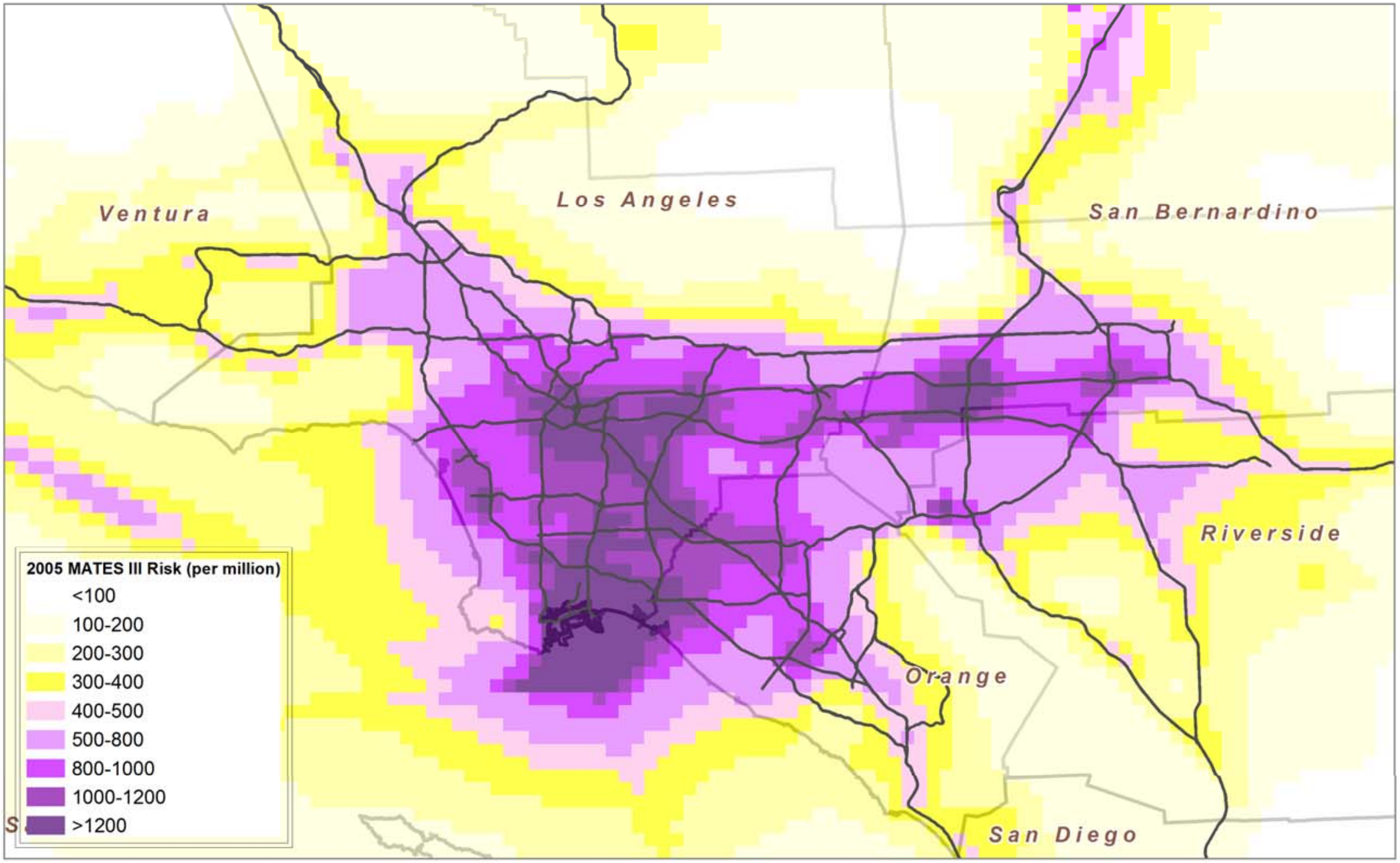


Figure 4-7
2005 MATES III CAMx RTRAC Simulated Air Toxic Cancer Risk

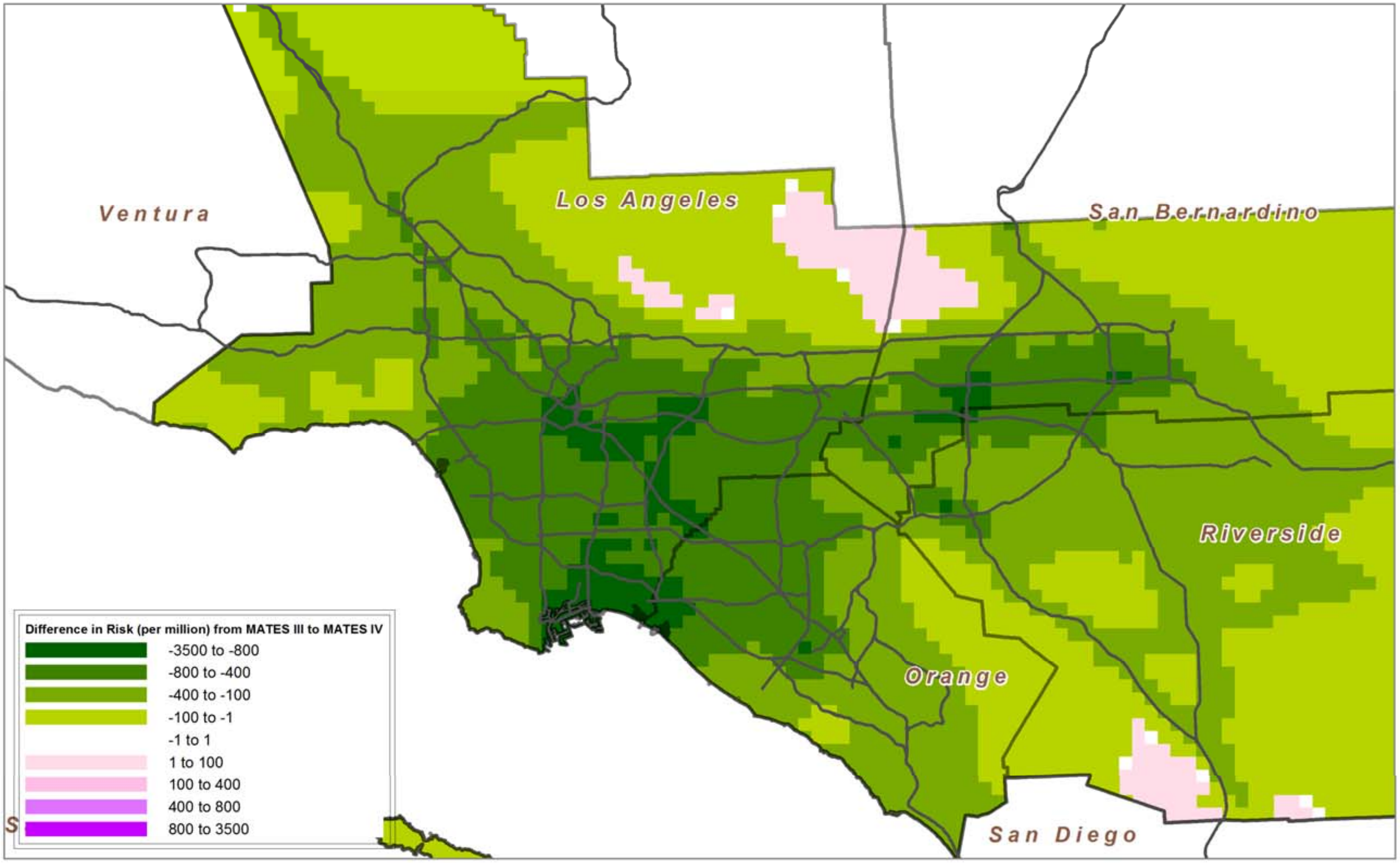


Figure 4-8
Change in CAMx RTRAC Simulated Air Toxics Cancer Risk (per million) from 2005 to 2012/2013

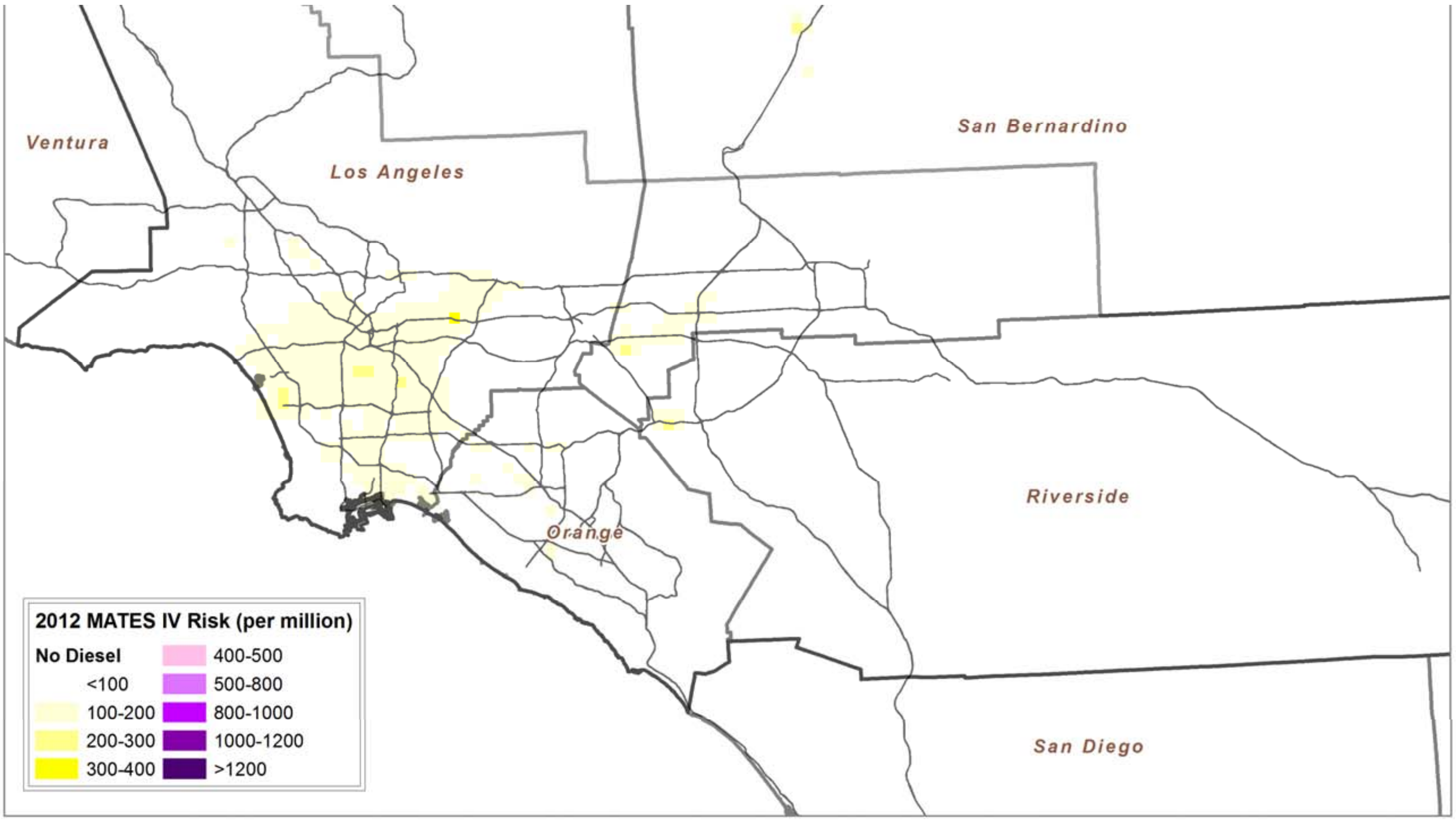


Figure 4-9
MATES IV Simulated Air Toxic Cancer Risk excluding Diesel PM

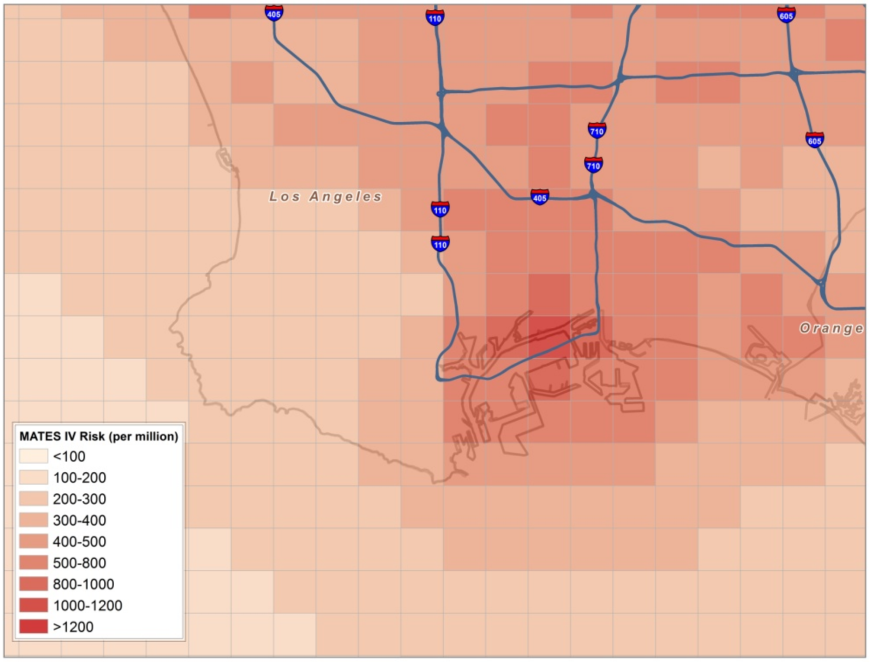


Figure 4-10
2012 Ports Area MATES IV Simulated Air Toxic Cancer Risk

Table 4-4
Basin and Port Area Population-Weighted Cancer Risk

Region	MATES IV		MATES III		Average Percentage Change in Risk
	2012 Population	Average Risk (Per Million)	2005 Population	Average Risk (Per Million)	
Basin	15,991,150	367	15,662,620	853	-57
Ports Area	998,745	480	959,761	1,415	-66
Basin Excluding Ports Area	14,992,806	359	14,702,859	816	-56

Figures 4-11 through 4-14 provide close-up depictions of risk in Central Los Angeles, Mira Loma, Colton, Central Orange County, and West Los Angeles areas, respectively.

Table 4-5 provides the county-by-county air toxics risk to the affected population. As presented in the spatial distribution, Los Angeles County bears the greatest average cancer risk at 415 per one million. The SCAB portion of San Bernardino County has the second highest projected risk at 339 per one million. The estimated risk for Orange County is 315 per million, and the SCAB portion of Riverside County was estimated to have the lowest population-weighted risk at 223 per million. As expected, the Coachella Valley portion of Riverside County, which is outside of SCAB, has the lowest toxic risk at 139 per million. It should be noted that these are county-wide averages, and individual communities could have higher risks than the average if they are near emissions sources, such as railyards or intermodal facilities.

Comparison of the county-wide population-weighted risk shows that the greatest reduction occurred in Orange County, but the amount of risk reduction among the counties is very similar. Reductions in emissions from mobile sources including benzene, 1,3-butadiene, and diesel particulate are the primary contributors to the improved county-wide risk. It is noteworthy that San Bernardino County now has higher population-weighted risk than Orange County. This is likely due to the port area having a proportionally larger impact in Orange County than in San Bernardino County.

Table 4-5
County-Wide Population-Weighted Cancer Risk

Region	MATES IV		MATES III		Average Percentage Change in Risk
	2012 Population	Average Risk (Per Million)	2005 Population	Average Risk (Per Million)	
Los Angeles*	9,578,586	415	9,887,127	951	-56
Orange	3,067,909	315	2,764,620	781	-60
Riverside*	1,784,872	223	1,548,031	485	-54
San Bernardino*	1,560,183	339	1,462,842	712	-52
SCAB	15,991,550	367	15,662,620	853	-57
Coachella Valley	465,064	139	N/A	N/A	N/A

* Including the SCAB portion only
N/A - MATES III modeling did not include the Coachella Valley

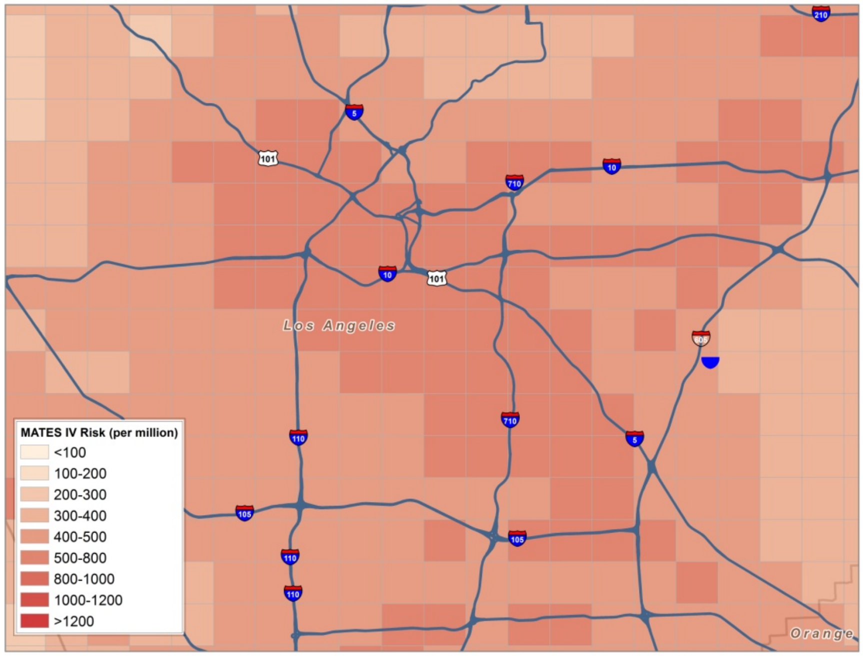


Figure 4-11
2012/2013 Central Los Angeles MATES IV Simulated Air Toxic Cancer Risk

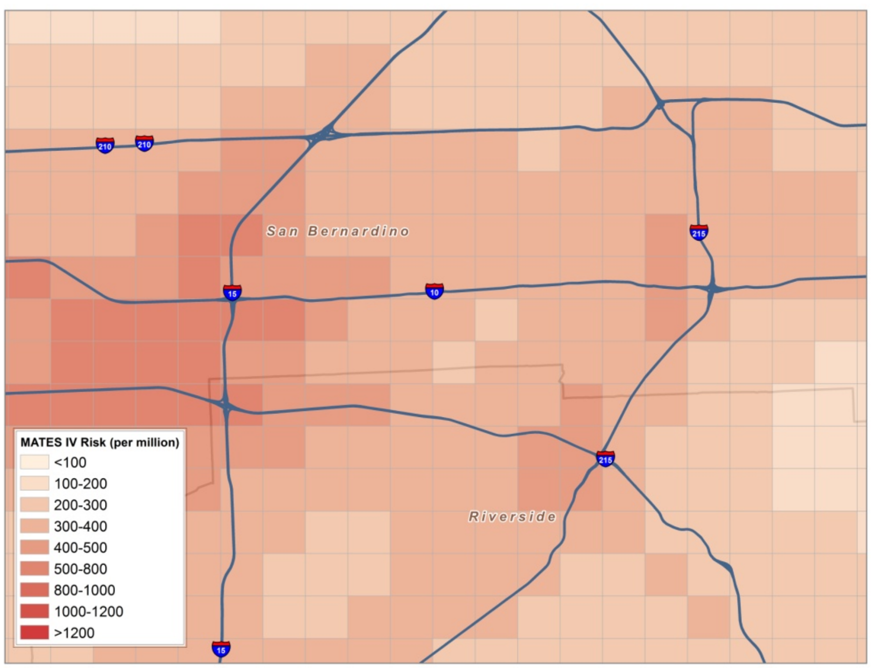


Figure 4-12
2012/2013 Mira Loma/Colton MATES IV Simulated Air Toxic Cancer Risk

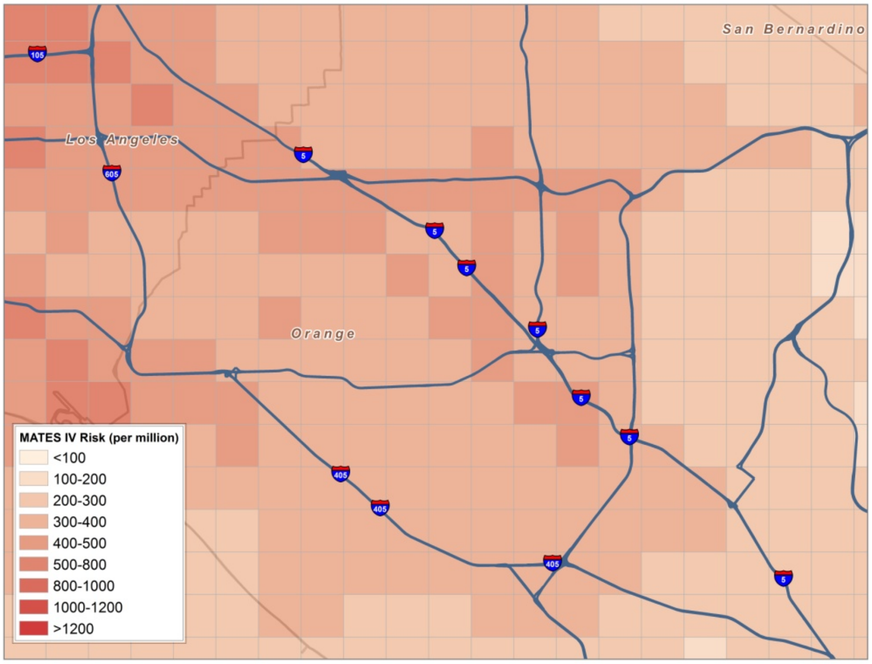


Figure 4-13
2012/2013 Central Orange County MATES IV Simulated Air Toxic Cancer Risk

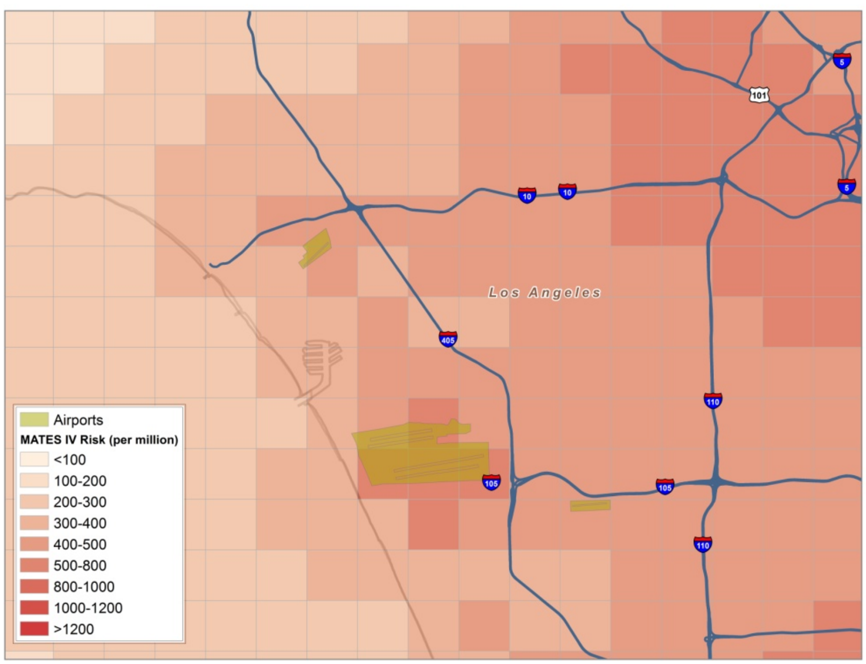


Figure 4-14
2012/2013 West Los Angeles MATES IV Simulated Air Toxic Cancer Risk

Table 4-6 provides the Basin-wide average risk associated with each of the key air toxics simulated in the analysis. Diesel particulate was responsible for the largest contribution to cancer risk from air toxics. The next three highest contributors included benzene, hexavalent chromium, and 1,3-butadiene.

Table 4-6
2012/2013 MATES IV Cancer Risk from Simulated Individual Toxic Air Contaminants

Toxic Compound	Risk Factor (µg/m^3)	Peak Annual Average Concent-ration	Population Weighted Annual Average Concentration	Units	Cumulative Risk (per million)	% Contri-bution
Diesel	3.00E-04	3.1	0.93	µg/m^3	279.67	76.2
Benzene	2.90E-05	0.51	0.25	ppb	22.82	6.2
Hexavalent Chromium	1.50E-01	0.001	1.37E-04	µg/m^3	20.52	5.6
1,3- Butadiene	1.70E-04	0.58	0.03	ppb	12.54	3.4
Secondary Formaldehyde	6.00E-06	2.35	1.24	ppb	9.12	2.5
Primary Formaldehyde	6.00E-06	2.71	0.50	ppb	3.7	1.0
Secondary Acetaldehyde	2.70E-06	0.93	0.73	ppb	3.56	1.0
Arsenic	3.30E-03	0.043	9.97E-04	µg/m^3	3.29	0.9
p-Dichlorobenzene	1.10E-05	0.11	4.38E-02	ppb	2.90	0.8
Perchloroethylene	5.90E-06	0.356	0.07	ppb	2.71	0.7
Naphthalene	3.40E-05	0.03	9.87E-03	ppb	1.76	0.5
Cadmium	4.20E-03	0.014	3.29E-04	µg/m^3	1.38	0.4
Nickel	2.60E-04	0.11	3.69E-03	µg/m^3	0.96	0.3
Primary Acetaldehyde	2.70E-06	0.67	0.16	ppb	0.80	0.2
Methylene Chloride	1.00E-06	0.59	0.21	ppb	0.74	0.2
Trichloroethylene	2.00E-06	0.39	3.08E-02	ppb	0.33	0.1
Lead	1.20E-05	0.065	4.17E-03	µg/m^3	0.05	<0.1

Table 4-7 provides the simulated air toxics risk at each of the 10 stations for the three main toxic compounds and the remaining aggregate based on the regional modeling. Risk is calculated using the predicted concentrations of each toxic component for the specific monitoring station location (based on a nine-cell weighted average concentration). The summary also provides the comparison between simulated average risk for the 10 stations combined and the average risk calculated using the annual toxic compound measurements and the estimated diesel concentrations at those sites.

Table 4-7
Comparison of Network Averaged CAMx RTRAC 2012-2013 Modeled Cancer Risk to Measured Risk at the 10 MATES IV Sites

Location	2012/2013 MATES IV CAMX RTRAC Simulation				
	Benzene	1,3-Butadiene	Diesel	Others	Total
Anaheim	26	14	301	54	395
Burbank	27	13	333	59	431
Central Los Angeles	33	19	516	78	646
Compton	26	17	383	63	489
Inland Valley San Bernardino	21	9	309	61	400
Huntington Park	30	62	389	96	576
North Long Beach	27	16	395	65	503
Pico Rivera	25	13	358	62	459
Rubidoux	20	7	296	46	369
West Long Beach	32	15	662	69	778
10-Station Average Modeled	27	18	394	65	505
10-Station MATES IV Average Measured ($EC_{2.5}$ x 0.82 for Diesel)	35	33	287	47*	402

*Including modeled species only, Risk from some measured species, such as carbon tetrachloride, chloroform and PAHs are excluded.

Among the monitored areas, the highest simulated risk was estimated for West Long Beach followed by Central Los Angeles, Huntington Park, North Long Beach, and Compton. The lowest modeled risk was simulated at Anaheim. As previously discussed, simulation performances at those high risk sites showed a tendency for overprediction relative to measurements.

Cancer risk averaged over the 10 stations was simulated as 505 in a million, which is approximately 25% higher than the estimate from the measurements. This includes the contribution of diesel particulates. An emission based conversion factor of 0.82 was applied to the $EC_{2.5}$ measurements in order to estimate the diesel PM contributions (See Chapter 2).

The nondiesel portion of the simulated cancer risk can be directly compared to risk calculated from the toxic compound measurements. Figure 4-15 presents a comparison of the model simulated and measurement estimated nondiesel risk at each monitoring site, as well as the 10-station average. Simulated nondiesel risk is within 30% of measurements at all stations. The simulated 10-station average cancer risk agrees very well with the risk estimated from the measurements.

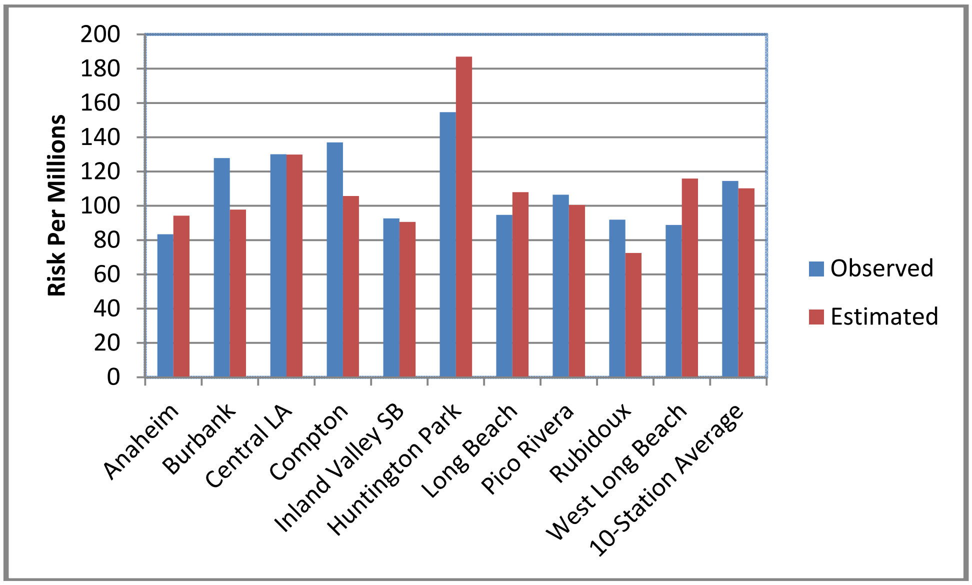


Figure 4-15
2012/2013 MATES IV Simulated vs. Measured NonDiesel Air Toxics Risk

4.5 Evaluation

The population-weighted average Basin air toxics risk (367 per million) simulated using CAMx RTRAC for the 2012-2013 MATES IV period was estimated to be 57% lower than that estimated (853 in a million) for the MATES III period. The areas of the Basin that are exposed to the most risk continue to be the Ports of Los Angeles and Long Beach with a secondary maximum occurring in an area around a railyard in Los Angeles.

A majority of the risk reduction was due to a 66% reduction in diesel emissions from 2005 to 2012. The emissions reductions of benzene (11%), 1,3-butadiene (50%), arsenic (43%) and other air toxics also contribute to the overall reduction in 2012/2013 simulated risk. A general assessment of the observed meteorological conditions for the two simulated years suggests that the two monitoring periods had comparable potentials for pollutant dispersion.

4.6 Updates to Cancer Risk Estimation Methods

The California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) has adopted revised methods for estimating cancer risks (CalEPA, 2015). The proposed new method includes utilizing higher estimates of cancer potency during early life exposures. There are also differences in the assumptions on breathing rates and length of residential exposures. When combined together, staff estimates that risks for the same inhalation exposure level will be about 2.5 times higher using the proposed updated methods. This would be reflected in the average lifetime air toxics risk estimated from the monitoring sites data going from 418 per million to an 1023 per million. While the previous method is used to compare results with past studies, staff notes that using the updated method would give the same percentage change in risks for previous MATES study estimates.

Under the revised risk assessment methodology, OEHHA has made refinements to be more health protective of children. Among other things, age sensitivity factors (ASFs) are now included in the risk calculations. These factors increase the carcinogenic potency by a factor of 10 for exposures occurring between 0 and 2 years of age, and increase the potency by a factor of 3 for exposures between ages 2 and 16. Refinements have also been made to the intake rates (e.g., breathing and ingestion rates) for the various exposures pathways (inhalation, soil, dermal, etc.) by age as well. For example, instead of using a single estimate of lifetime breathing rate for a point estimate of risk, point estimates of breathing rate for various age groups are applied. These latter two changes increase the estimate of dose at a given exposure concentration. An additional change is using 30 years as the time of residence at a given receptor rather than the current 70 years. This latter change decreases the estimate of dose at a given concentration. Applying these changes in age specific potency factors, age specific breathing rates and time of residence gives the overall estimate of the change in risk from inhalation exposures of about a 2.5 fold increase. [1] Unit Risk Factors were calculated based on the revised methodology and are show in Appendix I.

Applying the calculated Unit Risk Factors based on the update methodology to the modeled ambient levels gives a higher estimated risk across the SCAB as depicted in Figure 4-16. As shown, the revised risk levels based on the revised methodology are similar to those originally calculated for the MATES III study using the then current risk assessment methodology.

[1] In the October, 2014 Draft MATES IV Report, the increased in risk estimates was given as a 2.7 fold increase. This was based on using the 90th percentile of breathing rate distribution. In anticipation of CARB guidance for risk management, we have used the 80th percentile of the breathing rate distribution for ages greater than 2 years. This resulted in a 2.45 fold change in the estimate of risk.

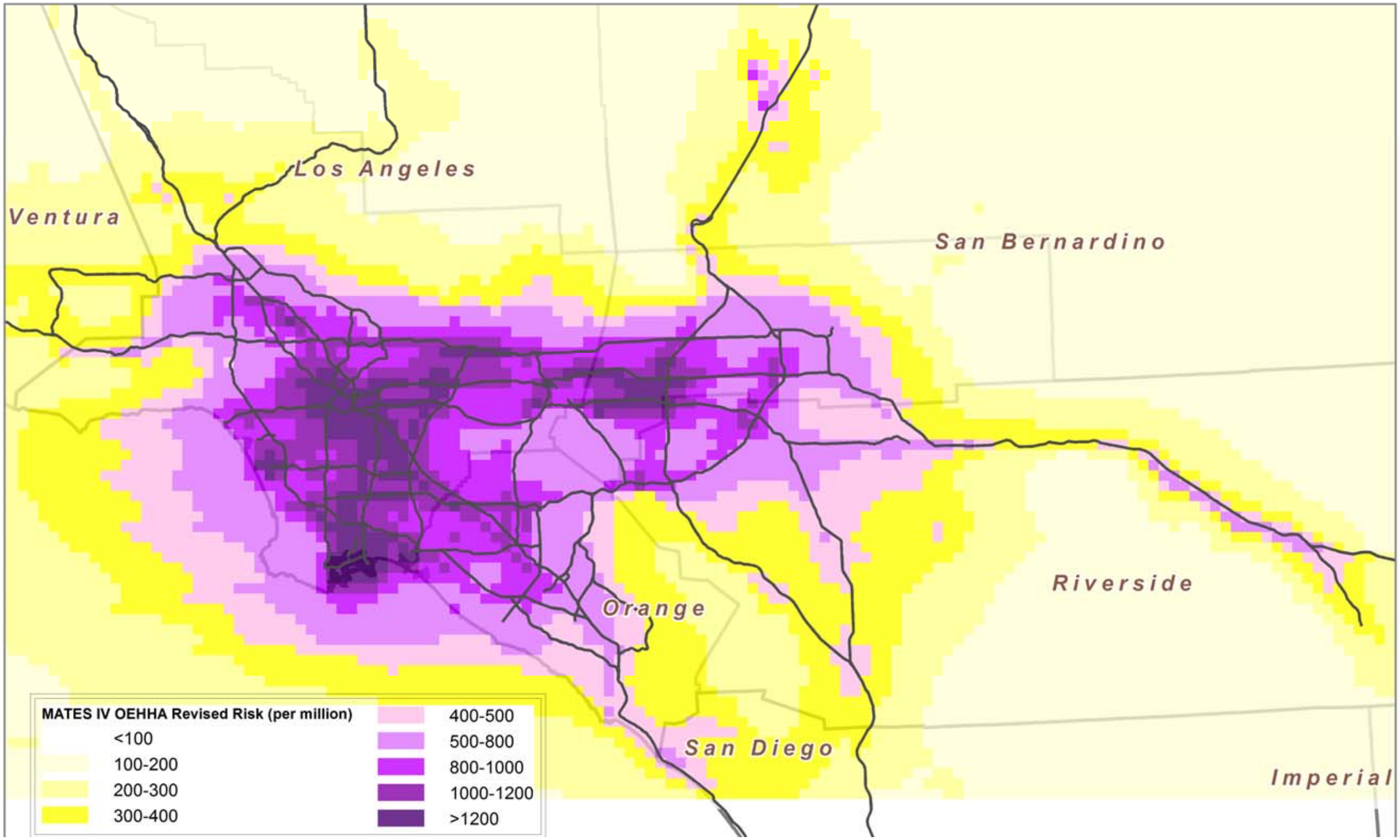


Figure 4-16
MATES IV Modeled Air Toxics Risks Estimates using OEHHA Updated Method

4.7 Comparison with Another Pollution Impacts Mapping Tool (CalEnviroScreen)

Below is a comparison of the MATES IV estimated diesel PM emissions with that of another analysis that estimated emissions of this substance, the California Communities Environmental Health Screening Tool (CalEnviroScreen).

The California Communities Environmental Health Screening Tool (CalEnviroScreen) has been developed by the Office of Environmental Health Hazard Assessment (OEHHA) and California Environmental Protection Agency (CalEPA). It is a science-based guidance and screening tool aiming to assess the cumulative impacts of environmental pollution in California communities. It is primarily designed to identify disadvantaged communities and is used to assist planning and decision-making such as administering environmental justice grants, prioritizing cleanup activities and guiding environmental community programs. Unlike MATES, which is a quantitative health risk assessment, CalEnviroScreen is a screening methodology that provides a relative ranking of impacted communities, and is not intended to be comparable to full risk assessments.
In August 2014, CalEnviroScreen version 2.0 (CES 2.0) was released. CES 2.0 produces results at the census tract level with approximately 8,000 census tracts in California and approximately 3,600 tracts within the jurisdiction of SCAQMD. The CES 2.0 model consists of two component groups – pollution burden and population characteristics. A set of statewide indicators (Table 4-8), selected based on existing environmental, health, demographic and socioeconomic data, is used to characterize pollution burden and population characteristics. Note that up to three pollution burden exposure indicators (diesel PM emissions, traffic density, and toxic releases) have potential to correspond to the emissions data that was used for MATES IV analysis.

Table 4-8
Indicators used to Represent Pollution Burden and Population Characteristics in CalEnviroScreen 2.0

Component Group 1: Pollution Burden		**Component Group 2: Population Characteristics**	
Exposures	Environmental Effects	Sensitive Populations	Socioeconomic Factors
PM 2.5 concentrations	Cleanup sites	Children and elderly	Educational attainment
Ozone concentrations	Groundwater threats	Asthma emergency department	Linguistic isolation
Diesel PM emissions	Impaired water bodies	Low birth weight births	Poverty
Pesticide use	Solid waste sites and facilities		Unemployment
Toxic releases from facilities	Hazardous waste		
Traffic density			
Drinking water quality			

For each indicator, a value is assigned for each census tract. Among the areas with an indicator value, the values are ranked from highest to lowest and a statewide percentile score is created for each indicator in each census tract. The percentile score for all individual indicators is averaged in each component group and then divided by the maximum value observed in the State. In the pollution burden component group, environmental effects indicators are weighted half as much as the exposure indicators. The component group scores are both scaled to a maximum of 10 with a possible range of zero to 10. Finally, the overall CES score is calculated by multiplying the scaled component group score for pollution burden by the scaled component group score for population characteristics. The highest possible CES percentile score is 100 with an equal contribution from the two component groups. An area with a high score would be expected to have higher pollution burdens and vulnerabilities than other areas with low scores. More details about the indicator selection and scoring, model characteristics and methodology can be found in the CES 2.0 documentation.

Figure 4-17 depicts the CES 2.0 score in SCAQMD highlighting the census tracts scoring in the highest percentiles across the state. Most urbanized areas are in the top 30% score, indicating these tracts have relatively high pollution burdens and population sensitivities compared to other communities in the State. In particular, a significant fraction of census tracts in the Los Angeles, Riverside and San Bernardino counties are in the top 10% of the relative statewide scoring.

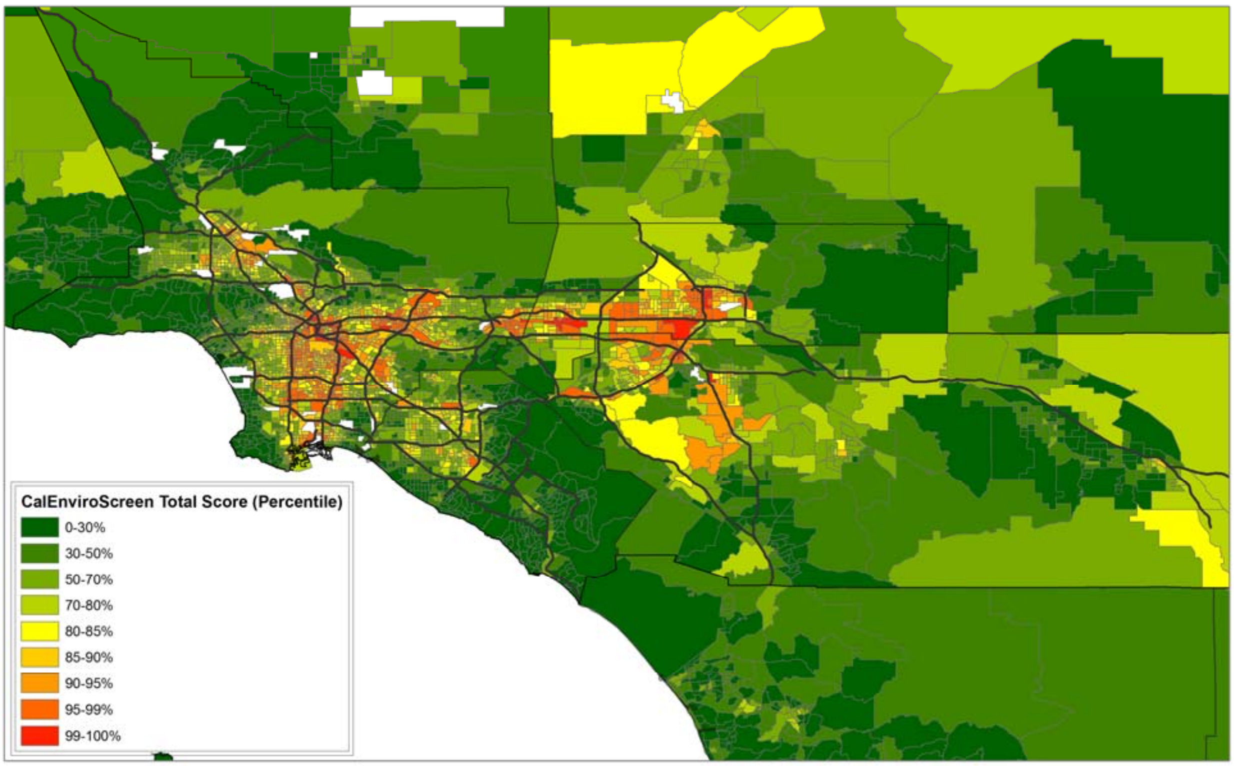


Figure 4-17

CalEnviroScreen 2.0 Overall Scores. *Data retrieved from OEHHA in September 2014.*

Within the pollution burden component, five out of the 12 indicators ($PM_{2.5}$ concentrations, ozone concentrations, diesel PM emissions, toxic releases from facilities and traffic density) are utilized to fully or partially characterize air pollution exposure. CES 2.0 estimates diesel PM emissions based on emission inventories and models similar to those used in MATES IV. On-road diesel PM emissions are calculated using California Air Resources Board (CARB)'s EMFAC 2013 for a 2010 summer day in July, and non-road diesel PM emissions are estimated from CARB's emission inventory forecasting system (CEPAM). County-wide estimates are distributed to 4 km grid cells and allocated to census tracts. Figure 4-18 shows the statewide percentile score of diesel PM emissions. Central Los Angeles and the Long Beach Port area score the highest (top 1%, shown as red color) in the State.

The diesel PM emissions in the MATES IV period (July 2012 to June 2013) are shown in Figure 4-19. Despite different study time period and geographical units, the spatial distribution of diesel PM emissions in MATES IV is similar to the diesel PM emission pattern in CES 2.0. Both models yield the highest diesel PM emissions in Central Los Angeles and in the area near the Ports.

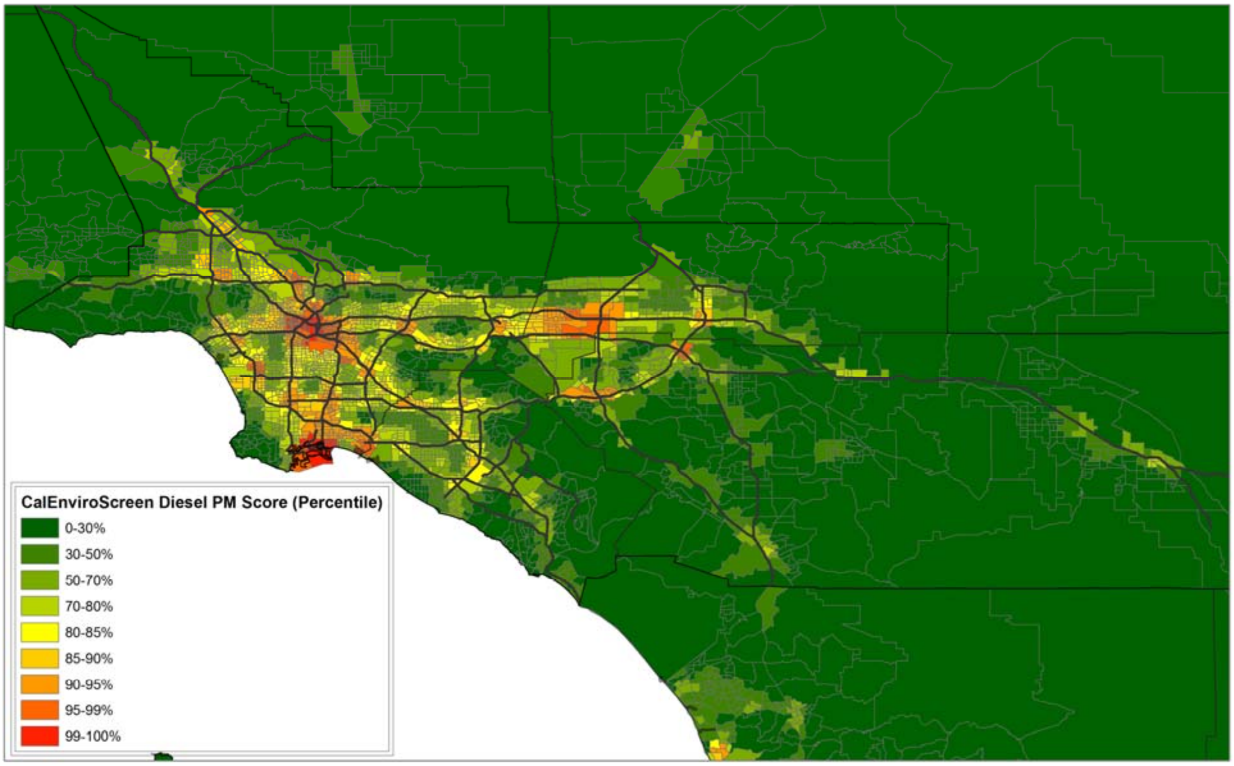


Figure 4-18
CalEnviroScreen 2.0 Diesel PM Scores. *Data retrieved from OEHHA in September 2014.*

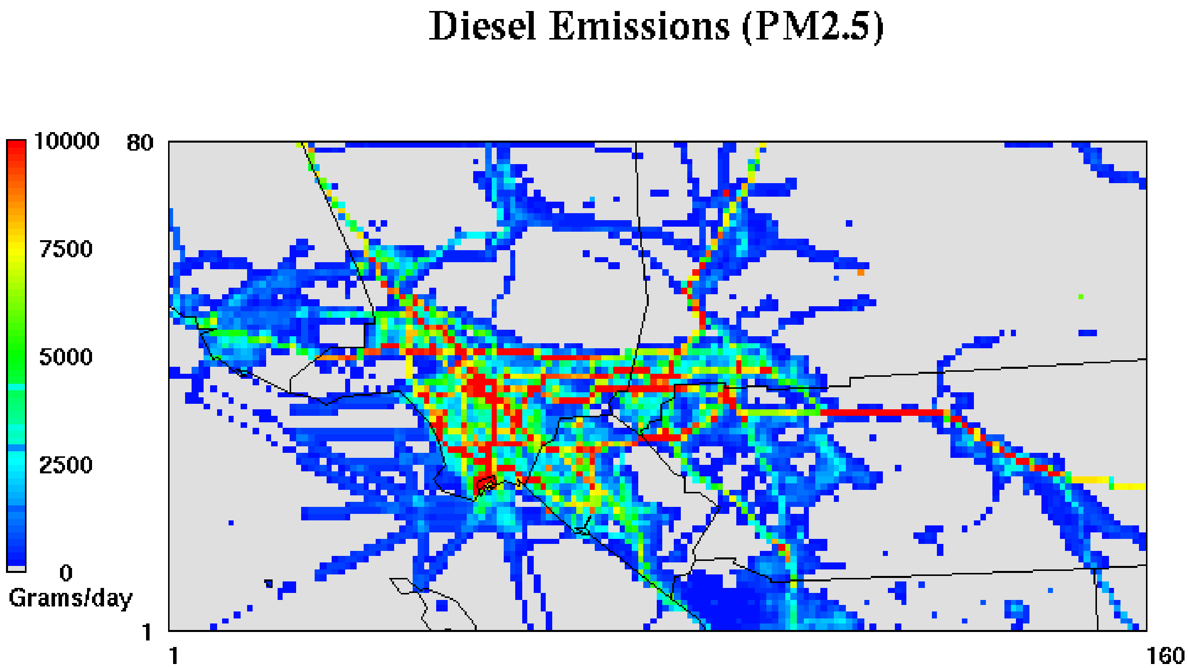


Figure 4-19
Weekday average emissions pattern for Total Diesel $PM_{2.5}$.

While CalEnviroScreen can assist CalEPA in prioritizing resources and helping promote greater compliance with environmental laws, it is important to note some of its limitations. The tool's output provides a relative ranking of communities based on a selected group of available datasets, through the use of a summary score. Unlike MATES, the CalEnviroScreen score is not an expression of health risk, and does not provide quantitative information on increases in cumulative impacts for specific sites or projects. Further, as a comparative screening tool, the results do not provide a basis for determining when differences between scores are significant in relation to public health or the environment. Accordingly, CalEnviroScreen is not intended to be used as a health or ecological risk assessment for a specific area or site.

4.8 References

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CHAPTER 5

ULTRAFINE PARTICLES AND BLACK CARBON MEASUREMENTS

Chapter 5 Ultrafine Particles and Black Carbon Measurements

5.1 Introduction

One of the key findings of the MATES III Study was that diesel particulate matter (DPM) accounts for over 80% of the total carcinogenic risk due to exposure to air toxics in the South Coast Air Basin (SCAB) (MATES III; SCAQMD, 2008). DPM is mostly comprised of impure carbon particles (soot) resulting from the incomplete combustion of diesel-type fuels and is often emitted along with ultrafine particles (UFP) and other combustion products. Soot is often referred to as black carbon (BC) or elemental carbon (EC) depending on the measurement method used (see Chapter 2 for details). In urban areas, EC and BC are often considered good surrogates for DPM. Although EC and BC are currently unregulated, the implementation of national, state and local regulations and programs to mitigate fine PM (i.e. $PM_{2.5}$) and diesel emissions often results in the control of EC and BC.

While substantial effort has been made to characterize the health risks associated with exposure to $PM_{2.5}$ in general and DPM in particular, the health impact caused by exposure to UFPs is still not well-understood. These very small particles have a diameter of 100 nm or less, consist of organic material, soot, trace metals, and are likely to be more toxic than larger PM fractions. Because of their small size, UFPs can penetrate deeply into the respiratory tract, into the bloodstream, and can be transported to other critical organs such as the heart and the brain. Thus, exposure to UFPs can potentially cause adverse health effects (both acute and chronic) in humans (HEI, 2010).

In an attempt to better characterize their spatial and temporal variations in the SCAB, potential sources and mechanism of formation, and their potential impact on public health, continuous measurements of UFP and BC concentrations were taken at all 10 MATES IV fixed sites, using state-of-the-art methods and techniques that were not mature at the time of MATES III.

BC measurements (i.e. 1- to 5-min. time resolution) were carried out using two different types of Aethalometers (AE22; Magee Scientific, Berkeley, CA; and AE33; Teledyne API, San Diego, CA). These are instruments that continuously measure the light transmission through particulate matter (PM) collected on a sampling filter. Specifically, they utilize the light-absorbing properties of BC-containing particles at a wavelength of 880 nm in order to gain a light absorption coefficient, which is related to the particulate BC mass concentration. Aethalometers are small, reliable, easy to operate, provide continuous real-time data, and are the most common instruments used to measure ambient BC. The principle of operation of both types of Aethalometers used during MATES IV is described in detail in Appendix III.

Ultrafine particle number concentration data was collected continuously (i.e. 1-min. time resolution) using water-based condensation particle counters (CPC Model 651; Teledyne API, San Diego, CA). This instrument provides the total number concentration of particles above 7 nm in real-time. UFPs are grown through condensation in a controlled super-saturation environment to larger sizes that can be detected and counted using a photodetector. The particular model used during MATES IV was specifically designed for routine ambient air quality monitoring in network applications (See Appendix VII for details).

Continuous BC and UFP measurements were conducted at all 10 fixed MATES IV locations (i.e. West Long Beach, North Long Beach, Compton, Huntington Park, Pico Rivera, Central Los Angeles, Burbank, Inland Valley San Bernardino, Rubidoux, and Anaheim) for a period of at least 12 months from July 2012 until the end of June 2013, or beyond. Only data collected from July 1, 2012, through June 30, 2013 have been included for the present report. The SCAQMD is committed to achieving the highest possible data quality level. A comprehensive summary of the data review and validation procedures is provided in Chapter 2 and Appendix III.

5.2 Measurement Results

The spatial and temporal variations in BC and UFP concentrations discussed below provide invaluable information regarding daily and seasonal patterns and, more importantly, potential source contributions of these two air pollutants throughout the SCAB.

5.2.1 Spatial Variations

Figure 5-1 shows the study average BC concentration at each of the 10 fixed sites, along with the overall Basin average BC concentration [MATES IV (AVG)] and the Basin average EC concentration for both MATES III and MATES IV [MATES III (EC) and MATES IV (EC), respectively][1]. Typically, the highest BC levels were observed at the more urban sites located near major roadways (i.e. Burbank, Central Los Angeles, Pico Rivera and Huntington Park) and at inland/receptor sites such as Inland Valley San Bernardino and Rubidoux. While BC was not measured during MATES III, the average EC levels decreased substantially (about 35% reduction) from MATES III to MATES IV (See Chapter 2).

[1] BC and EC both refer to impure carbon particles resulting from combustion processes. While these terms are often used interchangeably, they are two methodologically-defined species that are measured using optical and thermal-optical methods, respectively. A comprehensive comparison between BC and EC measurements is available in Appendix VI.

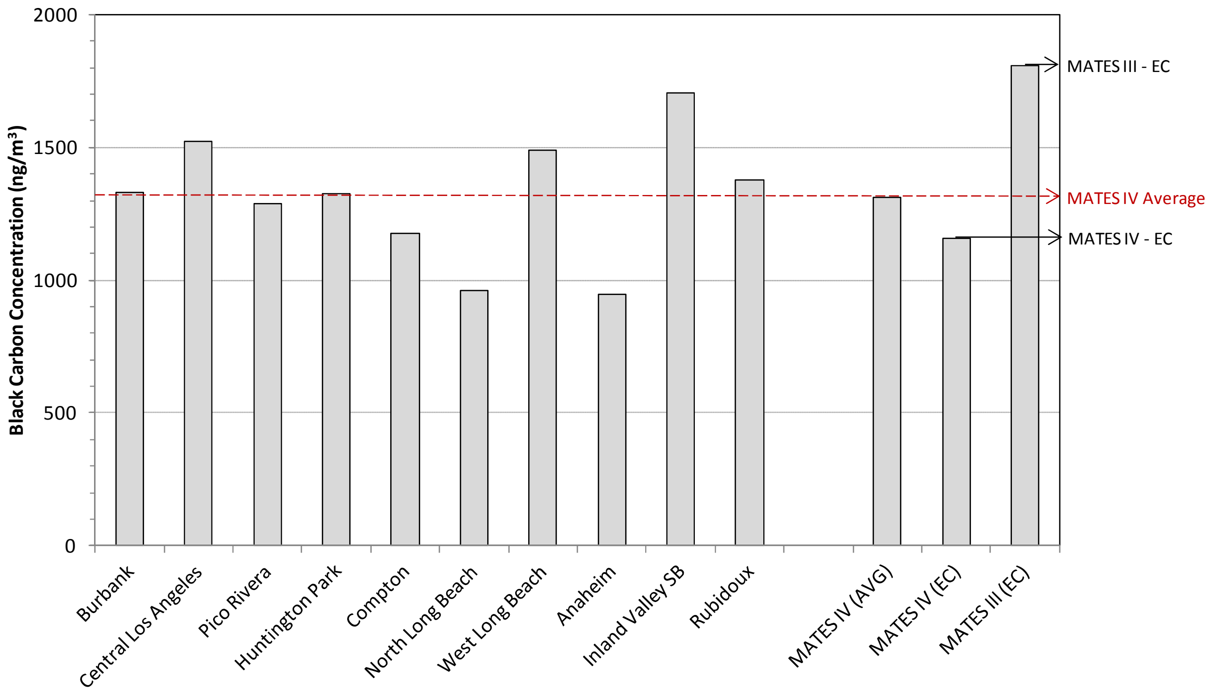

Figure 5-1 – Spatial Distribution of Average Black Carbon (BC) Concentrations during MATES IV and Comparison with MATES IV and MATES III Elemental Carbon (EC) Averages.

Sampling sites located near heavily-trafficked freeways are usually characterized by increased levels of UFPs compared to more rural sites. For this reason the West Long Beach site (located in a highly industrial area near the San Pedro Bay Port complex) exhibited the highest study average UFP concentration during MATES IV (Figure 5-2).

In particular, BC and UFP levels in West Long Beach are probably affected by emissions from the Terminal Island Freeway 103 located upwind of the sampling station, where vehicular traffic from goods movement associated with the San Pedro Bay Ports is particularly pronounced. Similarly, emissions from railroads and goods movement are likely to contribute to the elevated study average UFP concentration observed at the Huntington Park site (Figure 5-2).

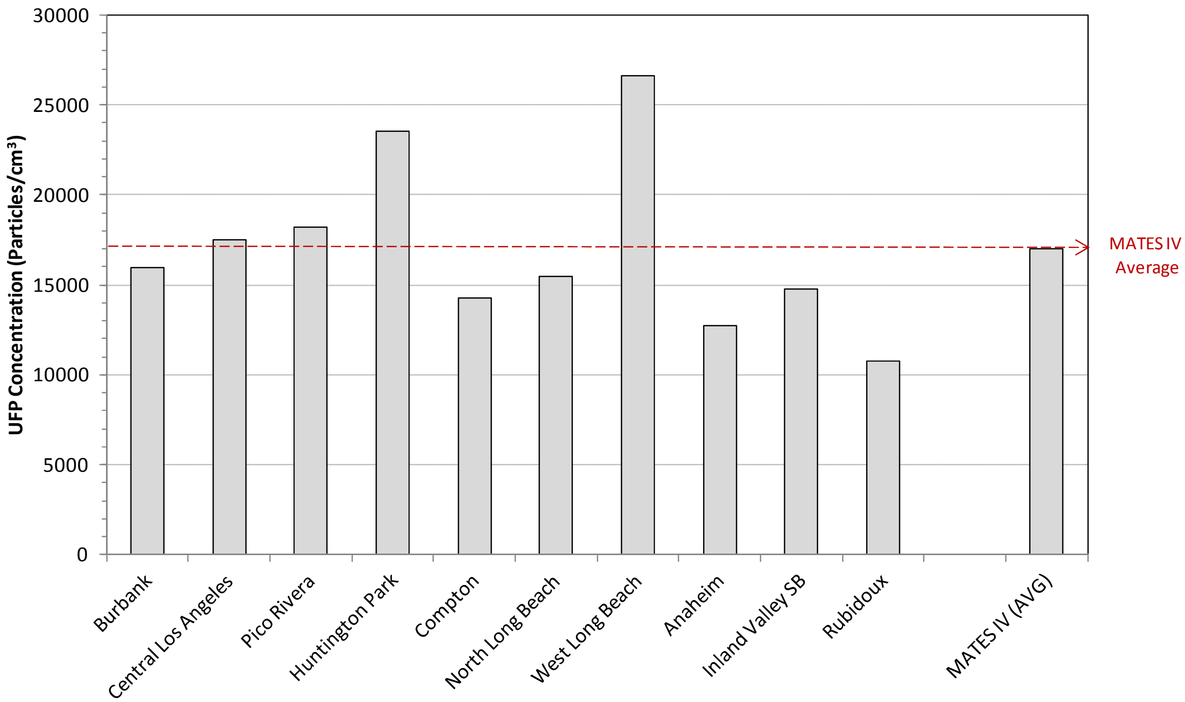

Figure 5-2 – Spatial Distribution of Average Ultrafine Particle (UFP) Concentrations during MATES IV.

5.2.2 Temporal Variations

Both BC and UFP exhibited considerable daily, monthly, and seasonal variations. Studying these variations can yield insights into potential contributions from local and regional sources. Hourly average measurements (discussed in Appendix VI and VII) can also provide estimates of the frequencies and magnitudes of high concentrations to which the SCAB population might have been exposed.

5.2.2.1 Monthly Trends

Occurrences of high daily mean BC and UFP concentrations were observed mostly during the colder months (November to February), as shown in Figures 5-3 to 5-5. Conversely, concentrations during the spring and summer months (April to August) were distinctly lower.

As mentioned earlier, vehicular diesel exhaust often contributes to increasing the ambient concentration of BC at most sites. Other potential sources may include industrial emissions (particularly diesel-powered), meat charbroiling, biomass burning, and heavy fuel oil combustion (ship emissions). Emissions from these sources often show some seasonality and may impact the spatial distribution of BC within the Basin (Magliano, 1999; Reinhart, 2006). For instance, the higher BC concentrations observed during the winter season can be partly attributed to enhanced BC emissions from increased usage of wood burning for space heating (Jordan, 2006; Fine, 2004). Variations in meteorological conditions are another important contributing factor. The boundary layer in the winter is much shallower than in the summer; this causes a lowering of the "mixing height," less atmospheric transport and dilution, and thus a consequent increase in atmospheric BC concentrations.

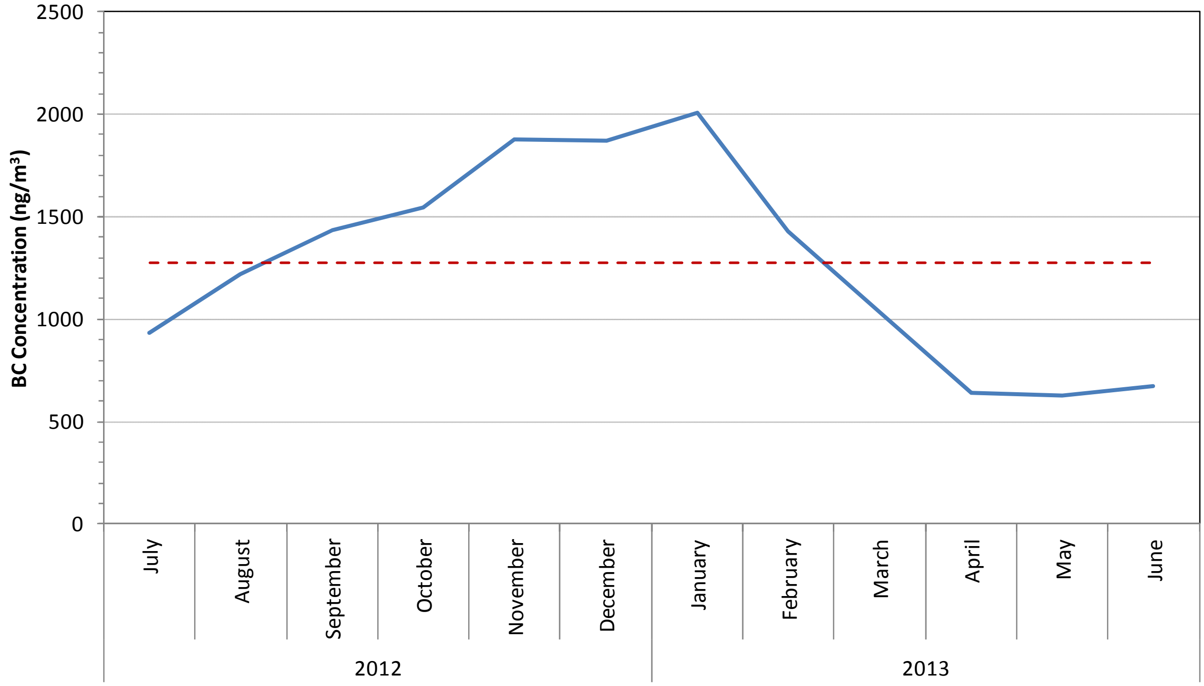

Figure 5-3- Monthly Average Black Carbon (BC) Concentration Trends in the South Coast Air Basin During MATES IV. The Red Line Represents the Study Average BC Concentration During MATES IV.

These seasonal trends are further highlighted in Figure 5-4, where BC concentrations for each site were averaged over a period of three months (i.e. summer: June, July and August; fall: September, October and November; winter: December, January and February; and spring: March, April and May).

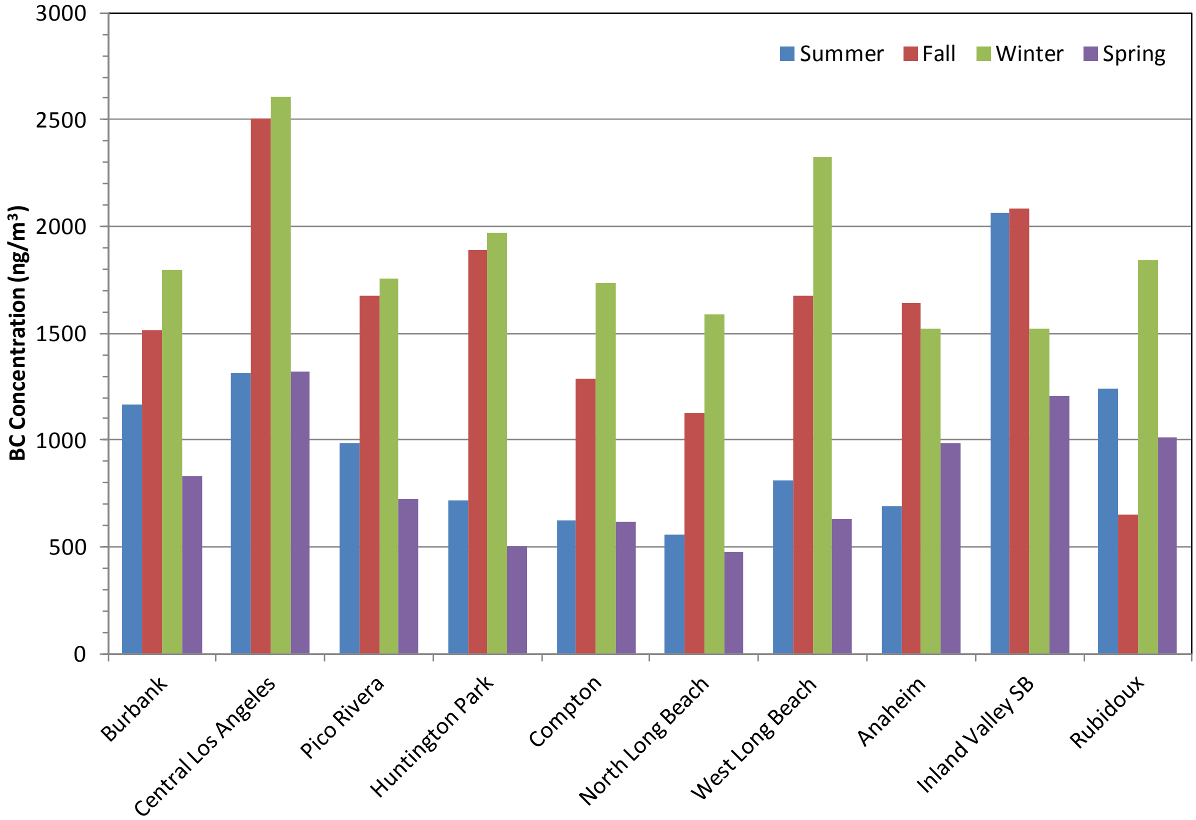

Figure 5-4 - Seasonal Variations of Black Carbon (BC) Concentrations at Each MATES IV Site.

Figure 5-5 displays the seasonal variation in UFP concentration for all 10 fixed monitoring sites. In most instances, the winter months were characterized by increased UFP levels. This is because, in the winter, decreased ambient temperatures and lower mixing heights led to less atmospheric particle dilution and favor the formation of a larger number of small UFP particles (Kittleson 1998, Wang et al. 2013).

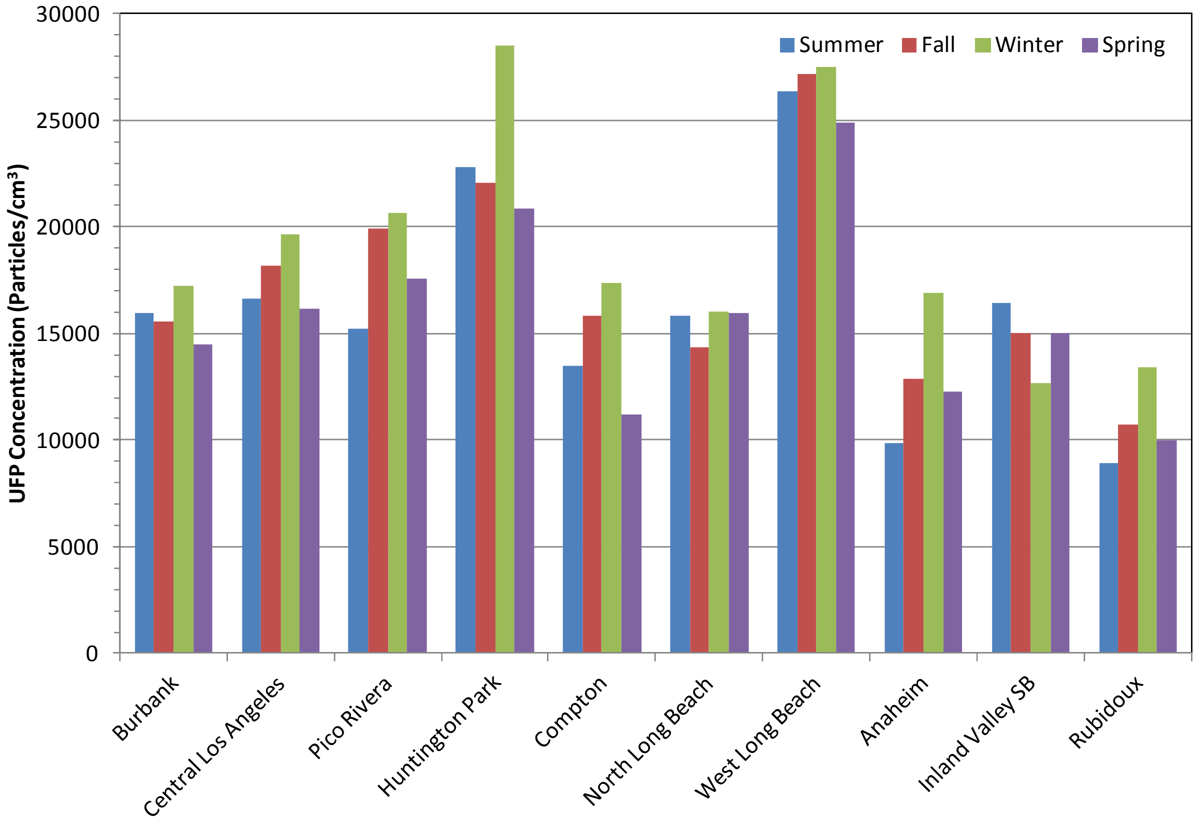

Figure 5-5 - Seasonal Variations of Ultrafine Particle (UFP) Concentrations at Each MATES IV Site.

5.2.2.2 Diurnal Trends

Typically, BC and UFP exhibit distinct diurnal profiles. BC is associated with primary combustion activities and is widely considered as one of the best indicators of mobile source emissions (diesel vehicles in particular) in urban environments. BC and UFP concentrations in urban environments have been shown to closely follow the temporal variation in traffic density, with the highest levels observed on weekdays during rush hours (Hussein et al., 2004; Morawska et al., 2008; AQMD, 2012). UFPs can also be formed by photochemical reactions in the atmosphere, particularly in photochemically-active, sunnier seasons. This is often reflected in a mid-day peak associated with secondary particles.

The 10-site average diurnal variation of BC (indicative of the typical diurnal BC trend in the South Coast Air Basin) is shown in Figure 5-6. Typically, the BC mass concentration peaked in the morning between 0600 and 0900 PST because of rush-hour traffic and decreased throughout the day due to decreased traffic volume, increased wind speeds and subsequent dispersion of ambient pollutants. Early in the evening, evening rush hour, lower wind speeds and a shallow inversion layer led to a slight increase in BC concentration and stable conditions until the early morning.

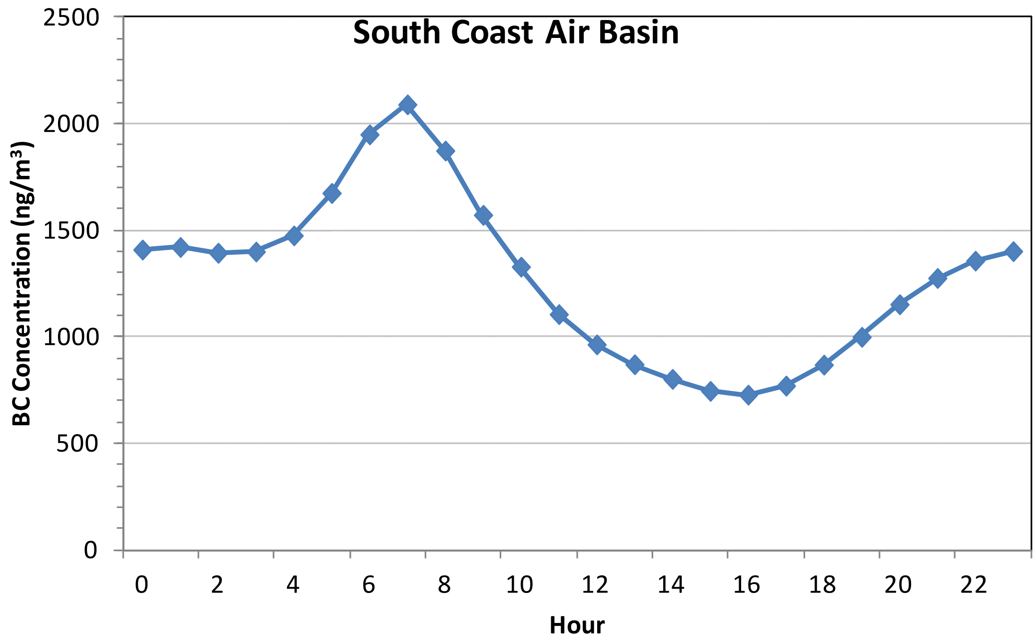

Figure 5-6 - Diurnal Variation in Black Carbon (BC) Concentration in the South Coast Air Basin During MATES IV

The effect of the meteorology on the diurnal trend of BC is more evident when comparing diurnal patterns in different seasons (Figure 5-7). As expected, diurnal variations are more pronounced in the winter and fall because of more stable atmospheric conditions, as explained in previous sections.

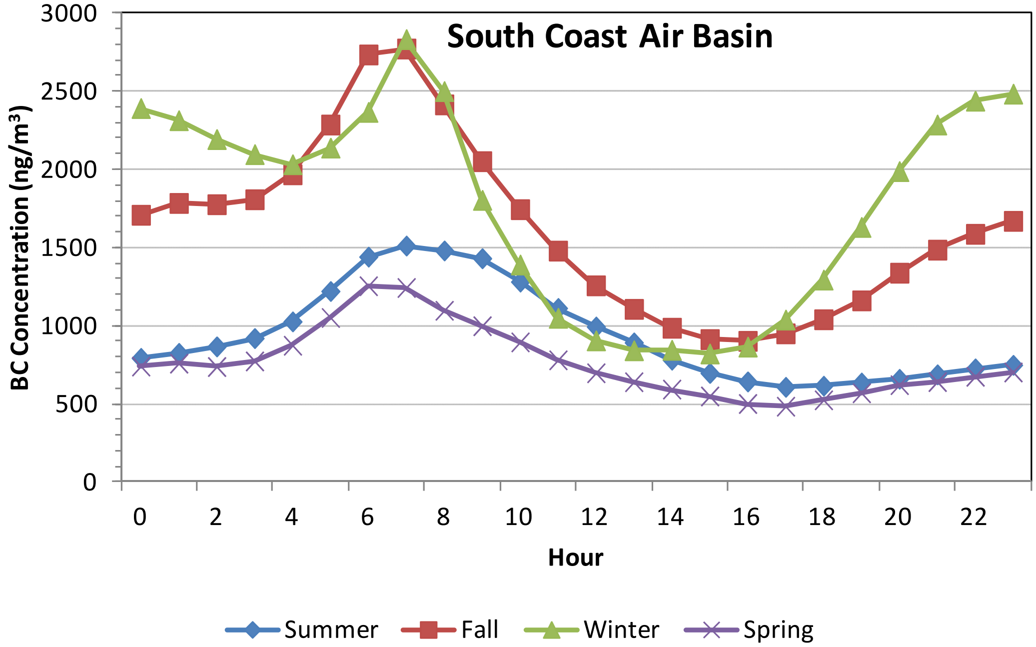

Figure 5-7 - Diurnal Variation in Black Carbon (BC) Concentration in the South Coast Air Basin During MATES IV

Unlike what was observed for BC, the study average diurnal trend for UFP is characterized by three distinct peaks, one early in the morning coinciding with rush hour traffic, followed by a wider mid-day peak which is probably related to photochemical particle formation, and a less pronounced peak in the late afternoon, mostly caused by evening rush hour and a lower mixing height (Figure 5-8).

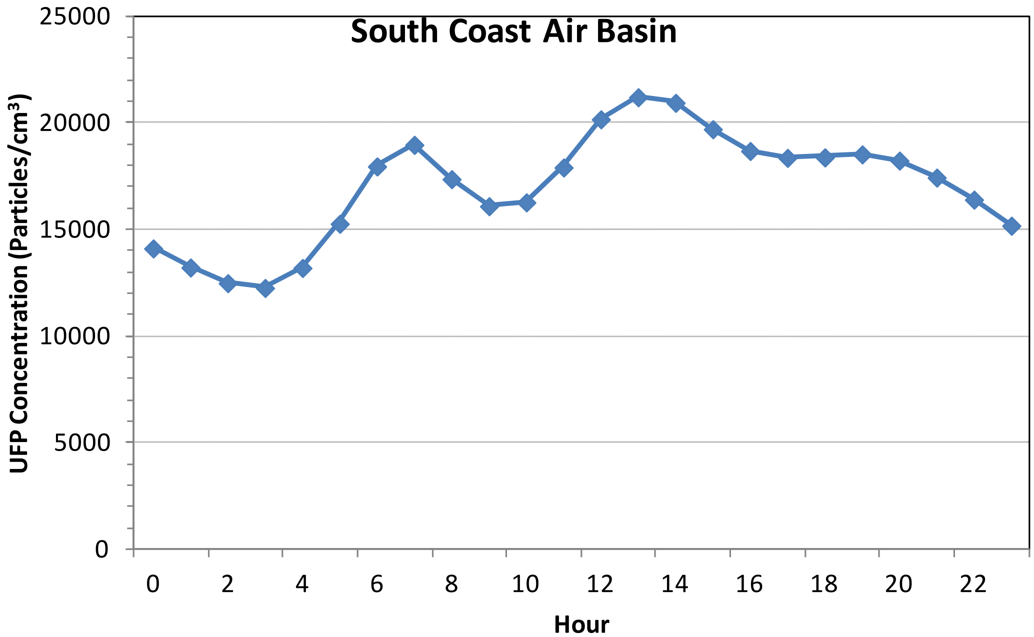

Figure 5-8 - Diurnal Variation in Ultrafine Particle (UFP) Concentration in the South Coast Air Basin During MATES IV

The effect of meteorology on UFP concentration is more evident when comparing average diurnal patterns for different seasons (Figure 5-9). Several factors contribute to the seasonal variability of UFPs. Winters, characterized by stable atmospheric conditions and lower mixing heights, result in elevated UFP levels during morning rush hours and at night (Singh et al. 2006, Wang et al. 2012). Moreover, lower temperatures favor the nucleation/condensation of volatile components of combustion exhaust and, in turn, led to an increase in UFPs. Summer months are typically characterized by a distinct mid-day peak due to increased photochemical activity, which favors particle formation.

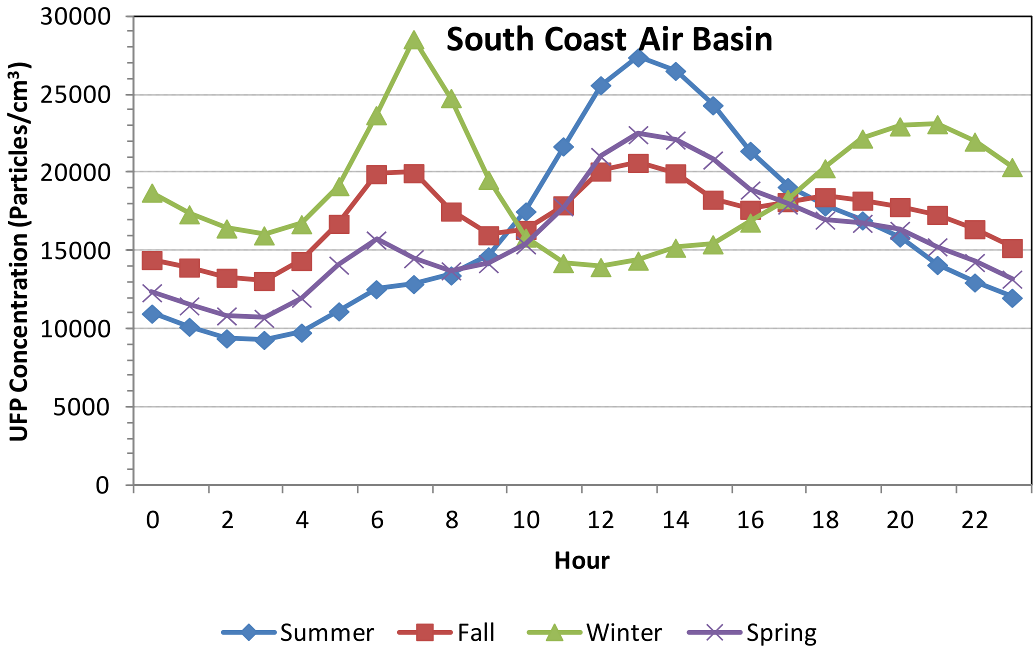

Figure 5-9 - Diurnal Variation of Ultrafine Particle (UFP) Concentration in the South Coast Air Basin During MATES IV.

5.3 Summary for Fixed Sites

Long-term BC and UFP measurements were carried out over a period of one year from July 2012 to June 2013 in a network of 10 sampling sites located in the SCAB. This data was used to characterize the spatial and temporal variations in BC and UFP concentrations and their association with meteorology and local sources.

The morning peak in BC and UFP concentrations observed at most MATES IV sites was probably associated with increased traffic density during rush hours. This effect is particularly pronounced during the colder months, when higher traffic density is coupled with a shallower mixing height. UFPs also exhibit a mid-day peak during the warmer season which is likely to be associated with generation of secondary particles through photochemical processes in the atmosphere.

Seasonal variations in BC and UFP concentrations are mostly related to changes in meteorology. For example, in the wintertime biomass burning smoke may contribute to the observed elevated BC concentrations, and lower temperatures can promote condensation of volatile species and subsequent formation of UFPs.

Various existing regulations and emission reduction strategies are designed to control the atmospheric concentration of BC, either directly by reducing diesel emissions, or indirectly by reducing total PM emissions. Some examples include: (a) promoting regular vehicle emissions testing and retrofitting older diesel powered vehicles and equipment; (b) controlling ship emissions by regulating idling at terminals and mandating fuel standards for ships seeking to dock at port; (c) requiring the use of cleaner fuels; (d) controlling and limiting biomass burning;

(e) requiring permits for operation of industrial, power-generating and oil refining facilities; and (f) promoting filtering and aftertreatment technologies. In most cases, measures to mitigate BC will probably also reduce UFP emissions.

5.4 Local-Scale Studies

Programs such as MATES are designed to monitor and characterize toxic emissions over the entire Basin. However, ambient monitoring is necessarily conducted at a limited number of locations, and modeling is limited to a spatial resolution of 2km. For this reason, communities located very near industrial sources or large mobile source facilities (such as marine ports, railyards and commercial airports) can be affected by higher air contaminant levels than cannot be captured in the typical MATES analysis. Near-road monitoring studies and dispersion modeling results for point sources indicate that exposure can vary greatly over distances much shorter than 2 km. The local-scale monitoring program of MATES IV aims to characterize the impacts of large sources on nearby communities by utilizing portable platforms designed to sample for a period of several weeks at selected locations with an emphasis on diesel particulate matter (DPM) and ultrafine particle (UFP) emissions. The studies are designed to assess gradients in ambient pollutant levels within communities as well as provide a comparison to the fixed MATES monitoring sites. The communities chosen for sampling were selected based on proximity to potential sources as well as environmental justice concerns.

To complete these short-term studies, the SCAQMD employed two mobile monitoring platforms (MMP) and/or up to six environmental enclosures (EE) that were specifically designed for fast-response deployment in communities of the Basin. The MMPs integrate multiple monitoring technologies on a mobile platform and are capable of characterizing the atmospheric concentrations of a wide array of particle and gaseous pollutants in real time, including UFPs and BC (measured using a water-based particle counter and a portable Aethalometer, respectively). Similarly, each EE consists of a water-based condensation particle counter (for continuous UFP measurements) and a micro-Aethalometer (for measuring BC in real-time), powered by a portable battery and enclosed inside a rigid synthetic case.

5.4.1 Los Angeles International Airport (LAX)

SCAQMD conducted a series of air quality measurements at the Los Angeles International Airport (LAX) to characterize the atmospheric levels of UFPs and BC downwind of the main runways. Specifically, these local-scale studies were conducted to: (a) delineate local air toxic concentration gradients that might be driven by proximity to the airport; (b) establish if airport-related emissions are distinguishable from those of other potential sources such as nearby traffic from the I-405. These objectives are consistent with the community-scale air monitoring grant program goals of the EPA, which partially funded this deployment.

5.4.1.1 Gradient Study

On 09/11/2012 between 08:00 and 17:00 (PST), UFP and BC measurements were taken at eight different sites east (downwind) of and at different distances from runway 25R (typically used for aircraft take-off) and runway 25L (usually used for landing), as shown in Figure 5-10. Since most sites were located in highly restricted areas where access was only possible under LAX personnel supervision, only a limited number of measurements were collected for this part of MATES IV. However, the highly resolved one-minute UFP and BC data provided useful information on the local gradients, short-term variations, and potential impacts on local communities. It should be noted that sites 4 and 8 were located 100 and 250 m downwind of the I-405 to evaluate the potential relative contributions of airport and freeway emissions. Lastly, BC measurements were also conducted at a "Community" site, in a highly populated residential area further away from LAX and the I-405. However, all data collected at this last location were invalidated because of unexpected construction activities occurring near this site.

Figure 5-10 - SCAQMD monitoring sites used for the Los Angeles International Airport (LAX) gradient study.

The study average UFP concentrations at sites 1 through 8 were substantially more elevated than the corresponding MATES IV Basin average measured at the 10 fixed sites (Figure 5-10). As expected, the average UFP level peaked at site 1 immediately downwind of runway 25R (where aircraft take-off) and decreased exponentially away from the runway. Interestingly, the average UFP concentrations downwind of runway 25 L (used for landing) followed the opposite trend and increased with increasing distance from the runway (Figure 5-11). This suggests that aircraft landing may also impact the atmospheric levels of UFPs in the area (and possibly communities) east of LAX. Given the short duration of these measurements, it is difficult to assess the full extent of this impact.

It should be noted that motor-vehicle emissions from the I-405 Freeway may have contributed to increasing the ambient UFP concentrations at site 8. The relative contribution of freeway emissions to the measured UFP levels is difficult to assess with this limited dataset. More information regarding the potential impacts of airport-related emissions on ambient air quality of communities adjacent to the airport is available in the Los Angeles International Airport (LAX) Air Quality and Source Apportionment Study (AQSAS).

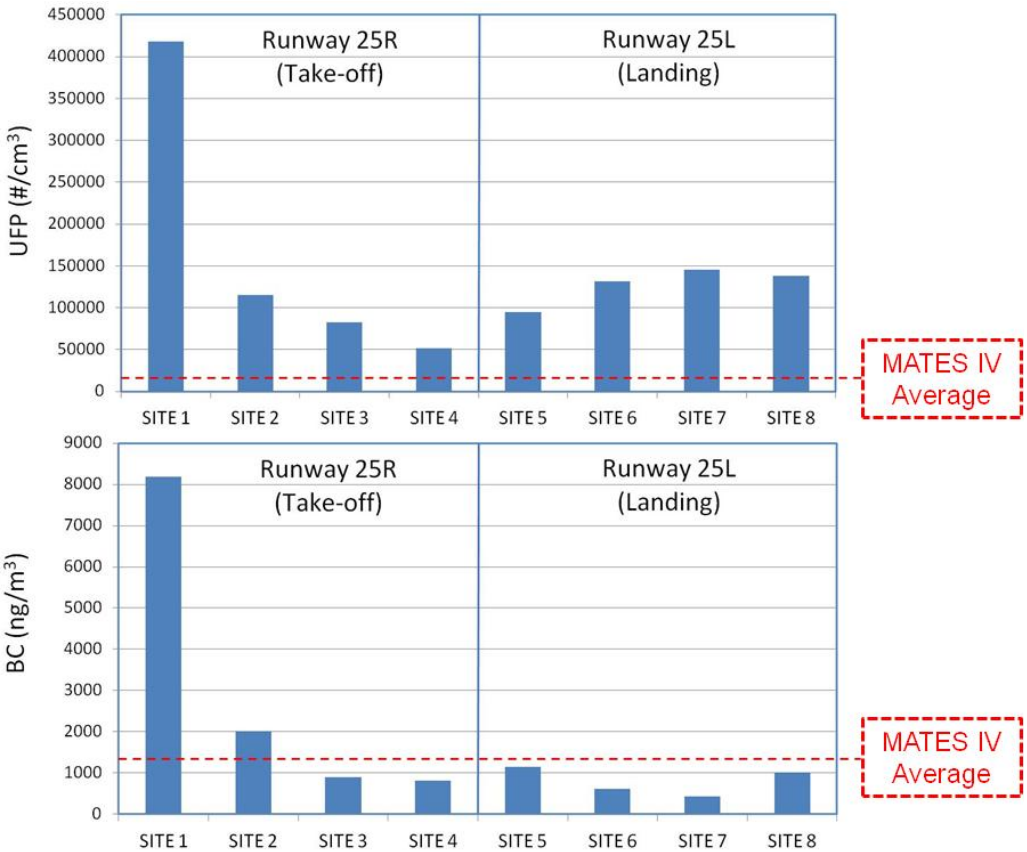

Figure 5-11 - Average UFP and BC levels measured at the eight temporary sites downwind of runway 25R (where aircraft take-off) and runway 25L (typically used for landing).

Similarly, the average concentration of BC downwind of runway 25R peaked at site 1 because of aircraft take-off and decreased steeply moving away from the airport (Figure 5-11). However, while the average BC level at site 1 (8188 ng/m^3) was well above what is typically found in urban areas, the ambient concentrations at the remaining downwind sites were close or below the MATES IV BC study average (1313 ng/m^3). No evidence of a significant contribution of BC emissions from aircraft landing was found from the data collected downwind of runway 25L.

Site 8 showed slightly higher BC concentrations than those measured closer to the airport, probably because of contributions from the I-405. However, since the traffic volume on this freeway is dominated by light-duty gasoline vehicles, these contributions are probably not very significant, as confirmed by previous studies conducted in Los Angeles.

5.4.2 San Bernardino Railyard

The San Bernardino Railyard (located in the city of San Bernardino) was selected to further characterize ambient air pollutant levels in the communities surrounding this facility. Railyards are a complex mix of many source types including trains, stationary equipment, terminal operations and on-road vehicles, particularly heavy-duty diesel trucks. A unique set of rapidly deployable mobile air toxics monitoring platforms using the latest technologies for continuous measurements, including both MMPs and EEs, were utilized. A combination of continuous air monitoring and meteorological data is extremely valuable in determining source locations, emission profiles, and exposure variability.

The MMPs were equipped with a condensation particle counter (CPC, model 3785; TSI, Inc.) which measures the number concentration of particles larger than 5 nm in size and up to 10,000,000 particles per cubic centimeter (#/cm^3). A portable Aethalometer (AE22; Magee, Inc.) for real-time measurements of BC was also installed in MMP as an indicator of DPM. EEs were equipped with a condensation particle counter (CPC, model 3781; TSI, Inc.), which monitors number concentrations of particles down to 6 nm in size and up to concentrations of 500,000 (#/cm^3), while BC was measured using micro-Aethalometers (AethLabs). The MMPs and EEs were placed around the San Bernardino Railyard facility as shown in Figure 5-12, to assess potential gradients in exposure as a function of distance from the railyard activities. Measurements were taken between 09/06/2013 to 09/19/2013.

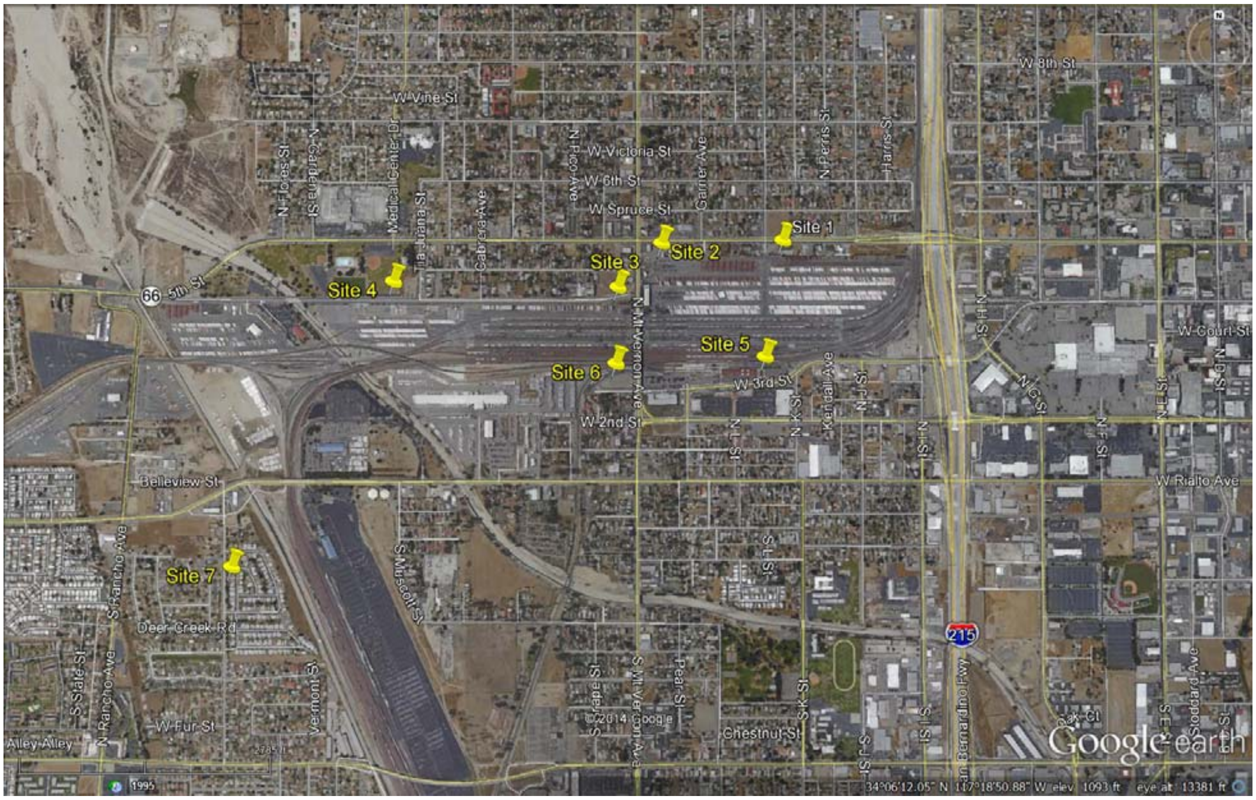

Figure 5-12 - SCAQMD Monitoring Sites for MATES IV San Bernardino Railyard Microscale Study.

Comparing the levels measured at these local-scale sampling sites to those collected from other fixed MATES IV locations can yield insights as to the magnitude of local impacts. Both BC and UFP concentrations were elevated compared to the MATES IV Basin averages, the annual levels measured at the fixed Inland Valley San Bernardino site, as well as the levels measured at this fixed site during the same period when the local-scale measurements were conducted. Particularly, the study average BC concentrations at sites 1 through 7 were substantially elevated relative to the corresponding MATES IV Basin average measured at the 10 fixed sites (Figure 5-13). Elevated BC concentrations are expected in vicinity of a railyard facility due to high traffic activity of heavy-duty vehicles. It should be noted that sites 1, 2 and 3 that are located close to the intersection between Highway 66 and the I-215 Freeway may experience relatively higher heavy-duty diesel traffic. The BC levels were also significantly higher than the annual average BC concentration at the Inland Valley San Bernardino site (1703 ng/m^3), as well as those recorded at the Inland Valley San Bernardino site during the same period as the local-scale study (1564 ng/m^3 between 09/06/2013 and 09/19/2013).

Compared to BC, UFP concentrations are only slightly higher than the MATES IV Basin average concentration (Figure 5-13). Relatively higher UFP concentrations at sites 1, 2 and 3 close to Highway 66 and the I-215 Freeway suggest that the motor-vehicle emissions may have contributed to higher ambient UFP concentrations.

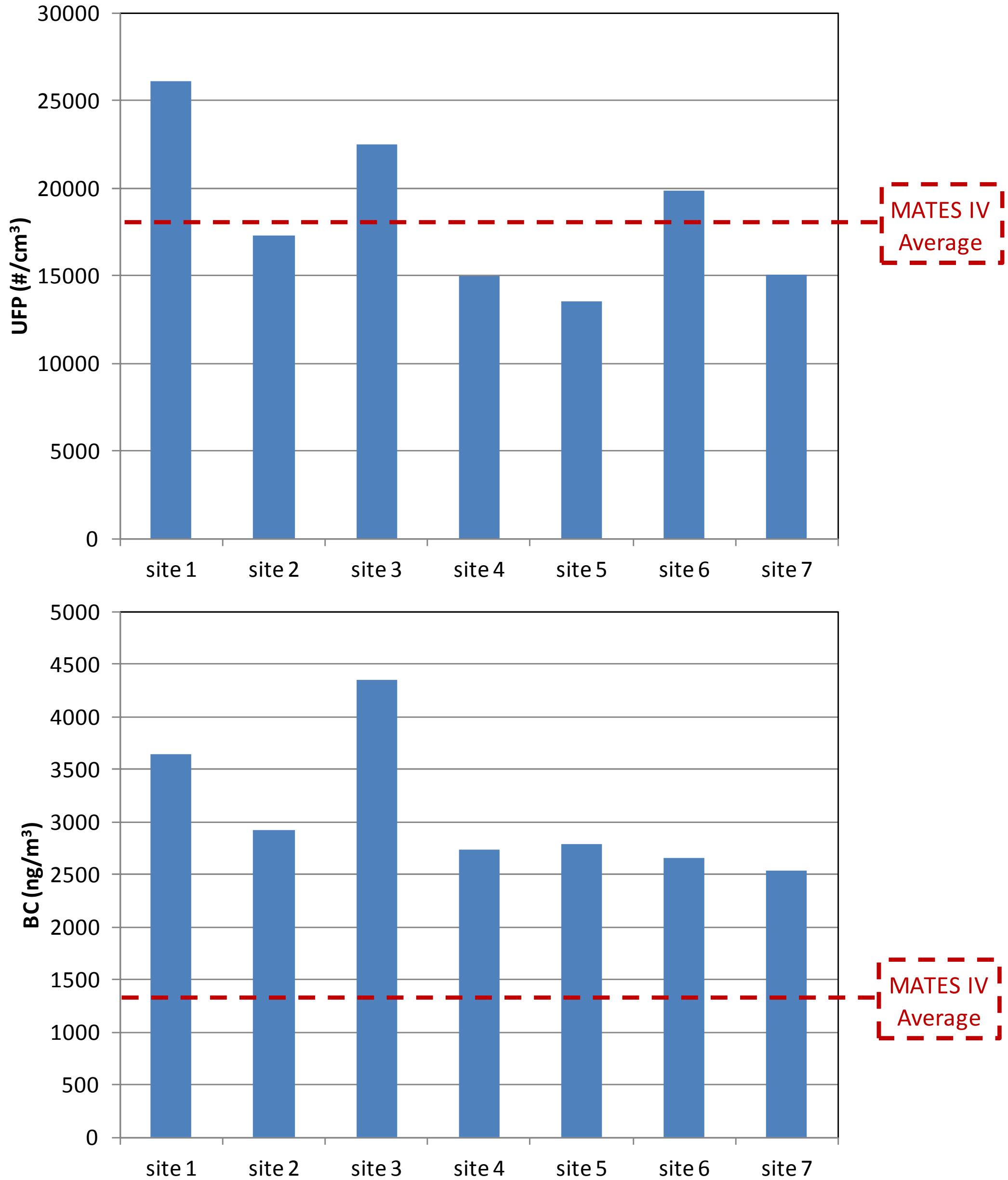

Figure 5-13 - Average UFP and BC levels measured at the seven temporary sites surrounding San Bernardino Railyard.

5.4.3 Mira Loma/CA-60 Freeway

This location was selected to assess the impact of motor-vehicle emissions from the CA-60 Freeway and Etiwanda Ave on a local community. As for the LAX and San Bernardino Railyard studies, each EE contained a micro-Aethalometers (AethLabs) and a portable CPC (Model 3781), and each MMP included a Magee portable Aethalometer and a CPC model 3785. Sampling was conducted at six different sites on seven different dates from mid January to early March, 2013. Each sampling period started before pre-morning rush-hour traffic and concluded in mid afternoon. Sites were selected to capture the potential gradients of BC and UFP concentrations in this residential neighborhood. Sites 1, 3 and 4 were located in the residential area, downwind and away from major roads. Site 2 was located at the intersection of two roadways, while sites 5 and 6 were closest to the 60 Freeway (Figure 5-14).

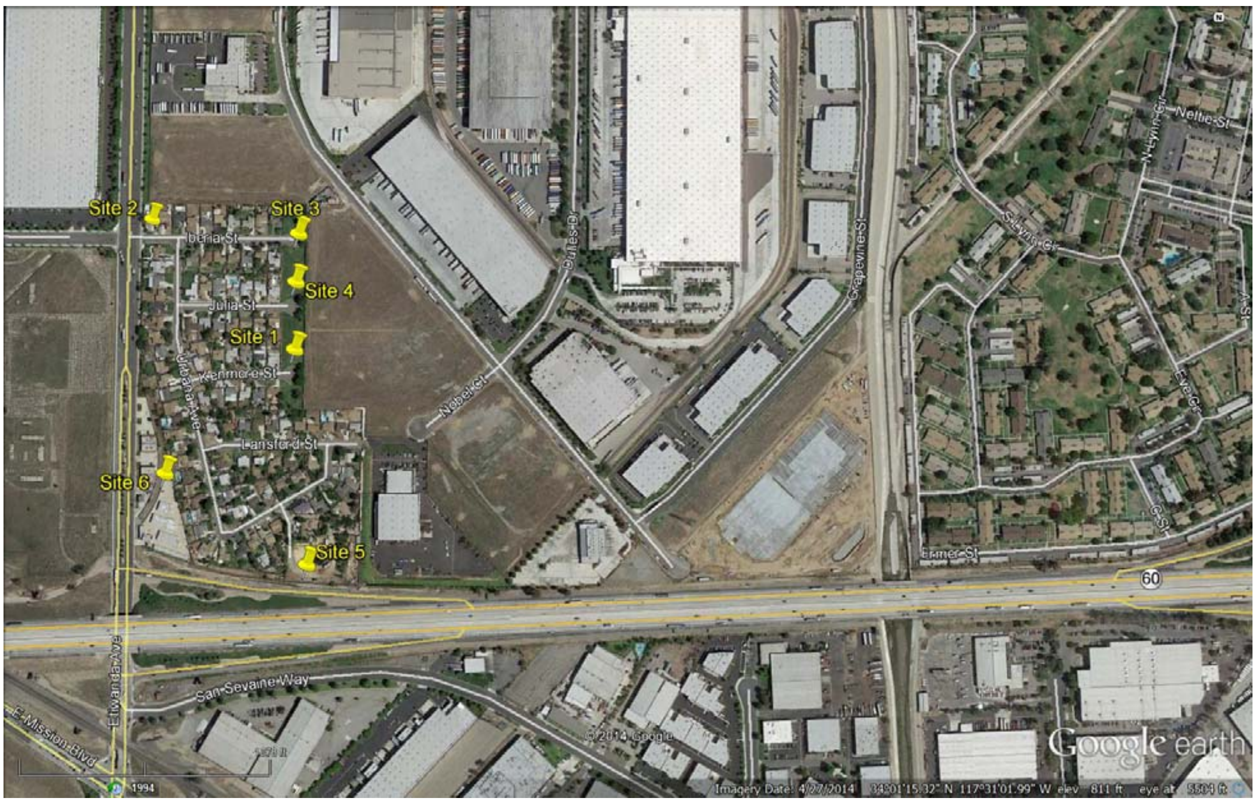

Figure 5-14 - SCAQMD monitoring sites used for the Mira Loma study.

The study average BC and UFP concentrations at all sites was close to or exceeded the corresponding MATES IV Basin average (Figure 5-15), probably due to the intense traffic activity in this industrial area, and the relatively high contributions from heavy- duty diesel trucks. As expected, the average BC and UFP concentrations peaked at sites closer to the 60 Freeway and to major roads (e.g. sites 2, 5 and 6) and decreased substantially away from the freeway (as observed at sites 1, 3 and 4).

Figure 5-15 - Average UFP and BC levels measured at the six temporary sites in Mira Loma.

CHAPTER 6

FINDINGS AND DISCUSSION

Chapter 6. Findings and Discussion

The MATES IV Study incorporates several updates and improved methodologies compared to previous air toxics studies in the Basin to measure and model ambient levels of air toxics and their associated risks. Key elements and findings are listed below.

6.1. Ambient Monitoring

- Air toxics samples were taken at 10 fixed sites, once every six days, from July, 2012 through July, 2013.

6.2. Air Toxics Modeling

- Updated emissions inventories based on the 2012 year were used, as well as meteorology for 2012.
- An air quality modeling platform, CAMx, was used to estimate levels of air toxics throughout the Basin using the 2012 emissions inventory. The estimates were allocated to a 2 km x 2 km regional grid scale.

6.3. Key Findings

- During the study period, the average Basin cancer risk from air toxics based on the annual average levels calculated from the 10 monitoring sites data was approximately 418 per million. This is about 65% lower than the estimated risk from the 2004-2006 time period.
- Diesel exhaust was the key driver for air toxics risk, accounting for 68% of the total estimated air toxics risk estimated from monitoring.
- None of the annual averages of pollutants measured were above the chronic reference exposure levels (RELs) for noncancer health effects developed by OEHHA.
- Ambient levels of most substances measured were lower compared to that of the MATES III Study, which was conducted in 2004-2006, reflecting the success of various control strategies to reduce exposure to air toxics.
- Diesel PM showed the most dramatic reductions, with the levels found about 70% lower compared to MATES III.
- Benzene and 1,3-butadiene average levels, pollutants mainly from vehicles, were down 35% and 11%, respectively.
- Stationary source-related pollutants, perchloroethylene (an industrial solvent) also showed declines of 53%.
- Hexavalent chromium, which is from mobile as well as stationary sources, was lower by 70%.
- Regional modeling analysis shows the highest risks from air toxics surrounding the port areas, with the highest grid cell risk about 1,000 per million, followed by Central Los Angeles, where there is a major transportation corridor, with grid cell modeled risks

ranging from about 700 to 750 per million.

- Model estimated air toxics risk showed an overall Basin-wide reduction, with the greatest reductions occurring near the ports.
- The Basin-wide estimated population-weighted risk was 57% lower in MATES IV compared to MATES III.
- The spatial distribution of diesel $PM_{2.5}$ emission in MATES IV is similar to the diesel PM emission pattern derived in CalEnviroScreen 2.0, both showing the highest diesel PM emission in Central Los Angeles and area around the Ports.
- Risk estimates in this study do not include mortality from particulate exposure. This was done in the recent update to the AQMP.
- Ultrafine particle measurements at the ten fixed sites revealed that regional ultrafine levels are higher in western areas of the Basin with greater population and traffic density.
- Consistent with previous studies, short-term, local-scale measurements near a rail yard, an airport, and a busy freeway intersection showed higher diesel PM and ultrafine concentrations than the nearest fixed site monitor.
-

6.4. Discussion and Policy Implications

- Although there are uncertainties in the ambient estimates, diesel particulate continues to be the dominant toxic air pollutant based on cancer risk. The study findings therefore clearly indicate a continued focus in reducing diesel emissions.
- Additionally, application of the updated risk estimation methods recently adopted by OEHHA result in about a 2.5-fold increase in inhalation risks from air toxics. Using the updated methods yields estimated lifetime risks near the ports of over 2,500 per million from air toxics.
- Goods movement is a significant source of diesel emissions. With the projected future growth in goods movement, diesel source activity may increase. The interplay between (a) the increase in goods movement and (b) projected emission reduction strategies will be crucial in further decreasing diesel exposures in the future.
- There are several uncertainties in estimating air toxics risks. These include uncertainties in the cancer potencies of the substances, in the estimates of population exposure, and uncertainty in estimating the level of diesel particulate.
- Since the time frame of the MATES III Study, there have been numerous regulations and initiatives to reduce diesel exhaust emissions by local, state and national authorities. These efforts along with those of the ports and private sector organizations have been successful in reducing actual risks from air toxics exposure.
- Although the estimated Basin-wide risks declined from the MATES III period, areas near the ports and near transportation corridors continue to show the highest air toxics risk.

- Many current and future measures designed to meet Air Quality Management Plan goals for $PM_{2.5}$ and ozone will have the additional benefits of reducing air toxic emissions as well as greenhouse gas emissions. The opportunities to achieve co-benefits towards multiple objectives should be maximized in future air quality policies and strategies

Attachment C

AIR QUALITY AND LAND USE HANDBOOK: A COMMUNITY HEALTH PERSPECTIVE

April 2005

California Environmental Protection Agency
California Air Resources Board

Air Agency Contacts

Federal-

U.S. EPA, Region 9
Phone: (866)-EPA-WEST
Website: www.epa.gov/region09
Email: r9.info@epa.gov

-State-

California Air Resources Board
Phone: (916) 322-2990 (public info)
(800) 363-7664 (public info)
(800) 952-5588 (complaints)
(866)-397-5462 (env. justice)
Website: www.arb.ca.gov
Email: helpline@arb.ca.gov

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Antelope Valley AQMD
Phone: (661) 723-8070
Complaint Line: (888) 732-8070
Website: www.avaqmd.ca.gov
E-Mail: bbanks@avaqmd.ca.gov

Bay Area AQMD
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E-Mail: webmaster@baaqmd.gov

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Colusa County APCD
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Website: www.colusanet.com/apcd
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El Dorado County AQMD
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www.co.el-dorado.ca.us/emd/apcd
E-Mail: mcctaggart@co.el-dorado.ca.us

Feather River AQMD
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E-Mail: fraqmd@fraqmd.org

Glenn County APCD
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Great Basin Unified APCD
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Kern County APCD
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Lake County AQMD
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Mojave Desert AQMD
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Website: www.mdaqmd.ca.gov

Monterey Bay Unified APCD
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(800) 253-6028 (Complaints)
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To My Local Government Colleagues….

I am pleased to introduce this informational guide to air quality and land use issues focused on community health. As a former county supervisor, I know from experience the complexity of local land use decisions. There are multiple factors to consider and balance. This document provides important public health information that we hope will be considered along with housing needs, economic development priorities, and other quality of life issues.

An important focus of this document is prevention. We hope the air quality information provided will help inform decision-makers about the benefits of avoiding certain siting situations. The overarching goal is to avoid placing people in harm's way. Recent studies have shown that public exposure to air pollution can be substantially elevated near freeways and certain other facilities. What is encouraging is that the health risk is greatly reduced with distance. For that reason, we have provided some general recommendations aimed at keeping appropriate distances between sources of air pollution and land uses such as residences.

Land use decisions are a local government responsibility. The Air Resources Board's role is advisory and these recommendations do not establish regulatory standards of any kind. However, we hope that the information in this document will be seriously considered by local elected officials and land use agencies. We also hope that this document will promote enhanced communication between land use agencies and local air pollution control agencies. We developed this document in close coordination with the California Air Pollution Control Officers Association with that goal in mind.

I hope you find this document both informative and useful.

Barbara Riordan

Mrs. Barbara Riordian
Interim Chairman
California Air Resources Board

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APPENDICES

Acknowledgments

The ARB staff would like to acknowledge the exceptional contributions made to this document by members of the ARB Environmental Justice Stakeholders Group. Since 2001, ARB staff has consistently relied on this group to provide critical and constructive input on implementing the specifics of ARB's environmental justice policies and actions. The Stakeholders Group is convened by the ARB, and comprised of representatives from local land use and air agencies, community interest groups, environmental justice organizations, academia, and business. Their assistance and suggestions throughout the development of this Handbook have been invaluable.

Executive Summary

The Air Resources Board's (ARB) primary goal in developing this document is to provide information that will help keep California's children and other vulnerable populations out of harm's way with respect to nearby sources of air pollution. Recent air pollution studies have shown an association between respiratory and other non-cancer health effects and proximity to high traffic roadways. Other studies have shown that diesel exhaust and other cancer-causing chemicals emitted from cars and trucks are responsible for much of the overall cancer risk from airborne toxics in California. Also, ARB community health risk assessments and regulatory programs have produced important air quality information about certain types of facilities that should be considered when siting new residences, schools, day care centers, playgrounds, and medical facilities (i.e., sensitive land uses). Sensitive land uses deserve special attention because children, pregnant women, the elderly, and those with existing health problems are especially vulnerable to the non-cancer effects of air pollution. There is also substantial evidence that children are more sensitive to cancer-causing chemicals.

Focusing attention on these siting situations is an important preventative action. ARB and local air districts have comprehensive efforts underway to address new and existing air pollution sources under their respective jurisdictions. The issue of siting is a local government function. As more data on the connection between proximity and health risk from air pollution become available, it is essential that air agencies share what we know with land use agencies. We hope this document will serve that purpose.

The first section provides ARB recommendations regarding the siting of new sensitive land uses near freeways, distribution centers, rail yards, ports, refineries, chrome plating facilities, dry cleaners, and gasoline dispensing facilities. This list consists of the air pollution sources that we have evaluated from the standpoint of the proximity issue. It is based on available information and reflects ARB's primary areas of jurisdiction – mobile sources and toxic air contaminants. A key air pollutant common to many of these sources is particulate matter from diesel engines. Diesel particulate matter (diesel PM) is a carcinogen identified by ARB as a toxic air contaminant and contributes to particulate pollution statewide.

Reducing diesel particulate emissions is one of ARB's highest public health priorities and the focus of a comprehensive statewide control program that is reducing diesel PM emissions each year. ARB's long-term goal is to reduce diesel PM emissions 85% by 2020. However, cleaning up diesel engines will take time as new engine standards phase in and programs to accelerate fleet turnover or retrofit existing engines are implemented. Also, these efforts are reducing diesel particulate emissions on a statewide basis, but do not yet capture every site where diesel vehicles and engines may congregate. Because living or going to school too close to such air pollution sources may increase both cancer and non-cancer health risks, we are recommending that proximity be considered in the siting of new sensitive land uses.

There are also other key toxic air contaminants associated with specific types of facilities. Most of these are subject to stringent state and local air district regulations. However, what we know today indicates that keeping new homes and other sensitive land uses from siting too close to such facilities would provide additional health protection. Chrome platers are a prime example of facilities that should not be located near vulnerable communities because of the cancer health risks from exposure to the toxic material used during their operations.

In addition to source specific recommendations, we also encourage land use agencies to use their planning processes to ensure the appropriate separation of industrial facilities and sensitive land uses. While we provide some suggestions, how to best achieve that goal is a local issue. In the development of these guidelines, we received valuable input from local government about the spectrum of issues that must be considered in the land use planning process. This includes addressing housing and transportation needs, the benefits of urban infill, community economic development priorities, and other quality of life issues. All of these factors are important considerations. The recommendations in the Handbook need to be balanced with other State and local policies.

Our purpose with this document is to highlight the potential health impacts associated with proximity to air pollution sources so planners explicitly consider this issue in planning processes. We believe that with careful evaluation, infill development, mixed use, higher density, transit-oriented development, and other concepts that benefit regional air quality can be compatible with protecting the health of individuals at the neighborhood level. One suggestion for achieving this goal is more communication between air agencies and land use planners. Local air districts are an important resource that should be consulted regarding sources of air pollution in their jurisdictions. ARB staff will also continue to provide updated technical information as it becomes available.

Our recommendations are as specific as possible given the nature of the available data. In some cases, like refineries, we suggest that the siting of new sensitive land uses should be avoided immediately downwind. However, we leave definition of the size of this area to local agencies based on facility specific considerations. Also, project design that would reduce air pollution exposure may be part of the picture and we encourage consultation with air agencies on this subject.

In developing the recommendations, our first consideration was the adequacy of the data available for an air pollution source category. Using that data, we assessed whether we could reasonably characterize the relative exposure and health risk from a proximity standpoint. That screening provided the list of air pollution sources that we were able to address with specific recommendations. We also considered the practical implications of making hard and fast recommendations where the potential impact area is large, emissions will be reduced with time, and air agencies are in the process of looking at options for additional emission control. In the end, we tailored our recommendations to minimize the highest exposures for each source category independently. Due to the large variability in relative risk in the source categories, we chose not to apply a uniform, quantified risk threshold as is typically done in air quality permitting programs. Instead, because these guidelines are not regulatory or binding on local agencies, we took a more qualitative approach in developing the distance-based recommendations.

Where possible, we recommend a minimum separation between a new sensitive land use and known air pollution risks. In other cases, we acknowledge that the existing health risk is too high in a relatively large area, that air agencies are working to reduce that risk, and that in the meantime, we recommend keeping new sensitive land uses out of the highest exposure areas. However, it is critical to note that our implied identification of the high exposure areas for these sources does not mean that the risk in the remaining impact area is insignificant. Rather, we hope this document will bring further attention to the potential health risk throughout the impact area and help garner support for our ongoing efforts to reduce health risk associated with air pollution sources. Areas downwind of major ports, rail yards, and other inter-modal transportation facilities are prime examples.

We developed these recommendations as a means to share important public health information. The underlying data are publicly available and referenced in this document. We also describe our rationale and the factors considered in developing each recommendation, including data limitations and uncertainties. These recommendations are advisory and should not be interpreted as defined "buffer zones." We recognize the opportunity for more detailed site-specific analyses always exists, and that there is no "one size fits all" solution to land use planning.

As California continues to grow, we collectively have the opportunity to use all the information at hand to avoid siting scenarios that may pose a health risk. As part of ARB's focus on communities and children's health, we encourage land use agencies to apply these recommendations and work more closely with air agencies. We also hope that this document will help educate a wider audience about the value of preventative action to reduce environmental exposures to air pollution.

1. ARB Recommendations on Siting New Sensitive Land Uses

Protecting California's communities and our children from the health effects of air pollution is one of the most fundamental goals of state and local air pollution control programs. Our focus on children reflects their special vulnerability to the health impacts of air pollution. Other vulnerable populations include the elderly, pregnant women, and those with serious health problems affected by air pollution. With this document, we hope to more effectively engage local land use agencies as partners in our efforts to reduce health risk from air pollution in all California communities.

Later sections emphasize the need to strengthen the connection between air quality and land use in both planning and permitting processes. Because the siting process for many, but not all air pollution sources involves permitting by local air districts, there is an opportunity for interagency coordination where the proposed location might pose a problem. To enhance the evaluation process from a land use perspective, section 4 includes recommended project related questions to help screen for potential proximity related issues.

Unlike industrial and other stationary sources of air pollution, the siting of new homes or day care centers does not require an air quality permit. Because these situations fall outside the air quality permitting process, it is especially important that land use agencies be aware of potential air pollution impacts.

The following recommendations address the issue of siting "sensitive land uses" near specific sources of air pollution; namely:

- High traffic freeways and roads
- Distribution centers
- Rail yards
- Ports
- Refineries
- Chrome plating facilities
- Dry cleaners
- Large gas dispensing facilities

The recommendations for each category include a summary of key information and guidance on what to avoid from a public health perspective.

Sensitive individuals refer to those segments of the population most susceptible to poor air quality (i.e., children, the elderly, and those with pre-existing serious health problems affected by air quality). Land uses where sensitive individuals are most likely to spend time include schools and schoolyards, parks and playgrounds, daycare centers, nursing homes, hospitals, and residential communities (sensitive sites or sensitive land uses).

We are characterizing sensitive land uses as simply as we can by using the example of residences, schools, day care centers, playgrounds, and medical facilities. However, a variety of facilities are encompassed. For example, residences can include houses, apartments, and senior living complexes. Medical facilities can include hospitals, convalescent homes, and health clinics. Playgrounds could be play areas associated with parks or community centers.

In developing these recommendations, ARB first considered the adequacy of the data available for each air pollution source category. We assessed whether we could generally characterize the relative exposure and health risk from a proximity standpoint. The documented non-cancer health risks include triggering of asthma attacks, heart attacks, and increases in daily mortality and hospitalization for heart and respiratory diseases. These health impacts are well documented in epidemiological studies, but less easy to quantify from a particular air pollution source. Therefore, the cancer health impacts are used in this document to provide a picture of relative risk. This screening process provided the list of source categories we were able to address with specific recommendations. In evaluating the available information, we also considered the practical implications of making hard and fast recommendations where the potential impact area is large, emissions will be reduced with time, and air agencies are in the process of looking at options for additional emission control. Due to the large variability in relative risk between the source categories, we chose not to apply a uniform, quantified risk threshold as is typically done in regulatory programs. Therefore, in the end, we tailored our recommendations to minimize the highest exposures for each source category independently. Additionally, because this guidance is not regulatory or binding on local agencies, we took a more qualitative approach to developing distance based recommendations.

Where possible, we recommend a minimum separation between new sensitive land uses and existing sources. However, this is not always possible, particularly where there is an elevated health risk over large geographical areas. Areas downwind of ports and rail yards are prime examples. In such cases, we recommend doing everything possible to avoid locating sensitive receptors within the highest risk zones. Concurrently, air agencies and others will be working to reduce the overall risk through controls and measures within their scope of authority.

The recommendations were developed from the standpoint of siting new sensitive land uses. Project-specific data for new and existing air pollution sources are available as part of the air quality permitting process. Where such information is available, it should be used. Our recommendations are designed to fill a gap where information about existing facilities may not be readily available. These recommendations are only guidelines and are not designed to substitute for more specific information if it exists.

A summary of our recommendations is shown in Table 1-1. The basis and references[1] supporting each of these recommendations, including health studies, air quality modeling and monitoring studies is discussed below beginning with freeways and summarized in Table 1-2. As new information becomes available, it will be included on ARB's community health web page.

[1]Detailed information on these references are available on ARB's website at: http://www.ARB.ca.gov/ch/landuse.htm.

Table 1-1

Recommendations on Siting New Sensitive Land Uses Such As Residences, Schools, Daycare Centers, Playgrounds, or Medical Facilities*

Source Category	Advisory Recommendations
Freeways and High-Traffic Roads	• Avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
Distribution Centers	• Avoid siting new sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating transport refrigeration units (TRUs) per day, or where TRU unit operations exceed 300 hours per week). • Take into account the configuration of existing distribution centers and avoid locating residences and other new sensitive land uses near entry and exit points.
Rail Yards	• Avoid siting new sensitive land uses within 1,000 feet of a major service and maintenance rail yard. • Within one mile of a rail yard, consider possible siting limitations and mitigation approaches.
Ports	• Avoid siting of new sensitive land uses immediately downwind of ports in the most heavily impacted zones. Consult local air districts or the ARB on the status of pending analyses of health risks.
Refineries	• Avoid siting new sensitive land uses immediately downwind of petroleum refineries. Consult with local air districts and other local agencies to determine an appropriate separation.
Chrome Platers	• Avoid siting new sensitive land uses within 1,000 feet of a chrome plater.
Dry Cleaners Using Perchloro-ethylene	• Avoid siting new sensitive land uses within 300 feet of any dry cleaning operation. For operations with two or more machines, provide 500 feet. For operations with 3 or more machines, consult with the local air district. • Do not site new sensitive land uses in the same building with perc dry cleaning operations.
Gasoline Dispensing Facilities	• Avoid siting new sensitive land uses within 300 feet of a large gas station (defined as a facility with a throughput of 3.6 million gallons per year or greater). A 50 foot separation is recommended for typical gas dispensing facilities.

*Notes:

- These recommendations are advisory. Land use agencies have to balance other considerations, including housing and transportation needs, economic development priorities, and other quality of life issues.

- Recommendations are based primarily on data showing that the air pollution exposures addressed here (i.e., localized) can be reduced as much as 80% with the recommended separation.
- The relative risk for these categories varies greatly (see Table 1-2). To determine the actual risk near a particular facility, a site-specific analysis would be required. Risk from diesel PM will decrease over time as cleaner technology phases in.
- These recommendations are designed to fill a gap where information about existing facilities may not be readily available and are not designed to substitute for more specific information if it exists. The recommended distances take into account other factors in addition to available health risk data (see individual category descriptions).
- Site-specific project design improvements may help reduce air pollution exposures and should also be considered when siting new sensitive land uses.
- This table does not imply that mixed residential and commercial development in general is incompatible. Rather it focuses on known problems like dry cleaners using perchloroethylene that can be addressed with reasonable preventative actions.
- A summary of the basis for the distance recommendations can be found in Table 1-2.

Table 1-2

Summary of Basis for Advisory Recommendations

Source Category	Range of Relative Cancer Risk[1,2]	Summary of Basis for Advisory Recommendations
Freeways and High-Traffic Roads	300 – 1,700	• In traffic-related studies, the additional non-cancer health risk attributable to proximity was seen within 1,000 feet and was strongest within 300 feet. California freeway studies show about a 70% drop off in particulate pollution levels at 500 feet.
Distribution Centers[3]	Up to 500	• Because ARB regulations will restrict truck idling at distribution centers, transport refrigeration unit (TRU) operations are the largest onsite diesel PM emission source followed by truck travel in and out of distribution centers. • Based on ARB and South Coast District emissions and modeling analyses, we estimate an 80 percent drop-off in pollutant concentrations at approximately 1,000 feet from a distribution center.
Rail Yards	Up to 500	• The air quality modeling conducted for the Roseville Rail Yard Study predicted the highest impact is within 1,000 feet of the Yard, and is associated with service and maintenance activities. The next highest impact is between a half to one mile of the Yard, depending on wind direction and intensity.
Ports	Studies underway	• ARB will evaluate the impacts of ports and develop a new comprehensive plan that will describe the steps needed to reduce public health impacts from port and rail activities in California. In the interim, a general advisory is appropriate based on the magnitude of diesel PM emissions associated with ports.
Refineries	Under 10	• Risk assessments conducted at California refineries show risks from air toxics to be under 10 chances of cancer per million.[4] • Distance recommendations were based on the amount and potentially hazardous nature of many of the pollutants released as part of the refinery process, particularly during non-routine emissions releases.
Chrome Platers	10-100	• ARB modeling and monitoring studies show localized risk of hexavalent chromium diminishing significantly at 300 feet. There are data limitations in both the modeling and monitoring studies. These include variability of plating activities and uncertainty of emissions such as fugitive dust. Hexavalent chromium is one of the most potent toxic air contaminants. Considering these factors, a distance of 1,000 feet was used as a precautionary measure.
Dry Cleaners Using Perchloro-ethylene (perc)	15-150	• Local air district studies indicate that individual cancer risk can be reduced by as much as 75 percent by establishing a 300 foot separation between a sensitive land use and a one-machine perc dry cleaning operation. For larger operations (2 machines or more), a separation of 500 feet can reduce risk by over 85 percent.

Source Category	Range of Relative Cancer Risk[1,2]	Summary of Basis for Advisory Recommendations
Gasoline Dispensing Facilities (GDF)[5]	Typical GDF: Less than 10 Large GDF: Between Less than 10 and 120	• Based on the CAPCOA Gasoline Service Station Industry-wide Risk Assessment Guidelines, most typical GDFs (less than 3.6 million gallons per year) have a risk of less than 10 at 50 feet under urban air dispersion conditions. Over the last few years, there has been a growing number of extremely large GDFs with sales over 3.6 and as high as 19 million gallons per year. Under rural air dispersion conditions, these large GDFs can pose a larger risk at a greater distance.

[1]For cancer health effects, risk is expressed as an estimate of the increased chances of getting cancer due to facility emissions over a 70-year lifetime. This increase in risk is expressed as chances in a million (e.g., 10 chances in a million).

[2]The estimated cancer risks are a function of the proximity to the specific category and were calculated independent of the regional health risk from air pollution. For example, the estimated regional cancer risk from air toxics in the Los Angeles region (South Coast Air Basin) is approximately 1,000 in a million.

[3]Analysis based on refrigerator trucks.

[4]Although risk assessments performed by refineries indicate they represent a low cancer risk, there is limited data on non-cancer effects of pollutants that are emitted from these facilities. Refineries are also a source of non-routine emissions and odors.

[5]A typical GDF in California dispenses under 3.6 million gallons of gasoline per year. The cancer risk for this size facility is likely to be less than 10 in a million at the fence line under urban air dispersion conditions.

A large GDF has fuel throughputs that can range from 3.6 to 19 million gallons of gasoline per year. The upper end of the risk range (i.e., 120 in a million) represents a hypothetical worst case scenario for an extremely large GDF under rural air dispersion conditions.

Freeways and High Traffic Roads

Air pollution studies indicate that living close to high traffic and the associated emissions may lead to adverse health effects beyond those associated with regional air pollution in urban areas. Many of these epidemiological studies have focused on children. A number of studies identify an association between adverse non-cancer health effects and living or attending school near heavily traveled roadways (see findings below). These studies have reported associations between residential proximity to high traffic roadways and a variety of respiratory symptoms, asthma exacerbations, and decreases in lung function in children.

One such study that found an association between traffic and respiratory symptoms in children was conducted in the San Francisco Bay Area. Measurements of traffic-related pollutants showed concentrations within 300 meters (approximately 1,000 feet) downwind of freeways were higher than regional values. Most other studies have assessed exposure based on proximity factors such as distance to freeways or traffic density.

These studies linking traffic emissions with health impacts build on a wealth of data on the adverse health effects of ambient air pollution. The data on the effects of proximity to traffic-related emissions provides additional information that can be used in land use siting and regulatory actions by air agencies. The key observation in these studies is that close proximity increases both exposure and the potential for adverse health effects. Other effects associated with traffic emissions include premature death in elderly individuals with heart disease.

Key Health Findings

- Reduced lung function in children was associated with traffic density, especially trucks, within 1,000 feet and the association was strongest within 300 feet. (Brunekreef, 1997)
- Increased asthma hospitalizations were associated with living within 650 feet of heavy traffic and heavy truck volume. (Lin, 2000)
- Asthma symptoms increased with proximity to roadways and the risk was greatest within 300 feet. (Venn, 2001)
- Asthma and bronchitis symptoms in children were associated with proximity to high traffic in a San Francisco Bay Area community with good overall regional air quality. (Kim, 2004)
- A San Diego study found increased medical visits in children living within 550 feet of heavy traffic. (English, 1999)

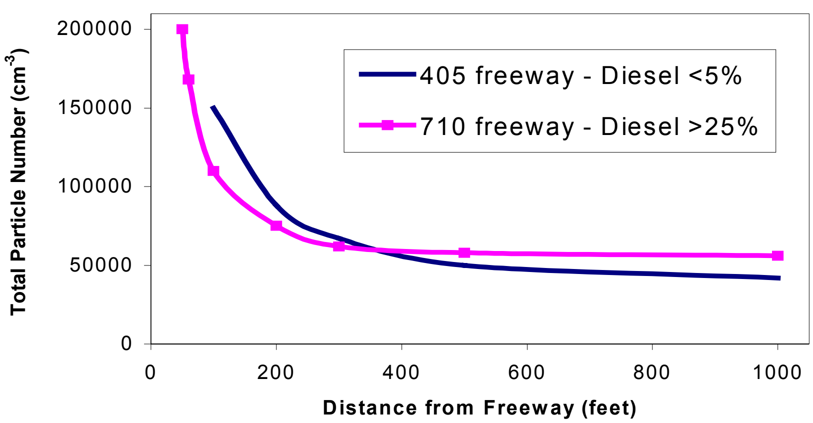
In these and other proximity studies, the distance from the roadway and truck traffic densities were key factors affecting the strength of the association with adverse health effects. In the above health studies, the association of traffic-related emissions with adverse health effects was seen within 1,000 feet and was strongest within 300 feet. This demonstrates that the adverse effects diminished with distance.

In addition to the respiratory health effects in children, proximity to freeways increases potential cancer risk and contributes to total particulate matter exposure. There are three carcinogenic toxic air contaminants that constitute the majority of the known health risk from motor vehicle traffic – diesel particulate matter (diesel PM) from trucks, and benzene and 1,3-butadiene from passenger vehicles. On a typical urban freeway (truck traffic of 10,000-20,000/day), diesel PM represents about 70 percent of the potential cancer risk from the vehicle traffic. Diesel particulate emissions are also of special concern because health studies show an association between particulate matter and premature mortality in those with existing cardiovascular disease.

Distance Related Findings

A southern California study (Zhu, 2002) showed measured concentrations of vehicle-related pollutants, including ultra-fine particles, decreased dramatically within approximately 300 feet of the 710 and 405 freeways. Another study looked at the validity of using distance from a roadway as a measure of exposure

Figure 1-1
Decrease In Concentration of Freeway Diesel PM Emissions With Distance



to traffic related air pollution (Knape, 1999). This study showed that concentrations of traffic related pollutants declined with distance from the road, primarily in the first 500 feet.

These findings are consistent with air quality modeling and risk analyses done by ARB staff that show an estimated range of potential cancer risk that decreases with distance from freeways. The estimated risk varies with the local meteorology, including wind pattern. As an example, at 300 feet downwind from a freeway (Interstate 80) with truck traffic of 10,000 trucks per day, the potential cancer risk was as high as 100 in one million (ARB Roseville Rail Yard Study). The cancer health risk at 300 feet on the upwind side of the freeway was much less. The risk at that distance for other freeways will vary based on local conditions – it may be higher or lower. However, in all these analyses the relative exposure and health risk dropped substantially within the first 300 feet. This phenomenon is illustrated in Figure 1-1.

State law restricts the siting of new schools within 500 feet of a freeway, urban roadways with 100,000 vehicles/day, or rural roadways with 50,000 vehicles with some exceptions.[2] However, no such requirements apply to the siting of residences, day care centers, playgrounds, or medical facilities. The available data show that exposure is greatly reduced at approximately 300 feet. In the traffic-related studies the additional health risk attributable to the proximity effect was strongest within 1,000 feet.

The combination of the children's health studies and the distance related findings suggests that it is important to avoid exposing children to elevated air pollution levels immediately downwind of freeways and high traffic roadways. These studies suggest a substantial benefit to a 500-foot separation.

The impact of traffic emissions is on a gradient that at some point becomes indistinguishable from the regional air pollution problem. As air agencies work to reduce the underlying regional health risk from diesel PM and other pollutants, the impact of proximity will also be reduced. In the meantime, as a preventative measure, we hope to avoid exposing more children and other vulnerable individuals to the highest concentrations of traffic-related emissions.

Recommendation

- Avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.

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Distribution Centers

Distribution centers or warehouses are facilities that serve as a distribution point for the transfer of goods. Such facilities include cold storage warehouses, goods transfer facilities, and inter-modal facilities such as ports. These operations involve trucks, trailers, shipping containers, and other equipment with diesel engines. A distribution center can be comprised of multiple centers or warehouses within an area. The size can range from several to hundreds of acres, involving a number of different transfer operations and long waiting periods. A distribution center can accommodate hundreds of diesel trucks a day that deliver, load, and/or unload goods up to seven days a week. To the extent that these trucks are transporting perishable goods, they are equipped with diesel-powered transport refrigeration units (TRUs) or TRU generator sets.

The activities associated with delivering, storing, and loading freight produces diesel PM emissions. Although TRUs have relatively small diesel-powered engines, in the normal course of business, their emissions can pose a significant health risk to those nearby. In addition to onsite emissions, truck travel in and out of distribution centers contributes to the local pollution impact.

ARB is working to reduce diesel PM emissions through regulations, financial incentives, and enforcement programs. In 2004, ARB adopted two airborne toxic control measures that will reduce diesel PM emissions associated with distribution centers. The first will limit nonessential (or unnecessary) idling of diesel-fueled commercial vehicles, including those entering from other states or countries. This statewide measure, effective in 2005, prohibits idling of a vehicle more than five minutes at any one location.[3] The elimination of unnecessary idling will reduce the localized impacts caused by diesel PM and other air toxics

[3] For further information on the Anti-Idling ATCM, please click on: http://www.arb.ca.gov/toxics/idling/outreach/factsheet.pdf

in diesel vehicle exhaust. This should be a very effective new strategy for reducing diesel PM emissions at distribution centers as well as other locations.

The second measure requires that TRUs operating in California become cleaner over time. The measure establishes in-use performance standards for existing TRU engines that operate in California, including out-of-state TRUs. The requirements are phased-in beginning in 2008, and extend to 2019.[4]

ARB also operates a smoke inspection program for heavy-duty diesel trucks that focuses on reducing truck emissions in California communities. Areas with large numbers of distribution centers are a high priority.

<u>Key Health Findings</u>

Diesel PM has been identified by ARB as a toxic air contaminant and represents 70 percent of the known potential cancer risk from air toxics in California. Diesel PM is an important contributor to particulate matter air pollution. Particulate matter exposure is associated with premature mortality and health effects such as asthma exacerbation and hospitalization due to aggravating heart and lung disease.

<u>Distance Related Findings</u>

Although distribution centers are located throughout the state, they are usually clustered near transportation corridors, and are often located in or near population centers. Diesel PM emissions from associated delivery truck traffic and TRUs at these facilities may result in elevated diesel PM concentrations in neighborhoods surrounding those sites. Because ARB regulations will restrict truck idling at distribution centers, the largest continuing onsite diesel PM emission source is the operation of TRUs. Truck travel in and out of distribution centers also contributes to localized exposures, but specific travel patterns and truck volumes would be needed to identify the exact locations of the highest concentrations.

As part of the development of ARB's regulation for TRUs, ARB staff performed air quality modeling to estimate exposure and the associated potential cancer risk of onsite TRUs for a typical distribution center. For an individual person, cancer risk estimates for air pollution are commonly expressed as a probability of developing cancer from a lifetime (i.e., 70 years) of exposure. These risks were calculated independent of regional risk. For example, the estimated regional cancer risk from air toxics in the Los Angeles region (South Coast Air Basin) is approximately 1,000 additional cancer cases per one million population.

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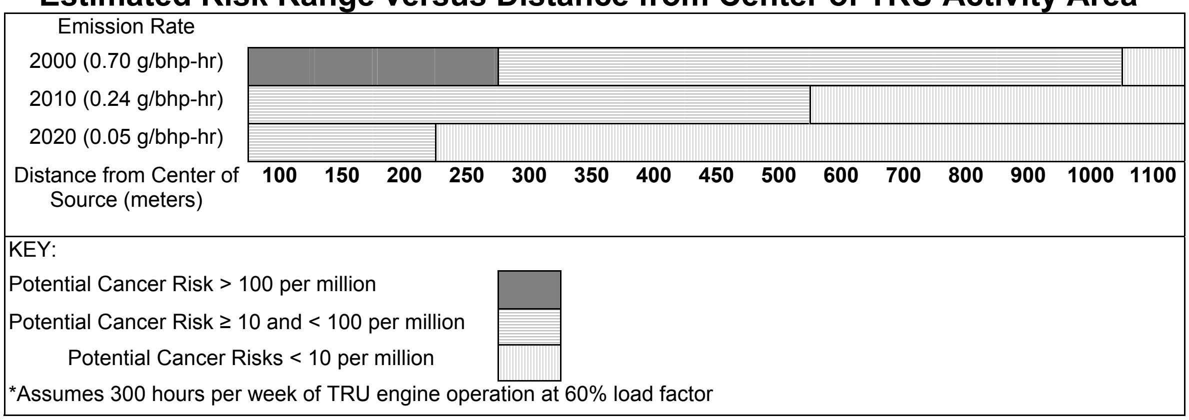
[4] For further information on the Transport Refrigeration Unit ATCM, please click on: http://www.arb.ca.gov/diesel/documents/trufaq.pdf

The diesel PM emissions from a facility are dependent on the size (horsepower), age, and number of engines, emission rates, the number of hours the truck engines and/or TRUs operate, distance, and meteorological conditions at the site. This assessment assumes a total on-site operating time for all TRUs of 300 hours per week. This would be the equivalent of 40 TRU-equipped trucks a day, each loading or unloading on-site for one hour, 12 hours a day and seven days a week.

As shown in Figure 1-2 below, at this estimated level of activity and assuming a current fleet diesel PM emission rate, the potential cancer risk would be over 100 in a million at 800 feet from the center of the TRU activity. The estimated potential cancer risk would be in the 10 to 100 per million range between 800 to 3,300 feet and fall off to less than 10 per million at approximately 3,600 feet. However with the implementation of ARB's regulation on TRUs, the risk will be significantly reduced.[5] We have not conducted a risk assessment for distribution centers based on truck traffic alone, but on an emissions basis, we would expect similar risks for a facility with truck volumes in the range of 100 per day.

Figure 1-2

Estimated Risk Range versus Distance from Center of TRU Activity Area*



The estimated potential cancer risk level in Figure 1-2 is based on a number of assumptions that may not reflect actual conditions for a specific site. For example, increasing or decreasing the hours of diesel engine operations would change the potential risk levels. Meteorological and other facility specific parameters can also impact the results. Therefore, the results presented here are not directly applicable to any particular facility or operation. Rather, this information is intended to provide an indication as to the potential relative levels of risk that may be observed from operations at distribution centers. As shown in Figure 1-2, the estimated risk levels will decrease over time as lower-emitting diesel engines are used.

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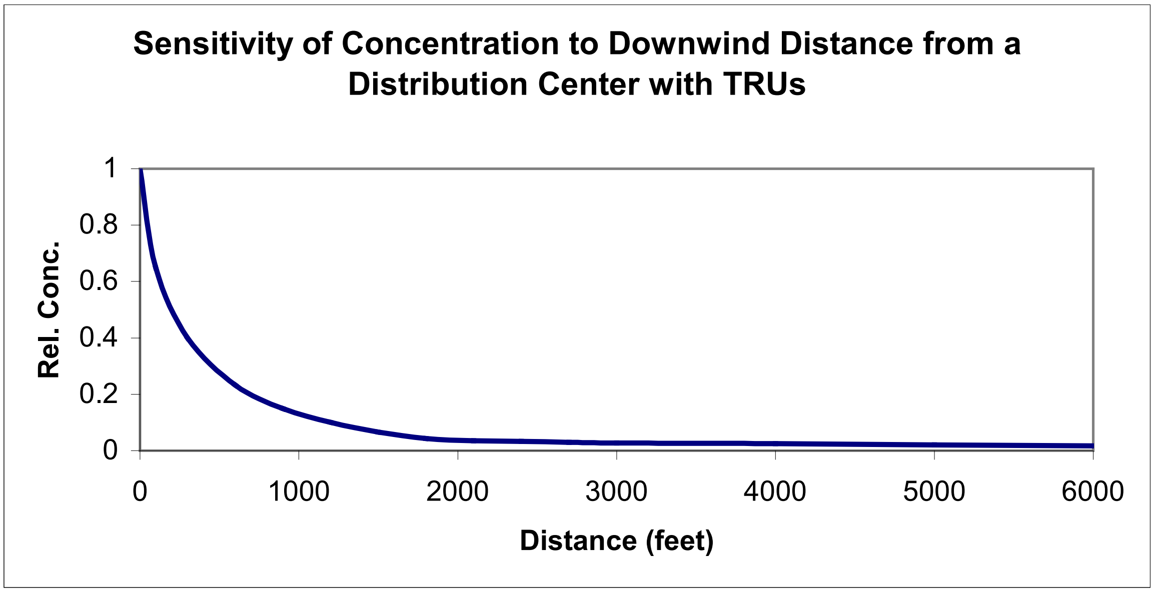
[5] These risk values assume an exposure duration of 70 years for a nearby resident and uses the methodology specified in the 2003 OEHHA health risk assessment guidelines.

Another air modeling analysis, performed by the South Coast Air Quality Management District (South Coast AQMD), evaluated the impact of diesel PM emissions from distribution center operations in the community of Mira Loma in southern California. Based on dispersion of diesel PM emissions from a large distribution center, Figure 1-3 shows the relative pollution concentrations at varying distances downwind. As Figure 1-3 shows, there is about an 80 percent drop off in concentration at approximately 1,000 feet.

Figure 1-3
Decrease In Relative Concentration of Risk
With Distance



Both the ARB and the South Coast AQMD analyses indicate that providing a separation of 1,000 feet would substantially reduce diesel PM concentrations and public exposure downwind of a distribution center. While these analyses do not provide specific risk estimates for distribution centers, they provide an indication of the range of risk and the benefits of providing a separation. ARB recommends a separation of 1,000 feet based on the combination of risk analysis done for TRUs and the decrease in exposure predicted with the South Coast AQMD modeling. However, ARB staff plans to provide further information on distribution centers as we collect more data and implement the TRU control measure.

Taking into account the configuration of distribution centers can also reduce population exposure and risk. For example, locating new sensitive land uses away from the main entry and exit points helps to reduce cancer risk and other health impacts.

Recommendations

- Avoid siting new sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating TRUs per day, or where TRU unit operations exceed 300 hours per week).

- Take into account the configuration of existing distribution centers and avoid locating residences and other new sensitive land uses near entry and exit points.

References

- *Airborne Toxic Control Measure To Limit Diesel-Fueled Commercial Motor Vehicle Idling.* ARB (August 20, 2004). Rule effectiveness date awaiting submittal of regulation to the Office of Administration Law. http://www.arb.ca.gov/regact/idling/idling.htm

- *Revised Staff Report: Initial Statement of Reasons for Proposed Rulemaking. Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate.* ARB (October 28, 2003). http://www.arb.ca.gov/regact/trude03/revisor.doc

- *Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis.* SCAQMD (August 2003) http://www.aqmd.gov/ceqa/handbook/diesel_analysis.doc

- *"Mira Loma Study: Analysis of the Impact of Diesel Particulate Emissions from Warehouse/Distribution Center Operations",* PowerPoint presentation. SCAQMD (July 31, 2002)

Rail Yards

Rail yards are a major source of diesel particulate air pollution. They are usually located near inter-modal facilities, which attract heavy truck traffic, and are often sited in mixed industrial and residential areas. ARB, working with the Placer County air district and Union Pacific Railroad, recently completed a study[6] of the Roseville Rail Yard (Yard) in northern California that focused on the health risk from diesel particulate. A comprehensive emissions analysis and air quality modeling were conducted to characterize the estimated potential cancer risk associated with the facility.

[6] To review the study, please click on: http://www.arb.ca.gov/diesel/documents/rrstudy.htm

The Yard encompasses about 950 acres on a one-quarter mile wide by four-mile long strip of land that parallels Interstate 80. It is surrounded by commercial, industrial, and residential properties. The Yard is one of the largest service and maintenance rail yards in the West with over 30,000 locomotives visiting annually.

Using data provided by Union Pacific Railroad, the ARB determined the number and type of locomotives visiting the Yard annually and what those locomotives were doing - moving, idling, or undergoing maintenance testing. Union Pacific provided the annual, monthly, daily, and hourly locomotive activity in the yard including locomotive movements; routes for arrival, departure, and through trains; and locomotive service and testing. This information was used to estimate the emissions of particulate matter from the locomotives, which was then used to model the potential impacts on the surrounding community.

The key findings of the study are:

- Diesel PM emissions in 2000 from locomotive operations at the Roseville Yard were estimated at about 25 tons per year.

- Of the total diesel PM in the Yard, moving locomotives accounted for about 50 percent, idling locomotives about 45 percent, and locomotive testing about five percent.

- Air quality modeling predicts potential cancer risks greater than 500 in a million (based on 70 years of exposure) in a 10-40 acre area immediately adjacent to the Yard's maintenance operations.

- The risk assessment also showed elevated cancer risk impacting a larger area covering about a 10 by 10 mile area around the Yard.

The elevated concentrations of diesel PM found in the study contribute to an increased risk of cancer and premature death due to cardiovascular disease, and non-cancer health effects such as asthma and other respiratory illnesses. The magnitude of the risk, the general location, and the size of the impacted area depended on the meteorological data used to characterize conditions at the Yard, the dispersion characteristics, and exposure assumptions. In addition to these variables, the nature of locomotive activity will influence a risk characterization at a particular rail yard. For these reasons, the quantified risk estimates in the Roseville Rail Yard Study cannot be directly applied to other rail yards. However, the study does indicate the health risk due to diesel PM from rail yards needs to be addressed. ARB, in conjunction with the U.S. Environmental Protection Agency (U.S. EPA), and local air districts, is working with the rail industry to identify and implement short term, mid-term and long-term mitigation strategies. ARB also intends to conduct a second rail study in southern California to increase its understanding of rail yard operations and the associated public health impacts.

Key Health Findings

Diesel PM has been identified by ARB as a toxic air contaminant and represents 70 percent of the known potential cancer risk from air toxics in California. Diesel PM is an important contributor to particulate matter air pollution. Particulate matter exposure is associated with premature mortality and health effects such as asthma exacerbation and hospitalization due to aggravating heart and lung disease.

Distance Related Findings

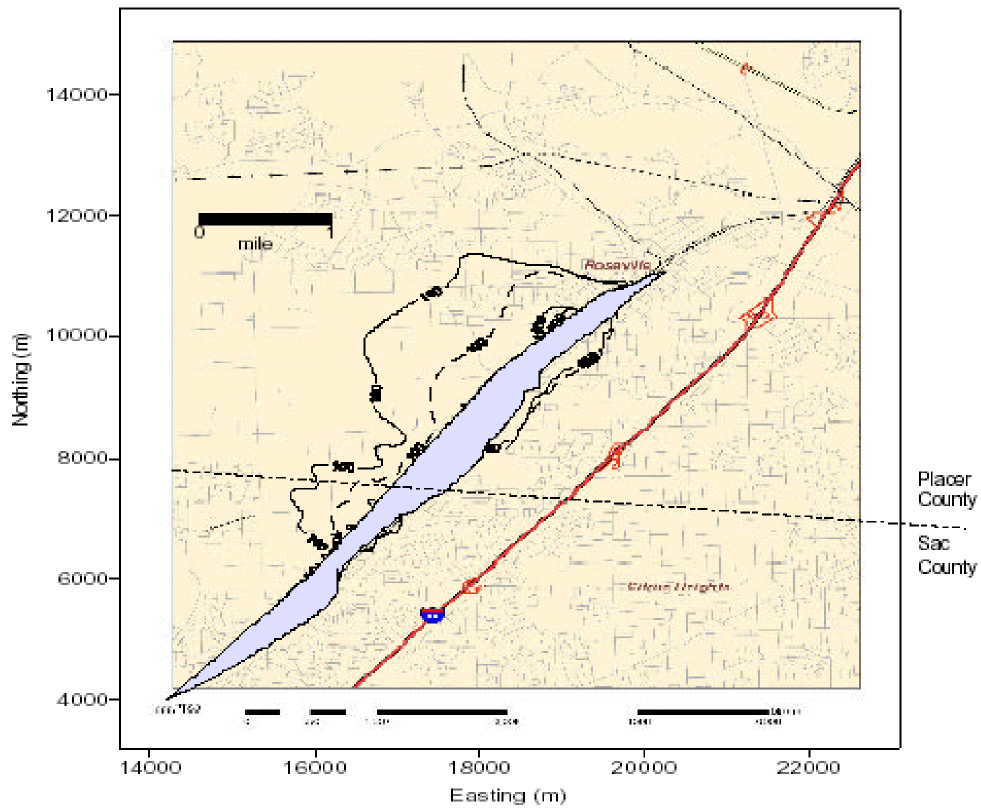
Two sets of meteorological data were used in the Roseville study because of technical limitations in the data. The size of the impact area was highly dependent on the meteorological data set used. The predicted highest impact area ranged from 10 - 40 acres with the two different meteorological data sets. This area, with risks estimated above 500 in a million, is adjacent to an area that includes a maintenance shop (see Figure 1-4). The high concentration of diesel PM emissions is due to the number of locomotives and nature of activities in this area, particularly idling locomotives.

The area of highest impact is within 1,000 feet of the Yard. The next highest impact zone as defined in the report had a predicted risk between 500 and 100 in one million and extends out between a half to one mile in some spots, depending on which meteorological conditions were assumed. The impact areas are irregular in shape making it difficult to generalize about the impact of distance at a particular location. However, the Roseville Rail Yard Study clearly indicates that the localized health risk is high, the impact area is large, and mitigation of the locomotive diesel PM emissions is needed.

For facilities like rail yards and ports, the potential impact area is so large that the real solution is to substantially reduce facility emissions. However, land use planners can avoid encroaching upon existing rail facilities and those scheduled for expansion. We also recommend that while air agencies tackle this problem, land use planners try not to add new sensitive individuals into the highest exposure areas. Finally, we recommend that land use agencies consider the potential health impacts of rail yards in their planning and permitting processes. Additional limitations and mitigation may be feasible to further reduce exposure on a site-specific basis.

Figure 1-4

Estimated Cancer Risk from the Yard
(100 and 500 in a million risk isopleths)



Notes: 100/Million Contours: Solid Line – Roseville Met Data; Dashed Line-McClellan Met Data, Urban Dispersion Coefficients, 80th Percentile Breathing Rate, All Locomotives' Activities (23 TPY), 70-Year Exposure

Recommendation

- Avoid siting new sensitive land uses within 1,000 feet of a major service and maintenance rail yard[7].

- Within one mile of a rail yard, consider possible siting limitations and mitigation approaches.

References

- *Roseville Rail Yard Study.* ARB (2004)

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[7] The rail yard risk analysis was conducted for the Union Pacific rail yard in Roseville, California. This rail yard is one of the largest in the state. There are other rail yards in California with comparable levels of activity that should be considered "major" for purposes of this Handbook.

Ports

Air pollution from maritime port activities is a growing concern for regional air quality as well as air quality in nearby communities. The primary air pollutant associated with port operations is directly emitted diesel particulate. Port-related activities also result in emissions that form ozone and secondary particulate in the atmosphere. The emission sources associated with ports include diesel engine-powered ocean-going ships, harbor craft, cargo handling equipment, trucks, and locomotives. The size and concentration of these diesel engines makes ports one of the biggest sources of diesel PM in the state. For that reason, ARB has made it a top priority to reduce diesel PM emissions at the ports, in surrounding communities, and throughout California.

International, national, state, and local government collaboration is critical to reducing port emissions based on both legal and practical considerations. For example, the International Maritime Organization (IMO) and the U.S. EPA establish emission standards for ocean-going vessels and U.S.-flagged harbor craft, respectively. ARB is pursuing further federal actions to tighten these standards. In addition, ARB and local air districts are reducing emissions from ports through a variety of approaches. These include: incentive programs to fund cleaner engines, enhanced enforcement of smoke emissions from ships and trucks, use of dockside electricity instead of diesel engines, cleaner fuels for ships, harbor craft, locomotives, and reduced engine idling. The two ATCMs that limit truck idling and reduce emissions from TRUs (discussed under "Distribution Centers") also apply to ports.

ARB is also developing several other regulations that will reduce port-related emissions. One rule would require ocean-going ships to use a cleaner marine diesel fuel to power auxiliary engines while in California coastal waters and at dock. Ships that frequently visit California ports would also be required to further reduce their emissions. ARB has adopted a rule that would require harbor craft to use the same cleaner diesel fuel used by on-road trucks in California. In 2005, ARB will consider a rule that would require additional controls for in-use harbor craft, such as the use of add-on emission controls and accelerated turnover of older engines.

Key Health Findings

Port activities are a major source of diesel PM. Diesel PM has been identified by ARB as a toxic air contaminant and represents 70 percent of the known potential cancer risk from air toxics in California. Diesel PM is an important contributor to particulate matter air pollution. Particulate matter exposure is associated with premature mortality and health effects such as asthma exacerbation and hospitalization due to aggravating heart and lung disease.

Distance Related Findings

The Ports of Los Angeles and Long Beach provide an example of the emissions impact of port operations. A comprehensive emissions inventory was completed in June 2004. These ports combined are one of the world's largest and busiest seaports. Located in San Pedro Bay, about 20 miles south of downtown Los Angeles, the port complex occupies approximately 16 square miles of land and water. Port activities include five source categories that produce diesel emissions. These are ocean-going vessels, harbor craft, cargo handling equipment, railroad locomotives, and heavy-duty trucks.

The baseline emission inventory provides emission estimates for all major air pollutants. This analysis focuses on diesel PM from in-port activity because these emissions have the most potential health impact on the areas adjacent to the port. Ocean vessels are the largest overall source of diesel PM related to the ports, but these emissions occur primarily outside of the port in coastal waters, making the impact more regional in nature.

The overall in-port emission inventory for diesel particulate for the ports of Los Angeles and Long Beach is estimated to be 550 tons per year. The emissions fall in the following major categories: ocean-going vessels (17%), harbor craft (25%), cargo handling (47%), railroad locomotive (3%), and heavy duty vehicles (8%). In addition to in-port emissions, ship, rail, and trucking activities also contribute to regional emissions and increase emissions in nearby neighborhoods. Off-port emissions associated with related ship, rail, and trucking activities contribute an additional 680 tons per year of diesel particulate at the Port of Los Angeles alone.

To put this in perspective, the diesel PM emissions estimated for the Roseville Yard in ARB's 2004 study are 25 tons per year. The potential cancer risk associated with these emissions is 100 in one million at a distance of one mile, or one half mile, depending on the data set used. This rail yard covers one and a half square miles. The Los Angeles and Long Beach ports have combined diesel PM emissions of 550 tons per year emitted from a facility that covers a much larger area - 16 miles. The ports have about twice the emission density of the rail yard - 34 tons per year per square mile compared to 16 tons per year per square mile. However, while this general comparison is illustrative of the overall size of the complex, a detailed air quality modeling analysis would be needed to assess the potential health impact on specific downwind areas near the ports.

ARB is in the process of evaluating the various port-related emission sources from the standpoint of existing emissions, growth forecasts, new control options, regional air quality impacts, and localized health risk. A number of public processes - both state and local - are underway to address various aspects of these issues. Until more of these analyses are complete, there is little basis for recommending a specific separation between new sensitive land uses and ports.

For example, the type of data we have showing the relationship between air pollutant concentrations and distance from freeways is not yet available.

Also, the complexity of the port facilities makes a site-specific analysis critical. Ports are a concentration of multiple emission sources with differing dispersion and other characteristics. In the case of the Roseville rail yard, we found a high, very localized impact associated with a particular activity, service and maintenance. By contrast, the location, size, and nature of impact areas can be expected to vary substantially for different port activities. For instance, ground level emissions from dockside activities would behave differently from ship stack level emissions.

Nonetheless, on an emissions basis alone, we expect locations downwind of ports to be substantially impacted. For that reason, we recommend that land use agencies track the current assessment efforts, and consider limitations on the siting of new sensitive land uses in areas immediately downwind of ports.

Recommendations

Avoid siting new sensitive land uses immediately downwind of ports in the most heavily impacted zones. Consult local air districts or the ARB on the status of pending analyses of health risks.

References

- *Roseville Rail Yard Study.* ARB (2004)
- Final Draft, "*Port-Wide Baseline Air Emissions Inventory.*" Port of Los Angeles (June 2004)
- Final Draft, "*2002 Baseline Air Emissions Inventory.*" Port of Long Beach (February 2004)

Petroleum Refineries

A petroleum refinery is a complex facility where crude oil is converted into petroleum products (primarily gasoline, diesel fuel, and jet fuel), which are then transported through a system of pipelines and storage tanks for final distribution by delivery truck to fueling facilities throughout the state. In California, most crude oil is delivered either by ship from Alaska or foreign sources, or is delivered via pipeline from oil production fields within the state. The crude oil then undergoes many complex chemical and physical reactions, which include distillation, catalytic cracking, reforming, and finishing. These refining processes have the potential to emit air contaminants, and are subject to extensive emission controls by district regulations.

As a result of these regulations covering the production, marketing, and use of gasoline and other oil by-products, California has seen significant regional air quality benefits both in terms of cleaner fuels and cleaner operating facilities. In the 1990s, California refineries underwent significant modifications and modernization to produce cleaner fuels in response to changes in state law. Nevertheless, while residual emissions are small when compared to the total emissions controlled from these major sources, refineries are so large that even small amounts of fugitive, uncontrollable emissions and associated odors from the operations, can be significant. This is particularly the case for communities that may be directly downwind of the refinery. Odors can cause health symptoms such as nausea and headache. Also, because of the size, complexity, and vast numbers of refinery processes onsite, the occasional refinery upset or malfunction can potentially result in acute or short-term health effects to exposed individuals.

Key Health Findings

Petroleum refineries are large single sources of emissions. For volatile organic compounds (VOCs), eight of the ten largest stationary sources in California are petroleum refineries. For oxides of nitrogen (NOx), four of the ten largest stationary sources in California are petroleum refineries. Both of these compounds react in the presence of sunlight to form ozone. Ozone impacts lung function by irritating and damaging the respiratory system. Petroleum refineries are also large stationary sources of both particulate matter under 10 microns in size (PM_{10}) and particulate matter under 2.5 microns in size ($PM_{2.5}$). Exposure to particulate matter aggravates a number of respiratory illnesses, including asthma, and is associated with premature mortality in people with existing cardiac and respiratory disease. Both long-term and short-term exposure can have adverse health impacts. Finer particles pose an increased health risk because they can deposit deep in the lung and contain substances that are particularly harmful to human health. NOx are also significant contributors to the secondary formation of $PM_{2.5}$.

Petroleum refineries also emit a variety of toxic air pollutants. These air toxics vary by facility and process operation but may include: acetaldehyde, arsenic, antimony, benzene, beryllium, 1,3-butadiene, cadmium compounds, carbonyl sulfide, carbon disulfide, chlorine, dibenzofurans, diesel particulate matter, formaldehyde, hexane, hydrogen chloride, lead compounds, mercury compounds, nickel compounds, phenol, 2,3,7,8 tetrachlorodibenzo-p-dioxin, toluene, and xylenes (mixed) among others. The potential health effects associated with these air toxics can include cancer, respiratory irritation, and damage to the central nervous system, depending on exposure levels.

Distance Related Findings

Health risk assessments for petroleum refineries have shown risks from toxic air pollutants that have quantifiable health risk values to be around 10 potential cancer cases per million. Routine air monitoring and several air monitoring studies conducted in the San Francisco Bay Area (Crockett) and the South Coast Air Basin (Wilmington) have not identified significant health risks specifically associated with refineries. However, these studies did not measure diesel PM as no accepted method currently exists, and there are many toxic air pollutants that do not have quantifiable health risk values.

In 2002, ARB published a report on the results of the state and local air district air monitoring done near oil refineries. The purpose of this evaluation was to try to determine how refinery-related emissions might impact nearby communities. This inventory of air monitoring activities included 10 ambient air monitoring stations located near refineries in Crockett and four stations near refineries in Wilmington. These monitoring results did not identify significant increased health risks associated with the petroleum refineries. In 2002-2003, ARB conducted additional monitoring studies in communities downwind of refineries in Crockett and Wilmington. These monitoring results also did not indicate significant increased health risks from the petroleum refineries.

Consequently, there are no air quality modeling or air monitoring data that provides a quantifiable basis for recommending a specific separation between refineries and new sensitive land uses. However, in view of the amount and potentially hazardous nature of many of the pollutants released as part of the refinery process, we believe the siting of new sensitive land uses immediately downwind should be avoided. Land use agencies should consult with the local air district when considering how to define an appropriate separation for refineries within their jurisdiction.

Recommendations

- Avoid siting new sensitive land uses immediately downwind of petroleum refineries. Consult with local air districts and other local agencies to determine an appropriate separation.

References

- *Review of Current Ambient Air Monitoring Activities Related to California Bay Area and South Coast Refineries. ARB (March 2002)* http://www.arb.ca.gov/aaqm/qmosqual/special/mldrefinery.pdf
- *Community Air Quality Monitoring: Special Studies – Crockett. ARB (September 2004)* http://www.arb.ca.gov/ch/communities/studies/crockett/crockett.htm
- *Wilmington Study - Air Monitoring Results. ARB (2003)* http://www.arb.ca.gov/ch/communities/studies/wilmington/wilmington.htm

Chrome Plating Operations

Chrome plating operations rely on the use of the toxic metal hexavalent chromium, and have been subject to ARB and local air district control programs for many years. Regulation of chrome plating operations has reduced statewide emissions substantially. However, due to the nature of chrome plating operations and the highly toxic nature of hexavalent chromium, the remaining health risk to nearby residents is a continuing concern.

Chrome plating operations convert hexavalent chromium in solution to a chromium metal layer by electroplating, and are categorized based upon the thickness of the chromium metal layer applied. In “decorative plating”, a layer of nickel is first plated over a metal substrate. Following this step, a thin layer of chromium is deposited over the nickel layer to provide a decorative and protective finish, for example, on faucets and automotive wheels. “Hard chrome plating” is a process in which a thicker layer of chromium metal is deposited directly on metal substrates such as engine parts, industrial machinery, and tools to provide greater protection against corrosion and wear.

Hexavalent chromium is emitted into the air when an electric current is applied to the plating bath. Emissions are dependent upon the amount of electroplating done per year and the control requirements. A unit of production referred to as an ampere-hour represents the amount of electroplating produced. Small facilities have an annual production rate of 100,000 – 500,000 ampere-hours, while medium-size facilities may have a production rate of 500,000 to about 3 million ampere-hours. The remaining larger facilities have a range of production rates that can be as high as 80 million ampere-hours.

The control requirements, which reduce emissions from the plating tanks, vary according to the size and type of the operation. Facilities either install add-on pollution control equipment, such as filters and scrubbers, or in-tank controls, such as fume suppressants and polyballs. With this combination of controls, the overall hexavalent chromium emissions have been reduced by over 90 percent. Larger facilities typically have better controls that can achieve efficiencies greater than 99 percent. However, even with stringent controls, the lack of maintenance and good housekeeping practices can lead to problems. And, since the material itself is inherently dangerous, any lapse in compliance poses a significant risk to nearby residents.

A 2002 ARB study in the San Diego community of Barrio Logan measured unexpectedly high concentrations of hexavalent chromium near chrome platers. The facilities were located in a mixed-use area with residences nearby. The study found that fugitive dust laden with hexavalent chromium was an important source of emissions that likely contributed to the elevated cancer risk. Largely as a result of this study, ARB is in the process of updating the current requirements to further reduce the emissions from these facilities.

In December 2004, the ARB adopted an ATCM to reduce emissions of hexavalent chromium and nickel from thermal spraying operations through the installation of best available control technology. The ATCM requires all existing facilities to comply with its requirements by January 1, 2006. New and modified thermal spraying operations must comply upon initial startup. An existing thermal spraying facility may be exempt from the minimum control efficiency requirements of the ATCM if it is located at least 1,640 feet from the nearest sensitive receptor and emits no more than 0.5 pound per year of hexavalent chromium.[8]

Key Health Findings

Hexavalent chromium is one of the most toxic air pollutants regulated by the State of California. Hexavalent chromium is a carcinogen and has been identified in worker health studies as causing lung cancer. Exposure to even very low levels of hexavalent chromium should be avoided.

The California Office of Environmental Health Hazard Assessment has found that: 1) many epidemiological studies show a strong association between hexavalent chromium exposure in the work place and respiratory cancer; and 2) all short-term assays reported show that hexavalent chromium compounds can cause damage to human DNA.

Hexavalent chromium when inhaled over a period of many years can cause a variety of non-cancer health effects. These health effects include damage to the nose, blood disorders, lung disease, and kidney damage. The non-cancer health impacts occur with exposures considerably higher than exposures causing significant cancer risks. It is less likely that the public would be exposed to hexavalent chromium at levels high enough to cause these non-cancer health effects. Non-cancer health effects, unlike cancer health effects, have a threshold or exposure level below which non-cancer health effects would not be expected.

Distance Related Findings

ARB's 2002 Barrio Logan Study measured concentrations of hexavalent chromium in the air near two chrome plating facilities. The study was conducted from December 2001 to May 2002. There were two chrome platers on the street - one decorative and one hard plater. The purpose of the study was to better understand the near source impact of hexavalent chromium emissions. Air monitors were placed at residences next to the platers and at varying distances down the street. The monitors were moved periodically to look at the spatial distribution of the impact. Source testing and facility inspections identified one of the facilities as the likely source.

The first two weeks of monitoring results showed unexpectedly high levels of hexavalent chromium at a number of the monitoring sites. The high concentrations were intermittent. The concentrations ranged from 1 to 22 ng/m3 compared to the statewide average of 0.1 ng/m3. If these levels were to continue for 70 years, the potential cancer risk would be 150 in one million. The highest value was found at an air monitor behind a house adjacent to one of the

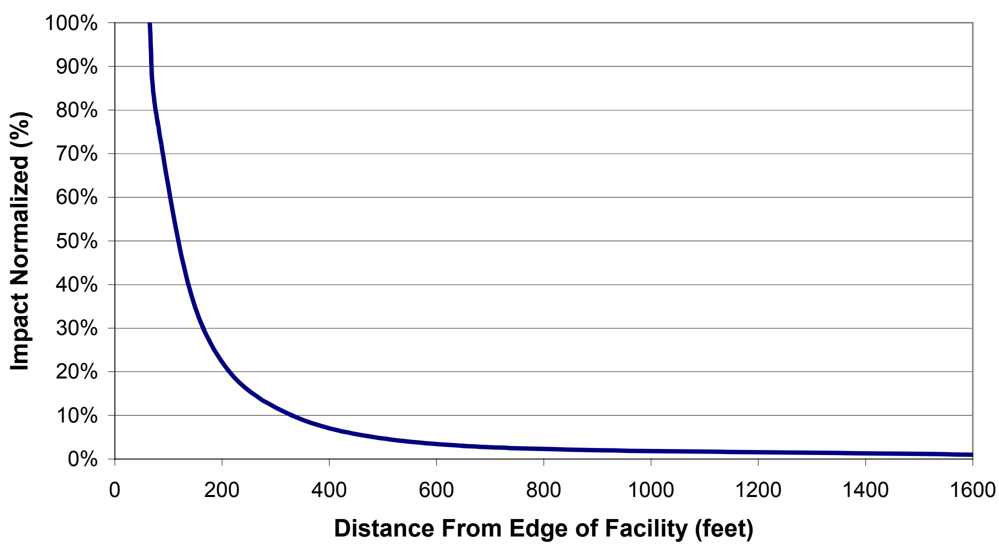
[8] For further information on the ATCM, please refer to: http://www.arb.ca.gov/regact/thermspr/thermalspr.htm

plating facilities–approximately 30 feet from the back entrance. Lower, but significant concentrations were found at an ambient air monitor 250 feet away.

The monitoring covered a period when the facility was not operating its plating tank. During this period, one of the highest concentrations was measured at an adjacent house. It appears that chromium-laden dust was responsible for high concentrations at this location since there was no plating activity at the time. Dust samples from the facility were tested and found to contain high levels of hexavalent chromium. On the day the highest concentration was measured at the house next door, a monitor 350 feet away from the plater's entrance showed very little impact. Similar proximity effects are shown in ARB modeling studies.

Figure 1-5 shows how the relative health risk varies as a function of distance from a chrome plater. This analysis is based on a medium-sized chrome plater with an annual production rate of 3 million ampere-hours. As shown in Figure 1- 5, the potential health risk drops off rapidly, with over 90 percent reduction in risk within 300 feet. This modeling was done in 2003 as part of a review of ARB's current air toxic control measure for chrome platers and is based on data from a recent ARB survey of chrome platers in California. The emission

Figure 1-5
Risk vs. Distance From Chrome Plater
(Based on plating tank emissions)



rates are only for plating operations. Because there are insufficient data available to directly quantify the impacts, the analysis does not include fugitive emissions, which the Barrio Logan analysis indicated could be significant.

Both the ARB Barrio Logan monitoring results and ARB's 2003 modeling analysis suggests that the localized emissions impact of a chrome plater diminishes significantly at 300 feet. However, in developing our recommendation, we also considered the following factors:

- some chrome platers will have higher volumes of plating activity,
- potential dust impacts were not modeled,
- we have only one monitoring study looking at the impact of distance, and,
- hexavalent chromium is one of the most potent toxic air contaminants ARB has identified.

Given these limitations in the analysis, we recommend a separation of 1,000 feet as a precautionary measure. For large chrome platers, site specific information should be obtained from the local air district.

Recommendation

- Avoid siting new sensitive land uses within 1,000 feet of a chrome plater.

References

- *Ambient Air Monitoring for Hexavalent Chromium and Metals in Barrio Logan: May 2001 through May 2002.* ARB, Monitoring and Laboratory Division (October 14, 2003)
- *Draft Barrio Logan Report.* ARB, Planning and Technical Support Division (November 2004)
- *Proposed Amendments to the Hexavalent Chromium Control Measure for Decorative and Hard Chrome Plating and Chromic Acid Anodizing Facilities.* ARB (April 1998)
- Murchison, Linda; Suer, Carolyn; Cook, Jeff. *"Neighborhood Scale Monitoring in Barrio Logan," (*AWMA Annual Conference Proceedings, June 2003)

Dry Cleaners Using Perchloroethylene (Perc Dry Cleaners)

Perchloroethylene (perc) is the solvent most commonly used by the dry cleaning industry to clean clothes or other materials. The ARB and other public health agencies have identified perc as a potential cancer-causing compound. Perc persists in the atmosphere long enough to contribute to both regional air pollution and localized exposures. Perc dry cleaners are the major source of perc emissions in California.

Since 1990, the statewide concentrations and health risk from exposure to perc has dropped over 70 percent. This is due to a number of regulatory requirements on perc dry cleaners and other sources, including degreasing operations, brake cleaners, and adhesives. ARB adopted an Airborne Toxic Control Measure (ATCM) for Perc Emissions from Dry Cleaning Operations in 1993. ARB has also prohibited the use of perc in aerosol adhesives and automotive brake cleaners.

Perc dry cleaners statewide are required to comply with ARB and local air district regulations to reduce emissions. However, even with these controls, some emissions continue to occur. Air quality studies indicate that there is still the potential for significant risks even near well-controlled dry cleaners. The South Coast AQMD has adopted a rule requiring that all new dry cleaners use alternatives to perc and that existing dry cleaners phase out the use of perc by December 2020. Over time, transition to non-toxic alternatives should occur. However, while perc continues to be used, a preventative approach should be taken to siting of new sensitive land uses.

Key Health Findings

Inhalation of perc may result in both cancer and non-cancer health effects. An assessment by California's Office of Environmental Health Hazard Assessment (OEHHA) concluded that perc is a potential human carcinogen and can cause non-cancer health effects. In addition to the potential cancer risk, the effects of long-term exposure include dizziness, impaired judgment and perception, and damage to the liver and kidneys. Workers have shown signs of liver toxicity following chronic exposure to perc, as well as kidney dysfunction and neurological effects. Non-cancer health effects occur with higher exposure levels than those associated with significant cancer risks. The public is more likely to be exposed to perchloroethylene at levels causing significant cancer risks than to levels causing non-cancer health effects. Non-cancer health effects, unlike cancer health effects, have a threshold or exposure level below which non-cancer health effects would not be expected. The ARB formally identified perc as a toxic air contaminant in October 1991.

One study has determined that inhalation of perc is the predominant route of exposure to infants living in apartments co-located in the same building with a business operating perc dry cleaning equipment. Results of air sampling within co-residential buildings indicate that dry cleaners can cause a wide range of exposures depending on the type and maintenance of the equipment. For example, a well-maintained state-of-the-art system may have risks in the range of 10 in one million, whereas a badly maintained machine with major leaks can have potential cancer risks of thousands in one million.

The California Air Pollution Control Officers Association (CAPCOA) is developing Industry-wide Risk Assessment Guidelines for Perchloroethylene Dry Cleaners which, when published, will provide detailed information on public health risk from exposure to emissions from this source.

Distance Related Findings

Risk created by perc dry cleaning is dependent on the amount of perc emissions, the type of dry cleaning equipment, proximity to the source, and how the emissions are released and dispersed (e.g., type of ventilation system, stack parameters, and local meteorology). Dry cleaners are often located near residential areas, and near shopping centers, schools, day-care centers, and restaurants.

The vast majority of dry cleaners in California have one dry cleaning machine per facility. The South Coast AQMD estimates that an average well-controlled dry cleaner uses about 30 to 160 gallons of cleaning solvent per year, with an average of about 100 gallons. Based on these estimates, the South Coast AQMD estimates a potential cancer risk between 25 to 140 in one million at residential locations 75 feet or less from the dry cleaner, with an average of about 80 in one million. The estimate could be as high as 270 in one million for older machines.

CAPCOA's draft industry-wide risk assessment of perc dry cleaning operations indicates that the potential cancer risk for many dry cleaners may be in excess of potential cancer risk levels adopted by the local air districts. The draft document also indicates that, in general, the public's exposure can be reduced by at least 75 percent, by providing a separation distance of about 300 feet from the operation. This assessment is based on a single machine with perc use of about 100 gallons per year. At these distances, the potential cancer risk would be less than 10 potential cases per million for most scenarios.

The risk would be proportionately higher for large, industrial size, dry cleaners. These facilities typically have two or more machines and use 200 gallons or more per year of perc. Therefore, separation distances need to be greater for large dry cleaners. At a distance of 500 feet, the remaining risk for a large plant can be reduced by over 85 percent.

In California, a small number of dry cleaners that are co-located (sharing a common wall, floor, or ceiling) with a residence have the potential to expose the inhabitants of the residence to high levels of perc. However, while special requirements have been imposed on these existing facilities, the potential for exposure still exists. Avoiding these siting situations in the future is an important preventative measure.

Local air districts are a source of information regarding specific dry cleaning operations—particularly for large industrial operations with multiple machines. The 300 foot separation recommended below reflects the most common situation – a dry cleaner with only one machine. While we recommend 500 feet when there are two or more machines, site specific information should be obtained from the local air district for some very large industrial operations. Factors that can impact the risk include the number and type of machines, controls used, source configuration, building dimensions, terrain, and meteorological data.

Recommendation

- Avoid siting new sensitive land uses within 300 feet of any dry cleaning operation. For operations with two or more machines provide 500 feet. For operations with 3 or more machines, consult with the local air district.

- Do not site new sensitive land uses in the same building with perc dry cleaning operations.

References

- *Proposed Amended Rule 1421 – Control of Perchloroethylene Emissions from Dry Cleaning Systems,* Final Staff Report. South Coast AQMD. (October 2002)
- *Air Toxic Control Measure for Emissions of Perchloroethylene from Dry Cleaning Operations.* ARB (1994) (http://www.arb.ca.gov/toxics/atcm/percatcm.htm)
- *"An Assessment of Tetrachloroethylene in Human Breast Milk"*, Judith Schreiber, New York State Department of Health – Bureau of Toxic Substance Assessment, Journal of Exposure Analysis and Environmental Epidemiology, Vol.2, Suppl.2, pp. 15-26, 1992.
- Draft *Air Toxics "Hot Spots" Program Perchloroethylene Dry Cleaner Industry-wide Risk Assessment Guidelines.* (CAPCOA (November 2002)
- *Final Environmental Assessment for Proposed Amended Rule 1421 – Control of Perchloroethylene Emissions from Dry Cleaning Systems.* South Coast AQMD. (October 18, 2002)

Gasoline Dispensing Facilities

Refueling at gasoline dispensing facilities releases benzene into the air. Benzene is a potent carcinogen and is one of the highest risk air pollutants regulated by ARB. Motor vehicles and motor vehicle-related activity account for over 90 percent of benzene emissions in California. While gasoline-dispensing facilities account for a small part of total benzene emissions, near source exposures for large facilities can be significant.

Since 1990, benzene in the air has been reduced by over 75 percent statewide, primarily due to the implementation of emissions controls on motor vehicle vapor recovery equipment at gas stations, and a reduction in benzene levels in gasoline. However, benzene levels are still significant. In urban areas, average benzene exposure is equivalent to about 50 in one million.

Gasoline dispensing facilities tend to be located in areas close to residential and shopping areas. Benzene emissions from the largest gas stations may result in near source health risk beyond the regional background and district health risk thresholds. The emergence of very high gasoline throughput at large retail or wholesale outlets makes this a concern as these types of outlets are projected to account for an increasing market share in the next few years.

Key Health Findings

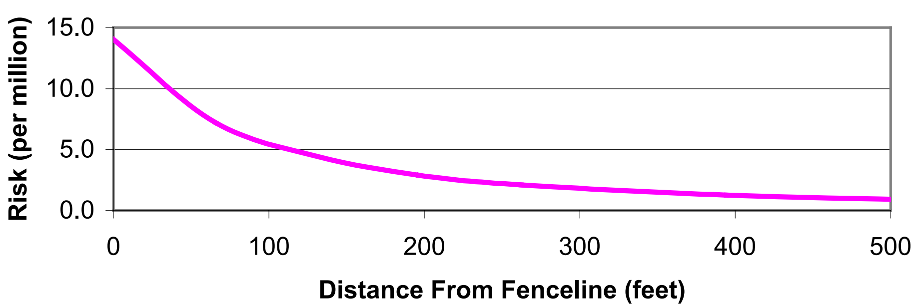
Benzene is a human carcinogen identified by ARB as a toxic air contaminant. Benzene also can cause non-cancer health effects above a certain level of exposure. Brief inhalation exposure to high concentrations can cause central nervous system depression. Acute effects include central nervous system symptoms of nausea, tremors, drowsiness, dizziness, headache, intoxication, and unconsciousness. It is unlikely that the public would be exposed to levels of benzene from gasoline dispensing facilities high enough to cause these non-cancer health effects.

Distance Related Findings

A well-maintained vapor recovery system can decrease emissions of benzene by more than 90% compared with an uncontrolled facility. Almost all facilities have emission control systems. Air quality modeling of the health risks from gasoline dispensing facilities indicate that the impact from the facilities decreases rapidly as the distance from the facility increases.

Statistics reported in the ARB's staff reports on Enhanced Vapor Recovery released in 2000 and 2002, indicated that almost 96 percent of the gasoline dispensing facilities had a throughput less than 2.4 million gallons per year. The remaining four percent, or approximately 450 facilities, had throughputs exceeding 2.4 million gallons per year. For these stations, the average gasoline throughput was 3.6 million gallons per year.

Figure 1-6
Gasoline Dispensing Facility Health Risk
for 3,600,000 gal/yr throughput



As shown in Figure 1-6, the risk levels for a gasoline dispensing facility with a throughput of 3.6 million gallons per year is about 10 in one million at a distance of 50 feet from the fenceline. However, as the throughput increases, the potential risk increases.

As mentioned above, air pollution levels in the immediate vicinity of large gasoline dispensing facilities may be higher than the surrounding area (although tailpipe emissions from motor vehicles dominates the health impacts). Very large gasoline dispensing facilities located at large wholesale and discount centers may dispense nine million gallons of gasoline per year or more. At nine million gallons, the potential risk could be around 25 in one million at 50 feet, dropping to about five in one million at 300 feet. Some facilities have throughputs as high as 19 million gallons.

Recommendation

- Avoid siting new sensitive land uses within 300 feet of a large gasoline dispensing facility (defined as a facility with a throughput of 3.6 million gallons per year or greater). A 50 foot separation is recommended for typical gas dispensing facilities.

References

- *Gasoline Service Station Industry-wide Risk Assessment Guidelines.* California Air Pollution Control Officers Association (December 1997 and revised November 1, 2001)
- *Staff Report on Enhanced Vapor Recovery.* ARB (February 4, 2000)
- *The California Almanac of Emissions and Air Quality.* ARB (2004)
- *Staff Report on Enhanced Vapor Recovery Technology Review.* ARB (October 2002)

Other Facility Types that Emit Air Pollutants of Concern

In addition to source specific recommendations, Table 1-3 includes a list of other industrial sources that could pose a significant health risk to nearby sensitive individuals depending on a number of factors. These factors include the amount of pollutant emitted and its toxicity, the distance to nearby individuals, and the type of emission controls in place. Since these types of facilities are subject to air permits from local air districts, facility specific information should be obtained where there are questions about siting a sensitive land use close to an industrial facility.

Potential Sources of Odor and Dust Complaints

Odors and dust from commercial activities are the most common sources of air pollution complaints and concerns from the public. Land use planning and permitting processes should consider the potential impacts of odor and dust on surrounding land uses, and provide for adequate separation between odor and dust sources. As with other types of air pollution, a number of factors need to be considered when determining an adequate distance or mitigation to avoid odor or

Table 1-3 – Examples of Other Facility Types That Emit[1] Air Pollutants of Concern

Categories	Facility Type	Air Pollutants of Concern
Commercial		
	Autobody Shops	Metals, Solvents
	Furniture Repair	Solvents[2], Methylene Chloride
	Film Processing Services	Solvents, Perchloroethylene
	Distribution Centers	Diesel Particulate Matter
	Printing Shops	Solvents
	Diesel Engines	Diesel Particulate Matter
Industrial		
	Construction	Particulate Matter, Asbestos
	Manufacturers	Solvents, Metals
	Metal Platers, Welders, Metal Spray (flame spray) Operations	Hexavalent Chromium, Nickel, Metals
	Chemical Producers	Solvents, Metals
	Furniture Manufacturers	Solvents
	Shipbuilding and Repair	Hexavalent chromium and other metals, Solvents
	Rock Quarries and Cement Manufacturers	Particulate Matter, Asbestos
	Hazardous Waste Incinerators	Dioxin, Solvents, Metals
	Power Plants	Benzene, Formaldehyde, Particulate Matter
	Research and Development Facilities	Solvents, Metals, etc.
Public		
	Landfills	Benzene, Vinyl Chloride, Diesel Particulate Matter
	Waste Water Treatment Plants	Hydrogen Sulfide
	Medical Waste Incinerators	Dioxin, Benzene, PAH, PCBs, 1,3-Butadiene
	Recycling, Garbage Transfer Stations	Diesel Particulate Matter
	Municipal Incinerators	Dioxin, Benzene, PAH, PCBs, 1,3-Butadiene
Transportation		
	Truck Stops	Diesel Particulate Matter
Agricultural Operations		
	Farming Operations	Diesel Particulate Matter, VOCs, NOx, PM10, CO, SOx, Pesticides
	Livestock and Dairy Operations	Ammonia, VOCs, PM10

[1]Not all facilities will emit pollutants of concern due to process changes or chemical substitution. Consult the local air district regarding specific facilities.
[2]Some solvents may emit toxic air pollutants, but not all solvents are toxic air contaminants.

dust complaints in a specific situation. Local air districts should be consulted for advice when these siting situations arise.

Table 1-4
Sources of Odor Complaints

- Sewage Treatment Plants
- Landfills
- Recycling Facilities
- Waste Transfer Stations
- Petroleum Refineries
- Biomass Operations
- Autobody Shops
- Coating Operations
- Fiberglass Manufacturing
- Foundries
- Rendering Plants
- Livestock Operations

Table 1-4 lists some of the most common sources of odor complaints received by local air districts. Complaints about odors are the responsibility of local air districts and are covered under state law. The types of facilities that can cause odor complaints are varied and can range from small commercial facilities to large industrial facilities, and may include waste disposal and recycling operations. Odors can cause health symptoms such as nausea and headache. Facilities with odors may also be sources of toxic air pollutants (See Table 1-3). Some common sources of odors emitted by facilities are sulfur compounds, organic solvents, and the decomposition/digestion of biological materials. Because of the subjective nature of an individual's sensitivity to a particular type of odor, there is no specific rule for assigning appropriate separations from odor sources. Under the right meteorological conditions, some odors may still be offensive several miles from the source.

Sources of dust are also common sources of air pollution-related complaints. Operations that can result in dust problems are rock crushing, gravel production, stone quarrying, and mining operations. A common source of complaints is the dust and noise associated with blasting that may be part of these operations. Besides the health impacts of dust as particulate matter, thick dust also impairs visibility, aesthetic values, and can soil homes and automobiles. Local air districts typically have rules for regulating dust sources in their jurisdictions, but dust sources can still be a concern. Therefore, separation of these facilities from residential and other new sensitive land uses should be considered.

In some areas of California, asbestos occurs naturally in stone deposits. Asbestos is a potent carcinogenic substance when inhaled. Asbestos-containing dust may be a public health concern in areas where asbestos-containing rock is mined, crushed, processed, or used. Situations where asbestos-containing gravel has been used in road paving materials are also a source of asbestos exposure to the general public. Planners are advised to consult with local air pollution agencies in areas where asbestos-containing gravel or stone products are produced or used.

2. Handbook Development

ARB and local air districts share responsibility for improving statewide air quality. As a result of California's air pollution control programs, air quality has improved and health risk has been reduced statewide. However, state and federal air quality standards are still exceeded in many areas of California and the statewide health risk posed by toxic air contaminants (air toxics) remains too high. Also, some communities experience higher pollution exposures than others - making localized impacts, as well regional or statewide impacts, an important consideration. It is for this reason that this Handbook has been produced - to promote better, more informed decision-making by local land use agencies that will improve air quality and public health in their communities.

Land use policies and practices, including planning, zoning, and siting activities, can play a critical role in air quality and public health at the local level. For instance, even with the best available control technology, some projects that are sited very close to homes, schools, and other public places can result in elevated air pollution exposures. The reverse is also true – siting a new school or home too close to an existing source of air pollution can pose a public health risk. The ARB recommendations in section 1 address this issue.

> *This Handbook is an informational document that we hope will strengthen the relationship between air quality and land use agencies. It highlights the need for land use agencies to address the potential for new projects to result in localized health risk or contribute to cumulative impacts where air pollution sources are concentrated.*

Avoiding these incompatible land uses is a key to reducing localized air pollution exposures that can result in adverse health impacts, especially to sensitive individuals.

Individual siting decisions that result in incompatible land uses are often the result of locating "sensitive" land uses next to polluting sources. These decisions can be of even greater concern when existing air pollution exposures in a community are considered. In general terms, this is often referred to as the issue of "cumulative impacts." ARB is working with local air districts to better define these situations and to make information about existing air pollution levels (e.g., from local businesses, motor vehicles, and other areawide sources) more readily available to land use agencies.

In December 2001, the ARB adopted "Policies and Actions for Environmental Justice" (Policies). These Policies were developed in coordination with a group of stakeholders, representing local government agencies, community interest groups, environmental justice organizations, academia, and business (Environmental Justice Stakeholders Group).

The Policies included a commitment to work with land use planners, transportation agencies, and local air districts to develop ways to identify, consider, and reduce cumulative air pollution emissions, exposure, and health risks associated with land use planning and decision-making. Developed under the auspices of the ARB's Environmental Justice Stakeholders Group, this Handbook is a first step in meeting that commitment.

ARB has produced this Handbook to help achieve several objectives:

- Provide recommendations on situations to avoid when siting new residences, schools, day care centers, playgrounds, and medical-related facilities (sensitive sites or sensitive land uses);

- Identify approaches that land use agencies can use to prevent or reduce potential air pollution impacts associated with general plan policies, new land use development, siting, and permitting decisions;

- Improve and facilitate access to air quality data and evaluation tools for use in the land use decision-making process;

- Encourage stronger collaboration between land use agencies and local air districts to reduce community exposure to source-specific and cumulative air pollution impacts; and

- Emphasize community outreach approaches that promote active public involvement in the air quality/land use decision-making process.

This Handbook builds upon California's 2003 General Plan Guidelines. These Guidelines, developed by the Governor's Office of Planning and Research (OPR), explain the land use planning process and applicable legal requirements. This Handbook also builds upon a 1997 ARB report, "The Land Use-Air Quality Linkage" ("Linkage Report").[9] The Linkage Report was an outgrowth of the California Clean Air Act which, among other things, called upon local air districts to focus particular attention on reducing emissions from sources that indirectly cause air pollution by attracting vehicle trips. Such indirect sources include, but are not limited to, shopping centers, schools and universities, employment centers, warehousing, airport hubs, medical offices, and sports arenas. The Linkage Report summarizes data as of 1997 on the relationships between land use, transportation, and air quality, and highlights strategies that can help to reduce the use of single occupancy automobile use. Such strategies

[9] To access this report, please refer to ARB's website or click on: http://www.arb.ca.gov/ch/programs/link97.pdf

complement ARB regulatory programs that continue to reduce motor vehicle emissions.

In this Handbook, we identify types of air quality-related information that we recommend land use agencies consider in the land use decision-making processes such as the development of regional, general, and community plans; zoning ordinances; environmental reviews; project siting; and permit issuance. The Handbook provides recommendations on the siting of new sensitive land uses based on current analyses. It also contains information on approaches and methodologies for evaluating new projects from an air pollution perspective.

The Handbook looks at air quality issues associated with emissions from industrial, commercial, and mobile sources of air pollution. Mobile sources continue to be the largest overall contributors to the state's air pollution problems, representing the greatest air pollution health risk to most Californians. Based on current health risk information for air toxics, the most serious pollutants on a statewide basis are diesel PM, benzene, and 1,3-butadiene, all of which are primarily emitted by motor vehicles. From a state perspective, ARB continues to pursue new strategies to further reduce motor vehicle-related emissions in order to meet air quality standards and reduce air toxics risk.

While mobile sources are the largest overall contributors to the state's air pollution problems, industrial and commercial sources can also pose a health risk, particularly to people near the source. For this reason, the issue of incompatible land uses is an important focus of this document.

Handbook Audience

Even though the primary users of the Handbook will likely be agencies responsible for air quality and land use planning, we hope the ideas and technical issues presented in this Handbook will also be useful for:

- public and community organizations and community residents;
- federal, state and regional agencies that fund, review, regulate, oversee, or otherwise influence environmental policies and programs affected by land use policies; and
- private developers.

3. Key Community Focused Issues Land Use Agencies Should Consider

Two key air quality issues that land use agencies should consider in their planning, zoning, and permitting processes are:

1) **Incompatible Land Uses.** Localized air pollution impacts from incompatible land use can occur when polluting sources, such as a heavily trafficked roadway, warehousing facilities, or industrial or commercial facilities, are located near a land use where sensitive individuals are found such as a school, hospital, or homes.

2) **Cumulative Impacts.** Cumulative air pollution impacts can occur from a concentration of multiple sources that individually comply with air pollution control requirements or fall below risk thresholds, but in the aggregate may pose a public health risk to exposed individuals. These sources can be heavy or light-industrial operations, commercial facilities such as autobody shops, large gas dispensing facilities, dry cleaners, and chrome platers, and freeways or other nearby busy transportation corridors.

Incompatible Land Uses

Land use policies and practices can worsen air pollution exposure and adversely affect public health by mixing incompatible land uses. Examples include locating new sensitive land uses, such as housing or schools, next to small metal plating facilities that use a highly toxic form of chromium, or very near large industrial facilities or freeways. Based on recent monitoring and health-based studies, we now know that air quality impacts from incompatible land uses can contribute to increased risk of illness, missed work and school, a lower quality of life, and higher costs for public health and pollution control.[10]

Avoiding incompatible land uses can be a challenge in the context of mixed-use industrial and residential zoning. For a variety of reasons, government agencies and housing advocates have encouraged the proximity of affordable housing to employment centers, shopping areas, and transportation corridors, partially as a means to reduce vehicle trips and their associated emissions. Generally speaking, typical distances in mixed-use communities between businesses and industries and other land uses such as homes and schools, should be adequate to avoid health risks. However, generalizations do not always hold as we addressed in section 1 of this Handbook.

In terms of siting air pollution sources, the proposed location of a project is a major factor in determining whether it will result in localized air quality impacts. Often, the problem can be avoided by providing an adequate distance or setback

[10] For more information, the reader should refer to ARB's website on community health: http://www.arb.ca.gov/ch/ch.htm

between a source of emissions and nearby sensitive land uses. Sometimes, suggesting project design changes or mitigation measures in the project review phase can also reduce or avoid potential impacts. This underscores the importance of addressing potential incompatible land uses as early as possible in the project review process, ideally in the general plan itself.

Cumulative Air Pollution Impacts

The broad concept of cumulative air pollution impacts reflects the combination of regional air pollution levels and any localized impacts. Many factors contribute to air pollution levels experienced in any location. These include urban background air pollution, historic land use patterns, the prevalence of freeways and other transportation corridors, the concentration of industrial and commercial businesses, and local meteorology and terrain.

When considering the potential air quality impacts of polluting sources on individuals, project location and the concentration of emissions from air pollution sources need to be considered in the land use decision-making process. In section 4, the Handbook offers a series of questions that helps land use agencies determine if a project should undergo a more careful analysis. This holds true regardless of whether the project being sited is a polluting source or a sensitive land use project.

Large industrial areas are not the only land uses that may result in public health concerns in mixed-use communities. Cumulative air pollution impacts can also occur if land uses do not adequately provide setbacks or otherwise protect sensitive individuals from potential air pollution impacts associated with nearby light industrial sources. This can occur with activities such as truck idling and traffic congestion, or from indirect sources such as warehousing facilities that are located in a community or neighborhood.

In October 2004, Cal/EPA published its Environmental Justice Action Plan. In February 2005, the Cal/EPA Interagency Working Group approved a working definition of “cumulative impacts” for purposes of initially guiding the pilot projects that are being conducted pursuant to that plan. Cal/EPA is now in the process of developing a Cumulative Impacts Assessment Guidance document. Cal/EPA will revisit the working definition of “cumulative impacts” as the Agency develops that guidance. The following is the working definition:

> *“Cumulative impacts means exposures, public health or environmental effects from the combined emissions and discharges, in a geographic area, including environmental pollution from all sources, whether single or multi-media, routinely, accidentally, or otherwise released. Impacts will take into account sensitive populations and socio-economic factors, where applicable, and to the extent data are available.”*

4. Mechanisms for Integrating Localized Air Quality Concerns Into Land Use Processes

Land use agencies should use each of their existing planning, zoning, and permitting authorities to address the potential health risk associated with new projects. Land use-specific mechanisms can go a long way toward addressing both localized and cumulative impacts from new air pollution sources that are not otherwise addressed by environmental regulations. Likewise, close collaboration and communication between land use agencies and local air districts in both the planning and project approval stages can further reduce these impacts. Local agency partnerships can also result in early identification of potential impacts from proposed activities that might otherwise escape environmental review. When this happens, pollution problems can be prevented or reduced before projects are approved, when it is less complex and expensive to mitigate.

The land use entitlement process requires a series of planning decisions. At the highest level, the General Plan sets the policies and direction for the jurisdiction, and includes a number of mandatory elements dealing with issues such as housing, circulation, and health hazards. Zoning is the primary tool for implementing land use policies. Specific or community plans created in conjunction with a specific project also perform many of the same functions as a zoning ordinance. Zoning can be modified by means of variances and conditional use permits. The latter are frequently used to insure compatibility between otherwise conflicting land uses. Finally, new development usually requires the approval of a parcel or tract map before grading and building permits can be issued. These parcel or tract maps must be consistent with the applicable General Plan, zoning and other standards.

Land use agencies can use their planning authority to separate industrial and residential land uses, or to require mitigation where separation is not feasible. By separating incompatible land uses, land use agencies can prevent or reduce both localized and cumulative air pollution impacts without denying what might otherwise be a desirable project.[11] For instance:

- a dry cleaner could open a storefront operation in a community with actual cleaning operations performed at a remote location away from residential areas;
- gas dispensing facilities with lower fuel throughput could be sited in mixed-use areas;
- enhanced building ventilation or filtering systems in schools or senior care centers can reduce ambient air from nearby busy arterials; or
- landscaping and regular watering can be used to reduce fugitive dust at a building construction site near a school yard.

[11] It should be noted that such actions should also be considered as part of the General Plan or Plan element process.

The following general and specific land use approaches can help to reduce potential adverse air pollution impacts that projects may have on public health.

General Plans

The primary purpose of planning, and the source of government authority to engage in planning, is to protect public health, safety, and welfare. In its most basic sense, a local government General Plan expresses the community's development goals and embodies public policy relative to the distribution of future land uses, forming the basis for most land use decisions. Therefore, the most effective mechanism for dealing with the central land use concept of compatibility and its relationship to cumulative air pollution impacts is the General Plan. Well before projects are proposed within a jurisdiction, the General Plan sets the stage for where projects can be sited, and their compatibility with comprehensive community goals, objectives, and policies.

In 2003, OPR revised its General Plan Guidelines, highlighting the importance of incorporating sustainable development and environmental justice policies in the planning process. The OPR General Plan Guidelines provides an effective and long-term approach to reduce cumulative air pollution impacts at the earliest planning stages. In light of these important additions to the Guidelines, land use agencies should consider updating their General Plans or Plan elements to address these revisions.

The General Plan and related Plan elements can be used to avoid incompatible land uses by incorporating air quality considerations into these documents. For instance, a General Plan safety element with an air quality component could be used to incorporate policies or objectives that are intended to protect the public from the potential for facility breakdowns that may result in a dangerous release of air toxics. Likewise, an air quality component to the transportation circulation element of the General Plan could include policies or standards to prevent or reduce local exposure to diesel exhaust from trucks and other vehicles. For instance, the transportation circulation element could encourage the construction of alternative routes away from residential areas for heavy-duty diesel trucks. By considering the relationship between air quality and transportation, the circulation element could also include air quality policies to prevent or reduce trips and travel, and thus vehicle emissions. Policies in the land use element of the General Plan could identify areas appropriate for future industrial, commercial, and residential uses. Such policies could also introduce design and distance parameters that reduce emissions, exposure, and risk from industrial and some commercial land uses (e.g., dry cleaners) that are in close proximity to residential areas or schools.

Land use agencies should also consider updating or creating an air quality element in the jurisdiction's General Plan. In the air quality element, local decision-makers could develop long-term, effective plans and policies to address air quality issues, including cumulative impacts. The air quality element can also provide a general reference guide that informs local land use planners about regional and community level air quality, regulatory air pollution control requirements and guidelines, and references emissions and pollution source data bases and assessment and modeling tools. As is further described in Appendix C of the Handbook, new assessment tools that ARB is developing can be included into the air quality element by reference. For instance, ARB's statewide risk maps could be referenced in the air quality element as a resource that could be consulted by developers or land use agencies

Zoning

The purpose of "zoning" is to separate different land uses. Zoning ordinances establish development controls to ensure that private development takes place within a given area in a manner in which:

- All uses are compatible (e.g., an industrial plant is not permitted in a residential area);
- Common development standards are used (e.g., all homes in a given area are set back the same minimum distance from the street); and,
- Each development does not unreasonably impose a burden upon its neighbors (e.g., parking is required on site so as not to create neighborhood parking problems).

To do this, use districts called "zones" are established and standards are developed for these zones. The four basic zones are residential, commercial, industrial and institutional.

Land use agencies may wish to consider how zoning ordinances, particularly those for mixed-use areas, can be used to avoid exacerbating poor land use practices of the past or contributing to localized and cumulative air pollution impacts in the community.

Sometimes, especially in mixed-use zones, there is a potential for certain categories of existing businesses or industrial operations to result in cumulative air pollution impacts to new development projects. For example:

- An assisted living project is proposed for a mixed-use zone adjacent to an existing chrome plating facility, or several dry cleaners;
- Multiple industrial sources regulated by a local air district are located directly upwind of a new apartment complex;
- A new housing development is sited in a mixed-use zone that is downwind or adjacent to a distribution center that attracts diesel-fueled delivery trucks and TRUs; or
- A new housing development or sensitive land use is sited without adequate setbacks from an existing major transportation corridor or rail yard.

As part of the public process for making zoning changes, local land use agencies could work with community planning groups, local businesses, and community residents to determine how best to address existing incompatible land uses.

Land Use Permitting Processes

- **Questions to Consider When Reviewing New Projects**

Very often, just knowing what questions to ask can yield critical information about the potential air pollution impacts of proposed projects – both from the perspective of a specific project as well as in the nature of existing air pollution sources in the same impact area. Available land use information can reveal the proximity of air pollution sources to sensitive individuals, the potential for incompatible land uses, and the location and nature of nearby air pollution sources. Air quality data, available from the ARB and local air districts, can provide information about the types and amounts of air pollution emitted in an area, regional air quality concentrations, and health risk estimates for specific sources.

General Plans and zoning maps are an excellent starting point in reviewing project proposals for their potential air pollution impacts. These documents contain information about existing or proposed land uses for a specific location as well as the surrounding area. Often, just looking at a map of the proposed location for a facility and its surrounding area will help to identify a potential adjacent incompatible land use.

The following pages are a "pull-out" list of questions to consider along with cross-references to pertinent information in the Handbook. These questions are intended to assist land use agencies in evaluating potential air quality-related concerns associated with new project proposals.

The first group of questions contains project-related queries designed to help identify the potential for localized project impacts, particularly associated with incompatible land uses. The second group of questions focuses on the issue of potential cumulative impacts by including questions about existing emissions and air quality in the community, and community feedback. Depending on the answers to these questions, a land use agency may decide a more detailed review of the proposal is warranted.

The California Department of Education has already developed a detailed process for school siting which is outlined in Appendix E. However, school districts may also find this section helpful when evaluating the most appropriate site for new schools in their area. At a minimum, using these questions may encourage school districts to engage throughout their siting process with land use agencies and local air districts. The combined expertise of these entities can be useful in devising relevant design standards and mitigation measures that can reduce exposure to cumulative emissions, exposure, and health risk to students and school workers.

As indicated throughout the Handbook, we strongly encourage land use agencies to consult early and often with local air districts. Local air districts have the expertise, many of the analytical tools, and a working knowledge of the sources they regulate. It is also critical to fully involve the public and businesses that could be affected by the siting decision. The questions provided in the chart below do not imply any particular action should be taken by land use agencies. Rather the questions are intended to improve the assessment process and facilitate informed decision-making.

- **Project-Related Questions**

This section includes project-related questions that, in conjunction with the questions in the next section, can be used to tailor the project evaluation. These questions are designed to help identify the potential for incompatible land uses from localized project impacts.

Questions to Consider When Reviewing New Projects

Project-Related Questions	Cross-Reference to Relevant Handbook Sections
1. Is the proposed project: ▲ A business or commercial license renewal ▲ A new or modified commercial project ▲ A new or modified industrial project ▲ A new or modified public facility project ▲ A new or modified transportation project ▲ A housing or other development in which sensitive individuals may live or play	See Appendix A for typical land use classifications and associated project categories that could emit air pollutants.
2. Does the proposed project: ▲ Conform to the zoning designation? ▲ Require a variance to the zoning designation? ▲ Include plans to expand operations over the life of the business such that additional emissions may increase the pollution burden in the community (e.g., from additional truck operations, new industrial operations or process lines, increased hours of operation, build-out to the property line, etc.)?	See Appendix F for a general explanation of land use processes. In addition, Section 3 contains a discussion of how land use planning, zoning, and permitting practices can result in incompatible land uses or cumulative air pollution impacts.
3. Has the local air district provided comments or information to assist in the analysis?	See Section 5 and Appendix C for a description of air quality-related tools that the ARB and local air districts use to provide information on potential air pollution impacts.
4. Have public meetings been scheduled with the affected community to solicit their involvement in the decision-making process for the proposed project?	See Section 7 for a discussion of public participation, information and outreach tools.
5. If the proposed project will be subject to local air district regulations: ▲ Has the project received a permit from the local air district? ▲ Would it comply with applicable local air district requirements? ▲ Is the local air district contemplating new regulations that would reduce emissions from the source over time? ▲ Will potential emissions from the project	See Appendix C for a description of local air district programs.

Project-Related Questions	Cross-Reference to Relevant Handbook Sections
trigger the local air district's new source review for criteria pollutants or air toxics emissions? ▲ Is the local air district expected to ask the proposed project to perform a risk assessment? ▲ Is there sufficient new information or public concern to call for a more thorough environmental analysis of the proposed project? ▲ Are there plans to expand operations over time? ▲ Are there land-use based air quality significance thresholds or design standards that could be applied to this project in addition to applicable air district requirements?	
6. If the proposed project will release air pollution emissions, either directly or indirectly, but is not regulated by the local air district: ▲ Is the local air district informed of the project? ▲ Does the local air district believe that there could be potential air pollution impacts associated with this project category because of the proximity of the project to sensitive individuals? ▲ If the project is one in which individuals live or play (e.g., a home, playground, convalescent home, etc.), does the local air district believe that the project's proximity to nearby sources could pose potential air pollution impacts? ▲ Are there indirect emissions that could be associated with the project (e.g., truck traffic or idling, transport refrigeration unit operations, stationary diesel engine operations, etc.) that will be in close proximity to sensitive individuals? ▲ Will the proposed project increase or serve as a magnet for diesel traffic? ▲ Are there land-use based air quality significance thresholds or design standards that could be applied to this project in addition to applicable air district requirements? ▲ Is there sufficient new information or public concern to call for a more thorough environmental analysis of the proposed project? ▲ Should the site approval process include identification and mitigation of potential	See Section 1 for recommendations on situations to avoid when siting projects where sensitive individuals would be located (sensitive sites).

Project-Related Questions	Cross-Reference to Relevant Handbook Sections
direct or indirect emissions associated with the potential project?	
7. Does the local air district or land use agency have pertinent information on the source, such as: ▲ Available permit and enforcement data, including for the owner or operator of the proposed source that may have other sources in the State. ▲ Proximity of the proposed project to sensitive individuals. ▲ Number of potentially exposed individuals from the proposed project. ▲ Potential for the proposed project to expose sensitive individuals to odor or other air pollution nuisances. ▲ Meteorology or the prevailing wind patterns between the proposed project and the nearest receptor, or between the proposed sensitive receptor project and sources that could pose a localized or cumulative air pollution impact.	See Appendix C for a description of local air district programs. See Appendix B for a listing of useful information that land use agencies should have on hand or have accessible when reviewing proposed projects for potential air pollution impacts. Also, do not hesitate to contact your local air district regarding answers to any of these questions that might not be available at the land use agency. See Section 1 for recommendations on situations to avoid when siting projects where sensitive individuals would be located (sensitive sites).
8. Based upon the project application, its location, and the nature of the source, could the proposed project: ▲ Be a polluting source that is located in proximity to, or otherwise upwind, of a location where sensitive individuals live or play? ▲ Attract sensitive individuals and be located in proximity to or otherwise downwind, of a source or multiple sources of pollution, including polluting facilities or transportation-related sources that contribute emissions either directly or indirectly? ▲ Result in health risk to the surrounding community?	See Section 3 for a discussion of what is an incompatible land use and the potential cumulative air pollution impacts. See Section 1 for recommendations on situations to avoid when siting projects where sensitive individuals would be located (sensitive sites).
9. If a CEQA categorical exemption is proposed, were the following questions considered: ▲ Is the project site environmentally sensitive as defined by the project's location? (A project that is ordinarily insignificant in its impact on the environment may in a particularly sensitive environment be significant.) ▲ Would the project and successive future projects of the same type in the approximate location potentially result in cumulative impacts? ▲ Are there "unusual circumstances" creating the possibility of significant effects?	See CEQA Guidelines section 15300, and Public Resources Code, section 21084. See Section 1 for recommendations on situations to avoid when siting projects where sensitive individuals would be located (sensitive sites). See also Section 5 and Appendix C for a description of air quality-related tools that the ARB and local air districts use to provide information on potential air pollution impacts.

- **Questions Related to Cumulative Impact Assessment**

The following questions can be used to provide the decision-maker with a better understanding of the potential for cumulative air pollution impacts to an affected community. Answers to these questions will help to determine if new projects or activities warrant a more detailed review. It may also help to see potential environmental concerns from the perspective of the affected community. Additionally, responses can provide local decision-makers with information with which to assess the best policy options for addressing neighborhood-scale air pollution concerns.

The questions below can be used to identify whether existing tools and procedures are adequate to address land use-related air pollution issues. This process can also be used to pinpoint project characteristics that may have the greatest impact on community-level emissions, exposure, and risk. Such elements can include: the compliance record of existing sources including those owned or operated by the project proponent; the concentration of emissions from polluting sources within the approximate area of sensitive sites; transportation circulation in proximity to the proposed project; compatibility with the General Plan and General Plan elements; etc.

The local air district can provide useful assistance in the collection and evaluation of air quality-related information for some of the questions and should be consulted early in the process.

Questions Related to Cumulative Impact Assessment

Technical Questions	Cross-Reference to Relevant Handbook Sections
1. Is the community home to industrial facilities?	See Appendix A for typical land use classifications and associated project categories that could emit air pollutants.
2. Do one or more major freeways or high-traffic volume surface streets cut through the community?	See transportation circulation element of your general plan. See also Appendix B for useful information that land use agencies should have on hand or have accessible when reviewing proposed projects for potential air pollution impacts. See Section 1 for recommendations on situations to avoid when siting projects where sensitive individuals would be located (sensitive sites).
3. Is the area classified for mixed-use zoning?	See your general plan and zoning ordinances.
4. Is there an available list of air pollution sources in the community?	Contact your local air district.
5. Has a walk-through of the community been conducted to gather the following information:	See Appendix B for a listing of useful information that land use agencies

Technical Questions	Cross-Reference to Relevant Handbook Sections
▲ Corroborate available information on land use activities in the area (e.g., businesses, housing developments, sensitive individuals, etc.)? ▲ Determine the proximity of existing and anticipated future projects to residential areas or sensitive individuals? ▲ Determine the concentration of emission sources (including anticipated future projects) to residential areas or sensitive individuals?	should have on hand or have accessible when reviewing proposed projects for potential air pollution impacts. Also contact your local air district.
6. Has the local air district been contacted to obtain information on sources in the community?	See Section 7 for a discussion of public participation, information and outreach tools.
7. What categories of commercial establishments are currently located in the area and does the local air district have these sources on file as being regulated or permitted?	See Appendix A for typical land use classifications and associated project categories that could emit air pollutants. Also contact your local air district.
8. What categories of indirect sources such as distribution centers or warehouses are currently located in the area?	See Appendix A for typical land use classifications and associated project categories that emit air pollutants.
9. What air quality monitoring data are available?	Contact your local air district.
10. Have any risk assessments been performed on emission sources in the area?	Contact your local air district.
11. Does the land use agency have the capability of applying a GIS spatial mapping tool that can overlay zoning, sub-development information, and other neighborhood characteristics, with air pollution and transportation data?	See Appendix B for a listing of useful information that land use agencies should have on hand or have accessible when reviewing proposed projects for potential air pollution impacts. Also contact your local air district for tools that can be used to supplement available land use agency tools.
12. Based on available information, is it possible to determine if the affected community or neighborhood experiences elevated health risk due to a concentration of air pollution sources in close proximity, and if not, can the necessary information be obtained?	Contact your local air district. Also see Section 1 for recommendations on situations to avoid when siting projects where sensitive individuals would be located (sensitive sites).
13. Does the community have a history of chronic complaints about air quality?	See Section 7 for a discussion of public participation, information and outreach tools. Also contact your local air district.
14. Is the affected community included in the public participation process for the agency's decision?	See Section 7 for a discussion of public participation, information and outreach tools.
15. Have community leaders or groups been contacted about any pre-existing or chronic community air quality concerns?	See Section 7 for a discussion of public participation, information and outreach tools. Also contact your local air district.

- **Mitigation Approaches**

In addition to considering the suitability of the project location, opportunities for mitigation of air pollution impacts should be considered. Sometimes, a land use agency may find that selection of a different project location to avoid a health risk is not feasible. When that happens, land use agencies should consider design improvements or other strategies that would reduce the risk. Such strategies could include performance or design standards, consultation with local air districts and other agencies on appropriate actions that these agencies should, or plan to, undertake, and consultation and outreach in the affected community. Potential mitigation measures should be feasible, cost-effective solutions within the available resources and authority of implementing agencies to enforce.[12]

- **Conditional Use Permits and Performance Standards**

Some types of land uses are only allowed upon approval of a conditional use permit (also called a CUP or special use permit). A conditional use permit does not re-zone the land but specifies conditions under which a particular land use will be permitted. Such land uses could be those with potentially significant environmental impacts. Local zoning ordinances specify the uses for which a conditional use permit is required, the zones they may be allowed in, and public hearing procedures. The conditional use permit imposes special requirements to ensure that the use will not be detrimental to its surroundings.

In the context of land use planning, performance standards are requirements imposed on projects or project categories through conditional use permits to ensure compliance with general plan policies and local ordinances. These standards could apply to such project categories as distribution centers, very large gas dispensing facilities, autobody shops, dry cleaners, and metal platers. Land use agencies may wish to consider adding land use-based performance standards to zoning ordinances in existing mixed-use communities for certain air pollution project categories. Such standards would provide certainty and equitable treatment to all projects of a similar nature, and reserve the more resource intensive conditional or special use permits to projects that require a more detailed analysis. In developing project design or performance standards, land use agencies should consult with the local air district. Early and regular consultation can avoid duplication or inconsistency with local air district control requirements when considering the site-specific design and operation of a project.

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[12] A land use agency has the authority to condition or deny a project based upon information collected and evaluated through the land use decision-making process. However, any denial would need to be based upon identifiable, generally applicable, articulated standards set forth in the local government's General Plan and zoning codes. One way of averting this is to conduct early and regular outreach to the community and the local air district so that community and environmental concerns can be addressed and accommodated into the project proposal.

Examples of land use-based air quality-specific performance standards include the following:

- Placing a process vent away from the direction of the local playground that is nearby or increasing the stack height so that emissions are dispersed to reduce the emissions impact on surrounding homes or schools.
- Setbacks between the project fence line and the population center.
- Limiting the hours of operation of a facility to avoid excess emissions exposure or foul odors to nearby individuals.
- An ordinance that requires fleet operators to use cleaner vehicles before project approval (if a new business), or when expanding the fleet (if an existing business); and
- Providing alternate routes for truck operations that discourage detours into residential neighborhoods.

Outreach to Other Agencies

When questions arise regarding the air quality impacts of projects, including potential cumulative impacts, land use agencies should consult the local air district. Land use agencies should also consider the following suggestions to avoid creating new incompatible land uses:

- Consult with the local air district to help determine if emissions from a particular project will adversely impact sensitive individuals in the area, if existing or future effective regulations or permit requirements will affect the proposed project or other sources in the vicinity of the proposed project, or if additional inspections should be required.
- Check with ARB for new information and modeling tools that can help evaluate projects seeking to site within your jurisdiction.
- Become familiar with ARB's Land Use-Air Quality Linkage Report to determine whether approaches and evaluation tools contained in the Report can be used to reduce transportation-related impacts on communities.
- Contact and collaborate with other state agencies that play a role in the land use decision-making process, e.g., the State Department of Education, the California Energy Commission, and Caltrans. These agencies have information on mitigation measures and mapping tools that could be useful in addressing local problems.

- **Information Clearinghouse**

  - Land use agencies can refer to the ARB statewide electronic information clearinghouse for information on what measures other jurisdictions are using to address comparable issues or sources.[13]

[13] This information can be accessed from ARB's website by going to: http://www.arb.ca.gov/ch/clearinghouse.htm

The next section addresses available air quality assessment tools that land use agencies can use to evaluate the potential for localized or cumulative impacts in their communities.

5. Available Tools to Evaluate Cumulative Air Pollution Emissions and Risk

Until recently, California has traditionally approached air pollution control from the perspective of assessing whether the pollution was regional, category-specific, or from new or existing sources. This methodology has been generally effective in reducing statewide and regional air pollution impacts and risk levels. However, such an incremental, category-by-category, source-by-source approach may not always address community health impacts from multiple sources - including mobile, industrial, and commercial facilities.

As a result of air toxics and children's health concerns over the past several years, ARB and local air districts have begun to develop new tools to evaluate and inform the public about cumulative air pollution impacts at the community level. One aspect of ARB's programs now underway is to consolidate and make accessible air toxics emissions and monitoring data by region, using modeling tools and other analytical techniques to take a preliminary look at emissions, exposure, and health risk in communities.

ARB has developed multiple tools to assist local air districts perform assessments of cumulative emissions, exposure, and risk on a neighborhood scale. These tools include:

- Regional risk maps that show trends in potential cancer risk from toxic air pollutants in southern and central California between 1990 and 2010. These maps are based on the U.S. EPA's ASPEN model. These maps provide an estimate of background levels of toxic air pollutant risk but are not detailed enough to assess individual neighborhoods or facilities.[14]

- The Community Health Air Pollution Information System (CHAPIS) is a user-friendly, Internet-based system for displaying information on emissions from sources of air pollution in an easy to use mapping format. CHAPIS contains information on air pollution emissions from selected large facilities and small businesses that emit criteria and toxic air pollutants. It also contains information on air pollution emissions from motor vehicles. When released in 2004, CHAPIS did not contain information on every source of air pollution or every air pollutant. However, ARB continues to work with local air districts to include all of the largest air pollution sources and those with the highest documented air pollution risk. Additional facilities will be added to CHAPIS as more data become available.[15]

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[14] For further information on these maps, please visit ARB's website at: http://www.arb.ca.gov/toxics/cti/hlthrisk/hlthrisk.htm

[15] For further information on CHAPIS, please click on: http://www.arb.ca.gov/ch/chapis1/chapis1.htm

- The Hot Spots Analysis and Reporting Program (HARP) is a software database package that evaluates emissions from one or more facilities to determine the overall health risk posed by the facility(-ies) on the surrounding community. Proper use of HARP ensures that the risk assessment meets the latest risk assessment guidelines published by the State Office of Environmental Health Hazard Assessment (OEHHA). HARP is designed with air quality professionals in mind and is available from the ARB.

- The Urban Emissions Model (URBEMIS) is a computer program that can be used to estimate emissions associated with land development projects in California such as residential neighborhoods, shopping centers, office buildings, and construction projects. URBEMIS uses emission factors available from the ARB to estimate vehicle emissions associated with new land uses.

Local air districts, and others can use these tools to assess a new project, or plan revision. For example, these tools can be used to:

- Identify if there are multiple sources of air pollution in the community;
- Identify the major sources of air pollution in the area under consideration;
- Identify the background potential cancer risk from toxic air pollution in the area under consideration;
- Estimate the risk from a new facility and how it adds to the overall risk from other nearby facilities; and
- Provide information to decision-makers and key stakeholders on whether there may be significant issues related to cumulative emissions, exposure, and health risk due to a permitting or land use decision.

If an air agency wishes to perform a cumulative air pollution impact analysis using any of these tools, it should consult with the ARB and/or the local air district to obtain information or assistance on the data inputs and procedures necessary to operate the program. In addition, land use agencies could consult with local air districts to determine the availability of land use and air pollution data for entry into an electronic Geographical Information System (GIS) format. GIS is an easier mapping tool than the more sophisticated models described in Appendix C. GIS mapping makes it possible to superimpose land use with air pollution information so that the spatial relationship between air pollution sources, sensitive receptors, and air quality can be visually represented. Appendix C provides a general description of the impact assessment process and micro-scale, or community level modeling tools that are available to evaluate potential cumulative air pollution impacts. Modeling protocols will be accessible on ARB's website as they become available. The ARB will also provide land use agencies and local air districts with statewide regional modeling results and information regarding micro-scale modeling.

6. ARB Programs to Reduce Air Pollution in Communities

ARB's regulatory programs reduce air pollutant emissions through statewide strategies that improve public health in all California communities. ARB's overall program addresses motor vehicles, consumer products, air toxics, air-quality planning, research, education, enforcement, and air monitoring. Community health and environmental justice concerns are a consideration in all these programs. ARB's programs are statewide but recognize that extra efforts may be needed in some communities due to historical mixed land-use patterns, limited participation in public processes in the past, and a greater concentration of air pollution sources in some communities.

ARB's strategies are intended to result in better air quality and reduced health risk to residents throughout California. The ARB's priority is to prevent or reduce the public's exposure to air pollution, including from toxic air contaminants that pose the greatest risk, particularly to infants and children who are more vulnerable to air pollution.

In October 2003, ARB updated its statewide control strategy to reduce emissions from source categories within its regulatory authority. A primary focus of the strategy is to achieve federal and state air quality standards for ozone and particulate matter throughout California, and to reduce health risk from diesel PM. Along with local air districts, ARB will continue to address air toxics emissions from regulated sources (see Table 6-1 for a summary of ARB activities). As indicated earlier, ARB will also provide analytical tools and information to land use agencies and local air districts to help assess and mitigate cumulative air pollution impacts.

The ARB will continue to consider the adoption of or revisions to needed air toxics control measures as part of the state's ongoing air toxics assessment program.[16]

As part of its effort to reduce particulate matter and air toxics emissions from diesel PM, the ARB has developed a Diesel Risk Reduction Program[17] that lays out several strategies in a three-pronged approach to reduce emissions and their associated risk:

- Stringent emission standards for all new diesel-fueled engines;
- Aggressive reductions from in-use engines; and
- Low sulfur fuel that will reduce PM and still provide the quality of diesel fuel needed to control diesel PM.

[16] For continuing information and updates on state measures, the reader can refer to ARB's website at http://www.arb.ca.gov/toxics/toxics.htm.
[17] For a comprehensive description of the program, please refer to ARB's website at http://www.arbB.ca.gov/diesel/dieselrrp.htm.

Table 6-1
ARB ACTIONS TO ADDRESS
CUMULATIVE AIR POLLUTION IMPACTS IN COMMUNITIES

Information Collection

- Improve emission inventories, air monitoring data, and analysis tools that can help to identify areas with high cumulative air pollution impacts
- Conduct studies in coordination with OEHHA on the potential for cancer and non-cancer health effects from air pollutants emitted by specific source categories
- Establish web-based clearinghouse for local land use strategies

Emission Reduction Approaches (2004-2006)*

- Through a public process, consider development and/or amendment of regulations and related guidance to reduce emissions, exposure, and health risk at a statewide and local level for the following sources:
  - Diesel PM sources such as stationary diesel engines, transport refrigeration units, portable diesel engines, on-road public fleets, off-road public fleets, heavy-duty diesel truck idling, harbor craft vessels, waste haulers
  - Other air toxics sources, such as formaldehyde in composite wood products, hexavalent chromium for chrome plating and chromic acid anodizing, thermal spraying, and perchloroethylene dry cleaning
- Develop technical information for the following:*
  - Distribution centers
  - Modeling tools such as HARP and CHAPIS
- Adopt rules and pollution prevention initiatives within legal authority to reduce emissions from mobile sources and fuels, and consumer products
- Develop and maintain Air Quality Handbook as a tool for use by land use agencies and local air districts to address cumulative air pollution impacts

Other Approaches

- Establish guidelines for use of statewide incentive funding for high priority mobile source emission reduction projects

*Because ARB will continue to review the need to adopt or revise statewide measures, the information contained in this chart will be updated on an ongoing basis.

A number of ARB's diesel risk reduction strategies have been adopted. These include measures to reduce emissions from refuse haulers, urban buses, transport refrigeration units, stationary and portable diesel engines, and idling trucks and school buses. These sources are all important from a community perspective.[18]

[18] The reader can refer to ARB's website for information on its mobile source-related programs at: http://www.arb.ca.gov/msprog/msprog.htm, as well as regulations adopted and under consideration as part of the Diesel Risk Reduction Program at: http://www.arb.ca.gov/diesel/dieselrrp.htm

The ARB will continue to evaluate the health effects of air pollutants while implementing programs with local air districts to reduce air pollution in all California communities.

Local air districts also have ambitious programs to reduce criteria pollutants and air toxics from regulated sources in their region. Many of these programs also benefit air quality in local communities as well as in the broader region. For more information on what is being done in your area to reduce cumulative air pollution impacts through air pollution control programs, you should contact your local air district.[19]

[19] Local air district contacts can be found on the inside cover to this Handbook.

7. Ways to Enhance Meaningful Public Participation

Community involvement is an important part of the land use process. The public is entitled to the best possible information about the air they breathe and what is being done to prevent or reduce unhealthful air pollution in their communities. In particular, information on how land use decisions can affect air pollution and public health should be made accessible to all communities, including low-income and minority communities.

Effective community participation consistently relies on a two-way flow of information – from public agencies to community members about opportunities, constraints, and impacts, and from community members back to public officials about needs, priorities, and preferences. The outreach process needed to build understanding and local neighborhood involvement requires data, methodologies, and formats tailored to the needs of the specific community. More importantly, it requires the strong collaboration of local government agencies that review and approve projects and land uses to improve the physical and environmental surroundings of the local community.

Many land use agencies, especially those in major metropolitan areas, are familiar with, and have a long-established public review process. Nevertheless, public outreach can often be improved. Active public involvement requires engaging the public in ways that do not require their previous interest in or knowledge of the land use or air pollution control requirements, and a commitment to taking action where appropriate to address the concerns that are raised.

- **Direct Community Outreach**

In conjunction with local air districts, land use agencies should consider designing an outreach program for community groups, other stakeholders, and local government agency staffs that address the problem of cumulative air pollution impacts, and the public and government role in reducing them. Such a program could consider analytical tools that assist in the preparation and presentation of information in a way that supports sensible decision-making and public involvement. Table 7-1 contains some general outreach approaches that might be considered.

Table 7-1
Public Participation Approaches

- Staff and community leadership awareness training on environmental justice programs and community-based issues
- Surveys to identify the website information needs of interested community-based organizations and other stakeholders
- Information materials on local land use and air district authorities
- Community-based councils to facilitate and invite resident participation in the planning process
- Neighborhood CEQA scoping sessions that allows for community input prior to technical analysis
- Public information materials on siting issues are under review including materials written for the affected community, and in different media that widens accessibility
- Public meetings
- Identify other opportunities to include community-based organizations in the process

To improve outreach, local land use agencies should consider the following activities:

- Hold meetings in communities affected by agency programs, policies, and projects at times and in places that encourage public participation, such as evenings and weekends at centrally located community meeting rooms, libraries, and schools.
- Assess the need for and provide translation services at public meetings.
- Hold community meetings to update residents on the results of any special air monitoring programs conducted in their neighborhood.
- Hold community meetings to discuss and evaluate the various options to address cumulative impacts in their community.
- In coordination with local air districts, make staff available to attend meetings of community organizations and neighborhood groups to listen to and, where appropriate, act upon community concerns.
- Establish a specific contact person for environmental justice issues.
- Increase student and community awareness of local government land use activities and policies through outreach opportunities.
- Make air quality and land use information available to communities in an easily understood and useful format, including fact sheets, mailings, brochures, public service announcements, and web pages, in English and other languages.
- On the local government web-site, dedicate a page or section to what the land use program is doing regarding environmental justice and cumulative environmental impacts, and, as applicable, activities conducted with local air districts such as neighborhood air monitoring studies, pollution prevention, air pollution sources in neighborhoods, and risk reduction.

- Allow, encourage, and promote community access to land use activities, including public meetings, General Plan or Community Plan updates, zoning changes, special studies, CEQA reviews, variances, etc.
- Distribute information in multiple languages, as needed, on how to contact the land use agency or local air district to obtain information and assistance regarding environmental justice programs, including how to participate in public processes.
- Create and distribute a simple, easy-to-read, and understandable public participation handbook, which may be based on the "Public Participation Guidebook" developed by ARB.

- **Other Opportunities for Meaningful Public Outreach**

  - Community-Based Planning Committees

  Neighborhood-based or community planning advisory councils could be established to invite and facilitate direct resident participation into the planning process. With the right training and technical assistance, such councils can provide valuable input and a forum for the review of proposed amendments to plans, zone changes, land use permits, and suggestions as to how best to prevent or reduce cumulative air pollution impacts in their community.

  - Regional Partnerships

  Consider creating regional coalitions of key growth-related organizations from both the private and public sectors, with corporations, communities, other jurisdictions, and government agencies. Such partnerships could facilitate agreement on common goals and win-win solutions tailored specifically for the region. With this kind of dialogue, shared vision, and collaboration, barriers can be overcome and locally acceptable sustainable solutions implemented. Over the long term, such strategies will help to bring about clean air in communities as well as regionally.

LAND USE CLASSIFICATIONS AND ASSOCIATED FACILITY CATEGORIES THAT COULD EMIT AIR POLLUTANTS

(1) Land Use Classifications – by Activity[i]	(2) Facility or Project Examples	(3) Key Pollutants[ii,iii]	(4) Air Pollution Permits[iv]
COMMERCIAL/ LIGHT INDUSTRIAL: SHOPPING, BUSINESS, AND COMMERCIAL			
▲ Primarily retail shops and stores, office, commercial activities, and light industrial or small business	Dry cleaners; drive-through restaurants; gas dispensing facilities; auto body shops; metal plating shops; photographic processing shops; textiles; apparel and furniture upholstery; leather and leather products; appliance repair shops; mechanical assembly cleaning; printing shops	VOCs, air toxics, including diesel PM, NOx, CO, SOx	Limited; Rules for applicable equipment
▲ Goods storage or handling activities, characterized by loading and unloading goods at warehouses, large storage structures, movement of goods, shipping, and trucking.	Warehousing; freight-forwarding centers; drop-off and loading areas; distribution centers	VOCs, air toxics, including diesel PM, NOx, CO, SOx	No[v]
LIGHT INDUSTRIAL: RESEARCH AND DEVELOPMENT			
▲ Medical waste at research hospitals and labs	Incineration; surgical and medical instrument manufacturers, pharmaceutical manufacturing, biotech research facilities	Air toxics, NOx, CO, SOx	Yes
▲ Electronics, electrical apparatus, components, and accessories	Computer manufacturer; integrated circuit board manufacturer; semi-conductor production	Air toxics, VOCs	Yes
▲ College or university lab or research center	Medical waste incinerators; lab chemicals handling, storage and disposal	Air toxics, NOx, CO, SOx, PM10	Yes
▲ Research and development labs	Satellite manufacturer; fiber-optics manufacturer; defense contractors; space research and technology; new vehicle and fuel testing labs	Air toxics, VOCs	Yes
▲ Commercial testing labs	Consumer products; chemical handling, storage and disposal	Air toxics, VOCs	Yes

(1) Land Use Classifications – by Activity[i]	(2) Facility or Project Examples	(3) Key Pollutants[ii,iii]	(4) Air Pollution Permits[iv]
INDUSTRIAL: NON-ENERGY-RELATED			
▲ Assembly plants, manufacturing facilities, industrial machinery	Adhesives; chemical; textiles; apparel and furniture upholstery; clay, glass, and stone products production; asphalt materials; cement manufacturers, wood products; paperboard containers and boxes; metal plating; metal and canned food product fabrication; auto manufacturing; food processing; printing and publishing; drug, vitamins, and pharmaceuticals; dyes; paints; pesticides; photographic chemicals; polish and wax; consumer products; metal and mineral smelters and foundries; fiberboard; floor tile and cover; wood and metal furniture and fixtures; leather and leather products; general industrial and metalworking machinery; musical instruments; office supplies; rubber products and plastics production; saw mills; solvent recycling; shingle and siding; surface coatings	VOCs, air toxics, including diesel PM, NOx, PM, CO, SOx	Yes
INDUSTRIAL: ENERGY AND UTILITIES			
▲ Water and sewer operations	Pumping stations; air vents; treatment	VOCs, air toxics, NOx, CO, SOx, PM10	Yes
▲ Power generation and distribution	Power plant boilers and heaters; portable diesel engines; gas turbine engines	NOx, diesel PM, NOx, CO, SOx, PM10, VOCs	Yes
▲ Refinery operations	Refinery boilers and heaters; coke cracking units; valves and flanges; flares	VOCs, air toxics, including diesel PM, NOx, CO, SOx, PM10	Yes
▲ Oil and gas extraction	Oil recovery systems; uncovered wells	NOx, diesel PM, VOCs, CO, SOx, PM10	Yes
▲ Gasoline storage, transmission, and marketing	Above and below ground storage tanks; floating roof tanks; tank farms; pipelines	VOCs, air toxics, including diesel PM, NOx, CO, SOx, PM10	Yes
▲ Solid and hazardous waste treatment, storage, and disposal activities.	Landfills; methane digester systems; process recycling facility for concrete and asphalt materials	VOCs, air toxics, NOx, CO, SOx, PM10	Yes
CONSTRUCTION (NON-TRANSPORTATION)			
	Building construction; demolition sites	PM (re-entrained road dust), asbestos, diesel PM, NOx, CO, SOx, PM10, VOCs	Limited; state and federal off-road equipment standards

(1) Land Use Classifications – by Activity[i]	(2) Facility or Project Examples	(3) Key Pollutants[ii,iii]	(4) Air Pollution Permits[iv]
DEFENSE			
	Ordnance and explosives demolition; range and testing activities; chemical production; degreasing; surface coatings; vehicle refueling; vehicle and engine operations and maintenance	VOCs, air toxics, including diesel PM, NOx, CO, SOx, PM10	Limited; prescribed burning; equipment and solvent rules
TRANSPORTATION			
▲ Vehicular movement	Residential area circulation systems; parking and idling at parking structures; drive-through establishments; car washes; special events; schools; shopping malls, etc.	VOCs, NOx, PM (re-entrained road dust) air toxics e.g., benzene, diesel PM, formaldehyde, acetaldehyde, 1,3 butadiene, CO, SOx, PM10	No
▲ Road construction and surfacing	Street paving and repair; new highway construction and expansion	VOCs, air toxics, including diesel PM, NOx, CO, SOx, PM10	No
▲ Trains	Railroads; switch yards; maintenance yards	VOCs, NOx, CO, SOx, PM10, air toxics, including diesel PM	Limited; Applicable state and federal MV standards, and possible equipment rules
▲ Marine and port activities	Recreational sailing; commercial marine operations; hotelling operations; loading and un-loading; servicing; shipping operations; port or marina expansion; truck idling		
▲ Aircraft	Takeoff, landing, and taxiing; aircraft maintenance; ground support activities		
▲ Mass transit and school buses	Bus repair and maintenance		
NATURAL RESOURCES			
▲ Farming operations	Agricultural burning; diesel operated engines and heaters; small food processors; pesticide application; agricultural off-road equipment	Diesel PM, VOCs, NOx, PM10, CO, SOx, pesticides	Limited[vi]; Agricultural burning requirements, applicable state and federal mobile source standards; pesticide rules
▲ Livestock and dairy operations	Dairies and feed lots	Ammonia, VOCs, PM10	Yes[vii]
▲ Logging	Off-road equipment e.g., diesel fueled chippers, brush hackers, etc.	Diesel PM, NOx, CO, SOx, PM10, VOCs	Limited; Applicable state/federal mobile source standards
▲ Mining operations	Quarrying or stone cutting; mining; drilling or dredging	PM10, CO, SOx, VOCs, NOx, and asbestos in some geographical areas	Applicable equipment rules and dust controls

(1) **Land Use Classifications – by Activity**[i]	(2) **Facility or Project Examples**	(3) **Key Pollutants**[ii,iii]	(4) **Air Pollution Permits**[iv]
RESIDENTIAL			
Housing	Housing developments; retirement developments; affordable housing	Fireplace emissions (PM10, NOx, VOCs, CO, air toxics); Water heater combustion (NOx, VOCs, CO)	No[vii]
ACADEMIC AND INSTITUTIONAL			
▲ Schools, including school-related recreational activities	Schools; school yards; vocational training labs/classrooms such as auto repair/painting and aviation mechanics	Air toxics	Yes/No[viii]
▲ Medical waste	Incineration	Air toxics, NOx, CO, PM10	Yes
▲ Clinics, hospitals, convalescent homes		Air toxics	Yes

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[i] These classifications were adapted from the American Planning Association's "Land Based Classification Standards." The Standards provide a consistent model for classifying land uses based on their characteristics. The model classifies land uses by refining traditional categories into multiple dimensions, such as activities, functions, building types, site development character, and ownership constraints. Each dimension has its own set of categories and subcategories. These multiple dimensions allow users to have precise control over land-use classifications. For more information, the reader should refer to the Association's website at http://www.planning.org/LBCS/GeneralInfo/.

[ii] This column includes key criteria pollutants and air toxic contaminants that are most typically associated with the identified source categories.

Additional information on specific air toxics that are attributed to facility categories can be found in ARB's Emission Inventory Criteria and Guidelines Report for the Air Toxics Hot Spots Program (May 15, 1997). This information can be viewed at ARB's web site at http://www.arb.ca.gov/ab2588/final96/guide96.pdf.

Criteria air pollutants are those air pollutants for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set. Criteria pollutants include ozone (formed by the reaction of volatile organic compounds and nitrogen oxides in the presence of sunlight), particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead.

Volatile organic compounds (VOCs) combine with nitrogen oxides to form ozone, as well as particulate matter. VOC emissions result primarily from incomplete fuel combustion and the evaporation of chemical solvents and fuels. On-road mobile sources are the largest contributors to statewide VOC emissions. Stationary sources of VOC emissions include processes that use solvents (such as dry-cleaning, degreasing, and coating operations) and petroleum-related processes (such as petroleum refining, gasoline marketing and dispensing, and oil and gas extraction). Areawide VOC sources include consumer products, pesticides, aerosols and paints, asphalt paving and roofing, and other evaporative emissions.

Nitrogen oxides (NOx) are a group of gaseous compounds of nitrogen and oxygen, many of which contribute to the formation of ozone and particulate matter. Most NOx emissions are produced by the combustion of fuels. Mobile sources make up about 80 percent of the total statewide NOx emissions. Mobile sources include on-road vehicles and trucks, aircraft, trains, ships, recreational boats, industrial and construction equipment, farm equipment, off-road recreational vehicles, and other equipment. Stationary sources of NOx include both internal and external combustion processes in industries such as manufacturing, food processing, electric utilities, and petroleum refining. Areawide source, which include residential fuel combustion, waste burning, and fires, contribute only a small portion of the total statewide NOx emissions, but depending on the community, may contribute to a cumulative air pollution impact.

Particulate matter (PM) refers to particles small enough to be breathed into the lungs (under 10 microns in size). It is not a single substance, but a mixture of a number of highly diverse types of particles and liquid droplets. It can be formed directly, primarily as dust from vehicle travel on paved and unpaved roads, agricultural operations, construction and demolition.

Carbon monoxide (CO) is a colorless and odorless gas that is directly emitted as a by-product of combustion. The highest concentrations are generally associated with cold stagnant weather conditions that occur during winter. CO problems tend to be localized.

An Air Toxic Contaminant (air toxic) is defined as an air pollutant that may cause or contribute to an increase in mortality or in serous illness, or which may pose a present or potential hazard to human health. Similar to criteria pollutants, air toxics are emitted from stationary, areawide, and mobile sources. They contribute to elevated regional and localized risks near industrial and commercial facilities and busy roadways. The ten compounds that pose the greatest statewide risk are: acetaldehyde; benzene; 1,3-butadiene; carbon tetrachloride; diesel particulate matter (diesel PM); formaldehyde; hexavalent chromium; methylene chloride; para-dichlorobenzene; and perchloroethylene. The risk from diesel PM is by far the largest, representing about 70 percent of the known statewide cancer risk from outdoor air toxics. The exhaust from diesel-fueled engines is a complex mixture of gases, vapors, and particles, many of which are known human carcinogens. Diesel PM is emitted from both mobile and stationary sources. In California, on-road diesel-fueled vehicles contribute about 26 percent of statewide diesel PM emissions, with an additional 72 percent attributed to other mobile sources such as construction and mining equipment, agricultural equipment, and other equipment. Stationary engines in shipyards, warehouses, heavy equipment repair yards, and oil and gas production operations contribute about two percent of statewide emissions. However, when this number is disaggregated to a sub-regional scale such as neighborhoods, the risk factor can be far greater.

[iii] The level of pollution emitted is a major determinant of the significance of the impact.

[iv] Indicates whether facility activities listed in column 4 are generally subject to local air district permits to operate. This does not include regulated products such as solvents and degreasers that may be used by sources that may not require an operating permit per se, e.g., a gas station or dry cleaner.

[v] Generally speaking, warehousing or distribution centers are not subject to local air district permits. However, depending on the district, motor vehicle fleet rules may apply to trucks or off-road vehicles operated and maintained by the facility operator. Additionally, emergency generators or internal combustion engines operated on the site may require an operating permit.

[vi] Authorized by recent legislation SB700.

[vii] Local air districts do not require permits for woodburning fireplaces inside private homes. However, some local air districts and land use agencies do have rules or ordinances that require new housing developments or home re-sales to install U.S. EPA –certified stoves. Some local air districts also ban residential woodburning during weather inversions that concentrate smoke in residential areas. Likewise, home water heaters are not subject to permits; however, new heaters could be subject to emission limits that are imposed by federal or local agency regulations.

[viii] Technical training schools that conduct activities normally permitted by a local air district could be subject to an air permit.

LAND USE-BASED REFERENCE TOOLS TO EVALUATE NEW PROJECTS FOR POTENTIAL AIR POLLUTION IMPACTS

Land use agencies generally have a variety of tools and approaches at hand, or accessible from local air districts that can be useful in performing an analysis of potential air pollution impacts associated with new projects. These tools and approaches include:

- Base map of the city or county planning area and terrain elevations.
- General Plan designations of land use (existing and proposed).
- Zoning maps.
- Land use maps that identify existing land uses, including the location of facilities that are permitted or otherwise regulated by the local air district. Land use agencies should consult with their local air district for information on regulated facilities.
- Demographic data, e.g., population location and density, distribution of population by income, distribution of population by ethnicity, and distribution of population by age. The use of population data is a normal part of the planning process. However, from an air quality perspective, socioeconomic data is useful to identify potential community health and environmental justice issues.
- Emissions, monitoring, and risk-based maps created by the ARB or local air districts that show air pollution-related health risk by community across the state.
- Location of public facilities that enhance community quality of life, including parks, community centers, and open space.
- Location of industrial and commercial facilities and other land uses that use hazardous materials, or emit air pollutants. These include chemical storage facilities, hazardous waste disposal sites, dry cleaners, large gas dispensing facilities, auto body shops, and metal plating and finishing shops.
- Location of sources or facility types that result in diesel on-road and off-road emissions, e.g., stationary diesel power generators, forklifts, cranes, construction equipment, on-road vehicle idling, and operation of transportation refrigeration units. Distribution centers, marine terminals and ports, rail yards, large industrial facilities, and facilities that handle bulk goods are all examples of complex facilities where these types of emission sources are frequently concentrated.[1] Very large facilities, such as ports, marine terminals, and airports, could be analyzed regardless of proximity to a receptor if they are within the modeling area.
- Location and zoning designations for existing and proposed schools, buildings, or outdoor areas where sensitive individuals may live or play.
- Location and density of existing and proposed residential development.
- Zoning requirements, property setbacks, traffic flow requirements, and idling restrictions for trucks, trains, yard hostlers[2], construction equipment, or school buses.
- Traffic counts (including diesel truck traffic counts), within a community to validate or augment existing regional motor vehicle trip and speed data.

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[1] The ARB is currently evaluating the types of facilities that may act as complex point sources and developing methods to identify them.

[2] Yard hostler means a tractor less than 300 horsepower that is used to transfer semi-truck or tractor-trailer containers in and around storage, transfer, or distribution yards or areas and is often equipped with a hydraulic lifting fifth wheel for connection to trailer containers.

ARB AND LOCAL AIR DISTRICT INFORMATION AND TOOLS CONCERNING CUMULATIVE AIR POLLUTION IMPACTS

It is the ARB's policy to support research and data collection activities toward the goal of reducing cumulative air pollution impacts. These efforts include updating and improving the air toxics emissions inventory, performing special air monitoring studies in specific communities, and conducting a more complete assessment of non-cancer health effects associated with air toxics and criteria pollutants.[1] This information is important because it helps us better understand links between air pollution and the health of sensitive individuals -- children, the elderly, and those with pre-existing serious health problems affected by air quality.

ARB is working with CAPCOA and OEHHA to improve air pollutant data and evaluation tools to determine when and where cumulative air pollution impacts may be a problem. The following provides additional information on this effort.

<u>How are emissions assessed?</u>

Detailed information about the sources of air pollution in an area is collected and maintained by local air districts and the ARB in what is called an emission inventory. Emission inventories contain information about the nature of the business, the location, type and amount of air pollution emitted, the air pollution-producing processes, the type of air pollution control equipment, operating hours, and seasonal variations in activity. Local districts collect emission inventory data for most stationary source categories.

Local air districts collect air pollution emission information directly from facilities and businesses that are required to obtain an air pollution operating permit. Local air districts use this information to compile an emission inventory for areas within their jurisdiction. The ARB compiles a statewide emission inventory based on the information collected by the ARB and local air districts. Local air districts provide most of the stationary source emission data, and ARB provides mobile source emissions as well as some areawide emission sources such as consumer products and paints. ARB is also developing map-based tools that will display information on air pollution sources.

Criteria pollutant data have been collected since the early 1970's, and toxic pollutant inventories began to be developed in the mid-1980's.

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[1] A criteria pollutant is any air pollutant for which EPA has established a National Ambient Air Quality Standard or for which California has established a State Ambient Air Quality Standard, including: carbon monoxide, lead, nitrogen oxides, ozone, particulates and sulfur oxides. Criteria pollutants are measured in each of California's air basins to determine whether the area meets or does not meet specific federal or state air quality standards. Air toxics or air toxic contaminants are listed pollutants recognized by California or EPA as posing a potential risk to health.

How is the toxic emission inventory developed?

Emissions data for toxic air pollutants is a high priority for communities because of concerns about potential health effects. Most of ARB's air toxics data is collected through the toxic "Hot Spots" program. Local air districts collect emissions data from industrial and commercial facilities. Facilities that exceed health-based thresholds are required to report their air toxics emissions as part of the toxic "Hot Spots" program and update their emissions data every four years. Facilities are required to report their air toxics emissions data if there is an increase that would trigger the reporting threshold of the hotspots program. Air toxics emissions from motor vehicles and consumer products are estimated by the ARB. These estimates are generally regional in nature, reflecting traffic and population.

The ARB also maintains chemical speciation profiles that can be used to estimate toxics emissions when no toxic emissions data is available.

What additional toxic emissions information is needed?

In order to assess cumulative air pollution impacts, updated information from individual facilities is needed. Even for sources where emissions data are available, additional information such as the location of emissions release points is often needed to better model cumulative impacts. In terms of motor vehicles, emissions data are currently based on traffic models that only contain major roads and freeways. Local traffic data are needed so that traffic emissions can be more accurately assigned to specific streets and roads. Local information is also needed for off-road emission sources, such as ships, trains, and construction equipment. In addition, hourly maximum emissions data are needed for assessing acute air pollution impacts.

What work is underway?

ARB is working with CAPCOA to improve toxic emissions data, developing a community health air pollution information system to improve access to emission information, conducting neighborhood assessment studies to better understand toxic emission sources, and conducting surveys of sources of toxic pollutants.

How is air pollution monitored?

While emissions data identify how much air pollution is going into the air, the state's air quality monitoring network measures air pollutant levels in outdoor air. The statewide air monitoring network is primarily designed to measure regional exposure to air pollutants, and consists of more than 250 air monitoring sites.

The air toxics monitoring network consists of approximately 20 permanent sites. These sites are supplemented by special monitoring studies conducted by ARB and local air districts. These sites measure approximately sixty toxic air pollutants. Diesel PM, which is the major driver of urban air toxic risk, is not monitored directly. Ten of the

60 toxic pollutants, not including diesel, account for most of the remaining potential cancer risk in California urban areas.

What additional monitoring has been done?

Recently, additional monitoring has been done to look at air quality at the community level. ARB’s community monitoring was conducted in six communities located throughout the state. Most sites were in low-income, minority communities located near major sources of air pollution, such as refineries or freeways. The monitoring took place for a year or more in each community, and included measurements of both criteria and toxic pollutants.

What is being learned from community monitoring?

In some cases, the ARB or local air districts have performed air quality monitoring or modeling studies covering a particular region of the state. When available, these studies can give information about regional air pollution exposures.

The preliminary results of ARB’s community monitoring are providing insights into air pollution at the community level. Urban background levels are a major contributor to the overall risk from air toxics in urban areas, and this urban background tends to mask the differences between communities. When localized elevated air pollutant levels were measured, they were usually associated with local ground-level sources of toxic pollutants. The most common source of this type was busy streets and freeways. The impact these ground-level sources had on local air quality decreased rapidly with distance from the source. Pollutant levels usually returned to urban background levels within a few hundred meters of the source.

These results indicate that tools to assess cumulative impacts must be able to account for both localized, near-source impacts, as well as regional background air pollution. The tools that ARB is developing for this purpose are air quality models.

How can air quality modeling be used?

While air monitoring can directly measure cumulative exposure to air pollution, it is limited because all locations cannot be monitored. To address this, air quality modeling provides the capability to estimate exposure when air monitoring is not feasible. Air quality modeling can be refined to assess local exposure, identify locations of potential hot spots, and identify the relative contribution of emission sources to exposure at specific locations. The ARB has used this type of information to develop regional cumulative risk maps that estimate the cumulative cancer air pollution risk for most of California. While these maps only show one air pollution-related health risk, it does provide a useful starting point.

What is needed for community modeling?

Air quality models have been developed to assess near-source impacts, but they have very exacting data requirements. These near-source models estimate the impact of local sources, but do not routinely include the contribution from regional air pollution background. To estimate cumulative air pollution exposure at a neighborhood scale, a modeling approach needs to combine features of both micro-scale and regional models.

In addition, improved methods are needed to assess near-source impacts under light and variable wind conditions, when high local concentrations are more likely to occur. A method for modeling long-term exposure to air pollutants near freeways and other high traffic areas is also needed.

What modeling work has ARB developed?

A key component of ARB's Community Health Program is the Neighborhood Assessment Program (NAP). As described later in this section, the NAP studies are being conducted to better understand pollution impacts at the community level. Through two such studies conducted in Barrio Logan (San Diego) and Wilmington (Los Angeles), ARB is refining community-level modeling methodologies. Regional air toxics modeling is also being performed to better understand regional air pollution background levels.

In a parallel effort, ARB is developing modeling protocols for estimating cumulative emissions, exposure, and risk from air pollution. The protocols will cover modeling approaches and uncertainties, procedures for running the models, the development of statewide risk maps, and methods for estimating health risks. The protocols are subject to an extensive peer review process prior to release.

How are air pollution impacts on community health assessed?

On a statewide basis, ARB's toxic air contaminant program identifies and reduces public exposure to air toxics. The focus of the program has been on reducing potential cancer risk, because monitoring results show potential urban cancer risk levels are too high. ARB has also looked for potential non-cancer risks based on health reference levels provided by OEHHA. On a regional basis, the pollutants measured in ARB's toxic monitoring network are generally below the OEHHA non-cancer reference exposure levels.

As part of its community health program, the ARB is looking at potential cancer and non-cancer risk. This could include chronic or acute health effects. If the assessment work shows elevated exposures on a localized basis, ARB will work with OEHHA to assess the health impacts.

What tools has ARB developed to assess cumulative air pollution impacts?

ARB has developed the following tools and reports to assist land use agencies and local air districts assess and reduce cumulative emissions, exposure, and risk on a neighborhood scale.

Statewide Risk Maps

ARB has produced regional risk maps that show the statewide trends for Southern and Central California in estimated potential cancer risk from air toxics between 1990 and 2010.[2] These maps will supplement U.S. EPA's ASPEN model and are available on the ARB's Internet site. These maps are best used to obtain an estimate of the regional background air pollution health risk and are not detailed enough to estimate the exact risk at a specific location.

ARB also has maps that focus in more detail on smaller areas that fall within the Southern and Central California regions for these same modeled years. The finest visual resolution available in the maps on this web site is two by two kilometers. These maps are not detailed enough to assess individual neighborhoods or facilities.

Community Health Air Pollution Information System (CHAPIS)

CHAPIS is an Internet-based procedure for displaying information on emissions from sources of air pollution in an easy to use mapping format. CHAPIS uses Geographical Information System (GIS) software to deliver interactive maps over the Internet. CHAPIS relies on emission estimates reported to the ARB's emission inventory database - California Emissions Inventory Development and Reporting System, or CEIDARS.

Through CHAPIS, air district staff can quickly and easily identify pollutant sources and emissions within a specified area. CHAPIS contains information on air pollution emissions from selected large facilities and small businesses that emit criteria and toxic air pollutants. It also contains information on air pollution emissions from motor vehicle and areawide emissions. CHAPIS does not contain information on every source of air pollution or every air pollutant. It is a major long-term objective of CHAPIS to include all of the largest air pollution sources and those with the highest documented air pollution risk. CHAPIS will be updated on a periodic basis and additional facilities will be added to CHAPIS as more data becomes available.

CHAPIS is being developed in stages to assure data quality. The initial release of CHAPIS will include facilities emitting 10 or more tons per year of nitrogen oxides, sulfur dioxide, carbon monoxide, PM10, or reactive organic gases; air toxics from refineries and power plants of 50 megawatts or more; and facilities that conducted health risk

[2]ARB maintains state trends and local potential cancer risk maps that show statewide trends in potential inhalable cancer risk from air toxics between 1990 and 2010. This information can be viewed at ARB's web site at http://www.arb.ca.gov/toxics/cti/hlthrisk/hlthrisk.htm)

assessments under the California Air Toxics “Hot Spots” Information and Assessment Program.[3]

CHAPIS can be used to identify the emission contributions from mobile, area, and point sources on that community.

“Hot Spots” Analysis and Reporting Program (HARP)

HARP[4] is a software package available from the ARB and is designed with air quality professionals in mind. It models emissions and release data from one or more facilities to estimate the potential health risk posed by the selected facilities on the neighboring community. HARP uses the latest risk assessment guidelines published by OEHHA.

With HARP, a user can perform the following tasks:

- Create and manage facility databases;
- Perform air dispersion modeling;
- Conduct health risk analyses;
- Output data reports; and
- Output results to GIS mapping software.

HARP can model downwind concentrations of air toxics based on the calculated emissions dispersion at a single facility. HARP also has the capability of assessing the risk from multiple facilities, and for multiple locations of concern near those facilities. While HARP has the capability to assess multiple source impacts, there had been limited application of the multiple facility assessment function in the field at the time of HARP’s debut in 2003. HARP can also evaluate multi-pathway, non-inhalation health risk resulting from air pollution exposure, including skin and soil exposure, and ingestion of meat and vegetables contaminated with air toxics, and other toxics that have accumulated in a mother’s breast milk.

Neighborhood Assessment Program (NAP)

The NAP[5] has been a key component of ARB’s Community Health Program. It includes the development of tools that can be used to perform assessments of cumulative air pollution impacts on a neighborhood scale. The NAP studies have been done to better understand how air pollution affects individuals at the neighborhood level. Thus far, ARB has conducted neighborhood scale assessments in Barrio Logan and Wilmington.

As part of these studies, ARB is collecting data and developing a modeling protocol that can be used to conduct cumulative air pollution impact assessments. Initially these

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[3] California Health & Safety Code section 44300, et seq.
[4] More detailed information can be found on ARB’s website at: http://www.arb.ca.gov/toxics/harp/harp.htm
[5] For more information on the Program, please refer to: http://www.arb.ca.gov/ch/programs/nap/nap.htm

assessments will focus on cumulative inhalation cancer health risk and chronic non-cancer impacts. The major challenge is developing modeling methods that can combine both regional and localized air pollution impacts, and identifying the critical data necessary to support these models. The objective is to develop methods and tools from these studies that can ultimately be applied to other areas of the state. In addition, the ARB plans to use these methods to replace the ASPEN regional risk maps currently posted on the ARB Internet site.

Urban Emissions Model (URBEMIS)

URBEMIS[6] is a computer program that can be used to estimate emissions associated with land development projects in California such as residential neighborhoods, shopping centers, office buildings, and construction projects. URBEMIS uses emission factors available from the ARB to estimate vehicle emissions associated with new land uses. URBEMIS estimates sulfur dioxide emissions from motor vehicles in addition to reactive organic gases, nitrogen oxides, carbon monoxide, and PM10.

Land-Use Air Quality Linkage Report[7]

This report summarizes data currently available on the relationships between land use, transportation and air quality. It also highlights strategies that can help to reduce the use of the private automobile. It also briefly summarizes two ARB-funded research projects. The first project analyzes the travel patterns of residents living in five higher density, mixed use neighborhoods in California, and compares them to travel in more auto-oriented areas. The second study correlates the relationship between travel behavior and community characteristics, such as density, mixed land uses, transit service, and accessibility for pedestrians.

[6] For more information on this model, please refer to ARB's website at http://www.arb.ca.gov/html/soft.htm.
[7] To access this report, please refer to ARB's website or click on: http://www.arb.ca.gov/ch/programs/link97.pdf

LAND USE AND AIR QUALITY AGENCY ROLES IN THE LAND USE PROCESS

A wide variety of federal, state, and local government agencies are responsible for regulatory, planning, and siting decisions that can have an impact on air pollution. They include local land use agencies, regional councils of government, school districts, local air districts, ARB, the California Department of Transportation (Caltrans), and the Governor's Office of Planning and Research (OPR) to name a few. This Section will focus on the roles and responsibilities of local and state agencies. The role of school districts will be discussed in Appendix E.

Local Land Use Agencies

Under the State Constitution, land use agencies have the primary authority to plan and control land use.[1] Each of California's incorporated cities and counties are required to adopt a comprehensive, long-term General Plan.[2]

The General Plan's long-term goals are implemented through zoning ordinances. These are local laws adopted by counties and cities that describe for specific areas the kinds of development that will be allowed within their boundaries.

Land use agencies are also the lead for doing environmental assessments under CEQA for new projects that may pose a significant environmental impact, or for new or revised General Plans.

Local Agency Formation Commissions (LAFCOs)

Operating in each of California's 58 counties, LAFCOs are composed of local elected officials and public members who are responsible for coordinating changes in local governmental boundaries, conducting special studies that review ways to reorganize, simplify, and streamline governmental structures, and preparing a sphere of influence for each city and special district within each county. Each Commission's efforts are directed toward seeing that local government services are provided efficiently and economically while agricultural and open-space lands are protected. LAFCO decisions strive to balance the competing needs in California for efficient services, affordable housing, economic opportunity, and conservation of natural resources.

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[1] The legal basis for planning and land use regulation is the "police power" of the city or county to protect the public's health, safety and welfare. The California Constitution gives cities and counties the power to make and enforce all local police, sanitary and other ordinances and regulations not in conflict with general laws. State law reference: California Constitution, Article XI §7.
[2] OPR General Plan Guidelines, 2003: http://www.opr.ca.gov/planning/PDFs/General_Plan_Guidelines_2003.pdf

Councils of Government (COG)

COGs are organizations composed of local counties and cities that serve as a focus for the development of sound regional planning, including plans for transportation, growth management, hazardous waste management, and air quality. They can also function as the metropolitan planning organization for coordinating the region's transportation programs. COGs also prepare regional housing need allocations for updates of General Plan housing elements.

Local Air Districts

Under state law, air pollution control districts or air quality management districts (local air districts) are the local government agencies responsible for improving air quality and are generally the first point of contact for resolving local air pollution issues or complaints. There are 35 local air districts in California[3] that have authority and primary responsibility for regional clean air planning. Local air districts regulate stationary sources of air pollutants within their jurisdiction including but not limited to industrial and commercial facilities, power plants, construction activities, outdoor burning, and other non-mobile sources of air pollution. Some local air districts also regulate public and private motor vehicle fleet operators such as public bus systems, private shuttle and taxi services, and commercial truck depots.

- **Regional Clean Air Plans**

Local air districts are responsible for the development and adoption of clean air plans that protect the public from the harmful effects of air pollution. These plans incorporate strategies that are necessary to attain ambient air quality standards. Also included in these regional air plans are ARB and local district measures to reduce statewide emissions from mobile sources, consumer products, and industrial sources.

- **Facility-Specific Considerations**

Permitting. In addition to the planning function, local air districts adopt and enforce regulations, issue permits, and evaluate the potential environmental impacts of projects.

Pollution is regulated through permits and technology-based rules that limit emissions from operating units within a facility or set standards that vehicle fleet operators must meet. Permits to construct and permits to operate contain very specific requirements and conditions that tell each regulated source what it must do to limit its air pollution in compliance with local air district rules, regulations, and state law. Prior to receiving a permit, new facilities must go through a New Source Review (NSR) process that establishes air pollution control requirements for the facility. Permit conditions are typically contained in the permit to operate and specify requirements that businesses must follow; these may include limits on the amount of pollution that can be emitted, the

[3] Contact information for local air districts in California is listed in the front of this Handbook.

type of pollution control equipment that must be installed and maintained, and various record-keeping requirements.

Local air districts also notify the public about new permit applications for major new facilities, or major modifications to existing facilities that seek to locate within 1,000 feet of a school.

Local air districts can also regulate other types of sources to reduce emissions. These include regulations to reduce emissions from the following sources:

- hazardous materials in products used by industry such as paints, solvents, and de-greasers;
- agricultural and residential burning;
- leaking gasoline nozzles at service stations;
- public fleet vehicles such as sanitation trucks and school buses; and
- fugitive or uncontrolled dust at construction sites.

However, while emissions from industrial and commercial sources are typically subject to the permit authority of the local air district, sensitive sites such as a day care center, convalescent home, or playground are not ordinarily subject to an air permit. Local air district permits address the air pollutant emissions of a project but not its location.

Under the state's air toxics program, local air districts regulate air toxic emissions by adopting ARB air toxic control measures, or more stringent district-specific requirements, and by requiring individual facilities to perform a health risk assessment if emissions at the source exceed district-specific health risk thresholds[4], [5] (See the section on ARB programs for a more detailed summary of this program).

One approach by which local air districts regulate air toxics emissions is through the "Hot Spots" program.[6] The risk assessments submitted by the facilities under this

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[4] Cal/EPA's Office of Environmental Health Hazard Assessment has published "A Guide to Health Risk Assessment" for lay people involved in environmental health issues, including policymakers, businesspeople, members of community groups, and others with an interest in the potential health effects of toxic chemicals. To access this information, please refer to http://www.oehha.ca.gov/pdf/HRSguide2001.pdf

[5] Section 44306 of the California Health & Safety Code defines a health risk assessment as a detailed comprehensive analysis that a polluting facility uses to evaluate and predict the dispersion of hazardous substances in the environment and the potential for exposure of human populations, and to assess and quantify both the individual and population-wide health risks associated with those levels of exposure.

[6] AB-2588 (the Air Toxics "Hot Spots" Information and Assessment Act) requires local air districts to prioritize facilities by high, intermediate, and low priority categories to determine which must perform a health risk assessment. Each district is responsible for establishing the prioritization score threshold at which facilities are required to prepare a health risk assessment. In establishing priorities for each facility, local air districts must consider the potency, toxicity, quantity, and volume of hazardous materials released from the facility, the proximity of the facility to potential receptors, and any other factors that the district determines may indicate that the facility may pose a significant risk. All facilities within the highest category must prepare a health risk assessment. In addition, each district may require facilities in the intermediate and low priority categories to also submit a health risk assessment.

Table D-1
Local Sources of Air Pollution, Responsible Agencies, and Associated Regulatory Programs

Source	Examples	Primary Agency	Applicable Regulations
Large Stationary	Refineries, power plants, chemical facilities, certain manufacturing plants	Local air districts	Operating permit rules Air Toxics "Hot Spots" Law (AB 2588) Local district rules Air Toxic Control Measures (ATCMs)* New Source Review rules Title V permit rules
Small Stationary	Dry cleaners, auto body shops, welders, chrome plating facilities, service stations, certain manufacturing plants	Local air districts	Operating permit conditions, Air Toxics "Hot Spots" Law (AB 2588) Local district rules ATCMs* New Source Review rules
Mobile (non-fleet)	Cars, trucks, buses	ARB	Emission standards Cleaner-burning fuels (e.g., unleaded gasoline, low-sulfur diesel) Inspection and repair programs (e.g., Smog Check)
Mobile Equipment	Construction equipment	ARB, U.S. EPA	ARB rules U.S. EPA rules
Mobile (fleet)	Truck depots, school buses, taxi services	Local air districts, ARB	Local air district rules ARB urban bus fleet rule
Areawide	Paints and consumer products such as hair spray and spray paint	Local air district, ARB	ARB rules Local air district rules

*ARB adopts ATCMs, but local air districts have the responsibility to implement and enforce these measures or more stringent ones.

program are reviewed by OEHHA and approved by the local air district. Risk assessments are available by contacting the local air district.

Enforcement. Local air districts also take enforcement action to ensure compliance with air quality requirements. They enforce air toxic control measures, agricultural and residential burning programs, gasoline vapor control regulations, laws that prohibit air pollution nuisances, visible emission limits, and many other requirements designed to clean the air. Local districts use a variety of enforcement tools to ensure compliance. These include notices of violation, monetary penalties, and abatement orders. Under some circumstances, a permit may be revoked.

- **Environmental Review**

As required by the California Environmental Quality Act (CEQA), local air districts also review and comment on proposed land use plans and development projects that can have a significant effect on the environment or public health.[7]

California Air Resources Board

The ARB is the air pollution control agency at the state level that is responsible for the preparation of air plans required by state and federal law. In this regard, it coordinates the activities of all local air districts to ensure all statutory requirements are met and to reduce air pollution emissions for sources under its jurisdiction.

Motor vehicles are the single largest emissions source category under ARB's jurisdiction as well as the largest overall emissions source statewide. ARB also regulates emissions from other mobile equipment and engines as well as emissions from consumer products such as hair sprays, perfumes, cleaners, and aerosol paints.

Air Toxics Program

Under state law, the ARB has a critical role to play in the identification, prioritization, and control of air toxic emissions. The ARB statewide comprehensive air toxics program was established in the early 1980's. The Toxic Air Contaminant Identification and Control Act of 1983 (AB 1807, Tanner 1983) created California's program to reduce exposure to air toxics.[8] The Air Toxics "Hot Spots" Information and Assessment Act (Hot Spots program) supplements the AB 1807 program, by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks.

Under AB 1807, the ARB is required to use certain criteria to prioritize the identification and control of air toxics. In selecting substances for review, the ARB must consider criteria relating to emissions, exposure, and health risk, as well as persistence in the atmosphere, and ambient concentrations in the community. AB 1807 also requires the ARB to use available information gathered from the Hot Spots program when prioritizing compounds.

The ARB identifies pollutants as toxic air contaminants and adopts statewide air toxic control measures (ATCMs). Once ARB adopts an ATCM, local air districts must

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[7] Section 4 of this Handbook contains more information on the CEQA process.
[8] For a general background on California's air toxics program, the reader should refer to ARB's website at http://www.arb.ca.gov/toxics/tac/appendxb.htm.

implement the measure, or adopt and implement district-specific measures that are at least as stringent as the state standard. Taken in the aggregate, these ARB programs will continue to further reduce emissions, exposure, and health risk statewide.

With regard to the land use decision-making process, ARB, in conjunction with local air districts, plays an advisory role by providing technical information on land use-related air issues.

Other Agencies

Governor's Office of Planning and Research (OPR)

In addition to serving as the Governor's advisor on land use planning, research, and liaison with local government, OPR develops and implements the state's policy on land use planning and coordinates the state's environmental justice programs. OPR updated its General Plan Guidelines in 2003 to highlight the importance of sustainable development and environmental justice policies in the planning process. OPR also advises project proponents and government agencies on CEQA provisions and operates the State Clearinghouse for environmental and federal grant documents.

California Department of Housing and Community Development

The Department of Housing and Community Development (HCD) administers a variety of state laws, programs and policies to preserve and expand housing opportunities, including the development of affordable housing. All local jurisdictions must update their housing elements according to a staggered statutory schedule, and are subject to certification by HCD. In their housing elements, cities and counties are required to include a land inventory which identifies and zones sites for future residential development to accommodate a mix of housing types, and to remove barriers to the development of housing.

An objective of state housing element law is to increase the overall supply and affordability of housing. Other fundamental goals include conserving existing affordable housing, improving the condition of the existing housing stock, removing regulatory barriers to housing production, expanding equal housing opportunities, and addressing the special housing needs of the state's most vulnerable residents (frail elderly, disabled, large families with children, farmworkers, and the homeless).

Transportation Agencies

Transportation agencies can also influence mobile source-related emissions in the land use decision-making process. Local transportation agencies work with land use agencies to develop a transportation (circulation) element for the General Plan. These local government agencies then work with other transportation-related agencies, such as the Congestion Management Agency (CMA), Metropolitan Planning Organization

(MPO), Regional Transportation Planning Agency (RTPA), and Caltrans to develop long and short range transportation plans and projects.

Caltrans is the agency responsible for setting state transportation goals and for state transportation planning, design, construction, operations and maintenance activities. Caltrans is also responsible for delivering California's multibillion-dollar state Transportation Improvement Program, a list of transportation projects that are approved for funding by the California Transportation Commission in a 4-year cycle.

When safety hazards or traffic circulation problems are identified in the existing road system, or when land use changes are proposed such as a new residential subdivision, shopping mall or manufacturing center, Caltrans and/or the local transportation agency ensure the projects meet applicable state, regional, and local goals and objectives.

Caltrans also evaluates transportation-related projects for regional air quality impacts, from the perspective of travel-related emissions as well as road congestion and increases in road capacity (new lanes).

California Energy Commission (CEC)

The CEC is the state's CEQA lead agency for permitting large thermal power plants (50 megawatts or greater). The CEC works closely with local air districts and other federal, state and local agencies to ensure compliance with applicable laws, ordinances, regulations and standards in the permitting, construction, operation and closure of such plants. The CEC uses an open and public review process that provides communities with outreach and multiple opportunities to participate and be heard. In addition to its comprehensive environmental impact and engineering design assessment process, the CEC also conducts an environmental justice evaluation. This evaluation involves an initial demographic screening to determine if a qualifying minority or low-income population exists in the vicinity of the proposed project. If such a population is present, staff considers possible environmental justice impacts including from associated project emissions in its technical assessments.[9]

Department of Pesticides Regulation (DPR)

Pesticides are industrial chemicals produced specifically for their toxicity to a target pest. They must be released into the environment to do their job. Therefore, regulation of pesticides focuses on using toxicity and other information to ensure that when pesticides are used according to their label directions, potential for harm to people and the environment is minimized. DPR imposes strict controls on use, beginning before pesticide products can be sold in California, with an extensive scientific program to ensure they can be used safely. DPR and county enforcement staff tracks the use of pesticides to ensure that pesticides are used properly. DPR collects periodic

[9] See California Energy Commission, "Environmental Performance Report," July 2001 at http://www.energy.ca.gov/reports/2001-11-20_700-01-001.PDF

measurements of any remaining amounts of pesticides in water, air, and on fresh produce. If unsafe levels are found, DPR requires changes in how pesticides are used, to reduce the possibility of harm. If this cannot be done - that is, if a pesticide cannot be used safely - use of the pesticide will be banned in California.[10]

Federal Agencies

Federal agencies have permit authority over activities on federal lands and certain resources, which have been the subject of congressional legislation, such as air, water quality, wildlife, and navigable waters. The U.S. Environmental Protection Agency generally oversees implementation of the federal Clean Air Act, and has broad authority for regulating certain activities such as mobile sources, air toxics sources, the disposal of toxic wastes, and the use of pesticides. The responsibility for implementing some federal regulatory programs such as those for air and water quality and toxics is delegated by management to specific state and local agencies. Although federal agencies are not subject to CEQA they must follow their own environmental process established under the National Environmental Policy Act (NEPA).

[10] For more information, the reader is encouraged to visit the Department of Pesticide Regulation web site at www.cdpr.ca.gov/docs/empm/pubs/tacmenu.htm.

SPECIAL PROCESSES THAT APPLY TO SCHOOL SITING

The California Education Code and the California Public Resources Code place primary authority for siting public schools with the local school district, which is the 'lead agency' for purposes of CEQA. The California Education Code requires public school districts to notify the local planning agency about siting a new public school or expanding an existing school. The planning agency then reports back to the school district regarding a project's conformity with the adopted General Plan. However, school districts can overrule local zoning and land use designations for schools if they follow specified procedures. In addition, all school districts must evaluate new school sites using site selection standards established in Section 14010 of Title 5 of the California Code of Regulations. Districts seeking state funding for school site acquisition must also obtain site approval from the California Department of Education.

Before making a final decision on a school site acquisition, a school district must comply with CEQA and evaluate the proposed site acquisition/new school project for air emissions and health risks by preparing and certifying an environmental impact report or negative declaration. Both the California Education Code section 17213 and the California Public Resources Code section 21151.8 require school districts to consult with administering agencies and local air districts when preparing the environmental assessment. Such consultation is required to identify both permitted and non-permitted "facilities" that might significantly affect health at the new site. These facilities include, but are not limited to, freeways and other busy traffic corridors, large agricultural operations, and rail yards that are within one-quarter mile of the proposed school site, and that might emit hazardous air emissions, or handle hazardous or acutely hazardous materials, substances, or waste.

As part of the CEQA process and before approving a school site, the school district must make a finding that either it found none of the facilities or significant air pollution sources, or alternatively, if the school district finds that there are such facilities or sources, it must determine either that they pose no significant health risks, or that corrective actions by another governmental entity would be taken so that there would be no actual or potential endangerment to students or school workers.

In addition, if the proposed school site boundary is within 500 feet of the edge of the closest traffic lane of a freeway or traffic corridor that has specified minimum average daily traffic counts, the school district is required to determine through specified risk assessment and air dispersion modeling that neither short-term nor long term exposure poses significant heath risks to pupils.

State law changes effective January 1, 2004 (SB352, Escutia 2003, amending Education Code section 17213 and Public Resources Code section 21151.8) also provides for cases in which the school district cannot make either of those two findings and cannot find a suitable alternative site. When this occurs, the school district must adopt a statement of over-riding considerations, as part of an environmental impact report, that the project should be approved based on the ultimate balancing of the merits.

Some school districts use a standardized assessment process to determine the environmental impacts of a proposed school site. In the assessment process, school districts can use maps and other available information to evaluate risk, including a local air district's database of permitted source emissions. School districts can also perform field surveys and record searches to identify and calculate emissions from non-permitted sources within one-quarter mile radius of a proposed site. Traffic count data and vehicular emissions data can also be obtained from Caltrans for major roadways and freeways in proximity to the proposed site to model potential emissions impacts to students and school employees. This information is available from the local COG, Caltrans, or local cities and counties for non-state maintained roads.

GENERAL PROCESSES USED BY LAND USE AGENCIES TO ADDRESS AIR POLLUTION IMPACTS

There are several separate but related processes for addressing the air pollution impacts of land use projects. One takes place as part of the planning and zoning function. This consists of preparing and implementing goals and policies contained in county or city General Plans, community or area plans, and specific plans governing land uses such as residential, educational, commercial, industrial, and recreational activities. It also includes recommending locations for thoroughfares, parks and other public improvements.

Land use agencies also have a permitting function that includes performing environmental reviews and mitigation when projects may pose a significant environmental impact. They conduct inspections for zoning permits issued, enforce the zoning regulations and issue violations as necessary, issue zoning certificates of compliance, and check compliance when approving certificates of occupancy.

Planning

- **General Plan**[1]

The General Plan is a local government "blueprint" of existing and future anticipated land uses for long-term future development. It is composed of the goals, policies, and general elements upon which land use decisions are based. Because the General Plan is the foundation for all local planning and development, it is an important tool for implementing policies and programs beneficial to air quality. Local governments may choose to adopt a separate air quality element into their General Plan or to integrate air quality-beneficial objectives, policies, and strategies in other elements of the Plan, such as the land use, circulation, conservation, and community design elements.

More information on General Plan elements is contained in Appendix D.

- **Community Plans**

Community or area plans are terms for plans that focus on a particular region or community within the overall general plan area. It refines the policies of the general plan as they apply to a smaller geographic area and is implemented by ordinances and other discretionary actions, such as zoning.

[1] In October 2003, OPR revised its General Plan Guidelines. An entire chapter is now devoted to a discussion of how sustainable development and environmental justice goals can be incorporated into the land use planning process. For further information, the reader is encouraged to obtain a copy of OPR's General Plan Guidelines, or refer to their website at: http://www.opr.ca.gov/planning/PDFs/General_Plan_Guidelines_2003.pdf

- **Specific Plan**

A specific plan is a hybrid that can combine policies with development regulations or zoning requirements. It is often used to address the development requirements for a single project such as urban infill or a planned community. As a result, its emphasis is on concrete standards and development criteria.

- **Zoning**

Zoning is the public regulation of the use of land. It involves the adoption of ordinances that divide a community into various districts or zones. For instance, zoning ordinances designate what projects and activities can be sited in particular locations. Each zone designates allowable uses of land within that zone, such as residential, commercial, or industrial. Zoning ordinances can address building development standards, e.g., minimum lot size, maximum building height, minimum building setback, parking, signage, density, and other allowable uses.

Land Use Permitting

In addition to the planning and zoning function, land use agencies issue building and business permits, and evaluate the potential environmental impacts of projects. To be approved, projects must be located in a designated zone and comply with applicable ordinances and zoning requirements.

Even if a project is sited properly in a designated zone, a land use agency may require a new source to mitigate potential localized environmental impacts to the surrounding community below what would be required by the local air district. In this case, the land use agency could condition the permit by limiting or prescribing allowable uses including operating hour restrictions, building standards and codes, property setbacks between the business property and the street or other structures, vehicle idling restrictions, or traffic diversion.

Land use agencies also evaluate the environmental impacts of proposed land use projects or activities. If a project or activity falls under CEQA, the land use agency requires an environmental review before issuing a permit to determine if there is the potential for a significant impact, and if so, to mitigate the impact or possibly deny the project.

- **Land Use Permitting Process**

In California, the authority to regulate land use is delegated to city and county governments. The local land use planning agency is the local government administrative body that typically provides information and coordinates the review of development project applications. Conditional Use Permits (CUP) typically fall within a land use agency's discretionary authority and therefore are subject to CEQA. CUPs are intended to provide an opportunity to review the location, design, and manner of development of land uses prior to project approval. A traditional purpose of the CUP is to enable a municipality to control certain uses that could have detrimental environmental effects on the community.

The process for permitting new discretionary projects is quite elaborate, but can be broken down into five fundamental components:

- Project application
- Environmental assessment
- Consultation
- Public comment
- Public hearing and decision

Project Application

The permit process begins when the land use agency receives a project application, with a detailed project description, and support documentation. During this phase, the agency reviews the submitted application for completeness. When the agency deems the application to be complete, the permit process moves into the environmental review phase.

Environmental Assessment

If the project is discretionary and the application is accepted as complete, the project proposal or activity must undergo an environmental clearance process under CEQA and the CEQA Guidelines adopted by the California Resources Agency.[2] The purpose of the CEQA process is to inform decision-makers and the public of the potential significant environmental impacts of a project or activity, to identify measures to minimize or eliminate those impacts to the point they are no longer significant, and to discuss alternatives that will accomplish the project goals and objectives in a less environmentally harmful manner.

What is a "Lead Agency"?

A lead agency is the public agency that has the principal responsibility for carrying out or approving a project that is subject to CEQA. In general, the land use agency is the preferred public agency serving as lead agency because it has jurisdiction over general land uses. The lead agency is responsible for determining the appropriate environmental document, as well as its preparation.

What is a "Responsible Agency"?

A responsible agency is a public agency with discretionary approval authority over a portion of a CEQA project (e.g., projects requiring a permit). As a responsible agency, the agency is available to the lead agency and project proponent for early consultation on a project to apprise them of applicable rules and regulations, potential adverse impacts, alternatives, and mitigation measures, and provide guidance as needed on applicable methodologies or other related issues.

What is a "Commenting Agency"?

A commenting agency is any public agency that comments on a CEQA document, but is neither a lead agency nor a responsible agency. For example, a local air district, as the agency with the responsibility for comprehensive air pollution control, could review and comment on an air quality analysis in a CEQA document for a proposed distribution center, even though the project was not subject to a permit or other pollution control requirements.

[2] Projects and activities that may have a significant adverse impact on the environment are evaluated under CEQA Guidelines set forth in title 14 of the California Code of Regulations, sections 15000 et seq.

To assist the lead agency in determining whether the project or activity may have a significant effect that would require the preparation of an EIR, the land use agency may consider criteria, or thresholds of significance, to assess the potential impacts of the project, including its air quality impacts. The land use agency must consider any credible evidence in addition to the thresholds, however, in determining whether the project or activity may have a significant effect that would trigger the preparation of an EIR.

The screening criteria to determine significance is based on a variety of factors, including local, state, and federal regulations, administrative practices of other public agencies, and commonly accepted professional standards. However, the final determination of significance for individual projects is the responsibility of the lead agency. In the case of land use projects, the lead agency would be the City Council or County Board of Supervisors.

A new land use plan or project can also trigger an environmental assessment under CEQA if, among other things, it will expose sensitive sites such as schools, day care centers, hospitals, retirement homes, convalescence facilities, and residences to substantial pollutant concentrations.[3]

CEQA only applies to "discretionary projects." Discretionary means the public agency must exercise judgment and deliberation when deciding to approve or disapprove a particular project or activity, and may append specific conditions to its approval. Examples of discretionary projects include the issuance of a CUP, re-zoning a property, or widening of a public road. Projects that are not subject to the exercise of agency discretion, and can therefore be approved administratively through the application of set standards are referred to as ministerial projects. CEQA does not apply to ministerial projects.[4] Examples of typical ministerial projects include the issuance of most building permits or a business license.

Once a potential environmental impact associated with a project is identified through an environmental assessment, mitigation must be considered. A land use agency should incorporate mitigation measures that are suggested by the local air district as part of the project review process.

<u>Consultation</u>

Application materials are provided to various departments and agencies that may have an interest in the project (e.g., air pollution, building, police, fire, water agency, Fish and Game, etc.) for consultation and input.

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[3] Readers interested in learning more about CEQA should contact OPR or visit their website at http://www.opr.ca.gov/.

[4] See California Public Resources Code section 21080(b)(1).

Public Comment

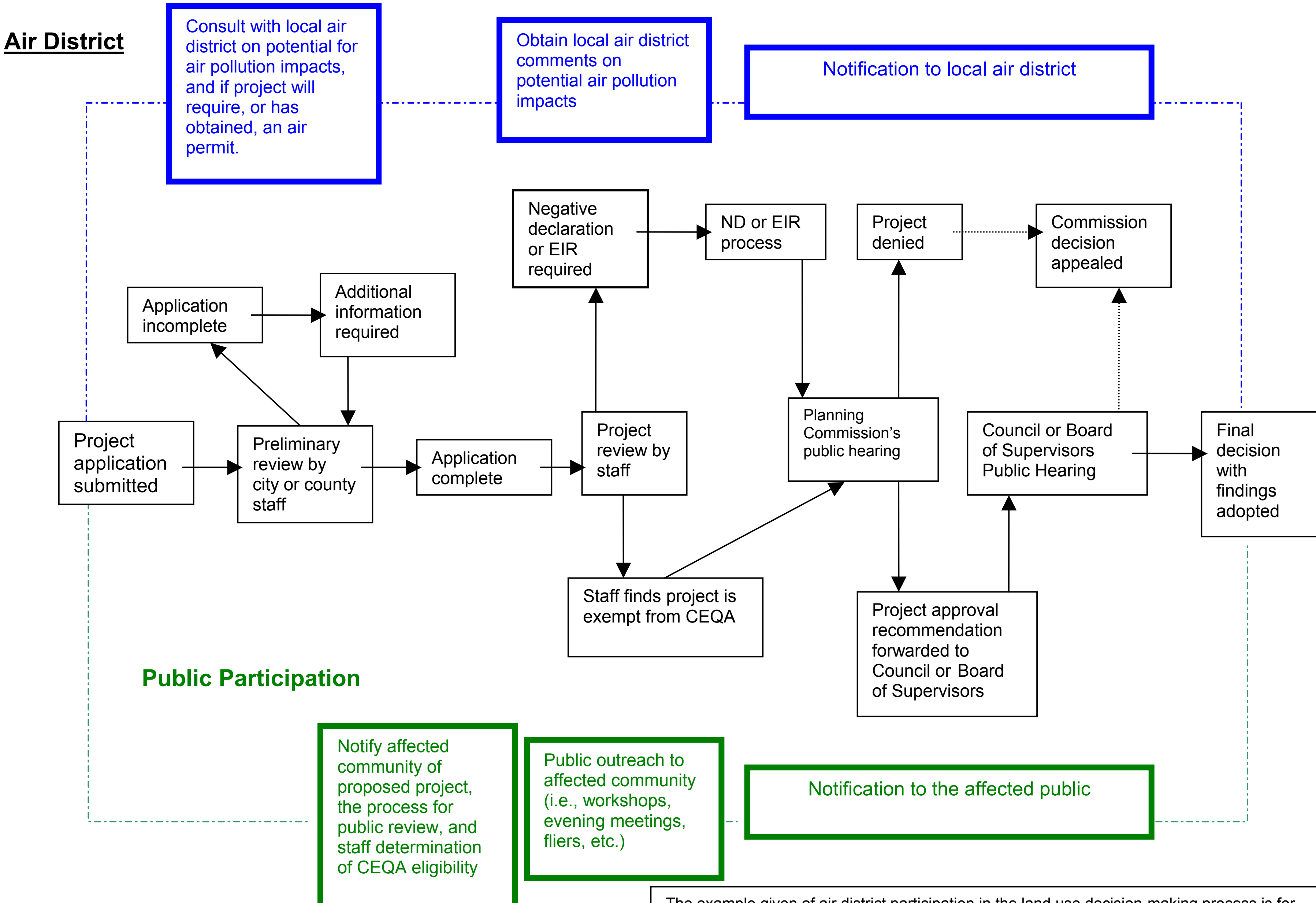
Following the environmental review process, the Planning Commission reviews application along with the staff's report on the project assessment and a public comment period is set and input is solicited.

Public Hearing and Decision

Permit rules vary depending on the particular permit authority in question, but the process generally involves comparing the proposed project with the land use agency standards or policies. The procedure usually leads to a public hearing, which is followed by a written decision by the agency or its designated officer. Typically, a project is approved, denied, or approved subject to specified conditions.

APPENDIX F

USE PERMIT (DISCRETIONARY ACTION) REVIEW PROCESS*



The example given of air district participation in the land use decision-making process is for illustrative purposes only. In reality, the land use siting process involves the ongoing participation of multiple affected agencies and stakeholders throughout the process.

GLOSSARY OF KEY AIR POLLUTION TERMS

Air Pollution Control Board or Air Quality Management Board: Serves as the governing board for local air districts. It consists of appointed or elected members from the public or private sector. It conducts public hearings to adopt local air pollution regulations.

Air Pollution Control Districts or Air Quality Management Districts (local air district): A county or regional agency with authority to regulate stationary and area sources of air pollution within a given county or region. Governed by a district air pollution control board.

Air Pollution Control Officer (APCO): Head of a local air pollution control or air quality management district.

Air Toxic Control Measures (ATCM): A control measure adopted by the ARB (Health and Safety Code section 39666 et seq.), which reduces emissions of toxic air contaminants.

Ambient Air Quality Standards: An air quality standard defines the maximum amount of a pollutant that can be present in the outdoor air during a specific time period without harming the public's health. Only U.S. EPA and the ARB may establish air quality standards. No other state has this authority. Air quality standards are a measure of clean air. More specifically, an air quality standard establishes the concentration at which a pollutant is known to cause adverse health effects to sensitive groups within the population, such as children and the elderly. Federal standards are referred to as National Ambient Air Quality Standards (NAAQS); state standards are referred to as California ambient air quality standards (CAAQS).

Area-wide Sources: Sources of air pollution that individually emit small amounts of pollution, but together add up to significant quantities of pollution. Examples include consumer products, fireplaces, road dust, and farming operations.

Attainment vs. Nonattainment Area: An attainment area is a geographic area that meets the National Ambient Air Quality Standards for the criteria pollutants and a non-attainment area is a geographic area that doesn't meet the NAAQS for criteria pollutants.

Attainment Plan: Attainment plans lay out measures and strategies to attain one or more air quality standards by a specified date.

California Clean Air Act (CCAA): A California law passed in 1988, which provides the basis for air quality planning and regulation independent of federal regulations. A major element of the Act is the requirement that local air districts in violation of the CAAQS must prepare attainment plans which identify air quality problems, causes, trends, and actions to be taken to attain and maintain California's air quality standards by the earliest practicable date.

California Environmental Quality Act (CEQA): A California law that sets forth a process for public agencies to make informed decisions on discretionary project approvals. The process helps decision-makers determine whether any potential, significant, adverse environmental impacts are associated with a proposed project and to identify alternatives and mitigation measures that will eliminate or reduce such adverse impacts.[1]

California Health and Safety Code: A compilation of California laws, including state air pollution laws, enacted by the Legislature to protect the health and safety of people in California. Government agencies adopt regulations to implement specific provisions of the California Health and Safety Code.

Clean Air Act (CAA): The federal Clean Air Act was adopted by the United States Congress and sets forth standards, procedures, and requirements to be implemented by the U.S. Environmental Protection Agency (U.S. EPA) to protect air quality in the United States.

Councils of Government (COGs): There are 25 COGs in California made up of city and county elected officials. COGs are regional agencies concerned primarily with transportation planning and housing; they do not directly regulate land use.

Criteria Air Pollutant: An air pollutant for which acceptable levels of exposure can be determined and for which an ambient air quality standard has been set. Examples include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and PM10 and PM2.5. The term "criteria air pollutants" derives from the requirement that the U.S. EPA and ARB must describe the characteristics and potential health and welfare effects of these pollutants. The U.S. EPA and ARB periodically review new scientific data and may propose revisions to the standards as a result.

District Hearing Board: Hears local air district permit appeals and issues variances and abatement orders. The local air district board appoints the members of the hearing board.

Emission Inventory: An estimate of the amount of pollutants emitted into the atmosphere from mobile, stationary, area-wide, and natural source categories over a specific period of time such as a day or a year.

Environmental Impact Report (EIR): The public document used by a governmental agency to analyze the significant environmental effects of a proposed project, to identify

[1] To track the submittal of CEQA documents to the State Clearinghouse within the Office of Planning and Research, the reader can refer to CEQAnet at http://www.ceqanet.ca.gov.

alternatives, and to disclose possible ways to reduce or avoid the possible negative environmental impacts.

Environmental Justice: California law defines environmental justice as the fair treatment of people of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (California Government Code sec.65040.12(c)).

General Plans: A statement of policies developed by local governments, including text and diagrams setting forth objectives, principles, standards, and plan proposals for the future physical development of the city or county.

Hazardous Air Pollutants (HAPs): An air pollutant listed under section 112 (b) of the federal Clean Air Act as particularly hazardous to health. U.S. EPA identifies emission sources of hazardous air pollutants, and emission standards are set accordingly. In California, HAPs are referred to as toxic air contaminants.

Land Use Agency: Local government agency that performs functions associated with the review, approval, and enforcement of general plans and plan elements, zoning, and land use permitting. For purposes of this Handbook, a land use agency is typically a local planning department.

Mobile Source: Sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats, and airplanes.

National Ambient Air Quality Standard (NAAQS): A limit on the level of an outdoor air pollutant established by the US EPA pursuant to the Clean Air Act. There are two types of NAAQS. Primary standards set limits to protect public health and secondary standards set limits to protect public welfare.

Negative Declaration (ND): When the lead agency (the agency responsible for preparing the EIR or ND) under CEQA, finds that there is no substantial evidence that a project may have a significant environmental effect, the agency will prepare a "negative declaration" instead of an EIR.

New Source Review (NSR): A federal Clean Air Act requirement that state implementation plans must include a permit review process, which applies to the construction and operation of new or modified stationary sources in nonattainment areas. Two major elements of NSR to reduce emissions are best available control technology requirements and emission offsets.

Office of Planning and Research (OPR): OPR is part of the Governor's office. OPR has a variety of functions related to local land-use planning and environmental programs. It provides General Plan Guidelines for city and county planners, and coordinates the state clearinghouse for Environmental Impact Reports.

Ordinance: A law adopted by a City Council or County Board of Supervisors. Ordinances usually amend, repeal or supplement the municipal code; provide zoning specifications; or appropriate money for specific purposes.

Overriding Considerations: A ruling made by the lead agency in the CEQA process when the lead agency finds the importance of the project to the community outweighs potential adverse environmental impacts.

Public Comment: An opportunity for the general public to comment on regulations and other proposals made by government agencies. You can submit written or oral comments at the public meeting or send your written comments to the agency.

Public Hearing: A public hearing is an opportunity to testify on a proposed action by a governing board at a public meeting. The public and the media are welcome to attend the hearing and listen to, or participate in, the proceedings.

Public Notice: A public notice identifies the person, business, or local government seeking approval of a specific course of action (such as a regulation). It describes the activity for which approval is being sought, and describes the location where the proposed activity or public meeting will take place.

Public Nuisance: A public nuisance, for the purposes of air pollution regulations, is defined as a discharge from any source whatsoever of such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. (Health and Safety Code section 41700).

Property Setback: In zoning parlance, a setback is the minimum amount of space required between a lot line and a building line.

Risk: For cancer health effects, risk is expressed as an estimate of the increased chances of getting cancer due to facility emissions over a 70-year lifetime. This increase in risk is expressed as chances in a million (e.g.,10 chances in a million).

Sensitive Individuals: Refers to those segments of the population most susceptible to poor air quality (i.e., children, the elderly, and those with pre-existing serious health problems affected by air quality).

Sensitive Sites or Sensitive Land Uses: Land uses where sensitive individuals are most likely to spend time, including schools and schoolyards, parks and playgrounds, day care centers, nursing homes, hospitals, and residential communities.

Setback: An area of land separating one parcel of land from another that acts to soften or mitigate the effects of one land use on the other.

State Implementation Plan (SIP): A plan prepared by state and local agencies and submitted to U.S. EPA describing how each area will attain and maintain national ambient air quality standards. SIPs include the technical information about emission inventories, air quality monitoring, control measures and strategies, and enforcement mechanisms. A SIP is composed of local air quality management plans and state air quality regulations.

Stationary Sources: Non-mobile sources such as power plants, refineries, and manufacturing facilities.

Toxic Air Contaminant (TAC): An air pollutant, identified in regulation by the ARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process (California Health and Safety Code section 39650 et seq.) than pollutants subject to State Ambient Air Quality Standards. Health effects associated with TACs may occur at extremely low levels. It is often difficult to identify safe levels of exposure, which produce no adverse health effects.

Urban Background: The term is used in this Handbook to represent the ubiquitous, elevated, regional air pollution levels observed in large urban areas in California.

Zoning ordinances: City councils and county boards of supervisors adopts zoning ordinances that set forth land use classifications, divides the county or city into land use zones as delineated on the official zoning, maps, and set enforceable standards for future develop

From: <MKrell1026@aol.com>
Date: Sun, Jun 12, 2016 at 5:24 PM
Subject: Landmark Apartments Project
To: alejandro.huerta@lacity.org
Cc: tricia.keane@lacity.org, ezra.gale@lacity.org, debbie.dynerharris@lacity.org, klonner@burnsbouchard.com, LWatts@seyfarth.com

Dear Mr. Huerta:

I am writing on behalf of the board and members of the South Brentwood Residents Association. SBRA represents approximately 13,000 home-owners and renters who reside in the area south of San Vicente Blvd., north of Wilshire Blvd., east of Centinela Ave. and west of Federal Ave. Additionally, SBRA represents the interests of those in multi-family dwellings throughout the entire Brentwood community.

The representatives of the Landmark Apartment Project have presented their project to our board several times. SBRA strongly supports the change from a market to much needed housing as there are numerous markets within a short distance of the project.
SBRA also supports the concept of replacing a parking lot with a secured park which can be enjoyed by both Landmark Apartment residents, office workers and the community.

Sincerely,

Marylin Krell,
Marylin Krell,
President, SBRA

cc:
Tricia Keane
Ezra Gale
Debbie Dyner-Harris
Kristen Lonner
Larry Watts

South Brentwood Residents Association
149 South Barrington Ave. #194
Los Angeles, California 90049

June 12, 2016

Alejandro A. Huerta
Major Projects and Environmental Analysis
Department of City Planning-City Hall
City of Los Angeles
200 North Spring Street Rm. 750
Los Angeles, CA 90012

Via email: alejandro.huerta@lacity.org

Re: Landmark Apartments Project ENV-2013-3747-EIR

Dear Mr. Huerta:
I am writing on behalf of the board and members of the South Brentwood Residents Association. SBRA represents approximately 13,000 home-owners and renters who reside in the area south of San Vicente Blvd., north of Wilshire Blvd., east of Centinela Ave. and west of Federal Ave. Additionally, SBRA represents the interests of those in multi-family dwellings throughout the entire Brentwood community.

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Sincerely,

Marylin Krell,
Marylin Krell,
President, SBRA

cc:
Tricia Keane
Ezra Gale
Debbie Dyner-Harris
Kristen Lonner
Larry Watts

info@southbrentwood.com • southbrentwood.org • Tel: (310) 281-8566

From: **Donna Aiello** <donnaaiello@msn.com>
Date: Sat, May 21, 2016 at 6:17 PM
Subject: Parking and traffic concerns for Landmark Apartments project
To: "alejandro.huerta@lacity.org" <alejandro.huerta@lacity.org>

Dear Mr. Huerta,
I have lived on Granville my entire life and have seen an area turn into a parking and traffic nightmare. How doesn't a city planner think that more living congestion with less parking spaces won't impact an area. There is currently never any street parking due to the 17 story office building tenants and workers parking on the street. Not sure if this is due to the lack of spaces or not wanting to pay a monthly parking fee. Also the other end of the street is a very large high school that has no parking. I see that the new plan reduces parking spaces. How can that work!! I work 4 miles away and it takes 45 minutes to drive to and from daily. I can walk faster than the busses moving on Wilshire. How does bringing in more people living on top of each other make for a better community?? I understand growth and development but this one doesn't make sense! I am guessing city monetary gains. I don't see how an environmental impact report would not reflect all these big issues especially in the Wilshire region between Barrington and Westgate.
I am sure my voice doesn't count for much but appreciate the opportunity.
Sincerely,
Donna Dooley Aiello
1249 Granville Ave
90025

From: **Shahin Farshchi** <shahin.farshchi@luxcapital.com>
Date: Sat, May 28, 2016 at 5:32 PM
Subject: ENV-2013-3747-EIR / Landmark Apartments Project
To: alejandro.huerta@lacity.org

Alejandro, I am a 13-year resident of 11740 Wilshire which is across the street from the proposed Landmark Apartments Project. I would like to share my concerns, or specifically, objection to this project for the following 3 reasons:

1) There is ***virtually no parking*** on Stoner, Texas, Wilshire, or Granville as it is. The project is proposing removing parking spaces and more than doubling the residences on this tiny street, which will debilitate current residents.
2) The amount of ***congestion*** on Wilshire nears gridlock during rush hour. Again, doubling the traffic amount of through this area will certainly not alleviate the problem.
3) The Stoner/Wilshire intersection is ***dangerous and accidents occur regularly***. Traffic in and out of Stoner will double, while adding another traffic light will likely exacerbate the gridlock problem noted above.

How do you recommend I formally document my concerns with the City of LA?

Best,
Shahin

--
Shahin Farshchi, Ph.D. | Partner | Lux Capital | 925.323.2784 | @farshchi

From: **Jay** <sgrest@aol.com>
Date: Thu, Jun 9, 2016 at 3:37 PM
Subject: Douglas Emmett (ENV2013-3747-EIR)
To: alejandro.huerta@lacity.org
Cc: klonner@burnsbouchard.com

June 9, 2016

Mr. Alejandro Huerta
Department of City Planning
City Hall
200 N. Spring Street, Room 750
Los Angeles, CA 90012

Dear Mr. Huerta,

I am writing to you today regarding the proposed project located on the site at Wilshire Boulevard between Stoner Avenue and Granville Avenue owned by Douglas Emmett (ENV2013-3747-EIR). As you are aware, the applicant is proposing a residential high rise including 376 units of which 16 units are proposed for very low income housing.

Douglas Emmett presented before our neighborhood group in West Los Angeles and also met with me to get additional feedback, as well as many others. They have made a solid effort to outreach to this community and the Brentwood community just across Wilshire Boulevard to ensure they heard any concerns and attempted to address them. Having a residential project at this location is a win for this community as it is an incredibly jobs rich area, including the office high rise that is located on the exact same site. The market use that was previously on this site is not needed in this community and is a traffic generator that is not wanted.

While the jobs housing balance makes this a good project there are other reasons as well. When my fellow community members and I saw this project initially, it included a small restaurant fronting Wilshire Boulevard and a large surface parking lot behind that. There was absolute consensus that we needed more open space on this site. At first, we were talking about green space on the roof of the restaurant. When Douglas Emmett returned to the community they had removed the restaurant and placed a 25,000 square foot park in its place. We have now discussed with them the need to activate the park to be more inviting to community members, and they have agreed.

Another benefit to this project is the cross of uses and the availability of parking. With an office tower and a residential tower on the same site the possibilities of utilizing parking during off hours of either use, are endless. With four levels of underground parking, including 1,122 spaces, that is quite an opportunity.

We are fortunate to have this project being proposed in our community. Douglas Emmett has owned and operated buildings in West Los Angeles and Brentwood for many years. They care about this community and are invested in its success. I am proudly offering my support of this project.

Best

Jay Handal

310-466-0645

P Please consider the environment before printing this email.

To unsubscribe, hit "reply" and type in unsubscribe in the subject box.
For immediate assistance, please call the following numbers:

- Immediate life threatening police, fire or medical emergency: **9-1-1**
- Parking enforcement (blocked driveway, parking violation, locate impounded vehicle): **213-485-4184**
- Police non-emergency: **877-ASK-LAPD (877-275-5273)**
- Sanitation (missed trash pick-up, broken container): **800-773-2489**
- Traffic control (signal light out): **213-485-4184**
- Dept. of Water & Power: **800-342-5397**
- Other City issues: **3-1-1**

From: **Tommy Robinson** <tommy_robinson@westfin.com>
Date: Fri, Jun 3, 2016 at 10:04 AM
Subject: Re: ENV-2013-3747-EIR
To: "alejandro.huerta@lacity.org" <alejandro.huerta@lacity.org>

I would submit that if Douglas-Emmett is asking the community for significant variances in zoning ordinances designed to protect the community from reckless building, that they should give something back to the community. As a 20-year resident of the community, I have seen the problem develop that for a number of reasons now there is a very real lack of parking spots throughout the neighboring streets; so instead of this proposed project reducing the number of available parking spaces, they should increase the number of parking spaces in the garage that can be made available to non-tenants of the complex, and do so at an affordable rate (maybe ~$100/month).

Thomas L. Robinson
Westwood Financial Corp. | *MIT*
11440 San Vicente Boulevard, Ste 200 | Los Angeles, CA 90049
Office: 310.820.5443 | Fax: 310.207.5154
tommy_robinson@westfin.com | *www.westfin.com*

From: **Jay Ross** <ross_jay@hotmail.com>
Date: Wed, May 11, 2016 at 8:08 PM
Subject: ENV-2013-3747-EIR - 11750–11770 Wilshire Boulevard; 1211–1235 Stoner Avenue; 1222 Granville Avenue
To: "alejandro.huerta@lacity.org" <alejandro.huerta@lacity.org>

Mr. Huerta:

My suggestions:

Move the south building north into the area where the surface parking is. That will provide more setback for neighbors to the south.

15-20 ft. rear setback with trees planted at ground level in dirt. No potted plants, no planters with small shrubs. Big trees.

Park should have a wide entrance on the corner (20 ft. wide) with an arch over it that says Wilshire Park – Public Welcome.
Park should have 2000-sf flat grass area at grade. No planters with small plants/shrubs, except for treewells. Developers sometimes use planters for stormwater collection, which is un-usable for recreation, and try to claim it for open space. If that is the case, then the developer needs to re-design the site plan with more flat area for stormwater planters, and separate flat area for play areas.

Unbundled parking, no free parking, free MTA passes for residents and office workers in perpetuity.

Thank you,

Jay Ross
West LA 90064

From: **Josh Stephens** <jrstephens@gmail.com>
Date: Fri, Jun 10, 2016 at 8:02 AM
Subject: Support for 11750 Wilshire
To: Alejandro.huerta@lacity.org

Dear Mr. Huerta,

Please see attached letter regarding the proposed project at 11750 Wilshire. Thank you.

-Josh Stephens

June 9, 2016

Mr. Alejandro Huerta
Department of City Planning
City Hall
200 N. Spring Street, Room 750
Los Angeles, CA 90012

RE: 11750 Wilshire Boulevard; ENV-2013-3747-EIR

Dear Mr. Huerta,

I recently had the opportunity to see a presentation of the above-referenced Douglas Emmett project at the Brentwood Community Council. I previously saw them at our land use committee as well. I am sending in my comment letter to lend my support to their proposal.

As someone who has great respect for good design and well thought-out planning, this project has achieved both. It is clear, as building operators, that they understand the importance of having jobs and housing in close proximity to each other. Most people in our community, where Douglas Emmett operates over 90% of the commercial office buildings, see Douglas Emmett as a commercial operator. Having the foresight to envision a residential tower in the midst of their commercial buildings, is a testament to the leadership at Douglas Emmett and will be a great benefit to this neighborhood.

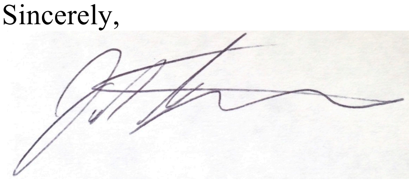
As to the requested zone change, the previous market use on the site is simply unnecessary. There are multiple grocery stores in this area and, frankly, the traffic reduction created by a residential use is welcome. Of course, the true hope being that putting residential this close to jobs will even further reduce traffic, more than is expected.

Another benefit to this project is the proposed green space at the corner of Wilshire and Stoner. This condition is not required by the city but was proposed because the developer received feedback from both our community and West Los Angeles that this area needed greening. I support activation of the park through a coffee kiosk and/or other retail outlet or organized activities. This neighborhood is more dense than many in our communities and this space is greatly needed.

Finally, while Douglas Emmett has shared the benefits of the uses on the site for parking, they have not committed to unbundled parking. As a planner, I believe that unbundled parking is a real benefit and rewards people who are trying to make more transit friendly choices. Therefore, while I support the proposed project, I request that parking be unbundled from the uses.

Thank you for your consideration.

Sincerely,



Josh Stephens
Member, Brentwood Community Council (Land Use Committee)
jrstephens@gmail.com

Note: This letter represents my opinion only; mention of BCC is for identification purposes only.

FORM GEN. 160 (Rev. 8-12)

CITY OF LOS ANGELES

INTER-DEPARTMENTAL CORRESPONDENCE

DATE: July 12, 2016

RECEIVED
CITY OF LOS ANGELES
JUL 21 2016
ENVIRONMENTAL UNIT

TO: Vincent P. Bertoni, Director of Planning
Department of City Planning

Attn: Alejandro A. Huerta, Planning Assistant
Department of City Planning

FROM: Ali Poosti, Division Manager
Wastewater Engineering Services Division
LA Sanitation

SUBJECT: LANDMARK APARTMENTS PROJECT-NOTICE OF COMPLETION AND AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT REPORT

This is in response to your April 28, 2016 letter requesting a review of your proposed mixed-use project located at 11750-11770 Wilshire Blvd, 1211-1235 Stoner Ave, and 1222 Granville Ave, Los Angeles, CA 90025. LA Sanitation has conducted a preliminary evaluation of the potential impacts to the wastewater and stormwater systems for the proposed project.

WASTEWATER REQUIREMENT

LA Sanitation, Wastewater Engineering Services Division (WESD) is charged with the task of evaluating the local sewer conditions and to determine if available wastewater capacity exists for future developments. The evaluation will determine cumulative sewer impacts and guide the planning process for any future sewer improvement projects needed to provide future capacity as the City grows and develops.

Projected Wastewater Discharges for the Proposed Project:

Type Description	Average Daily Flow per Type Description (GPD/UNIT)	Proposed No. of Units	Average Daily Flow (GPD)
Existing			
Supermarket	50 GPD/1000 SQ.FT	42,900 SQ.FT	(2,145)
Proposed			
Residential: Studio	75/DU	79 DU	5,925
1-BDRM	110/DU	226 DU	24,860
2-BDRMS	150/DU	71 DU	10,650
Cafe	720/1000 SQ.FT	800 SQ.FT	576
Leasing Office	120/1000 SQ.FT	1,350 SQ.FT	162
Fitness Room	200/1000 SQ.FT	2,560 SQ.FT	512
Community Room	120/1000 SQ.FT	1,450 SQ.FT	174
Commercial	50/1000 SQ.FT	4,700 SQ.FT	235
Total			**40,949**

File Location: \Div Files\SCAR\CEQA Review\FINAL CEQA Response LTRs \ Landmark Apartments Project – NOC and Availability of Draft EIR.doc

SEWER AVAILABILITY

The sewer infrastructure in the vicinity of your proposed project includes existing 8-inch lines on Stoner Ave and Granville Ave. The sewages from both lines discharge into a 10-inch line on Westgate Ave. and then to a 12-inch line in Mississippi Ave. From Mississippi Ave, the flow feeds into an 18-inch line on Bundy Dr before discharging into a 30-inch line on Granville Ave. Figure 1 shows the details of the sewer system within the vicinity of the project. The current flow level (d/D) in the 8-inch lines cannot be determined at this time without additional gauging.

The current approximate flow level (d/D) and the design capacities at d/D of 50% in the sewer system are as follows:

Pipe Diameter (in)	Pipe Location	Current Gauging d/D (%)	50% Design Capacity
8	Stoner Ave.	*	725,182 GPD
8	Granville Ave.	*	383,730 GPD
8	Ohio Ave.	58	229,323 GPD
10	Westgate Ave.	54	588,015 GPD
12	Mississippi Ave.	53	676,120 GPD
18	Bundy Ave.	52	2.27 MGD
30	Granville Ave.	47	9.61 MGD
30	National Blvd.	56	7.38 MGD
42	Barrington Ave A/W	43	13.8 MGD

* No gauging available

Based on the estimated flows, it appears the sewer system might be able to accommodate the total flow for your proposed project. However, the 30-inch line on National Blvd is slowing reaching its capacity and is currently being addressed by the City. Further detailed gauging and evaluation will be needed as part of the permit process to identify a specific sewer connection point. If the public sewer has insufficient capacity then the developer will be required to build sewer lines to a point in the sewer system with sufficient capacity. A final approval for sewer capacity and connection permit will be made at that time. Ultimately, this sewage flow will be conveyed to the Hyperion Treatment Plant, which has sufficient capacity for the project.

If you have any questions, please call Eduardo Perez of my staff at (323) 342-6207.

STORMWATER REQUIREMENTS

LA Sanitation, Watershed Protection Division (WPD) is charged with the task of ensuring the implementation of the Municipal Stormwater Permit requirements within the City of Los Angeles. We anticipate the following requirements would apply for this project.

POST-CONSTRUCTION MITIGATION REQUIREMENTS

The project requires implementation of stormwater mitigation measures. These requirements are based on Stormwater Low Impact Development (LID) requirements. The projects that are subject to LID are required to incorporate measures to mitigate the impact of stormwater runoff. The requirements are outlined in the guidance manual titled "*Development Best Management Practices Handbook – Part B: Planning Activities*". Current regulations prioritize infiltration, capture/use, and then biofiltration as the preferred stormwater control measures. The relevant documents can be found at: www.lastormwater.org.

It is advised that input regarding LID requirements be received in the early phases of the project from WPD's plan-checking staff.

GREEN STREETS

The City is developing a Green Street Initiative that will require projects to implement Green Street elements in the parkway areas between the roadway and sidewalk of the public right-of-away to capture and retain stormwater and urban runoff to mitigate the impact of stormwater runoff and other environmental concerns. The goals of the Green Street elements are to improve the water quality of stormwater runoff, recharge local ground water basins, improve air quality, reduce the heat island effect of street pavement, enhance pedestrian use of sidewalks, and encourage alternate means of transportation. The Green Street elements may include infiltration systems, biofiltration swales, and permeable pavements where stormwater can be easily directed from the streets into the parkways and can be implemented in conjunction with the LID requirements.

CONSTRUCTION REQUIREMENTS

The project is required to implement stormwater control measures during its construction phase. All projects are subject to a set of minimum control measures to lessen the impact of stormwater pollution. In addition for projects that involve construction during the rainy season that is between October 1 and April 15, a Wet Weather Erosion Control Plan is required to be prepared. Also projects that disturb more than one-acre of land are subject to the California General Construction Stormwater Permit. As part of this requirement a Notice of Intent (NOI) needs to be filed with the State of California and a Storm Water Pollution Prevention Plan (SWPPP) needs to be prepared. The SWPPP must be maintained on-site during the duration of construction.

If there are questions regarding the stormwater requirements, please call Kosta Kaporis at (213) 485-0586, or WPD's plan-checking counter at (213) 482-7066. WPD's plan-checking counter can also be visited at 201 N. Figueroa, 3rd Fl, Station 18.

SOLID RESOURCE REQUIREMENTS

The City has a standard requirement that applies to all proposed residential developments of four or more units or where the addition of floor areas is 25 percent or more, and all other development projects where the addition of floor area is 30 percent or more. Such developments must set aside a recycling area or room for onsite recycling activities. For more details of this requirement, please contact Daniel Hackney of the Special Project Division at (213)485-3684.

EP/AP:as

Attachment: Figure 1 – Sewer Map

c: Kosta Kaporis, LASAN
Daniel Hackney, LASAN
Eduardo Perez, LASAN

Wastewater Engineering Services Division
Bureau of Sanitation
City of Los Angeles

FIGURE 1
Landmark Apartments Project
Sewer Map

0 700 1,400 2,100 2,800 Feet