California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

LOCATION:

South Coast Air Quality Management District Office
Auditorium
21865 Copley Drive
Diamond Bar, California 91765-4182

This facility is accessible by public transit. For transit information, call: (800) 743-3463, http://www.foothilltransit.org/ (This facility is accessible to persons with disabilities.)

September 27, 2007
9:00 a.m.

Item #

07-9-1: Public Health and Improvement in Air Quality: The Contributions of Dr. Henry Gong

In 2004 Gov. Schwarzenegger appointed Dr. Henry Gong to the Air Resources Board as the medical member. In that capacity he contributed the perspective of a physician and researcher to the deliberations of the Board. He maintained an active interest in the Board's research activities and was also an advisor to the annual health research plan. His career and contributions will be highlighted in the health update for the September Board meeting.

07-9-2: Public Meeting to Consider Seven Research Proposals

1. *"On-Road Motor Vehicle Emissions Measurements Including Ammonia, Sulfur Dioxide, and Nitrogen Dioxide," University of Denver, $90,042, Proposal No. 2632-257.*
2. *"Improved Geospatial Forecasting of Commercial Marine Vessels," University of Delaware, $47,954, Proposal No. 2635-257.*
3. *"Cardiopulmonary Health Effects: Toxicity of Semi-volatile and Non-volatile Components of Ultrafine PM," University of California, Irvine, $501,484, Proposal No. 2633-257.*
4. *"Assessing Near-Field Exposures from Distributed Residential Wood Smoke Combustion Sources," California Polytechnic State University, San Luis Obispo, $320,286, Proposal No. 2634-257.*
5. *"Using Lead and Strontium Isotopes to Assess Asian Aerosol Impacts in Urban and Interior California," University of California, Berkeley, $48,983, Proposal No. 2639-257.*
6. *"Evaluation of Efficiency Activities in the Industrial Sector Undertaken in Response to Greenhouse Gas Emission Reduction Targets," University of California Berkeley/Lawrence Berkeley National Laboratory, $95,000, Proposal No. 2638-257.*
7. *"Retail Climate Change Mitigation: Life-Cycle Emission and Energy Efficiency Labels and Standards," University of California, Berkeley, $135,000, Proposal No. 2640-257.*

07-8-4: Public Meeting to Consider Appointment to the Research Screening Committee

Staff will recommend an appointment to the Board's Research Screening Committee. The committee reviews and recommends air pollution research projects to the Board.

07-9-3: Public Hearing to Consider Adoption of a Regulation to Limit Ozone Emissions from Indoor Air Cleaning Devices

As directed by Assembly Bill 2276 (Pavley, 2006), staff proposes the Board limit the ozone emissions from indoor air cleaning devices sold for use in occupied spaces. The proposed regulation would establish a 0.050 parts per million concentration limit for ozone emissions from indoor air cleaners, and require electrical safety certification and specified labeling of products. Over 500,000 Californians who use the highest ozone-emitting devices are estimated to routinely experience ozone levels well above the state ambient air quality standards from those devices. This regulation would prevent such exposures.

07-7-7: <u>CONTINUED FROM JUNE 22:</u> Public Meeting to Consider Approval of the Proposed State Strategy for California's State Implementation Plan (SIP) for the Federal 8-Hour Ozone and PM2.5 Standards

The proposed State Strategy for California's 2007 SIP is a comprehensive strategy that lays out the pathway to achieve federal air quality standards as quickly as possible through a combination of technologically feasible, cost effective, and far reaching measures. At its June 22, 2007 public meeting the Board received comments on the proposed State Strategy and then postponed its consideration. The Board will resume its consideration of the matter.

07-9-4: Public Meeting to Consider Approval of the 2007 Air Quality Management Plan for Attaining the Federal 8-hour Ozone and PM2.5 Standards in the South Coast Air Basin and the Coachella Valley

The Board will consider approval of the proposed 2007 Air Quality Management Plan (AQMP) for attaining the 8-hour ozone and PM2.5 (fine particulates) standards in the South Coast Air Basin, and the 8-hour ozone standard in the Coachella Valley nonattainment area. The proposed 2007 AQMP was developed by the South Coast Air Quality Management District in coordination with the Southern California Association of Governments. It identifies the strategies needed to bring these areas into attainment with the federal PM2.5 standard by 2014 and the federal 8-hour ozone standard by 2023, and proposes transportation conformity budgets for the region.

07-9-5: <u>CONTINUED FROM JUNE 22:</u> Public Meeting to Consider Approval of a Modification to the Current SIP Commitment for Pesticide Emission Reductions in the Ventura County Nonattainment Area

ARB staff will present for the Board's consideration a proposed modification to the current State Implementation Plan (SIP) commitment for pesticide emission reductions in the Ventura County nonattainment area. This item was originally considered at a public meeting held on June 22, 2007. In response to public comments, ARB staff has revised the original proposed released on May 7, 2007, and has prepared a new environmental analysis for the revised proposal.

CLOSED SESSION – LITIGATION

The Board will hold a closed session as authorized by Government Code section 11126(e) to confer with, and receive advice from, its legal counsel regarding the following pending litigation:

Central Valley Chrysler-Jeep, Inc. et al. v. Witherspoon, U.S. District Court (E.D. Cal. – Fresno), No. CIV-F-04-6663 REC LJO.

Fresno Dodge, Inc. et al. v. California Air Resources Board and Witherspoon, Superior Court of California (Fresno County), Case No. 04CE CG03498.

General Motors Corp. et al. v. California Air Resources Board and Witherspoon, Superior Court of California (Fresno County), No. 05CE CG02787.

OPPORTUNITY FOR MEMBERS OF THE BOARD TO COMMENT ON MATTERS OF INTEREST.

Board members may identify matters they would like to have noticed for consideration at future meetings and comment on topics of interest; no formal action on these topics will be taken without further notice.

OPEN SESSION TO PROVIDE AN OPPORTUNITY FOR MEMBERS OF THE PUBLIC TO ADDRESS THE BOARD ON SUBJECT MATTERS WITHIN THE JURISDICTION OF THE BOARD.

Although no formal Board action may be taken, the Board is allowing an opportunity to interested members of the public to address the Board on items of interest that are within the Board's jurisdiction, but that do not specifically appear on the agenda. Each person will be allowed a maximum of three minutes to ensure that everyone has a chance to speak.

TO SUBMIT WRITTEN COMMENTS ON AN AGENDA ITEM IN ADVANCE OF THE MEETING GO TO:
http://www.arb.ca.gov/lispub/comm/bclist.php

IF YOU HAVE ANY QUESTIONS,
PLEASE CONTACT THE CLERK OF THE BOARD
1001 I Street, 23rd Floor, Sacramento, CA 95814

(916) 322-5594
FAX: (916) 322-3928
ARB Homepage: www.arb.ca.gov

To request special accommodation or language needs, please contact the following:

- **For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at 916-323-4916 by voice or through the California Relay Services at 711, to place your request for disability services.**
- **If you are a person with limited English and would like to request interpreter services to be available at the Board meeting, please contact ARB's Bilingual Manager at 916-323-7053.**

THE AGENDA ITEMS LISTED ABOVE MAY BE CONSIDERED IN A DIFFERENT ORDER AT THE BOARD MEETING. THIS WILL BE A ONE-DAY BOARD MEETING HOWEVER, DEPENDING ON THE NUMBER OF THE PUBLIC WHO SIGN UP TO SPEAK, THIS MEETING MAY GO LATE INTO THE EVENING.

SMOKING IS NOT PERMITTED AT MEETINGS OF THE CALIFORNIA AIR RESOURCES BOARD

California Environmental Protection Agency

Air Resources Board

PUBLIC MEETING AGENDA

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September 27, 2007
9:00 a.m.

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TITLE 17. CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF A REGULATION TO LIMIT OZONE EMISSIONS FROM INDOOR AIR CLEANING DEVICES

The Air Resources Board (the Board or ARB) will conduct a public hearing at the time and place noted below to consider adoption of a regulation establishing emission standards and certification, labeling and recordkeeping requirements for indoor air cleaning devices introduced into commerce in California that are used in occupied spaces. The proposed regulation would, among other things, require that such devices be tested and certified not to emit ozone at an emission concentration in excess of 0.050 parts per million (ppm), and prohibit the introduction into California of such devices that exceed this emission standard.

DATE: September 27, 2007

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 East Copley Drive
Diamond Bar, CA 91765-4182

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 27, 2007, and may continue at 8:30 a.m., September 28, 2007. This item may not be considered until September 28, 2007. Please consult the agenda for the meeting, which will be available at least 10 days before September 27, 2007, to determine the day on which this item will be considered.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053.

INFORMATIVE DIGEST OF PROPOSED ACTION AND POLICY STATEMENT OVERVIEW

Sections Affected

Proposed adoption of new sections 94800, 94801, 94802, 94803, 94804, 94805, 94806, 94807, 94808, 94809, and 94810, title 17, California Code of Regulations. The final revised 2007 American National Standards Institute/Underwriters Laboratories, Inc. (ANSI/UL) Standard 867 and ANSI/UL Standard 507 for mechanical devices, would be

incorporated by reference. Ozone emissions would be determined using the final 2007 revision of Section 37 of ANSI/UL Standard 867. The current revised version that is still undergoing ANSI/UL approval is dated June 22, 2007; the final revised Section 37 is expected to be approved in fall 2007.

Background

A number of manufacturers sell devices represented to be air purifiers or air cleaners, which in fact purposely generate large quantities of ozone, the primary component of photochemical smog. Operation of these devices, also known as "ozone generators," in occupied spaces has been known for some time to cause unhealthful ozone exposures, that is, exposure to elevated room ozone concentrations above the health-based state and federal ambient air quality standards for ozone. Currently, Canada does not certify any type of intentional ozone-generating air cleaners for residential use.

Other common types of air cleaners include electrostatic precipitators (ESPs), ionizers, and mechanical filter devices. ESPs and ionizers may emit ozone as a byproduct of their functioning, although the levels are usually much lower than those produced by ozone generators. Mechanical filter devices emit little or no ozone.

Exposure to ozone is a public health concern. Ozone is a highly reactive molecule composed of three atoms of oxygen, and can damage the lungs and airways. Ozone inflames and irritates respiratory tissues, and can worsen asthma symptoms. Ozone exposure can cause coughing, chest tightness and impaired breathing. Elevated exposures have the potential to induce permanent lung damage, and chronic ozone exposure can increase the risk of premature death in persons with poor health. Ozone can also damage plants, fabrics and building materials such as paint, walls, and flooring. Ozone is a primary component of photochemical smog, and has been recognized and regulated as an outdoor air pollutant for many years. The current California outdoor air quality standards for ozone are 0.09 ppm (averaged over one hour) and 0.070 ppm (averaged over eight hours).

The market for air cleaning devices, particularly for residential use, has grown as public concern over indoor air quality has increased. Annual sales of air cleaners have surpassed $400 million nationally. A recent survey found that 14 percent of California households currently own an air cleaner or owned one during the past five years. An estimated 828,000 California residents reside in the approximately 2 percent of households that own an ozone generator, while about 2.8 million people live in the approximately 8 percent of households that own an air cleaner that may emit ozone as a by-product.

In 2006 the Legislature passed Assembly Bill 2276 (Pavley) which was signed into law by Governor Schwarzenegger (stats 2006 ch 770). The legislation enacted Health and Safety Code sections 41985-41986, which direct ARB to regulate ozone emissions from portable air cleaners sold in California that are used in occupied spaces by December 31, 2008.

Description of the Proposed Regulatory Action

The regulation proposed by staff (the proposal) would require that indoor air cleaning devices used in occupied spaces that are introduced into commerce in California must not emit a concentration of more than 0.050 ppm of ozone. The proposed regulation would specify requirements for testing, labeling, certification and record-keeping, and establish specific exemptions as described below.

The proposal would apply to any person or entity who manufactures, sells, supplies, offers for sale, or introduces into commerce into California indoor air cleaning devices that are used in occupied spaces. Under the proposal, indoor air cleaning devices could not be manufactured for use in California 12 months after the effective date of the regulation ("manufacture date"), nor could they be sold, supplied, offered for sale or introduced into commerce in California 9 months after the manufacture date ("sell-through date"), unless the devices are certified by ARB.

Under the proposal, an application for certification of an indoor air cleaning device would be submitted to ARB by a manufacturer, or by a professional association or certification organization on behalf of a manufacturer. Application information would include manufacturer contact information, specified details about the brand and model of the air cleaning device, and specified details about the testing conducted on that model device. All indoor air cleaning devices, unless exempted, would be tested following the ANSI/UL Standard 867, or ANSI/UL Standard 507 for mechanical devices. Ozone emissions would be determined using the 2007 revision of Section 37 of ANSI/UL Standard 867. All testing must be performed by a Nationally Recognized Testing Laboratory (NRTL) recognized by the U.S. Occupational Safety and Health Administration, or by an approved NRTL Program 2 independent laboratory. An appropriate certification mark or listing mark would be shown on each device once that model passes the test. Devices certified for use in California would also have to display a certification label on the product packaging. Specific wording would be required for non-medical devices, while medical devices must be labeled in accordance with federal law.

Specific industrial uses for air cleaning devices as defined would be exempt from the proposed requirements. Also, devices designed to be integrated into heating and air conditioning systems (e.g. "in-duct" systems) would be exempt from the proposed regulation at this time. However, these exemptions may be reevaluated by ARB at a future time. Additionally, based on their known *de minimis* ozone emissions, indoor air cleaning devices using only mechanical filtration would be exempt from the ozone testing requirements after certain required documentation is submitted, but such devices would still have to be tested for electrical safety, and would be subject to labeling requirements.

Finally, under the proposal, manufacturers, distributors, retailers, sellers and testing laboratories would have to maintain production, quality control, sales and testing records for at least three years, and make them available to ARB upon request.

COMPARABLE FEDERAL REGULATIONS

Health and Safety Code section 41986 requires that the proposed regulation be consistent with federal law. The U.S. Food and Drug Administration has promulgated a maximum acceptable level of ozone of 0.05 ppm for medical devices, as well as certain labeling requirements (21 CFR § 801.415). The emission standard in the proposed regulation is equivalent to the federal limit of 0.05 ppm, as required. Health and Safety Code section 41986 also requires that an indoor air cleaning device that is a medical device shall be labeled in compliance with federal law, including Section 801.415 of Title 21 of the Code of Federal Regulations.

AVAILABILITY OF DOCUMENTS AND AGENCY CONTACT PERSONS

The ARB staff has prepared a Staff Report: Initial Statement of Reasons (ISOR) for the proposed regulatory action, which includes a summary of the potential environmental and economic impacts of the proposal and supporting technical documentation. The report is entitled: "Staff Report: Initial Statement of Reasons for the Proposed Regulation to Limit Ozone Emissions from Indoor Air Cleaning Devices."

Copies of the Staff Report and full text of the proposed regulatory language may be accessed on the ARB's web site listed below, or may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990 at least 45 days prior to the scheduled hearing on September 27, 2007.

Upon its completion, the Final Statement of Reasons (FSOR) will be available and copies may be requested from the agency contact persons in this notice, or may be accessed on the ARB's website listed below.

Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Ms. Peggy Jenkins, Manager of the Indoor Exposure Assessment Section, at (916) 323-1504 or by email at mjenkins@arb.ca.gov, or Mr. Chris Jakober, Air Pollution Specialist, at (916) 327-8693 or by email at cjakober@arb.ca.gov.

Further, the agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed are Ms. Alexa Malik, Manager, Board Administration & Regulatory Coordination Unit (BARCU), (916) 322-4011, or Ms. Amy Whiting, Regulations Coordinator, BARCU, (916) 322-6533. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

This notice, the ISOR, and all subsequent regulatory documents, including the Final Statement of Reasons, when completed, are available on the ARB Internet site for this rulemaking at www.arb.ca.gov/regact/2007/iacd07/iacd07.htm.

COSTS TO PUBLIC AGENCIES AND TO BUSINESSES AND PERSONS AFFECTED

The determinations of the Board's Executive Officer concerning the costs or savings necessarily incurred by public agencies and private persons and businesses in reasonable compliance with the proposed regulatory action are presented below and in specific detail in the Staff Report.

Pursuant to Government Code sections 11346.5(a)(5) and 11346.5(a)(6), the Executive Officer has determined that the proposed regulatory action would create costs to the ARB. The ARB is expected to incur ongoing costs of approximately $175,000 per year for one additional staff and contract funds to implement the regulation and enforce compliance. Costs would not be created for any other state agency, or in federal funding to the state. The regulation would not create costs or mandate to any local agency or school district whether or not reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code, or other nondiscretionary cost or savings to state or local agencies.

In developing this regulatory proposal, the ARB staff evaluated the potential economic impacts on representative private persons or businesses. The proposed regulation would affect the manufacturers, distributors, sellers, and consumers of portable indoor air cleaners if the products are marketed for sale in California. The potential economic impact of the regulations would primarily include the cost to test and certify air cleaning devices to meet the 0.050 ppm emission concentration standard for ozone. Additionally, all manufacturers of ozone generators and a few manufacturers of ESPs and ionizers that do not meet the emission limit would also need to redesign their products. Annualized costs for a typical small business (producing an average of three models of air cleaners) during the first five years are estimated to be between $50,000 and $179,000, and for a typical larger share company (producing an average of 6-8 models of air cleaners) are estimated to be between $132,000 and $357,000. These estimates include all aspects of certification, i.e., testing, labeling, redesign for those requiring it, and certification paperwork. The added cost to consumers is estimated to range from $11 to $16 per air cleaner. The total statewide cost to businesses and representative private persons or consumers to comply with the proposed regulation during its lifetime is estimated to be $8,000,000, the cost to businesses, or $12,100,000, the cost to consumers if compliance costs and a profit margin are passed on to consumers. Some small manufacturers may be impacted over the short-term due to costs for testing as well as the possible need for some to redesign certain models. The potential costs, however, are estimated to be insignificant. Costs are also expected to decline rapidly after five years because it is estimated that there would only be turnover costs for the introduction of new models. ARB believes that all of the potential economic impacts are either absorbable or would be passed on to consumers.

Because manufacturers are fully expected, and required, to comply with the regulations, enforcement costs to manufacturers should also be negligible.

The Executive Officer has made an initial determination that the proposed regulatory action would not have a significant statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states or on representative private persons. Of an estimated 61 manufacturers of indoor air cleaning devices, two large manufacturers and at least two smaller manufacturers are based in California. All manufacturers of indoor air cleaning devices marketed for sale in California would be subject to the proposed regulations, so there should be no effect on the business competitiveness of the California-based manufacturers.

In accordance with Government Code section 11346.3, the Executive Officer has determined that the proposed regulatory action would not affect the creation or elimination of jobs within the State of California, the creation of new businesses or elimination of existing businesses within the State of California, or the expansion of businesses currently doing business within the State of California. Overall, the impacts should be absorbable. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the ISOR.

The Executive Officer has also determined, pursuant to title 1, CCR, section 4, that the proposed regulatory action would affect small businesses. Some distributors and retailers of ozone generators are one- and two- person businesses where there may be significant impacts if their manufacturers decide to not seek certification for the California market.

In accordance with Government Code sections 11346.3(c) and 11346.5(a)(11), the Executive Officer has found that the proposal would establish no reporting requirements, but it would establish certain recordkeeping requirements. Under the proposal, businesses would have to maintain certain specified records relating to production, quality control, sales and testing for three years and make them available to the Air Resources Board upon request. The Executive Officer has found that these recordkeeping requirements are necessary for the health, safety, and welfare of the people of the State of California.

Before taking final action on the proposed regulatory action, the Board must determine that no reasonable alternative considered by the Board or that has otherwise been identified and brought to the attention of the Board would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.

SUBMITTAL OF COMMENTS

Interested members of the public may also present comments orally or in writing at the meeting, and in writing or by e-mail before the meeting. To be considered by the Board,

written comments not physically submitted at the meeting must be received **no later than 12:00 noon, September 26, 2007,** and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

Please note that under the California Public Records Act (Government Code section 6250 *et seq.*), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

The Board requests but does not require that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the hearing so that ARB staff and Board Members have time to fully consider each comment. The Board encourages members of the public to bring to the attention of staff in advance of the hearing any suggestions for modification of the proposed regulatory action.

STATUTORY AUTHORITY AND REFERENCES

This regulatory action is proposed under the authority granted to the ARB in Health and Safety Code section 41986. This action is proposed to implement, interpret and make specific sections 41985, 41985.5, and 41986 of the Health and Safety Code; and sections 91000 et seq. of title 17, subchapter 4 (Disclosure of Records) of the California Code of Regulations; 29 CFR 1910.7, 21CFR 801.415; section 201 U.S.C. 321.

HEARING PROCEDURES

The public hearing will be conducted in accordance with the California Administrative Procedure Act, title 2, division 3, part 1, chapter 3.5 (commencing with section 11340) of the Government Code.

Following the public hearing, the Board may adopt the regulatory language as originally proposed, or with nonsubstantial or grammatical modifications. The Board may also adopt the proposed regulatory language with other modifications if the text as modified is sufficiently related to the originally proposed text that the public was adequately placed on notice that the regulatory language as modified could result from the proposed regulatory action. In the event that such modifications are made, the full regulatory text, with the modifications clearly indicated, will be made available to the public for written comment at least 15 days before it is adopted.

The public may request a copy of the modified regulatory text from the ARB's Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

CALIFORNIA AIR RESOURCES BOARD

Tom Cackette
Acting Executive Officer

Date: July 31, 2007

California Environmental Protection Agency

Air Resources Board

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

PROPOSED REGULATION TO LIMIT OZONE EMISSIONS FROM INDOOR AIR CLEANING DEVICES

Research Division
Health and Exposure Assessment Branch

August 10, 2007

Arnold Schwarzenegger
Governor

State of California
AIR RESOURCES BOARD

INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKIING

Public Hearing to Consider

ADOPTION OF PROPOSED REGULATION TO LIMIT OZONE EMISSIONS FROM INDOOR AIR CLEANING DEVICES

To be considered by the California Air Resources Board
on September 27-28, 2007

at

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

Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

State of California
AIR RESOURCES BOARD

PROPOSED REGULATION TO LIMIT OZONE EMISSIONS FROM INDOOR AIR CLEANING DEVICES

Prepared by:

Research Division
California Air Resources Board

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Bart Croes, P.E., Chief, Research Division
Michael H. Scheible, Deputy Executive Officer

August 10, 2007

ACKNOWLEDGEMENTS

We wish to acknowledge the assistance and cooperation we received from many individuals and organizations. In particular we would like to thank:

Bonnie Holmes-Gen, American Lung Association of California; Wayne Morris and Chris Hudgins, Association of Home Appliance Manufacturers; Chanté White Maurio and Joseph Musso, Underwriters Laboratories, Inc.; Steve Hartquist and Joan Sterling, Intertek Testing Services NA, Inc.; Mark Mason, U. S. EPA; Richard Shaughnessy, University of Tulsa; Bernard Pasquet, OSHA; James Hardy, Paul Cowhan and Peter Biasone, Health Canada; Jim Nanni, Consumers Union; numerous manufacturers' representatives who shared their production and cost information with ARB staff; and all stakeholders who participated in the public workshops and provided comments to ARB. We also thank ARB staff members Steve Giorgi, Dodie Weiner, Susan Lum, Nargis Ahmed, Hien Tran, and Lily Wu, for their assistance on this regulation.

DISCLAIMER

This report has been prepared by the staff of the California Air Resources Board. Publication does not signify the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute or imply endorsement or recommendation for use.

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ABBREVIATIONS AND ACRONYMS

AAQS	Ambient Air Quality Standard
AB	Assembly Bill
AER	air exchange rate
ANSI	American National Standards Institute
ARB	California Air Resources Board
CAAQS	California Ambient Air Quality Standard
CADR	clean air delivery rate
Cal/OSHA	California Department of Industrial Relations, Occupational Safety and Health
CEQA	California Environmental Quality Act
COPD	chronic obstructive pulmonary disorder
CPSC	U.S. Consumer Product Safety Commission
BP	by-product ozone air cleaning device
CSA	Canadian Standards Association
DHS	California Department of Health Services
EPA	U.S. Environmental Protection Agency
ESP	electrostatic precipitator
FDA	U.S. Food and Drug Administration
FSOR	final statement of reasons
HSC	California Health and Safety Code
IACD	indoor air cleaning device
ISOR	initial statement of reasons
NRTL	Nationally Recognized Testing Laboratory
OG	ozone generator
OSHA	U.S. Occupational Safety and Health Administration
PCO	photocatalytic oxidation
SOP	standard operating procedure
UL	Underwriters Laboratories, Inc.
U.S.	United States
UV	ultraviolet
VOC	volatile organic compound

UNITS

ACH	air changes per hour
ft^2	square feet
m^3	cubic meter
nm	nanometer (one-billionth of a meter)
ppb	parts per billion by volume (such as one grain of sand in a billion grains of sand)
ppm	parts per million by volume (such as one grain of sand in a million grains of sand)
%	percent
µg	microgram (one-millionth of a gram)

EXECUTIVE SUMMARY

Regulation is Required and Necessary

Assembly Bill (AB) 2276 (Pavley, 2006; Health and Safety Code [HSC] Section 41986) directs the Air Resources Board (ARB) to develop and adopt regulations, consistent with federal law, to protect public health from ozone emitted by indoor air cleaning devices used in occupied spaces. Indoor air cleaning devices that produce ozone intentionally have been shown to produce unhealthful ozone concentrations well above the health-based state and federal ambient air quality standards. Extensive scientific research has shown that exposure to ozone above these standard levels can cause respiratory symptoms (such as cough, wheeze, and difficulty breathing), reduced lung function, increased airway hyperreactivity, and increased airway inflammation. Additionally, exposure to ozone above the California standards has been associated with asthma onset and exacerbation, increased school absences, hospitalizations due to respiratory diseases, and premature death. The only limit for air cleaning devices currently in place is the U.S. Food and Drug Administration's ozone emission concentration limit of 0.05 ppm for medical devices.

Ozone Exposures are Too High

Several different research groups have found that some ozone generating air cleaners produce ozone concentrations several times higher than the California Ambient Air Quality Standard (CAAQS) of 0.070 ppm, 8-hour average, and 0.09 ppm, 1-hour average (Phillips *et al.*, 1999; Mason *et al.*, 2000; Tung *et al.*, 2005; Britigan *et al.*, 2006; ARB, 2006a). Additionally, ARB staff measured ozone emissions at the face of current ozone generating air cleaners, and observed ozone concentrations above 1 ppm at a distance of two inches from the face and concentrations as high as 0.567 ppm at a distance of 24 inches from the face (ARB, 2006a). These studies indicate that ozone emissions from indoor air cleaning devices can elevate room concentrations of ozone above state health-based standards, and create indoor ozone levels equal to a Stage 1 smog alert or an "unhealthy" rating using the Air Quality Index.

The highest levels of ozone are produced by indoor air cleaning devices that intentionally produce ozone, which are often referred to as "ozone generators". Two other types of air cleaners – ionizers and electrostatic precipitators – may emit ozone as a by-product of their design and function. These usually emit much lower levels of ozone than intentional ozone generators, but some emit ozone at levels of health concern. Mechanical air cleaners that use a physical filter to remove pollutants from the air typically emit very little ozone. Other technologies that may be utilized in an indoor air cleaning device include ultraviolet light and photocatalytic oxidation, both of which can emit ozone, but usually at low levels.

Recent survey results from Piazza *et al.* (2006) found that 14% of California households own one or more air cleaning devices, and 2% own an ozone generator. Of particular concern is that 45% of the households using an ozone generator also had children in the home, and 50% of those households had purchased the air cleaners to help one or more members with allergies or asthma. Additionally, a majority of households indicated that they operate their air cleaner continuously, 24 hours a day throughout the year. Based on these survey results and studies of air concentrations produced by these devices, well over 500,000 Californians are estimated to be routinely exposed to ozone concentrations above the 8-hour CAAQS of 0.070 ppm due to the use of an ozone generator. Piazza *et al.* also found that another 8% of California

households use an air cleaner that may emit ozone as a by-product; thus, the number of persons potentially exposed to unhealthful levels of ozone from their air cleaner is even higher than the 500,000+ persons affected by intentional ozone generators.

Ozone is Not Effective at Cleaning the Air

Manufacturers of ozone generators often claim that "safe" levels of ozone can remove indoor air pollutants such as particles, gases, allergens, viruses, odorous compounds, mold, and bacteria. In fact, ozone reacts with some indoor air chemicals to produce significant increases in other pollutants such as formaldehyde and ultrafine particles, which can be harmful to health (Boeniger, 1995; Nazaroff and Weschler, 2004; Hubbard *et al.*, 2005). While ozone reduces a few odorous compounds, it simultaneously fatigues the olfactory sense and reduces one's ability to smell odors, essentially masking odors rather than removing them. Ozone is somewhat effective in killing mold and bacteria on building material surfaces, but only at extremely high levels – over 5.0 ppm – and even those levels do not denature or remove microbial residues and spores in building materials (Foarde *et al.*, 1997), which can continue to trigger asthma and allergy symptoms. Extensive expert testimony in the successful lawsuit by the Federal Trade Commission against Alpine Air and Living Air, two ozone generator manufacturers, confirmed the almost complete lack of effectiveness of ozone for indoor air treatment (FTC, 2002). More recently, Chen *et al.* (2005) confirmed that two ozone generators did not effectively remove volatile organic compounds from a test room, except for limonene, which reacts quickly with ozone to produce formaldehyde, a known human carcinogen and respiratory irritant.

Extensive Public Outreach

Throughout the development of this regulation, ARB staff made extensive effort to obtain input from manufacturers of air cleaners, other interested stakeholders, and the general public. In order to facilitate involvement with the proposed regulation, an email listserve and Internet webpage were made available in November 2006. Three public workshops were conducted between December 2006 and June 2007 to develop the proposed regulation and obtain public input. Additionally, numerous individual meetings and teleconferences were held with testing laboratory representatives, manufacturers and other industry representatives, the American Lung Association, and scientific research experts to obtain information needed to develop the test method, certification procedures, labeling requirements, economic impacts, and regulation effective dates.

ARB staff also conducted a general outreach program on intentional ozone generators both prior to, and during the development of, the regulation. The general outreach program included personal contacts with, and materials distributed to: county and regional air quality management districts; local health and environmental health officers; twelve professional medical organizations; seven physician groups; numerous local asthma and allergy organizations throughout the state; over a dozen business associations; senior citizen organizations; and health-related non-profit organizations.

Types of Air Cleaners Covered by This Regulation

This regulation addresses portable air cleaning devices designed for room, whole house, whole floor, and in-vehicle use, and those designed to be carried on one's person. Devices not covered in this regulation include in-duct devices that are an integrated component of a heating, air conditioning and ventilation system, and industrial use air cleaners. Industrial use devices are exempted as long as specified labeling and point-of-purchase requirements are met.

Testing, Labeling and Certification are Required

The proposed regulation would limit the ozone emission concentration from indoor air cleaning devices for sale in California to 0.050 ppm, consistent with the federal limit for medical devices; require compliance with electrical safety standards and specified labeling requirements; and require certification by ARB. The American National Standards Institute (ANSI) / Underwriters Laboratories, Inc. (UL) Standards 867 and 507 are the test methods that would be used to determine compliance with the requirements of this regulation. Ozone emissions from indoor air cleaners would be determined following the test conditions outlined in the 2007 revision of Section 37 of the ANSI/UL Standard 867. This revision is currently undergoing review through the ANSI standard revision process, but is expected to be finalized and approved in September 2007. Indoor air cleaning devices using only mechanical filtration for pollutant removal would be exempt from the testing requirement for ozone emissions, based on their known *de minimis* ozone emissions, but would still be required to obtain ARB certification by submitting verification of electrical safety certification based on Standard 507 and by following the labeling requirements. Any mechanical air cleaners certified to Standard 507 prior to the enactment of the proposed regulation would be eligible for certification without additional testing.

Any indoor air cleaning device for use in an occupied space, not qualifying for exemption, also would be required to display the proper label on product packaging prior to sale in California. Medical devices would be labeled to comply with federal law, and state "ARB certified". Non-medical devices certified by ARB would be required to display a label with text that reads "This air cleaner complies with the federal ozone emissions limit. ARB certified." on the product packaging. Air cleaners that qualify for exemption from this regulation would likewise be required to display a specified exemption label on their packaging. Any non-certified air cleaner for non-industrial use in occupied spaces would be required to display an advisory warning stating "Device does not meet California requirements; cannot be shipped to California." in a prominent place on all Internet webpages, catalog pages and related materials for marketing and sale of the device. All air cleaners sold in California for use in occupied spaces would be required to display the appropriate electrical safety certification or listing mark on the product.

The proposed regulation would apply to any person, manufacturer, distributor, or retailer that manufactures or offers for sale indoor air cleaning devices, for use in occupied spaces, within the state of California. Manufacturers would be responsible for the initial certification of their devices for ozone emissions and electrical safety, and full compliance by the effective manufacture date. The effective manufacture date is proposed for 12 months following the effective date of the regulation, anticipated to be the date of approval by the California Office of Administrative Law. An effective sale date is proposed for 21 months after the effective date of the regulation; then only certified devices could be sold in California. This provision essentially allows distributors and retailers a nine month sell-through period.

Regulation Costs Not Significant for Businesses and Consumers

Potential economic impacts of the regulation would primarily be cost increases to most manufacturers to certify air cleaners, i.e., to meet testing and labeling requirements. An estimated 61 manufacturers and their distributors may be affected. For most manufacturers of ozone generators and a few manufacturers of by-product devices, this certification also would require redesign of some products to meet ozone emission limits. The potential economic impact for most manufacturers is estimated to be insignificant. However, some smaller manufacturers of these devices may be impacted over the short-term. The potential economic impacts on distributors, retailers, and consumers are estimated to be minimal, except for

distributors whose suppliers choose not to provide a compliant product. The potential fiscal impact on ARB is about $175,000 per fiscal year after approval of the regulation. No fiscal impact is anticipated for other state agencies and local agencies. The potential impact in California on jobs, business competitiveness, and business creation, elimination, or expansion is expected to be insignificant. The expected impact on consumers is estimated to be minimal, depending on how much of the certification cost and profit margin are passed on to consumers; the increased cost of purchasing an air cleaner is estimated to be no more than $11-16 per unit, for devices that currently cost from about $100-700 each.

Regulation Will Reduce Exposure to Ozone

The proposed regulation would provide significant public health benefits by greatly reducing the exposure of Californians to indoor ozone, especially in households that use indoor air cleaning devices. The proposed regulation would prevent the routine exposure of well over 500,000 Californians to ozone concentrations above the 8-hour CAAQS of 0.070 ppm due to the use of an indoor air cleaning device that emits ozone. Most importantly, many of these Californians are exposed to ozone levels several times greater than the health-based standard; thus their exposure reduction would be substantial. Reduction in ozone exposure would greatly reduce the risk of respiratory symptoms, reduced lung function, and increased airway inflammation and hyperreactivity. The regulation may also reduce asthma exacerbation, school absences, hospitalizations for respiratory disease, and other health impacts associated with ozone exposure above health-based standards. In addition, the reduced levels of indoor ozone would reduce the potential for oxidative damage to indoor materials and furnishings. The reduction of indoor ozone would also reduce exposure to chemical reaction products from ozone with other indoor pollutants, such as formaldehyde, a known human carcinogen.

Regulation is Recommended to Reduce Risk from High Ozone Air Cleaners

During the development of the proposed regulation, several alternatives were considered. These included no action, allowing devices with "occupied" and "unoccupied" settings ("dual use" devices) or use of devices labeled for unoccupied use, and selection of an alternate test method. Taking no action is not an acceptable option because AB 2276 requires ARB to regulate ozone emissions from indoor air cleaning devices, and the health risk posed by some air cleaners is clearly unacceptable. Allowing "dual-use" devices or high-emitting devices labeled for unoccupied space use only is not acceptable as these devices have the potential for very high ozone exposure if not used exactly as instructed, and this approach (written warnings) is essentially the status quo. While other test methods were considered, ARB staff propose to follow the test methods of ANSI/UL 867 and 507, because this avoids the substantial additional time and resource requirements involved with developing a new test method and utilizes the industry standard that is currently used by most manufacturers. Because testing to the ANSI/UL Standard 867 is already performed by existing third party laboratories, there is no added cost to the state of California to develop the test method or test facility to implement this regulation. The 2007 revision of ANSI/UL Standard 867 is health protective and is consistent with the federal ozone emissions limit of 0.05 ppm, as mandated by AB 2276.

After evaluating public input and considering several regulatory alternatives, ARB staff believe that the proposed regulation is necessary and beneficial for the protection of public health. The proposed regulation is both technologically and commercially feasible. Approval of the proposed regulation would greatly reduce the exposure of more than half a million Californians to acceptable levels, especially children and sensitive groups such as those with asthma and other respiratory diseases who commonly purchase air cleaning devices.

STAFF REPORT

I. Introduction

A. Overview

This Staff Report presents the technical justification and analysis for the proposed regulation of ozone emissions from indoor air cleaning devices (IACD). The report is part of the Initial Statement of Reasons (ISOR) for the Proposed Regulation Order to adopt Title 17 Sections 94800 to 94810 to the California Code of Regulations. The proposed regulation order is intended to satisfy the requirements of Assembly Bill (AB) 2276 (Pavley, 2006; see Appendix A for complete bill). The proposed regulation order is provided in Appendix B of this document.

The following information is included in this technical support document:

- A discussion of the process used to develop the proposed regulation, and the associated public outreach efforts.
- A discussion of the technical basis for the proposed regulation.
- A review of the need for indoor ozone emission reductions.
- A description of the proposed regulation.
- An analysis of the potential economic and environmental impacts from the proposed regulation.

B. Regulatory Authority

In 2006, AB 2276 was approved by the California Legislature and signed by Governor Schwarzenegger to address the serious threat to public health posed by the emission of ozone, either intentionally or as a by-product, by IACD. AB 2276 added Article 8, Sections 41985 and 41986 to Chapter 3 of Part 4 of Division 26 of the California Health and Safety Code (HSC). Section 41986 instructs the Air Resources Board (ARB or Board) to develop and adopt regulations, consistent with federal law, to protect public health from ozone emitted by IACD, including both medical and non-medical devices, used in occupied spaces. Section 41986 further stipulates that the regulations must include the following elements:

- An emission concentration standard for ozone emissions that is equivalent to the federal ozone emission concentration limit for IACD.
- Test procedures for manufacturers to utilize to determine ozone emissions from IACD.
- Certification procedures that enable the Board to verify that an IACD meets the emission concentration standard for ozone emissions using the testing procedures adopted by the Board.

- Package labeling requirements that indicate that an IACD is certified as meeting the emission concentration standard for ozone emissions.

AB 2276 also allows a ban on the sale of IACD that exceed the allowable emission concentration standard; procedures for allowing independent laboratories or others to verify products as meeting the standard; an exemption for IACD that emit only *de minimis* levels of ozone due to their design; and any other element the Board deems necessary to protect the public health from emissions of ozone from IACD.

C. Background

1. Ozone Properties and Standards

Ozone is a highly reactive molecule composed of three oxygen atoms. Ozone is a primary component of photochemical smog, and has been recognized and regulated as a serious outdoor pollutant for many years. Human exposure to ozone can damage the respiratory system. Ozone inflames and irritates respiratory tissues, and can worsen asthmatic symptoms in individuals with asthma. Ozone exposure can produce symptoms such as coughing, chest tightness, and impaired breathing. Elevated exposures have the potential to induce permanent lung damage, and chronic exposure can even increase the risk of premature death (ARB 2005b). Ozone can also damage plants, fabrics, rubber products, and building materials, such as paint and flooring (ARB 2005b).

To prevent these health and environmental impacts, ozone in the ambient (outdoor) air is currently regulated at both the federal and California state level. State and federal ambient air quality standards (AAQS) have been established for ozone, as shown in Table I-1 below. The U.S. Environmental Protection Agency (U.S. EPA) is currently considering revisions to the federal standard.

Table I-1. State and Federal Ambient Air Quality Standards for Ozone

Averaging Time	California Standard [a]	Federal Standard [a]
1 hour	0.09 ppm [b] (180 µg/m^3) [c]	NA
8 hour	0.070 ppm (137 µg/m^3)	0.08 ppm (157 µg/m^3)

Notes:
a. Ozone concentration determined using ultraviolet photometry
b. ppm: parts per million
c. µg/m^3: micrograms per cubic meter

2. Types of Air Cleaning Devices

The indoor air cleaning devices on the market use a variety of technologies to remove unwanted contaminants from users' indoor environments. Some of these technologies emit ozone during their operation. A number of manufacturers market appliances labeled as "air purifiers" or "air cleaners" that intentionally generate ozone; these are often referred to as "ozone generators" (OGs). Current OGs most often use metal plate electrodes or needle

electrodes to create electrical discharges that produce ozone, typically in large quantities. Two other types of IACD that may emit ozone as a by-product of their operation, hereafter referred to as by-product (BP) devices, include ionizers and electrostatic precipitators. These devices emit ozone as a by-product of their design, and typically emit much lower levels of ozone than do OGs. Ionizers release electrons into the air, forming ions with molecules in the air which then attract particles to form larger particles that have a greater tendency for deposition. Electrostatic precipitators (ESPs) utilize an electric corona to charge airborne particles and collect them with charged metal plates of opposite polarity. In addition to the technologies mentioned, IACD may also incorporate an ultraviolet (UV) illumination into their operation. The UV irradiation purportedly reduces the microbial activity of the 'treated or cleaned' air, essentially acting as a biocide. A new emerging technology for IACD is photocatalytic oxidation (PCO). Photocatalytic oxidation attempts to remove pollutants using UV irradiation in conjunction with a catalytic surface to produce hydroxyl radicals and superoxide ions which react with organic pollutants. Finally, another group of air cleaners, those that use only pleated fibrous filters or a similar physical barrier type technology, emit little or no ozone, and are not a concern; these are hereafter referred to as mechanical-filtration devices.

The market for portable air cleaning devices advertised for residential use has expanded substantially as public concern over indoor air pollutants has increased. Recent figures indicate that annual national sales of these products have surpassed $400 million (Consumers Union, 2005a). Additionally, national market data indicate the sale of IACD grew by 34% over the five years from 1998 to 2003, and the trend was expected to continue through at least 2008 (The Freedonia Group, 2004). Survey results from Piazza *et al.* (2006) found that two out of every three IACD in California homes were purchased since 2003. Thus, the market for IACD within California is showing rapid growth consistent with this expectation.

3. Ozone Concentrations Produced by Air Cleaners

The operation of IACD that produce ozone in the confined spaces of homes and commercial buildings may cause unhealthful ozone exposures, that is, elevated room ozone concentrations above the health-based state and federal AAQS for ozone. To ensure adequate protection of public health, the ozone emissions from IACD need to be limited, especially considering the observed and expected growth of this industry.

Sources of ozone emissions data for currently available models of IACD include U.S. EPA test reports, a small number of scientific journal articles, manufacturers' product test data (generally not available), and tests of four models by ARB staff. A test home study by researchers at the U.S. EPA found that an OG could produce indoor ozone levels up to three times the California Ambient Air Quality Standards (CAAQS) of 0.09 ppm averaged over one hour and 0.070 ppm averaged over eight hours (Mason *et al.*, 2000). In another study, a number of IACD, including ESPs, ionizers and OGs, were evaluated in representative indoor room environments and found to produce steady-state indoor ozone concentrations as high as 0.650 ppm, which is over seven times the 1-hour CAAQS and over nine times the 8-hour CAAQS (Britigan *et al.*, 2006). Measurements within a stainless steel test chamber showed ozone concentrations as high as 1.8 ppm, twenty times the 1-hour CAAQS, from one IACD which has both ESP and ionizer functions (Tung *et al.*, 2005). Ozone emissions as high as 0.389 ppm have been measured from a "personal air purifier" worn by the user near their face (Phillips *et al.*, 1999). Additional measurements of ozone emissions from current model OGs performed by ARB staff, described in Section IV.D. of this report, found face emissions and room concentrations of ozone well above 1-hour and 8-hour CAAQS (ARB, 2006a). Thus, previous

research indicates that ozone emissions from IACD may elevate room concentrations of ozone above acceptable health values, and thus pose a substantial health risk.

4. Ineffectiveness of Ozone in Cleaning Air

Manufacturers of OGs often claim that "safe" levels of ozone can remove indoor air pollutants such as particles, gases, allergens, viruses, odorous compounds, mold, and bacteria. In fact, ozone reacts only with some gases of concern (aromatic hydrocarbons such as benzene) and with terpenes, such as limonene and pinene, and this produces significant increases in other pollutants such as formaldehyde and ultrafine particles, which can be harmful to health (Boeniger, 1995; Nazaroff and Weschler, 2004; Hubbard *et al.*, 2005). While ozone reduces a few odorous compounds, it simultaneously fatigues the olfactory sense and reduces one's ability to smell odors; essentially masking odors rather than removing them. Ozone is somewhat effective in killing mold and bacteria on building material surfaces, but only at extremely high levels – over 5.0 ppm – and even those levels do not denature or remove microbial residues and spores in building materials (Foarde *et al.*, 1997). This leaves them available to trigger asthma and allergy symptoms.

Ozone treatment is recognized by scientists as an effective means of killing microorganisms for purifying water, but not as a means of cleaning indoor air. Extensive expert testimony in the successful lawsuit by the federal government against Alpine Air and Living Air, two OG manufacturers, confirmed the almost complete lack of effectiveness of ozone for indoor air treatment (FTC, 2002). More recently, Chen *et al.* (2005) confirmed that two OGs did not effectively remove volatile organic compounds from a test room, except for limonene, which reacts quickly with ozone to produce formaldehyde, a known human carcinogen and respiratory irritant.

5. Government Authority

Prior to AB 2276, no California state agency had clear regulatory authority to address the problem of ozone emissions from IACD, and relevant federal programs had not been effective. An ozone emission concentration standard for IACD has been in existence since the late 1970s, under the U.S. Food and Drug Administration (FDA), for air cleaners that are considered medical devices, i.e., marketed with health claims (FDA, 2005a). The FDA standard for medical devices is a maximum of 0.05 ppm ozone in the air circulating through the device or in an enclosed space that is designed for human occupancy, but the specific test protocols are not well defined. Non-compliant devices cannot be used in houses, hospitals, medical offices, or other occupied spaces. The FDA requires listing and labeling of these devices, including the smallest room area allowed when using the device (FDA, 2005a,b). However, the FDA has conducted very little enforcement of their regulation to date. The U.S. Consumer Product Safety Commission (CPSC) has the authority to regulate air cleaners that are marketed without health claims, i.e., non-medical devices; however, it has not developed any regulations for IACD to date, although it is considering possible action (CPSC, 2006).

6. Industry Standards

The Underwriters Laboratories Inc. (UL), an independent, not-for-profit product safety certification organization, has developed an American National Standards Institute (ANSI) approved standard, ANSI/UL Standard 867, for testing electrostatic air cleaners. This standard evaluates the electrical safety and ozone emissions of this class of IACD. Certification to this

standard is voluntary; however, many retail establishments require electrical products to meet the relevant electrical safety standard before they will carry them in their stores. Section 37 of Standard 867 provides a test for ozone that limits room ozone concentrations to 0.050 ppm at two inches from the face of the device after 24 hours of continuous operation. However, until recently, the test method provisions were somewhat general, allowing for variability in how the test was conducted in various laboratories, which consequently allowed some high-emitting air cleaners that produce unhealthy ozone levels to pass the test (Niu *et al.*, 2001a,b; Chen *et al.*, 2005; Mullen *et al.*, 2005). Consequently, UL convened an *ad hoc* committee to clarify and refine the details of the standard test protocol. This resulted in the publication by UL of their March 20, 2007 "Clarification for Ozone Testing of Electrostatic Air Cleaners and Ionizers," which is now undergoing review within the ANSI standards approval process. A final, revised test protocol is expected to be approved in September, 2007.

7. Previous Actions to Address Ozone Generating Air Cleaners

Efforts have been taken to reduce the potential exposure of the public to ozone from IACD. During the 1990s, ARB staff contacted two manufacturers of OGs, asking that they discontinue their production, marketing, and sale of IACD within California due to concern about excessive human exposure and unsubstantiated health claims. The OG manufacturers did not comply with this request. Several agencies and organizations have issued warnings about ozone generators. In 1997, the California Department of Health Services (DHS) issued a press release warning citizens of the potential harm from ozone generators (DHS, 1997). ARB issued similar press releases in 2005 and 2006 (ARB 2005a, 2006b). In 2000, ARB published a fact sheet on how to select a safe and effective indoor air cleaner, and in 2005, ARB published a fact sheet describing the dangers of OG use and established a website to inform consumers about specific models of known OGs, to help minimize their sale to Californians (ARB, 2006c). *Consumer Reports* has published several articles detailing IACD testing for efficacy and ozone emissions, in which they informed the public about IACD which exceeded the ANSI/UL Standard 867 requirements for ozone emission (Consumers Union 2005a,b). In 1998 the Canadian Standards Association (CSA) announced they would no longer certify for household use air cleaning devices that intentionally generate ozone, and invoked additional requirements for IACD for commercial use (CSA TIL H-13). Based on a risk evaluation conducted in 1999 and the action taken by CSA in 1998, Health Canada released a warning in 2000 which instructed consumers to avoid OG use in occupied spaces (Health Canada, 2000).

To date, only limited legal actions have been taken to address the ozone emissions from IACD. In 1995, the Federal Trade Commission (FTC) entered a consent order with Alpine Air (Alpine Industries), Living Air, and Quantum Air to prevent them from making unsubstantiated claims in marketing their ozone generator products, including claims regarding their effectiveness in indoor pollutant removal and the prevention of, or relief from, allergies, asthma, and other specified conditions (FTC, 1995). Subsequently, the FTC successfully sued Alpine Air for violating the consent order (FTC, 2002). The court fined the defendants $1,490,000 plus interest and costs. It also barred the defendants from: making health claims without scientific substantiation; making claims that their "air purifier" would remove any indoor air pollutant, except for visible tobacco smoke and some odors; making claims that their products prevent, or provide relief from, medical conditions of any kind; or claiming that sensors in the machines control the ozone levels in indoor spaces. Additionally, the Minnesota Attorney General successfully sued Alpine Air for consumer fraud in misrepresenting the effects of ozone and their air purifiers, and for price fixing through independent distributors (State of Minnesota, 1992a,b; 1993). However, neither the federal or Minnesota court decisions were successfully enforced, nor did they significantly affect the design or sales of ozone generators. These

collective actions have had little impact on the sales of ozone-generating air cleaners in California, which has seen increased sales in recent years.

8. Californians' Use of Air Cleaners

Recent survey results from 2,019 California households showed that a total of 14% of California households currently own an air cleaner or have owned one within the past five years (Piazza *et al.*, 2006). Intentional OGs were reported in 2% of California households, potentially exposing 282,000 households, or 828,000 persons, to unhealthful levels of ozone. About 8% of California households use an air cleaner that may emit ozone as a by-product; thus, the number of persons potentially exposed is much higher. Of particular concern is that 45% of the households containing an OG also had children in the home. Children are a particularly vulnerable group because of the proportionally higher dose of ozone that they inhale due to their breathing rates and activity patterns, their developing lungs, and other factors. Additionally, the survey showed that 50% of the households that own air cleaners purchased them to help relieve allergies or asthma in one or more household members, and about 30% of households that own air cleaners own two or more units. The survey data also showed that most air cleaner owners operate their IACD year-round, 24 hours a day; thus there is the potential for significant indoor ozone exposure within the California population, including children.

II. Development of Proposed Regulation

A. Public Outreach and Participation

Extensive effort was made to obtain input from manufacturers, the general public, and interested stakeholders throughout the development of this regulation. In order to facilitate public involvement, an email listserve and Internet webpage (http://www.arb.ca.gov/research/indoor/aircleaners/aircleaners.htm) were made available in November 2006. The ARB invited any individuals with interest in this regulation to join the list serve at (http://www.arb.ca.gov/listserv/listserv.php) in order to receive email notification of all notices given and actions taken related to the development of the proposed regulation order. The initial list was formed from ARB's existing indoor air quality lists, email and address information for all companies identified as producing purposeful OGs, and known associations and manufacturers of non-OG air cleaners. There are approximately 2,000 individuals or companies registered for the list serve. For companies that use private distributors, attempts were made to obtain lists of their distributors, but were unsuccessful.

Three public workshops were conducted between December 2006 and June 2007 to develop the proposed regulation order. At the first workshop on December 13, 2006, ARB staff discussed the requirements of AB 2276, presented a draft regulation concept, outlined the proposed regulation schedule, and responded to questions. During the second workshop on March 29, 2007, ARB staff presented a draft regulation order and preliminary economic impact analysis. Additional time was taken to discuss the proposed ozone emission test method, which follows the March 2007 Certification Bulletin for Section 37 of ANSI/UL Standard 867. At the third and final public workshop on June 11, 2007, staff discussed the revised proposed regulation order, the staff report, and further analysis of the economic impacts of the regulation. The public was able to attend each workshop in person or participate via teleconference and/or Webcast. A three week written public comment period was provided following each workshop. Comments were received from a variety of stakeholders, including manufacturers, professional

organizations, testing/certification entities, public health organizations, and private citizens. When preparing this report, ARB staff considered the comments received at the public workshops; many of those comments helped to shape the proposed regulation.

To solicit additional information and comments, staff held numerous individual meetings and teleconferences with testing laboratory representatives, manufacturers and other industry representatives, the American Lung Association, and scientific research experts. These meetings helped provide ARB staff with information needed for the development of the test method, certification procedures, labeling requirements, economic impacts, and regulation effective dates.

In addition to the actions listed above, ARB staff also conducted a general outreach program on intentional ozone generators both prior to and during the development of the regulation. The general outreach program included: (1) production of a fact sheet describing intentional ozone generators and their potential harmful effects; (2) contacting relevant organizations to convey information to their constituents; (3) submission of articles for publication in newsletters and other print media; and (4) where possible, speaking to interested groups. The fact sheet was distributed to: county and regional air quality management districts, local health and environmental health officers; twelve professional medical organizations; seven physician groups; numerous local asthma and allergy organizations throughout the state; senior citizen organizations; health-related non-profit organizations; and over a dozen business associations. Each organization was then personally contacted to describe the problems with ozone generators, answer questions, and provide additional information and printed materials for publication in newsletters. Organizations throughout California were extremely helpful in conveying factual information on ozone generators to their constituencies.

This report and associated materials have been released for public review 45 days prior to the planned Board public hearing date of September 27, 2007, as required for proposed regulations. Staff will fully consider all comments received during that period, and respond to those comments as part of the regulatory process. An oral report summarizing the staff recommendations for regulating ozone emissions from air cleaners will be presented to the Board at the September 27 hearing.

Once a regulation is adopted by the Board, staff plans to conduct additional outreach to retail associations, large retail chains, and other distributors and sellers to assure that all affected parties are aware of the regulatory requirements. Under the proposed regulation, manufacturers are required to notify their distributors and retailers about this regulation, and provide contact information for those businesses to ARB. Staff plans to follow up to assure that all on such lists have been notified, and to respond to any questions they may have. Staff also will continue to check for manufacturers who may not be aware of this regulation.

B. Comment Period and Board Hearing

Release of this Staff Report opens the official 45-day public comment period required by the Administrative Procedure Act prior to the public meeting of the Air Resources Board to consider the staff's recommendations. The public may present comments relating to this matter orally or in writing at the hearing, and in writing or by e-mail before the hearing. To be considered by the Board, written submissions not physically submitted at the meeting must be received no later than 12:00 noon, September 26, 2007 and addressed to one of the following:

Postal mail: Clerk of the Board
Air Resources Board
1001 I Street, 23rd floor
Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: to the Clerk of the Board at (916) 322-3928

Information on the three public workshops, as well as summaries of the presentations from past workshops and meetings are available by calling 1-916-445-0753 or at the following ARB website: http://www.arb.ca.gov/research/indoor/aircleaners/aircleaners.htm. Inquiries concerning the substance of the proposed regulation may be directed to the designated agency contact persons, Ms. Peggy Jenkins, Manager of the Indoor Exposure Assessment Section, at (916) 323-1504 or by email at mjenkins@arb.ca.gov, or Mr. Chris Jakober, Air Pollution Specialist, at (916) 327-8693 or by email at cjakober@arb.ca.gov.

The agency representative and designated back-up contact persons to whom nonsubstantive inquiries concerning the proposed administrative action may be directed, are Ms. Amy Whiting, Regulations Coordinator, Board Administration & Regulatory Coordination Unit, (916) 322-6533 or Ms. Alexa Malik, Regulations Coordinator, (916) 322-4011. Requests for copies of the proposed regulation also should be directed to these contacts. The Board has compiled a record for this rulemaking action, which includes all the information upon which the proposal is based. This material is available for inspection upon request to the contact persons.

C. Evaluation of Alternatives

1. Different Test Method

As specified in HSC Section 41986, ARB is required to include testing procedures for determining the ozone emissions from IACD in the regulation. Section 41986 specifically requires ARB to consider the available ANSI/UL standard, as well as other existing and proposed test methods. Accordingly, ARB staff evaluated several different test methods prior to selection of Section 37 of ANSI/UL Standard 867. Additionally, ARB also considered developing a new test protocol beyond what is currently being used. Existing test methods that were considered included Blue Angel test methods RAL-UZ 62, 114 and 85 and ECMA Standard 328. The RAL test protocols are designed for office equipment, not for IACD, and were thus eliminated. ARB staff felt that the ECMA Standard 328 method was unacceptable due to the high air exchange rate (AER) of 1 ACH and a test chamber ozone half-life that was only required to be longer than 10 minutes.

After evaluation of existing test methods and possible development of a new emission rate method, ARB staff opted to follow the existing test methods of ANSI/UL. Using the existing ANSI/UL Standard 867 avoids substantial additional time requirements involved with developing a new test method and utilizes the industry standard that is currently familiar to manufacturers. To aid in refinement of Section 37 (the ozone emissions test section) of ANSI/UL Standard 867, UL formed an *ad hoc* committee to refine the method for improvements in repeatability and clarification, leading to a reduction in inter-laboratory variability. Since testing to the ANSI/UL Standard 867 is already performed by existing third party laboratories, there is no added cost to the state of California to develop the test method or test facility to implement this regulation. The

revised Section 37 of ANSI/UL Standard 867 is health protective and is consistent with the federal ozone emissions limit of 0.05 ppm, as mandated by AB 2276. Furthermore, selection of a test method that is currently utilized within the IACD manufacturing industry minimizes the impact that this regulation will have on manufacturers. Thus the revised ANSI/UL Standard 867 was chosen to be incorporated into this regulation.

2. Allow Dual-purpose Devices or Devices Labeled for Unoccupied Use

While developing this regulation ARB staff considered requests from OG manufacturers to allow IACD that utilize dual operation modes for occupied and unoccupied spaces, and those that emit high levels of ozone but are labeled for use only in unoccupied spaces. IACD having an "away mode" operating setting in addition to other settings (dual purpose devices) and those labeled for use in unoccupied settings typically produce ozone levels much greater than 0.050 ppm, usually several times higher than the CAAQS. ARB staff are concerned that even with more prominent warnings about the danger of using such devices, not all consumers will follow the manufacturers' instructions. For example, owners of dual purpose devices may use the device at the unoccupied setting while the space is occupied. Additional risk of exposure exists if one person were to set the device to operate in the "away mode" without informing a second person who may unknowingly enter the space while the device is producing high concentrations of ozone. The dual-purpose devices and devices labeled for unoccupied use have the potential for very high ozone exposure if not used exactly as instructed and this approach (written warnings) is essentially the status quo. Thus, ARB staff propose not to certify dual-purpose IACD under the proposed regulation, and to allow devices labeled for use in unoccupied spaces only for industrial purposes as defined in section 94801(a)(14).

3. No Action

A third alternative is to take no action. However, this is not an acceptable option because AB 2276 requires the ARB to regulate the ozone emissions from IACD, and regulation is necessary to protect the public's health from the elevated ozone exposures caused by some air cleaning devices.

D. Potential Regulation Benefits

The proposed regulation would provide significant public health benefits by greatly reducing the exposure of Californians to indoor ozone. The proposed regulation is estimated to prevent the routine exposure of well over 500,000 Californians to ozone concentrations above the 8-hour CAAQS of 0.070 ppm due to the use of an indoor air cleaning device that emits ozone. Most importantly, many of these Californians are exposed to ozone levels several times greater than the health-based standard.

This reduction in ozone exposure would greatly reduce the risk of adverse health impacts in a substantial fraction of the persons exposed, including reduced pulmonary function and increased lung inflammation and airway hyperresponsiveness to allergens. Young children and people with asthma would especially benefit from the avoided exposure. Exposure to ozone above the CAAQS has also been associated with increased risk of premature death, hospitalization for respiratory disease, emergency room visits for asthma for children, asthma onset and exacerbation, school absences, and minor restricted activity days for adults (ARB, 2005b). This proposed regulation may also reduce such health impacts in people living and working in buildings where ozone generating air cleaning devices are used. In addition, the

reduced levels of indoor ozone would reduce the potential for oxidative damage to indoor materials and furnishings (ARB 2005b).

This reduction of indoor ozone exposures would also reduce exposure to chemical reaction by-products from ozone. Indoor chemical reactions of ozone with certain substances from cleaning products and building materials are known to produce pollutants of health concern. Specifically, using products that contained terpenes such as pinene and limonene – the fragrance components of pine and citrus oils – in rooms where ozone is present results in the production of formaldehyde and ultrafine particles, which can potentially harm human health (Nazaroff and Weschler, 2004; Destaillats *et al.*, 2006; Singer *et al.*, 2006).

III. Technical Basis for Proposed Regulation

A. Technological Feasibility

The proposed emission concentration limit is considered technologically feasible if it meets one of the following criteria: (1) the limit is already being met by several IACD, or (2) the limit can reasonably be expected to be met in the time frame provided through additional development efforts.

Given the language stipulating consistency between the proposed regulation and the federal ozone emission concentration limit, ARB staff are bound to the federal emission level. This concentration limit is already being met by all mechanical filtration devices and most by-product IACD as described previously (Consumers Union 2005a,b; Chen *et al.* 2005). For the by-product devices that would exceed the emission limit, only a slight modification to product design is expected to be necessary to lower the ozone emissions to attain compliance with the proposed regulation, and thus is not considered technology forcing. Such modification may include the following: adjustment of electrode geometry and spacing, increase in corona wire surface temperature, and decrease in corona wire diameter (Liu *et al.*, 2000). Thus, the proposed regulation is currently technologically feasible.

B. Commercial Feasibility

The term "commercially feasible" is not defined in California State law. ARB staff took the approach that the regulation is commercially feasible as long as the basic market demand for IACD can be met. Staff interpretation of basic market demand is based primarily on the decision set forth by the United States Court of Appeals for the District of Columbia in the case of International Harvester Company vs. Ruckelshaus, (D.C. Cir. 1973) 478 F.2d 615. The court ruled that the U.S. EPA could promulgate technology-forcing motor vehicle emissions limits which might result in fewer available models and a more limited choice of engine types for consumers, as long as the basic market demand for new passenger automobiles could generally be met.

For the purposes of this regulation the basic market demand is defined as the consumer need for a product that removes indoor air pollutants. Basic market demand should not be confused with consumer preference, where a particular brand or attribute is desired. By considering the fulfillment of the basic market demand for IACD, and not necessarily the consumer preference, it is likely that certain models of IACD will no longer be available for sale in California. The models that are most likely to be eliminated from the California market are the

intentional OGs. Ozone generators are found in just 2% of California households, which represent less than 15% of the IACD market in California, (see Piazza *et al.*, 2006), but they constitute the majority of air cleaning devices that produce excessive indoor ozone exposures. A considerable majority of the current models of IACD marketed in California will remain available to consumers, although most OGs would have to be redesigned to attain compliance with the specified ozone emission standard. The proposed regulation allows the basic market demand for IACD to be satisfied, even though it would no longer be possible to manufacture and sell in California IACD that emit high levels of ozone.

IV. Need for Emissions Reductions

A. Health Effects of Ozone

The health effects resulting from exposure to ozone have been examined in detail and are summarized in an ARB staff report entitled *Review of the California Ambient Air Quality Standard for Ozone* (ARB, 2005b). The following provides an overview of the staff report findings.

Scientific studies have shown that exposure to ozone can result in increased respiratory symptoms (such as cough, wheeze, difficulty breathing, and chest tightness) reduced lung function, increased airway hyperreactivity, and increased airway inflammation. Moreover, exposure to ozone is associated with premature death, hospitalization for respiratory causes, increased school absences, and increased minor restricted activity days for adults (ARB, 2005b). As required by HSC 39605, special consideration needs to be made for infants and children in assessing the effects of ozone exposure. By virtue of their higher breathing rates, children are likely to inhale larger total doses of ozone than the general population. Furthermore, two studies have shown evidence of lower lung function in young adults raised in high ozone areas (Galizia & Kinney, 1999; Kunzli *et al.*, 1997). There is also evidence that children who play three or more sports may be at higher risk of developing asthma if they also live in high ozone communities (McConnell *et al.*, 2002).

Ozone in the ambient outdoor environment is currently a regulated pollutant at both the federal and California State level. In 2006, a new state ozone standard of 0.070 ppm (8-hour average) became effective, and the 1-hour standard of 0.090 ppm was retained. Because current outdoor ambient levels of ozone are sometimes above the State standards, significant health benefits would result by attaining the standards throughout California. Specifically the number of adverse health effects avoided each year is estimated to be:

- 630 premature deaths (310 - 950, probable range)
- 4200 hospitalizations due to respiratory diseases (2400 - 5800, 95% confidence interval [CI])
- 4.7 million illness-related school absences for children 5 to 17 years of age (1,200,000 - 8,600,000, 95% CI)
- 3.1 million minor restricted activity days for adults over 18 years of age (1,300,000 – 5,000,000, 95% CI)

Some other health effects that would be avoided to some extent include exacerbation of asthma, asthma attacks, and the onset of asthma; however, the reduction in these effects cannot yet be quantified.

B. Controlled Exposure Studies

While no epidemiology study to date has focused on the health effects of indoor ozone exposures, there is a body of controlled exposures studies that can be used to estimate the proportion of the general population that might experience adverse health outcomes from indoor exposures. These studies are based on known ozone concentrations, breathing rates, and exposure durations. Because of this, and because estimates of indoor activity levels and exposure durations are available, we can use these studies to make rough estimates of the proportion of people exposed to ozone from operation of ozone-emitting air cleaners who might experience adverse health outcomes for several endpoints.

1. Lung Function

A number of studies have investigated lung function responses to ozone. The most frequently reported measure of lung function is functional expiratory volume in one second (FEV1: the volume of air one can exhale in one second). This test is the most reproducible of the various measures of lung function, and consequently is the most frequently reported. The ARB staff report on the ozone standard concluded that a reduction in FEV1 of greater than 10% was an unacceptable level of response, and should be protected against (ARB, 2005b), and this convention is applied to the present analysis.

Results of studies of two-hour duration during which the subjects alternated periods of light to moderate exercise (comparable to walking at three miles per hour or less) are shown in Table IV-1 (Gliner *et al.*, 1983; McDonnell *et al.*, 1983; Kulle *et al.*, 1985; Horvath *et al.*, 1981, 1986; Drechsler-Parks *et al.*, 1987, 1990; Bedi *et al.*, 1988; Hazucha *et al.*, 1996).

Table IV-1. Percentage of Subjects Having Decreases in FEV1 Greater Than 10% and 20% with 2-Hour Ozone Exposures (Healthy Subjects)

Ozone (ppm)	% >10%	% >20%
0.18-0.20	20	5
0.24	35	22
0.30	60	35
0.40-0.45	55	30
0.50	77	48

These results suggest that significant numbers of people are likely to experience a decrease in lung function with two-hour or greater exposure to indoor ozone concentrations as low as 0.18 ppm. This concentration is well below the concentrations measured in ARB's chamber study of ozone generators (ARB, 2006a) and the Mason *et al.* (2000) chamber and test home study, which each ranged up to 0.300 ppm or higher.

Results of lung function studies of four hours duration that included alternating periods of light to moderate exercise (comparable to walking at three miles per hour or less) are summarized in Table IV-2 (Balmes *et al.*, 1996; Gong *et al.*, 1997).

Table IV-2. Percentage of Subjects Having Decreases in FEV1 Greater Than 10% and 20% with 4-Hour Ozone Exposures

Ozone (ppm)	Subjects	% >10%	% >20%
0.22	healthy	41	23
0.24	COPD	78	55
0.24	healthy	0	0

The results at 0.24 ppm reported in Table IV-2 are based on one small study (N=9 chronic obstructive pulmonary disorder (COPD) patients; N=10 healthy), which may not be representative of the broader population. However, the findings at 0.22 ppm, based on a larger group of subjects (N=56), suggest that a significant proportion of the population is likely to experience FEV1 decreases of concern with a 4-hour exposure at this level.

Table IV-3 summarizes the reduction in FEV1 for ozone exposures of 6.6 to 8 hours duration. These studies included moderate exercise of 50 minutes per hour, with a 30 minute break at the mid-point of the exposure (Folinsbee *et al.*, 1988; Horvath *et al.*, 1991; Peden *et al.*, 1997; Kehrl *et al.*, 1999; Jenkins *et al.*, 1999). While relevant in terms of exposure duration, it is likely that few people exercise to this extent indoors, likely overstating risks to a more sedentary population.

Table IV-3. Percentage of Subjects Having Decreases in FEV1 with 6.6 to 8-Hour Exposures

Ozone (ppm)	Subjects	% >10%	% >30%
0.08	healthy	26	12
0.10	healthy	31	4
0.12	healthy	46	13
0.16	asthmatics	41	18

The results provided in Table IV-3 suggest that a significant fraction of the population is likely to experience large decreases in lung function if they undergo 6.6- to 8-hour exposures to ozone concentrations as low as 0.08 ppm.

2. Pulmonary Inflammation

Pulmonary (lung + airway) inflammation is another common effect of ozone exposure. Ozone is a strong oxidant that can damage the tissues lining the airways, causing tissue injury and inflammation. Inflammation is the initial sign of tissue damage. Repeated ozone-induced injury and repair cycles lead to permanent damage to, and remodeling of, lung structure. Table IV-4 presents the percentage of healthy and asthmatic subjects who showed evidence for pulmonary inflammation following exposures to ozone for the concentrations and durations indicated (Seltzer *et al.*, 1986; Koren *et al.*, 1989; Graham & Koren, 1990; Devlin *et al.*, 1996; Peden *et al.*, 1997; Krishna *et al.*, 1997; Nightingale *et al.*, 2000; Newson *et al.*, 2000; Vaggagini *et al.*, 2001). In each case, subjects alternated periods of light to moderate exercise and rest during exposure.

Table IV-4. Percentage of Subjects Having Evidence of Pulmonary Inflammation Following Ozone Exposure

Ozone (ppm)	Exposure Time (hr)	Subjects	%
0.16	7.6	asthmatics	88
0.20	4	healthy	65
0.20	2	asthmatics	78
0.20	2	healthy	62
0.27	2	healthy	85
0.40	2	healthy	100

The results in Table IV-4 suggest that the majority of people exposed for 2 to 7.6 hours to ozone at concentrations greater than 0.16 ppm will develop evidence of pulmonary inflammation.

3. Airway Hyperresponsiveness

Airway hyperresponsiveness refers to the tendency for the muscle cells in the larger airways to contract in response to irritants (i.e., methacholine) or allergens. Research has shown that increased airway hyperresponsiveness is a characteristic of asthma, and that aggravation of hyperresponsiveness is associated with asthma exacerbation. Some non-asthmatic individuals also have hyperreactive airways. In addition, several studies showed that allergic asthmatics tend to have increased responses to allergen challenge following exposure to ozone, compared to that following exposure to filtered air. Table IV-5 shows the percentage of subjects who experienced increased airway hyperreactivity from methacholine or allergen challenge after controlled exposure to ozone (Seltzer *et al.*, 1986; Folinsbee *et al.*, 1988; Hiltermann *et al.*, 1995; Ball *et al.*, 1996; Jorres *et al.*, 1996; Kehrl *et al.*, 1999; Foster *et al.*, 2000).

Table IV-5. Percentage of Subjects Having Increased Airway Hyperreactivity in Response to Methacholine or Allergen Challenge Following Ozone Exposure

Ozone (ppm)	Exposure Time (hr.)	Subjects	%
0.10	7.6	asthmatics	89
0.12	1 (resting)	asthmatics	33
0.18	2 (mean)	healthy	88
0.25	3	asthmatics	100
0.40	2	healthy	100
0.40	2	asthmatic	66

As can be seen from Table IV-5, a large proportion of healthy and asthmatic subjects are likely to experience increased responses to irritants or allergens after ozone exposure.

4. Uncertainties

Controlled human exposure studies are typically from one to eight hours in duration, and are typically designed to simulate some form of outdoor activity. Because of this, most study designs include periods of light to moderate exercise, which may not be fully analogous to the longer, semi-chronic exposures likely in homes that operate ozone generating air cleaners. The controlled human exposure studies used in this analysis employed exercise that was comparable to walking at two to three miles per hour for 15 or 20 minute periods, alternated with rest periods of the same length for two to four hours, or for 50 minutes per hour for 6.6 to 8 hours. People are not typically completely at rest while indoors, except while sleeping; adults commonly engage in various types of housework and indoor exercise programs, and children engage in moderately active play. However, the breathing rates employed in the controlled human exposure studies may overestimate those typical of indoor activities to the extent that indoor activity is more episodic, less intense, or of shorter duration. Lung function and symptoms responses to ozone exposure plateau at levels primarily related to ozone dose rate (concentration x breathing rate). Consequently, the effect prevalences described above for two to eight hour exposures would likely be overestimates for populations who have lower breathing rates during indoor exposures. Exposure duration plays a role in response magnitude, although it is of less importance than either concentration or ventilation rate in driving effects. It should also be noted that the information in Tables IV-1 to IV-5 above is based on sample sizes that vary from as few as 8 subjects, to as many as 93 individuals. It is unknown to what extent the subjects studied are representative of the population as a whole. Because of this, the proportions of affected people shown in Tables IV-1 to IV-5 should be regarded as approximations. Finally, it should also be noted that purchasers of ozone generating air cleaners who find that the units adversely affect their breathing may stop using them. Piazza *et al.* (2006) found 29% of air cleaner owners had stopped using their air cleaner, but for a variety of reasons.

C. Physical and Chemical Properties

Ozone at ambient temperature and pressure is a pale blue, reactive gas comprised of three oxygen atoms, and thus is also referred to as triatomic oxygen. The gas has a pungent odor, with an odor threshold of approximately 0.010 – 0.030 ppm (NLM, 2007). Ozone is both corrosive and a strong oxidant, and can damage vegetation and a variety of materials including fabrics and building materials, such as paint, walls and flooring (ARB 2005b). Occasionally ozone may also be referred to as "super oxygen" and "activated oxygen" by some IACD manufacturers; however these are incorrect, misleading terms.

Ozone is primarily found in the stratosphere of the earth's atmosphere, commonly referred to as the 'ozone layer' (U.S. EPA, 2007). The stratosphere is located between approximately 6-30 miles above the earth's surface, with the ozone layer found between 10-25 miles above the surface. The ozone layer absorbs selective bands of radiation from the sun preventing it from reaching the earth's surface. UV radiation in band C (<280 nm) is completely removed by the ozone layer, and most of band B (280-320 nm) is also absorbed. The shielding from UV-B is beneficial as it has been shown to contribute to various types of skin cancer.

Additional atmospheric ozone (~10%) is found in the troposphere (U.S. EPA, 2007). This tropospheric ozone is commonly referred to as "ground-level ozone" and is in the air that people breathe. Tropospheric ozone in California is primarily produced via photochemical reactions of volatile organic compounds (VOCs) and nitrogen oxides (NOx). Ambient ground-level ozone

concentrations exhibit a diurnal pattern as its formation reactions require the energy input from sunlight. Thus, ozone levels typically increase during the mid-day and decrease at night. However, transport of polluted air masses can result in high ozone concentrations at night. Ozone concentrations also exhibit seasonal variation with the length of day and night. Outdoor ozone levels are typically the highest in the summer, on hot, stagnant, and cloud-free days. Ozone can also be produced via electrical discharge, electrochemical and UV radiation, of which electrical discharge is the most efficient. Ozone production via electrical discharge, and possibly UV radiation, are of concern to IACD where ozone production may be either intentional or result as a by-product of operation.

D. Measured Ozone Emissions

In 2005, ARB staff evaluated several models of OGs to identify current emissions levels and to assess potential ozone exposure resulting from their use (ARB, 2006a). Room ozone concentration tests were conducted in a small room furnished with a desk and chair, under temperature, humidity, and air exchange conditions common in homes. The IACD were operated according to manufacturers' instructions. Prior to the room concentration tests, measurements were made at 2, 6, 12, and 24 inches from the face of each device to locate the major output stream for each and identify the range of emissions in preparation for the room concentration tests. The test methods used are described further in Appendix C.

Room concentration results for OGs, shown in Table IV-6, show that all of the models tested produce room concentrations that exceed health-based standards and can pose a serious risk to health. The Biozone® 500, the Prozone® Whole House, and the Prozone® Compact produced room concentrations that substantially exceed both the CAAQS of 0.09 ppm, 1-hour average, and 0.070 ppm, 8-hour average, for ozone. They also would exceed the U.S. FDA standard of 0.05 ppm that applies to medical devices (devices for which the manufacturers make health-related claims). Additionally, the Alpine Air XL-15 / LA Lightning Air RA 2500 unit exceeded the 1-hour and 8-hour CAAQS, as well as the FDA standard when set at a medium setting (ozone output for a 1,000 square foot area). This unit was not tested at its highest setting, but has been shown in other studies (e.g., Mason *et al.*, 2000) to produce room levels over 0.300 ppm at its highest settings.

The Prozone® Whole House unit produced the highest room concentrations measured when operated in the continuous mode – over 0.400 ppm, more than four times the 1-hour CAAQS, and over six times the 8-hour CAAQS. Although the continuous mode is designed for an unoccupied home with greater volume than the test room in this study, consumers could naively operate the unit in this mode when their home is occupied, which would result in extremely high ozone exposures. Additionally, when operated for 15 minutes per hour as recommended by the manufacturer for occupied spaces, the Prozone® still produced unhealthy ozone levels: concentrations reached 0.09 ppm within 7 minutes, and the maximum 60-minute average was 0.119 ppm, well above both CAAQS.

Table IV-6. Room Concentrations Measured from Intentional Ozone Generators

Manufacturer and Model	Operational Setting	Maximum 60-minute average room concentration (ppm)	Minutes to reach 0.070 ppm (8-hr std)	Minutes to reach 0.09 ppm (1-hr std)
Alpine Air XL-15 / LA Lightning Air RA 2500	Low [a]	0.001	NA [b]	NA
	Medium	0.088	28	NA
Biozone® 500	Low	0.096	42	135
	High	0.099	111	162
Prozone® Whole House	Intermittent	0.119	6	7
	Continuous	0.435	6	7
Prozone® Compact A	On	0.109	18	31
Prozone® Compact B [c]	On	0.149	15	20

Notes:
a. Unit was set at low fan, with Ozonator turned to lowest setting.
b. NA: unit never reached the level indicated.
c. A second Prozone® Compact unit was purchased to test for between-unit variability.

Results of the face emissions tests for the four OGs are presented in Table IV-7. Of particular concern are the high ozone emission concentrations measured, several of which exceeded 1 ppm at the 2 and 6 inch measurement distances. Three OG tests yielded ozone concentration in excess of 0.360 ppm at a distance of 24 inches, which is over 4 times the 1-hour CAAQS. The elevated ozone concentrations observed at the measurement distances warrant public health protection to limit near-source ozone exposures from IACD, such as use near a bed or baby crib.

E. Estimated Pre-regulation Exposure to Ozone

The estimated residential concentrations of ozone resulting from the current use of portable indoor air cleaners in California are shown in Table IV-8, along with the estimated number of persons that experience each level of exposure. In total, well over 500,000 Californians are estimated to be routinely exposed to ozone concentrations above the 8-hour CAAQS of 0.070 ppm due to the use of an indoor air cleaning device that emits ozone. The supporting bases for this estimate are discussed below.

Table IV-7. Face Test Results for Intentional Ozone Generator Air Cleaners

		Ozone Concentration at Varying Distances from Unit Face (ppm) [a,b]			
Model	**Operational Setting**	**2"**	**6"**	**12"**	**24"**
Alpine XL-15 / Living Air 2500 [c]	2,500 ft^2; Fan at Low speed	1.29	1.17	0.907	0.567
	2,500 ft^2; Fan at High speed	0.781	0.718	0.580	0.373
Biozone® 500	Fan at Low speed	0.438	0.095	0.011	0.011
	Fan at High speed	0.379	0.144	0.043	0.013
Prozone® Whole House	Continuous mode (System on; Timer inactive; UV on)	1.03	0.815	0.577	0.389
Prozone® Compact B	On mode (no user-defined controls)	1.13	0.695	0.304	0.061

Notes:

a. Concentrations are 10-minute averages after the unit has been operating for at least 10 minutes.

b. For the face tests, values have not been adjusted for differences in background ozone levels, which ranged from 0-0.025 ppm during the testing.

c. The 2,500 ft^2 Ozonator setting was also used in the emission rate tests, but not in the room tests.

1. Indoor Ozone Concentrations: Ozone Generators

Table IV-8, Column B shows three ranges of ozone exposure for households using ozone generators (0.201-0.400, 0.101-0.200, and 0-0.100 ppm). These estimates are based on the following;

1. In a study of ozone generators in a single-family test home, Mason *et al.* (2000) reported in-home concentrations of 0.038-0.310 ppm for a larger, whole-house OG unit, and 0.018-0.065 ppm for a smaller OG unit. Various device settings, room locations, and central air system settings were tested. The air exchange rate of the home was similar to that typically found in newer and weatherized homes, but was not as low as some new homes.

2. In a study of ozone generators in a test room, Phillips *et al.* (ARB, 2006a), reported indoor ozone concentrations of 0.088-0.435 ppm for larger OG units, and 0.096-0.149 ppm for smaller OG units. Note that maximum ozone settings were not tested in some cases, and that devices with even higher ozone emission rates are on the market.

The in-home concentration values for ozone are reasonable estimates of average 8-hour exposures in California for several reasons:

- Current OG models by Alpine Air / EcoQuest have maximum settings that can produce even higher ozone levels than the settings used in the study by Mason *et al.* (2000).

- California adults on average spend 62% of their 24-hour day in their home, and children spend 76% of their time in their home. About 64-72% of California households with ozone-emitting air cleaners in a survey of 2,019 households reported operating their air cleaners continuously, 24 hours a day, 7 days a week (Piazza *et al.*, 2006). This indicates that an 8-hour exposure duration may be a conservative assumption for most air cleaner users.

- 28-40% of California households with OG or BP devices have two or more such devices in their home (Piazza *et al.*, 2006), indicating that there may be multiple ozone emission sources in many homes (thus producing higher ozone concentrations) and that the residents may often be in close proximity to one of those ozone emission sources.

Table IV-8. Estimated Population Exposure to Ozone from Indoor Air Cleaners

A Type of Air Cleaner [a]	B In-Home Ozone Concentration (ppm) [b]	C Percent of Homes in Category	D Number of Persons Exposed in California [c,d] (C x Subtotal)
Ozone Generators	0.201 - 0.400	25	160,000
	0.101 - 0.200	45	290,000
	0 - 0.100	30	190,000
	Subtotal [e]	**100**	**650,000**
By-Product Devices	0.081 - 0.120	5	110,000
	0.021 - 0.080	15	330,000
	0 - 0.020	80	1,770,000
	Subtotal [f]	**100**	**2,200,000**

Notes:

a. The By-Product Device category includes devices that use ionizer, electrostatic precipitator (ESP), or photocatalytic oxidation (PCO) technologies, but are not ozone generators (OGs). Ionizers, ESPs, and other By-Product devices are combined due to lack of data on market share by type of air cleaner technology. Results in Piazza *et al.* (2006, pp. 87-88) suggest at least 34% of all brands reported in the survey were ionizers.

b. Ozone Generator concentration estimates are based on Mason *et al.* (2000) test house data, and ARB (2006a) test room data. By-Product concentration estimates are based on test chamber data from Chen *et al.* (2005, 2006), Mullen *et al.* (2005), Britigan *et al.* (2005), and Consumers Union (2005a,b).

c. Based on 2006 data on the number of households in California with certain types of indoor air cleaners, the number of persons per household, and the fraction of households that were presently using the device (78%) from Piazza *et al.* (2006).

d. Number of persons value is rounded to the nearest 10,000.

e. Actual value for number of persons is 10,000 more than the apparent subtotal, due to rounding.

f. Number of persons value is rounded to nearest 100,000.

2. Indoor Ozone Concentrations: By-Product Devices

The same approach as above for OGs was used for By-Product air cleaners, as shown in the lower part of Table IV-8. The pre-regulation ozone exposure estimates are based on reported results from room and test chamber studies of a number of different models studied by Chen *et al.* (2005, 2006), Mullen *et al.* (2005), Britigan *et al.* (2005), and Consumers Union (2005a,b). The fractions of the households exposed at the three different levels of ozone are based on the statewide survey data of Piazza *et al.* (2006), and an estimated distribution of model types with higher emissions. The two highest categories of ozone emissions, 0.081-0.120 ppm and 0.021-0.080 ppm, are estimated to account for 5 and 15% of the BP category respectively, for a total of 20%. The remaining 80% of the BP devices are estimated to emit very low amounts of ozone.

3. Percent of Homes in Exposure Category

Table IV-8, Column C shows the estimated fractions of homes likely to experience the ozone exposure ranges discussed above. Data are not currently available on the distribution of air cleaners by ozone emission rate and type, or on the distribution of ozone output settings used across homes. Therefore, a reasonable assumption was made that the size of the ozone generator and emission rate would correlate well with the size of the room where it is used. The size of the room where the device was used was also considered in estimating the indoor ozone exposures.

The statewide survey of 2,019 households in California discussed earlier (see Background) also provides information on room sizes where air cleaners are used. Piazza *et al.* (2006) indicates that about 50% of the OGs are used in larger rooms such as the living room. Presumably these are the larger, whole-house units with the highest emission rates, or devices designed for large rooms, and would be operated at the higher settings. As a conservative estimate, it is assumed that some of these households operate the device at lower settings or have higher air exchange rates and larger home volumes than the 1,200 square foot test home in Mason *et al.* (2000), and that household members would not typically spend a full 8 hours near the device. These assumptions lead staff to estimate that only about 25% of these households experience the highest range of ozone exposures.

The survey results showed that about 30% of OGs are used in medium sized rooms such as the master bedroom and the family room, and about 20% are used in other types of rooms. Presumably these units would be either smaller units with low or medium emission rates, or the larger whole house units used at low or medium settings. This suggests that, out of the remaining 75% of the households, the medium- and low-ozone exposure categories comprise about 45% and 30% respectively. Note that, depending on the ozone output setting and the tightness of the room, the resultant ozone concentration in the room could still be in the high range. Also, 28% of the households with OGs reported having two or more air cleaners (Piazza *et al.*, 2006), which could increase indoor ozone levels even further. Thus, 45% and 30% are reasonable, or perhaps even conservative, estimates for the medium- and low-ozone exposure categories, respectively.

In addition, the distribution of sales prices for OGs in California (Piazza *et al.*, 2006) was examined as an indicator of the size of the ozone generators, and this yielded a similar distribution as above.

4. Number of Persons Exposed

The estimates of the number of persons exposed are shown in Table IV-8, Column D. These estimates are based largely on the results of the statewide survey by Piazza *et al.* (2006). That survey found that 282,000 households (2.28%) comprised of 828,000 persons, reported owning an ozone generator within the past five years. About 78% of the households reported current use of an OG, yielding an estimated 650,000 persons currently exposed to ozone from OGs, as shown in Column D of Table IV-8.

This value was then multiplied by the percent of homes in each category (Column C), to yield the exposed population for each category of exposure level and air cleaner, as shown in Column D. Of the 650,000 subtotal for owners of ozone generators, 160,000 persons are estimated to be exposed to indoor ozone concentrations of 0.201-0.400 ppm over 8 hours or more, and 290,000 persons are estimated to be exposed to indoor ozone concentrations of 0.101-0.200 ppm over 8 hours or more.

The same approach was used to estimate the number of persons exposed to ozone from BPs, except that the statewide survey reported that 7.83% of households, comprised of 2,800,000 persons, owned BPs within the past five years. Accounting for the 78% current use rate, this yields an estimated subtotal of 2,200,000 persons currently using BPs in their homes. Of these persons, 111,000 persons are estimated to be exposed to indoor ozone concentrations of 0.081-0.120 ppm over 8 hours or more, and 330,000 persons are estimated to be exposed to indoor ozone concentrations of 0.051-0.080 ppm over 8 hours or more.

In summary, well over 500,000 Californians are estimated to be routinely exposed to ozone concentrations above the 8-hour CAAQS of 0.070 ppm due to the use of an indoor air cleaning device that emits ozone. Most importantly, many of these Californians are exposed to ozone levels several times greater than the health-based standard.

V. Proposed Regulation

This chapter provides a discussion of the proposed regulation required by AB 2276, and the rationale behind each section. Where applicable the key terms or concepts involved in the development of the proposed regulation are described in detail. The discussion in this Chapter is intended to fulfill the requirement of Government Code Section 11343.2, which requires a "plain English" summary of the proposed regulation be available to the public. The proposed regulation order, in its entirety, can be found in Appendix B. In short this proposed regulation requires that IACD intended for use in occupied spaces meet a 0.050 ppm ozone emission concentration limit, be labeled and marked appropriately, and be certified by ARB.

A. Applicability (Section 94800)

Section 94800 of the proposed regulation order indicates the responsible parties and the devices covered under the regulation. The proposed regulation would apply to anyone who manufactures, sells, supplies, offers for sale, or introduces into commerce IACD used or intended for use in occupied spaces. This regulation would apply to portable IACD designed for room, whole house, whole floor, whole building, and in-vehicle use, as well as those designed to be carried on one's person (because people typically spend substantial time indoors). The use

of some of these devices in spaces intended for occupied use has the potential for very high ozone exposure to the public.

Under the proposed regulation, any device used or intended for use in an enclosed space intended to be occupied by people for extended periods of time, e.g., houses, apartments, hospitals, and offices, would be banned from being introduced into commerce in California unless it met the proposed emission standard and other proposed requirements. In the staff's experience such measures as "dual use" settings and labeling are not effective in preventing exposures to high levels of ozone, especially in the case of air cleaning devices that are marketed for residential use. Users, including residential users, are inclined to use high emitting devices and set devices at high emission levels, particularly in light of misleading marketing claims alleging health benefits from ozone exposure. Users of these devices are commonly unable to accurately gauge the actual levels of ozone either emitted directly by these devices or which accumulate as the devices are used for periods of time for a variety of reasons, including the deadening effect of ozone on people's sense of smell (olfactory sense). While exiting an enclosed area may offer some protection to the person who sets a dual use device on a high setting or uses an otherwise high emitting device, this offers no protection to other people who may enter the area. For these reasons the staff proposes defining the term "occupied space" in the regulation in the same wide sense it is used in federal law at 21 CFR section 801.415 and paraphrased in HSC 41985.5(a). Under this proposed definition it would be a violation to introduce air cleaners into commerce in California unless they comply with the regulation's proposed requirements regardless of whether they are "dual" use or are labeled not for use in the presence of people because the proposed regulation would apply to all devices that can be used in an enclosed space intended to be occupied by people for extended periods of time, e.g., houses, apartments, hospitals, and offices. In addition to being consistent with federal law, this also carries out the intent of HSC section 41985.5(c)(1) which directs ARB to ban high emitting devices. Notably, the Health and Safety Code does not limit the regulation only to devices that are used exclusively in the presence of people. Indeed, given the way the staff understands that these devices are actually used, limiting the regulation in such a way would severely limit its ability to do what it is intended to do – protect people from exposures to high levels of ozone emitted from these devices.

B. Definitions (Section 94801)

For the purposes of clarification and brevity within the proposed regulation order the intended meanings of a number of terms are provided in Section 94801. Several acronyms are defined for state and federal agencies and entities. Specific terms of importance to the appropriate application of the proposed regulation order are explicitly defined to avoid ambiguous interpretation.

C. Emission Standard (Section 94802)

Section 94802 outlines the specific ozone emission standard for IACD offered for sale within the state of California. The proposed regulation stipulates that all IACD manufactured for use in California in occupied spaces 12 months after the effective date of this regulation would need to be certified under the requirements of this regulation. Additionally, no IACD could be offered for sale within the state of California that produces an ozone emission concentration in excess of 0.050 ppm nine months after the effective manufacture date. This ozone emission concentration is consistent with the federal ozone emissions limit, as required by Section 41986

of the HSC. Verification of the ozone emission concentration of the IACD would be attained via certification by ARB, following the procedures described in Section 94804, discussed below. All of the IACD certified as complying with the 0.050 ppm ozone emission standard also would be required to satisfy the labeling and mark requirements described in Section 94806. All IACD would need to continue to meet the ozone emission standard in order to continue sale within California.

D. Exclusions and Exemptions (Section 94803)

Two classes of IACD are excluded or exempt from compliance with the ozone emission standard, as detailed in Section 94803. These exemptions would be for the use of IACD for industrial applications and for devices that are an integrated component of a central heating, air conditioning, or ventilation system. The following describes the qualifications and rationale of each exemption in greater detail.

There are several industrial applications that utilize ozone for a variety of purposes, most as an oxidant alternative to chlorine. Drinking water, wastewater and sewage treatment applications use ozone for purification. The pulp and paper industry use ozone for bleaching purposes, in addition to wastewater treatment. In certain circumstances ozone is used to increase the shelf-life of perishable food stuffs. Ozone is also used for odor control in several industries, and is used in the remediation of fire, smoke, and mold damage. Given the diversity of ozone use as an alternative oxidant we propose to provide an exemption for industrial applications that satisfy the "industrial use" definition specified in Section 94801. Indoor air cleaning devices that are manufactured, advertised, marketed, and used solely for industrial use would be eligible for exemption from the proposed regulation, provided these IACD are marketed and sold only through industrial supply outlets or businesses. Additionally, these IACD would have to be prominently labeled as "Solely for industrial use. Potential health hazard: emits ozone." in order to satisfy the requirements for exemption. Any potential workplace exposure from such exempt IACD would fall under the authority of the California Department of Industrial Relations (Cal/OSHA). These exemptions may be reconsidered in the future if future information indicates they pose a risk to public health.

Indoor air cleaning devices that are a physically integrated component of a central heating, air conditioning or ventilation system, commonly referred to as "in-duct" devices, would be exempt from meeting the ozone emission standard. The primary reason for exemption of these IACD is the lack of relevant ozone emissions and exposure data from this type of device, and the need for a different test method. However, if future data show the ozone emissions from such devices pose a risk to public health, regulation measures would be proposed.

E. Certification Requirements (Section 94804)

The proposed regulation would require all IACD sold in California for use in occupied spaces to be certified by the ARB, except for devices qualifying for exemption under Section 94803 above. To attain certification, the IACD manufacturer is required to submit an application for consideration to ARB. Alternatively the application may be submitted by a professional or certification organization on the manufacturers' behalf, provided the required information and appropriate signatures are included. If the IACD is deemed compliant with the proposed regulation, ARB will issue an Executive Order of certification for the IACD, allowing for sale within California.

The certification application would require information about the IACD manufacturer, the applicant (if different from the manufacturer), the IACD to be certified, other models in the model group covered, and the IACD test information. The format for submission of the certification application information is presented in Appendix D. Application materials would be required to be submitted together as a single submission. If some of the requested certification information is not available or not applicable it must be indicated in the application. The ARB Executive Officer could waive the requirement to provide such information for certification if they concur with the judgment of the applicant.

Certification applications would initially be reviewed by ARB for completeness. A written notice would be provided within 30 days of receipt indicating if the application has been accepted for review or, if incomplete, what additional information is required. Within 30 days after application acceptance, written notification of certification approval or disapproval will be provided. Upon receiving certification approval, the IACD model and its associated group models, if any, would be added to a list of certified IACD that would be maintained on the ARB website. ARB staff would strive to process certification applications as quickly as possible, because the ARB understands the implications of a slow approval process for manufacturers.

Indoor air cleaning devices using only mechanical filtration for pollutant removal would be exempt from the testing requirement for the ozone emission standard, based on their known *de minimis* ozone emissions. Mechanical filtration achieves pollutant removal via physical barrier methods by forcing air through a filter medium. Due to the absence of an electrical discharge the potential for ozone production is minimal. Verification of qualification for the mechanical filtration exclusion would be made by the ARB Executive Officer based on information provided by the certification applicant. The information required for verification includes the product design specifications, a description of the air cleaning performance technology employed, and a block diagram or schematic of the IACD. Indoor air cleaning devices qualifying for this exclusion are still required to submit the information for certification, including certification for electrical safety according to ANSI/UL Standard 507 or any ANSI/UL Standard that addresses electrical safety for mechanical filtration air cleaners that succeeds Standard 507. Any IACD certified to Standard 507 prior to the enactment of the proposed regulation are eligible for certification without additional testing, provided they continue to comply with Standard 507 requirements. Mechanical filtration IACD are still required comply with the labeling requirements described in Section 94806 and be certified by ARB.

Following certification the IACD must maintain compliance with the requirements of this regulation. Notification must be provided to ARB, within 30 days, if at any time a certified IACD or indoor air cleaner model group fails follow-up testing under ANSI/UL Standard 867 or 507 protocols. Additionally, ARB staff may at any time purchase a certified device and evaluate its compliance with the regulation requirements. If at any time an IACD or indoor air cleaner model group is found to be non-compliant with the regulation requirements, their certification may be revoked. The ability to revoke certification for a non-compliant device ensures that ARB has the necessary authority to adequately protect the public from unnecessary ozone exposures from IACD.

F. Test Method (Section 94805)

Section 94805 details the test methods proposed to be used for verification of compliance with the ozone emission standard described in Section 94802. For the purpose of

compliance with the requirements of this regulation it is necessary to examine only one model of IACD within a model group, as defined in Section 94801, if a model group exists, to verify compliance with the test methods. The allowance for IACD model groups will limit unnecessary testing of IACD that may have non-performance related differences such as aesthetic modifications (i.e., color), several different brand names, or other similar cosmetic differences.

ANSI/UL Standards 867 and 507 are the test methods that would be used to determine compliance with the requirements of this regulation. Both are available from http://www.comm-2000.com. The ANSI/UL Standard 867 will be used to evaluate both the ozone emissions and electrical safety for all applicable IACD. Indoor air cleaning devices that are verified as mechanical-filtration only devices will be evaluated for electrical safety using ANSI/UL Standard 507, or any ANSI/UL Standard that addresses electrical safety for mechanical filtration air cleaners that succeeds Standard 507, and ozone emissions testing would not be required for certification. Inclusion of the electrical safety testing requirement for compliance with this regulation would provide protection to consumers by ensuring that any IACD design modifications to meet the ozone emissions limit do not compromise the integrity and fire safety of the device.

Ozone emissions from IACD would be determined following the test conditions outlined in the 2007 revision to Section 37 of ANSI/UL Standard 867. As the standard revision process is taking place in parallel to the development of this regulation, the following discussion of the ozone test method is based on the revision draft released for public comment on June 22, 2007. While changes to the released draft are expected, ARB staff anticipate that they will be small with little impact on the determined ozone emission. A copy of the June 22, 2007 Standard revision is provided in Appendix E. The revisions to Section 37 of Standard 867 are proposed by UL to provide clarification of the ozone emissions test protocol described in Section 37 in order to minimize variability among laboratories and to address uncertainties in the original language of Section 37. Briefly this test measures the ozone emissions of the IACD at a distance of 2 inches from the device over a period of 24 hours within a test chamber. ARB staff feel that by following the revised Section 37 and the 2 inch measurement location, any potential for extremely high near-source ozone exposures from IACD, as discussed in Section IV.D., would be minimized for the assured protection of public health. This is very important as several IACD examined by ARB staff emitted ozone in excess of 1 ppm at this distance, illustrating the substantial risk for extremely high near-source exposure levels. Since the emission test is conducted for a period of 24 hours, any ozone accumulation in the room will be ascertained in a manner consistent with the FDA regulation.

There are several important changes specified in the proposed revision of Section 37 of ANSI/UL Standard 867. A notable change to the ozone emission test procedure is the manner in which the background ozone concentration is determined. Accurate determination of the background ozone levels is essential. Previously, the pre- and post-test background measurements were averaged and then subtracted from the highest concentration measured during the IACD device test to calculate the ozone emission concentration. The previous language of Section 37 allowed for varied interpretation regarding when the pre- and post-test background measurements were to be performed, potentially allowing high ozone emitting IACD to pass the 0.050 ppm emission restriction (Niu *et al.*, 2001a,b; Chen *et al.*, 2005; Siegel, 2005). The revised Section 37 now stipulates that the background measurement is to be performed in the test chamber immediately prior to the start of the IACD emission testing. Additionally, the proposed revision stipulates that none of the background measurements can exceed 0.005 ppm. These additional specifications for the background measurements should prevent high

ozone emitting devices from meeting the 0.050 ppm emission limit due to differences in interpretation of test details.

Other changes in the proposed Section 37 revision pertain to the test chamber. The majority of the changes to the test chamber were aimed to reduce variability in the ozone emissions determined by different laboratories. Test chambers may be constructed from stainless steel or any other non-porous and non-reactive material provided the chamber is able to attain the specified performance characteristics. These performance characteristics include verifying an ozone half-life of 16 ± 1 minutes, an air exchange rate between 0–0.35 ACH, and an air supply system capable of providing particulate-free, VOC-free, and ozone-free air. By tightening the specifications of the test chamber, the proposed revisions to Section 37 would substantially reduce inter-laboratory variability which is essential to avoid certified devices later failing a compliance test if tested by another laboratory.

Other notable revisions include the following:

- If the ozone emission of the first device exceeds 0.030 ppm, compliance with the emissions concentration limit will be verified by testing a second unit of the same model.
- The device will be operated for a 72 hour run-in period prior to emissions testing.
- The average of five consecutive measurements taken 60 seconds apart must not exceed 0.050 ppm.
- The maximum ozone emission location would be determined and used for the location of the monitoring inlet.
- Devices with multiple operation settings would be tested on each setting, or for continuous dials, on the high, medium and low settings.
- IACD containing ozone-monitoring circuitry must meet the emission limit with and without the circuitry engaged, unless its reliability has been demonstrated under specified tests.

For compliance with this regulation testing to determine the ozone emissions and electrical safety of IACD must be performed by an independent laboratory currently recognized as a Nationally Recognized Testing Laboratory (NRTL) by the U.S. OSHA. The laboratory must have NRTL status to complete the ANSI/UL Standard 507 and revised Standard 867 testing in their entirety. Such a NRTL may also utilize a Program #2 independent laboratory per the March 9, 1995 OSHA Federal Register Notice 60: 12980-12985 for Section 37 ozone testing required in this regulation. Prior to performing testing for this regulation, laboratories must also pass an ARB audit. The ARB audit would include an initial paper evaluation of the laboratories' Standard Operating Procedures (SOPs). Once the laboratories' SOPs are deemed acceptable, ARB staff may conduct an on-site inspection to verify the test chamber and instrumentation configurations, as well as to observe the successful attainment of the test conditions specified in the proposed revisions to Standard 867. Upon satisfactory completion of the ARB audit, laboratories may begin testing for certification submission.

G. Labeling and Safety Mark Requirements (Section 94806)

Any IACD subject to this regulation that does not qualify for exemption from this regulation would be required to display the proper label on the product packaging prior to sale within California. Medical devices would be labeled to comply with federal law by satisfying the requirements of Section 801.415 of Title 21 of the Code of Federal Regulations (see Appendix F), and state "ARB certified". For non-medical devices the label would be displayed upon completion of the requirements of Section 94804 and approval for certification by ARB.

Dimensions of the label would be at least 1 inch by 2 inches and would contain the text "This air cleaner complies with the federal ozone emissions limit. ARB certified".

Indoor air cleaning devices that qualify for exemption to this regulation would likewise be required to display the appropriate exemption label on their packaging and in specified advertising. Any IACD for non-industrial use in occupied spaces that is advertised or sold via the Internet or mail catalogs and lacks ARB certification under Section 94804 would be required to display an advisory warning stating "Device does not meet California requirements, cannot be shipped to California." in a prominent place on all Internet webpages, catalog pages and related materials for marketing and sale of the device. The inclusion of associated marketing materials, especially Internet-related items, in the labeling requirements is necessary as many IACD are obtained from Internet shopping, and consumers need to be aware of potential dangers that certain IACD may pose prior to their purchase, and whether or not the device under consideration complies with California regulations.

All IACD sold in California and subject to this regulation would be required to display the appropriate electrical safety certification or listing mark on the product. The mark must be consistent with the ANSI/UL Standard 867 requirements of the appropriate NRTL safety certification organization for devices required to undergo ozone emission testing. Indoor air cleaning devices meeting the requirements as "mechanical-filtration only" devices would be required to display the certification mark for Standard 507, or for any electrical safety standard for air cleaners that succeeds Standard 507. The combination of package labels, sales materials labels and the certification marks help assure consumers that their IACD is in compliance with this regulation.

H. Notice to Distributors, Retailers, and Sellers (Section 94807)

Within 12 months of the effective date of this regulation, all IACD manufacturers would be required to provide ARB with documentation indicating the manufacturer has provided all of its known distributors, retailers, and sellers with true and accurate copies of the final regulation order approved by ARB and the California Office of Administrative Law. Accepted documentation of an electronic notification will include a copy of the email and the contact information for each email address. Accepted documentation of a mailed notification will include a paper copy of the materials mailed and the associated mailing list and contact information. Any new distributors, retailers and sellers that become known to the manufacturer after the initial notification must be provided the same required materials, with their contact information provided to ARB. Additionally, manufacturers are required to submit the contact information for all of their known California distributors, retailers and sellers. Failure to comply with this provision may result in the rejection or revocation of ARB certification.

I. Recordkeeping Requirements (Section 94808)

The manufacturers, distributors, retailers, sellers and test laboratories would be required to maintain production, quality control, sales, or testing records for products that are sold, supplied, offered for sale, introduced into commerce, or manufactured for sale within the state of California, for at least three years. These records must be made available upon request to ARB. Such a request would be made only for enforcement purposes. Requested recorded information may be kept confidential if necessary.

J. Rejection, Revocation, Recall, and Penalties (Section 94809)

Failure to comply with any provision of the proposed regulation order could result in the denial of a certification application or having certification suspended or revoked. If a non-compliant device is found, the Executive Officer may order the products involved be recalled and replaced with compliant devices. In the event of a violation with an article of the proposed regulation, all other penalties authorized by law apply as well.

In enforcing this regulation, ARB's Enforcement Division inspectors will visit retail, wholesale, Internet outlets and distributors to ensure that air cleaners available for sale in California meet certification and labeling requirements. Periodically, air cleaners would be purchased and submitted to a laboratory for testing to ensure that they are in compliance with the ozone emission standards in Section 94805 of the regulation. Potential violations would be investigated, Notices of Violation (NOV) would be issued, and appropriate civil or administrative action could be taken by the Air Resources Board to enforce NOVs issued under this regulation. Civil penalties could be imposed as provided in Health and Safety Code sections 42402 *et seq.* Criminal cases may be referred to the appropriate prosecuting agency and would be subject to penalties under Health and Safety Code sections 42400 *et seq.*

K. Severability (Section 94810)

Each section and subsection of the proposed regulation is an independent entity. If any portion of the regulation is found to be invalid, the remainder of the regulation would continue to apply in full force and effect. Thus, each article is deemed severable.

VI. Economic Impacts

A. Summary

The potential economic impacts of the regulation will primarily be cost increases to most manufacturers to certify air cleaners, i.e., to meet testing and labeling requirements. Approximately 60 manufacturers and their distributors may be affected. For most manufacturers of OGs and a few manufacturers of BP devices, this certification also will require redesign of some products to meet ozone emission limits. The potential economic impact for most manufacturers is estimated to be insignificant relative to total sales and profits. However, some smaller manufacturers of OG and BP devices may be impacted over the short-term. The potential economic impacts on distributors, retailers, and consumers, are estimated to be minimal, except for those distributors whose suppliers choose not to provide a compliant product. The potential fiscal impact on ARB is about $175,000 per fiscal year after approval of the regulation. The fiscal impact on other state agencies and local agencies is expected to be insignificant. The potential impact in California on jobs, business competitiveness, and business creation, elimination, or expansion is expected to be insignificant.

B. Affected Businesses and Agencies

The proposed regulation will affect the manufacturers, distributors, and sellers of portable air cleaners used or intended for use in occupied spaces if the products are marketed for sale in California. Staff estimate that 61 manufacturers may be affected, and that their

combined annual California sales averaged approximately $40,000,000 per year from 2003-2006, as discussed in the following section.

Only a few of the manufacturers are based in California: three large manufacturers (Jarden Consumer Solutions, Sharper Image, and Biotech Research), and at least three smaller manufacturers (Aqua Sun Ozone International, Zojirushi America Corporation, Wein Products). A large majority of the actual manufacturing is done under contract with manufacturers in Asia, according to industry representatives.

ARB is the only state or local agency directly affected by this proposed regulation. Other state agencies such as the California Department of Public Health and some local health agencies such as health departments and district attorneys are not expected to be affected.

C. Potential Impacts on Businesses

1. Manufacturers

Industry-wide information on the number of air cleaner manufacturers, the number of models to be certified and the likely cost of redesign and certification is not currently available. Consequently, ARB staff sent a confidential market survey and a follow-up survey to all major manufacturers of portable air cleaners, and to known manufacturers of ozone generators. The survey asked about annual sales volume, retail price mark-ups, the number of models to be certified, the number of employees, and sales distribution channels. It also asked about the expected costs to redesign products, conduct ozone and safety tests, and label the products affected by the regulation. Only six manufacturers responded to these ARB requests for information. Nearly all of the responses supplied information on sales volumes, distribution channels, and employee numbers, but not on the number of models to be certified and the expected costs.

Detailed, comprehensive listings of all manufacturers and models of air cleaners sold in California are not available. Therefore, to estimate the number of manufacturers affected and the number of models that will require certification under the regulation, ARB staff used available sources of information on air cleaner models on the market, including the following:

- The list of ozone generator models on the ARB website (ARB, 2006c).
- The final report and data from a statewide survey of residential air cleaner use (Piazza *et al.*, 2006).
- The listing of portable air cleaner models, brands, and their Clean Air Delivery Rates (CADR) by the Association of Home Appliance Manufacturers (AHAM, 2007).
- The websites of various manufacturers.

Based on the information indicated above, ARB staff estimated that a total of 61 manufacturers have current models of air cleaners that would need to be certified in the first year (Year 1) after the effective date of the regulation (see Table VI-1). Eight of those manufacturers are considered "large share" manufacturers, based on their share of the California market from survey data by Piazza *et al.* (2006).

Staff also estimated that the California sales of air cleaners in 2003-2006 averaged about $40,000,000 per year. This estimate is based on household purchase data from the California survey by Piazza *et al.* (2006). This estimate is consistent with estimated California

sales of $41,000,000 for 2006, derived from an interpolation of national estimates of $275,000,000 in 2003 and $485,000,000 in 2013 (Freedonia, 2004), after adjusting for California's relative population size of 12% of the national population. Freedonia (2004) estimated that the U.S. market would grow by 76% from 2003 to 2013.

a. Number of Models to Be Certified

The following definitions of types of air cleaners were used to distinguish among different levels of ozone emissions and the resultant certification costs:

- Ozone Generators (OG): devices that intentionally produce ozone.
- By-Product (BP) Devices: devices that produce ozone as a by-product of their air cleaning technology. BP High Emitter Devices are BP devices that produce ozone emission concentrations near or above the UL 867 standard.
- Mechanical-filtration Devices (M): devices that only use filtration with a physical barrier, and non-electronic techniques; they produce *de minimis* ozone emissions.

Based on the available information indicated above, ARB estimated that a total of 215 models of air cleaners will need to be certified in the first year (Year 1) after the effective date of the regulation (Table VI-1). A total of 61 manufacturers would be affected; 53 (87%) are small businesses.

The results shown in Table VI-1 are listed for the three general types of portable air cleaner technologies. Each type of air cleaner is also broken down into Large Share and Small Share, based on the brand prevalence (market share) in the California survey data (Piazza *et al.*, 2006). Brands were combined when they had the same manufacturer, based on the CADR list and product websites. Staff assumed all models other than those with only cosmetic differences such as color or minor features would require certification. Staff also assumed that older models that are currently in retail and distribution channels, but no longer produced, will be phased out by the time the regulation is in effect. Note that the CADR directory lists a total of about 30 manufacturers of BP or Mechanical devices, while the California survey (Piazza *et al.*, 2006) indicates about 40 manufacturers after subtracting those brands made by the same manufacturer. This difference is attributed to the fact that not all manufacturers are AHAM members with CADR listings.

The total number of models to be certified was estimated by multiplying the average number of models per manufacturer (Column B) by the number of manufacturers in the category (Column C). The overall total number of models was estimated to be 215 models: 42 OG models, 94 BP models, and 79 Mechanical models. As seen in Table VI-1, the estimated average numbers of models were similar among manufacturers in the same market share category. The Large Share manufacturers were estimated to produce 6-8 models on average, while Small Share manufacturers were estimated to produce 3 models on average. The available lists of manufacturers and models are not completely comprehensive, so these estimates may be an underestimate for the current market. Additional details on how the estimates in Table VI-1 were developed are presented in Appendix G.

Table VI-1. Estimated Number of Air Cleaner Models to Be Certified, By Type of Air Cleaner

A Type of Air Cleaner	B Average # of Models per Manufacturer	C # of Manufacturers in Category	D Total # of Models to be Certified (B x C)
Ozone generators [a]			
Small share	3	10	30
Large share	6	2	12
Subtotal	NA [e]	12	42
By-product devices [b,c]			
Small share	3	22	66
Large share	7	4	28
Subtotal	NA	26	94
Mechanical devices [b,c,d]			
Small share	3	21	63
Large share	8	2	16
Subtotal	NA	23	79
Total	**NA**	**61**	**215**

Notes:

a. The number of models per ozone generator (OG) manufacturer was compiled from ARB (2006). The number of OG manufacturers was compiled from Piazza *et al.* (2006).

b. The number of By-Product (BP) device manufacturers and market share are from a California statewide survey (Piazza *et al.*, 2006, Appendix B, and brand name data). Brands made by the same manufacturer were identified using the CADR directory list (AHAM, 2007). For mechanical devices, the number of models was estimated using the same approach described above for BP devices.

c. Older models that are currently in retail and distribution channels but are no longer produced are assumed to be phased out by the time the regulation is in effect.

d. Assumes that about half of the models from small share producers that are on the CADR list are currently marketed in California and are considered mechanical devices.

e. NA: not applicable.

b. Cost of Certification to Typical Manufacturers

The cost to manufacturers to comply with this regulation will vary widely, depending on the type of air cleaner and the number of models produced by the manufacturer. First, estimates were developed for the initial costs per model for typical manufacturers to redesign, test ozone emissions, and label their products (Table VI-2). The BP category was broken into two categories – High Emitters and Low Emitters – because of potential differences in certification

costs. A range of initial costs for a single model was obtained from test laboratories currently performing the UL 867 and UL 507 tests and from AHAM, and staff used the mid-points of the cost ranges. The assumptions for the estimates in columns A, B, and C are provided in the footnotes to Table VI-2.

The sum of these costs per model is shown in Column D of Table VI-2. The Total Initial Cost per manufacturer ranges from $14,500 to $51,500 per model. In Column E, the initial costs were annualized, assuming a 5% discount rate over 5 years, to estimate the real cost over the product life. A product life of 5 years is typically used for research activities and equipment, so it is an appropriate time period for air cleaner redesign, testing, and labeling. The Years 1-5, Annualized Initial Cost, shown in Column E of Table VI-2, ranges from $3,300 to $11,900 per model. The actual cost per model for Mechanical devices is expected to be much lower because most manufacturers in this category already have UL certification for electrical safety.

Table VI-2. Initial Certification Costs per Model

A Year 1 Redesign Cost ($/model)	B Year 1 UL Testing ($/model) [a]	C Year 1 UL Labeling ($/model) [b]	D Total Initial Cost ($/model) (A+B+C)	E Years 1-5, Annualized Initial Cost ($/yr) [c]
OG				
20,000	14,000	17,500	51,500	11,900
BP High Emitter				
10,000	12,000	10,000	32,000	7,400
BP Low Emitter				
0	10,000	10,000	20,000	4,600
Mechanical				
0	4,500	10,000	14,500	3,300

Notes:

a. Assumptions: UL ozone test costs for UL 867 Clarification Sec. 37 protocol, at 3 settings, no second units tested.
OG cost: 2 ozone pre-tests ($2,000 each), plus 1 UL 867 test ($10,000), totals $14,000.
BP High Emitter: 1 ozone pretest ($2,000), plus 1 UL 867 test ($10,000), totals $12,000.
BP Low Emitter: 1 UL 867 test ($10,000).
Mechanical: $4,500 for UL 507 certification, if needed (most are already certified); no ozone tests.

b. OG: estimated range 5,000 - $30,000, midpoint $17,500. BP and mechanical: estimated range $5,000 - $15,000, midpoint $10,000.

c. Total Initial Cost discounted at 5% over Years 1-5. Rounded to the nearest $100.

In Table VI-3a, the potential costs for manufacturers were estimated using the annualized initial costs, plus ongoing costs due to model turnover. Model Turnover Costs in Years 2-5 (Column C) were estimated by assuming 10% of the models on average would be replaced by new models that required testing and labeling only.

Table VI-3a. Typical Costs to Manufacturers

Total Cost per Model			Typical Cost per Manufacturer			
A Year 1 Initial Cost ($/model) (Table VI-2)	B Years 1-5, Annualized Initial Cost per Model ($/yr) (Table VI-2)	C Years 2-5, Model Turnover Cost per Model [a] ($/yr)	D Average # of Models per Mfr (Table VI-1)	E Years 1-5 Total Cost per Mfr ($) [b] D x (5B+4C)	F Annual Average Cost per Mfr ($/yr) (E / 5)	G Years 2-5 Total Turnover Cost per Mfr ($) (4xCxD)
OG						
Small Share						
51,500	11,900	3,200	3	217,000	43,400	38,400
Large Share						
51,500	11,900	3,200	6	434,000	86,800	76,800
BP - High						
Small Share						
32,000	7,400	2,200	3	137,000	27,400	26,400
Large Share						
32,000	7,400	2,200	7	321,000	64,200	61,600
BP - Low						
Small Share						
20,000	4,600	2,000	3	93,000	18,600	24,000
Large Share						
20,000	4,600	2,000	7	217,000	43,400	56,000
Mechanical[c]						
Small Share						
14,500	3,300	1,500	3	68,000	13,600	18,000
Large Share						
14,500	3,300	1,500	8	180,000	36,000	48,000

Notes:

a. Assumption: 10% model turnover per year; only testing and labeling needed. Ongoing costs in Years 2-5 = (B + C from Table VI-2) x 10%. Rounded to nearest $100.
b. Includes annualized costs and ongoing costs. Rounded to nearest $1,000.
c. Most manufacturers of Mechanical devices would experience lower costs because most already have Standard 507 certification.

In addition, Table VI-3a shows the Years 1-5 Total Cost per Manufacturer in Column E for each category of manufacturer. The Years 1-5 Annualized Initial Cost in Column B was multiplied by 5 years, and the Year 2-5 Model Turnover Cost in Column C was multiplied by 4 years. The sum of these two values was then multiplied by the Average Number of Models per

manufacturer in Column D to yield the Years 1-5 Total Cost per Manufacturer in Column E. This value was then divided by 5 years to yield the Annual Average Cost per Manufacturer (Column F).

In general, the estimated Years 1-5 Total Costs per Manufacturer range from $68,000 to $434,000. The total costs are greatest for the OG group, followed in declining order by the BP High Emitter group, the BP Low Emitter Group, and the Mechanical group. As expected, the total costs estimated for the Small Share manufacturers in all categories are about ½ of the total costs of the Large Share manufacturers. These differences are largely due to different costs for redesign and labeling and the number of models to be certified. The estimated Annual Average Cost per Manufacturer ranges from $13,600 to $86,800. To the extent that the manufacturer passes on these costs to the consumer, the impact on the manufacturer will be less than projected here.

Smaller businesses will likely be impacted more by the increased costs for product certification. The Annual Average Cost for Large Share manufacturer was estimated to be about $36,000 to $86,800, as shown in Table VI-3a. These costs are insignificant relative to annual sales for manufacturers in this group, which are estimated to reach $50-120 million worldwide. For Small Share manufacturers, the Annual Average costs were estimated to be about $13,600 to $43,400 per year, while their sales were estimated to be $500,000 or less per year. However, because air cleaners appear to have a profit markup on the order of 40-60% added to their costs, the actual economic impact of the regulation is expected to be relatively insignificant for typical Small Share manufacturers, as well. In addition, the annual costs would decline rapidly after Year 5, reflecting only the ongoing costs from model turnover.

Table VI-3b shows the breakdown of the total initial costs and annual ongoing costs per manufacturer in the 5 years after the regulation is adopted. The total initial cost per manufacturer was calculated by multiplying Years 1-5 Annualized Initial Cost per Model by the Number of Models and by 5 years. The annual ongoing cost per manufacturer was calculated by multiplying Years 2-4 Annual Turnover Costs per Model by the Number of Models. As shown in Column E, the total initial costs for a small business (represented by Small Share Manufacturers) ranged from $50,000 to $179,000, depending on the type of indoor air cleaner. For a typical business (represented by Large Share Manufacturers), the total initial costs ranged from $132,000 to $357,000. As shown in Column F, the total ongoing costs were estimated to range from $5,000 to $10,000 for small businesses, and $12,000 to $19,000 for typical businesses.

The maximum potential impact of certification costs on the profits of manufacturers is shown in Table VI-4. The Annual Sales per Manufacturer (Column B), as estimated above, were multiplied by 0.5, assuming a 50% markup on costs. Next, the Average Annual Cost per Manufacturer (Column D) from Table VI-3a was adjusted for a 40% reduction in taxes to estimate the After-Tax Cost per Manufacturer (Column E). This value was then divided by the annual profits (Column C) to estimate the Percent Decrease in Profitability for each category of manufacturers (Column F).

Table VI-3b. Total Initial and Ongoing Costs per Manufacturer

A Type of Air Cleaner Mfr	B Number of Models per Mfr (Table VI-1)	C Years 1-5, Annualized Initial Cost per Model ($/yr) (Table VI-3a)	D Years 2-5, Annual Turnover Costs per Model ($/yr) (Table VI-3a)	E Years 1-5 Total Annualized Initial Cost per Mfr($) (5xBxC) [a]	F Years 2-5 Annual Turnover Costs per per Mfr ($/yr) [a] (BxD)
OG					
Small Share	3	11,900	3,200	179,000	10,000
Large Share	6	11,900	3,200	357,000	19,000
BP High Emitter					
Small Share	3	7,400	2,200	111,000	7,000
Large Share	7	7,400	2,200	259,000	15,000
BP Low Emitter					
Small Share	3	4,600	2,000	69,000	6,000
Large Share	7	4,600	2,000	161,000	14,000
Mechanical					
Small Share	3	3,300	1,500	50,000	5,000
Large Share	8	3,300	1,500	132,000	12,000

Notes:
a. Rounded to nearest $1,000.

The estimates of maximum decrease in profitability range from 0.1 to 10.4%, as shown in Table VI-4. The weighted average, based on the number of manufacturers in each category, is a 0.6% decrease in profitability. Only two categories have more than a 5% decrease in profitability: the Small Share manufacturers in the OG and BP High Emitter categories are estimated to have maximum profit decreases of about 10% and 7%, respectively. This may produce a potential for significant adverse impact for some Small Share Manufacturers if they are unable to pass the cost increase on to consumers. In conclusion, because of the low (0.6%) estimated average decrease in manufacturer profitability, staff does not expect the regulation to have a significant impact on the long-term profitability of most manufacturers, although there may be short term adverse impacts on some of the Small Share manufacturers to the extent they are unable to pass cost increases on to consumers.

Table VI-4. Potential Impact on Profits of Manufacturers

A Type of Air Cleaner	B Annual Sales per Mfr ($/yr)	C Annual Profits per Mfr ($/yr) (0.5 x B) [a]	D Annual Average Cost per Mfr ($/yr) (Table VI-3a)	E After-Tax Cost per Mfr ($/yr) (0.6 x D) [b]	F % Decrease in Profitability (E/C x 100) [c]
OG					
Small Share	500,000	250,000	43,400	26,000	10.4
Large Share	50,000,000	25,000,000	86,800	52,100	0.2
BP High Emitter					
Small Share	500,000	250,000	27,400	16,400	6.6
Large Share	50,000,000	25,000,000	64,200	38,500	0.2
BP Low Emitter					
Small Share	500,000	250,000	18,600	11,200	4.5
Large Share	50,000,000	25,000,000	43,400	26,000	0.1
Mechanical					
Small Share	500,000	250,000	13,600	8,200	3.3
Large Share	50,000,000	25,000,000	36,000	21,600	0.1
				Weighted Average [d]	**0.6**

Notes:

a. Calculation assumes a 50% retail markup.
b. Calculation assumes that the combined state and federal taxes are at the highest rate of 40%, reducing the after-tax cost to 60% of the pre-tax cost.
c. Rounded to the nearest 0.1%.
d. Calculated by 1) dividing the number of manufacturers in each category of Table VI-2 by 61, the total number of manufacturers, to yield the fraction of all manufacturers for that category of manufacturers; 2) splitting the BP category into 20% High Emitters and 80% Low Emitters; and 3) multiplying this fraction by the % Decrease in Profitability (Column F) for each category, and averaging all categories.

c. Cost to All Manufacturers

In order to estimate the total cost of the regulation for all manufactures combined, the total costs for all types of air cleaners were estimated for Years 1-5 (Table VI-5).

For each category of air cleaner, the Years 1-5 Annualized Cost (Column C) was multiplied by 5 years, and the Year 2-5 Model Turnover Cost per Model (Column D) was multiplied by 4 years. The sum of these two values was then multiplied by the Average Number of Models per category of air cleaner type (Column B). This yields the Years 1-5 Total Industry Costs, shown in Column E. In addition, the BP models were apportioned into two categories: 20% were estimated to be High Emitters, and 80% were estimated to be Low Emitters. This apportionment is based on an estimated number of ionizer and photocatalytic oxidation models with ozone emissions that may exceed the UL 867 limit of 0.05 ppm.

Table VI-5. Total Potential Cost to All Manufacturers, Years 1-5

A Type of Air Cleaner [a]	B # of Models (Table VI-1)	C Year 1 Annualized Cost per Model ($/yr) (Table VI-3a)	D Year 2-5 Model Turnover Cost per Model ($/yr) (Table VI-3a)	E Year 1-5 Total Industry Cost ($), [b] B x (5C+4D)	F Year 1-5 Average Industry Cost ($/yr), [b] (E / 5)
OG	42	11,900	3,200	3,036,600	607,300
BP High Emitter	19	7,400	2,200	870,200	174,000
BP Low Emitter	75	4,600	2,000	2,325,200	465,000
Mechanical	79	3,300	1,500	1,777,500	355,500
TOTAL INDUSTRY COSTS				**8,000,000**	**1,600,000**

Notes:
a. Assumed that 20% of By-Product devices are high emitters, and 80% are low emitters.
b. Rounded to nearest $100. Totals rounded to nearest $100,000

Column E values were divided by 5 to estimate the Years 1-5 Average Industry Cost per Year, as shown in Column F. The Year 1-5 Total Industry Costs based on the sum for all types of air cleaners, was estimated to be $8,000,000. The Total Average Industry Cost is estimated at $1,600,000 per year over the first 5 years (Column F). The annual average would decline rapidly after Year 5 because only the model turnover costs would be a factor.

2. Distributors and Retailers

Economic impacts on distributors and retailers as a whole in California are expected to be insignificant, but may be significant for small distributors and retailers of some OG brands. Some OG manufacturers have indicated that they will provide products that meet California certification requirements, so their distributors and retailers should not be affected significantly unless there is a temporary shortage of product. Some small distributors and retailers may decide to discontinue the sales of these products in California, especially for the Small Share manufacturers of OGs, because the manufacturing cost impacts for OGs are high compared to the other types of air cleaners. For the distributors and retailers of OGs that are 1- or 2-person businesses, impacts from the regulation may be substantial if their manufacturers decide not to certify air cleaners for the California market.

Ozone generators are distributed much differently than BP and Mechanical devices. For example, California survey results indicate that 26% of OG owners report purchasing their unit

from an independent distributor, 24% at a retail store, 19% from the Internet, and 29% from "somewhere else" (primarily "over the phone") (Piazza *et al.*, 2006). In contrast, 64% of BP owners report purchasing their units at a retail store, and 15% report purchasing via the Internet (Piazza *et al.*, 2006). Staff estimate some OG manufacturers sell as much as 80 to 100% of their units through independent distributors.

For BP and Mechanical devices the increased costs to manufacturers are expected to be relatively insignificant, and should not affect distributors and retailers unless there is a temporary shortage of product. In addition, for all types of air cleaners, the proposed sell-through period will allow manufacturers to sell existing inventory or perhaps continue selling it in other states. This sell-through provision would minimize any potential impacts of the regulations on distributors and retailers.

D. Potential Impacts on Consumers

The actual impact of the proposed regulation on consumers will depend on how much the manufacturers pass on their cost increases and profit markup to the consumer via price increases. The lower bound of the potential impacts on consumers would be the case where the manufacturers do not pass on any of the increased costs. This would result in no cost impact to consumers. The upper bound of the potential impact on consumers would be the case where manufacturers pass on all of their cost increases plus a profit markup, as discussed below. However, price increases may lead to reduced sales, which would impact the profitability of the manufacturers, and lead manufacturers to reduce or drop their price increases.

The upper bounds of the potential economic impacts on consumers in California were estimated by calculating the potential impacts on retail prices (Table VI-6). First, the Average Number of Units Sold per Year in California (Column A) was calculated using the 2003-2006 sales data by air cleaner category from the California survey (Piazza *et al.*, 2006) averaged over 3.5 years. The median sales prices in column B also were taken from the California survey. The Average Industry Cost for all manufacturers per year (Column C) for each category was taken from Table VI-5, and adjusted for a 50% profit markup added to the manufacturers' costs (Column D). This adjusted cost was then divided by the Average Number of Units Sold per Year (Column A), to yield the Average Price Increase per Unit (Column E).

The results shown in Table VI-6 indicate that the Average Price Increase per Unit (Column E) would potentially be $11 to $16. This assumes that the manufacturers pass on all of their costs, add a 50% profit markup, and average the cost over 5 years. This price increase of $11 to $16 translates into a Percent Increase in Median Sales Price (Column F) of 5% to 12%. The 5% increase in median sales price for the OG and BP categories does not appear to be a significant impact on the consumer. The 12% increase in median sales price for the Mechanical category appears to be potentially significant; however, many manufacturers of Mechanical air cleaners already have UL certification and would not need to have additional UL electrical safety testing, so their actual price increase would be much less than 12%. Therefore, the actual impact of the proposed regulation is expected to be insignificant to consumers, even if the manufactures pass on their cost and profit markup to the consumer.

The total potential cost to consumers in California, shown in Column G of Table VI-6, is $12,100,000 in the first five years after the regulation is approved. This cost is calculated as the product of the number of units sold per year, the price increase per unit, and 5 years. This cost

also represents the maximum total statewide cost to individuals, assuming that manufacturers pass on all of their costs to consumers and add an estimated 50% profit markup.

Table VI-6. Potential Cost to Consumer

A Avg. # of Units Sold per Year in CA, 2003-2006 (units/yr) [a]	B Median Retail Price ($/unit) [b]	C Average Industry Cost: All Mfrs ($/yr) (Table VI-5) [c]	D Average Industry Cost with 50% Markup ($/yr) [d] (1.5 x C)	E Average Price Increase per Unit ($/unit) [e] (D / A)	F % Increase in Median Retail Price (E/B x 100)	G Total Cost to Consumer, Years 1-5 ($) [f] (5xAxE)
OG						
55,600	300	607,300	911,000	16	5	4,600,000
BP						
74,400	250	639,000	958,500	13	5	4,800,000
Mechanical						
49,900	90	355,500	533,300	11	12	2,700,000
TOTAL						12,100,000

Notes:

a. Based on California data on percent of households buying OG between 2003 and mid-2006, averaged over 3.5 yr (Piazza *et al.*, 2006). Rounded to nearest 100.
b. Based on California data for (Piazza *et al.* 2006).
c. From Table VI-5. For BP devices, the sum of the total costs for BP high & low emitter manufacturers from Table VI-5 is used here to obtain an overall cost for BPs. Rounded to nearest $100.
d. Assumption: 50% profit markup added to manufacturers' cost increases. Rounded to nearest $100.
e. Manufacturers will probably absorb these costs because their customers are price-sensitive and the manufacturers' markup is currently about 40-60%.
f. Cost to consumers represents the total statewide cost to individuals over 5 years. Rounded to the nearest $100,000.

E. Potential Impacts on Employment

Portable air cleaner manufacturers are included in the category of small electrical appliance manufacturing industry (North American Industry Classification System, Code 33521), which includes establishments engaged in manufacturing small electric appliances and electric house wares, household-type fans, household-type vacuum cleaners, and other electric household-type floor care machines. According to the 2006 U. S. Census Bureau (2006a,b), California employment in this industry category was 182 jobs in 2004, or about 2 percent of the national employment in the industry. This also represents only about 0.01 percent of the total manufacturing jobs in California. These employees working in 18 establishments generated about $6,300,000 in payroll, accounting for less than 0.01 percent of total California manufacturing payroll in 2004. Ten establishments had four employees or less; the rest had five or more employees each. These data show that the contribution of industries such as the indoor

air cleaner industry to the California economy is very small, and the proposed regulation would have no significant impact on the economy.

F. Potential Impacts on Business Competitiveness

The proposed regulation would have no noticeable impact on the ability of California manufacturers to compete with manufacturers of similar products in other states. This is because all manufacturers that produce indoor air cleaning devices for sale in California are subject to the proposed regulation regardless of their location. In addition, the proposed regulation is expected to cause a negligible increase in the retail price of indoor air cleaning devices which is unlikely to dampen the demand for these products in California.

G. Potential Impacts on California State or Local Agencies

For FY 2008-9 and FY 2009-10, ARB anticipates that one additional staff position ($125,000) and $50,000 in contract funds will be needed each year for ongoing work to enforce the regulation after approval of the regulation. The total amount needed will be $175,000 per year. This assumes the current ARB estimate of $125,000 per year for an Air Pollution Specialist staff position.

Other state agencies such as the Department of Public Health and local agencies such as local health departments and district attorneys are not expected to be impacted by the proposed regulation.

H. Business Creation, Elimination, or Expansion

The proposed regulation is likely to have a small impact on the status of the manufacturing of indoor air cleaning devices in California. Most manufacturers are located outside of California. Only a few of these manufacturers are based in California: two Large Share manufacturers (Sharper Image and JCS/THG), and two Small Share manufacturers (Aqua Sun Ozone International and Wein Products). It is likely that some of the Small Share manufacturers will drop out of the California market because of the cost associated with the proposed regulation, especially for those OG manufacturers that focus primarily on water purification and only minimally on air purification. Some small distributors and retailers may also decide to discontinue the sales of these products in California. However, we do not expect the impact on California businesses to be significant because indoor air cleaning devices usually account for only a small share of products carried for sale by these businesses, or the products of some manufacturers may already meet UL 867 ozone limits.

Businesses that perform testing and certification for these products, however, may experience an increase in demand for their services.

I. Other Possible Economic Impacts

No other major economic impacts of the regulation are expected. Because the costs to individual manufacturers, distributors, and retailers are estimated to be insignificant or very small, staff does not expect any significant impacts on the number of California jobs or the air cleaner market in California. Two of the Large Share BP manufacturers are based in California

– Sharper Image and JCS/THG – but the impact on their California jobs and market should be insignificant because they have a large worldwide market and their products are manufactured in Asia. One of the Small Share manufacturers of OGs, Aqua Sun Ozone International, is based in California, but because they also manufacture water purification products, the proposed regulation should not force this company out of business.

J. Costs and Benefits of Alternatives to the Regulation

Staff considered three alternatives to the proposed regulation (See subsection II.B). The no-action alternative is not viable because AB 2276 requires ARB to regulate the emissions of ozone from indoor air cleaners, and the health impacts of exposures to high levels of ozone are substantial. The two action alternatives considered by staff are: 1) use a different test method; and 2) allow dual-purpose devices, i.e., those with an optional mode for producing much higher levels of indoor ozone for use in an unoccupied space. Compared to the proposed regulation, the alternative of using a different test method would take more time and ARB staff resources to develop, so it would increase costs to ARB and could result in a failure to meet the legislatively mandated schedule. It also could increase the costs to some manufacturers because many of them already obtain UL 867 certification and would have to switch to another test method. This alternative would not provide any discernible benefit to businesses or consumers.

The dual-purpose device alternative would increase the risk of public exposures to very high levels of indoor ozone, and hence, increase the risk of the resultant health impacts and medical costs. Because a dual-purpose device poses such a substantial health risk, this alternative would require stringent surveillance to prevent misuse of the product. This would increase ARB's costs to enforce the labeling, advertising, and sales provisions of the regulation and to improve consumer education. This alternative would not produce any substantial benefits; ozone treatment for indoor mold or odor problems is already available through commercial services.

VII. Environmental Impacts

A. Summary of Environmental Impacts

The proposed regulation is expected to protect public health by reducing human exposure to, and the health impacts of, ozone from IACD. The proposed regulation is also expected to provide public health benefits by reducing human exposures to chemical reaction products of indoor ozone such as formaldehyde, a known human carcinogen, as well as ultrafine particles and other irritant compounds. In consideration of the data analyses performed herein, staff has determined that no significant adverse environmental impacts should occur as a result of adopting this proposed regulation. This chapter describes the potential impacts that the proposed regulation may have on the environment.

B. Legal Requirements

The California Environmental Quality Act (CEQA) and ARB policy require that an analysis be performed to determine the potential adverse environmental impacts of proposed regulations. To meet this requirement, ARB must assess the extent and severity of reasonably foreseeable environmental impacts, and respond (in writing) to all significant environmental

issues raised in the public review period and at the Board hearing. Presently, ARB's regulatory program is certified by the Secretary of Resources (cf. Public Resources Code §21080.5), which allows ARB to include an environmental analysis in the ISOR instead of preparing an environmental impact report or negative declaration. Written responses to significant environmental issues raised by the public will be included in the Final Statement of Reasons (FSOR) for the proposed regulation. Public Resources Code §21159 requires that the environmental analysis prepared by ARB include analyses of the following "reasonably foreseeable" items:

- Impacts of the methods of compliance.
- Feasible mitigation measures.
- Alternate means of compliance with the proposed regulation.

With respect to mitigation measures, CEQA requires state agencies to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

C. Foreseeable Environmental Impacts

1. Reduced Exposure to Ozone and Public Health Impacts

As discussed in Chapter IV.D, staff estimates that over 500,000 Californians are currently exposed routinely to indoor ozone concentrations above the 8-hour CAAQS of 0.070 ppm due to the use of IACD in their homes. Nearly one-third of these persons (161,000) are estimated to be exposed to indoor ozone concentrations of 0.201-0.400 ppm, three to five times greater than the CAAQS. As discussed in Chapter IV.A, controlled exposure studies of healthy and asthmatic human subjects over 1-8 hours have shown that exposure to ozone concentrations of 0.08 ppm or more can produce significant adverse effects on pulmonary function, and causes lung inflammation, tissue damage, and airway hyperresponsiveness. These adverse health effects were observed in substantial fractions of the subjects.

The proposed regulation is expected to reduce indoor ozone exposures from the use of indoor air cleaners to below 0.050 ppm, which is well below the 8-hour CAAQS and the ozone concentrations found to have significant effects in the controlled clinical studies of humans. Therefore, staff expects the proposed regulation to produce a public health benefit by preventing exposures to high concentrations of ozone and the resultant adverse health effects.

2. Other Potential Environmental Impacts

Ozone reacts chemically with terpenes, common fragrance compounds found in cleaning products and deodorants, to produce formaldehyde, a known human carcinogen and Toxic Air Contaminant, as well as ultrafine particles, and other airborne irritant compounds (Nazaroff and Weschler, 2004; Nazaroff *et al.*, 2006). Relatively low levels of indoor ozone (below the CAAQS) can produce indoor levels of these pollutants that may pose a substantial health risk. The proposed regulation would substantially reduce these health risks by greatly reducing ozone emissions from new IACD.

The ozone produced by IACD, and the chemical reaction by-products such as formaldehyde can eventually reach the outdoor air. However, the indoor ozone reacts quickly with indoor surfaces and indoor air pollutants, and the net amount of ozone and formaldehyde

that reaches the outdoor air is quickly diluted to very small concentrations in the outdoor air. Therefore, staff does not expect the proposed regulation to have a significant impact on outdoor air quality.

The proposed regulation does not include any requirements or effects on hazardous waste, water quality, bioaccumulation, or other significant adverse environmental impacts. Therefore, staff does not expect any adverse environmental impacts in these areas of concern.

D. Reasonably Foreseeable Feasible Mitigation Measures

Staff has concluded that no significant adverse environmental impacts would occur from implementing the proposed regulation. Thus, no mitigation measures would be needed.

E. Alternate Means of Compliance

As discussed in Chapters II.C and VI.J above, staff considered but did not recommend any alternate means of compliance. The alternative of using a different test method for ozone emissions is expected to cause a substantial delay and increased cost to business and ARB to develop the proposed regulation. This would result in a delay in achieving the pubic health benefits of the proposed regulation due to reduced ozone emissions and indoor exposures. The other alternate means of compliance was to allow dual-use devices, which produce very high ozone emission concentrations for mold and odor treatment, to be sold in California. This alternate is expected to produce only very limited potential benefits and would not outweigh the possible ozone exposure risks.

F. Environmental Justice

Environmental justice is a core consideration in ARB's efforts to provide clean air for all California communities (ARB, 2001). The proposed regulation, calling for emission concentration limits for ozone from portable indoor air cleaning devices, would not cause significant adverse impacts in any community. Rather, implementation of the proposed regulation would likely reduce exposures to ozone and its toxic by-products in all types of households, including those in low-income areas and ethnically diverse communities. Further, because the estimated increased cost of an air cleaner is $11-16 per unit, impacts on low income consumers are not expected to be significant.

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Appendix A: Assembly Bill 2276

Assembly Bill No. 2276

CHAPTER 770

An act to add Article 8 (commencing with Section 41985) to Chapter 3 of Part 4 of Division 26 of the Health and Safety Code, relating to air pollution.

[Approved by Governor September 29, 2006. Filed with Secretary of State September 29, 2006.]

LEGISLATIVE COUNSEL'S DIGEST

AB 2276, Pavley. Ozone: indoor air cleaning devices.

(1) Existing law imposes various limitations on emissions of air contaminants for the control of air pollution from vehicular and nonvehicular sources, including emissions of volatile organic compounds from consumer products. Existing law generally designates the State Air Resources Board as the state agency with the primary responsibility for the control of vehicular air pollution, and air pollution control districts and air quality management districts with the primary responsibility for the control of air pollution from all sources other than vehicular sources. Existing law requires each district to attain ambient air standards for specified air pollutants, including, but not limited to, ozone. Existing law classifies emissions of ozone in nonattainment areas as moderate, serious, severe, or extreme. Existing law generally sets forth crimes and penalties for violations of air pollution laws and any rule, regulation, permit, or order of the state board.

This bill would require the state board, on or before December 31, 2008, to develop and adopt regulations, consistent with federal law and including specified elements, to protect public health from ozone emitted by indoor air cleaning devices, including both medical and nonmedical devices, used in occupied spaces. Because a violation of these regulations would come within the existing provision making a violation of state board regulations a crime, this bill would create a state-mandated local program by expanding an existing crime. The bill would make related legislative findings and declarations. The bill would authorize the state board to seek a preemption waiver from the federal government to authorize the state board to adopt regulations that are more stringent than federal law.

(2) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Article 8 (commencing with Section 41985) is added to Chapter 3 of Part 4 of Division 26 of the Health and Safety Code, to read:

Article 8. Indoor Air Cleaning Devices

41985. The Legislature finds and declares all of the following:

(a) Ozone is a harmful air pollutant and lung irritant that has serious health impacts at current levels in outdoor air. The state board has determined that each year exposure to ozone results in significant numbers of premature deaths, hospitalizations due to respiratory and cardiac illnesses, emergency room visits for asthma for children under 18 years of age, school absences, and restricted activity days.

(b) Ozone exposure poses a serious health hazard, whether exposure is from outdoor or indoor sources.

(c) Research has demonstrated that long-term exposure to ozone may permanently damage lung tissue and reduce a person's breathing ability.

(d) According to recent studies, ozone-generating air cleaning devices have produced harmful levels of ozone indoors, up to three times the state outdoor air quality standard of 90 parts per billion within an hour or two of operation.

(e) Ozone is not an effective cleaner for indoor air when operated at levels that are safe for human occupation. Independent studies cited by the United States Environmental Protection Agency and the Consumers Union have shown that ozone-generating air cleaning devices do not destroy microbes or reduce indoor air pollutants effectively enough to provide any measurable health benefits.

(f) The state board, the State Department of Health Services, and other governmental agencies have issued warnings to advise the public not to use devices that are specifically designed to generate ozone indoors and advertised or marketed as air cleaning devices.

(g) Ozone emitted from indoor air cleaning devices poses an unnecessary risk to public health, and, therefore, it is the intent of the Legislature that the state board establish regulations to promote improved public health by restricting ozone emissions generated by these devices.

41985.5. For purposes of this article, the following terms have the following meanings:

(a) "Federal ozone emissions limit for air cleaning devices" means the level of generation of ozone above which the device would be considered adulterated or misbranded pursuant to Section 801.415 of Title 21 of the Code of Federal Regulations, specifically the generation of ozone at a level in excess of 0.05 part per million by volume of air circulating through the device or causing an accumulation of ozone in excess of 0.05 part per million by volume of air when measured under standard conditions at 25 degrees Celsius (77 degrees Fahrenheit) and 760

millimeters of mercury in the atmosphere of enclosed space intended to be occupied by people for extended periods of time.

(b) "Medical device" means "device" as defined in subsection (h) of Section 321 of Title 21 of the United States Code.

41986. (a) On or before December 31, 2008, the state board shall develop and adopt regulations, consistent with federal law, to protect public health from ozone emitted by indoor air cleaning devices, including both medical and nonmedical devices, used in occupied spaces.

(b) The regulations shall include all of the following elements:

(1) An emission concentration standard for ozone emissions that is equivalent to the federal ozone emissions limit for air cleaning devices.

(2) Testing procedures for manufacturers to utilize to determine ozone emissions from devices. In developing the procedures, the state board shall consider existing and proposed testing methods, including, but not limited to, those developed by the American National Standards Institute and Underwriters Laboratory.

(3) Certification procedures that enable the state board to verify that an indoor air cleaning device meets the emission concentration standard for ozone emissions using the testing procedures adopted by the state board.

(4) (A) Package labeling requirements that indicate that an indoor air cleaning device is certified as meeting the emission concentration standard for ozone emissions.

(B) The state board shall consider recommendations of affected industries and the public in developing the labeling requirements.

(C) The label for an indoor air cleaning device that is not a medical device shall include the following statement: "This air cleaner complies with the federal ozone emissions limit."

(D) The label for an indoor air cleaning device that is a medical device shall be labeled in compliance with federal law, including Section 801.415 of Title 21 of the Code of Federal Regulations.

(c) The regulations may include any or all of the following elements:

(1) A ban on the sale of air cleaning devices that exceed the emission concentration standard for ozone emissions from indoor air cleaning devices adopted by the state board.

(2) Procedures for authorizing independent laboratories or other approved certification organizations to verify products as meeting the emission concentration standard for ozone emissions from indoor air cleaning devices adopted by the state board. Any authorization shall ensure that verification shall be conducted consistent with the testing procedures adopted by the state board.

(3) An exemption for indoor air cleaning devices that, by design, emit de minimis levels of ozone during their operation, as determined by the state board.

(4) Any other element the state board determines to be necessary to protect the public health from emissions of ozone from indoor air cleaning devices that exceed the emission concentration standard for ozone emissions from air cleaning devices and are used in occupied spaces.

(d) Devices verified by the state board or the United States Food and Drug Administration as meeting the emission concentration standard for ozone emissions from indoor air cleaning devices and the labeling requirements adopted by the state board shall not be subject to further regulatory requirements for ozone pursuant to this article.

(e) It is the intent of the Legislature that this section be interpreted and applied in a manner that is consistent with federal law. The regulations adopted by the state board pursuant to this section shall be consistent with federal law. The state board may, to the extent a waiver is required, seek a preemption waiver from the federal government to authorize the state board to adopt regulations that are more stringent than federal law.

SEC. 2. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the only costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

O

Appendix B: Proposed Regulation Order

Proposed Regulation Order

REGULATION FOR LIMITING OZONE EMISSIONS FROM INDOOR AIR CLEANING DEVICES

Subchapter 8.7 Indoor Air Cleaning Devices

Adopt Title 17, California Code of Regulations, Sections 94800, 94801, 94802, 94803, 94804, 94805, 94806, 94807, 94808, 94809, and 94810 as follows:

Article 1. Indoor Air Cleaning Devices

§ 94800. Applicability.

Except as provided in Section 94803, this article shall apply to any person who manufactures, sells, supplies, offers for sale, or introduces into commerce in the state of California indoor air cleaning devices, including both medical and non-medical devices, used or intended for use in occupied spaces.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code.

§ 94801. Definitions.

(a) For the purpose of this article, the following definitions apply:

(1) "Air exchange rate" means the rate at which outdoor air replaces the volume of indoor air within a given space.

(2) "ANSI" means American National Standards Institute.

(3) "ARB" means the California Air Resources Board.

(4) "Certification mark" means the symbol used by a recognized testing organization to indicate that a representative sample of the product bearing the symbol meets certain quality or safety criteria. For this regulation the organizations of interest are the nationally recognized testing laboratories that verify compliance with the applicable ANSI/UL Standards for indoor air cleaning devices.

(5) "CCR" means the California Code of Regulations.

(6) "CFR" means the U. S. Code of Federal Regulations.

(7) "Concentration" means the amount of a specified substance in a unit amount of another substance.

(8) "*de minimis*" refers to a quantity so little, small, miniscule or tiny that the law does not refer to it and will not consider it.

(9) "Distributor" means any person to whom an indoor air cleaning device is sold or supplied for the purposes of resale or distribution in commerce.

(10) "Emission" means the release or discharge of a substance into the environment.

(11) "Executive Officer" means the Executive Officer of the Air Resources Board or the Executive Officer's designee.

(12) "Half-life" means the time required for the concentration of a substance to be reduced to half of its initial value.

(13) "Indoor air cleaning device" means an energy-using product whose stated function is to reduce the concentration of airborne pollutants, including but not limited to allergens, microbes (e.g., bacteria, fungi, viruses, and other microorganisms), dusts, particles, smoke, fumes, gases or vapors, and odorous chemicals, from the air inside an enclosed space. Such devices include, but are not necessarily limited to, portable devices of any size intended for cleaning the air nearest a person, in a room of any size, in a whole house or building, or in a motor vehicle; and stand-alone devices designed to be attached to a wall, ceiling, post, or other indoor surface.

(14) "Industrial use" or "industrial application" means the use of ozone in the following manner:

- (A) purification of water in an industrial plant, water treatment facility, municipal water facility, or similar facility, and swimming pools and spas
- (B) the destruction of microbes on produce in an agricultural processing plant, refrigerated transport truck, or related facility
- (C) chemical oxidation and disinfection in the electronics, pharmaceutical, biotechnology and chemical industries
- (D) bleaching and other processing purposes in the pulp and paper industry
- (E) odor control from industrial stack gases or wastewater treatment facilities
- (F) odor and smoke control in the hotel industry, provided no people are physically present
- (G) mold remediation, provided no people are physically present
- (H) fire and smoke damage remediation, provided no people are physically present.

(15) "Label" means an area containing the required statement in an easily readable format, separate from unrelated text. This is printing on the product packaging, or, prior to January 1, 2010 may be an adhesive sticker.

(16) "Listing mark" means the symbol used by Underwriters Laboratories, Inc. to indicate that a representative sample of the product bearing the symbol meets certain UL safety criteria. The safety criteria are found in UL nationally recognized Standards 867 and 507 for air cleaning device safety.

(17) "Manufacturer" means any person who imports, manufactures, assembles, produces, or packages an indoor air cleaning device.

(18) "Medical device" means "device" as defined in subsection (h) of Section 321 of Title 21 of the United States Code.

(19) "Mechanical filtration" means removal of suspended particles from air via filtration with physical barrier, non-electronic techniques, i.e. air is forced through a filter medium. Materials used in the construction of the filter media may include substances such as activated charcoal, paper, foam, synthetics, ceramics, or natural fibers.

(20) "Model group" means indoor air cleaning devices sharing the same design, operational features, device output, and performance characteristics, and manufactured by the same manufacturer. Units in the same model group may be marketed under different brand names. Units that differ only in decorative treatments such as color, remote control, or other cosmetic features not related to ozone output would belong to the same model group.

(21) "NIST" means the U. S. National Institute of Standards and Technology.

(22) "Non-medical device" means any indoor air cleaning device that does not meet the definition of "medical device" above.

(23) "NRTL" means Nationally Recognized Testing Laboratory, as recognized by U. S. OSHA per 29 CFR 1910.7.

(24) "Occupied space" means an enclosed space intended to be occupied by people for extended periods of time, e.g. houses, apartments, hospitals and offices.

(25) "OSHA" means U. S. Occupational Safety and Health Administration.

(26) "Packaging" means the materials around the consumer or institutional product which serve only to contain, enclose, incorporate, deliver, dispense, wrap or store the product. "Packaging" includes any article onto or into which the principal display panel and other accompanying literature or graphics are

incorporated, etched, printed or attached. "Packaging" does not refer to a secondary container used for shipping purposes.

(27) "ppm" is a unit of concentration measure meaning parts per million by volume. For the purposes of this regulation the volume considered is air and the substance of interest is ozone.

(28) "Retailer" means any person who sells, supplies, or offers for sale, indoor air cleaning devices, directly to consumers.

(29) "Supply" means to make available for purchase or use.

(30) "UL" means Underwriters Laboratories, Inc.

(31) "U. S." means United States of America.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code; 29 CFR 1910.7; 21 CFR 801.415; and Title 21 U.S.C. 321.

§ 94802. Standards for Indoor Air Cleaning Devices.

Except as provided in Section 94803 (Exclusions and Exemptions), Title 17, California Code of Regulations, no person shall manufacture for use in California 12 months after the effective date of this regulation, or sell, supply, offer for sale, or introduce into commerce, any indoor air cleaning device for use or intended for use in occupied spaces unless the device is certified by ARB to produce an emission concentration not exceeding 0.050 ppm, as specified in Section 94804; is labeled as required in Section 94806; meets all requirements of this article; and continues to meet all requirements of this article, including the ozone emissions limit as determined by the test procedure in Section 94805. Indoor air cleaning devices manufactured before the effective date of this regulation may be sold in California until 21 months after the effective date of this regulation, provided there is no evidence that such devices were stockpiled to avoid the effective date of this regulation.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code; 21 CFR 801.415.

§ 94803. Exclusions and Exemptions.

(a) *Industrial use*: The provisions of this article do not apply to indoor air cleaning devices manufactured, advertised, marketed, labeled, and used solely for

industrial use as defined in Section 94801(a)(14) above, provided that they are marketed solely through industrial supply outlets or businesses and prominently labeled as "Solely for industrial use. Potential health hazard: emits ozone".

(b) *In-duct systems:* Air cleaning devices designed, marketed, and used solely as a physically integrated part of a central heating, air conditioning, or ventilating system, such as an "in-duct system", are exempt from this regulation.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code.

§ 94804. Certification Requirements.

(a) Each manufacturer of an indoor air cleaning device subject to Section 94802 is required to submit an application for certification to the ARB Executive Officer, P.O. Box 2815, Sacramento, CA 95812, Attn: Indoor Air Cleaning Device Certification. Information submitted on the certification application must be true and correct. Applications may be submitted by a professional association or certification organization on behalf of a manufacturer, as long as all required information and signatures from the manufacturer and test lab representatives are included. Upon verification of compliance with the test methods described in Section 94805, from a laboratory meeting the performance specifications in Section 94805(d), the ARB will issue an Executive Order that the indoor air cleaning device has completed certification for sale of the device within California. Certification will be granted to manufacturers, who have the responsibility to comply with all provisions of this article.

(b) Any indoor air cleaning device using only mechanical filtration for pollutant removal is exempt from the testing requirement for the ozone emission standard of 0.050 ppm as determined in Section 94805, based on their known *de minimis* ozone emissions. Verification of this mechanical-filtration-only exclusion from ozone emission testing will be made by the ARB Executive Officer based on the submission of product design specifications and documentation by the manufacturer, distributor, or retailer. Documentation to the ARB shall include a description of the air cleaning performance technology employed, as well as a block diagram and schematic of the model. Indoor air cleaning devices qualifying as a "mechanical filtration only" device shall be certified under ANSI/UL Standard 507, or any ANSI/UL Standard that addresses electrical safety for mechanical air cleaners that succeeds Standard 507. Devices certified to Standard 507 prior to the enactment of this regulation are eligible for certification without further testing provided continued compliance with Standard 507 requirements are met. To be certified under this regulation, manufacturers of such indoor air cleaning devices must submit the information required in sections 94804 c(1) through 94804 c(3)

below. These products are still subject to the labeling requirements specified in Section 94806(b) and 94806(d).

(c) The application for certification must include the information in subsections (c)(1) through (c)(5) below, and any other information deemed necessary by the ARB Executive Officer. If the requested information is not applicable to the indoor air cleaning device in question, the applicant must indicate "not applicable". If the Executive Officer concurs with the applicant's judgment, the Executive Officer may waive the requirement to provide the information requested.

(1) Manufacturer name, mailing address, physical address, phone number, email address, and website;

(2) Applicant or representative name, mailing address, physical address, phone number, and email address, if different from manufacturer;

(3) Indoor air cleaning device information:

(A) Brand name
(B) Model name
(C) Model number
(D) Model group, and other models included in model group, where applicable
(E) Discussion of the principles of operation and design
(F) Device schematics depicting operation
(G) Maintenance requirements
(I) Operations manual, if available
(J) Marketing materials, if available

(4) Indoor air cleaning device test information:

(A) Test facility identification and proof of current Nationally Recognized Testing Laboratory (NRTL) accreditation
(B) Ozone emission concentrations for all units tested, as measured according to Section 94805, including both the 24-hour measurement as well as information regarding whether any transitory measurements exceeded 0.050 ppm
(C) Whether a device failed the ozone emission test for any reason during final certification testing, and if so, the reason (e.g., excess transitory excursions, motor failure during the test, device not received with packaging intact, electrical part overheated/unsafe to continue, etc.)
(D) Chain of custody of test device(s)
(E) Statement from the testing laboratory that the ozone emissions were determined in accordance with the protocols in the 2007 Revision of Section 37 of UL Standard 867.

(F) Notification by a testing laboratory or certification organization of compliance with the electrical safety provisions of ANSI/UL Standard 867 or 507, where applicable, for all units tested.

(5) Any additional information the laboratory needs to communicate.

(d) A written notification will be provided within 30 days of receipt indicating whether the certification application has been accepted for review or, if incomplete, what additional information is required. Within 30 days after application acceptance, written notification of certification approval or disapproval will be provided. These time periods may be extended by the Executive Officer if deemed necessary because of extenuating circumstances.

(e) Notification must be provided to the Executive Officer within 30 days if the indoor air cleaning device fails any post-certification testing conducted to verify compliance with ANSI/UL Standard 867 or Standard 507, whichever is applicable.

(f) ARB may revoke certification for any device deemed noncompliant in the future when tested according to procedures described in Section 94805, or if any other ARB certification requirements are no longer met.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code; 21 CFR 801.415; ANSI/UL Standard 867 for Electrostatic Air Cleaners, fourth edition, 2004; ANSI/UL Standard 507 for Electric Fans, 2007.

§ 94805. Test Method.

(a) For the purpose of compliance with this regulation only a single model of indoor air cleaning device within a model group, if one exists, must be evaluated under the test methods.

(b) Testing to determine compliance with the requirements of this article, shall be performed following the ANSI/UL Standard 867 or 507, where applicable, in their entirety, which are hereby incorporated by reference.

(c) Ozone emissions will be determined using the 2007 revision of the ANSI/UL Standard 867 Section 37, which is hereby incorporated by reference. (See Appendix E to this report).

(d) Testing of indoor air cleaning devices must be conducted by a laboratory currently recognized as an NRTL by the U. S. Occupational Safety and Health Administration (OSHA), to perform testing for the entire ANSI/UL Standard 867 or

507, where applicable. Such a NRTL may also utilize Program #2 in the March 9, 1995 OSHA Federal Register Notice 60: 12980-12985 for Section 37 ozone testing required in this regulation. Laboratories, including those qualifying for use in Program #2, also must pass an ARB audit to verify their ability to accurately perform the ozone emissions testing procedure as described in the 2007 revision of ANSI/UL Standard 867 Section 37. The ARB audit may include, and is not necessarily limited to, review of written test protocol operating procedures, test chamber and analyzer configuration, background ozone measurements, air exchange rate, ozone half-life test results, equipment calibration and maintenance records, and other related information; and an onsite review.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code; ANSI/UL Standard 867 for Electrostatic Air Cleaners, fourth edition, 2004; ANSI/UL Standard 507 for Electric Fans, 2007.

§ 94806. Labeling and Safety Mark Requirements.

(a) All indoor air cleaning devices are required to display an ozone emissions certification label on the product packaging after completion of requirements of Section 95804 prior to sale in California, unless satisfying the requirements for exemption as specified in Section 94803.

(b) For non-medical devices, the label shall be at least 1 inch by 2 inches in size, easily readable, and shall state "This air cleaner complies with the federal ozone emissions limit. ARB certified" in bold type whose uppercase letters are not less than 3 mm high.

(c) For medical devices, the label shall be in compliance with federal law, including Section 801.415 of Title 21 of the Code of Federal Regulations. The label shall also state "ARB certified".

(d) All indoor air cleaning devices (both medical and non-medical) are required to display the ANSI/UL Standard 867 safety certification or listing mark on the device, consistent with the Standard 867 requirements of the appropriate NRTL safety certification organization, after completion of requirements of Sections 94804 and 94805 and prior to sale in California, unless the device satisfies the requirements for exemption as specified in Section 94803. Devices qualifying as a "mechanical filtration only" device as described in Section 94801(a)(19) and Section 94804(b) shall display the ANSI/UL Standard 507 certification mark, or the mark of any ANSI/UL Standard that addresses electrical safety for mechanical air cleaners that succeeds Standard 507.

(e) Any indoor air cleaning device for non-industrial use that is advertised or sold via the Internet or by catalog but that has not been certified according to 94804 must display the following advisory in a prominent place on the primary web pages, catalog pages, and related materials where such device is advertised or displayed for sale: "Does not meet California requirements; cannot be shipped to California."

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code; 21 CFR 801.415; ANSI/UL Standard 867 for Electrostatic Air Cleaners, fourth edition, 2004; ANSI/UL Standard 507 for Electric Fans, 2007.

§ 94807. Notice to distributors, retailers, and sellers.

Within 12 months of the effective date of this regulation, manufacturers of indoor air cleaning devices manufactured, sold, supplied, offered for sale, or introduced into commerce in California must submit documentation that they have provided to all of their known distributors, retailers, and sellers true and accurate copies of the final regulation approved by the ARB and the California Office of Administrative Law. Accepted documentation of a mailed notification will include a hard copy of the materials mailed and the associated mailing list with complete contact information for each address submitted to the ARB Executive Officer. Accepted documentation of an email notification will include a copy of the email and the complete contact information for each email address submitted to the ARB Executive Officer. Such information may be kept confidential upon request as specified in Sections 91000 *et seq.* of Title 17, Subchapter 4 (Disclosure of Records) of the California Code of Regulations. For new distributors, retailers and sellers who become known to manufacturers after manufacturers' initial notification to their distributors and retailers, manufacturers must provide similar notice to them and provide contact information to the ARB. Non-compliance with this provision may result in rejection or revocation of certification.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code; Sections 91000 *et seq.* of Title 17, Subchapter 4 (Disclosure of Records) of the California Code of Regulations.

§ 94808. Recordkeeping Requirements.

Manufacturers, distributors, retailers, sellers, and test laboratories are required to maintain production, quality control, sales, or testing records for products sold, supplied, offered for sale, introduced into commerce, or manufactured for sale within California for at least three years, and to make them available to the ARB upon request. Such information may be kept confidential upon request as specified in Sections 91000 *et*

seq. of Title 17, Subchapter 4 (Disclosure of Records) of the California Code of Regulations.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code, Sections 91000 *et seq.* of Title 17, Subchapter 4 (Disclosure of Records) of the California Code of Regulations.

§ 94809. Rejection, Revocation, Recall, and Penalties.

An application for certification may be denied, or a certification may be revoked or suspended, for failure to comply with any provision of this article. If the Executive Officer determines that a violation of this article has occurred, he or she may order that the products involved in or affected by the violation be recalled and replaced with products that comply with this article. In the event of a violation of this article, all other penalties authorized by law apply as well.

NOTE: Authority cited: Sections 41986 and 42300 *et seq.*, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code.

§ 94810. Severability.

Each part of this article shall be deemed severable, and in the event that any part of this article is held to be invalid, the remainder of this article shall continue in full force and effect.

NOTE: Authority cited: Section 41986, Health and Safety Code. Reference: Sections 41985, 41985.5, and 41986, Health and Safety Code.

Appendix C: Method Used by ARB to Determine Ozone Room Concentrations from IACD

Method Used by ARB to Determine Ozone Room Concentrations from IACD

The test room was a small office approximately 8 ft. wide, 11 ft. long, and 8 ft. high (88 ft^2, volume of about 20 m^3), the size of a small bedroom or home office. The room is located in a warehouse building in Sacramento, California, about 1,000 meters from any major freeway or surface street. The room was furnished with an office desk made of hard wood and laminated composite wood, and one upholstered desk chair with a high back. The room had linoleum flooring, and painted wallboard construction for the walls and ceiling. A 6-foot fluorescent light fixture was mounted in the ceiling. The room had no air supply or return registers, and no large openings other than the door. All power cords and air sampling lines were run through an 8-inch hole in the door's center, which was sealed with duct tape. The adjoining warehouse space was conditioned, and its doors were kept closed during the tests in this study. Two adjoining bathrooms had automatic exhaust fans, which were turned off during the testing.

We selected a target range of 0.3-0.5 indoor-outdoor air changes per hour for the air exchange rate (AER) for the room tests. This range reflects common conditions for older single-family homes in California without open windows or mechanical ventilation in operation. Compared to newer homes in California, older single-family homes tend to have less airtight exterior shells, and they often have additional air exchange when the central heating or cooling system is operating because the system has substantial air leakage in its ductwork. This range does not reflect comparable "closed" conditions for new homes, which can have indoor-outdoor air exchange rates of 0.1 air changes per hour or less when closed up. Thus, the target AER range is realistic for California homes, and does not provide conditions that would result in an overestimation of ozone concentrations from the ozone generators tested.

In order to provide the target AER of about 0.3-0.5 air changes per hour, any suspected air leakage paths were sealed. The door frame was sealed with one-half inch wide, closed cell foam weather-stripping. In addition, two-inch wide duct tape was used to seal the edges of the door, the gap around the ceiling light fixture, and both horizontal edges and vertical gaps of the baseboard vinyl coving.

The AER of the test room was measured on three consecutive days prior to the start of the room tests. Once the ozone generator room tests began, the room AER was measured once a week. The room AER was measured using the single zone tracer gas decay method of ASTM Standard E741, with carbon dioxide (CO_2) gas as the tracer gas (Persily, 2000). CO_2 gas from a cylinder was injected into the room center with the door closed. CO_2 concentrations were measured inside the test room, and in the warehouse during the pre-tests, using a TSI QTrak Plus. Once the CO_2 concentration reached more than 3,000 ppm (usually much higher) in the test room, the CO_2 source was turned off. The decay of measured CO_2 concentration over time was used to calculate the dilution (by room ventilation) with "replacement" air using the empirical equation shown below. A decay period of 30 minutes was chosen to obtain an accurate measurement.

The initial and end concentrations of CO_2 were used to calculate the AER of the test room as follows, assuming no change in CO_2 concentrations in the adjoining space:

AER = Air exchange rate (number of air exchanges per hour, h^{-1})
= [ln C (t1) - ln C (t2)] / (t2 - t1) (Persily, 2000)

where:
ln = Natural log
C = Concentration (dimensionless)
t1 = Time at start of measurement period (hours in decimal fraction form)
t2 = Time at end of measurement period (hours in decimal fraction form)

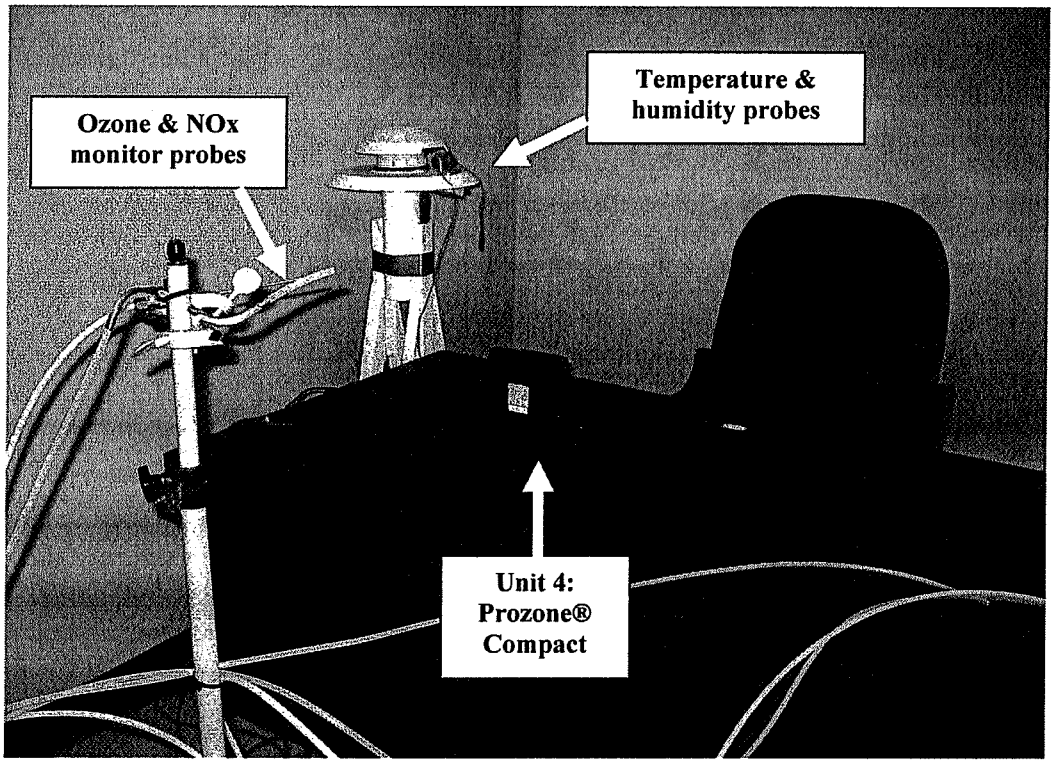
The results of the AER testing are shown in Table C-1. Both the initial AERs on the three days prior to the room tests of the ozone generators and the AERs measured during the test periods were stable – they ranged from 0.25 to 0.28 AER. The measured AERs during the test periods averaged 0.27 air changes per hour. This AER was slightly below our target level of 0.3-0.5 per hour. This method assumes no significant change in CO_2 concentrations in the adjoining space during the testing, and that the concurrent CO_2 concentrations were much less in the adjoining space than those utilized for the AER measurement. The adjoining space did not contain any combustion sources or other notable sources of CO_2, so levels were assumed to be near the average of 358 ppm measured in the warehouse during the pre-tests, a reasonably low amount relative to the room CO_2 concentrations, which ranged from about 2,900 ppm to 4,900 ppm.

Table C-1. Summary of Room Air Exchange Rate Tests

Date	**Room Test #**	**AER (air exchange rate; air changes per hour)**
6/23/05	Pre-test	0.27
6/24/05	Pre-test	0.25
6/27/05	Pre-test	0.28
Pretest Average		**0.27**
7/12/05	1L, 3L, 3LA, 3H, 4, 4D	0.28
7/25/05	1H, 2L, 2H	0.25
Test Average		**0.27**

Room tests were conducted during daytime hours on weekdays between July 5 and September 12, 2005. Prior to appliance testing, ozone concentrations were monitored in the test room and the adjacent warehouse open area for 30 minutes to characterize initial background conditions. At the completion of background ozone monitoring, appliance testing began. The appliance was placed in a central location in the room on top of a desk, 3 feet from the wall, at a height of approximately 2.5 feet off the floor. User instructions from the manufacturers were considered in selecting the location and settings for each appliance. The room-sampling probe for ozone was situated four feet above the floor to approximate the average "breathing zone height" for adults, and located ~3 feet from the device.

The appliance was remotely started at one of the pre-selected settings. For each test, the appliance was operated until ozone levels in the room reached steady-state (defined as a maintained constant ozone level of ± 5% for 30 minutes), or for 3 hours if steady-state was not achieved. After steady-state or 3 hours was reached, the appliance was turned off by remote switch, and the monitoring was continued until the room ozone level returned to ambient levels. In addition, the test room was monitored before and during the room tests for NO, NO_2, NO_x, room temperature (T), and relative humidity (RH). After each test period, room air was fully vented out of the building.



Test room set-up with Prozone® Compact

Appendix D: Certification Application Format

California Air Resources Board ARB Application No._____

INDOOR AIR CLEANING DEVICE CERTIFICATION APPLICATION

MANUFACTURER INFORMATION:

Company Name: _____

Phone Number: _____

Your Name: _____

Mailing Address: _____

_____

Email address: _____

Website: _____

APPLICANT OR REPRESENTATIVE INFORMATION: (fill in only if different from manufacturer)

Your Name: _____

Organization: _____

Phone Number: _____

Relationship to manufacturer: _____

Mailing Address: _____

_____

Email Address: _____

INDOOR AIR CLEANING DEVICE INFORMATION:

Brand Name: _____

Model Number: _____

Model Name: _____

Model Group: _____

(Please list additional models within this model group here):

This model group meets ARB definition. **Signature:** _____

DEVICE OPERATION:

Principles of Design and Operation: (please attach schematics, and additional documentation if necessary)

Maintenance Requirements: (please attach additional documentation if necessary)

All available marketing materials or owner's manuals should be included with application materials.

The information provided on this form is true and correct to the best of my knowledge.

Signature _____ **Date:** _____

Page 1

California Air Resources Board ARB Application no. _____

INDOOR AIR CLEANING DEVICE CERTIFICATION APPLICATION

AIR CLEANER TEST INFORMATION:

Test Facility Name _____

Test Facility ID No.: _____

Mailing Address: _____

_____

Phone Number: _____

Contact Person: _____

Electrical safety requirements of ANSI/UL: (circle applicable standard and if passed)

867 **Y / N** 507 **Y / N**

Date the ozone emission measurements were performed _____

Ozone emissions from unit 1 (background subtracted maximum, ppm): _____

Ozone emissions from unit 2 (where necessary, background subtracted maximum, ppm): _____

Ozone measurements were obtained following procedures in UL Section 37 March 2007 Certification Bulletin:

Circle one: **Y / N**

Please describe any test failures or exceedances:

Additonal comments:

Please attach a copy of the chain of custody for the devices tested.

I personally tested this device; the information on this page is true and correct to the best of my knowledge.

Signature: _____ **Date:** _____

(Test lab technician who conducted tests)

Appendix E: ANSI/UL Standard 867 Section 37 Proposed Revisions

Subject 867 June 22, 2007

SUMMARY OF TOPICS

The following changes in requirements are being proposed:

1. Clarification for Ozone Testing of Electrostatic Air Cleaners and Ionizers

STP BALLOTS DUE: JULY 23, 2007

COMMENTS DUE: JULY 23, 2007

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~.

1. Clarification for Ozone Testing of Electrostatic Air Cleaners and Ionizers

RATIONALE

Proposal submitted by: the Revised Ozone Test Task Group; Chante' Maurio, UL, Chair.

As currently described, the UL 867 ozone test method lacks specificity with regard to the test chamber and conditions of operation. The test repeatability and reproducibility (R&R) clarifications included herein have been developed from feedback provided by members of the Ozone Working Group of UL's Standards Technical Panel (STP) responsible for UL 867 and supporting documents. (Supporting documents include: BS EN ISO 16000-9:2006 - Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method; ECMA-328 - Determination of Chemical Emission Rates from Electronic Equipment, and Blauer Engel's Basic Criteria for the Award of the Environmental Label for Printers RAL-UZ 85 - Test Method for the Determination of Emissions of Hardcopy Devices.)

Ozone test R & R depends upon many factors, the most critical of which include: stability of temperature and humidity conditions within the defined range, uniformity of conditions within the test environment and chamber half-life.

As cited in the clarification of requirements, the chamber half life of 16 ± 1 minutes is specified based upon nominal chamber half-life calculated from variables defined within "Technical Assessment for CPSC - Part II: Ozone Devices Modeling Considerations," Shaughnessy, R; Krause, D; Ball, L. When calculating the half life using the equation $C_t = C_0 e^{-kt}$, the following assumptions were made:

- A ventilation rate of 0.35 h^{-1} is specified by the International Mechanical Code (2003), and the International Residential Code (2003) as the minimum that should be provided by windows or mechanical means within a home. This therefore is the maximum air exchange rate allowed within the test chamber.

- A deposition velocity of 1.76 ± 0.612 m/h was calculated from a study of 43 homes by Lee *et al.* (1999). A rate of 1.15 m/h (1.76 - 0.612 m/h) was therefore chosen as the appropriate deposition velocity.

- The nominal chamber surface area to volume ratio is 2.

This proposal contains an expanded rendition of Section 37 (including new Sections 28A and 37A) of UL 867 in which test criteria are more fully explained and "best practices" are identified to clarify the repeatability and reproducibility of the ozone tests. Because of the increased use of electronics in these devices, it was determined necessary to require that ozone monitoring circuitry be non user-defeatable. Therefore, the proposal includes a new Section 28A in the Protection Against Injury to Persons section of the Standard.

Please note that Section 37 will be renumbered as paragraphs 37.1 - 37.16 when revision pages are issued for the Standard.

PROPOSAL

28A Electronic Circuits

28A.1 Ozone monitoring circuitry shall not be user-defeatable.

37 Ozone Test

37.X The test described in 37.1 - 37.7.3 shall be conducted on a total of two samples of each air cleaning product.

Exception: Only one sample shall be subjected to this test when maximum ozone concentration of the first sample tested measures less than 0.030 parts per million.

37.1 A portable air cleaning product for household use shall not produce a concentration of ozone exceeding 0.050 parts per million by volume when tested as described in 37.2 - ~~37.7~~ 37.7.3. A transitory concentration in excess of 0.050 ppm but less than 0.100 ppm is acceptable; however, the average of any five consecutive measurements taken 60 seconds apart shall be less than 0.050 parts per million.

37.2 The test is to be conducted in a ~~room~~ chamber having a volume of 950 - 1100 cubic feet (26.9 - 31.1 m^3) with a minimum side dimension of 8 feet (2.4 m) and a maximum height dimension of 10 feet (3.0 m) without openings. The test ~~room~~ chamber walls, ~~and~~ ceiling, and floor are to be ~~covered with a sheet of polyethylene or aluminum. The floor is to be of a nonporous material such as vinyl tile or aluminum.~~ surface treated (polished) stainless steel or other nonporous and non-reactive material. The suitability of chamber materials shall be validated by the half-life procedure of 37.2.1 and background level of 37.3.2.

37.2.1 Performance of the test chamber shall be validated prior to each test and after any modification or cleaning through verification of the ozone half-life at the air exchange rate used for testing (see 37.3.1). The ozone half-life is determined using an initial steady state concentration of 0.100 to 0.200 ppm ozone. The measured ozone half-life for the chamber shall be 16 ± 1 minutes. For the purpose of this measurement, steady state is defined as a fluctuation not greater than ± 10 percent or 0.0020 ppm, whichever is greater, during a fifteen minute period.

37.2.2 Prior to testing, the unit shall be subjected to a 72 hour run-in period. During the run-in period the unit shall be operated at maximum ozone output, speed, etc.

37.3 During the test, the test ~~room~~ chamber is to be maintained at a temperature of 25 ±2°C (77 ±4°F) and a relative humidity of 50 ±5 percent. Prior to the start of ~~and immediately after this~~ each test, the ozone background level is to be measured as specified in 37.3.2 with the product off. The background level ~~average~~ shall be ~~calculated and~~ subtracted from the maximum measurement during the test.

37.3.1 The following criteria achieve the desired conditions of 37.3, including a stable background level.

a) The test chamber shall be sufficiently airtight to avoid uncontrolled air exchange. The chamber is considered sufficiently airtight if at least one of the following requirements is fulfilled:

1) the air leakage is less than 0.5 percent of the chamber volume per minute at an overpressure of 1000 Pa;

2) the air leakage is less than 5 percent of the supply airflow rate.

b) The test chamber shall possess an air exchange rate between 0 and 0.35, where the air exchange rate is defined as the ratio of the volume of clean air brought into the chamber per hour to the unloaded chamber volume.

c) The test chamber shall have proper mixing verified via the mixing procedure of the Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products, ASTM 6670, and shall not create local airflow across the surface of the unit under test exceeding 0.1 m/s.

d) The test chamber supply air system shall be equipped with sufficient carbon and HEPA media to remove particles, reactive VOCs, and ozone.

37.3.2 With respect to determining background level, the following measurement criteria shall be applied:

a) The ozone background measurement shall not exceed 0.005 ppm at steady state. Measurements above this value may interfere with emissions determinations.

b) Background measurements within the chamber shall be taken immediately prior to the inception of testing.

For the purpose of this measurement, steady state is defined as a fluctuation not greater than ± 10 percent or 0.0020 ppm, whichever is greater, during a fifteen minute period.

37.4 The product is to be located in the center of the test ~~room~~ chamber floor and ~~about~~

a) 30 inches (762 mm) above the floor for ~~a~~ table-mounted products.

b) attached to the ceiling or other horizontal non-reactive surface at a minimum height of 30 inches for ceiling-mounted products.

c) attached to a non-reactive vertical surface at a minimum height of 30 inches for wall-mounted products.

37.5 ~~The~~ A single ozone monitor sampling tube is to be positioned with the sample tube opening located 2 inches (50 mm) from the air outlet of the product and is to point directly into the air stream. Monitoring shall occur where ozone emissions are highest as determined by the Peak Ozone Emission Location Determination test of Section 37A.

37.6 The emission of ozone is to be monitored for 24 hours to determine the concentration.

37.6.1 Ozone analysis equipment shall meet the following criteria:

a) Ranges of 0.02, 0.04, 0.1, 0.2, and 0.4 mg/m^3 on the full scale (or have auto ranging capability);

b) The capability to detect 4 µg/m^3 or lower concentration;

c) A precision of ± 2 percent from the mean value in the 0 mg/m^3 to 0.2 mg/m^3 range (i.e. 2 µg/m^3 or 1 percent on the full scale);

d) A sampling rate of not less often than once every 60 seconds.

e) A sampling line of minimum length, not to exceed 13 feet (4 m), made of a flexible material that is inert, such as PTFE.

To prevent impact on the test, the ozone analysis equipment shall be placed outside of the chamber.

37.7 If the filter cell or other high voltage component can be energized with any of its fans not functioning or with ~~particle~~ filters removed, the test described in 37.1 - ~~37.6~~ 37.6.1 is to be repeated with the various components not operating or with ~~particle~~ filters removed.

37.7.1 If the appliance is provided with multiple speeds/output levels of operation, the test described in 37.1 - 37.6.1 is to be repeated on each speed/output level. For those appliances with continuous or near-continuous dial settings, tests shall be conducted at the minimum, middle, and maximum settings.

37.7.2 If ozone-monitoring circuitry is provided as part of the appliance, the test described in 37.1 - 37.6.1 shall be repeated with the circuitry bypassed unless its reliability has been demonstrated as described in 37.7.3. Air cleaners must comply with the requirements of 37.1 in both operational states (with and without circuitry).

37.7.3 For the sake of the test in 37.7.2, reliability is defined as compliance with the applicable requirements of the Standards for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991; Software in Programmable Components, UL 1998; or Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1A, whichever is most suitable.

37A Peak Ozone Emission Location Determination

37A.1 The peak ozone location for monitoring shall be determined by pre-testing the product in an open space with a minimum volume of 4000 feet^3 (113.3 m^3) and a minimum dimension in any direction of 10 feet (3.0 m). The air cleaner shall be placed in the center of the test space. Tabletop models shall be tested in the center of a square table with a surface that extends 1 foot (0.30 m) beyond the perimeter of the product and is located 30 inches (762 mm) above the floor. Lab ventilation should be sufficient to prevent a change in background lab ozone levels during conduct of the pre-test. Lab ventilation shall not cause turbulence around the air cleaner's discharge air stream or otherwise alter its performance.

37A.2 Using an anemometer or other appropriate means, the periphery of the air stream in a plane parallel to and 2 inches (50.8 mm) from the surface of the air cleaner discharge grille shall be established. If the air stream boundary is smaller than the discharge grille in either dimension, the corresponding discharge grille dimension shall be used to establish the air stream's boundary. The area of this bounded plane shall be divided using a 2 inch x 2 inch (50.8 mm x 50.8 mm) grid pattern for purposes of locating the ozone analyzer sampling probe. In no case shall there be fewer than a total of 10 ozone sampling locations.

37A.3 The ozone emitted from the air cleaner shall be measured in the open space at each grid intersection point. The air cleaner shall be operated on both the highest and lowest fan speed if so equipped. If the air cleaner is equipped with special ionizers that can be activated independently, they shall be "on" for purposes of the test. The sampling probe shall be positioned at a grid intersection point and allowed sufficient time for stabilization of ozone levels before recording the peak ozone level at each grid intersection point. The grid location and operating condition that produced the highest ozone reading in the air stream shall be identified for use during the Ozone Test, Section 37.

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Appendix F: 21 CFR 801.415

Westlaw.

21 C.F.R. § 801.415

C

Effective: [See Text Amendments]

Code of Federal Regulations Currentness
Title 21. Food and Drugs
Chapter I. Food and Drug Administration, Department of Health and Human Services (Refs & Annos)
Subchapter H. Medical Devices
Part 801. Labeling (Refs & Annos)
Subpart H. Special Requirements for Specific Devices

➡§ 801.415 Maximum acceptable level of ozone.

(a) Ozone is a toxic gas with no known useful medical application in specific, adjunctive, or preventive therapy. In order for ozone to be effective as a germicide, it must be present in a concentration far greater than that which can be safely tolerated by man and animals.

(b) Although undesirable physiological effects on the central nervous system, heart, and vision have been reported, the predominant physiological effect of ozone is primary irritation of the mucous membranes. Inhalation of ozone can cause sufficient irritation to the lungs to result in pulmonary edema. The onset of pulmonary edema is usually delayed for some hours after exposure; thus, symptomatic response is not a reliable warning of exposure to toxic concentrations of ozone. Since olfactory fatigue develops readily, the odor of ozone is not a reliable index of atmospheric ozone concentration.

(c) A number of devices currently on the market generate ozone by design or as a byproduct. Since exposure to ozone above a certain concentration can be injurious to health, any such device will be considered adulterated and/or misbranded within the meaning of sections 501 and 502 of the act if it is used or intended for use under the following conditions:

(1) In such a manner that it generates ozone at a level in excess of 0.05 part per million by volume of air circulating through the device or causes an accumulation of ozone in excess of 0.05 part per million by volume of air (when measured under standard conditions at 25 degrees C (77 degrees F) and 760 millimeters of mercury) in the atmosphere of enclosed space intended to be occupied by people for extended periods of time, e.g., houses, apartments, hospitals, and offices. This applies to any such device, whether portable or permanent or part of any system, which generates ozone by design or as an inadvertent or incidental product.

(2) To generate ozone and release it into the atmosphere in hospitals or other establishments occupied by the ill or infirm.

(3) To generate ozone and release it into the atmosphere and does not indicate in its labeling the maximum acceptable concentration of ozone which may be generated (not to exceed 0.05 part per million by volume of air circulating through the device) as established herein and the smallest area in which such device can be used so as not to produce an ozone accumulation in excess of 0.05 part per million.

(4) In any medical condition for which there is no proof of safety and effectiveness.

(5) To generate ozone at a level less than 0.05 part per million by volume of air circulating through the device and it is labeled for use as a germicide or deodorizer.

(d) This section does not affect the present threshold limit value of 0.10 part per million (0.2 milligram per cubic meter) of ozone exposure for an 8-hour-day exposure of industrial workers as recommended by the American Conference of Governmental Industrial Hygienists.

(e) The method and apparatus specified in 40 CFR Part 50, or any other equally sensitive and accurate

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method, may be employed in measuring ozone pursuant to this section.

SOURCE: 41 FR 6896, Feb. 13, 1976; 50 FR 30154, July 24, 1985; 54 FR 39640, Sept. 27, 1989; 62 FR 51519, Oct. 1, 1997; 64 FR 404, Jan. 5, 1999, unless otherwise noted.

AUTHORITY: 21 U.S.C. 321, 331, 351, 352, 360i, 360j, 371, 374.

21 C. F. R. § 801.415, 21 CFR § 801.415

Current through August 2, 2007; 72 FR 42626

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END OF DOCUMENT

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Appendix G: Methodology for Estimating the Number of Indoor Air Cleaning Models to be Certified

Methodology for Estimating the Number of Indoor Air Cleaning Models to be Certified

For OGs, the number of models per manufacturer was compiled from the list of OG models (ARB, 2006a and the manufacturers' websites, and the number of manufacturers was compiled from Piazza *et al.* (2006). Model information was updated for the top two manufacturers (Large Share) which make up over 90% of the California market for OGs (Piazza *et al.*, 2006): Alpine Air / Ecoquest and Biotech / Edenpure. Alpine and Ecoquest products were assumed to be from the same manufacturer because they market some of the same products and have historically been connected. Alpine / Ecoquest has 10 different OG models listed on their websites. Biotech / Edenpure has 2 OG models on their website. The average number of models among the Large Share manufacturers of OGs is 6 models.

Among the remaining 31 OG manufacturers on the ARB list (Small Share), none of the brands were found in more than 2% of the households with OGs in the California survey (Piazza *et al.*, 2006). The number of models in the Small Share category ranged from 1-6, with an average of 3 models. Staff estimates some Small Share manufacturers may drop out of the California market because of the expense in having their products certified, especially for those firms that focus primarily on water purification.

For By-Product (BP) devices, the number of manufacturers was estimated by first counting the different brands sold in California (Piazza *et al.*, 2006, Appendix B, and brand name data for first and second air cleaners, by air cleaner type). Next, the brands most commonly found in California (Large Share) and the brands made by the same manufacturer were identified. Then, the websites of these brands were checked for current models for sale. The Large Share manufacturers comprise about 75% of the units reported in this category, and consist of the following four manufacturers:

- Sharper Image currently lists 5 models of BPs on their website.
- Oreck lists 2 BP models on their website.
- Jarden Consumer Solutions / The Holmes Group (JCS/THG) makes air cleaner models under the brand names of not only Bionaire, but also under Arm and Hammer, Family Care, General Electric, and Holmes (AHAM, 2007). Bionaire and Holmes each have almost 40 models on the CADR list, but their websites currently list only 6 and 4 BP models for sale, respectively. Arm and Hammer has 2 BP models currently on their website, and a web listing of GE air cleaners could not be found. This suggests that JCS/THG has a total of about 12 current BP models.
- The Kaz website indicates they make 4 Honeywell BP models, 2 Enviracaire BP models, and 4 Vicks BP models, suggesting a total model number of 10 BP models for Kaz.

Based on these results, staff estimated the range of BP model numbers for Large Share is about 2-12 models, with an average of 7 models per manufacturer.

The remaining 22 BP manufacturers were considered Small Share manufacturers. The large majority of these manufacturers have only 1-4 models on the CADR list, and not all of those models are BP devices. Only a few manufacturers had higher numbers of models, i.e., in the 5-18 models range. Based on inspection of websites for several manufacturers, staff estimated typically half of the models on the CADR list are currently produced and fall into the BP

category. Although a few manufacturers have many models on the CADR list, a much smaller number are actually BP models that are currently marketed. For example, Hunter Fan / Casablanca has 66 models on the CADR list, but their website lists only 18 models of BPs currently marketed. The three other manufacturers that have 8-11 models on the CADR list (3M, Hung Hsing, and Winix) currently have only 0, 6, and 5 BP devices listed on their website, respectively. Therefore, staff estimated the number of BP models for Small Share manufacturers has a range of 1-18; because the distribution is skewed, staff estimated an average of 3 models per Small Share manufacturer.

For mechanical devices, the number of models was estimated using the same approach described above for BP devices. The most commonly found brands (Large Share) in the California survey were Honeywell (made by Kaz) and Holmes (made by JCS). These brands comprised over 50% of the units reported in this category. These manufacturers currently list 11 and 4 different mechanical models on their websites, respectively, for an average of 8 models per manufacturer.

All but one of the mechanical device manufacturers in the Small Share category have 1-8 models on the CADR list. Hunter Fan Company / Casablanca has 66 fans listed, but their website lists only 11 mechanical devices. Therefore, assuming about half of the models from Small Share manufacturers are currently marketed and are considered mechanical devices, staff estimated manufacturers of mechanical devices produce a range of 1-4 models, with average of 3 models per manufacturer.

The available lists of manufacturers and models are not comprehensive, so these estimates may be an underestimate for the current market. On the other hand, many of the BP and mechanical models in the Small Share groups may actually be made by one of the Large Share manufacturers, or be in the same "model group" regarding ozone test requirements. However, once this regulation is adopted, staff expects some smaller manufacturers to drop out of the California market, and other manufacturers may streamline their model assortment to reduce their certification costs.

NOTICE OF CONTINUATION

CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC MEETING TO CONSIDER APPROVAL OF THE PROPOSED STATE STRATEGY FOR CALIFORNIA'S STATE IMPLEMENTATION PLAN (SIP) FOR THE FEDERAL 8-HOUR OZONE AND PM2.5 STANDARDS

At its June 22, 2007 public meeting the Air Resources Board (ARB or Board) received comments on the proposed State Strategy for California's State Implementation Plan (SIP) for the federal 8-hour ozone and PM2.5 ambient air quality standards. The Board then continued its consideration to allow staff to investigate whether a postponement until September 2007 would result in potential adverse impacts on transportation planning activities in the San Joaquin Valley Air Basin. Staff has completed its investigation and determined that this delay will not adversely impact these activities. Therefore, the proposed State Strategy has been postponed until the Board's September 27, 2007 meeting, at which the proposed SIP for the South Coast Air Basin is also scheduled to be considered. The September 27, 2007 meeting will occur at the time and place noted below.

DATE: September 27, 2007

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 27, 2007 and may continue at 8:30 a.m., September 28, 2007. This item may not be considered until September 28, 2007. Please consult the agenda for the meeting, which will be available at least 10 days before September 27, 2007 to determine the day on which this item will be considered.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette or computer disk. Please contact ARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact ARB's Bilingual Manager at (916) 323-7053.

THE CONTINUED MEETING

At the June 22, 2007 hearing on the State Strategy, the Board expressed its preference not to act on the proposed State Strategy until it could be jointly considered with the South Coast SIP. However, the Board was concerned about the potential adverse

impacts on transportation conformity for the San Joaquin Valley if there were a delay, and directed ARB staff to determine whether it would need to consider the State Strategy at its July 26, 2007 hearing to avoid transportation planning problems in the Valley beginning August 2007.

ARB staff has consulted with staff from the U.S. Environmental Protection Agency, San Joaquin Valley Councils of Governments, and San Joaquin Valley Air Pollution Control District regarding the timing of new conformity determinations for the Valley. ARB staff has concluded that there is an existing mechanism already in place, outlined in the Federal Highway Administration's letter to California metropolitan planning organizations dated February 1, 2007, that allows the Valley transportation agencies to complete a Fall 2007 conformity determination utilizing existing budgets. It is ARB staff's understanding that the Valley transportation agencies intend to take advantage of this mechanism. Thus, no new budgets are necessary to amend transportation plans or programs in Fall 2007. This means that continuation of the Board's consideration of the proposed State Strategy to September 27, 2007 will not impact Valley transportation projects.

The continued meeting will be conducted as described in the original notice, except that written submissions must be addressed to and received by the Clerk of the Board as described below. All comments submitted for the June 22, 2007 meeting will remain part of the public record.

AVAILABILITY OF DOCUMENTS

This notice and the proposed State Strategy are also available on the ARB website at: http://www.arb.ca.gov/planning/sip/sip.htm, or from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the meeting, and in writing or by email before the meeting. To allow for full consideration of comments received, the Board strongly encourages that all comments be submitted to the Clerk of the Board by September 26, 2007, but the Board will accept written submissions physically submitted at the September 27, 2007 hearing or received by other means by **no later than 12:00 noon, September 26, 2007,** and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

The Board requests, but does not require, that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the meeting so that ARB staff and Board Members have time to fully consider each comment. The board encourages members of the public to bring to the attention of staff in advance of the meeting any suggestions for the proposal.

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

Further inquiries regarding these items should be directed to Jeff Weir, Staff Air Pollution Specialist, at (916) 445-0098 or Ravi Ramalingam, Manager, Transportation Strategies Section at (916) 322-2085.

CALIFORNIA AIR RESOURCES BOARD

Tom Cackette
Acting Executive Officer

Date: July 19, 2007

CALIFORNIA AIR RESOURCES BOARD

NOTICE OF PUBLIC HEARING TO CONSIDER APPROVAL OF A MODIFICATION TO THE CURRENT SIP COMMITMENT FOR PESTICIDE EMISSION REDUCTIONS IN THE VENTURA COUNTY NONATTAINMENT AREA

The California Air Resources Board (ARB) will conduct a public hearing to consider the approval of a proposed modification to the current State Implementation Plan (SIP) commitment for pesticide emission reductions in the Ventura County nonattainment area. This item was originally considered at a public hearing held on July 22, 2007. In response to public comments, ARB staff has revised the original proposal released on May 7, 2007, and has also prepared a new environmental analysis for the revised proposal. At the same hearing, ARB will also consider staff's proposed State Strategy to attain the national ambient air quality standards for 8-hour ozone and fine particulate matter (PM2.5).

DATE: September 27, 2007

TIME: 9:00 a.m.

PLACE: South Coast Air Quality Management District
Auditorium
21865 Copley Drive
Diamond Bar, California 91765

This item will be considered at a two-day meeting of the Board, which will commence at 9:00 a.m., September 27, 2007, and may continue at 8:30 a.m , September 28, 2007. This item may not be considered until September 28, 2007. Please consult the agenda for the meeting, which will be available at least 10 days before September 27, 2007, to determine the day on which this item will be considered.

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BACKGROUND

In the 1994 Ozone SIP, the Department of Pesticide Regulation (DPR) committed to obtain Reactive Organic Gas (ROG) emission reductions from pesticides in five nonattainment areas. For the Ventura County nonattainment area (Ventura), the target, a 20 percent ROG emission reduction from the 1990 base year emissions by 2005, has not been achieved. The difficulty in reaching the target is due in part to the very large increase since 1990 in the amount of acreage under cultivation with crops requiring fumigation. As a result, the 2004 pesticide emission levels in Ventura were about

4.8 tons per day (tpd), as compared to 3.7 tpd in 1990. The near-term fumigation measure commitment in DPR's proposed 2008 Pesticide Plan will be considered as part of the proposed 2007 State Strategy at the September 27, 2007 Board Hearing. The proposed control measures will achieve reductions from the current pesticide emission levels in all 1-hour nonattainment areas by imposing a pesticide emission cap. For all 1-hour ozone nonattainment areas except Ventura, application of Best Available Control Technology (BACT) would achieve the ROG reductions from pesticides that are required by the 1994 Ozone SIP. Application of BACT in Ventura County will achieve reductions from the current pesticide emission levels, but not enough to meet levels required by the 1994 Ozone SIP.

On May 7, 2007 ARB staff published a proposal to substitute 1.0 tpd of surplus ROG emission reductions from California's on-going mobile source emission control program for 1.0 tpd of the ROG emission reductions SIP commitment for pesticides in Ventura. Based on public comment, ARB staff now understands that in Ventura, the near-term measures in DPR's proposed 2008 Pesticide Plan would achieve reductions in 2008 that are 1.3 tpd short of the ROG reduction commitment in the 1994 SIP.

Ventura is also designated as nonattainment for the newer federal 8-hour ozone standard, and is classified as a "moderate" nonattainment area with an attainment date of June 15, 2010. Effectively this means that Ventura must attain the standard in 2009, since nonattainment areas must show attainment for a complete ozone season prior to the attainment date. Because a 2009 attainment requirement allows little time for the implementation of new controls for ozone-forming emissions, attainment by 2009 is largely dependent on reductions from the existing control program. Preliminary photochemical modeling results indicate that Ventura will not attain the standard in 2009. Under the federal Clean Air Act the State can request reclassification to a higher classification. Reclassification as a "serious" ozone nonattainment area would give the area a June 15, 2013 attainment deadline, requiring the reductions that will result in attainment to be in place by 2012.

The Board will also be considering approval of the proposed State Strategy for California's 2007 State Implementation Plan (State Strategy) at its September 27-28, 2007 public hearing. Preliminary photochemical modeling indicates that attainment of the 8-hour federal ozone standard in Ventura County may be possible by 2012. The additional emission reductions for attainment would be provided by the proposed State Strategy, the upwind reductions from the proposed State Strategy and local controls adopted in the South Coast Air Basin, and additional local stationary source controls.

PROPOSED ACTION

ARB staff is proposing to revise the 1994 Ozone SIP to substitute 1.3 tpd of ROG emission reductions from California's on-going mobile source emission control program for 1.3 tpd of the ROG emission reduction commitment for pesticides in the 1994 Ozone SIP in Ventura in 2008. In addition, staff is proposing that this substitution be phased out over time; the amount of surplus non-pesticide ROG emission reductions used to

meet the 1994 SIP pesticide reduction commitment would be reduced by approximately 1/3 ton per day each year after 2008, as shown in the following table.

Proposed Commitment for
Surplus Emission Reductions
Used to Meet the 1994 Pesticide SIP Commitment

Year	ROG (tons per day)
2008	1.3
2009	1.0
2010	0.6
2011	0.3
2012	0.0

This proposed SIP revision will ensure that all of the pesticide reductions required under the 1994 SIP commitment will be achieved by 2012, as a result of the pesticide use and application controls included in the proposed 2007 State Strategy. This proposal will encourage reduced pesticide usage and better pesticide application practices, while providing growers with additional time to identify and implement alternatives. The revised proposal for Ventura differs from staff's original proposal released on May 7, 2007, which was to substitute 1.0 tpd of ROG emission reductions in Ventura (instead of 1.3 tons). Staff's original proposal also differs in that the 1.0 tpd substitution was a long-term substitution with no termination date and no phase-out schedule.

Staff has also prepared a new environmental analysis for the revised proposal. Both the proposed SIP revision and the new environmental analysis are available for public comment as described below.

AVAILABILITY OF DOCUMENTS

This notice is available on the ARB website at:
http://www.arb.ca.gov/planning/sip/sip.htm
The proposed revision to the pesticide commitment in the 1994 SIP, and the new environmental analysis for this proposed revision, are available at:
http://www.arb.ca.gov/planning/sip/2007sip/2007sip.htm, or from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

SUBMITTAL OF COMMENTS

The public may present comments relating to this matter orally or in writing at the meeting, and in writing or by email before the meeting. To allow for full consideration of comments received, the Board strongly encourages that all comments be submitted to the Clerk of the Board by September 26, 2007, but the Board will accept written submissions physically submitted at the September 27, 2007, hearing or received by

other means by **no later than 12:00 noon, September 26, 2007**, and addressed to the following:

Postal mail: Clerk of the Board, Air Resources Board
1001 I Street, Sacramento, California 95814

Electronic submittal: http://www.arb.ca.gov/lispub/comm/bclist.php

Facsimile submittal: (916) 322-3928

The Board requests, but does not require, that 30 copies of any written statement be submitted and that all written statements be filed at least 10 days prior to the meeting so that ARB staff and Board Members have time to fully consider each comment. The board encourages members of the public to bring to the attention of staff in advance of the meeting any suggestions for the proposal.

Please note that under the California Public Records Act (Government Code section 6250 et seq.), your written and oral comments, attachments, and associated contact information (e.g., your address, phone, email, etc.) become part of the public record and can be released to the public upon request. Additionally, this information may become available via Google, Yahoo, and any other search engines.

Further inquiries regarding these items should be directed to Jeff Weir, Staff Air Pollution Specialist, at (916) 445-0098 or Ravi Ramalingam, Manager, Transportation Strategies Section at (916) 322-2085

CALIFORNIA AIR RESOURCES BOARD

Michael N. Scheible

for Tom Cackette
Acting Executive Officer

Date: August 13, 2007

Appendix H

REVISED
Proposed Revision to the Pesticide Element of the 1994 Ozone SIP for the Ventura County Nonattainment Area

(August 13, 2007)

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REVISED
Proposed Revision to the Pesticide Element of the 1994 Ozone SIP for the Ventura County Nonattainment Area

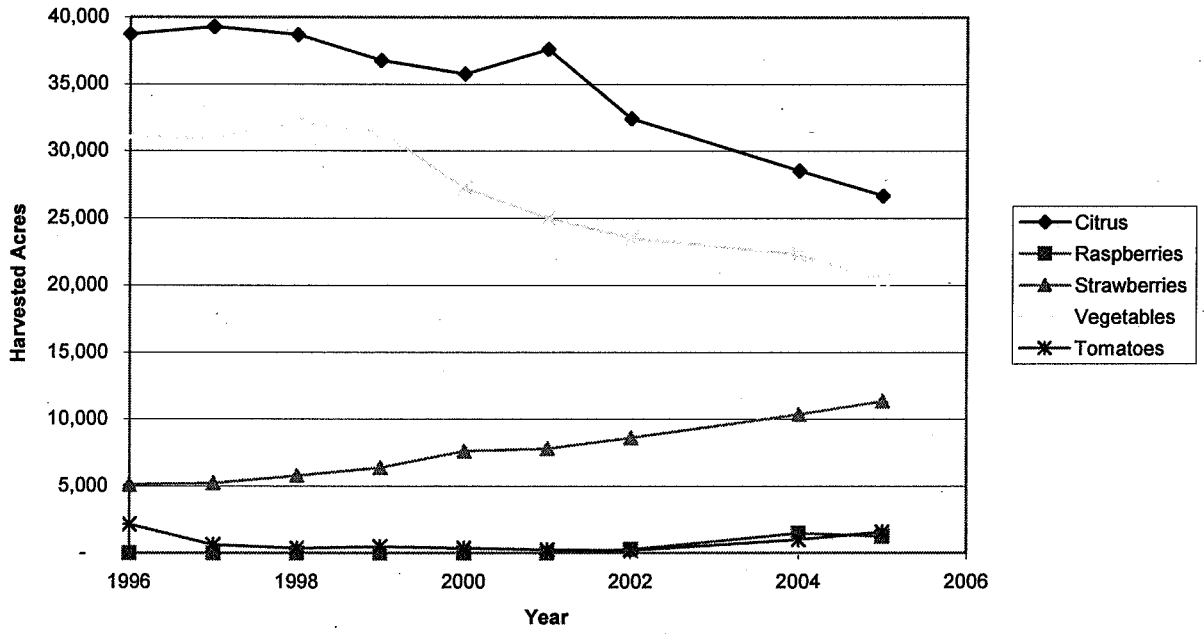
In the 1994 Ozone SIP, the Department of Pesticide Regulation (DPR) committed to obtain Reactive Organic Gas (ROG) emission reductions from pesticides in the five 1-hour ozone nonattainment areas. For the Ventura County nonattainment area (Ventura), the target was a 20 percent ROG emission reduction from the 1990 base year emissions by 2005 (see 62 Federal Register 1169-1170; January 8, 1997).

In all nonattainment areas, DPR's proposed fumigant regulations will achieve all of the ROG reductions from pesticides that are required by the 1994 Ozone SIP. DPR's proposed regulation expects to achieve all the reductions in 2008. Reductions will be achieved by instituting a regulatory cap on pesticide emissions and placing annual limits on fumigant emissions to ensure the overall pesticide emission cap is not exceeded. The measures include changing to application methods with lower emissions. Monitoring studies demonstrate that emissions differ between methods of applications. Emissions can be significantly reduced through tarping, irrigating after applications, or applying through drip irrigation systems. Changing to these applications can provide a feasible means for meeting the overall emission limits for fumigants. Quantifying the difference in emission rates associated with different fumigant application methods also accounts for the revisions to earlier estimates of pesticide ROG emissions, including revisions to the baseline estimates. Widescale adoption of low emission practices will assist in meeting the pesticide emission cap, but will not likely meet the entire demand. The measures anticipate a mechanism to allocate, track and oversee fumigant emissions.

Land use changes in Ventura have created difficulties in meeting the fumigant cap in the proposed 2008 Pesticide Plan. Overall pesticide ROG emissions, and fumigant emissions in particular, have increased over the last several years in the Ventura nonattainment area, from approximately 3.3 tpd in 1991 to an estimated 4.8 tpd in 2004. Fumigants represent 80-90% of the overall pesticide emissions in Ventura. The increased emissions are due to changes in Ventura cropping patterns. Crops that require annual fumigation are replacing crops that require minimal fumigation. For example, fumigant use for strawberries accounts for most of the pesticide ROG emissions in the Ventura nonattainment area, and strawberry acreage has increased from 4,500 acres in 1996 to 10,300 acres in 2004 (McPhail 1997, 1999, 2001, 2003, 2006; Figure 1). Smaller acreage increases occurred for raspberries and fresh market tomatoes that require annual fumigation. The increased strawberry, raspberry, and tomato acreage coincides with a decrease in acreage for crops that require less fumigation, such as citrus (grapefruit, lemon, orange) and most vegetables (broccoli, cabbage, carrot, cauliflower, celery, lettuce, parsley, spinach). Under the proposed measures, Ventura would be required to reduce its pesticide emissions in 2008 by 46%

(2.2 tpd) based on 2004. Adoption of Best Available Control Technology (BACT) will not allow all of the planted acres to remain economically viable and to meet pesticide emission cap.

Figure 1
Trends of harvested acres in Ventura



DPR estimates that approximately 83% of the fumigant emissions in the Ventura nonattainment area come from applications that already employ Best Available Control Technology (BACT), such as tarping, intermittent irrigation following fumigation, or application using drip irrigation systems (Barry, et al. 2007). Comments received on the proposed regulations indicate that BACT adoption may be greater than currently estimated. However, even if all fumigant applications adopted BACT, an additional 34% (1.3 tpd) fumigant emission reduction from 2008 levels would be needed to achieve the overall pesticide SIP commitment. To achieve this reduction, growers and applicators will need to employ some combination of acreage reduction, application rate reduction, and shifting applications outside the May – October window. The likely scenario would be that land would not remain in agricultural production. DPR estimates that 5,800 – 7,500 acres would be lost if the 1.3 tpd ROG reduction is achieved solely through acreage reduction (Spurlock 2007).

A draft analysis of the proposed regulations predicts that most growers will reduce fumigant application rates to achieve the needed ROG reductions in Ventura, with the fumigated area reduced by several hundred acres (Goodhue, et al. 2007). The reduced application rates would cause a decrease in yields, with the most likely scenario leading to a loss of $11 million, and a maximum loss of

$31 million. Separate analyses by ARB (Dean 2007) and the California Strawberry Commission (Murai 2007) estimated losses of up to $80 million and $286 million, respectively, based on a 10,000 acres reduction.

In the short term, the loss of these high value crops would likely have a negative economic impact on the farm economy and farm employment in Ventura. Growers would be expected to recuperate that loss by converting the land to other uses. Although it is unknown what the new uses would be, a reasonable possibility is that a significant number of acres would be converted to non-agricultural uses (such as housing developments). The conversion of agricultural land to other uses would likely result in various adverse environmental impacts, the extent of which cannot be analyzed at this time.

An extensive amount of research is being conducted by federal and state agencies as well as commodity groups on ways to reduce pesticide emissions. ARB has funded some of these approaches. With the enactment of the 2007-08 budget, DPR will restore its Pest Management Alliance grant program that funds pesticide use reduction programs. These efforts will lead to improved BACT but not in time for the 2008 season. DPR expects that, as further research is completed over the next few years, the ability for growers in Ventura County to further reduce pesticide emissions will also increase.

To avoid the potential impacts described above, ARB proposes to revise the Pesticide Element of the 1994 Ozone SIP for Ventura only. This SIP revision would substitute emission reductions from other sources of ROG for a portion of the emission reductions committed to in the 1994 SIP for pesticides. There would be no "backsliding" from the overall 1994 SIP commitments for Ventura, because all the ROG emission reductions committed to in the 1994 SIP would still be achieved. What would change is the source of the emission reductions – a portion of the ROG reductions for Ventura would come from other emission sources instead of pesticides.

ARB staff has calculated the amount of ROG emission reductions that have been achieved in Ventura since 1994. This analysis shows that all of the ROG reductions committed to (except for those anticipated to come from pesticides) have already been achieved in Ventura County (Table 1). Plus, between 2005 and 2008, an additional 1.9 tpd of ROG reductions will be achieved from California's on-going mobile source and consumer product emission control program (Table 2), beyond the reductions committed to in the 1994 SIP.

Table 1
2008 Emission Reductions Compared to 1994 SIP Emission Reduction Commitment in Ventura County APCD*

Emission Reduction Commitment**	**4.11**
Enhanced Vehicle Inspection and Maintenance	0.98
On-Road Measures	1.08
Off-Road Measures	0.90
Consumer Product Measures	1.16
Total 1994 SIP New Measure Emission Reductions Achieved	**4.11**

* All emissions are reported in the 1994 SIP emission inventory currency. Does not include DPR, or local (stationary or area-wide) commitments

** Commitment for Emission Reductions in 2005.

Table 2
Decline in ROG Emissions from California's On-going Mobile Source and Consumer Product Emission Control Program*

	2005	**2008**	**Change**
On-road Emissions	11.4	9.0	2.4
Off-road Emissions	4.0	4.1	-0.1
Consumer Product Emissions	5.7	6.1	-0.4
Total	**21.1**	**19.3**	**1.9**

* Does not include pesticide emissions, or local (stationary or area-wide) emissions under the jurisdiction of the Ventura County Air Pollution Control District. Does not include benefits of new measure commitments identified in Table 1, above. All emissions are reported in the 1994 SIP emission inventory currency.

Notes: ARB did not have emission reduction commitments beyond 2005 in Ventura County. As such, all declines in baseline achieved through California's on-going mobile source control program are surplus to the emission reduction commitments in the 1994 SIP for Ventura County.

ARB staff's May 7, 2007 Proposed State Strategy proposed to revise the 1994 Ozone SIP to substitute 1.0 tpd of ROG emission reductions from California's on-going mobile source emission control program for 1.0 tpd of the ROG emission reductions committed to for pesticides in the 1994 Ozone SIP in Ventura County in 2008.

ARB received written comments and heard testimony at its June 22, 2007 public meeting on the State Strategy expressing concern about the impact the additional pesticide emissions could have on ozone formation, and about the toxic air contaminants that would result from the continued use of fumigants. ARB also heard testimony that failure to provide substitute emissions for the entire shortfall – estimated by industry representatives at 1.9 tpd -- would result in adverse economic impacts for strawberry farmers, and could force some fields out of production.

Potential Impacts on 8-hour Ozone Planning in Ventura County

Ventura County is designated as nonattainment for the federal 8-hour ozone standard, classified as a "moderate" nonattainment area with an attainment date of June 15, 2010. Effectively this means Ventura must attain the standard in 2009, since nonattainment areas must show attainment for a complete ozone season prior to the attainment date, and the ozone season in California is year round. Because a 2009 attainment requirement allows little time for the implementation of new controls to ozone-forming emissions, attainment by 2009 is largely dependent on reductions from the existing control program. Preliminary photochemical modeling results indicate that Ventura will not attain the standard in 2009. Ventura District staff has indicated that they may recommend that their Board request reclassification as a "serious" ozone nonattainment area. Such a "bump up" would give the area a June 15, 2013 attainment deadline and would require attainment in 2012.

The photochemical modeling indicates that ozone formation in Ventura responds to both NOx and ROG reductions. ARB staff's estimates indicate that Ventura needs NOx reductions of approximately 16 tons per day (tpd) and ROG reductions of 7 tpd in order to attain the standard in 2012. Existing State and local controls will reduce emissions by approximately 11 tpd NOx and 6 tpd ROG by 2012. The measures in the proposed State Strategy will provide an additional 5 tpd NOx and 1 tpd ROG. Since Ventura is impacted by air pollution transport from the South Coast, Ventura's air quality will also benefit from emission reductions in the South Coast Air Basin. As mentioned previously, 80 to 90 percent of the pesticides applied in Ventura County are fumigants. Nearly half of the fumigants applied are methyl bromide, and methyl bromide is a low reactivity ROG (Carter, et al. 2007). Given these emission reductions and the low reactive nature of methyl bromide, preliminary analysis still shows a very close attainment demonstration for 2012.

ARB staff is revising its ROG substitution proposal for Ventura County, as described below, in light of the reductions needed to ensure expeditious attainment of the federal 8-hour ozone standard, and in light of the comments received in response to the original proposal.

1) In the May 7, 2007 proposal, staff recommended the substitution of 1.0 tpd ROG reductions. Staff is now recommending that ARB provide 1.3 TPD in 2008, reflecting updated DPR estimates of the ROG emission reduction shortfall.

2) In the May 7, 2007 proposal, staff did not identify an end-date for the use of substitute ROG emissions. Staff is now recommending a phase-down that provides 1.3 tpd of ROG reductions starting in 2008, declining to zero by 2012. This will provide DPR with the time necessary to identify and construct additional pesticide measures to achieve the remaining necessary reductions, and will help ensure that reductions are in place by the 2012 "serious" area attainment deadline. The proposed ROG substitution schedule shown below reflects this phase-out.

Table 3
Proposed Commitment for
Surplus Emission Reductions
Used to Meet the 1994 Pesticide SIP Commitment

Year	ROG (tons per day)
2008	1.3
2009	1.0
2010	0.6
2011	0.3
2012	0.0

This proposed revision will ensure that all of the pesticide reductions required under the 1994 SIP commitment will be achieved, by 2012, as a result of the pesticide use and application controls included in the proposed 2007 State Strategy.

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REVISED (8/13/2007)

Environmental Analysis for the Proposed Revision to the Pesticide Commitment of the 1994 Ozone SIP for the Ventura County Nonattainment Area

ARB received a number of public comments after the May 7, 2007 release of staff's proposed revision to the Pesticide Commitment of the 1994 Ozone SIP for the Ventura County Nonattainment Area (Ventura). In response to these comments, ARB staff revised the originally proposed SIP revision. The revised proposal is set forth in Appendix H (revised on 8/13/2007) to the Proposed State Strategy for California's SIP for the Federal 8-hour Ozone and PM2.5 Standards (State Strategy).

When the proposed State Strategy was released on May 7, 2007, the potential environmental impacts of the State Strategy were analyzed by ARB staff. The analysis is contained in Appendix E to the State Strategy. Among other things, Appendix E includes an environmental analysis of DPR's 2008 pesticide element of the State Strategy, as well as an analysis of ARB staff's originally proposed SIP revision for Ventura.

ARB staff has now prepared a new environmental analysis for the newly proposed revisions to the Pesticide Commitment of the 1994 Ozone SIP for Ventura. The new analysis is set forth below. Comments received on this new analysis will be summarized and responded to as provided in ARB regulations (title 17, California Code of Regulations, section 60007). Although this is a new analysis for the revised proposal, the analysis also summarizes and responds to comments raising significant environmental issues that are contained in comment letter dated June 12, 2007 and submitted by the Center for Race, Poverty & the Environment (CRPE). CPRE's June 12, 2007 letter asserts that staff's environmental analysis on the originally proposed SIP revision is inadequate for various reasons. Although CPRE's letter is directed to the original proposal, many of CPRE's comments are relevant to the revised as well as the original proposal. Staff therefore believes it is appropriate to respond to these comments in order to provide full public disclosure of potential environmental impacts.

Potential Air Quality Impacts on Ozone Formation

Methyl bromide and methyl isothiocyanate-generating fumigants comprise approximately 50 percent of the pesticide VOC inventory in Ventura. These two fumigants have very low photochemical reactivity, indicating that they do not appreciably contribute to ozone formation. The remaining fumigants used in Ventura have greater photochemical reactivity and do contribute to ozone formation. This means that the proposed SIP revision will result in emissions in 2008 of an additional 0.65 tpd of ROG that will make some contribution to ozone formation.

Preliminary photochemical modeling indicates that Ventura County will need to be reclassified as a serious nonattainment area for the 8-hour ozone standard, which will result in a June 2013 attainment date. Based on the preliminary photochemical modeling, it is apparent that ozone formation in Ventura responds to both NOx and ROG reductions. Consequently, the proposed revision may have a significant adverse impact on air quality in the short term as it may slow down slightly the improvement in ozone levels as compared to fully achieving the pesticide emission reductions in the 1994 Ozone SIP. However, the revised proposal phases out the substitution rapidly over four years and so is structured to ensure that the substitution will not interfere with Ventura's ability to attain the 8-hour ozone standard by the deadline for "serious" nonattainment areas.

Potential Toxic Impacts

Four fumigants accounted for 87% of the pesticide VOC emissions in the Ventura nonattainment area during 2004: 1,3-dichloropropene, chloropicrin, methyl bromide, and metam-sodium. Emissions of these fumigants would be the most impacted by this SIP revision. DPR anticipates a negligible health risk from toxic exposure to the fumigant levels under all of the emission scenarios described in this SIP revision. Complementary regulatory requirements and oversight by three regulatory agencies provide a comprehensive system for protecting people from toxic exposure to fumigants. The U.S. Environmental Protection Agency specifies nationwide restrictions through label requirements. Fumigant labels specify legally binding instructions and restrictions pertaining to storage, disposal, first aid, air concentration limits, methods of application, worker protection, and environmental protection.

In addition to the label requirements, DPR develops and implements more stringent statewide requirements. DPR's statewide requirements for methyl bromide and 1,3-dichloropropene include buffer zones, air concentration or use limits, application method restrictions, and worker protection provisions (Title 3, California Code of Regulations, Sections 6450, 6450.1, 6450.2, 6450.3; DPR 2002). As described below, DPR is in the process of assessing the risk and developing mitigation measures for chloropicrin and metam-sodium. All four fumigants are "restricted materials" in California. As restricted materials, they require a permit issued by the county agricultural commissioner prior to use and can only be applied under the supervision of a certified applicator. State law requires county agricultural commissioners to evaluate local conditions prior to issuing restricted materials permits. Based on his evaluation of local conditions, the Ventura County agricultural commissioner includes additional restrictions on the permits for chloropicrin and metam-sodium. These permit conditions include buffer zones, tarpaulins for chloropicrin applications, and sprinkler systems for metam-sodium to be used in the event odors are detected (Ventura County Agricultural Commissioner).

The statewide requirements described above are the result of DPR's comprehensive risk assessment and risk management process. This process includes a toxicological and exposure evaluation, and mitigation as toxic air contaminants. DPR has completed risk assessments for 1,3-dichloropropene, methyl bromide and metam-sodium (as the methyl isothiocyanate breakdown product) (DPR 1997; Lim 2002; Rubin 2002). The risk assessment for chloropicrin is in progress. As part of the risk management process, DPR has identified acceptable exposure levels for 1,3-dichloropropene, methyl bromide, and methyl isothiocyanate-generating pesticides, based on the toxicology evaluation in the risk assessment. As described above, DPR has implemented statewide requirements for 1,3-dichloropropene and methyl bromide. DPR has proposed mitigation measures for methyl isothiocyanate-generating pesticides and plans to implement regulatory requirements later in 2007 (DPR 2007). The statewide requirements for these fumigants are designed to meet the acceptable exposure levels. The Ventura nonattainment area is one of the highest use counties for fumigants, and is an area that DPR closely evaluates. As part of its efforts to evaluate the effectiveness of the statewide regulatory requirements, the ARB (at the request of DPR) conducted monitoring in Ventura during 2005 and 2006. Results of the monitoring show that air concentrations of 1,3-dichloropropene and methyl bromide are acceptable (Table 1). The Office of Environmental Health Hazard Assessment (OEHHA) recommended a lower acceptable concentration for methyl bromide and the measured concentrations also meet these levels. Air concentrations should be lower than shown here once DPR's VOC regulations are implemented, under all of the emission scenarios described in this SIP revision.

Table 1. Methyl bromide and 1,3-dichloropropene air monitoring in Ventura during 8-week summer peak use season.

	Measured Concentration (ppb)		Acceptable Concentration (ppb)	
	2005	2006	DPR	OEHHA
Methyl bromide				
Average of 5 sites	0.24	0.64	9.00	1.00
Highest site	0.39	0.88	9.00	1.00
1,3-dichloropropene				
Average of 5 sites	0.90	0.45	26.00	
Highest site	2.33	0.84	26.00	

Potential Impacts on Ozone Depletion

Methyl bromide is an ozone depleting substance, and its production and importation are regulated under the Clean Air Act. Under the proposal, it is estimated that 0.6 tons per day more methyl bromide would be allowed from field fumigation in Ventura in 2008 than would be allowed under the 1994 Plan. Though methyl bromide is an ozone depleting substance, this revision will not have a significant adverse impact on the ozone layer. Ozone depletion is not a

localized effect, and the additional methyl bromide permitted in Ventura County under the revision is negligible, approximately 0.0003 percent of the worldwide methyl bromide emissions. Also, it is likely that if the proposal were not adopted, additional methyl bromide emissions prohibited in Ventura would be allocated elsewhere in the country.

The cumulative impact of methyl bromide emission on ozone depletion is addressed by the Montreal Protocol, which is implemented in the United States by U.S. EPA under Title VI of the federal Clean Air Act. U.S. EPA limits the total amount of methyl bromide consumed in the United States. The U.S. EPA has steadily decreased the amount of methyl bromide allowed as alternatives become available.

Potential Impacts on Global Climate Change

Methyl Bromide has a Global Warming Potential (GWP) of 5, which is five times the global warming potential of carbon dioxide but approximately one-fifth of the GWP of methane. Methyl bromide (CH_3Br) has an atmospheric lifetime of approximately 0.7 year. The proposed addition of less than 0.5 tpd methyl bromide, to be eliminated by 2012, is too small to have a significant adverse impact on climate change.

Other Environmental Impacts

Except for the impacts discussed above, staff has not identified any other significant environmental impacts that would result from the proposed SIP revision.

Project Alternatives

ARB staff evaluated the following alternatives to the proposed SIP revision.

Alternative 1 – No Project

CEQA documents typically contain an evaluation of the "no project" alternate. In this case, the "no project" alternative means that the ARB would not adopt the SIP revision and that an additional 1.3 tpd of pesticide emission reductions would occur in Ventura from implementation of DPR's pesticide regulations. As discussed in Appendix H, staff is not recommending this alternative because it would have serious adverse economic impacts on agriculture in Ventura. Staff believes that avoiding these agricultural impacts outweighs the slight negative impact on ozone air quality discussed above.

Alternative 2 – Substitute ROG reductions of less than 1.3 tpd

Instead of providing ROG reductions of 1.3 tpd, ARB could provide lesser supplemental reductions of 1.0 tpd of ROG starting in 2008 with a phase down into 2012. This would make up part of the shortfall from DPR's 2008 pesticide regulation. In order to mitigate the remaining 0.3 tpd of ROG, farmers would have to take agricultural fields out of production or use fewer pesticides, which would result in a loss in yield and farmland. Staff is not recommending this alternative because of the greater economic impacts associated with reduced productions or yield.

Alternative 3 – Substitute ROG reductions of 1.3 tpd with no gradual phase-down prior to 2012

This alternative would provide the same immediate relief from the potential economic impacts of reduced production or yield, but would continue that relief indefinitely compared to staff proposal. Research is currently underway to improve application methods. Within one to two years, advanced application methods could reduce ROG emissions from pesticides and provide the necessary reductions for Ventura's ozone attainment in 2012. Nevertheless, staff is not recommending this alternative because it does not ensure that the significant adverse impact on air quality in the short term is fully mitigated by 2012.

Alternative 4 – Substitute ROG reductions of 1.9 tpd

This alternative would provide ROG substitution of 1.9 tpd, which is the maximum amount of surplus ROG reductions that exists from ARB's on-road motor vehicle program. Some persons who commented believe that 1.9 tpd for ROG substitution is necessary to fully mitigate the impacts on agriculture of DPR's proposed pesticide regulation. These persons believe that DPR's proposed estimate of a 1.3 tpd shortfall is too low because of their estimates of the recent growth in fumigated acreage.

Staff is not recommending this alternative because DPR estimates that a 1.3 tpd substitution is sufficient to meet the 1994 SIP obligation.

Feasible Mitigation Measures

As described above, the proposed SIP revision may have a significant short-term adverse impact on air quality, since it may slightly slow down improvement in ozone levels in Ventura. The previous section describes the alternatives to the proposed SIP revision that were evaluated by staff, and explains that staff was not able to identify any feasible alternatives that would substantially reduce the potential adverse impacts of the SIP revision while at the same time achieving its benefits.

Staff also evaluated measures to mitigate the air quality impacts of the proposed SIP revision. Staff was unable to identify any feasible mitigation measures that would substantially reduce these impacts, while at the same time achieving the benefits of the SIP revision. However, it should be noted that the proposed SIP revision does incorporate mitigation measures that were not part of the original proposal released for public comment on May 7, 2007. The original proposal was to substitute 1.0 tpd of surplus ROG emission reductions in Ventura for 1.0 tons of pesticide emissions. This was a long-term substitution with no termination date and no phase-out schedule. Staff's revised proposal incorporates a phase-out schedule and a 2012 termination date in order to mitigate the air quality impacts of the SIP revision. The effect of the provisions on air quality is described in detail in Appendix H.

Cumulative Impacts

Staff has also considered the potential cumulative impacts of the proposed SIP revision. With respect to air quality, evaluating cumulative impacts essentially means that the impact of an extra 1.3 tons of ROG emissions must be considered in combination with other sources of ROG emissions in the Ventura County Nonattainment Area. The nature of the photochemical modeling done for Ventura County analyzes the cumulative impacts of all know ROG emission on ozone formation. Consequently, staff did a cumulative analysis when determining the effect of the proposed SIP revision on ozone formation and attainment in Ventura.

Summaries and Responses to Significant Environmental Issues

Following are summaries and ARB staff's responses to the environmental issues raised in the June 12, 2007 comment letter submitted by the Center for Race, Poverty & the Environment (CRPE).

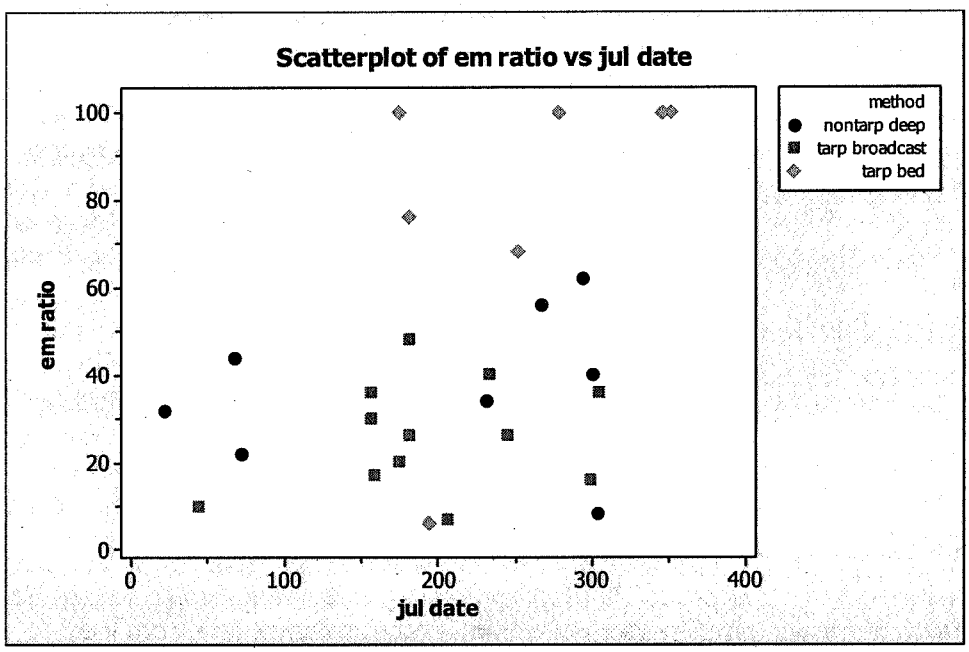
Comment in Section II, page 4: "...the AMAFs are based on unrepresentative field fumigation studies conducted in other states under cool soil conditions, which do not provide an accurate estimate of emissions from California fumigations conducted at high temperatures in the Central Valley during the peak ozone season from May to October. Studies conducted under worst-case scenarios have been excluded from the group of studies on which the regulation is based."

Response: We have included in this analysis those studies that have been reviewed and accepted as sufficient quality to provide reliable results. The studies were conducted at a variety of locations under a variety of meteorological conditions and over the entire year. The variety of locations, application methods, and meteorological conditions are varied in large part due to the

diverse nature of agriculture in California. The current set of studies used in this analysis is the database available.

We agree in concept that temperature is important. However, DPR's work with methyl bromide applications throughout the year found that winter applications can show high flux, high emissions, and high air concentrations. In fact, analysis of the relationship between Julian date of the application (as a surrogate for temperature) and the percentage of emissions (emission ratio) for monitored applications shows no significant relationship between emissions and day of application. A measurable temperature effect should be clearly discernable by a regression analysis. Thus, a simple, clear relationship between temperature and flux is not supported by the DPR methyl bromide database. More likely many factors act together and, thus, the more global approach that DPR has taken to estimating the AMAF's is more appropriate.

A plot of the methyl bromide emission ratios is shown below. Note the complete lack of trend for the tarp broadcast data. In particular, the February 13, 1997 application has an emission ratio of 9.8%. This could be argued to support the low temperature, low flux theory. However, the July 25, 1998 application shows an emission ratio of 6.8%. It is also clear the tarp bed application method shows a high emission ratio no matter when the application is made. In fact, the tarp bed applications in December show a 100% emission ratio, similar to those applications made in June and October. The methyl bromide database is the largest available and likely reflects trends in flux and emission ratios for other fumigants.



Comment: The memorandum from Susan Kegley to Brent Newell, dated June 12, 2007, recommends "Base emission estimates on all available studies with valid experimental procedures that are relevant to the currently allowable applications methods."

The memorandum provides four examples of unrepresentative and excluded studies. "For example, the chloropicrin fumigation that was conducted in Washington State was done on a night that the air temperature actually dropped below freezing. It is very likely that the low emission rate observed for this fumigation had nothing to do with the application method and everything to do with the fact that the air temperature was nine degrees below freezing."

Response: This comment inaccurately reports the study results and does not mention that the 33.8% emissions shown in the Washington results is similar to the 36.5% emissions shown in the Florida results. The temperature during the day when the application was actually made was 57 degrees F. The temperature on the night immediately following the application was 46 degrees F. The night air temperatures during the majority of the study were above 37 degrees F and the maximum night temperature was 57 degrees F. The average night air temperature was 40 degrees F. The average day air temperature was 48 degrees F. When "*...air temperature was nine degrees below freezing...,*" this event occurred 2 weeks following the application during the second to last sampling interval. By that sampling interval the majority of the 34% of applied mass lost was already measured. The 33.8% emissions shown in Washington results are similar to 36.5% emissions shown in the Florida results. These were both broadcast tarp applications. The air temperatures during the Florida study were 15 to 20 degrees F warmer yet the mass loss results are similar to the Washington study. Thus, the commenter's views are not supported by the data.

Comment: "None of the chloropicrin studies were conducted in California... Soil type is one of the factors that controls the amount of fumigant released from the soil during a fumigation..."

Response: It is true that none of the chloropicrin studies were conducted in California. We agree in concept that soil type is among many factors that has an effect on emissions. In fact, the Arizona studies were conducted on sandy soil that in concept could result in a higher loss than most soils in California. However, we will reiterate that DPR has taken a global approach to estimating the AMAF's for several reasons including the lack of studies to quantify what are essentially small scale refinements of the AMAF's and the fact that when the AMAF's are used to estimate the total VOCs the scale is very large. There is no practical way to incorporate soil type into the estimates.

Comment : "In contrast, industry studies with glaring experimental errors were accepted for use in the emission estimates. For example, the soil study used to estimate emissions from "standard sprinkler" applications of metam sodium, had

samplers placed nearly perpendicular to the wind direction, thus ensuring the maximum concentrations could not be measured."

Response: No studies with "*glaring experimental errors*" were used in the AMAF development. It is true that the standard sprinkler study, and also the standard shank study, had a sampler layout that was not optimal. The sampler layout was an attempt to capture the predominant wind direction. However, studies conducted over several days typically have no true predominant wind direction. It should be noted that both studies were done according to Good Laboratory Practices and were submitted, accepted, and used to characterize off-site exposure by the U.S. Environmental Protection Agency (U.S. EPA) in their Metam Sodium Risk Assessment. Thus, both U.S. EPA and DPR have reviewed these studies. Further, the layout of the samplers in both those studies actually caused very high emission estimates to be obtained for some sampling intervals due to inherent shortcomings of the computer model. As a result, the emissions estimated from those studies may be overestimated, not underestimated as the commenter suggests.

Comment: "Studies like this should be discarded in preference to studies with valid experimental procedures such as the ARB/DPR study conducted in 1993 where the experiment was done correctly and captures the representative emissions from a worst-case scenario application. In the current emission estimate, this ARB study is not used."

Response: The 1993 ARB/DPR study is not used for several reasons:

1) The study was not designed to estimate flux:
   a) Only four samplers were used, one on each side of the field for an 84 acre field. This is not sufficient to characterize the flux.
   b) Only summarized weather data was available, no on-site weather data was reported.
   c) The sampling intervals span sunrise and sunset. In order to accurately estimate emissions, the sampling periods must separate the day and night periods.

2) There are significant events that cast doubt on the reported air concentrations:
   a) Samples from sampling periods 3 and 4 were left in an ice chest over the weekend in air temperatures over 100 degrees F. No dry ice was left in the ice chest by the time the samples were retrieved. Therefore, those samples are not valid.
   b) The west sample from sampling period 5 was left by mistake in the freezer for 10 weeks and then analyzed. The storage stability over 10 weeks was not evaluated.

Comment in Section II, page 4: ..."natural variability in flux rates (the rate at which the fumigant escapes from the soil) is large, thus a single study – or even several studies – will not provide an accurate estimate of actual emissions."

The memorandum from Susan Kegley to Brent Newell, dated June 12, 2007, recommends "Use high-end emission estimates from these studies to estimate VOC emissions during the summer ozone season."

Response: We agree that the variability in flux rates (emissions) between applications is large. For fumigants and application methods with multiple studies, the standard deviations of the emissions are approximately 50%. DPR has chosen to use the average flux rates to estimate emissions for three reasons. First, the emission inventory represents the aggregate emissions from all agricultural and structural pesticide applications within a region over several months. The average flux rates represent the most accurate estimate of aggregate emissions. Second, all pesticide applications included in DPR's inventory represent their most accurate and consistent estimate of emissions, for both the base year and subsequent years. Using a consistent method to estimate emissions is essential for making relative comparisons and determining compliance with the SIP commitments. Using the most accurate estimates for some applications and high-end estimates for other applications would skew the inventory and make relative comparisons unreliable. Third, even if high-end emission estimates were to be used, they would affect both current emissions and emissions for the 1991 base year. Estimates of the 1991 base year emissions are generally more uncertain than current emissions. Therefore, it would probably be appropriate to apply a larger uncertainty factor to the 1991 base year than current emissions, and the emission reductions achieved would be larger than currently estimated using the average flux rates.

Comment: The memorandum from Susan Kegley to Brent Newell, dated June 12, 2007, recommends "Determine 4-hour and 8-hour averages and use them to estimate peak ozone-forming emissions."

Response: Data is not available for all but a few pesticides to determine 4-hour or 8-hour peak emissions. Using a consistent method to estimate emissions is essential for making relative comparisons and determining compliance with the SIP commitments. Using peak emissions for some, but not all applications would skew the inventory and make relative comparisons unreliable.

Comment in Section II, page 4: "DPR has not presented any evidence supporting its estimates of historical fumigant application methods, nor has it made public the details of the process by which this information was obtained."

Response: DPR provided a detailed explanation of its method for determining the frequency of use of historical fumigant application methods in its memorandum

from Barry, Spurlock, and Segawa to Sanders, dated April 6, 2007. The explanation from this memorandum is excerpted here.

In California, all agricultural and commercial pesticide applications must be reported. County agricultural commissioners and DPR compile these PURs into a database. The PUR database includes the identity of the product applied, the amount applied, location, date, crop/site treated, and other information. DPR uses the pounds of product applied recorded in the PUR database to calculate the VOC emissions for each pesticide application included in the pesticide VOC emission inventory. The PUR database contains general information about the application method (i.e. air, ground, or other), but it does not indicate the specific application method. Therefore, another adjustment is needed to account for the use of each fumigant application method.

In general, different crops use different fumigant application methods. Roush (2006) found that the different nonattainment areas have different crops responsible for the majority of pesticide VOC emissions. Therefore, each nonattainment area should have a different set of adjustment factors to characterize the use of fumigant application methods. While the application method depends on the crop to be planted, other factors such as soil type, cost, and equipment availability also influence the choice of application method. For example, strawberries always use a shallow application method. However, the tarp broadcast and tarp bed application methods are both commonly used for strawberries, and these application methods have different emissions. Therefore, the type of crop is an unreliable surrogate to identify the fumigant application method in some cases.

DPR proposes to use a variety of methods to estimate the use of each of the fumigant application methods (method use fraction). The method for 1,3-D is the most accurate. As required under DPR's 1,3-D management plan, the registrants maintain records of the specific application method for all 1,3-D applications. Johnson (2006) describes the May–October method use fractions, based on the registrants' data.

Lawson (2006) provides a survey of metam-sodium practices by several dozen growers and applicators in certain areas of the state. This survey includes a compilation of the application methods. The survey includes specific information for three nonattainment areas, as well as the top ten counties. DPR uses the percentage breakdown described in Lawson (2006) on the use of the various metam-sodium applications for the San Joaquin Valley, Southeast Desert, and Ventura nonattainment areas. DPR uses the breakdown for the top ten counties described in Lawson (2006) as a surrogate for the Sacramento Metro nonattainment area, and Ventura as a surrogate for the South Coast nonattainment area.

Similar to the approach described by Stangellhini (2006a, 2006b; Appendix 1), DPR uses information from the PURs to estimate the May–October method use fractions for methyl bromide and chloropicrin based on the following assumptions:

- For 1990/91 methyl bromide and chloropicrin applications, all row, vegetable, and nursery crops (except strawberries) were fumigated using a shallow injection broadcast method with a high permeability tarpaulin or no tarpaulin.
- For 1990/91 methyl bromide and chloropicrin applications, one-half of the strawberry applications were conducted with a shallow injection broadcast method and a high permeability tarpaulin, and one-half of the strawberry applications were conducted with a shallow injection bed method and a high permeability tarpaulin.
- For 1990/91 methyl bromide and chloropicrin applications, all tree and vine crops were fumigated using a deep injection method with a high permeability tarpaulin or no tarpaulin.

Comment in Section III.A., page 8: "it is inconceivable for the Environmental Impact Analysis to assert that an increase in toxic fumigant use will have no impact on the environment."

Comment in Section III.A.1., page 8: "Substantial evidence shows that neither DPR regulations nor EPA labeling requirements adequately prevent acute or chronic health impacts."

Comment: The memorandum from Anne Katten to Brent Newell and Susan Kegley, dated June 6, 2007, states that for methyl bromide "OEHHA has recommended that regulations should be designed to reduce sub-chronic exposure of the general public and adjust workers below 1 ppb and 2 ppb respectively to prevent neurobehavioral effects, while DPR's current regulations are only designed to control exposures to 9 ppb for the general public and 16 ppb for fumigation workers."

Response: These comments are addressed in the section of this Environmental Analysis entitled "Potential Toxic Impacts."

Comment in Section III.A.2, page 9: "Substantial evidence demonstrates that fumigants cause acute chronic impacts to human health and to threatened and endangered species." "These fumigants also may inflict substantial harm on the California red-legged frog, which is found in Ventura County and listed endangered under the federal Endangered Species Act."

Response: Pesticide use restrictions implemented under a court injunction and order specifically address red-legged frog populations. On October 20, 2006, the U.S. District Court for the Northern District of California imposed no-use buffer zones around California red–legged frog upland and aquatic habitats for certain pesticides. This injunction and order will remain in effect for 66 pesticides (including the fumigants 1,3-dichloropropene and metam-sodium) until the U.S. Environmental Protection Agency goes through formal consultation with the Fish and Wildlife Service on each of the 66 pesticides, and the Fish and Wildlife

Service issues a Biological Opinion including a "not likely to adversely affect" statement for the pesticides. Under the injunction and order, no-use buffer zones of 60 feet for ground applications and 200 feet for aerial applications apply from the edge of California red-legged frog habitats, including habitats in Ventura County.

Specifically for Ventura County, California Red-legged frogs occur in three Critical Habitat units: Ventura 1 – Matilija Creek, Ventura 2 – San Antonio Creek, and Ventura 3 – Piru Creek as designated by the U.S. Fish & Wildlife Service in 2006. Additional habitat is found within one Non-critical Habitat Section near the southeast corner of the county. During 2001 – 2005, there was no reported use of 1,3-dichloropropene, chloropicrin, metam-sodium, or methyl bromide within a one mile of any of the habitats, well outside the 60-foot or 200-ft buffers required under the court order. DPR's evaluation, in consultation with California Department of Fish and Game, indicates that non-target wildlife exposure to these fumigants in Ventura.

References

DPR. 1997. Risk Assessment of 1,3-Dichloropropene, January 10, 1997. California Department of Pesticide Regulation.

DPR. 2002. California Management Plan: 1,3-Dichloropropene, January 30, 2002. California Department of Pesticide Regulation.

DPR. 2007. Mitigation Proposal, Control of Off-Site and Bystander Short-Term Exposure to Methyl Isothiocyanate (MITC) from Metam-Sodium and Metam-Potassium Applications, January 5, 2007. California Department of Pesticide Regulation.

Roush, T.L. 2006. 2006 Update to the Pesticide VOC Emission Inventory: Estimated Emissions 1990-2004. Memorandum to John Sanders, October 24, 2006. California Department of Pesticide Regulation.

Rubin, A.L. 2002. Evaluation of Methyl Isothiocyanate as a Toxic Air Contaminant, Part C – Human Health Assessment, August 2002. California Department of Pesticide Regulation.

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