

California Environmental Protection Agency



Air Resources Board

**INITIAL STATEMENT OF REASONS
FOR
PROPOSED AMENDMENTS TO THE CALIFORNIA
CONSUMER PRODUCTS REGULATION**

**Release Date:
September 10, 1999**

**State of California
AIR RESOURCES BOARD**

**INITIAL STATEMENT OF REASONS
FOR PROPOSED RULEMAKING**

Public Hearing to Consider

**PROPOSED AMENDMENTS TO THE
CALIFORNIA CONSUMER PRODUCTS REGULATION**

To be considered by the Air Resources Board on October 28, 1999, at:

Air Resources Board
Board Hearing Room, Lower Level
2020 L Street
Sacramento, California

Air Resources Board
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**State of California
AIR RESOURCES BOARD**

**PROPOSED AMENDMENTS TO THE
CALIFORNIA CONSUMER PRODUCTS REGULATION**

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September 1999

**Initial Statement of Reasons for Proposed Amendments
to the
California Consumer Products Regulation**

**Introduction and Executive Summary
and
Technical Support Document**

Air Resources Board
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**Initial Statement of Reasons for Proposed Amendments to the
California Consumer Products Regulation**

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**State of California
AIR RESOURCES BOARD**

**Initial Statement of Reasons
for Proposed Amendments to the
California Consumer Products Regulation**

**Volume I:
Introduction and Executive Summary**

I.

INTRODUCTION

This report presents the Air Resources Board (ARB/Board) staff's proposed "Mid-term Measures II" amendments to the California regulation for reducing volatile organic compound (VOC) emissions from consumer products (the "consumer products regulation"). The proposed amendments are designed to meet the ARB's statutory requirement to achieve the maximum feasible reductions from consumer products. The proposed amendments, along with other ARB regulations under development, are also designed to fulfill the requirements of a lawsuit settlement agreement with environmental groups regarding ARB's progress under the State Implementation Plan (SIP).

This report represents the Initial Statement of Reasons for Proposed Rulemaking required by the California Administrative Procedure Act and is comprised of two volumes. Volume I, "Introduction and Executive Summary," provides a short overview of the ARB's consumer products program, the consumer products element of the SIP, the SIP lawsuit settlement agreement, and the proposed "Mid-term Measures II" amendments. For simplicity, this summary is presented in question-and-answer format, including commonly asked questions about this regulatory effort. Volume II, the Technical Support Document, is a more detailed presentation of the technical basis for the proposed amendments.

A. HISTORY AND BACKGROUND

In 1988, the Legislature enacted the California Clean Air Act (CCAA or "the Act"), which declared that attainment of the California state ambient air quality standards is necessary to promote and protect public health, particularly of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practicable date.

The CCAA added section 41712 to the California Health and Safety Code (HSC), which requires the ARB to adopt regulations to achieve the maximum feasible reduction in reactive organic compounds (ROCs) emitted by consumer products (note: ROC is equivalent to VOC). As part of the regulatory adoption process, the ARB must determine that adequate data exist for it to adopt the regulations. The ARB must also find that the regulations are necessary, technologically and commercially feasible, and do not eliminate a product form. In enacting section 41712, the Legislature gave the ARB clear new authority to control emissions from consumer products, an area that had previously been subject to very few air pollution control regulations.

To date, the Board has adopted the following five regulatory actions to fulfill the requirements of the California Clean Air Act as it pertains to consumer products:

- Antiperspirant and Deodorant Regulation (1989)
- “Phase I” Consumer Products Regulation (1990)
- “Phase II” amendments to the Consumer Products Regulation (1992)
- Aerosol Coatings Regulation (1995, 1998)
- “Phase III” (Mid-term Measures) amendments to the Consumer Products Regulation (1997)

The first regulation was approved in November 1989, and required a reduction in VOC emissions from antiperspirants and deodorants (the “Antiperspirant and Deodorant Regulation”). The second regulation, the “Phase I Consumer Products Regulation,” was approved in October 1990, and required a reduction in VOC emissions from 16 different consumer product categories. In January 1992, the Board approved “Phase II” amendments to the consumer products regulation which required emission reductions from ten additional consumer product categories. To provide greater flexibility to the regulated industry, the ARB approved the Alternative Control Plan regulation in September 1994. This regulation provides manufacturers with an alternative means of complying with the regulations by allowing “emissions averaging” of products above and below the applicable VOC limits. In March 1995, the Board adopted the aerosol coatings regulation, which required emissions reductions from 35 categories of aerosol paints and related coating products. In November 1998, the Board adopted revisions to many of the future effective VOC limits in the aerosol coatings regulation after a review of their technological and commercial feasibility. Finally, in July 1997, the Board approved the “Phase III” amendments to the consumer products regulation. These amendments added 18 additional categories to the consumer products regulation and were designed to partially fulfill the “Mid-term Measures” commitments under the SIP as discussed below.

B. CALIFORNIA’S SIP AND CONSUMER PRODUCTS

On November 15, 1994, the ARB adopted the SIP for ozone. The 1994 SIP serves as California's overall long-term plan for attainment of the federal 1-hour ozone standard. Together with significant reductions from stationary industrial facilities, mobile sources (e.g. cars, trains, boats), and other area sources (e.g. architectural and industrial maintenance coatings), the reductions in the consumer products element of the SIP are an essential part of California’s effort to attain the air quality standards for ozone. The VOC reductions from consumer products are also needed to help several local air pollution control districts meet rate-of-progress requirements in the federal Clean Air Act (CAA). California also relies on strategies in the 1994 SIP to make progress toward attaining federal standards for particulate matter and state ambient air quality standards.

The consumer products component of the SIP is a multi-faceted program comprised of “near-term,” “mid-term,” and “long-term” control measures. The near-term SIP measures consist of the Phase I consumer products regulation, the Phase II amendments to the consumer products regulation, and the aerosol coatings regulation. The mid-term measures currently consist of the “Phase III” amendments to the consumer products regulation. The Phase III amendments to the consumer products regulation partially fulfill the Mid-term Measures SIP commitment. As explained in the next section, the proposed “Mid-term Measures II” amendments are designed to fulfill the consumer products component of a lawsuit settlement regarding the ARB’s progress under the SIP. The long-term measures have not yet been developed and will rely on new technologies with components of market incentives and consumer education.

In the SIP, the ARB has committed to an overall 85 percent reduction in consumer product emissions by the year 2010 (including the adopted regulations). The reduction is necessary for the South Coast Air Basin (SCAB), among others, to attain the federal ozone standard and meet the rate-of-progress requirements under the CAA. Under the SIP, the various control measures will contribute the following emission reductions:

Consumer Products SIP Commitments	
SIP Measures	Emission Reduction
Near-term	30%
Mid-term	25%
Long-term	30%
All Measures	85%

C. SIP LAWSUIT SETTLEMENT AGREEMENT

On September 18, 1997, three environmental groups (Communities for a Better Environment, the Coalition for Clean Air, and the Natural Resources Defense Council) filed a complaint in the United States District Court for the Central District of California. The lawsuit was filed against the ARB, the South Coast Air Quality Management District (SCAQMD), and the United States Environmental Protection Agency related to California’s progress in achieving the 1994 SIP commitments. A supplemental complaint was filed on October 5, 1998, that addressed the ARB’s progress toward achieving the consumer products commitments in the SIP. The ARB reached a settlement agreement with these groups on January 28, 1999. Under the agreement, the ARB committed to achieve 42 tons per day (tpd) of reactive organic gas (ROG) reductions and 2 tpd of oxides of nitrogen (NO_x) reductions (in the SCAB in 2010), with 12 tpd of ROG reductions from control measures adopted by December 31, 1999. The ARB staff also committed to submit to the Board and propose for adoption a number of measures, including a consumer products measure that would be submitted to the Board no later than the first or second quarter of 2000 and would be implemented from 2002-2004. The emission reductions

estimated for this measure in the agreement are five to twelve tpd in the South Coast Air Basin in 2010. The proposed "Mid-term Measures II" amendments are designed to fulfill the commitment to propose a consumer products measure for adoption, and to partially fulfill the 42 tpd of ROG reductions commitment in the lawsuit settlement agreement.

D. PROPOSED MID-TERM MEASURES II AMENDMENTS

The proposed amendments to the consumer products regulation would add product category definitions and VOC limits for two new product categories, and revise the existing VOC limits for 15 consumer product categories to make them more stringent. Additional subcategories are proposed for some of the existing product categories with separate VOC limits for each subcategory. The new or modified VOC limits would become effective on one of the three following dates, depending on the product category: December 31, 2002, December 31, 2003, or December 31, 2004. In addition, various modifications are proposed to the existing definitions for certain product categories. The proposed amendments would also consolidate and expand the existing reporting requirements for products containing methylene chloride or perchloroethylene. These reporting requirements will allow the ARB to track the use of these compounds, which are classified as toxic air contaminants, and take appropriate action to protect public health if manufacturers increase the use of these compounds.

The proposed regulatory action will achieve VOC emission reductions of approximately 21 tons per day in California by the end of 2005, with full implementation of all proposed standards. This emission reduction equates to a 9 ton per day reduction in the South Coast Air Basin in 2010 (based on "1994 SIP currency" as explained in Chapter IV of the Technical Support Document). This proposal therefore partially satisfies the ARB's obligation under the SIP lawsuit settlement agreement for emission reductions from measures adopted in 1999.

In addition to the proposed Mid-term Measures II amendments, ARB staff is investigating options for an airborne toxic control measure (ATCM) for automotive consumer products containing chlorinated compounds, including perchloroethylene and methylene chloride. The ATCM may cover some of the automotive product categories impacted by the proposed Mid-term Measures II amendments. We are working closely with the affected industry representatives to ensure a smooth integration of the two regulations. The ATCM is currently scheduled to be considered by the Board in the Spring of 2000.

II.

EXECUTIVE SUMMARY

A. INTRODUCTION

In this executive summary, we provide a discussion of the staff's proposed "Mid-term Measures II" amendments to the consumer products regulation and explain the rationale for the proposed changes. A more detailed discussion in Chapter V of the Technical Support Document is intended to satisfy the requirements of Government Code section 11346.2(a)(1), which requires that a noncontrolling "plain English" summary of the regulation be made available to the public.

B. SUMMARY OF PROPOSED AMENDMENTS

What product categories are covered under the proposed amendments?

The proposed amendments will affect 17 consumer product categories. As shown in Table 1 below, these include two new categories, for which new product category definitions and VOC limits are proposed, and 15 previously regulated categories for which more stringent limits are proposed. Also, note that the three product categories with asterisks in Table 1 have been expanded to include some additional types of products.

Table 1
Product Categories Covered by Mid-term Measures II Amendments

New Categories	
Sealant and Caulking Compound	Tire Sealants and Inflators
Previously Regulated Categories	
Air Fresheners (double-phase aerosol)	Automotive Brake Cleaners
Automotive Windshield Washer Fluids (non-type "A" areas: dilutable and pre-mixed)	Carburetor or Fuel-Injection Air Intake Cleaner*
Construction, Panel, and Floor Covering Adhesive*	Crawling Bug Insecticide (aerosol)
Engine Degreasers	Flying Bug Insecticides (aerosol)
Furniture Maintenance Products (aerosol)	General Purpose Cleaners (non-aerosol)

**Table 1 (continued)
Previously Regulated Categories**

General Purpose Degreasers* (non-aerosol)	Glass Cleaners (non-aerosol)
Hair Mousses	Lawn and Garden Insecticides (non-aerosol)
Nail Polish Removers	
* These product categories have been modified to include additional types of products.	

How do the proposed VOC limits compare to the current VOC limits?

The proposed VOC limits and effective dates are shown in Table 2. As shown in the table, many of the proposed VOC limits are significantly lower than the current VOC limits, reflecting the use of new exempt compounds and technologies that have become available since the earlier limits were adopted. Also note that for four categories (general purpose cleaners, general purpose degreasers, glass cleaners, and engine degreasers), the existing limits were bifurcated into two separate limits.

**Table 2
Proposed VOC Limits**

Product Category	Product Form	Current VOC Limit (wt%)	Proposed VOC Limit (wt%)	Effective Date
Automotive Brake Cleaners	All forms	50	45	12/31/02
Automotive Windshield Washer Fluids all non-type "A" areas	All forms	10	1	12/31/02
Air Fresheners (double-phase aerosol)	Aerosol	30	20	12/31/04
Carburetor or Fuel-injection Air Intake Cleaners	All forms	75	45	12/31/02
Construction, Panel, and Floor Covering Adhesives	All forms	40	15	12/31/02
Crawling Bug Insecticides	Aerosol	20	15	12/31/04

**Table 2 (continued)
Proposed VOC Limits**

Product Category	Product Form	Current VOC Limit (wt%)	Proposed VOC Limit (wt%)	Effective Date
Engine Degreasers	Aerosol	50	35	12/31/04
	Non-aerosol	50	5	12/31/04
Flying Bug Insecticides	Aerosol	35	25	12/31/03
Furniture Maintenance Products	Aerosol	25	17	12/31/04
General Purpose Cleaners (non-aerosol)	Dilutable	10	1	12/31/04
	Ready-to-use	10	3	12/31/04
General Purpose Degreasers (non-aerosol)	Dilutable	10	1	12/31/04
	Ready-to-use	10	3	12/31/04
Glass Cleaners (non-aerosol)	Dilutable	6	1	12/31/04
	Ready-to-use	6	4	12/31/04
Hair Mousses	All forms	16	6	12/31/02
Lawn & Garden Insecticides	Non-aerosol	20	3	12/31/03
Nail Polish Removers	All forms	75	0	12/31/04
Sealant and Caulking Compounds	All forms	None	4	12/31/02
Tire Sealants & Inflators	All forms	None	20	12/31/02

What other amendments to the consumer products regulation are being proposed?

We are proposing to: (1) consolidate and expand the reporting requirements for perchloroethylene and methylene chloride; (2) delete outdated reporting requirements for hairsprays; (3) modify the Table of Standards to improve its clarity; and (4) modify certain definitions in the regulation.

Regarding the reporting requirements, the proposed amendments would consolidate the two existing reporting requirements for perchloroethylene and methylene chloride under sections 94513(e), and 94513(g). The existing reporting requirements under section 94513(e) apply to products regulated in the “Phase I and II” rulemakings, and only apply to perchloroethylene. The existing reporting requirements under section 94513(g) apply to products regulated in the “Phase III” rulemaking and apply to both perchloroethylene and methylene chloride. The new reporting requirements would apply to all consumer products subject to the regulation that contain either perchloroethylene or methylene chloride. Under the proposed reporting requirements, manufacturers would be required to report their annual sales of products containing perchloroethylene or methylene chloride in California, and the percentage of perchloroethylene or methylene chloride in each product. This information will allow ARB to track the use of these compounds, which are identified by regulation as Toxic Air Contaminants in California, and take appropriate action to protect public health if there is an increase in their use.

We are proposing to delete the outdated reporting requirements for hairsprays under section 94513(f). Under this provision, hairspray manufacturers were required to submit compliance plans and other information that would allow ARB staff to track the progress of manufacturers in developing hairsprays to meet the 55 percent VOC limit by June 1, 1999. The new 55 percent VOC limit for hairsprays is now in effect and the compliance dates for the reporting requirements have passed.

To improve the clarity of the Table of Standards, which specifies the VOC limits for the consumer product categories, we are proposing to alphabetize the product categories rather than leave them grouped into the “Phase I, II, and III” rulemakings. This will make it easier for manufacturers or other interested parties to find the product categories and VOC limits of interest to them. We are also proposing to add several footnotes to the Table of Standards that will direct the reader to exemptions or other provisions that apply to specific product categories.

Finally, modifications to several definitions are proposed. As mentioned under the response to the previous question, we have expanded some of the product category definitions to include additional products. We are proposing to define dilutable automotive windshield washer fluids as those products packaged in one quart or smaller containers. We are also proposing to modify the fabric protectant definition to make it more enforceable. Finally, we are proposing to modify the definition of “existing product” to replace the terms “Phase I,” “Phase II,” and “Phase III” with the appropriate dates for each of these rulemaking efforts. This is necessary because we are proposing to remove the “Phase I, II and III” terminology from the Table of Standards.

Why are we proposing the Mid-term Measures II amendments?

We are proposing the Mid-term Measures II amendments to help us meet our SIP commitments and fulfill the conditions of a SIP lawsuit settlement agreement. Specifically, on September 18, 1997, three environmental groups (Communities for a Better Environment, the Coalition for Clean Air, and the Natural Resources Defense Council) filed a complaint with a

United States District Court against the ARB, the South Coast Air Quality Management District (SCAQMD), and the United States Environmental Protection Agency related to California's progress in achieving the 1994 SIP commitments. A supplemental complaint was filed on October 5, 1998, that related to the ARB's progress in achieving the Mid-term Measures commitment in the SIP. However, the ARB reached a settlement agreement with these groups. Under the agreement, the ARB committed to adopt measures in 1999 that would achieve 12 tpd of ROG reductions in the South Coast Air Basin (SCAB) in 2010 toward an ultimate reduction commitment of 42 tpd ROG and 2 tpd NO_x. In the agreement, the ARB estimated that a consumer product regulation could achieve a five to 12 tpd reduction in ROG emissions in the SCAB in 2010 based on the assumptions in the 1994 SIP inventory ("1994 SIP currency"). The proposed regulatory action (referred to as "Mid-term Measures II") is designed to partially fulfill the ARB's commitment for ROG reductions in the lawsuit settlement agreement. Specifically, it will achieve a nine ton per day emission reduction in the SCAB in 2010 in "1994 SIP currency" (as explained in Chapter IV of the "Technical Support Document").

Who would be affected by these proposed amendments?

The proposed Mid-term Measures II amendments would apply to anyone who sells, supplies, offers for sale, or manufactures consumer products subject to the proposed amendments for use in California. The primary impact would be on manufacturers and marketers of consumer products, which will have to reformulate some of their products. There may also be an impact on distributors and retailers, who must ensure that they are selling or supplying complying products. In addition, since some products will have to be reformulated, suppliers of chemicals, propellants, containers, valves, and other components may be impacted, depending on whether there is an increased or decreased demand for their products. Finally, consumers may have to pay more for some consumer products, or may have to make some adjustments to their use of the reformulated products.

Will the provisions in the existing consumer products regulation apply to the Mid-term Measures II categories?

Yes, the existing provisions in the consumer products regulation (such as the low vapor pressure VOC exemption, innovative products provision, and variance provision) will apply to the Mid-term Measures II categories.

Will the Alternative Control Plan (ACP) be available to the Mid-term Measures II product categories?

Yes, the ACP will allow manufacturers to submit plans to "average" the emissions from any combination of consumer products subject to the VOC limits in section 94509 of the consumer products regulation, including the proposed new Mid-term Measures II categories.

However, manufacturers cannot submit plans which include consumer products subject to section 94509 and aerosol coating products (aerosol paints).

C. REGULATORY DEVELOPMENT PROCESS AND EVALUATION OF ALTERNATIVES

How did ARB staff develop the Mid-term Measures II?

The Mid-term Measures II amendments were developed in cooperation with the consumer products industry and other interested parties. ARB began this process with a comprehensive survey of the consumer products industry, the “1997 Consumer and Commercial Products Survey.” This survey collected sales and formulation information on about 100 different consumer product categories and provided ARB staff with technical information that was used to develop the proposed amendments. In addition, four public workshops were conducted from March 1999 through July 1999. During the first workshop, we discussed the results of the “1997 Consumer and Commercial Products Survey,” and discussed an initial prioritization of consumer product categories for regulation development. At the next three workshops, staff discussed various regulatory proposals. A chronology of the meetings held is shown in Table 3 below.

**Table 3
Chronology of Mid-term Measures II Public Meetings**

Date	Meeting	Location
March 18, 1999	1 st Public Workshop	El Monte, CA
April 14, 1999	Consumer Products Working Group Meeting and 2 nd Public Workshop	Sacramento, CA
May 18, 1999	3 rd Public Workshop and Industry Presentations	Sacramento, CA
July 13, 1999	4 th Public Workshop	Sacramento, CA

To solicit additional information and comments, staff held numerous individual meetings, teleconferences, and video conferences with industry representatives. At the request of several industry associations, we also arranged a meeting on June 16, 1999, where industry representatives presented technical information related to reformulating aerosol products for consideration in the rulemaking process. Staff also analyzed survey data, performed shelf surveys, and researched technical literature, patents, and trade journals during the development of the proposed amendments.

Who has been most active in the process?

Consumer product manufacturers and marketers, and their trade associations, have been the most active in the process. The trade associations include the following:

- Chemical Specialties Manufacturers Association (CSMA)
- Cosmetic, Toiletry, and Fragrance Association (CTFA)
- National Paint and Coatings Association (NPCA)
- Adhesives and Sealants Council (ASC)
- Plastic Pipes and Fittings Association (PPFA)
- Automotive Chemical Manufacturers Council (ACMC)
- Automotive Parts and Accessories Association (APPA)

ARB staff maintains a mailing list of nearly 3,000 companies and interested parties, which received information throughout the development of the Mid-term Measures II proposal.

How did ARB staff evaluate alternatives and choose the product categories proposed for regulation?

ARB staff began the selection process by reviewing all the consumer product categories included in the ARB's 1997 Consumer and Commercial Products Survey, including both unregulated categories and previously regulated categories. ARB then eliminated from consideration: (1) categories with less than 0.5 tons per day of VOC emissions; (2) categories recently regulated under the Mid-term Measures (with the exception of non-aerosol general purpose degreasers) or Aerosol Coatings Regulation; (3) 100 percent solvent categories such as paint thinners that are candidates for a reactivity-based approach; (4) certain health benefit products requiring consideration of recommendations from health experts prior to regulation; (5) categories subject to requirements of the local air pollution control districts or other jurisdictions; and (6) categories not amenable to regulation due to miscellaneous technical issues. The remaining 35 categories (including 9 unregulated categories and 26 regulated categories), were proposed for regulation at the first public workshop.

At each of the next three workshops, ARB staff presented regulatory proposals for discussion. These proposals represented alternative regulations that were considered by the industry. After each workshop, ARB staff modified the proposals based on the comments received during the workshop and technical information received from industry and staff investigations. During this process, several of the original 35 categories were dropped from consideration because of technical barriers to reformulation or lack of potential for emission reductions. As mentioned previously, the current proposal would affect 17 product categories, including two unregulated categories, and 15 previously regulated categories.

How were the proposed VOC limits in the Mid-term Measures II established?

The proposed VOC limits are the product of extensive interaction with the affected consumer products industry, as discussed in the response to a previous question. Although the proposed limits were based on factors unique to each individual category, the following general guiding principles were applied:

- technological and commercial feasibility - assuring that reformulation technologies will be available by the effective date for each proposed limit and that the basic consumer market demand can be met on that date.
- emission reductions achieved - assuring that our overall proposal will achieve the maximum feasible reduction as required by state law.
- preservation of product forms - assuring that each existing product form (e.g. liquid, semi-solid, solid, aerosol) is able to reformulate to meet the proposed VOC limit.
- minimize potential for use of Toxic Air Contaminants - assuring that the proposed limit can be met with formulations which do not rely on the increased use of Toxic Air Contaminants such as perchloroethylene or methylene chloride.

D. COMPLIANCE WITH THE MID-TERM MEASURES II PROPOSAL

How will manufacturers comply with the Mid-term Measures II proposal?

Manufacturers of noncomplying products will need to reformulate their products to meet the applicable VOC limits. Manufacturers have the flexibility to choose any formulation that meets the applicable VOC limits, and the reformulation options vary with each product category (see Chapter VI of the Technical Support Document). In general, VOC solvents or propellants will need to be replaced, or partially replaced, with non-VOC ingredients. This may require switching to a water-based formulation, a solvent-based formulation using acetone or another exempt solvent, a higher solids formulation, or a formulation with a non-VOC propellant. Manufacturers may also need to change the valve, container, or the other components of the consumer product depending on the individual formulation. ARB staff has proposed VOC limits that can be met without the increased use of Toxic Air Contaminants such as perchloroethylene or methylene chloride.

Are there alternative compliance options to the proposed VOC limits?

Yes, manufacturers can comply with the proposed amendments through the use of the Innovative Products Provision (IPP), or the Alternative Control Plan (ACP). The IPP allows manufacturers of “innovative products” to comply with the consumer products regulation if they demonstrate through clear and convincing evidence that their product will result in less VOC emissions per use than a complying product that meets the applicable VOC limit. The innovative

product may result in less emissions due to some characteristic of the product formulation, design, delivery system, or other factors.

The ACP allows manufacturers to average the emissions from products above and below the applicable VOC limits, as long as the overall emissions are less than or equal to the emissions that would have occurred had all the products complied with the VOC limits. Manufacturers must submit an application which includes the VOC content of the products in the plan, a method of verifying the sales of each product in the plan, and other information necessary to track overall emissions.

Are the VOC limits proposed in Mid-term Measures II technologically and commercially feasible?

As explained in detail in Chapters III and VI of the Technical Support Document, all the VOC limits proposed in Mid-term Measures II are technologically and commercially feasible. The Mid-term Measures II limits were targeted towards the lowest VOC content technology within a product category which would adequately perform the intended function. In doing this, we ensured that the various product forms within each category would be preserved, and the proposed limits could be met without the use of Toxic Air Contaminants. ARB staff will track manufacturers' progress in meeting the proposed VOC limits, as we have done in past regulatory efforts for consumer products. If manufacturers encounter insurmountable difficulties, we will consider proposing amendments to the consumer products regulation to address them.

As shown in Table 4 below, our survey results demonstrate that products are available that comply with the proposed limits for all of the product categories, except double-phase aerosol air fresheners. In the case of double-phase aerosol air fresheners, technology is currently available that can be used to reformulate products in this category, as explained in Chapter VI of the Technical Support Document. The complying market shares listed in Table 4 vary widely with each category (as in previous regulations) because the proposed limits were developed after considering a variety of factors unique to each category. These factors include the availability of reformulation options that may not be used in current products, the variety of product types in a given category, patents that may restrict some reformulation options, and economic issues. Also note that we are providing until December 31, 2004, for those product categories with the greatest reformulation challenges (see Table 2 of this Executive Summary).

**Table 4
Summary of Complying Products**

Product Category	Product Form	Proposed VOC Limit (wt%)	Number of Complying Products/ Total	Complying Market Share (%)
Automotive Brake Cleaners	All	45	51/119	40
Automotive Windshield Washer Fluids	All	1*	30/55	50
Air Fresheners (double-phase aerosol)	Aerosol	20	0/19	0
Carburetor or Fuel-injection Air Intake Cleaners	All	45	7/73	8
Construction, Panel, and Floor Covering Adhesives	All	15	29/74	17
Crawling Bug Insecticides	Aerosol	15	13/62	15
Engine Degreasers	Aerosol	35	14/48	46
	Non-aerosol	5	11/22	96
Flying Bug Insecticides	Aerosol	25	7/43	13
Furniture Maintenance Products	Aerosol	17	19/52	13
General Purpose Cleaners (non-aerosol)	Dilutable	1	329/384	99.9
	Ready-to-use	3	121/182	61
General Purpose Degreasers (non-aerosol)	Dilutable	1	132/199	83
	Ready-to-use	3	35/95	28
Glass Cleaners (non-aerosol)	Dilutable	1	22/73	31
	Ready-to-use	4	29/107	13

Table 4 (continued)
Summary of Complying Products

Product Category	Product Form	Proposed VOC Limit (wt%)	Number of Complying Products/ Total	Complying Market Share (%)
Hair Mousses	All forms	6	39/137	27
Lawn & Garden Insecticides	Non-aerosol	3	139/157	99
Nail Polish Removers	All forms	0	19/54	30
Sealant and Caulking Compounds	All forms	4	259/361	69
Tire Sealants & Inflators	All forms	20	4/13	50

* The VOC limit for automotive windshield washer fluids in the mountainous "Type A" areas remains at 35% by wt.

What are the emission reduction benefits from the Mid-term Measures II proposal?

The statewide emissions reductions from full implementation of the 21 proposed Mid-term Measures II limits is estimated to be about 21 tons per day in California in 1997. Table 5 summarizes the emissions and emission reductions from the Mid-term Measures II proposal. These categories currently contribute approximately 20 percent of the total consumer product emissions.

Table 5
VOC Emissions and Reductions by Product Category

Product Category	VOC Emissions Adjusted* (Tons/Day)	VOC Emission Reductions (Tons/Day)	2010 Emission Reductions in South Coast (Tons/Day)
Construction, Panel and Floor Covering Adhesives	0.96	0.44	0.23
Sealant and Caulking Compounds	1.87	0.79	0.42
Automotive Brake Cleaners (Non-aerosols)	0.34	0.02	0.01
Automotive Brake Cleaners (Aerosols)	5.26	0.29	0.15
Carburetor or Fuel-Injection Air Intake Cleaners (Non-aerosols)	0.23	0.05	0.03
Carburetor or Fuel-Injection Air Intake Cleaners (Aerosols)	6.25	2.14	1.13

Table 5 (continued)
VOC Emissions and Reductions by Product Category

Product Category	VOC Emissions Adjusted* (Tons/Day)	VOC Emission Reductions (Tons/Day)	2010 Emission Reductions in South Coast (Tons/Day)
Engine Degreasers (Aerosols)	1.67	0.37	0.20
Engine Degreasers (Non-aerosols)	0.08	0.05	0.03
Tire Sealants and Inflators	0.89	0.32	0.17
Auto Windshield Washer Fluids	8.30	7.42	3.94
Flying Bug Insecticide (Aerosols)	0.60	0.11	0.06
Lawn and Garden Insecticides (Non-aerosols)	1.35	0.35	0.19
Crawling Bug Insecticides (Aerosols)	3.81	0.49	0.26
General Purpose Cleaners (Non-aerosols) - Ready-to-Use	3.18	1.05	0.56
General Purpose Cleaners - (Non-aerosols) - Dilutables	4.77	0.41	0.22
General Purpose Degreasers (Aerosols) - (reductions from solvent parts cleaners)	0.73	0.36	0.19
General Purpose Degreasers - (Non-aerosols) - Ready-to-Use	0.95	0.15	0.08
General Purpose Degreasers - (Non-aerosols) - Dilutables	1.09	0.41	0.22
Glass Cleaners - (Non-aerosols) - Ready-to-Use	2.27	0.36	0.19
Glass Cleaners - (Non-aerosols) - Dilutables	1.21	0.82	0.43
Furniture Maintenance Products (Aerosols)	1.98	0.35	0.19
Dual Phase Aerosol Air Fresheners	4.57	1.54	0.82
Hair Mousses	0.76	0.33	0.18
Nail Polish Removers	0.85	0.85	0.45
Total	54	20.1	10.67
Acetone Credit in Nail Polish Remover		1.5	0.8
Total Combined Reduction		21.0	11.13**

* Survey emissions adjusted for complete market coverage as discussed in Chapter IV.

** 9.0 tpd in 1994 SIP currency as discussed in Chapter IV.

E. ECONOMIC IMPACTS

What are the expected economic impacts of the proposed regulation on businesses?

In our economic impacts analysis, we evaluated the proposed VOC limits for potential impacts on profitability and other aspects of businesses subject to the limits (with particular attention to California businesses), the cost-effectiveness of the limits, and the estimated cost impacts to consumers. To conduct our analysis, we relied on a combination of publicly available financial databases (*Dun and Bradstreet*, *Ward's Business Directory of U.S. Manufacturing Industries*), the ARB's 1997 Consumer and Commercial Products Survey, industry journals/literature such as the *Chemical Market Reporter*, discussions with industry representatives, and the cost analyses conducted for the existing ARB consumer products program.

Based on our analysis, we expect most manufacturers to be able to absorb the added costs of the proposed regulation without an adverse impact on their profitability. In addition, as explained in more detail in the responses to the following questions, we found that the proposed amendments are cost-effective relative to similar ARB regulations or measures, and the impacts to consumers are consistent with existing ARB regulations.

We estimated the change in "return-on-owners equity" (ROE) as an indicator of the limits' potential impacts on business profitability. The cost to comply with the proposed regulation, through increased research and development, equipment purchase and other investment costs, is presumed to impact a business' ROE and therefore its profitability. The cost to reformulate noncomplying products for a typical company was used to determine total annual reformulation costs. Our analysis indicates the estimated change in ROE can vary from essentially no change to 4 percent change. The average change in ROE is about 1.4 percent, relative to the ROE before the proposed amendments would take effect. This estimated change in ROE is well within the change in ROE estimated for ARB's existing consumer products and motor vehicle programs.

Our ROE analysis for the proposed limits may overestimate the impact on business because it assumes that all of the costs of the proposed limits will be absorbed by manufacturers. In reality, we expect that at least some of the investment costs to comply with the proposed limits will be passed on to consumers. The analysis also does not quantify the extent of cost mitigation due to "technology-transfer" between product lines and from third-party manufacturers (i.e., contract fillers) who fill essentially equivalent products for a number of competing businesses.

While we expect that most businesses will be able to absorb the costs of the proposed regulation without significant adverse impacts on their profitability, there is the possibility that some individual businesses will be adversely affected by this regulatory action. Therefore, it is possible that the proposed amendments may have a significant adverse impact on some

businesses that are not in a market position to invest monies to develop new low VOC products, or to absorb the increased cost resulting from their compliance with the proposed regulation.

Based on our analysis, we do not expect the proposed amendments to have a significant impact on employment, or business creation, elimination, or expansion. We also do not expect the regulation to have a significant impact on the competitiveness of California businesses compared with those outside of California. This is because all companies that sell these products in California would have to meet the proposed requirements, whether located in California or outside of California.

The VOC limits in the proposed amendments will primarily impact consumer product manufacturers and marketers (companies which contract out the manufacturing of their products). However, we recognize that other industries could also be impacted to a lesser amount which is difficult to quantify. These industries include distributors, retailers, and “upstream” suppliers who supply containers, valves, solvents, propellants, and other chemicals used in consumer products.

Distributors and retailers could be impacted if some manufacturers decide to carry a dual inventory of products (one for California and one for the rest of the nation). However, most manufacturers have indicated that they will not manufacture California and 49-state products because dual-distribution systems are expensive to establish and maintain. Another potential cost to distributors or retailers would be the implementation of procedures to ensure that noncomplying products are not sold past the three year “sell-through period.” However, based on retail sell-through data obtained during the development of ARB’s existing consumer products regulations, we believe the existing three year sell-through period should provide ample time to allow for the sale of noncomplying products.

Upstream suppliers could be impacted because manufacturers will be purchasing some different solvents, propellants, and other materials for their reformulated products. They may also purchase different containers, valves, or other components for their reformulated products. However, we do not expect these changes to result in a major impact on the affected industries because chemical companies generally supply many different industries, and because many of the upstream suppliers also provide the alternative products which will be used in the reformulated products. In fact, we expect some upstream suppliers will benefit since the proposed limits are likely to create new or increased demand for materials to be used in compliant formulations.

Will the proposed amendments be cost-effective?

Cost-effectiveness is one measure of a regulation’s efficiency in reducing a given amount of pollutant (often reported in “dollars (to be) spent per pound of VOC reduced”). The determination of cost-effectiveness is well-established and often used to compare a proposed regulation’s cost-efficiency with those of other regulations. We estimated a cost-effectiveness range for each of the 17 proposed categories (21 VOC limits including subcategories). To conduct our analysis, we relied on specific formulation data from the “1997 Consumer and

Commercial Products Survey,” industry journals/literature such as the Chemical Market Reporter for ingredient unit prices, discussions with industry representatives, and the cost analyses conducted for the existing ARB consumer products program. Based on our analyses, we estimate that the cost-effectiveness of the individual VOC limits ranges from essentially no cost to about \$6.30 per pound of VOC reduced. We estimate the average cost-effectiveness weighted by emissions reductions across all the proposed limits to be about \$0.40 per pound of VOC reduced. These estimated cost-effectiveness values are consistent with existing ARB regulations and control measures.

Will consumers have to pay more for consumer products subject to the Mid-term Measures II amendments?

Consumers may have to pay more for some products subject to the Mid-term Measures II amendments, depending on the extent to which manufacturers are able to pass along their costs to consumers. As explained in Chapter VIII of the Technical Support Document, assuming that all the costs of the proposed Mid-term Measures II amendments are passed along to consumers, the change in cost per unit would range from no cost to a cost increase of \$0.30, depending on the product category. The average cost increase per unit, is estimated to be about \$0.02 per unit.

F. ENVIRONMENTAL IMPACTS

What are the expected environmental benefits of the Mid-term Measures II amendments?

The primary environmental benefit of the Mid-term Measures II amendments will be a reduction in the formation of tropospheric (ground level) ozone. In the presence of sunlight, the VOCs from consumer products and other sources react with oxides of nitrogen (NO_x) to form ozone. Therefore, the 21 ton per day (tpd) statewide reduction in VOC emissions based on the 1997 survey results (or the 9 ton per day reduction in the SCAB in 2010 based on SIP currency), from the proposed amendments will result in a positive impact on air quality and public health. In addition, VOCs have also been found to be a source of PM_{10} (minute particulate matter of 10 microns or less equivalent aerodynamic diameter), either through condensation of the VOCs or complex reactions of VOCs with other compounds in the atmosphere. The exact reductions in ozone and PM_{10} cannot be accurately predicted due to the wide variety of factors that impact the formation of ozone and PM_{10} . These factors include atmospheric conditions, the ratio of VOCs to NO_x in the atmosphere, and the reactivity (ozone formation potential) of the individual VOCs emitted.

How would the Mid-term Measures II proposal reduce the risk to public health?

It has long been known that exposure to ground level ozone and PM₁₀ have adverse impacts on public health. Research has shown that, when inhaled, ozone and PM₁₀ can cause respiratory problems, aggravate asthma, and impair the immune system.

In light of this, we conducted a health risk assessment which shows that, by achieving the maximum feasible VOC emission reduction from the categories proposed for regulation, this regulation would reduce public health risks by a similar magnitude as other regulations adopted by the ARB and other environmental agencies. It is difficult to estimate the extent to which this regulation would reduce ozone and PM₁₀ concentrations because of the variety of factors that can influence ozone and PM₁₀ levels, such as weather, geography, emissions distribution, and the ratio of VOCs to NO_x. However, numerous scientific studies have shown that by reducing VOC emissions, ozone and PM₁₀ concentrations are reduced. Therefore, by reducing ozone and PM₁₀ concentrations, this regulation would reduce the health risks posed by exposure to these pollutants.

Are there any potential negative environmental impacts?

We examined the potential effect of the proposed regulation on air quality, global warming, stratospheric ozone depletion, the use of Toxic Air Contaminants, and the impacts on water quality and solid waste disposal. Based on our analysis, as detailed in Chapter VII of the Technical Support Document, we do not expect any adverse environmental impacts to result from the proposed Mid-term Measures II amendments, with one exception. In order to propose more stringent VOC limits on non-aerosol general purpose degreasers to be effective on December 31, 2004, it is necessary to repeal the less stringent 10 percent limit scheduled to become effective on January 1, 2001. Repealing the 10 percent limit will result in cumulative excess emissions of 0.5 tpd in California (based on the 1997 survey results) for the four year period from January 1, 2001, to December 31, 2004. However, the temporary delay will allow manufacturers to focus their research and development efforts on the much more stringent limits proposed in this rulemaking (three percent for ready-to-use products and one percent for dilutable products). These more stringent limits will achieve a permanent additional 1.1 tpd emission reduction beginning in 2005, which we believe overrides the temporary loss in emission reductions.

What about the potential for an increase in the use of methylene chloride or perchloroethylene?

We do not believe that manufacturers will reformulate their products to comply with the proposed VOC limits using perchloroethylene or methylene chloride. The proposed VOC limits are designed to allow manufacturers to reformulate using other reformulation options. In addition, we have also found that many manufacturers are reluctant to use these compounds because of health and safety concerns, as well as additional regulations, including labeling requirements and occupational exposure limits. Some companies also have corporate policies discouraging or limiting their use. Nevertheless, we have included reporting requirements in the regulation that will require manufacturers of products containing either perchloroethylene or

methylene chloride to report their usage. This will allow us to track the use of these compounds, and take appropriate action in the unlikely event that there is an increase. Finally, ARB staff is currently investigating options for an airborne toxic control measure (ATCM) for automotive consumer products containing chlorinated compounds such as perchloroethylene and methylene chloride.

G. FUTURE PLANS

How will the “reactivity” of individual VOC’s be considered in future consumer products rules?

Every VOC reacts differently under ambient conditions to form ozone; this tendency is called the VOC’s “reactivity.” Individual VOCs vary both in their rate of ozone formation and in the quantity of ozone formed. A relative reactivity scale was recently developed to rank VOCs based on their tendency to form ozone. Each VOC in this scale is assigned an “ozone formation potential” value based on smog chamber studies or by comparison with similar VOCs. Such a relative reactivity scale serves as the basis for the ARB’s existing Low Emissions Vehicle (LEV) program.

Traditional mass-based VOC limits have treated all VOCs equally, with no consideration for the reactivity of individual compounds (other than exempting negligibly-reactive compounds). Prior to the development of the consumer products element of the SIP, the consumer products industry expressed interest in using a reactivity-based strategy for controlling VOC emissions from consumer products. Therefore, the ARB included a commitment in the SIP to investigate the feasibility of incorporating a reactivity scheme into the consumer products program.

To oversee the development of reactivity-based limits, the Reactivity Subgroup of the Consumer Products Working Group was formed. The Reactivity Subgroup consists of representatives from the consumer products industry, academia, U.S. EPA, ARB and local air districts. In addition, ARB established the Reactivity Scientific Advisory Committee (RSAC) in April 1997. This committee is comprised of top researchers in the field of atmospheric photochemistry. The Reactivity Subgroup will coordinate with the RSAC to ensure that the consumer products reactivity program is based on the best available scientific information.

Reactivity-based limits are currently being developed for aerosol coating product categories, and may be developed for other consumer product categories as well. For most categories, we are considering developing reactivity-based limits that are optional to the mass-based limits. That is, manufacturers would have the option of complying with either the mass-based limit or the reactivity-based limit. Both limits will result in equivalent ozone reductions. However, for some categories comprised of 100 percent VOCs (e.g. paint thinners), mandatory reactivity limits may be the only feasible way to reduce the ozone formation potential from these products.

What are ARB’s plans for updating the State Implementation Plan?

Over the next year, the ARB will be working on a comprehensive update to our 1994 Ozone SIP. The motor vehicle emission inventory model is currently being updated, as is the off-road mobile source emissions inventory. The consumer products emissions inventory is also being updated using the 1997 Consumer Products Survey, and the South Coast Air Quality Management District is pursuing similar efforts for stationary sources in the region. These revised inventories, in combination with new ozone episode data from the Southern California Ozone Study, will be used to refine the air quality model for the South Coast Air Basin to determine the revised emission reduction target needed to attain federal and state health-based ozone standards in the Basin.

To kick off the development of new statewide strategies, on October 5-7, 1999, ARB will host Exploring New Technologies for Clean Air, a symposium to highlight technologies capable of achieving zero and near-zero emissions. We will follow up the symposium with workshops to discuss the comprehensive statewide emission reduction strategy. Throughout this process, we will continue to work closely with the regulated industry, government agencies, academia, environmental groups and the public as we develop plans for achieving the health-based ambient air quality standards. We will continue to work closely with the Consumer Products Working Group and other representatives of the consumer products industry to re-evaluate the appropriate level for long-term commitments for consumer products.

We anticipate presenting a revised control plan for the Board's consideration and adoption in 2000 or 2001. The revised statewide strategy will also be incorporated into the South Coast Air Quality Management District's updated Air Quality Management Plan (AQMP). Upon adoption of the AQMP by the District Board and the Air Resources Board, we will submit the revised emission inventories, attainment demonstration, and control plan to the U.S. Environmental Protection Agency (U.S. EPA) as a SIP revision. The 1994 Ozone SIP will continue to apply until U.S. EPA approves the SIP revision.

III.

RECOMMENDATION

We recommend that the Board approve the proposed amendments to the consumer products regulation.

**State of California
AIR RESOURCES BOARD**

**Initial Statement of Reasons
for Proposed Amendments to the
California Consumer Products Regulation**

**Volume II:
Technical Support Document**

I.

INTRODUCTION

A. OVERVIEW

In Volume II of the Initial Statement of Reasons (ISOR) for Proposed Amendments to the California Consumer Products Regulation, we present our technical justification and analysis of the “Mid-term Measures II” proposed amendments to the consumer products regulation. The proposed Mid-term Measures II amendments are intended to partially fulfill the mid-term measures commitment of the consumer products element in the State Implementation Plan (SIP), and satisfy part of a lawsuit agreement reached with environmental groups. The first component of our mid-term measures commitment in the SIP was adopted by the Air Resources Board (ARB/Board) on July 24, 1997.

Included in this technical support document (TSD) is the following information:

- a discussion of the process used to develop the proposed amendments;
- a discussion of the technical basis for the proposed amendments;
- a review of the emissions from the proposed categories for regulation and the overall need for the emission reductions;
- a description of the proposed amendments and the consumer product categories proposed for regulation;
- an analysis of the environmental and expected economic impacts from the proposed amendments; and
- a discussion of future activities.

B. ENABLING LEGISLATION

In 1988, the California Clean Air Act (CCAA or “the Act”) was adopted by the California State Legislature to address the State’s serious air pollution problems and the inability of many areas in California to attain the state and federal ambient air quality standards. The CCAA added section 41712 to the California Health and Safety Code (HSC) which, along with subsequent amendments, requires the Board to adopt regulations to achieve the maximum feasible reduction in volatile organic compound (VOC) emissions from consumer products, if the Board determines that adequate data exist to establish both of the following:

- The regulations are necessary to attain state and federal ambient air quality standards; and
- the regulations are commercially and technologically feasible.

It further stipulates that regulations adopted must not eliminate any product form, and that recommendations from health professionals must be considered to ensure any VOC reductions from health benefit products do not compromise their health benefits. In enacting section 41712, the Legislature gave the ARB authority to control emissions from a very diverse number of products sold statewide to household and commercial consumers.

C. BACKGROUND

1. Consumer Product Regulations Adopted to Date

To date, the Board has taken several actions to fulfill the legislative mandate. Three regulations have been adopted regulating a total of 45 consumer product categories and 35 categories of aerosol coatings. In addition, two voluntary regulations have been adopted to provide compliance flexibility to companies. (A complete summary of the regulations adopted and dates of regulatory amendments is provided in Appendix D.)

On November 8, 1989, the ARB approved a regulation for reducing VOC emissions from antiperspirants and deodorants (the “antiperspirant and deodorant regulation;” sections 94500-94506.5, Title 17, California Code of Regulations (CCR)) (ARB, 1989a-b).

The ARB then adopted a more comprehensive regulation for reducing VOC emissions from 26 additional categories of consumer products, which was adopted by the Board in two phases (the “Consumer Products Regulation;” sections 94507-95417, Title 17, CCR)(ARB, 1990a-c; ARB, 1991a-c). Phase I was approved on October 11, 1990, and Phase II was approved on January 9, 1992. This regulation reduces VOC emissions primarily by specifying maximum allowable VOC content limits (by weight percent) for individual product categories.

On September 22, 1994, the Board approved the first voluntary regulation, the “Alternative Control Plan Regulation for Consumer Products” (the “ACP”) (ARB, 1994a-b). The ACP is a market-based regulation that employs the concept of an aggregate emissions cap or “bubble.” This program supplements existing regulations by providing consumer products and aerosol coatings manufacturers additional flexibility when formulating consumer products. This regulation is contained in Title 17, CCR sections 94540-94555.

The Board adopted the next consumer product regulation on March 23, 1995, the “Regulation to Reduce Volatile Organic Compound Emissions from Aerosol Coating Products” (the “aerosol coating regulation”) (ARB, 1995 a-b). This regulation limits the VOC contents of 35 categories of aerosol coatings. At the same time, the ACP was amended to make it possible to “bubble” aerosol coatings emissions. The aerosol coatings regulation is contained in Title 17, CCR, sections 94520-94528.

On November 21, 1996, the Board adopted amendments to the “consumer products regulation” and the “aerosol coating regulation” (ARB, 1996a). Amendments to the consumer

products regulations were based on the staff's technical assessment, along with additional changes to clarify the regulations and improve enforceability. Finally, the VOC definition in the consumer products regulation and the aerosol coatings regulation was amended to exempt perchloroethylene as a VOC.

The Board approved several amendments (the Mid-term Measures or Phase III amendments) to the Consumer Products Regulation after a July 24, 1997, public hearing (ARB, 1997a). At that time, we partially met our mid-term measures commitment in the 1994 SIP with the approval of VOC limits for 18 new categories of consumer products.

On November 13, 1997, the Board approved the second voluntary regulation, the "Hairspray Credit Program Regulation" (the "hairspray credit program") (ARB, 1997b). The hairspray credit program and related amendments provide for a market-based emission reduction credit program for both credit generation from hairsprays and credit use within the consumer products arena. The hairspray credit program is contained in Title 17, CCR, sections 94560-94575.

On November 19, 1998, the Board adopted amendments to the aerosol coatings regulation; the consumer products regulation; and the antiperspirant and deodorant regulation (ARB, 1998). The amendments modified the December 31, 1999, VOC limits in the aerosol coatings regulation, and the effective dates for these VOC limits. Minor changes were also made to the definitions and administrative requirements in the aerosol coatings regulation. Finally, methyl acetate was added to the list of compounds exempt from the VOC definitions in the aerosol coatings, consumer products, and antiperspirant and deodorant regulations.

2. Consumer Products and the State Implementation Plan

The State Implementation Plan (SIP) for ozone (ARB, 1994c) is intended to satisfy the requirements of the federal Clean Air Act for ozone non-attainment areas in California. Together with significant reductions from stationary industrial facilities, mobile sources (e.g. cars, trains, boats), and other area sources (e.g. architectural and industrial maintenance coatings), the emission reduction commitments in the consumer products element of the SIP are an essential part of California's effort to attain the air quality standards for ozone. To attain the federal ozone standard, it is estimated that an overall 85 percent reduction in consumer product emissions is needed by 2010 in the South Coast Air Basin. The VOC reductions from consumer products are also needed to help several local air pollution control districts meet rate-of-progress requirements in the federal Clean Air Act (CAA).

The consumer products component of the SIP, approved by the Board on November 15, 1994, is a multi-faceted program comprised of "near-term", "mid-term", and "long-term" control measures. Under the SIP, the various control measures were anticipated to reduce emissions by: 30 percent from the near-term measures; 25 percent from the mid-term measures; and 30 percent from the long-term measures. The near-term SIP measures are

comprised of the antiperspirant and deodorant, consumer products (Phase I and II amendments), and aerosol coating regulations. We partially met our mid-term measures commitment with the approval of VOC limits for 18 additional consumer product categories (the Mid-term Measures or Phase III amendments) on July 24, 1997. This regulatory action (Mid-term Measures II) will achieve further emission reductions from additional and existing consumer product categories to fulfill our mid-term SIP commitment as specified in the SIP lawsuit settlement. The long-term SIP measures will rely on new technologies, market incentives, and consumer education.

On November 15, 1994, the ARB submitted the consumer products Phase I and II regulations and the antiperspirant and deodorant regulation to the United States Environmental Protection Agency (U.S. EPA) for approval as a SIP revision. On January 13, 1995, the U.S. EPA found the submittal complete and approved the regulations on February 14, 1995. The U.S. EPA's approval of the consumer products regulations was published in the Federal Register on August 21, 1995. The ACP was submitted to the U.S. EPA on August 27, 1996.

On December 18, 1998, the ARB submitted two new consumer products regulations that had not previously been submitted to the U.S. EPA: Title 17, California Code of Regulations, sections 94520-94528 (Article 3. Aerosol Coating Products, the "Aerosol Coating Products Regulation"), and Title 17, California Code of Regulations, sections 94560-94575 (Article 5. Hairspray Credit Program, the "HCP Regulation"). This revision also included the Mid-term Measures amendments (Phase III) partially fulfilling a commitment in the SIP to achieve an additional 25 percent reduction in VOC emissions from consumer products by 2005.

3. SIP Lawsuit Settlement

On January 28, 1999, the ARB approved a settlement with three Los Angeles based environmental groups (Communities for a Better Environment, the Coalition for Clean Air, and the Natural Resources Defense Council) regarding the 1994 SIP litigation. The lawsuit was filed in the U.S. District Court for the Central District of California against the ARB, the South Coast Air Quality Management District, and the U.S. EPA for failure to implement specific measures contained in the 1994 SIP.

ARB has aggressively pursued every feasible emission reduction from mobile and area sources including consumer products over the past four years to meet our near-term emission reduction commitments for reactive organic gases (ROG) and oxides of nitrogen (NO_x) in the 1994 SIP. As the ARB has implemented the SIP over the last four years, some measures have delivered more reductions than anticipated, while other measures have delivered fewer reductions due to technical or economic concerns. The ARB's ongoing evaluation has also demonstrated that some regulatory strategies in the 1994 SIP are not feasible or would be ineffective in reducing emissions. ARB has not implemented those measures, and as a result, the emission reductions from those measures need to be replaced with other measures to achieve attainment.

The lawsuit settlement addresses near-term emission reduction shortfalls of 42 tons per day of ROG and 2 tons per day (tpd) of NO_x (emission reduction numbers are for the South Coast Air Basin in 2010) including the shortfall remaining from the adoption of Mid-term Measures I. Under the terms of the settlement, ARB is obligated to achieve the following amounts of emission reductions (in the South Coast Air Basin in 2010):

12 tpd of ROG from measures adopted in 1999,
14 tpd of ROG from measures adopted in 2000,
16 tpd of ROG from measures adopted in 2001, and
2 tpd of NO_x from measures adopted in 2000.

The agreement also specifies a list of measures ARB staff will present to the Board for consideration, including: enhanced vapor recovery; fuel can spillage prevention; emission standards for medium and heavy-duty gas trucks; a lower NO_x standard for bus engines, additional reductions from consumer products; and a suggested control measure for architectural coatings. Although the agreement includes an estimate of the range of potential emission reductions from each measure, the total reductions from all measures on the list (at the high end of the range) are not sufficient to achieve the 42 tpd ROG commitment. ARB will need to pursue additional measures to ultimately achieve the 42 tpd ROG commitment in the agreement.

As a result of our evaluations, ARB staff believes that additional reductions from consumer products are achievable, but at a lower level of effectiveness than called for in the SIP. For consumer products, we estimate that the emission reductions that will be achieved by adopted consumer products and aerosol coatings measures will result in a shortfall of 29 tpd of VOC in the South Coast Air Basin when compared against the near-term and mid-term SIP commitments for consumer products (43 tpd). As part of the settlement, ARB staff committed to propose consumer products amendments that would be submitted to the Board no later than the first or second quarter of 2000. The ROG emissions reductions estimated for this measure in the settlement are between 5 and 12 tpd in 2010 in the South Coast Air Basin, based on the assumptions in the 1994 SIP inventory. A 5 to 12 tpd reduction in the South Coast Air Basin in 2010 equals about a 9 to 23 tpd reduction statewide in 1997 (based on the assumptions in the 1994 SIP inventory). The Mid-term Measures II amendments are our proposal to fulfill this commitment.

4. National Consumer Products Regulations

On September 11, 1998, the U.S. EPA promulgated a national consumer products regulation, the “National Volatile Organic Compound Emission Standards for Consumer Products (40 CFR Part 59, Subpart C, Sections 59.201 et seq.; see the September 11, 1998, Federal Register, Vol. 63, No. 176, pages 48819-48847).” This action promulgates national VOC emission standards for 24 categories of consumer products. The rule became effective on September 11, 1998, and the VOC limits became effective on December 10, 1998. There are

similarities and differences between the California and national consumer products regulations; however, the national rule does not preclude states from adopting more stringent regulations.

Although the national regulation is similar in many aspects to the California regulation, it is less effective in reducing VOC emissions from consumer products. The national regulation does not include second tier standards, mid-term measure categories, or aerosol coatings. The national regulation will achieve a 20 percent reduction in VOC emissions while California's existing consumer products and aerosol coatings regulations achieve a 40 percent reduction. Because California has unique air quality problems, we must reduce VOC emissions from consumer products to the maximum extent feasible to attain the federal ambient air quality standard for ozone.

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II.

DEVELOPMENT OF PROPOSED AMENDMENTS

A. PROCESS FOR DEVELOPING PROPOSED LIMITS

In order to gather the technical information necessary to develop the Mid-term Measures II amendments, staff worked closely with industry and interested stakeholders. Representatives from individual companies and trade associations were most active in the process. Members of the public and local air district representatives also participated.

Four public workshops were conducted from March 1999 through July 1999. During the first public workshop, we discussed the prioritization of the consumer product categories for regulation development. We also presented draft data summaries from the “1997 Consumer and Commercial Products Survey (Survey),” which is discussed in more detail in Chapter IV, “Emissions.” At the second public workshop, staff proposed VOC limits for consumer product categories prioritized at the first workshop. The proposed limits covered both unregulated and regulated product categories. At the third public workshop, staff discussed the 1997 Survey data summary table (which is a summary of sales and emissions obtained from the Survey), and proposed category definitions and VOC limits. We also heard technical presentations from industry representatives. The fourth public workshop was held on July 13, 1999, to discuss proposed regulatory language (including draft revised VOC limits), and a revised 1997 survey data summary table. A chronology of the meetings held is shown in Table II-1 below. Workshop notices are shown in Appendix B.

TABLE II-1
Chronology of Mid-term Measures II Public Meetings

Date	Meeting	Location
March 18, 1999	1 st Public Workshop	El Monte, CA
April 14, 1999	Consumer Products Working Group Meeting and 2 nd Public Workshop	Sacramento, CA
May 18, 1999	3 rd Public Workshop and Industry Presentations	Sacramento, CA
July 13, 1999	4 th Public Workshop	Sacramento, CA

To solicit additional information and comments, staff held numerous individual meetings, teleconferences, and video conferences with industry representatives. At the request of industry associations, we held a meeting on June 16, 1999, where industry representatives presented technical information related to reformulating aerosol products for consideration in the

rulemaking process. Staff also reviewed survey data, performed shelf surveys, and researched technical literature, patents, and trade journals during the development of the proposed amendments.

B. EVALUATION OF ALTERNATIVES

Development of the proposed Mid-term Measures II began with the review of the “1997 Consumer and Commercial Products Survey (Survey).” The staff conducted this Survey during 1998 to update the SIP emission inventory and modeling, develop reactivity-based limits, and prioritize categories for regulatory standard development. The Survey covered about 100 categories of consumer products, representing an estimated 70 percent of the total consumer products inventory. The results of this survey, in conjunction with the 1997 aerosol coatings survey, represent an estimated 80 percent of the total consumer products inventory.

After the Survey data were compiled, we prioritized product categories for regulation. This process began with the elimination of categories which could not be addressed under our schedule. For unregulated surveyed categories, we excluded categories with statewide emissions of less than 0.5 tons per day (tpd), categories comprised of 100 percent VOC products that require a reactivity-based strategy, health benefit products, and products that are regulated by the local districts. Looking at the regulated categories, we excluded categories with emissions less than 0.5 tpd, and recently regulated categories such as the Mid-term Measures categories (with the exception of general purpose degreasers). As a result of this process, we identified 35 product categories for potential regulation including 9 unregulated and 26 regulated categories. The total VOC emissions from these categories were 118 tpd statewide in 1997, including 14 tpd from unregulated and 104 tpd from regulated categories.

After further review, we dropped some product categories due to low potential for emission reductions; postponed some categories to provide adequate time to evaluate the feasibility of VOC limits and to address complicated technical issues; and we revised our emission estimates to address mis-categorization and district regulated products (large sizes of adhesives and sealants). The proposed VOC limits were developed based on the Survey results, discussions with industry, and the available reformulation technologies.

During the workshop process, we presented proposals and alternatives to be evaluated. After additional investigation of the product categories, we added some product categories; some categories were regrouped based on similarities in product function; and we increased or lowered the proposed VOC limits on a number of product categories based on technical information provided by industry and our research. We are currently proposing VOC limits for 17 product categories.

III.

TECHNICAL BASIS FOR THE PROPOSED AMENDMENTS

Health and Safety Code section 41712 requires all consumer product regulations adopted by the Board to be technologically and commercially feasible. During the development of the Phase I and II consumer product regulations, the ARB staff established guidelines in setting the limits to ensure that these statutory criteria were met. Also, 1996 revisions to section 41712 require that consumer product regulations not eliminate a product form. These guidelines and statutory criteria were followed in setting the proposed limits for the Mid-term Measures II categories. A detailed discussion of the technical basis for each proposed limit is included in Chapter VI of the Technical Support Document.

The Mid-term Measures II limits were targeted towards the lower volatile organic compound (VOC) content technologies within a product category. In doing this, staff made sure that the various product forms within each category would be preserved. In all categories proposed for regulation, with the exception of the double phase aerosol air fresheners, there exist products on the market which currently comply. For double phase aerosol air fresheners, technology exists for achieving the proposed 20 percent VOC limit. We discuss below the meaning of the terms “technologically feasible” and “commercially feasible.”

A. TECHNOLOGICALLY FEASIBLE

Health and Safety Code section 41712(b) requires the Board to adopt consumer product regulations that are “technologically feasible”. Technological feasibility is a different concept than "commercial feasibility", and does not take into account the cost of the complying product. The staff believes that a proposed limit is technologically feasible if it meets at least one of the following criteria: (1) the limit is already being met by at least one product within the same category, or (2) the limit can reasonably be expected to be met in the time frame provided through additional development efforts. With the exception of the double phase aerosol air fresheners, our survey results show that products are currently marketed that comply with the proposed limits for all of the product categories under consideration. In the case of double phase aerosol air fresheners, reformulation options are available which will allow manufacturers to produce complying products. As explained in Chapter VI, manufacturers can use exempt solvents such as acetone and exempt propellants to reformulate these products, and staff has proposed an effective date of December 31, 2004, to allow five years to develop viable air freshener formulations. Given the length of time and the possibilities for reformulation, staff believes that the proposed 20 percent VOC limit for this category is technologically feasible.

In setting the proposed limits for the Mid-term Measures II categories, staff made an effort wherever possible to ensure that multiple reformulation technologies exist which would allow products to comply. Proposed limits were set at VOC levels that staff determined could be met without increased use of Toxic Air Contaminants or ozone-depleting compounds. General reformulation options include addition of water with cosolvents, development of emulsion products, use of low vapor pressure volatile organic compound solvents, use of non-VOC propellants, and use of exempt solvents. Multiple reformulation options allow flexibility in the design of compliant products, ensuring that efficacious, cost-effective products will be brought to the marketplace.

B. COMMERCIALY FEASIBLE

Health and Safety Code section 41712(b) also requires the Board to adopt consumer product regulations that are “commercially feasible”. The term “commercially feasible” is not defined in State law. In interpreting this term, the staff has utilized the reasoning employed by the United States Court of Appeals for the District of Columbia in interpreting the federal Clean Air Act. In the leading case of International Harvester Company v. Ruckelshaus, (D.C. Cir. 1973) 478 F. 2d 615, the Court held that the United States Environmental Protection Agency could promulgate technology-forcing motor vehicle emission limits which might result in fewer models and a more limited choice of engine types for consumers, as long as the basic market demand for new passenger automobiles could be generally met.

Following this reasoning, the staff has concluded that a regulation is “commercially feasible” as long as the “basic market demand” for a particular consumer product can be met. “Basic market demand” is the underlying need of consumers for a product to fulfill a basic, necessary function. This must be distinguished from consumer “preference”, which may be towards specific attributes of a particular product. A “preference” is the choice of consumers for a certain product or products based upon fragrance, cost, texture, etc. By way of example, a consumer may need a glass cleaner to remove soils, grease, dirt or grime from their windows. Glass cleaners are formulated with glycol ether solvents or with ammonia. Consumers may choose an ammoniated glass cleaner because they prefer the performance characteristics, or they may choose a non-ammoniated glass cleaner because they dislike the smell of ammonia. This distinction is not recognized by all parties. Some commenters have expressed the view that consumers do not have a “basic market demand” for a general class of products, but that consumers instead have a number of separate and distinct “basic market demands” for many specialty products with differing characteristics.

The ARB staff believes the consumer “preference” interpretation of “basic market demand” is inconsistent with the reasoning from the International Harvester case. To adopt such a narrow interpretation would be inconsistent with the clearly expressed legislative intent that “...the state board shall adopt regulations to achieve the maximum feasible reduction in reactive organic compounds emitted by consumer products...” (Health and Safety Code section 41712(a)). In order to achieve emission reductions, manufacturers of high VOC products which perform the

same basic function as lower VOC counterparts must reduce the VOCs in their products. It is expected that when a product formulation changes, some attributes of the product will also change. If ARB were to establish limits which accounted for every distinct feature of every product, then each product would require a limit unto itself. Using this approach, it would be difficult to achieve the maximum feasible reduction in VOC emissions because changes in formulation would change product features.

Every currently marketed product has some unique features that differentiate it from other products. Consumers who purchase a product have demonstrated a preference over other competing products. This distinction between “preference” and “basic market demand” was clearly made in the International Harvester case. In the International Harvester case, the court stated that the proposed emissions limits would be feasible even though they might result in the unavailability of certain kinds of vehicles and engine types people preferred (e.g. fast “muscle” cars), as long as the basic market demand for passenger cars could be generally met. Applying this principle to consumer products, the proposed amendments allow the basic market demand to be met for each product category, even though it may no longer be possible to manufacture products with some specific attributes. The ARB staff believe that this approach complies with section 41712.

Table III-1 below lists the proposed VOC limits for each category, the emission reductions, and the number and market share of products that currently comply with the proposed limits. The total emission reductions from the proposed limits is 19.5 tons per day. Including the reduction credit in the nail polish remover category due to the exemption of acetone, the total statewide emission reductions due to the regulation are 21 tons per day based on the 1997 survey results. This represents an overall emission reduction of 39 percent from the Mid-term Measures II categories. The variation in complying market share reflects the fact that each limit is developed independently based on the available reformulation options.

Table III-1 Limits, Complying Products, and Complying Marketshare					
Product Category (Effective Date)	Sales Weighted Average VOC Content	Proposed VOC Limit (wt%)	VOC Emission Reduction (tpd) and Percent Reduction	Number of Complying Products/ Total Prod. and Percent Complying	Complying Market Share (%)
Construction, Panel and Flooring Adhesives					
All Forms (12/31/02)	22%	15%	0.44 44%	29/74 39%	17%
Sealant and Caulking Compounds					
All Forms (12/31/02)	3%	4%	0.79 42%	259/361 72%	69%
Automotive Brake Cleaners					
Aerosols (12/31/02)	42%	45%	0.29 6%	37/82 45%	40%
All Other Forms (12/31/02)	49%	45%	0.02 6%	14/37 38%	42%
Carburetor or Fuel Injection Air Intake Cleaners					
Aerosols (12/31/02)	68%	45%	2.14 34%	4/61 7%	5%
All Other Forms (12/31/02)	43%	45%	0.05 22%	3/12 25%	>50%
Engine Degreasers					
Aerosols (12/31/04)	34%	35%	0.37 22%	14/48 29%	46%
All Other Forms (12/31/04)	1%	5%	0.05 63%	11/22 50%	96%
Aerosol General Purpose Degreasers (reductions from aerosol solvents parts cleaners)					
Aerosols (1/1/02)	97%	50%	0.36 49%	2/12 17%	<10%
Tire Sealants and Inflators					
All Forms (12/31/02)	21%	20%	0.32 36%	4/13 31%	50%

Product Category (Effective Date)	Sales Weighted Average VOC Content	Proposed VOC Limit (wt%)	VOC Emission Reduction (tpd) and Percent Reduction	Number of Complying Products/ Total Prod. and Percent Complying	Complying Market Share (%)
Auto Windshield Washer Fluids - Non Type A Areas					
All Forms (12/31/02)	unknown	1%	7.42 89%	30 55%	50
Flying Bug Insecticides					
Aerosols (12/31/03)	30%	25%	0.11 18%	7/43 16%	13%
Lawn and Garden Insecticides					
Non-aerosols (12/31/03)	1%	3%	0.35 26%	139/157 89%	99%
Crawling Bug Insecticides					
Aerosols (12/31/04)	28%	15%	0.49 13%	13/62 21%	15%
General Purpose Cleaners (non-Aerosols)					
Ready To Use (12/31/04)	2%	3%	1.05 33%	121/182 66%	61%
Dilutables (12/31/04)	.01%	1%	0.41 9%	329/384 86%	99.9%
General Purpose Degreasers (non-Aerosols)					
Ready To Use (12/31/04)	22%	3%	0.15 16%	35/95 37%	28%
Dilutables (12/31/04)	.5%	1%	0.41 38%	132/199 66%	83%
Glass Cleaners (non-Aerosols)					
Ready To Use (12/31/04)	5%	4%	0.36 16%	29/107 27%	13%
Dilutables (12/31/04)	2%	1%	0.82 68%	22/73 30%	31%
Furniture Maintenance Products					
Aerosols (12/31/04)	20%	17%	0.35 18%	19/52 37%	13%

Product Category (Effective Date)	Sales Weighted Average VOC Content	Proposed VOC Limit (wt%)	VOC Emission Reduction (tpd) and Percent Reduction	Number of Complying Products/ Total Prod. and Percent Complying	Complying Market Share (%)
Double Phase Aerosol Air Fresheners					
Aerosols (12/31/04)	30%	20%	1.54 34%	0/19 0%	0%
Hair Mousses					
All Forms (12/31/02)	9%	6%	0.33 43%	39/137 28%	27%
Nail Polish Removers					
All Forms (12/31/04)	21%	0%	0.85 100%	19/54 35%	30%
Total Emission Reductions (tpd)			19.5		
Acetone Credit in Nail Polish Remover			1.5		
Total Combined Reduction			21.0		

IV.

EMISSIONS

California's extreme air quality problems require unique strategies for meeting federal and state ambient air quality standards. In this chapter we provide an overview of these air quality problems and the need for significant emission reductions from all sources of air pollution. We also describe the need for the regulation of consumer products and provide a detailed summary of the emissions from the categories proposed for regulation.

A. AMBIENT AIR QUALITY AND THE NEED FOR EMISSIONS REDUCTIONS

Volatile organic compound (VOC) emissions contribute to the formation of both ozone and PM₁₀ (particulate matter less than 10 microns equivalent aerodynamic diameter). Ozone formation in the lower atmosphere results from a series of chemical reactions between VOCs and nitrogen oxides in the presence of sunlight. PM₁₀ is the result of both direct and indirect emissions. Direct sources of PM₁₀ include emissions from fuel combustion and wind erosion of soil. Indirect PM₁₀ emissions result from the chemical reaction of VOCs, nitrogen oxides, sulfur oxides and other chemicals in the atmosphere.

Ozone

VOCs and nitrogen oxides (NO_x) react in the presence of sunlight to form ozone. The rate of ozone generation is related closely to the rate of VOC production (in the form of reactive organic gases, or ROG) as well as the availability of NO_x in the atmosphere (U.S. EPA, 1996; Seinfeld and Pandis, 1998). At low ambient concentrations, ozone is a colorless gas and the chief component of urban smog. It is one of the state's more persistent air quality problems. Air quality data have revealed that 75 percent of the nation's exposure to ozone occurs in California (ARB, 1994a). As shown in Figure IV-1, the population-weighted average exposure to ozone concentrations above the state ambient air quality standard (of 9 parts per hundred million) in the South Coast Air Basin has been declining. However, despite this decline and nearly 25 years of regulatory efforts, ozone continues to be an important environmental and health concern.

It has been well documented that ozone adversely affects the respiratory functions of humans and animals. Human health studies show that short term exposure to even very low levels of ozone injures the lung (ARB, 1997; U.S. EPA, 1996). Ozone is a strong irritant that can cause constriction of the airways, forcing the respiratory system to work harder in order to provide oxygen to the body. Besides shortness of breath, it can aggravate or worsen existing respiratory diseases such as bronchitis and asthma (U.S. EPA, 1996).

Chronic exposure to ozone may cause permanent damage in deep portions of the lung. In some animal studies, permanent structural changes due to long-term ozone exposure were noted. These changes remained even after periods of exposure to clean air (U.S. EPA, 1996). The ARB is currently conducting a study to determine the effects of air pollution, including ozone, on lung development. The “Epidemiologic Investigation to Identify Chronic Health Effects of Ambient Air Pollutants in Southern California” is a long-term study which is documenting the lung development of children in 12 cities in California. The air quality in these 12 communities varies from good to moderate and poor, so any trends in lung development may be determined. Preliminary results of this on-going study do indicate that chronic exposure to polluted air slows lung development, although no conclusions specific to ozone have been drawn.

Figure IV-1
Population-Weighted Exposure to Ozone Concentrations
Above the State Ambient Air Quality Standard

Not only does ozone adversely affect human and animal health, but it also affects vegetation throughout most of California resulting in reduced yield and quality in agricultural

crops and disfiguration or unsatisfactory growth in ornamental vegetation. During the summer, ozone levels are often highest in the urban centers in Southern California, the San Joaquin Valley, and Sacramento Valley, which are adjacent to the principal production areas in the state's multibillion dollar agricultural industry. ARB studies indicate that ozone pollution damage to crops is estimated to cost agriculture over 300 million dollars annually (ARB, 1987a). Similarly, the U.S. EPA estimates national agricultural losses to exceed 1 billion dollars annually (U.S. EPA, 1996).

PM₁₀

Airborne particulate matter (PM₁₀) is a solid or liquid substance with less than (<) 10 microns determined as the equivalent aerodynamic diameter. PM₁₀ can be directly emitted into the atmosphere as the result of anthropogenic actions such as fuel combustion or natural causes such as wind erosion. Indirect PM₁₀ is formed via a complex reaction involving a gas-to-particulate matter conversion process in which VOCs can participate (Seinfeld and Pandis, 1998). The focus of this discussion will be on the indirect aerosol formation of PM₁₀.

PM₁₀ is composed of up to 35 percent aerosols which may be the result of atmospheric chemical reactions of sulfate, nitrates, ammonium, trace metals, carbonaceous material (VOCs), and water. The products of the gas-phase reactions may combine to form new particles (either single or two or more vapor phase species) or increase existing particle growth by condensation of VOCs (Seinfeld and Pandis, 1998). Furthermore, although the contribution from VOCs is not known, carbonaceous aerosols generally account for a significant fraction of the fine (<2 micron equivalent aerodynamic diameter) urban particulate matter. In Los Angeles, for example, aerosol carbon alone accounts for about 40 percent of the total fine particulate mass (Seinfeld, 1989).

PM₁₀, and specifically, its smaller fraction, PM_{2.5}, are inhaled deep into the lungs, causing significant adverse health effects. The particulate matter irritates the respiratory tract, and may contain toxic as well as carcinogenic compounds (Godish, 1991). Epidemiologic evidence indicate that certain populations are particularly sensitive to PM₁₀, including the elderly, persons suffering from lung or cardiopulmonary disease, infants and children, and asthma sufferers. These populations suffer a range of health effects. Among children, decrements in lung function occur, leading to increased school absences, and asthmatic individuals may suffer from increased respiratory symptoms. Among the elderly and in individuals suffering from cardiopulmonary disease, exacerbations of chronic disease leading to increased hospital admissions are seen (U.S. EPA, 1997). PM₁₀ also contributes to reduced visibility.

To protect California's population from the harmful effects of ozone and PM₁₀, federal and state air quality standards for these contaminants have been established. These standards are shown in Table IV-1. The state hourly ozone standard is 9 parts per hundred million (pphm) and the national hourly ozone standard is 12 pphm. The state PM₁₀ standard for a 24 hour period is 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), and the national standard is 150 $\mu\text{g}/\text{m}^3$ over a 24 hour period.

**Table IV-1
Ambient Air Quality Standards for Ozone and PM₁₀**

Pollutant	Averaging Time	State Standard	National Standard
Ozone	1 hour	9 pphm (180 $\mu\text{g}/\text{m}^3$)	12 pphm (235 $\mu\text{g}/\text{m}^3$)
PM ₁₀	Annual Geometric Mean	30 $\mu\text{g}/\text{m}^3$	-----
	24 hour	50 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$
	Annual Arithmetic Mean	-----	50 $\mu\text{g}/\text{m}^3$

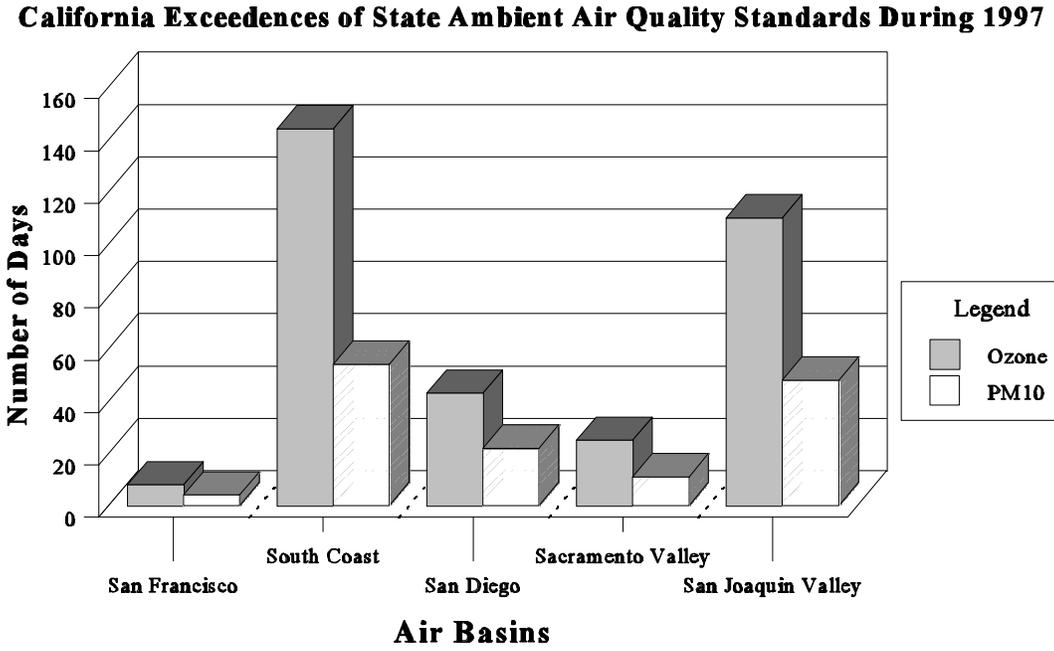
In 1997, the U.S. EPA promulgated a new 8-hour ozone ambient air quality standard. However, a recent court decision has put implementation of the new standard on hold until legal challenges can be resolved. All major urban areas in California continue to violate the pre-existing one-hour federal ozone standard and the state ozone standard, and need additional emission reductions in ozone precursors – such as VOC’s – to attain these health-based standards.

The U.S. EPA also recently adopted standards for particulate matter less than 2.5 microns (PM_{2.5}) in addition to the PM₁₀ standards (U.S. EPA, 1997). PM_{2.5} consists of directly emitted particulate matter, and secondary particulate matter such as nitrates, sulfates and condensibles that are formed in the atmosphere from precursors such as NO_x, ammonia, SO_x and complex hydrocarbons. Because PM_{2.5} is a subset of PM₁₀, these precursors contribute to PM₁₀ pollution as well.

The recent court decision also affects the particulate matter standards. However, U.S. EPA set the implementation schedule for the PM_{2.5} standards on a time line to allow the agency to complete its next review of the particulate matter standards in 2002 prior to designating non-attainment areas and requiring implementation plans for PM_{2.5}. With this lengthy time line, we expect the legal challenges and uncertainty regarding the PM_{2.5} standards to be resolved. Meanwhile, PM₁₀ non-attainment areas will continue to implement their plans to attain the pre-existing PM₁₀ standards.

The vast majority of California’s population who live in urban areas breathe unhealthy air for much of the year, as clearly shown in Figure IV-2 (ARB, 1998). Lastly, Figures IV-3 and IV-4 show that unhealthy levels of ozone and PM₁₀, respectively, are not limited to just urban areas, but can be found in nearly every county in California. As shown in these maps, 41 counties are currently designated as nonattainment for the state ozone standard, while 53 counties are designated as nonattainment for the state PM₁₀ standard (ARB, 1999). These counties contain over 97 and 99 percent, respectively, of California’s population, a clear indication of the extent and magnitude of the ozone and PM₁₀ problems in California.

Figure IV-2



**Figure IV-3
Area Designations for State Ambient Air Quality Standard for Ozone**

FIGURE 1

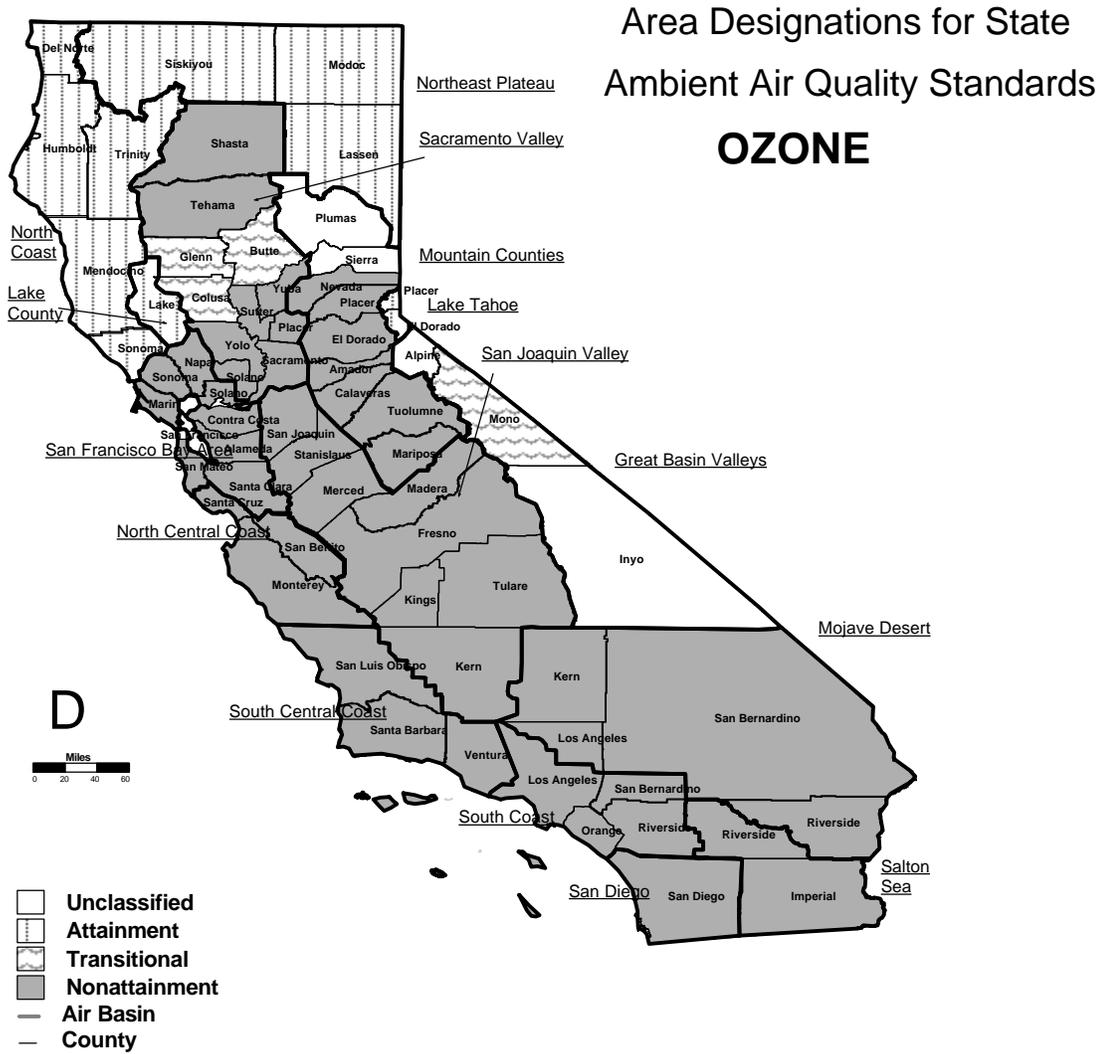
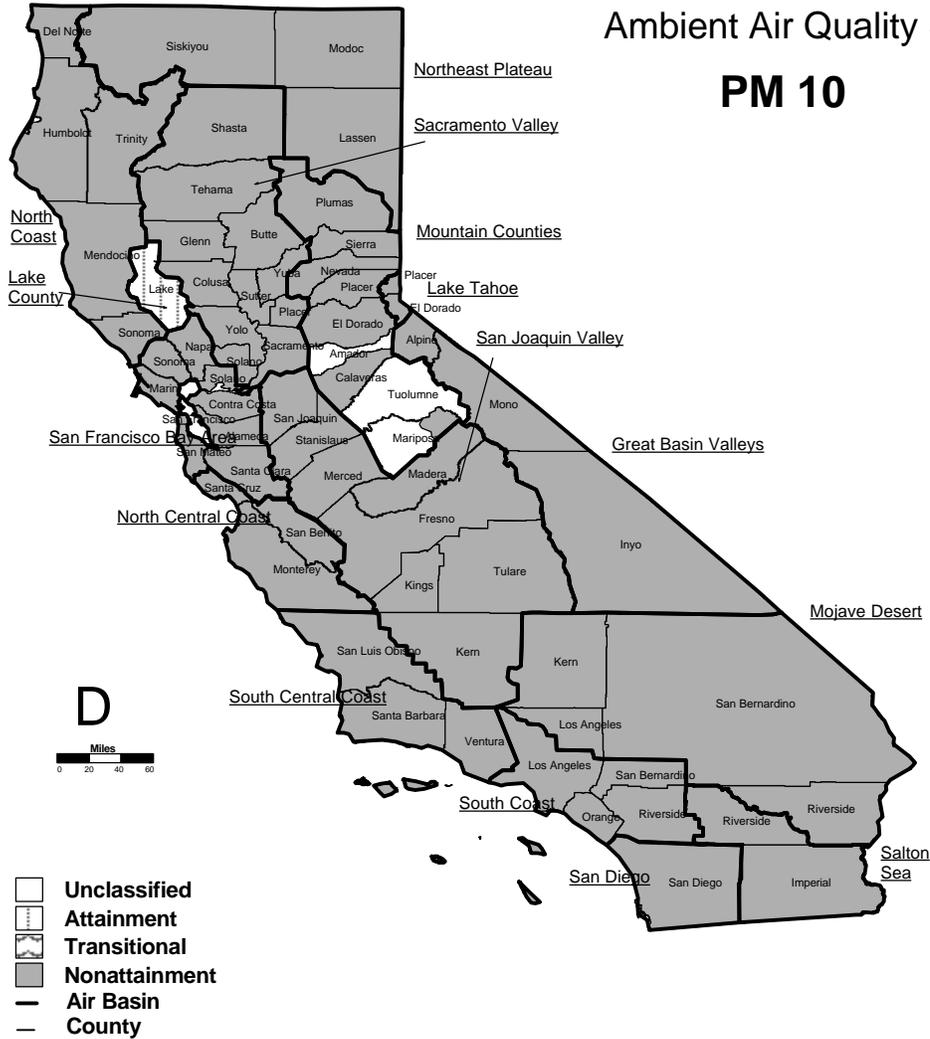


Figure IV-4
Area Designations for State Ambient Air Quality Standard for PM₁₀

FIGURE 5

Area Designations for State
 Ambient Air Quality Standards
PM 10



B. WHY REGULATE CONSUMER PRODUCTS?

Over the past 25 years, air pollution agencies in California have been working diligently to improve air quality. Much of the effort was directed to the more traditional sources of air pollution such as mobile sources (e.g., cars, trucks, etc.) and stationary sources (e.g., factories, power plants, etc.). There have been dramatic gains in reducing emissions from these traditional sources. However, to continue to make progress toward meeting the state and federal ambient air quality standards and protecting the public health of California citizens, there is a need for further reductions from other sources of emissions including consumer products. Also, as emissions from the traditional sources are further reduced, emissions from all other sources, including consumer products, have become more significant. Therefore, the emissions from these sources must be evaluated for possible reductions.

Consumer products comprise an important source of emissions in California because they are widely distributed, emit VOCs when used, and contribute to the air pollution problem in California. Although each consumer product may seem to be a small source of emissions, when the total number of users (e.g., about 34 million people) in California is aggregated, the total VOC emissions become significant. As the population in California continues to grow, the VOC emissions from consumer products will also grow.

Recognizing the importance of the potential impact of VOC emissions from consumer products, the California Legislature enacted the California Clean Air Act of 1988 (the Act). The Act declared that attainment of the California state ambient air quality standards is necessary to promote and protect public health, particularly the health of children, older people, and those with respiratory diseases. The Act added section 41712 to the California Health and Safety Code (HSC), which requires the ARB to adopt regulations to achieve the maximum feasible reduction in VOCs emitted by consumer products. As part of the regulatory process, the ARB must determine that adequate data exist to adopt the regulations. The ARB must also determine that the regulations are technologically and commercially feasible, necessary, and do not eliminate any product form. To date, VOC standards for 80 categories of consumer products (including antiperspirants and deodorants and aerosol coatings (35 categories)) have been established to meet the requirements of the Act.

The 1994 State Implementation Plan (SIP) for ozone projects that an 85 percent reduction in consumer products emissions (from the 1990 baseline year) is necessary to attain the federal ozone standard in the South Coast Air Basin. The consumer products regulations as a whole have not yet achieved emission reductions approaching this 85 percent goal. The current regulations will achieve a 40 percent reduction in VOC emissions from consumer products by the year 2005. Since much greater additional reductions are necessary to attain the federal ozone standard, the reductions from the Mid-term Measures II proposal are therefore “necessary” within the meaning of section 41712 of the HSC. In addition, section 41712(b)(1) of the HSC provides that a regulation’s “necessity” is to be evaluated in terms of both the state and federal standards. The 1994 Ozone SIP only addresses the ARB’s commitments to achieve the federal 1-hour air

quality standard for ozone. Both the federal 8-hour ozone standard and the state ozone standard are more stringent than the federal 1-hour standard, and will require even greater emission reductions to achieve attainment.

The applicable state and federal law show that both the U.S. Congress and the California Legislature intended progress toward clean air to be made as quickly as possible. The Act specifically declares that it is the intent of the Legislature that the state air quality standards be achieved "...by the earliest practicable date..." (see HSC, sections 40910 and 40913(a); see also the uncodified section 1(b)(2) of the Act (Stats. 1988, Chapter 1568)). A similar intent is expressed in the federal Clean Air Act, which declares that the federal air quality standards are to be achieved "...as expeditiously as practicable..." (see sections 172(a)(2), 181(a), and 188(c) of the federal Clean Air Act). For all of the reasons described above, the proposed amendments are "necessary" within the meaning of HSC section 41712.

Achieving significant VOC reductions from consumer products is a key element of the SIP (ARB, 1994b, 1994c, 1994d, 1994e). The SIP was adopted by the ARB on November 15, 1994, and serves as California's overall long-term plan for the attainment of the federal ambient air quality standard for ozone by early next century. Together with significant reductions from stationary industrial facilities, mobile sources (e.g., cars, trains, boats), and other area sources (e.g., architectural and industrial maintenance coatings), the reductions in the consumer products element of the SIP are an essential part of California's effort to attain the air quality standards for ozone. The 80 product categories currently being regulated represent our near-term measures and a portion of our mid-term measures commitment in the SIP. Based upon the settlement of the SIP lawsuit (See Chapter I), the 17 product categories with proposed VOC limits makes further progress toward our mid-term measures commitment. Through the implementation of these measures, we will continue to make progress toward meeting California's SIP commitment for ozone attainment.

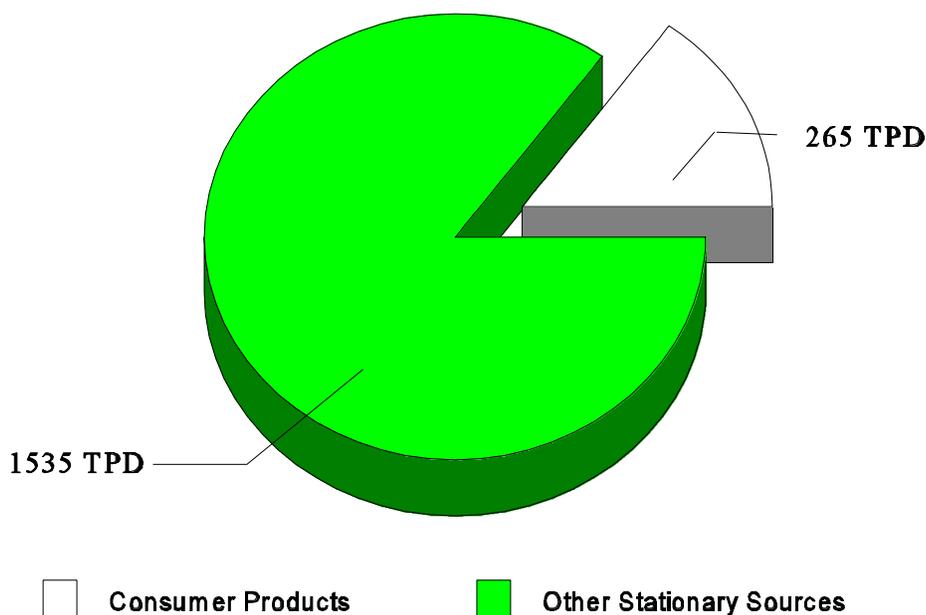
The VOC reductions from consumer products are an important component of local air pollution control district plans to attain the federal ozone standard and meet the rate-of-progress requirements under the federal Clean Air Act. For example, in the South Coast Air Basin where a large portion of the California population resides, the VOC emissions are substantial, reflecting the size of the regional pollution problem there. The 1990 baseline inventory of VOCs for the South Coast Air Basin was 1,517 tons per day (ARB, 1994b). In order to reach attainment of the federal ozone standard in the South Coast Air Basin by 2010, the VOC emissions must be reduced by 1,194 tons per day, or about 75 percent of the 1990 baseline inventory. In Ventura County and the Sacramento Metropolitan Area, the 1990 baseline VOC inventory was 87 and 222 tons per day, respectively (ARB, 1994b). To reach attainment of the federal ozone standard in both areas by 2005, the VOC emissions must be reduced by 42 (about 50 percent) and 85 (about 40 percent) tons per day, respectively.

C. ESTIMATED EMISSIONS FROM CONSUMER PRODUCTS AND MID-TERM MEASURES II CATEGORIES

Emission Estimates for Consumer Products

The 1994 SIP estimated the VOC emissions from consumer products to be about 265 tons per day in 1990, or 15 percent of the total stationary source emissions. These data are shown in Figure IV-5. New estimates developed from recent surveys, however, indicate that consumer product emissions were actually about 326 tpd in 1990, so their percentage of the stationary source emissions may be even greater than predicted in the 1994 SIP. If left uncontrolled, their relative contribution to the total smog-forming emissions will increase as California's population continues to grow and the emissions from mobile and stationary sources are increasingly regulated.

Figure IV-5
Stationary Source VOC Emissions
(per 1994 SIP),
1,800 Tons Per Day in 1990



Consumer Products Inventory Development

During the development of the first mid-term measures consumer products regulation, it became apparent that the available data on VOC emissions and speciation of the VOCs were lacking in many areas of the consumer products emissions inventory. An update to the inventory

was needed in order to assess the possibility of further emission reductions from consumer products and to track the progress of previous consumer product regulations toward achieving the 85 percent reduction commitment. Recognizing this need, the Board, at the July 1997 mid-term measures hearing, directed staff to develop a detailed, comprehensive inventory.

We formed an inventory task group with members of the consumer products industry in October 1997, to discuss the methodology of performing the update. Industry members in the task group were initially opposed to conducting a labor-intensive, large scale survey. The task group agreed that we should first conduct a study based upon previous surveys to identify areas with data gaps.

We began this study by compiling all available survey data from previous regulatory efforts. Using the 1990 U.S. EPA consumer products survey, the 1990 and 1991 ARB consumer products surveys, and the 1994/1995 mid-term measures survey, a preliminary inventory was developed for the 1990 emissions. This enabled us to identify consumer products categories requiring additional data. Presented to industry members at the January 14, 1998, consumer products meeting, the study highlighted both the lack of data and the need to better quantify consumer product emissions. The task group then agreed that a comprehensive survey of the consumer products industry was necessary to update the SIP inventory.

1997 Consumer and Commercial Products Survey

The 1997 Consumer and Commercial Products Survey (Survey) was mailed to over 3,000 companies at the end of February 1998. The survey requested data on about 100 categories of consumer products. Based on previous efforts, the emissions from these categories were estimated to account for over 70 percent of the entire consumer products inventory. The results of the Survey, in conjunction with the 1997 aerosol coatings survey, are estimated to account for over 80 percent of the entire inventory. The remaining 20 percent of the emissions are from numerous small categories. Because the 1990 U.S. EPA survey included these categories, we decided that it would not be necessary to resurvey them.

Extensive outreach efforts were made to maximize the market coverage of the 1997 Survey. First, we performed numerous shelf surveys, conducted trade journal and Internet searches and scrutinized previous surveys to identify manufacturers and add them to our mailing list. Following the Survey, shelf surveys were again performed, and the list of responding companies was scrutinized by trade associations and survey respondents to identify additional companies which had not responded. Non-responding companies were contacted and subsequently submitted surveys. The extensive outreach resulted in an estimated 90 percent market coverage in most categories.

The Survey requested detailed information on the formulations of consumer products, including complete speciation of VOC's and key exempt ingredients as well as total volumes of low vapor pressure VOC's (LVP-VOC's), and inorganic and exempt compounds. Information on

sales, product form, customer types, and company economics and size were also requested. Due to the complexity of the data, we thoroughly reviewed incoming surveys to ensure accuracy prior to entry in the database. When inconsistencies were found, we contacted the survey respondents and made the necessary corrections. Many corrections were made to formulation data to appropriately classify compounds as VOC's, LVP-VOCs, exempt compounds, or inorganic compounds. Prior to entry into the consumer products database, we made every effort to correct the Survey data.

To further ensure the accuracy of the Survey data, we provided extensive summaries to industry detailing the aggregate sales, VOC speciation, VOC tonnage, and other key information. Summary tables were also provided (scrambled to protect confidentiality) detailing VOC content, product form, LVP-VOC content, and other information. The results of the Survey were discussed in workshops, and comments from industry were used to correct inaccuracies in the data.

To minimize the burden to industry, we developed software to allow manufacturers to submit their surveys electronically. The software aided many manufacturers in reporting large numbers of products and also performed certain data checks automatically. We also developed software to automate calculations of emissions, emission reductions, market coverage and other frequently performed calculations.

Over 500 companies had responded to the Survey by December of 1998, reporting over 14,000 products sold in California. Based on the results of this Survey, and the aerosol coatings and U.S. EPA surveys, the 1997 VOC emissions from consumer products are estimated to be about 280 tons per day. Given the detailed information gathered in the Survey and the high response rate, these data will also be used to update the SIP inventory.

Market Coverage Adjustments to the Survey

It is not possible for a survey of this magnitude to reach the entirety of the consumer products industry. Therefore, the staff performed shelf surveys to adjust the emissions estimates to reflect complete market coverage. Estimates were made based upon the number of products on the shelves that were not reported in the Survey. Generally, we found about 1 of every 10 products had not been reported. Hence, for most categories, the market coverage was estimated to be about 90 percent.

Some market sectors have historically had a low response rate in previous surveys. For example, automotive windshield washer fluids are frequently produced by small companies which move in and out of the market, so tracking these companies and maintaining a complete mailing list is difficult. For categories where the coverage was determined to be low, adjustments were made by a variety of methods, including previous survey data, bar code data, estimates from industry experts, etc. These special adjustments were made in only 8 of the 100 categories surveyed.

Adjustments to the inventory to account for the incomplete market coverage inherent in the survey process is not without precedent. The U.S. EPA, in compiling their emissions estimates for their 1990 survey, increased the sales in most categories to account for incomplete market coverage. In addition, the 1994/1995 Mid-term Measures Survey results were also adjusted. Staff worked with industry members during the development of the mid-term measures to determine the survey coverage, and made adjustments to many categories.

Emission Estimates for Mid-term Measures II Categories

The 1997 emissions from the 17 categories under consideration for the Mid-term Measures II regulation is estimated to be 54 tons per day. Table IV-2 summarizes these emissions. These categories are responsible for approximately 20 percent of the total consumer product emissions.

**Table IV-2
VOC Emissions by Product Category**

Product Category	VOC Emissions Adjusted (Tons/Day)
Construction, Panel and Floor Covering Adhesives	1.00
Sealant and Caulking Compounds	1.87
Automotive Brake Cleaners (Non-aerosols)	0.34
Automotive Brake Cleaners (Aerosols)	5.26
Carburetor or Fuel-Injection Air Intake Cleaners (Non-aerosols)	0.23
Carburetor or Fuel-Injection Air Intake Cleaners (Aerosols)	6.25
Engine Degreasers (Aerosols)	1.67
Engine Degreasers (Non-aerosols)	0.08
Solvent Parts Cleaners (Aerosols) - (included under aerosol General Purpose Degreaser)	0.73
Tire Sealants and Inflators	0.89
Auto Windshield Washer Fluids	8.30
Flying Bug Insecticide (Aerosols)	0.60
Lawn and Garden Insecticides (Non-aerosols)	1.35

Product Category	VOC Emissions Adjusted (Tons/Day)
Crawling Bug Insecticides (Aerosols)	3.81
General Purpose Cleaners (Non-aerosols) - Ready-to-Use	3.18
General Purpose Cleaners - (Non-aerosols) - Dilutables	4.77
General Purpose Degreasers - (Non-aerosols) - Ready-to-Use	0.95
General Purpose Degreasers - (Non-aerosols) - Dilutables	1.09
Glass Cleaners - (Non-aerosols) - Ready-to-Use	2.27
Glass Cleaners - (Non-aerosols) - Dilutables	1.21
Furniture Maintenance Products (Aerosols)	1.98
Double Phase Aerosol Air Fresheners	4.57
Hair Mousses	0.76
Nail Polish Removers	0.85
Total	54

Adequate Data

With our estimate of 90 percent market coverage for most categories in the Survey, we feel confident that the Survey had full representation of the available technologies in the market place. This assumption has been verified by discussions with manufacturers, category research and the wide range of VOC content in the categories slated for regulation. Historically, the market sector representing the lowest coverage is the “private label” sector. This market sector does not manufacture products. They purchase products from manufacturers, then put their own brand name on them. Those products generally use the same technology as other products made by the manufacturer, and the ARB Survey had good coverage of manufacturers.

Staff has worked extensively with industry on all categories proposed for regulation. In dealing with members of industry, extensive discussions on the types of technologies used in each category have occurred. Numerous labels of products in each category were gathered, as well as product literature. Category information was obtained from trade journals, Internet sites, textbooks, and directly from manufacturers.

Adjustments for Lawsuit Commitments

The 1997 Survey results indicate that the VOC emissions from consumer products predicted in the 1994 SIP inventory were underestimated. The Survey results indicate that VOC emissions from consumer products in 1997 were about 280 tons per day. According to the 1994 SIP, VOC emissions in 1997 should have been about 200 tons per day.

Under the SIP lawsuit agreement, the ARB has committed to adopt measures to achieve 42 tpd of ROG reductions in the South Coast Air Basin (SCAB) in 2010, including measures in 1999 that would achieve 12 tons per day of ROG reductions. This proposed measure partially fulfills the ARB's ROG commitment. This commitment is based upon the SIP baseline inventory of 265 tons per day in 1990. Equivalent VOC reductions based on the new inventory are calculated by backcasting the Survey results to 1990 levels. This backcasting was performed using the following methodology:

1. For all regulated categories, we estimated the uncontrolled emissions. This was done by removing the control factor assigned for each category. For example, assume a category was expected to have a reduction of 69 percent (control factor: $1 - 0.69 = 0.31$). Then, the uncontrolled emissions in 1997 would be 3.2 times higher ($1/0.31$) than the emissions in the Survey.
2. Determine the total uncontrolled emissions in 1997. This is the sum of the emissions from all unregulated categories, the regulated category emissions with control removed, and the acetone, perchloroethylene (PERC) and volatile methyl siloxane (VMS) emissions from all categories. Inclusion of the acetone, PERC and VMS emissions is necessary since these exempt compounds were considered to be VOC's in the 1990 inventory.
3. Remove emissions from area source categories from the 1997 Survey results. Categories such as paint thinners, cold process roof cements and a portion of the adhesives and sealants are already included in the SIP inventory under area source emissions. The emissions from these categories must be removed from the consumer products inventory to avoid double-counting.
4. Remove growth from 1997 to 1990. The 1994 SIP, in predicting the growth over this period, used a statewide growth rate of 1.7 percent annually.

When these steps are performed, the uncontrolled emissions in 1990 are estimated to be about 326 tons per day. This figure is 23 percent higher than the emissions predicted in the 1994 SIP. The lawsuit estimates are then factored up by 23 percent to account for the larger inventory. In the lawsuit settlement agreement, the ARB estimated that a consumer products measure would achieve 5 to 12 tons per day of ROG emission reductions in the SCAB in 2010. The 5 to 12 ton per day estimate in "1994 SIP currency" is actually 6 to 15 tons per day of ROG emission reductions in the SCAB in 2010 based on the updated inventory using 1997 survey data.

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V.

PROPOSED AMENDMENTS TO THE CONSUMER PRODUCTS REGULATION

In this chapter, we provide a plain English discussion of the proposed amendments to the consumer products regulation, and explain the rationale for the amendments. Where applicable, key terms or concepts involved in each amendment are described. The discussion in this chapter is intended to satisfy the requirements of Government Code section 11343.2, which requires that a noncontrolling “plain English” summary of the regulation be made available to the public.

Amendments are being proposed to three sections in the regulation, section 94508, “Definitions”, section 94509, “Standards for Consumer Products”, and section 94513, “Reporting Requirements”. These are discussed below in some detail. No other amendments to the existing regulations are being proposed and the existing regulatory provisions such as exemptions and test methods will apply to the Mid-term Measures II categories as they apply to the currently regulated product categories. A few of the more significant existing regulatory provisions that will apply to the Mid-term Measures II categories are described briefly. However, for a more detailed discussion of the existing regulatory requirements, the reader is directed to the Phase I and Phase II Technical Support Documents, and the Mid-term Measures Initial Statement of Reasons (ARB, 1990; ARB, 1991; and ISOR, 1997).

A. DEFINITIONS (SECTION 94508)

Section 94508, “Definitions,” provides all the terms used in the regulation which are not self-explanatory. The proposed Mid-term Measures II amendments include new or revised definitions to help clarify and enforce the regulation. In Table V-1, we list five new definitions proposed for addition. These include two definitions for new product categories proposed for regulation, “Sealant and Caulking Compound” and “Tire Sealant and Inflator.” The three additional new definitions listed in Table V-1 were needed to clarify terminology referenced in the regulation. In Table V-2, we list nine existing definitions that are proposed for modification. In Table V-3, we list two existing definitions that are proposed for deletion.

Table V-1 New Definitions Proposed for Addition

Automotive Windshield Washer Fluid (pre-mixed)
Floor Seam Sealer
Sealant and Caulking Compound
Tire Sealant and Inflator
Waterproofer

Table V-2
Existing Definitions Proposed for Modification

Adhesive	Automotive Windshield Washer
Carburetor or Fuel-injection	Fluid (dilutable)
Air Intake Cleaner	Construction and Panel Adhesive
Existing Product	Fabric Protectant
General Purpose Adhesive	General Purpose Degreaser
Lubricant	

Table V-3
Existing Definitions Proposed for Deletion

Metallic Parts Cleaner	Household Sealants and Caulking Compounds
------------------------	---

We are proposing to modify the “Fabric Protectant” definition to clarify the intent of the definition and to make the definition more enforceable. Products which are designed for use solely on leather products, such as shoes, belts, or handbags, are proposed to be excluded from the definition. Additionally, we are replacing the phrase “silicone-based products whose function is to provide water repellency” with the term “waterproofer”. We have proposed a new definition for waterproofer to include any product that is exclusively designed and labeled for water repellency.

B. LIMITS AND REQUIREMENTS (SECTION 94509)

The proposed regulatory action would amend the existing consumer products regulation by adding product category definitions and VOC limits for two new categories, and by adding more stringent VOC limits for 15 existing categories. Some of these categories are split into subcategories for a total of 21 VOC limits. For example, the “Engine Degreaser” category is subcategorized into “aerosols” and “non-aerosols”. The new or modified VOC limits would become effective from December 31, 2002, to December 31, 2004, depending on the product category. We are also proposing to repeal the 10 percent limit for non-aerosol general purpose degreasers scheduled to become effective on January 1, 2001. This existing limit would be replaced with a more stringent three percent VOC limit for ready-to-use products, and a one percent VOC limit for dilutable products, that would become effective on December 31, 2004. For clarification purposes, we are proposing to list the categories and VOC limits in alphabetical order instead of by rulemaking action (e.g., Phase I, etc.).

The definition of VOC is contained in section 94508 (125) of the regulation, and includes most solvents and propellants used in consumer products. The VOC definition does not include, for example, inorganic solids, water, methylene chloride, perchloroethylene, 1,1,1-trichloroethane, and the propellant HFC-152a. There are three proposed effective dates by which the Mid-term Measures II categories must meet specified VOC content limits: December 31, 2002; December 31, 2003; and December 31, 2004. Seven standards would have an effective date of

December 31, 2002, two standards would have an effective date of December 31, 2003, and twelve standards would have an effective date of December 31, 2004.

**Table V-4
Proposed VOC Limits and Effective Dates**

<u>Product Category</u>	<u>VOC Limit</u>	<u>Effective Date</u>
Automotive Brake Cleaners	45	12/31/2002
Automotive Windshield Washer Fluids		
All non-Type A areas	1	12/31/2002
Carburetor or Fuel-injection Air Intake Cleaners	45	12/31/2002
Construction, Panel, and Floor Covering Adhesives	15	12/31/2002
Crawling Bug Insecticides		
(aerosols)	15	12/31/2004
Double Phase Aerosol Air Fresheners	20	12/31/2004
Engine Degreasers		
(aerosols)	35	12/31/2004
(non-aerosols)	5	12/31/2004
Flying Bug Insecticides		
(aerosols)	25	12/31/2003
Furniture Maintenance Products		
(aerosols)	17	12/31/2004
General Purpose Cleaners (non-aerosols)		
(dilutables)	1	12/31/2004
(ready-to-use)	3	12/31/2004
General Purpose Degreasers (non-aerosols)		
(dilutables)	1	12/31/2004
(ready-to-use)	3	12/31/2004
Glass Cleaners (non-aerosols)		
(dilutables)	1	12/31/2004
(ready-to-use)	4	12/31/2004
Hair Mousses	6	12/31/2002
Lawn and Garden Insecticides		
(non-aerosols)	3	12/31/2003
Nail Polish Removers	0	12/31/2004
Sealants and Caulking Compounds	4	12/31/2002
Tire Sealants and Inflators	20	12/31/2002

We are proposing to modify section 94509 (b)(1) to clarify that the dilution provision does not apply to “Automotive Windshield Washer Fluid” products sold in containers with a capacity greater than one quart. We are also proposing to add section 94509(k) to specify that consumer products that will be included in the carburetor or fuel-injection air intake cleaner and

construction, panel, and flooring covering adhesive category definitions for the first time under this rulemaking action will not be subject to VOC limits that are currently in effect.

C. OTHER SECTIONS (SECTIONS 94510-94517)

Although we are only proposing a modification to section 94513, “Reporting Requirements”, all of the provisions in sections 94510 through 94517 of the regulation apply to manufacturers of products in the Mid-term Measures II categories. These provisions include: exemptions, innovative products provision, administrative requirements, registration, variance provision, test methods, severability, and federal enforceability. We have provided a brief discussion highlighting some of the exemptions, innovative products provision, administrative requirements, and the variance provisions. For a more comprehensive discussion on these sections and for information on sections not discussed here, please see the Phase I and Phase II Technical Support Documents and the California Consumer Products Regulation (ARB, 1990; ARB, 1991; and ARB, 1997).

Exemptions

There are four exemptions in section 94510 which will be of interest to manufacturers, distributors, and retailers of products in the Mid-term Measures II categories. These include: the manufacturer’s exemption, the distributor’s exemption, the fragrance exemption, and the low vapor pressure volatile organic compound (LVP-VOC) exemption.

- *Manufacturer’s Exemption.* The manufacturer’s exemption excludes from the consumer products regulation those products that are manufactured in California for shipment and use outside of California.
- *Products sold in California but intended for use outside of California.* This exemption allows distributors or manufacturers to sell, supply or offer for sale a non-complying product if the product is to be shipped, sold, and used outside of California.
- *Fragrance Exemption.* This exemption allows up to 2 weight percent fragrance in a consumer product to be exempt from the VOC limits specified in section 94509(a).
- *LVP-VOC Exemption¹.* This exemption specifies that the limits specified in section 94509(a) do not apply to LVP-VOCs. A LVP-VOC is a volatile organic compound which contains at least one carbon atom and meets one of the following criteria: has a vapor pressure less than 0.1 millimeter of Mercury at 20 °C; has more than 12 carbon atoms, if the vapor pressure is unknown; has a

¹ Note that the provisions relating to boiling point have not yet been approved by the Office of Administrative Law and are not yet legally effective.

boiling point greater than 216 °C; or is the weight percent of a chemical “mixture” that boils above 216 °C.

Innovative Products Provision

The innovative products provision (section 94511) exempts a consumer product from the VOC limits specified in section 94509(a) if a manufacturer demonstrates by clear and convincing evidence that, due to some characteristic of the product formulation, design, delivery systems or other factors, the use of the product will result in less VOC emissions than a representative consumer product that complies with the VOC limit or the calculated VOC emissions from a noncomplying representative product, if the product has been reformulated to comply with the VOC limit.

Administrative Requirements

The Administrative Requirements Section, section 94512, sets forth the “most restrictive limit” provision and the code-dating requirements.

- *Most Restrictive Limit.* If a product could be classified in two separate categories, then the product must comply with the category with the most restrictive VOC limit.
- *Code-dating.* Each manufacturer of a consumer product subject to section 94509(a) must display on each consumer product container or package the day, month, and year on which the product was manufactured, or a code indicating such date. This date or code shall be displayed on each consumer product container or package no later than 12 months prior to the effective date of the applicable standard specified in section 94509(a) in the consumer products regulation.

Reporting Requirements

Several revisions are proposed for section 94513, “Reporting Requirements.” Basically, these revisions would expand and consolidate the reporting requirements for consumer products that contain perchloroethylene or methylene chloride, and would delete obsolete reporting requirements for hairsprays. We are proposing to: (1) modify subsection (e), “Special Reporting Requirements for Perchloroethylene-Containing Consumer Products that are subject to the Phase I or Phase II VOC Standards”; (2) delete subsection (f), “Special Reporting Requirements for Hairsprays”; and (3) delete subsection (g), “Special Reporting Requirements for Consumer Products that Contain Methylene Chloride or Perchloroethylene, and are subject to the Phase III VOC Standards.”

We are proposing to modify the reporting requirements under Subsection (e) to include all consumer products containing methylene chloride or perchloroethylene, regardless of the date the standard for the product category is adopted. It would require the responsible party for any consumer product subject to section 94509(a), which contains perchloroethylene or methylene chloride in amounts of 1.0 percent or more by weight, to submit annual reports to the ARB beginning with the year 2000 and ending with the year 2011. The annual reports, which provide information for one calendar year, will be due by March 1 of the following year (e.g. the annual report for the calendar year January 1, 2000 to December 31, 2000 will be due March 1, 2001). The annual reports will include information on the sales and formulations of products containing methylene chloride and/or perchloroethylene, and will allow ARB staff to track the use of these compounds.

Note that the existing reporting requirements under subsection (e) will be in effect until the proposed amendments become legally effective (which is expected in late 2000). As such, reporting for the 1999 calendar year will be due on March 1, 2000, under the existing provisions of subsection (e).

Subsection (f), which applies to special reporting requirements for hairsprays, is obsolete and has been deleted. This subsection required responsible parties for hairsprays with a VOC content of greater than 55 percent by weight, to submit compliance plans outlining how they would achieve compliance with the June 1, 1999, 55 percent VOC limit for hairsprays. The compliance plans are no longer required because the limit is now in effect. However, this amendment is not intended to prevent ARB staff from taking enforcement actions over failure to submit previously required plans. Companies that failed to submit such plans on time will remain legally responsible for this failure, because deleting these requirements now does not change the regulations that were on the books when the plans were due.

Subsection (g) pertained to special reporting requirements for Phase III consumer products that contain methylene chloride or perchloroethylene. Because subsection (e) has been modified to include reporting of all methylene chloride or perchloroethylene-containing consumer products, regardless of which phase of the consumer products regulation they are subject to, this subsection is no longer necessary and has been deleted.

However, the reporting requirements under subsection (g) will be in effect until the proposed amendments become legally effective (which is expected in late 2000). As such, reporting for the 1999 calendar year for Phase III product categories with initial effective dates of January 1, 2001, will be due on March 1, 2000, under the provisions of subsection (g).

Variances

If a manufacturer cannot comply with the requirements set forth in section 94509, because of reasons beyond their reasonable control, they may apply for additional time to reformulate under the variance provision in section 94514. A variance will only be granted if all of the following three criteria are met: (1) because of reasons beyond the reasonable control of the

applicant, requiring compliance with section 94509 would result in extraordinary economic hardship; (2) the public interest in mitigating the extraordinary hardship to the applicant by issuing the variance outweighs the public interest in avoiding any increased emissions of air contaminants which would result from issuing the variance; and (3) the compliance report proposed by the applicant can reasonably be implemented, and will achieve compliance as expeditiously as possible.

REFERENCES

Reduce Volatile Organic Compound Emissions from Consumer Products, Technical Support Document”, August 1990. (ARB, 1990)

State of California Air Resources Board Stationary Source Division, “Proposed Regulation to Air Resources Board, “Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation”, June 6, 1997. (ISOR, 1997)

State of California Air Resources Board Stationary Source Division, “Proposed Amendments to the Statewide Regulation to Reduce Volatile Organic Compound Emissions form Consumer Products - Phase II”, October 1991. (ARB, 1991)

The California Consumer Products Regulation (Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, Sections 94507-04517). Amended March 1997. (ARB, 1997)

VI.

DESCRIPTION OF PRODUCT CATEGORIES

In this chapter, we provide for each of the Mid-term Measures II product categories: 1) a product category description; 2) information on product use and marketing; 3) information on the product formulations; 4) a discussion of the proposed volatile organic compound (VOC) limit, our rationale for the proposed limit, and the options for compliance; and 5) if applicable, a discussion of the issues associated with the proposed VOC limit, as raised by some of the affected industry. The product categories are in alphabetical order.

A. Automotive Brake Cleaners

Product Category Description:

Automotive brake cleaners are designed to remove oil, grease, brake fluid, brake pad material, and dirt from motor vehicle brake mechanisms. These products are sometimes also labeled for use in cleaning dirt or grease from other motor vehicle parts.

Automotive brake cleaners were regulated under “Phase II” of the consumer products regulation adopted in January of 1992, and a description of these products is also included in the staff report for that item (ARB, 1991). At that time, the Board adopted a 50 percent VOC limit for these products which was effective on January 1, 1997.

Table VI-1 below summarizes the sales and emissions from automotive brake cleaners based on the results of the ARB’s 1997 Consumer and Commercial Products Survey (ARB, 1998). As shown in Table VI-1, automotive brake cleaners are sold in both the aerosol and liquid forms, with the aerosol form dominating the market. Automotive brake cleaners are one of the larger emissions sources in this regulatory effort, with estimated VOC emissions of about 5.6 tons per day (11,200 pounds per day) in California. In addition, there is a possibility that the VOC emissions could increase if Toxic Air Contaminants such as perchloroethylene are regulated in the future. ARB staff is currently investigating options for an airborne toxic control measure (ATCM) for automotive consumer products containing chlorinated compounds such as perchloroethylene and methylene chloride. If the use of these compounds is limited in the future, manufacturers may replace some of the four tons per day of perchloroethylene and three tenths of a ton per day of methylene chloride used in brake cleaners with VOC solvents.

**Table VI-1
Automotive Brake Cleaners***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Aerosol	37	25,000	10,600
Liquid	82	1,380	600
Total	119	26,380	11,200

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Automotive brake cleaners are used by both “do-it-yourself” and professional mechanics. These products are used on both disc and drum brake components such as drums, rotors, brake cylinders, linings, and springs (Kar).

Aerosol brake cleaners are typically sprayed on the entire brake assembly prior to repairs to remove gross oil, grease, or other contaminants. However, some manufacturers recommend that their products not be used on rubber parts and brake pads or linings (Kar, Ford). Brake cleaners are also used on individual components after disassembly, often to remove greasy fingerprints or other contaminants from friction surfaces.

Liquid brake cleaners are used primarily by mechanics. When using these products, mechanics disassemble brake components and immerse them in the liquid product for several minutes or longer. The product may be used repeatedly until it becomes too dirty, and must be replenished.

Some liquid products are water-based formulations used in portable “bird-bath” brake cleaning systems. These systems generally consist of a reservoir of the cleaning solution with a collection pan on top and a nozzle and brush (Clayton; Citation). Mechanics typically spray down the entire brake assembly with these systems and use the brush as necessary to clean the brake components. The dirty solution drips off the brake assembly and is collected in the pan and routed into the reservoir which may be filtered or skimmed to remove brake dust and oil, extending the life of the cleaning solution.

Automotive brake cleaners are sold primarily in auto parts stores, hardware stores, and by mass merchandisers. Manufacturers or distributors may also sell these products directly to large customers such as auto repair facilities, car dealerships, and companies that maintain their own vehicle fleets. Manufacturers of traditional solvent-based aerosol brake cleaners typically offer both a chlorinated and a nonchlorinated brake cleaner. Manufacturers have stated that the

chlorinated formulations are designed to give customers a nonflammable product, while the nonchlorinated products may not need to be disposed of as a hazardous waste. The nonchlorinated products constitute the majority of sales.

Product Formulation:

Automotive brake cleaners are typically composed almost entirely of solvents designed to remove grease, oil, and other contaminants from brake parts. As mentioned above, most manufacturers of traditional brake cleaners offer both a chlorinated and nonchlorinated formulation.

The chlorinated brake cleaners are most often composed entirely of perchloroethylene, with aerosols using a small amount of carbon dioxide propellant. However, as reported in ARB's consumer products survey, some perchloroethylene-containing formulations also contain methylene chloride and/or VOC solvents. Since both perchloroethylene and methylene chloride are exempt solvents, these products are generally below the proposed 45 percent VOC limit.

The nonchlorinated brake cleaners generally contain a variety of solvents, including acetone, toluene, methanol, hexane, heptane, and xylene (ARB, 1999). In addition, the aerosols generally contain a carbon dioxide propellant, although hydrocarbon propellants are also used in some products. Most of the nonchlorinated formulations comply with the current 50 percent VOC limit with a combination of acetone and carbon dioxide propellant. However, some formulations also incorporate water in the formulation. There are also some very low VOC water-based surfactant formulations used in the "bird-bath" brake cleaning systems mentioned earlier.

Proposed VOC Limit and Compliance:

The proposed VOC limit for automotive brake cleaners, both aerosol and liquid forms is 45 percent by weight, effective December 31, 2002. As shown in Table VI-2, using adjusted 1997 emissions, the proposed limit will result in an estimated emission reduction of 620 pounds per day or 0.31 tons per day (0.16 tpd in the South Coast Air Quality Management District in 2010).

Table VI-2 also shows that 40 percent of the market currently complies with the proposed 45 percent VOC limit. However, most of the complying products contain perchloroethylene or methylene chloride. After products containing either perchloroethylene or methylene chloride are removed from consideration, the complying market share is about four percent. The products that make up the four percent complying market share are aqueous or acetone-based formulations.

**Table VI-2
Automotive Brake Cleaners Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Emissions Reductions (lbs/day)**
Aerosol	45	37	40	580
Liquid	45	14	42	40
Total	45	51	40	620

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

The proposed 45 percent VOC limit is designed to allow manufacturers to reformulate their products without using perchloroethylene or methylene chloride. Since the 45 percent limit is close to the current 50 percent VOC limit, manufacturers can achieve compliance with relatively minor reformulation changes. Chlorinated and aqueous liquid formulations generally already comply with the proposed 45 percent limit, so this discussion will focus on the nonchlorinated solvent-based formulations. These products are expected to comply with the proposed 45 percent limit by increasing the percentage of acetone in their formulation (Berryman; CRC; Sherwin-Williams). The ARB approved the exemption of acetone as a VOC due to its low reactivity (potential to form tropospheric ozone) on September 28, 1995. Acetone is a quick-drying solvent that is currently used in most nonchlorinated brake cleaners to meet the existing VOC limit.

Other reformulation options that could be used by manufacturers to meet the proposed limit include: (1) adding water and emulsifiers to a solvent-based system to create an emulsion; (2) using alternative exempt solvents such as parachlorobenzotrifluoride (PCBTF), volatile methyl siloxane (VMS) solvents, or methyl acetate; and (3) using exempt propellants such as carbon dioxide or hydrofluorocarbon 152a (HFC-152a). However, as explained below, these options are not as likely to be utilized as acetone.

Regarding aqueous systems, microemulsion technology that could be used by brake cleaners is discussed in the literature (Dow). In addition, there are some water-containing aerosol formulations currently on the market that are well below the proposed limit. These products are marketed as safer alternatives to the existing chlorinated and solvent-based formulations. However, manufacturers have reported difficulty in formulating these types of systems to meet their customers' expectations (Kar, 4/19/99; Kar, 4/29/99; Pennzoil). In addition, if manufacturers switch to an aqueous aerosol system, they will probably replace their carbon dioxide propellant with a hydrocarbon propellant due to the potential for corrosion when using carbon dioxide with water. This would reduce the amount of usable product in the

container because the carbon dioxide propellant typically constitutes only about three to five percent of the formulation by weight, compared to 15 to 25 percent for a hydrocarbon propellant.

PCBTF, VMS solvents, and methyl acetate are exempt compounds that could be used to replace some of the existing VOC solvents in brake cleaners. However, PCBTF and the VMS solvents are much more expensive than the solvents currently used in brake cleaners. Methyl acetate is also more expensive than most of the solvents currently used and has properties similar to acetone, making it an unlikely choice over acetone.

Finally, exempt propellants could be used to lower the VOC content of aerosol brake cleaners. Carbon dioxide is already used in most products. However for those manufacturers using hydrocarbon propellants, they could significantly lower their VOC content by switching to carbon dioxide. HFC-152a could also be used to lower the VOC content of aerosol brake cleaners. However, it is more expensive than the carbon dioxide propellants generally used in brake cleaners. In addition, if a manufacturer is currently using a carbon dioxide propellant, switching from carbon dioxide to HFC-152a would increase the volume of the product taken up by the propellant and reduce the amount of usable product (referred to as “concentrate”) in the container.

Issues:

1. **Issue:** The proposed VOC limit for brake cleaners may encourage manufacturers to reformulate their products using perchloroethylene or methylene chloride.

Response: As explained in the “Proposed VOC Limit and Compliance” section above, the VOC limit is designed to allow manufacturers to reformulate their products without using perchloroethylene or methylene chloride. Manufacturers are unlikely to add chlorinated compounds to their nonchlorinated formulations because: (1) this would eliminate the benefits of a nonchlorinated product; (2) they can readily reformulate with acetone or other exempt compounds; and (3) the recognition of the potential health effects associated with perchloroethylene and methylene chloride. Nevertheless, the reporting requirements in the proposed amendments will allow ARB staff to track the use of perchloroethylene and methylene chloride in brake cleaners, and detect any increases in the use of these compounds. ARB staff is also currently investigating options for an ATCM for automotive consumer products containing chlorinated compounds such as perchloroethylene and methylene chloride.

2. **Issue:** ARB staff should propose a much lower VOC limit considering that zero or near zero water-based formulations are available.

Response: The zero and near zero water-based formulations are liquid products used in the “bird-bath” brake cleaning systems, described previously. These systems would not be feasible for “do-it-yourself” mechanics to purchase.

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Kar Products. Telephone conversation with ARB staff. April 29, 1999. (Kar, 4/29/99)

Pennzoil. Telephone conversation with ARB staff. April 28, 1999. (Pennzoil)

Sherwin Williams Company. Telephone conversation with ARB staff. July 21, 1999. (Sherwin-Williams)

B. Automotive Windshield Washer Fluids

Product Category Description:

Automotive windshield washer fluids are liquid products designed for use in motor vehicle windshield washer fluid systems either as an anti-freeze or for the purpose of cleaning, washing, bug removal, or wetting the windshield. Some products also claim to add a coating to the windshield that repels water, bugs, dirt and grime (Unelko product label, Prestone brochure). “Automotive Windshield Washer Fluid” does not include any fluid which is placed in the windshield washer reservoir of new motor vehicles at the time the vehicle is manufactured.

Automotive windshield washer fluids are sold as both ready-to-use (premixed) products and dilutable concentrates (dilutables). The premixed products make up the vast majority of the market and are generally sold in one gallon jugs. Premixed products, as one would expect, are intended to be poured directly into the fluid reservoir without any additional dilution or mixing. On the other hand, dilutable concentrates allow consumers to mix the concentrated windshield washer fluid with water to the desired concentration in a separate container or the washer fluid reservoir. These dilutable products are generally sold in sizes of one quart or less, although a few dilutable products are currently sold in half or one gallon containers.

Automotive windshield washer fluids were regulated under the Phase I Consumer Products Regulation adopted in October of 1990, and a description of these products is also included in the staff report for that item (ARB, 1990). At that time, the Board adopted a 10 percent VOC limit for these products in most areas of the State and a 35 percent VOC limit for products in “Type A” areas. “Type A” areas are regions of the State which experience colder temperatures and require a higher VOC content to prevent freezing of the fluid in the washer fluid reservoir. Specifically, Type A areas include only the following regions of California: Del Norte, Shasta and Trinity Counties; the Great Basin Valley, Lake Tahoe, Mountain Counties, and Northeast Plateau Air Basins, as defined in title 17, California Code of Regulations, sections 60105, 60108, 60111, and 60113.

As explained in the “Issues” section below, the results of the ARB’s 1997 Consumer and Commercial Products Survey for this category were incomplete. It should be noted that we also obtained incomplete results when we surveyed this industry in 1990 (*Id.*). This is because the washer fluids category is highly regionalized, with many small formulators moving in and out of the category throughout the State; making contact with enough manufacturers to obtain broad survey coverage problematic.

Consequently, we estimated the emissions and emission reductions from this category based on industry-estimated national sales of 150 million gallons per year (Prestone brochure), an assumed California proportion of national fluid consumption of 10 percent, and our shelf survey-based estimate of 5 percent average VOC content. Our estimate of 5 percent average VOC content is based on our observation that at least half of the shelf space occupied by

windshield washer fluids in non-Type A areas appears to be taken by zero-VOC products (i.e., those that have no freeze-point depression as indicated by their labels). Because the current limit is 10 percent VOC by weight, the mid-point of 5 percent VOC seems reasonable as an estimate of the average VOC content for these products. At least one manufacturer has also cited 5 percent as the average VOC content of “summer” formula products (Somesla, 1993).

Table VI-3 below summarizes our estimate of sales and VOC emissions from automotive windshield washer fluids based on the previous discussion. As shown in Table VI-3, automotive windshield washer fluids are the largest source of emissions in this regulatory effort, with estimated VOC emissions of about 8.3 tons per day (16,600 pounds per day) in California. Based on our shelf surveys, we estimate the premixed form accounts for about 95 percent of the California market by weight.

It should be noted that the 8.3 tons per day VOC emissions estimated through this approach is fully consistent with the methodology used in the original Phase 1 rulemaking and in the development of the 1994 State Implementation Plan (SIP) (ARB Workshop, 5/18/99). Indeed, the SIP methodology calculates the same emissions (8.3 tons per day) as the methodology described in this section. Because these two different methodologies (SIP vs. Industry-based) achieve equivalent results, we have high confidence that the approach we used to estimate emissions and reductions for this category is defensible and based on the best available data.

**Table VI-3
Automotive Windshield Washer Fluids***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs./day)**
Premixed (non-Type A)	40	315,000	15,800
Dilutable (non-Type A)	15	16,600	830

* Number of products for premixed and dilutables are rough estimates based on ARB staff’s shelf survey.

** Based on Prestone estimate of 150x10⁶ gallons/yr U.S. consumption and assumed California proportion of 10% of U.S. consumption; 5% average VOC (i.e., half California market at 0% and half at 10% VOC by weight based on ARB staff’s shelf survey.)

Product Use and Marketing:

Automotive windshield washer fluids are sold in auto parts stores, car dealerships, hardware stores, grocery supermarkets, convenience stores, and in mass-merchandisers

(Automotive Marketing). These products are also sold directly to businesses such as car dealerships and fleet maintenance companies (*Id.*).

Windshield washer fluids, particularly the premixed fluids, are among the easiest of automotive products to apply; nearly half of the respondents to a recent industry survey who use washer fluids consider themselves light do-it-yourself (DIY) consumers (Automotive Marketing). This is not surprising for premixed fluids, which users typically pour into the washer reservoir with minimal effort and cleanup and without following dilution instructions.

Automotive windshield washer fluids are periodically added to the vehicle reservoir by the DIY consumer or automotive repair facility as needed. A small pump moves the fluid through tubing until it is squirted onto the windshield(s) through orifices at the base of the front windshield and the top of the rear windshield (if applicable). In a similar fashion, windshield washer fluid can also be routed through separate tubing and sprayed onto the headlights of some newer vehicles to remove dirt and insects from the headlight lenses.

Requiring the physical “squeegee” action of the wiper blades, washer fluids help remove ice, dirt, bugs, dust and other contaminants from the windshield. Drivers typically squirt these products onto their vehicle windshield when they first start the vehicle to remove ice or accumulated dust. They may also apply them while driving to remove bugs or other contaminants that contact the windshield when the vehicle is moving. Washing bugs and other contaminants off the windshield with washer fluid as soon as possible after contact is the recommended practice (Prestone brochure), which aims to keep the still-moist insect remains and other contaminants motile until they are physically removed by the wiper blades. After insect bodies or tree sap have dried on the windshield, even so-called “premium” washer fluids may be inadequate for removing these contaminants, requiring the consumer to resort to conventional glass cleaning manual procedures (*Id.*).

There are significant differences in consumer expectations of windshield washer fluids and ordinary glass cleaners caused by differences in the way these products are used. Windshield washer fluids can only clean the “wipe area” of the windshield (i.e., the area which is swept by the wiper blades), whereas glass cleaners are intended for application to the entire glass surface. Also, glass cleaners are designed for an essentially unlimited residence time on the glass (Prestone, July 1999). In contrast, washer fluids are removed from the glass surface almost immediately in most late-model cars by the action of the wiper blades, which are automatically activated soon after the fluid is applied to the windshield (*Id.*).

Because of the differences in the way washer fluids and glass cleaners are used, we believe most consumers expect washer fluids to provide only enough cleaning of the windshield’s wipe area to return the windshield to a driveable and safe condition. Conversely, it seems reasonable to assume that most consumers do not expect washer fluids to provide the same thorough cleaning as glass cleaners that are applied by hand for an amount of time limited only by the consumer. Windshield washer fluids are not expected to provide the same aesthetic cleaning as glass

cleaners, because the washer fluids can only clean the wipe area dictated by the wiper blades, not the entire windshield. According to the Federal Motor Vehicle Safety Standard (FMVSS) No. 104, windshield washer systems (fluid in combination with the wiper blades) are only required to clean 75 percent of three specified areas of the windshield (USEPA). This means that up to 25 percent of the windshield will be unaffected by the washer fluid, limiting the aesthetic cleaning ability of the washer fluid.

Product Formulation:

Because these products are found in both premixed and dilutable concentrates, the VOC content of automotive windshield washer fluids ranges from zero to 100 percent, with the current average estimated to be around 5 percent as noted previously. While there is some variation, the formulations are relatively simple and straightforward. At a minimum, most products contain water, dye, and surfactants (e.g., Pluronic L-62, Triton N-101, and Igepal CO-630 surfactants). Those products that have VOCs usually contain methanol, although isopropanol, propylene glycol, and other VOCs can also be used (20/10 MSDS for “20/10 All Season Windshield Cleaner”). To supplement the inherent solvency of water, some products contain other ingredients such as ethylene glycol, certain glycol ethers, and other substances that qualify as non-regulated, low vapor pressure (LVP) VOCs under section 94508 of the consumer products regulation (20/10 MSDS for “20/10 Concentrated Instant Windshield Cleaner”).

The VOCs in windshield washer fluids serve several purposes. First, the VOCs typically serve as freeze-point depressors in most fluids (Somesla, 1993). However, methanol is by no means the only freeze-point depressor available; Somesla notes that ammonium acetate (a non-VOC under section 94508, title 17, CCR), provides equivalent freeze-point depression in carefully-formulated, commercially-produced washer fluids (*Id.*, at pp. 4-7). Moreover, freezing-point depression is largely irrelevant during California’s spring, summer, and fall seasons, which cover the entire ozone season. Freezing protection to maintain liquid in the reservoir for use on the windshield is only required during freezing conditions which, in California, is relatively rare outside of the “Type A” areas as defined in section 94509 of the consumer products regulation.

Organic compounds, including methanol, can also serve as growth inhibitors (Somesla, *op cit.*). This is an important function for preventing mold and algae growth in the reservoir and tubing of the windshield washer system. However, as with freeze-point depressors, methanol is not the only growth inhibitor available. Several varieties of glycol ethers are currently used as growth inhibitors and de-icing materials in airplane systems (Dow Glycol Ethers Handbook). A number of these glycol ethers would qualify as non-regulated LVP-VOCs. Manufacturers could therefore use one or more of several commercially-available glycol ethers to inhibit growth and provide freezing-point depression while meeting the proposed limit.

As noted previously, another purpose for VOCs in windshield washer fluids is to supplement the inherent solvency of water. Such ingredients are used to help solubilize windshield contaminants so that the wiper blades can remove them. However, the substantial market presence of near-zero washer fluids in California appears to contradict the notion that VOCs are absolutely required to meet consumer demands and expectations for windshield washer fluids. Based on our observations of the amount of shelf-space occupied by near-zero products, it appears that at least 50 percent of the fluids in the market have little or no VOCs (as indicated by the lack of freeze-point depression on their label). Thus, California consumers have shown, through their purchases, that near-zero washer fluids are providing the desired performance in cleaning windshields to a safe and driveable condition.

Proposed VOC Limit and Compliance:

The proposed VOC limit of one percent is shown in Table VI-4, and would be effective December 31, 2002. Our proposal affects only products sold in non-Type A areas. The mountainous, Type A areas will continue to have the existing 35 percent VOC limit applicable to any size container, calculated after the minimum recommended dilution. Therefore, our proposal maintains the current freezing protection needed by consumers in frigid conditions.

For the non-Type A areas, we are proposing a one percent by weight VOC limit for dilutable products, calculated after the minimum recommended dilution. Because dilutable concentrates are predominately found in small containers, we are defining dilutable concentrates as those products which are packaged in quart containers or smaller. This means that products in a quart or smaller container can have any VOC content, provided the label clearly instructs the user to dilute the product so that the resulting solution contains no more than one percent by weight VOC. Consumers typically purchase dilutable products, which tend to be more expensive per ounce than premixed products, with the expectation that they will be able to dilute the product into a larger volume of solution. Our definition for dilutable washer fluid is therefore consistent with ordinary consumer expectations for dilutable products.

In contrast, we are defining premixed washer fluids as those liquids packaged in containers larger than a quart. Premixed fluids are most typically found in half-gallon and one gallon containers, so this definition is consistent with current marketing practices. We are also proposing a one percent by weight VOC limit for premixed products, calculated for the product as found in the packaging (i.e., no dilution of the product is allowed). This means that all premixed fluids would be limited to a maximum of one percent VOC in the container.

By limiting premixed fluids to one percent VOC in the container, we intend to maximize the effectiveness of the proposed limit in reducing emissions from this category. As noted previously, the current market is comprised predominately of premixed products, with about 95 percent by weight comprised of premixed fluids. By definition, premixed products are products intended for the consumer to pour directly into the fluid reservoir without dilution. If we do not define dilutables as those products packaged in the smaller containers, manufacturers

could circumvent our emission reduction goals by placing a high VOC premixed product in a larger container with dilution instructions that would technically “meet” the one percent VOC limit. It is highly likely that typical consumers who purchase these “dilutable” products in large containers would not dilute them as directed, since they would look exactly the same as premixed products (i.e., in the same type of one gallon container). Under this foreseeable scenario, consumers would negate our emission reduction goals by using such “dilutable” products as-is in the reservoir (see “Issues” for additional discussion).

**Table VI-4
Automotive Windshield Washer Fluids Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Dilutable (non-Type A)	1	0***	0***	0
Premixed (non-Type A)	1	30	50	14,200

* Based on 1997 Consumer and Commercial Products Survey (Survey, 1998) and the staff’s store shelf surveys.

** Assumes premixed = 95% of the market, products going from 10% to 1%.

*** Compliance for all existing dilutables would require simple changes to the dilution instructions. All dilutables would therefore be theoretically capable of meeting the proposed limit. Some reductions will likely happen when users are instructed to dilute to 1%, but compliance with label instructions is difficult to measure and therefore no estimate of reductions from the dilutable limit was made. The dilutable limit is designed primarily to prevent circumvention of the premixed limit, as discussed earlier.

As noted earlier, windshield washer fluids are among the most straightforward of the products affected by the staff’s proposal. We therefore anticipate no particular difficulties in reformulating products to comply with the proposed limit. Indeed, we estimate that approximately half the market already meets the proposed limits, and the remaining portion of the market should have little difficulty in finding the right combination of water, surfactants, VOCs, LVP-VOCs, and dyes to market successful complying products.

Besides commercially available products, complying formulations can be gleaned from industry literature. Dow Chemical describes several formulations for very low VOC, complying

formulations in The Glycol Ethers Handbook, two of which (both zero VOC) are shown as follows:

Water-Based Summer Use Windshield Washer Solution (Glycol Ethers)

<u>Ingredients</u>	<u>Weight Percent</u>
Dowanol PM Glycol Ether	16.00
Dowanol DPM Glycol Ether	6.00
Pluronic L-62 Surfactant	0.02
Water	77.98

Water-Based Summer Use Windshield Washer Solution (Glycol Ethers/Silica)

<u>Ingredients</u>	<u>Weight Percent</u>
Dowanol PM Glycol Ether	5.00
Dowanol DPM Glycol Ether	5.00
Colloidol Silica	4.00
Dowfax 2A1 Surfactant	0.05
Water	85.95

Reproduced from: Dow Chemical U.S.A., The Glycol Ethers Handbook, Midland MI 48640

Issues:

1. Issue: The market data used to support the staff's proposal is an inadequate basis for proposing a limit.

Response: The staff's proposal is based on the best available data, relying on an estimate of national sales volume provided by a recognized manufacturer (Prestone brochure). As noted earlier, this methodology corroborates the result achieved by using the approach used in the 1994 SIP and the original Phase 1 rulemaking. Our methodology therefore represents a legally and scientifically defensible analysis of this product category's emissions and potential emission reductions in California.

2. Issue: The one percent limit would cause freezing problems as consumers purchase complying products in non-Type A areas and then travel to the Type A areas during winter.

Response: The proposal is designed to provide consumers with the freezing protection they need under the ambient conditions present at their location. For example, consumers located in a non-Type A area who are anticipating travel to a Type A area during winter can purchase a dilutable concentrate in a quart container. The consumer would then dilute the product and use it as instructed while in the non-Type A area, then apply the product at a higher concentration when travel to the Type A area commences. Alternatively, the consumer can use up the product already in the reservoir while in the non-Type A area, then purchase 35 percent VOC compliant

product at a local store in the Type A area.

Consumers can take either of these approaches under the existing limits, and we are not proposing to change the freezing protection provided by the current limits. However, it must be emphasized that with regard to washer fluids, similar to other functional fluids such as engine oil, the consumer is ultimately responsible for ensuring that their vehicle is properly prepared for the ambient conditions expected to be encountered.

3. Issue: The one percent limit would keep consumers from getting efficacious, higher VOC products that are superior in removing bugs and other road contaminants. The result would be increased streaking which, in turn, could increase traffic accidents due to impaired visibility (Prestone).

Response: The commenter provided no credible evidence that supports the claim that high VOC levels are required to remove bugs and other contaminants. Every premixed fluid staff purchased during the store shelf survey had label claims of efficacy in cleaning bugs and other road contaminants. Even the commenter's specifically-identified competitor in the so-called "premium" fluid niche market (Prestone, July 1999)-- Rain-X Plus Windshield Washer Fluid -- contains no more than 2.4 percent VOC (as indicated on its label), and this product claims superior efficacy against insects on windshields.

On the other hand, even the commenter's own product label suggests that a high level of VOC may not adequately remove dried bug splatter. Prestone's product label instructs the user to apply the product as soon as possible after encountering bug splatter. If the bug or other difficult stain is baked or dried on, the user is told that the product may not remove the stain and other manual cleaning procedures may be required (Prestone brochure). This suggests that the key to bug removal is not high VOC content, but rather the immediate application of washer fluid while the bug stain is still moist. The immediate application of fluid at such time helps ensure that the stain remains solubilized until removed by the physical "squeegee" action of the wiper blades.

Moreover, there are solid, no-VOC products designed to be dissolved in the reservoir which claim superior insect removal efficacy. For example, 303 Products' "Instant Windshield Washer Tablets" is claimed by the manufacturer to be "especially formulated to completely remove road film, dirt and grime leaving windshields sparkling clean." Testimonials published by the manufacturer attest to the product's efficacy against Florida "love bugs," which leave a reportedly thick, sticky, and very difficult stain to remove from windshields (303 product label; 303 internet site).

With regard to the implication that driver safety is potentially compromised by the proposed limits, the commenter again provided no evidence suggesting such an impact from the proposed limits. Indeed, the available evidence suggests no such linkage is likely. Zero and near-zero VOC fluids have been available for years in California and now account for about half of the market. If these products were causing accidents, it is hardly conceivable that consumers

would continue to purchase them at current rates.

Also, an extensive search of available databases with traffic accident statistics showed no such cause-and-effect relationship between reduced VOC content and increased traffic accidents. ARB staff conducted online searches of the Internet-based databases of the Department of Transportation's National Highway Traffic Safety Administration (NHTSA, 1998), the Insurance Institute for Highway Safety, the California Office of Traffic Safety, the California Department of Motor Vehicles, the California Highway Patrol, and the United States Consumer Protection Safety Commission (U.S. CPSC). Of these, only the U.S. CPSC's database had any reference to problems related to windshield washer fluid. In the one reference staff found, the U.S. CPSC required the recall of Petroleum Packers' "XCELI Windshield Washer Fluid" because of inadequate or missing warning labels and cautionary language to warn the user about the dangers of methanol in the product (USCPSC, 2/25/97). No other references related to windshield washer fluids, near-zero VOC or otherwise, were found in any of these comprehensive databases. In short, there is no evidence that near-zero VOC washer fluids have or will have any adverse impacts on a responsible driver's ability to drive safely.

4. Issue: The staff proposal provides an inadequate basis for requiring dilutable concentrates in one quart or smaller containers.

Response: As noted earlier, the staff's proposal to define dilutable concentrates as those products packaged in one quart or smaller containers is designed to prevent manufacturers from circumventing the emission reduction goals of this rulemaking. Without this definition, manufacturers could package high-VOC washer fluids in a half- or one-gallon container, which to the consumer would resemble premixed, ready-to-use products already on the shelf in similarly-sized containers. The consumers would then unwittingly pour the product into the fluid reservoir and use it as-is without any further dilution, thereby negating the emission reduction benefits of the staff proposal. Because this category's emission reductions represent approximately 35 percent of the total statewide reductions from this rulemaking, it would be prudent to minimize or eliminate this type of circumvention or any other possible circumvention of the proposed limit.

There are several compelling reasons why we are concerned about the potential for circumvention of the 1 percent limit without the small container definition for dilutable concentrates. First, some manufacturers already market high-VOC washer fluids in 1 gallon containers that have no indication on their principal display panels (i.e., the front label) that the product is intended to be diluted (Zep). In contrast, dilutable concentrates are packaged in smaller containers and are clearly labeled as concentrates that are intended to be diluted prior to use (see, for example, Prestone "Windshield Washer Concentrate" label on a 23 fluid ounce container, and Polar "Windshield Washer Concentrate" label on a 16 fluid ounce container). Even in cases where the principal display panel indicates the product is to be diluted prior to use, the dilution instructions appear on the back panel and may be either difficult to read or decipher. See Recochem's "All Season Windshield Washer" product label, which refers to the non-layman, regulatory definitions of "Type A" areas (Recochem). Finally, at least one manufacturer has

stated that, without the small container definition, it intended to meet the proposed 1 percent VOC limit for its existing, higher-VOC washer fluid by simply placing dilution instructions on its 1 gallon containers, despite the fact that the product appears to be intended as a ready-to-use product (Prestone, July 1999).

Because of these reasons and the fact that nearly all ready-to-use washer fluids are packaged in 1 gallon containers, it is reasonable to conclude that many consumers will likely ignore dilution instructions on large containers and use such products as-is, thereby negating to a significant extent the projected emission reductions from the VOC limit. We therefore believe the most reasonable way to minimize the potential for this circumvention is to require all dilutable washer fluids to be packaged in 1 quart or smaller containers, which consumers already associate with dilutable products (Prestone “Windshield Washer Concentrate” label for a 23 fluid ounce container, and Polar “Windshield Washer Concentrate” label for a 16 fluid ounce container, *op cit.*).

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C. Carburetor or Fuel-injection Air Intake Cleaners

Product Category Description:

Carburetor or fuel-injection air intake cleaners are products designed to remove fuel deposits, oil, dirt, and other contaminants from carburetors, chokes, and associated linkages, or the air intake systems of fuel injected vehicles. Some manufacturers also claim that their products remove deposits from fuel injectors, engine intake valves, and the combustion chamber. However, these deposits are more commonly removed by products designed to be introduced directly into the fuel lines or added to the fuel storage tank. These products are not subject to the proposed amendments.

Removal of fuel deposits is necessary because they can cause driveability problems such as hard starting, rough idling, and poor mileage. These deposits are formed by the oxidation and polymerization of fuel components, particularly olefins, and can form inside carburetor throats, idle air circuits, metering jets, and on throttle and choke plates (Owen and Coley). Deposits can also form in the air intake systems of fuel injected vehicles, particularly inside throttle bodies and on throttle plates. Removal of oil and dirt from the external surfaces of carburetors and throttle

bodies is desirable because contaminants can sometimes cause linkages or other moving parts to stick.

Carburetor cleaners were regulated under “Phase II” of the consumer products regulation adopted in January of 1992, and a description of these products is also included in the staff report for that item (ARB, 1991). At that time, the Board adopted a 75 percent VOC limit for these products that was effective on January 1, 1995. However, we are proposing to update the definition to include products designed to clean the air intake systems of fuel-injected vehicles. These products provide a similar function, the removal of fuel deposits and other contaminants. In fact, some products are labeled for use on both carburetors and fuel-injection throttle bodies (Dorman; Kar Products). We expect to see a trend toward the fuel-injection air intake cleaners as fuel injected vehicles continue to replace older vehicles with carburetors.

Table VI-5 below summarizes the sales and emissions from carburetor or fuel-injection air intake cleaners based on the results of the ARB’s 1997 Consumer and Commercial Products Survey (ARB, 1998). As shown in Table VI-5, carburetor and fuel-injection air intake cleaners are sold in both aerosol and liquid forms, with the aerosol form dominating the market. This category is one of the largest emissions sources in this regulatory effort, with estimated VOC emissions of about 6.5 tons per day (13,000 pounds per day) in California. However, this estimate did not attempt to determine the portion of VOC’s that may be combusted (see “Issues” section at the end of this chapter). We also did not attempt to estimate the emissions from fuel-injection air intake cleaners that did not report in the ARB survey. As explained in the “issues” section at the end of this chapter, we believe we have sufficient information to regulate fuel-injection air intake cleaners.

**Table VI-5
Carburetor or Fuel-injection Air Intake Cleaners***

Product Form	Number of Products	Adjusted Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Aerosols	12	18,400	12,600
Liquids	61	1,060	460
Total	73	19,460	13,060

* Based on the 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Carburetor and fuel-injection air intake cleaners are used by both “do-it-yourself” and professional mechanics. They are used both during routine maintenance and during repairs. Both aerosol and liquid products are sold, and these forms are used differently.

The aerosols are used to quickly remove deposits from carburetors, throttle bodies, and

associated parts, usually while they are still attached to the engine. Aerosols can be used to remove fuel deposits from the inside surfaces of carburetors by spraying into the carburetor throat while the engine is running. The solvents in the product combine with the fuel and are carried throughout the inside passages of the carburetor, eventually reaching the combustion chamber.

For the liquid products, carburetors and associated parts are generally disassembled and immersed in a container of the liquid product. Some products include a basket that can be used to hold parts that are immersed (Berryman). Often sensitive parts such as plastics or rubbers must be removed prior to immersion.

Carburetor cleaners are sold in auto parts stores, hardware stores, and mass merchandisers. Carburetor cleaners are also sold directly, or through specialized distributors, to commercial businesses such as auto repair facilities, car dealerships, and companies that maintain their own vehicle fleets.

Product Formulation:

Carburetor cleaners are composed primarily of a variety of solvents designed to dissolve fuel deposits, oil, and dirt. The most commonly used solvents are: (1) aromatic hydrocarbons such as toluene, xylene, and light or heavy aromatic solvent naphtha; and (2) oxygenated solvents such as methanol, acetone, methyl ethyl ketone, and 2-butoxyethanol (ARB, 1999). Chlorinated solvents such as methylene chloride, monochlorotoluene, and perchloroethylene are also used in some products.

Although water alone does not dissolve fuel deposits or oils, it is used in conjunction with other ingredients in some products (Hurrifair, Kar Products, Guardsman). One manufacturer reported that the water in their formulation creates steam inside the combustion chamber that can help to remove combustion chamber deposits when aided by the other ingredients in the formulation (Guardsman).

In addition to the solvents mentioned above, some products contain specialized ingredients designed to aid in cleaning. These ingredients include soaps such as ammonium oleate, and cresylic acid (Guardsman, Berryman).

Most aerosol products are solvent-based formulations containing a balance of aromatic hydrocarbons and oxygenated solvents, with either a carbon dioxide propellant, a hydrocarbon propellant such as propane, or a hydrocarbon blend such as A-85 or A-46 (ARB, 1999). The sales-weighted average VOC content of aerosol products is 68 percent. Most products meet the current 75 percent VOC limit using a combination of acetone and carbon dioxide propellant. However, some products containing significant amounts of water or chlorinated solvents are well below the current 75 percent VOC limit. Products designed exclusively for fuel-injection air intake systems are not currently subject to the 75 percent limit and are in some cases 100 percent VOC.

Since aerosol products are designed to be sprayed down the carburetor throat, they are subject to United States Environmental Protection Agency (U.S. EPA) regulations for fuel additives (USEPA, 40CFR79; USEPA, 4/6/99). These regulations require manufacturers to register their formulations. The U.S. EPA also required manufacturers to collectively fund a literature search on the potential health effects of using their products. Currently, manufacturers can only register formulations with compounds containing five elements: carbon, hydrogen, oxygen, nitrogen, and sulfur. However, formulations containing other elements were registered prior to the 1990 Clean Air Act Amendments. These formulations have been essentially “grandfathered” from the requirement that they contain only compounds with the five elements mentioned (USEPA, circa 5/17/99). Some of these grandfathered products contain chlorinated solvents such as methylene chloride and perchloroethylene.

The liquid products are formulated with many of the same solvents as the aerosol products. However, the usage of water and exempt chlorinated solvent is greater overall, reducing the sales weighted-average VOC content to 43 percent.

Proposed VOC Limit and Compliance:

The proposed VOC limit for carburetor or fuel-injection air intake cleaners is 45 percent by weight, effective December 31, 2002. As shown in Table VI-6, using adjusted 1997 emissions, the proposed limit will result in an estimated emission reduction of 2.2 tons per day (4,400 pounds per day) in California (1.2 tons per day in the South Coast Air Quality Management District in 2010).

Table VI-6 also shows that about eight percent of the market currently complies with the proposed limit, with a much greater percentage of the liquid products complying compared to the aerosols. The complying products are primarily either water-based or acetone-based formulations.

**Table VI-6
Carburetor or Fuel-injection Air Intake Cleaners Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Emissions Reductions (lbs/day)**
Aerosol	45	4	4.7	4,200
Liquid	45	3	>70	100
Both	45	7	8.4	4,400

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emission reductions adjusted for complete market coverage (see Chapter IV).

A 75 percent VOC limit (effective 1/1/95) was established for carburetor and choke cleaners when the Phase II consumer products regulation was adopted in January of 1992. However, there are now more reformulation options available than there were in 1992. Specifically, acetone and methyl acetate have been exempted from the VOC definition. These solvents are reportedly excellent for dissolving fuel deposits (Chevron). Acetone is probably the most likely choice of the two because it has properties similar to methyl acetate, but is less expensive. Manufacturers have reported that they plan to meet the proposed 45 percent limit, at least in part, with acetone (Berryman, 7/99; Sherwin-Williams, CRC).

Other reformulation options that could potentially be used by manufacturers include: (1) water-based formulations; (2) using low vapor pressure (LVP) solvents; and (3) using exempt propellants such as carbon dioxide (if not already used) or hydrofluorocarbon 152a (HFC-152a). Regarding aqueous systems, there are some water-containing aerosol carburetor cleaners on the market that comply with the proposed limit. Some of these products are marketed as safer alternatives to the existing chlorinated and solvent-based formulations (Kar, 4/19/99). However, manufacturers have reported difficulty in formulating these types of systems to meet their customers' expectations (Kar Products, 4/19/99). In addition, if manufacturers switch to an aqueous aerosol system, they may need to replace their carbon dioxide propellant with a hydrocarbon propellant due to the potential for corrosion when using carbon dioxide with water. This would reduce the amount of usable product in the container because the carbon dioxide propellant typically constitutes only about three to five percent of the formulation by weight, compared to 15 to 25 percent for a hydrocarbon propellant.

LVP solvents that could potentially be used include dimethyl adipate (a dibasic ester) and certain hydrocarbon distillates. Formulations containing dimethyl adipate and other dibasic esters have been reported to be effective in removing fuel deposits (DuPont). Manufacturers have also mentioned that LVP distillates may potentially be used unless they are found to leave residues (Sherwin Williams, CRC).

Finally, exempt propellants could be used to lower the VOC content of aerosol carburetor

or fuel-injection air intake cleaners. Carbon dioxide is already used by a large segment of the industry. However for those manufacturers using hydrocarbon propellants, they could significantly lower their VOC content by switching to carbon dioxide. HFC-152a could also be used alone or blended with a hydrocarbon propellant. However, it is much more expensive than the carbon dioxide and hydrocarbon propellants now used in brake cleaners. In addition, if a manufacturer is currently using a carbon dioxide propellant, switching from carbon dioxide to HFC-152a would increase the volume of the product taken up by the propellant and reduce the amount of usable product (referred to as “concentrate”) in the container.

Most carburetor and fuel-injection air intake system cleaners will not be able to reformulate using chlorinated compounds. This is because most of these products are regulated by the U.S. EPA as fuel additives. As explained previously in the “Product Formulation” section, new formulations cannot be registered if they contain compounds with elements other than carbon, hydrogen, oxygen, nitrogen, and sulfur.

Issues:

1. **Issue:** Manufacturers have pointed out that the 1997 ARB Consumer and Commercial Products Survey requested information only on carburetor and choke cleaners. Therefore, we should not expand the definition of carburetor-choke cleaners to include fuel-injection air intake cleaners.

Response: We believe we have adequate data to update the carburetor/choke cleaner definition to include fuel-injection air intake cleaners. Although the survey did not specifically request information for fuel-injection air intake cleaners, some manufacturers reported these products as carburetor/choke cleaners. This is because the products are similar, and in some cases are labeled for use on both carburetors and fuel-injection air intake systems. Both carburetor cleaners and fuel-injection air intake cleaners are designed to remove fuel deposits and other contaminants from metal surfaces, and they are formulated similarly.

2. **Issue:** Some manufacturers have stated that fuel-injection air intake cleaners should not be regulated because the primary means of reformulation is increasing the amount of acetone in the formulation, and some throttle bodies of fuel-injected vehicles have teflon coatings that are incompatible with acetone.

Response: ARB staff contacted manufacturers of fuel-injection air intake cleaners, the Automotive Chemical Manufacturers Council, and several automobile manufacturers to request service bulletins or other information that would verify whether the coatings on throttle bodies or other components of fuel-injection air intake systems could be damaged by acetone or other solvents. Based on this investigation, ARB staff found that some Ford vehicles have throttle bodies with teflon coatings that are labeled “Do not clean or adjust” (Ford). No other information was provided to indicate that acetone would be incompatible with other vehicles or components. Based on this information, we believe manufacturers could reformulate fuel-injection air intake

systems using acetone. In addition, manufacturers have other reformulation options as discussed in the previous section “Proposed VOC Limit and Compliance.”

3. Issue: Some of the VOC’s in carburetor or fuel-injection air intake cleaners are combusted during use, reducing actual emissions.

Response: We realize that some portion of the VOC’s in carburetor and fuel-injection air intake cleaners will be combusted. For example, when aerosol products are sprayed down the carburetor throat while the engine is running, much of the product is carried along with the fuel into the combustion chamber. However, aerosol products are also sprayed on the outside of carburetors, chokes, and linkages, and are used for general degreasing of tools and other objects (Berryman, 12/97). In addition, many liquid products are designed for use in dip containers and would not have a combustion fate. We have no information that would allow us to estimate the proportion of VOC’s that are combusted.

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D. Construction, Panel, and Floor Covering Adhesives

Product Category Description:

Construction, Panel, and Floor Covering Adhesive is defined as any one-component adhesive that is designed exclusively for the installation, remodeling, maintenance, or repair of: (a) structural and building components that include, but are not limited to, beams, trusses, studs, paneling (drywall or drywall laminates, fiberglass reinforced plastic (FRP), plywood, particle board, insulation board, pre-decorated hardboard or tileboard, etc.), ceiling and acoustical tile, molding, fixtures, countertops or countertop laminates, cove or wall bases, and flooring or subflooring; or (b) floor or wall coverings that include, but are not limited to, wood or simulated wood covering, carpet, carpet pad or cushion, vinyl-backed carpet, flexible flooring material, nonresilient flooring material, mirror tiles and other types of tiles, and artificial grass. Construction, panel, and floor covering adhesive does not include units of product, less

packaging, which weigh more than one pound and consist of more than 16 fluid ounces. Also, construction, panel, and floor covering adhesives that are sold in containers of one fluid ounce or less are exempt from the VOC limit.

The local air pollution control districts in California regulate the use of larger sizes (greater than 16 fluid ounces or one pound) and industrial-use adhesives. Currently, the following nine districts have adhesive regulations: Bay Area Air Quality Management District (AQMD), El Dorado County Air Pollution Control District (APCD), Placer County APCD, Sacramento Metropolitan AQMD, San Joaquin Valley Unified APCD, South Coast AQMD, Ventura County APCD, Yolo-Solano AQMD, and San Diego County APCD.

In December 1998, the ARB published the document titled “Determination of Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) for Adhesives and Sealants” (RACT/BARCT) (ARB, 1998b). The members of the California Air Pollution Control Officers Association’s Adhesives Committee (which includes ARB staff) developed the RACT/BARCT for the purpose of meeting California Clean Air Act requirements and to provide consistency between district rules. The RACT/BARCT contains suggested VOC limits for adhesives and sealants used in commercial and manufacturing processes that are regulated by the districts. As mentioned above, the districts also regulate adhesives sold in containers larger than 16 fluid ounces or one pound. The VOC limits in the RACT/BARCT are largely based on limits adopted in existing district adhesive and sealant rules. The district and RACT/BARCT limits are established on the basis of grams VOC per liter [g/l], less water and exempt solvents. There are VOC limits for seven subcategories in the RACT/BARCT that relate to the construction, panel, and floor covering adhesive category for consumer products. Most of the VOC limits for these subcategories range from 130 g/l to 250 g/l, however, there is one specialty substrate VOC limit of 660 g/l.

Volatile organic compound limits and the small size requirements were first introduced for consumer product adhesives during the development of the ARB “Phase II” consumer products regulation. Two subcategories, “Aerosols” and “All Others (General Purpose),” were described in the “Phase II” staff report, technical support document, and appendices (ARB, 1991a, 1991b, 1991c). Prior to the “Phase II” Board hearing (January 9, 1992), two additional adhesive subcategories, “Construction and Panel Adhesive” and “Contact Adhesive” were added to the list of “Phase II” categories for regulation. The VOC limit for “Construction and Panel Adhesive” is currently 40 percent, by weight, which became effective on January 1, 1995.

In the ARB survey (ARB, 1998a), “Carpet and Tile Adhesives” and “Construction and Panel Adhesives” were reported as separate categories. However, we combined the two categories to form the new category “Construction, Panel, and Floor Covering Adhesive.” We believe this is appropriate because the products in both categories are distributed similarly, used in the construction, remodeling, maintenance, and repair of residential and commercial buildings, and have an overlap on how they were reported in the survey. Floor covering adhesives are not

proposed to be subject to a VOC limit until the effective date of the proposed limit for the combined category.

Table VI-7 below summarizes the sales and emissions from construction, panel, and floor covering adhesives based on the sales and emissions of the small sizes (16 fluid ounces or one pound) of adhesive products sold in California. The information in Table VI-7 does not include non-aerosol adhesive products that are sold in larger container sizes, which are regulated by most of the larger air pollution control districts in California.

Based on the ARB survey, 74 construction, panel, and floor covering adhesives were sold in California in 1997. The sales in this adhesive category are estimated at 8,880 pounds of product per day. After adjusting for market coverage, the 1997 VOC emissions are estimated at 2,000 pounds per day from the sales of small size containers. The sales-weighted average for the small size containers of construction, panel, and floor covering adhesives is estimated to be 22 percent VOC.

**Table VI-7
Construction, Panel, and Floor Covering Adhesives***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Non-aerosol	74	8,880	2,000

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Construction, panel, and floor covering adhesives are used to construct, remodel, maintain, or repair houses, buildings, bridges, and other types of structures and their appurtenances. According to Skeist (1990), the construction industry is one of the largest users of adhesives, requiring about 40 types of adhesives in about 30 different applications. These products are used on most types of substrates including wood, wood-derived products (plywood, hardboard, particle board, and insulation board), steel, concrete, masonry, and fiberglass reinforced materials. Another major use for these products is to install decorative finishing materials (e.g., floor and wall carpeting and tiles, paneling, cove bases, ceiling tiles, etc.) to the inside of buildings.

Selection must be made for each application on the basis of performance requirements (such as durability and strength), type of substrates, working properties needed, desired production rates, and cost. Environmental conditions such as prolonged soaking, wetting and drying cycles, extremely low or high temperatures, and other adverse conditions that may arise during construction and service life must be considered when selecting the appropriate adhesive to

use.

Construction, panel, and floor covering adhesives are labeled and marketed for either multipurpose or specialty uses. The following examples indicate the types of application for which these products are marketed: cove base and stair treads; wall and floor tile, wood parquet floor, ceramic tile, mirror tile, and sheet flooring; indoor/outdoor carpet and carpet pad; FRP and wallboard, panel and construction, molding and trim, paneling and molding, and panel and foam; tub surrounds and shower walls; light duty, heavy duty, multipurpose, all-purpose, and general construction; subfloor and deck; and countertop.

Construction, panel, and floor covering adhesives are sold in different sizes ranging from 4 fluid ounce tubes to 55 gallon drums. The more common sizes used in construction and panel projects are 10-11 and 29 fluid ounce disposable cartridges that fit in half-barrel caulking guns. Larger sizes, such as 32 ounce or 1-5 gallon containers, are the more common sizes used in floor covering projects. As mentioned previously, non-aerosol containers of 16 fluid ounces or less, or one pound or less, are regulated under this category.

Construction, panel, and floor covering adhesives are primarily sold through hardware stores, home supply centers, warehouse clubs, and discount chain stores. Distributors also sell these products directly to firms with a large customer base such as contractors, residential and commercial builders, janitorial companies, and corporations and organizations that maintain their own facilities.

Individual or do-it-yourselfers, and professionals employed in residential and commercial development sites use construction, panel, and floor covering adhesives. Although these products are used in the “manufacture” or “construction” of homes and facilities at residential and commercial development sites, the adhesive products do not qualify as “industrial” use products as defined in the consumer products regulation because the development sites are temporary. In other words, the adhesive products are not being used at a permanent site or establishment to produce goods or commodities. In addition, many of these adhesive products are available for purchase at hardware stores, home supply centers, and warehouse clubs by both professional contractors and household users.

Product Formulation:

Typical construction, panel, and floor covering adhesives may contain any combination of the following components: diluent, binder, catalyst, hardener, accelerator, inhibitor, retarder, filler, plasticizer, stabilizer, and wetting agent (Shields, 1984).

The diluent (water-based or solvent-based) is the solvent vehicle for other adhesive components which also provides viscosity control to make a uniformly thin adhesive coating possible. The binder (resin system) may be the most important component because it provides the adhesive and cohesive strength in the bond. Fillers are nonadhesive materials that improve the

working properties, permanence, strength, or other qualities of the adhesive bond. Catalysts and hardeners are curing agents for adhesive systems, and accelerators, inhibitors, and retarders control the curing rate. Plasticizers provide the adhesive bond with flexibility or distensibility. Stabilizers help the adhesive increase its resistance to adverse service conditions such as light, heat, radiation, etc. Wetting agents promote interfacial contact between the adhesive and adherends (substrates) by improving the wetting and spreading qualities of the adhesive. Depending on the particular type of formulation, additional components such as tackifiers, humectants, thickeners, and foam control agents may be used (Skeist, 1990).

The water-based formulations that are included in the 1997 Survey may contain water in the range of 3 to 87 percent by weight. Although water is the primary diluent, some VOC co-solvents are used in the range of 1 to 10 percent and may include Stoddard solvent, mineral spirits, toluene, hexane, heptane, light solvent aliphatic naphtha, and alcohol (ethyl, methyl, and isopropyl). Some formulations also use LVP-VOCs such as ethylene glycol and propylene glycol ranging from 1 to 5 percent. The resins used in these formulations may include acrylic resin, acrylic latex resin, acrylic copolymer latex, or vinyl acetate/ethylene copolymer in amounts that range from 1 to 20 percent. The most common fillers used are limestone (calcium carbonate), kaolin, silica (quartz, crystalline and amorphous) in the range of 1 to 70 percent. A few formulations may also contain titanium dioxide as a colorant in the amount of 5 percent or less.

The typical solvent-based formulations that are included in the 1997 Survey may contain the following VOC diluents: toluene, hexane, heptane, hydrotreated light petroleum distillate, 2 or 3-methylpentane, dimethylpentane, dimethylbutane, ethyl alcohol, heptane, and light aliphatic solvent naphtha in the range of 1 to 40 percent. Exempt compounds, such as acetone, may also be used as a diluent in the range of 1 to 30 percent. One example of an LVP-VOC that is used is mineral oil, which can range from 1 to 10 percent. The resins found in these formulations may include polymethylene polphenyl isocyanate, methylene bisphenyl diisocyanate, styrene-butadiene polymer, and aromatic hydrocarbon resin in the range of 1 to 20 percent. The fillers may include silica (quartz, crystalline, and amorphous), talc, kaolin, and limestone (calcium carbonate) in amounts that range from 1 to 60 percent.

Proposed VOC Limit and Compliance:

The proposed VOC limit for construction, panel, and floor covering adhesives is 15 percent by weight, effective on December 31, 2002. We believe this limit is feasible using technology that is currently available. As shown in Table VI-8, using adjusted emissions, the proposed VOC limit will result in VOC emission reductions of approximately 880 pounds per day. Table VI-8 also shows that 29 products already meet the proposed limit and represent 17.4 percent of the market. In addition, there are several products slightly above the proposed limit that may comply with the proposed limit after minor reformulation.

**Table VI-8
Construction, Panel, and Floor Covering Adhesives Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Non-aerosol	15	29	17.4	880

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Based on the 1997 Survey, all the products that comply with the proposed limit are formulated with a large amount of water, inorganic solids, LVP-VOCs, or a combination of the three. Several formulations also contain acetone, an exempt VOC, which can be used to further reduce the VOC level. In addition, at least one complying formulation is available for each of the following applications: countertop, paneling, cove base, wall and floor covering, multipurpose construction, and subflooring. These formulations are made by a variety of manufacturers and are widely available in the market indicating that there is wide flexibility in reformulation. Furthermore, although the comparison between limits expressed in weight percent and limits expressed in grams per liter (less water and exempt solvents) vary with the density and formulation type, the proposed VOC limit of 15 percent, by weight, is slightly less than the equivalent RACT/BARCT VOC limit of 200 g/l suggested for “Multipurpose Construction Adhesive.”

It is primarily the solvent-based products that will need reformulation to meet the proposed 15 percent VOC limit. Manufacturers will be able to comply with the proposed limit using water, inorganic solids, LVP-VOCs, exempt VOCs such as acetone and methyl acetate, or any combination of the five.

Issues:

1. Issue: Although floor covering adhesives may have a low VOC content, the nature of their use and formulation is more specialized than that of construction and panel adhesives. Construction and panel adhesives are used for a wider array of conditions and performance standards. Therefore, the amount of VOCs in floor covering adhesives should not be the basis to further reduce the VOC level below the proposed 15 percent limit for Construction, Panel, and Floor Covering Adhesives in the future.

Response: Based on the 1997 Survey, there is a wide array of construction and panel adhesives whose VOC content is already below 15 percent indicating that, in many cases, the technology already exists. We also anticipate that the new technologies that will be developed in the next few years will also bring the VOC content in most products to levels that are below 15 percent. However, similar to other consumer product categories, if we decide to revisit this category in the future, we will assess the current and emerging technologies, current and potential

emission reductions, and manufacturers' progress in attaining a future proposed limit.

2. **Issue:** The category is too broad for a single VOC limit because there are too many end uses. It is suggested that there be 7 subcategories.

Response: We agree there are many different end uses in this category; however, based on the ARB survey, there are products with different end uses that already comply with the proposed limit indicating that subcategorization is not necessary. Also, allowing subcategorization to occur in this category would yield little, if any, emission reductions. We discussed this issue with representatives of the industry and their associations and determined that having one category with the proposed VOC limit of 15 percent is appropriate.

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E. Crawling Bug Insecticides

Product Category Description:

Crawling bug insecticides are consumer products designed to eradicate non-flying household insects or pests such as cockroaches, ants and spiders. These products may also be used in janitorial, institutional or commercial settings, but do not include those products designed specifically for use by licensed pest control operators (PCO's).

All insecticides sold within California must be registered with the California Department of Pesticide Regulation (DPR) and with the U.S. EPA under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Insecticides used by PCO's generally contain either higher levels of active ingredients than their consumer-use counterparts or use ingredients which are deemed too hazardous for consumer use. These products fall under the authority of the DPR, and are excluded from this regulation since they are not available to the consumer.

Crawling bug insecticides were regulated under "Phase II" of the consumer products regulation which was adopted in January of 1992. The Board adopted a two-tier limit for these products, initially setting a 40 percent VOC limit effective January 1, 1995, followed by a 20 percent VOC limit effective January 1, 1998. For products subject to registration requirements under FIFRA, an additional year is granted for compliance. Hence, the second-tier limit of 20 percent became effective in January of 1999. The staff report for the Phase II regulation contains additional information on these products (ARB, 1991).

Crawling bug insecticides come in a wide variety of product forms, and incorporate many different strategies for controlling insects. The most common forms include bait stations, residuals (solid granules), liquids and aerosols. The sales and emissions from the various product forms are presented in the table below.

Table VI-9
Crawling Bug Insecticides*

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs/day)**
Aerosols	62	24,600	7,620
Bait Stations	12	255	0
Liquids	21	18,200	160
Pumps	17	14,300	40
Solids exc Baits	24	5,840	0

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing

Crawling bug insecticides are sold in supermarkets, mass merchandise outlets, hardware stores, nurseries and other locations. These products are used around homes, offices, and commercial and institutional areas to control ants, roaches, spiders and other crawling bugs.

The aerosol insecticide products are marketed either as broad spectrum insecticides which will kill all kinds of flying or crawling bugs or as specific use products such as ant and roach killers. Aerosol crawling bug killers, while targeting specific bugs such as ants and roaches, usually are effective against any crawling bug.

Bait stations are designed to be effective against a single insect type. For example, ant traps contain foodstuffs to attract the ant. When the ants bring the foodstuff/toxin to the queen, the whole nest is killed. Roach stations contain foodstuffs/toxins which will kill roaches shortly after ingestion.

Residual insecticides, such as diazinon or chlorpyrifos, tend to be packaged in granules, wettable powders or emulsifiable concentrates. They are broad spectrum insecticides which will kill a wide variety of crawling bugs in and around the home. A layer of the residual insecticide is sprayed, dusted or spread in areas to be controlled. Residual insecticides are effective in preventing the return of bugs from days to months after application (Trumans, 1997; Dangerous Pests, 1998).

Product Formulation

Consumer insecticides generally follow a simple formulary. Typically, these products contain about 1 percent active ingredient, and the remainder of the product is a carrier, aiding in transporting the active ingredient to the bug and penetrating the exoskeleton. The following discussion on insecticide terminology, functions and active ingredients is applicable to all of the insecticide categories currently proposed for regulation.

The compound that carries out the desired insecticidal function is known as the active ingredient. The ability of an active ingredient to actually kill bugs, rather than simply flush them out or provide knockdown (both terms described below), is a key measure of its activity. A product may contain one or more active ingredients, targeting the same or different metabolic functions of the insect. A discussion on typical active ingredients is presented later in this chapter.

The ability of an insecticide to paralyze an insect is called its knockdown ability. Knockdown does not necessarily correlate with killing. Frequently, these events are carried out by different ingredients. The knockdown agent will paralyze the bug, allowing the consumer to douse the insect with sufficient amount of product to kill it. Knockdown is another key measure of an insecticide's "activity."

Bugs such as cockroaches or ants frequently inhabit tiny cracks, holes or other areas

where it is difficult to directly apply a stream of spray, and the bugs are shielded from the effects of the active ingredients. Therefore, certain ingredients in pesticides are used to bring insects from their hiding places into the open where they may be directly exposed. This phenomenon is referred to as flushing. Flushing ability is another measure of an insecticide's activity.

Some toxic ingredients of pesticides are relatively stable under ambient conditions, and may persist on surfaces from days to months after application. Their persistence leads to insecticidal activity and insect control long after the time of application. This persistence is referred to as residual kill.

Few, if any, active ingredients are effective at flushing, knocking down, killing and providing residual kill against all insects. More typically, active ingredients are used in combination to provide all or most of these functions. For example, an effective flushing and knockdown agent is used in combination with an effective killing agent. A fast knockdown and killing agent may be mixed with a stable, residual killer to provide both immediate and long lasting insect control. These ingredients are said to synergize each other. In some cases, synergists are used to target enzymes which would otherwise deactivate the active ingredient.

Insecticides kill their target insects by a variety of strategies. Neurotoxins kill by disrupting the activity of the insect's nervous system. Other poisons kill by disrupting key enzymes involved in various stages of the insect life cycle or reproductive processes. Still others may kill by destroying the insect's waxy outer cuticle, making the bug vulnerable to desiccation. Consumers purchase insecticides primarily in the forms of baits, which provide slow acting, but long lasting, ant and roach control, and ready-to-use killers for immediate insect control. This focused use of consumer insecticides tends to limit the number of active ingredients used in these products. A description of active ingredients used in consumer insecticides is provided below.

Pyrethrins and Pyrethroids -- Pyrethrins and pyrethroids are the most commonly used active ingredients in ready-to-use consumer insecticides. They are contact poisons. Contact poisons kill by penetrating the body wall, either by inhalation or by dissolving through the waxy cuticle. After penetrating the exoskeleton, pyrethrins and pyrethroids kill by disrupting the insect's nervous system. They affect the sodium channels which are instrumental in controlling nervous impulses.

Pyrethrins are natural extracts from the Chrysanthemum flower. They are oily liquids which were discovered to have insecticidal properties centuries ago. As a group, pyrethrins have fast knockdown and flushing ability, but insects may recover from the effects of pyrethrins within several hours. Hence, they tend to be used with a synergist such as piperonyl butoxide or MGK 264, which inactivate the enzymes that detoxify pyrethrins.

Pyrethroids are synthetic derivatives of pyrethrins which have improved killing power, knockdown or flushing ability. These synthetic derivatives may also be more stable than pyrethrins, providing residual kill, or may be more volatile, with enhanced vapor toxicity. Commonly used pyrethroids include tralomethrin, permethrin, tetramethrin, allethrin, and

cypermethrin.

As a group, pyrethrins and pyrethroids have low mammalian toxicity yet are highly effective against insects, which is why their use in consumer insecticides is prevalent.

Organophosphates and Carbamates -- These are synthetic compounds which kill by disrupting the action of the enzyme acetylcholine esterase. Acetylcholine is a neurotransmitter common to both insects and mammals. Its degradation following a nervous impulse by acetylcholine esterase is required in order to stop the impulse. Organophosphates and carbamates inhibit the enzyme, and hence disrupt the bug's nervous system.

Due to their mammalian toxicity, the use of organophosphates and carbamates in consumer aerosol products is limited. However, chlorpyrifos (Dursban™) and diazinon, which are organophosphates of relatively low mammalian toxicity, are occasionally used in aerosol products. Diazinon is frequently used in the control of garden pests, generally in the form of an emulsifiable concentrate. Chlorpyrifos, a contact poison, is used in bait stations and occasionally is used with pyrethrins in household insect sprays. Both diazinon and chlorpyrifos have good residual kill properties. Malathion is another organophosphate insecticide used both agriculturally and in the control of garden pests.

Carbamates such as carbaryl (Sevin™) and propoxur (Baygon™) are also in common use in consumer insecticides. Carbaryl is a broad spectrum insecticide, and in consumer products is frequently used in lawn and garden products. Propoxur is used in the control of ants and roaches.

Inorganics -- Inorganic pesticides are generally minerals such as boric acid or diatomaceous earth. They are usually deposited as a powder in areas where bugs are likely to pass, and provide long lasting insect control.

Boric acid dust granules are ingested by the bug after it has been exposed to the dust and attempts to clean itself. Upon ingestion, the boric acid then interferes with the bugs intracellular metabolism. Although the killing effect of the inorganics are slow, their effects are long lasting. Sodium fluoride, another inorganic, kills by much the same mechanism as boric acid.

Diatomaceous earth or silica aerogel are inorganics which kill by disrupting the waxy outer cuticle of the insect. Upon exposure to the dust, disruptions in the cuticle will lead to death by desiccation.

The active ingredients in consumer insecticides typically make up no more than a few percent of the product. The remainder of the product consists of inert ingredients, including the carrier which is either an organic solvent or water with an emulsifier. The inert ingredients may also contain attractants, pheromones or food in the case of insect baits, propellant in the case of aerosol products, fragrances to mask unpleasant odors, and other ingredients. Additional discussion on the carrier ingredients in crawling bug insecticides is provided below

(Trumans, 1997; Dangerous Pests, 1998; IPM, 1999; ARB, 1991).

Proposed VOC Limit and Compliance:

Crawling bug insecticides are currently limited to 20 percent VOC by weight, effective January 1, 1999. Staff propose to lower the allowable VOC content for aerosol products to 15 weight percent effective December 31, 2004. Table VI-10 below presents the emission reductions and complying marketshare at the proposed limit.

**Table VI-10
Crawling Bug Insecticides Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (tons/day)**
Aerosols	15	13	15	0.49

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

As shown above, aerosol products are currently marketed which will meet the proposed 15 percent limit. Based on the survey data, these products have a range of formulation technologies. Several of the complying products are solvent based, using an LVP distillate as the carrier and carbon dioxide as the propellant. Other complying products are water-based, using either dimethyl ether or a hydrocarbon propellant, a small amount of petroleum distillate or glycol ether solvent, and an emulsifier.

In technical discussions with crawling bug insecticide manufacturers, some have indicated that aerosol products require about 15 percent hydrocarbon propellant to achieve the proper particle size and still have adequate propellant to evacuate the container (Clorox, 1999). While this claim is not necessarily supported in light of the complying formulations, it is possible with a 15 percent VOC limit to use this amount of hydrocarbon propellant. In meeting the current 20 percent VOC limit, manufacturers have employed approximately 15 percent propellant and 5 percent of a VOC solvent, along with either an LVP solvent or a water/emulsifier carrier system or both. Staff feel that manufacturers may be able to substitute the 5 percent VOC solvent for either an exempt solvent such as acetone or an LVP distillate. Alternatively, compliance may be achieved by substitution of a non-VOC propellant for a portion of the hydrocarbon propellant.

While only 15 percent of the aerosol market complies with the proposed limit, a substantial marketshare is within 1 percent of this limit. Hence, minor formulation changes will bring manufacturers into compliance. In addition, since the Survey was conducted in 1997, the 20 percent limit was not yet in effect. In reformulating to meet the 20 percent limit, some major manufacturers have developed products that comply with the proposed 15 percent limit. Thus, the complying marketshare is actually much higher than the 15 percent listed in Table VI-10.

The proposed limit is therefore supported by some major manufacturers (United Industries, 1999).

Issues:

1. **Issue:** The 20 percent limit for this category just became effective in January of 1999. Substantial investments have been made by manufacturers to meet this limit. Therefore, regulation of this category should be postponed until the Long-Term Measures.

Response: We recognize that manufacturers have made substantial investments to achieve the current 20 percent limit. In consideration of this, we have extended the effective date of the limit to December 31, 2004. Since insecticides are regulated under FIFRA, the actual effective date is not until December 31, 2005, so manufacturers will be able to amortize the cost of reformulation over at least a 5 year span. We believe this is adequate time to develop new products to meet the proposed 15 percent limit and recoup the costs from the previous reformulation.

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F. Double-Phase Aerosol Air Fresheners

Product Category Description:

Double-phase air fresheners are consumer products designed for the purpose of masking odors, or freshening, cleaning, scenting, or deodorizing the air. They do not include products that are used on the human body, cleaning products, or dual purpose air freshener/disinfectant.

Double-phase air fresheners were first regulated under the consumer products regulation (“Phase I”) adopted in October, 1990 (ARB, 1990c). The current volatile organic compound (VOC) limit for double-phase aerosol air fresheners is 30 percent by weight effective January 1, 1993. In addition to the aerosol product form, air fresheners are available in other forms including, but not limited to, liquids, gels, powders, crystals and blocks. According to the 1997 Consumer and Commercial Products Survey, VOC emissions from all forms of air fresheners are 5.9 tons per day, of which 78 percent are from single- and double-phase aerosol forms (ARB, 1998). Table VI-11 below summarizes the sales and VOC emissions from aerosol air fresheners. Single-phase aerosol products make up one percent of the air freshener market and contribute about four percent of the VOC emissions from air fresheners. Double-phase aerosol products make up 18 percent of the air freshener market and contribute about 74 percent of the emissions from air fresheners. Because of the greater potential for further emission reductions from double-phase products, only double-phase products are being considered for further VOC reductions in this rulemaking.

The sales-weighted average VOC content, including the fragrance composition, of double-phase aerosol forms is 30 percent, consistent with the VOC limit of 30 percent by weight (ARB, 1998). The liquid content of the double-phase aerosol product is present in more than one phase. Generally, there is a water-based phase and an organic-based phase. To successfully discharge the product, double-phase air fresheners need to be shaken before use to mix the phases into a homogenous emulsion.

**Table VI-11
Single- and Double-Phase Air Fresheners***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs/day)**
Single-Phase	119	1509	447
Double-Phase	19	28996	8758

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Air fresheners are used in household, automotive, institutional, and commercial settings to treat unpleasant odors. This is accomplished by masking the odor with a pleasant scent or removing the odor. The household products are generally available through retailers, while the institutional and commercial products are sold via wholesalers through distribution channels or direct sales.

Household air fresheners are used to treat bathroom and kitchen odors, pet odors, garbage odors, smoke, and odors caused by moisture. The double-phase products make up the majority of the consumer use market. These products are generally sprayed as needed with the user controlling the amount of product emitted (ARB, 1990b).

Air fresheners used in institutional and commercial settings control odors from bathrooms, laundry areas, food preparation areas and specific industries such as diaper services (ARB, 1990b). However, most air fresheners used in this segment of the market are single-phase self-dispensing products. These products are described as “maintenance” air fresheners and are designed to maintain a constant scent over a long period of time, relying on the product’s higher fragrance content.

Product Formulation:

Double-phase products form the majority of the sales and emissions from aerosol air fresheners. The 1997 Survey indicates that these products have an average VOC content of approximately 30 percent. Double-phase products generally contain two liquid phases and a gas phase containing the hydrocarbon propellant.

The liquid phases consist of a larger water phase and a smaller organic phase(s). As reported in the Survey, another solvent that may be present in aerosol air fresheners is acetone. The organic phase(s) is generally made up of liquefied hydrocarbon propellant, emulsifiers, and fragrance oils (ARB, 1998). When the product is shaken, the emulsifiers produce a homogenous oil-in-water emulsion that allows the product to be uniformly sprayed.

The propellants used are typically blends of butanes and propane. Depending on the blend and the desired pressure, they generally constitute 25 to 30 percent of the product’s weight. As in most other aerosol products, the propellants in aerosol air fresheners are present in both liquid and gas phases. In the liquid phase, the propellant sits atop the denser liquid phase(s) and functions as a reservoir to replenish the propellant in the gas phase. The gas phase provides the pressure that discharges the product.

Fragrance oils, mostly present in the solvent phase, constitute up to two percent of the product’s weight. They produce the product’s scent. Although these are VOCs by definition, the

Consumer Products Regulations allow an exemption of up to two percent-by-weight of the product, as long as the vapor pressure is less than 2 millimeters mercury (mm Hg) at 20 degrees Celsius.

Emulsifiers are used in the product formulation to aid mixing of the fragrance oil in the water phase by creating a homogeneous liquid that can be sprayed. Because the desired emulsions are oil-in-water, surfactants with higher hydrophilic-lipophilic balance (HLB) values are more suitable in oil-in-water formulations (ICI Surfactants, 1992; 1997). Some examples of surfactants that can be used include Span® and Tween®. Another option for producing an emulsion in the product is the use of low-vapor pressure VOCs (LVP-VOCs) in the formulation (ARB, 1998). Typically, the emulsifiers in the product are less than 10 percent-by-weight of the product (ARB, 1998).

Proposed VOC Limit and Compliance:

The proposed VOC limit for double-phase aerosol air fresheners is 20 percent by weight. As shown in Table VI-12, a 20 percent VOC limit would result in emission reductions of 3,000 pounds per day, or about 1.5 tons per day statewide. While there are no products reported in the 1997 Survey that comply with the proposed limit of 20 percent by weight, ARB staff believes that the limit is both technologically and commercially feasible. Because it is a challenging VOC limit however, ARB staff is proposing to provide manufacturers with over five years, until December 31, 2004, to produce complying products.

**Table VI-12
Double-Phase Air Fresheners Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Double-Phase	20	0	0	3000

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Reformulating Aerosol Air Fresheners

The sales weighted average VOC content of double-phase air fresheners, including the fragrance component, is 30 percent by weight. As described above, the main ingredients in typical double-phase air fresheners are water, emulsifiers, hydrocarbon propellants, and fragrance oils. The emulsifiers typically used are LVP-VOCs and are not regulated as VOCs. In general, other than the fragrance oils, the only VOC ingredient is the hydrocarbon propellant. Hence, we expect that the most logical reformulation option would include some modification of the propellant. However, when the VOC propellant content is reduced, manufacturers have indicated that the vapor pressure in the product may not be sufficient to empty the contents of the product (SC Johnson). They further indicate that the volume of propellant lost would most likely be made up

by the addition of water, which would produce a wetter spray (Reckitt, SC Johnson).

To determine the available reformulation options for manufacturers of aerosol air fresheners, we evaluated products reported in the 1997 Survey, held numerous discussions with industry representatives, reviewed the technical literature, searched through the United States Patent and Trademark Office's (USPTO) Patent Database, and consulted with a researcher in academia. These reviews provided insight on some of the approaches manufacturers may take to comply with the proposed limit. Some of these options include, but are not limited to, the use of non-VOC propellants, the use of dispersion and emulsion systems, or the use of high vapor pressure propellant and solvent. While these are not intended to be all-inclusive, the discussions shown below should reasonably cover the likely formulation approaches companies would take.

Replacement of Hydrocarbon Propellants with Non-VOC Liquefied Propellants

One method of reformulation would be to replace a portion of the hydrocarbon propellant with a non-VOC propellant such as hydrofluorocarbon-152a (HFC-152a). With a propellant blend of HFC-152a and hydrocarbon propellant, sufficient vapor pressure could be attained to empty the product contents completely. As reported in the 1997 Survey for single-phase aerosol air fresheners, HFC-152a is currently in use as a co-propellant with a hydrocarbon propellant in organic-based formulations and also is in use as the sole propellant in a water-based formulation. Therefore, since HFC-152a can successfully be used to discharge a single-phase air freshener from the container, it is reasonable that it could also be successfully used in double-phase air fresheners to discharge the product.

As further evidence that HFC-152a may successfully be used as a reformulation option for double-phase air fresheners, in a recent journal article, two prototype double-phase aerosol air freshener formulations are presented (Johnsen). The article indicates that HFC-152a can be used in water-based aerosol air fresheners with no special corrosion or valve problems (Johnsen). The formulations, as shown below, suggest propellant blends of HFC-152a with the hydrocarbon propellant isobutane. Both formulations result in a final VOC content of 20 percent.

Formulas for Possible Isobutane/HFC-152a Water-based Aerosol Air Fresheners

Ingredients	Type 1	Type 2
Fragrance	0.80 %	0.80 %
Witcamide 511, et al.	0.20	0.20
Sodium Nitrite	0.10	0.10
Ammonium Benzoate	0.10	0.10
Deionized Water	72.80	68.80
Isobutane A-31	20.00	20.00
HFC-152a (CH ₃ -CF ₂)	6.00	10.00
Actual VOC	20	20

Source: *Spray Tech. & Marketing*, Aug. 1999, p. 46 (Johnsen).

It has also been suggested that a four-to-one ratio of hydrocarbon propellant blend A-55 (55 psi) to HFC-152a (62 psi) may be a feasible option because the blend pressure does not vary

significantly and could continue to deliver at near constant pressure (Frauenheim; DuPont). However in this case, the substitution of a non-VOC propellant, such as HFC-152a, for a hydrocarbon propellant is not necessarily accomplished on a one-to-one percent basis. If this option is chosen, the product's water content would need to be increased. Higher water content could lead to a wetter spray due to larger particle size being discharged. To counter this effect, vapor taps could be used to produce a drier spray. The valve mechanism may also be modified to allow better break-up of the aerosol spray droplets.

Use of Surfactants

The increase in water content may also decrease the miscibility of the fragrance and other organic compounds in the water phase. This effect may be mitigated by adding blends of surfactants and emulsifiers to the product. Surfactants aid in the mixing of the organic and water phases in the product to produce oil-in-water emulsions. Emulsion is necessary to allow the fragrance molecules to be discharged along with the water from the can. Surfactants can be categorized into many different types. Some candidate surfactants which may aid in mixing are blends of single-tailed or double-tailed non-ionic surfactants, cationic surfactants and/or anionic surfactants.

Available technology of dispersion and emulsion systems already allows complying formulations to be developed. Although some of the research and technology of the particulars in these systems have been patented as early as 1989, advancement and understanding of emulsion technology have yielded products that are efficacious and have low VOC content (Patent, 1989; Patent, 1990; Patent, 1992; ARB, 1998). Through the manipulation of emulsion systems, water-based single-phase aerosol products already have formulations that would comply with the proposed VOC limit. Water-based single-phase products require emulsion systems that are thermodynamically-stable to maintain a homogenized phase throughout the usable life of the product (Waterbury, 1999a). Because double-phase aerosol products can allow mild instability of the emulsion and thereby, phase separation, double-phase aerosol products are comparatively easier to reformulate than single-phase products (Scott's; Waterbury, 1999a). We expect that the emulsion technology being employed in single-phase air fresheners could be used to help reformulate low VOC double-phase aerosol air fresheners.

Patents for Low VOC Double-Phase Air Fresheners

A search of the USPTO database revealed patents that suggest formulations and preparations for aerosol air fresheners that would yield complying products. The patents describe improved emulsion systems created through the use of surfactants. Note that in each patent, typical hydrocarbon propellants are used to produce air fresheners that would have VOC contents below the proposed 20 percent limit.

U.S. Patent 4,904,464, "Insecticide and Air Freshener Preparations" and *U.S. Patent 4,826,674*, "Air Freshener Preparations," filed August 29, 1988, and March 4, 1985, respectively, Albanese, James J., United Industries Corporation (Patent, 1989; Patent, 1990).

The patents describe a type of emulsion system that utilizes cocodiethanolamide (an LVP-VOC) as the dispersal agent. One of the objects of this double-phase system is to provide a preparation with a “markedly-reduced” amount of propellant used in an aerosol air freshener. Other objectives include providing a preparation that has a “substantially indefinite shelf life” and is “economically produced in accordance with well known production techniques so that novel instrumentation and equipment are not required.” A sample aerosol air freshener formulation encompassed by the patent and which meets the proposed limit is as follows:

<u>Example</u>	
<u>Ingredient</u>	<u>In the Can</u>
Rose Fragrance	0.25%
Ethanol*	2.00%
Cocodiethanolamide	1.00%
Water	81.75%
Isobutane	12.6%
<u>Propane</u>	<u>2.4%</u>
	Total VOC 17%

*The ethanol serves to control particle size.

Source: *U.S. Patent 4,904,464*, “Insecticide and Air Freshener Preparations” and *U.S. Patent 4,826,674*, “Air Freshener Preparations,” filed August 29, 1988 and March 4, 1985, respectively, Albanese, James J., United Industries Corporation.

As shown above, the double-phase air freshener formulation developed has a VOC content of only 17 percent using a hydrocarbon propellant blend of isobutane and propane. It is also important to note that this patented technology will become publicly available before the effective date of the new limit (patent expires March 27, 2001, nearly four years prior to the proposed effective date).

U.S. Patent 5,145,604, “Aqueous Emulsion and Aerosol Delivery System Using Same,” Neumiller, Phillip J., S. C. Johnson & Son, Inc, filed February 6, 1992.

This patent covers an aqueous emulsion system that has the capacity to entrap or reservoir the propellant through the use of surfactants to effect a constant pressure over the usable life of

the product. A sample complying aerosol air freshener formulation obtained from the patent is as follows:

<u>Example</u>	
<u>Ingredient</u>	<u>In the Can</u>
Methylparaben	0.2%
Ethanol	0.5%
Monamid 150 ADY	1.5%
Glycerol	1.0%
Neodol 1	0.1%
IFF Fragrance 6673-AP	0.3%
Deionized Water	87.4%
Propane	3.0%
<u>Butane</u>	<u>6.0%</u>
Total VOC	9.5%

Source: *U.S. Patent 5,145,604*, "Aqueous Emulsion and Aerosol Delivery System Using Same," Neumiller, Phillip J., S. C. Johnson & Son, Inc., filed February 6, 1992.

As shown above, the formulation developed has a VOC content of less than 10 percent, using a blend of propane and butane as propellant. Additional formulations using differing concentrations and combinations of surfactants (e.g., Span® and Tween®) are also listed in this patent. It is likely that this new technology has not been tested for use in large scale production. It is also expected that more research and development would be required to produce an efficacious product. As mentioned earlier, however, ARB staff is proposing to provide manufacturers with over five years, until December 31, 2004, to produce complying products.

These two patented technologies provide further potential reformulation options that, with more research, could lead to production of efficacious low-VOC double-phase air fresheners.

Use of High Vapor Pressure Propellant and Exempt Solvent for Double-Phase Formulation

A manufacturer may also consider reformulating double-phase aerosol products through the use of high vapor pressure propellant and exempt VOC solvent. According to the 1997 survey, acetone is used in some single- and double-phase aerosol air fresheners. Acetone is an exempt VOC solvent that is fast drying and is completely miscible with water. Acetone also would increase the vapor pressure in the product because the vapor pressure of acetone is 186 mm Hg at 20 degrees Celsius. Therefore, use of acetone may be used to reduce the amount of propellant needed to discharge the product. An example formulation that may include acetone would use water along with the higher pressure propellants propane and dimethyl ether (Waterbury, 1999b).

Issues:

1. **Issue:** It is not possible to formulate a double-phase aerosol air freshener with a lower VOC content.

Response: Staff acknowledges that reformulating to the proposed 20 percent VOC content limit will be challenging. However, technology exists to produce double-phase aerosol air fresheners with a 20 percent VOC content. As stated above, reformulation options include use of HFC-152a in the propellant blend, use of acetone as a co-solvent, and/or use of a dispersion or emulsion system. Our proposal is also supported by the fact that there are already single-phase products in the Survey that contain less than 20 percent VOC by weight. The low-VOC technology from these products may be used to aid in the reformulation for the double-phase products. However, in order to allow manufacturers sufficient time to reformulate, it is proposed that the 20 percent by weight VOC limit be effective December 31, 2004.

2. **Issue:** Reformulating with HFC-152a will require use of a more expensive “DOT 2Q” can because it has a higher pressure. HFC-152a is also a global-warming gas.

Response: Depending on the concentration of HFC-152a and the partial pressure of the trapped air at 130 degrees Fahrenheit, a 20-to-10 ratio of isobutane A-31 to HFC-152a (161±6 pounds per square inch gage pressure at 130 degrees Fahrenheit) suggests that a “DOT 2Q” can should be used (Johnsen). However, with a 20-to-6 ratio of isobutane A-31 to HFC-152a (154±6 pounds per square inch gage pressure at 130 degrees Fahrenheit); i.e., a lower concentration of HFC-152a; a less costly “DOT 2P” can could be used (Johnsen). ARB staff acknowledges that HFC-152a emissions contribute to global-warming. A discussion of the potential environmental impact of using HFC-152a in aerosol products is provided in Chapter VII.

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Waterbury. Telephone conversation with ARB Staff on August 25, 1999. (Waterbury, 1999b)

G. Engine Degreasers

Product Category Description:

Engine degreasers are specialty cleaning products designed to remove grease, grime, oil and other contaminants from the external surfaces of automotive engines and other mechanical parts while the engine remains in the engine bay. These products can also be used to clean engines on motorcycles, boats, lawnmowers, and other powered vehicles.

When the ARB first regulated engine degreasers in 1990, ARB staff found that aerosol

products comprised the entire engine degreaser market (ARB, 1990, at 35). At that time, the Board adopted a 50 percent VOC limit effective January 1, 1996. It is interesting to note that the market has subsequently bifurcated into aerosols and liquid/pump products, with the liquid products now representing the majority of engine degreaser sales in California (by weight).

According to the ARB's 1997 Consumer and Commercial Products Survey, 46 manufacturers and marketers reported selling 70 aerosol and liquid product lines in California during 1997. These products were sold at the rate of approximately 11.85 tons per day, thereby releasing about 1.75 tons per day of VOCs (3,500 pounds per day). Although comprising only about 38 percent of sales, the aerosol products represented a disproportionate part of the VOC emissions from this category, emitting about 1.67 tons per day of VOCs or 95 percent of the total. The VOC content in engine degreasers ranged from zero to 60 percent by weight for the liquids and zero to 100 percent by weight for the aerosols. Table VI-13 below tabulates the Survey results, with the VOC emissions adjusted for survey under-reporting.

**Table VI-13
Engine Degreasers***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs./day)**
Aerosol	48	9,823	3,340
Liquid	22	16,000	160

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

As noted earlier, engine degreasers clean engine surfaces of oil, grease, grime, soil, and other contaminants. Typically, the entire cleaning process requires a combination of chemical and physical action to remove the engine surface contaminants. As a first step, many products instruct users to apply the product when the engine is still warm; other products even direct the user to leave the engine running while applying the product. Next, the products are sprayed on to the engine surfaces, using various combinations of solvents to first dissolve the contaminants. Most products direct the user to wait 10 to 15 minutes to allow the solvents to penetrate the oil and grime. For tough-to-remove deposits, the user may need to scrub the soil with a brush. At this point, surfactants in water-based products emulsify the dissolved oil into the water contained in the product. The final step requires the user to rinse the emulsified mixture to wash away the contaminants (users are directed to dispose of the rinsate in accordance with applicable environmental regulations).

Engine degreasers are used by household, commercial and institutional consumers. Commercial and institutional users include fleet managers, car washes, automotive detail shops,

and car dealerships. As noted earlier, engine degreasers are marketed in both aerosol and liquid/pump forms; however, no clear data were available on the breakdown of product use by form and type of consumer. The products are typically used by themselves, but can be combined with steam or high pressure wash cleaning to maximize the cleaning effectiveness.

Product Formulation:

Engine degreasers marketed as liquids and pumps tend to have high water content, with some combination of organic solvents, such as *d*-limonene and butyl cellosolve, with a relatively high amount of surfactant to help emulsify the engine surface contaminants. The amount of regulated VOCs in these products is quite low; in fact, we estimate based on the 1997 Survey that 96 percent of the liquid and pump engine degreaser market would meet the proposed 5 percent VOC limit.

Aerosol engine degreasers vary in formulation, but most share several common features. Most use either a hydrocarbon propellant (some blend of propane, butane, or isobutane) or carbon dioxide to propel the can contents onto the engine surface. The combination of propellant and spray system is chosen to provide a forceful stream, rather than a misty spray, to enhance the product's cleaning ability. Because it is more desirable to have a forceful stream, aerosol engine degreasers do not need as much propellant as other product categories, with typical hydrocarbon propellant contents of around 10 percent by weight (Survey, 1998).

The solvent content in engine degreasers varies, and the difference in solvent content often translates into different marketing terminologies. According to one manufacturer, aerosol engine degreasers are often marketed as either an engine degreaser or engine cleaner (Wells, 1999). The implication is that products with relatively high VOC content (approximately 50 percent) are geared more for heavy duty engine degreasing, while lower VOC content products are designed for light-duty maintenance cleaning of engine surfaces. However, it is not clear from either the product labels or the 1997 Survey whether there is any correlation between VOC content and the use of the term "degreaser" versus "cleaner." For example, "Tech 2000 Engine Degreaser," "STP Heavy Duty Engine Degreaser," and "Wynn's Professional Products Engine Degreaser" are low-VOC products that can comply with the proposed limit, but higher VOC products such as "K&W Products Engine Cleaner and Degreaser," "Valvoline Low VOC Engine Cleaner & Degreaser," and "Lilly Industry Engine Cleaner" would not comply as currently formulated (Survey, 1998).

The solvents in current engine degreasers include a wide variety of hydrocarbon and oxygenated compounds. Many of the older formulations use medium to high boiling-range petroleum distillates (e.g., kerosene, aromatic solvents such as Hysol[®] 15), while newer formulations often use *d*-limonene, 2-butoxyethanol, isopropanol and glycol ethers. Those products that contain water also have surfactants and corrosion inhibitors (e.g. ammonium hydroxide).

Proposed VOC Limit and Compliance:

Unlike the existing 50 percent VOC limit for all forms of engine degreasers, we are proposing to bifurcate the limits for this category, with a 5 percent VOC limit for nonaerosol products and a 35 percent VOC limit for aerosol engine degreasers, both effective on December 31, 2004. As Table VI-12 below shows, there are 11 nonaerosol and 14 aerosol products that currently meet the proposed limits.

It is clear from Table VI-14 that the majority of the nonaerosol market would easily meet the proposed new limit. We are proposing the new limit for nonaerosols to obtain emission reductions, but more importantly, to prevent nonaerosol emissions from increasing if they were subject to the same limit as the aerosol products. Because of the existing high rate of compliance with the proposed new limit, we do not expect any significant adverse impacts to the nonaerosol portion of the market.

While not as high as the nonaerosol products, the compliance rate of aerosol products with the proposed new limit is also significant. Based on the 1997 Survey, we estimate the complying market share for aerosol products to be 46 percent by weight.

**Table VI-14
Engine Degreasers Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Aerosol	35	14	46	740
Nonaerosol	5	11	96	100

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

The proposed new limits are technically and commercially feasible for several reasons. First, it is the minimum amount of VOC which industry representatives support as technically feasible (CSMA, APMC). Second, as noted earlier, the complying market shares for both nonaerosol and aerosol products are high. The fact that affected companies would have over five years to develop complying formulations using the various reformulation approaches discussed below ensures that the proposed limits meet the statutory requirements for commercial and technological feasibility.

Reformulating Nonaerosol Engine Degreasers

For nonaerosol products, we expect manufacturers of noncompliant products to formulate products similar to the compliant products which comprise 96 percent of the market. In general, this would require increasing the water content while reducing or replacing the VOC solvents in the products (e.g., 2-butoxyethanol, medium boiling range aliphatics) with *d*-limonene or some similar solvent that's suitable in high-water content products (see Appendix E). *D*-limonene is

currently used by most compliant formulations and works well in engine degreasers because of its high solvency; its Kauri-Butanol value is 61, which compares favorably to odorless kerosene (KB=27) and naphthol spirits (KB=33.5) (Arrison, 1993).

Because we expect the reformulation of nonaerosol engine degreasers to be relatively straightforward, the remainder of this discussion will focus on the reformulation options for manufacturers of aerosol engine degreasers.

Reformulating Aerosol Engine Degreasers

To determine the available reformulation options for manufacturers of aerosol engine degreasers, we evaluated the products reported in the 1997 Survey, held numerous discussions with industry representatives, reviewed the technical literature, and searched through the United States Patent Office's (USPTO) Patent Database. These reviews provided insight on some of the approaches manufacturers can take to comply with the proposed limit; while these are not intended to be all-inclusive, the discussions shown below should reasonably cover the likely formulation approaches companies will take.

General Approach

In general, we expect companies to reformulate noncomplying aerosol engine degreasers with the focus on replacing regulated VOC solvents with non-VOCs, non-regulated solvents (i.e., LVP-VOC solvents), or water-compatible VOC solvents that permit a high water content in the aerosol can. While the proposed limit is designed to allow compliance without a wholesale switch to non-VOC liquefied propellants (e.g., HFC-152a or HFC-134a), a discussion of some approaches for changing propellants is also included for informational purposes.

Use of Non-VOC Solvents

There are several organic compounds which are considered negligibly-ozone forming and are therefore exempt from the definition of VOC under section 94508 (title 17, CCR). These include acetone; methyl acetate; volatile methyl siloxanes (VMS); various CFCs and HCFCs; perchloroethylene (perc); methylene chloride (MEC); and parachlorobenzotrifluoride (PCBTF). However, because of volatility that's too high for use in engine degreasers (acetone, methyl acetate), environmental or health concerns (CFCs/HCFCs, perc, MEC), or high cost (VMS, \$10 per pound or more), the literature focuses mainly on PCBTF as a potential non-VOC that can be used in engine degreasers.

The Occidental Chemical Corporation (Oxychem) notes that PCBTF (Oxsol 100[®]) can be used in engine degreasers (Ostrowski, 1993) because it has "classical solvent performance" (Oxychem, 1999). Oxychem also states that, because PCBTF is not miscible in water, its removal from the wastewater should be easier than with other solvents because the PCBTF will float on top of the water stream (*Id.*, at 1). PCBTF has a Kauri-Butanol value of 64 (Ostrowski, *op cit.*,

at 44), which is comparable to the *d*-limonene used in many existing engine degreasers.

Use of LVP-VOCs

Many aerosol engine degreasers, including several of the market leaders, currently use high boiling (greater than 216 °C) petroleum distillates which qualify as non-regulated VOCs under section 94508 of the consumer products regulation (Survey, 1998; Morgester, 1997). We expect that some manufacturers will increase their existing use of these distillates or will switch over to these solvents if they are not using them at this time. At least one municipal wastewater treatment agency in California recommends the use of kerosene and similar high boiling distillates in place of gasoline for degreasing engines because these compounds can be removed from the wastewater stream (Flynn and Kessler, at 13).

Other LVP-VOC solvents that have been recently marketed by major solvent suppliers show significant potential for use in engine degreasers. These include LVP-VOCs from Exxon Chemical (Exxate[®], Exxsol[®], Norpar[®], and Isopar[®] series), Shell Chemical (Neosolv[®]), and others (Exxon, 1999c; Shell, 1999). In particular, Exxon reports KB values for Exxate[®] 1000, 1300, and Aromatic 200 as 111, 89 and “>99,” respectively, which indicate that these LVP fluids have similar degreasing ability as 1,1,1-trichloroethane, the solvent of choice until it was phased out due to ozone-depletion concerns (Exxon, 1999a). Reynolds and Schreiner report the development of an engine degreaser formulation with zero reportable VOCs using Exxsol[®] D110 and Exxate[®] 1000 to replace the kerosene and ethylene-based glycol ether in the existing product (Reynolds and Schreiner, 1993).

Exxon also reports that many of their LVP fluids meet the criterion of “readily biodegradable” when tested under the European Organization of Economic Cooperation and Development (OECD) method 301F (Manometric Respirometry). This method defines a material as “readily biodegradable” when 60% or greater of the tested material is degraded in a standardized 28 day test. The OECD’s method 301F is recommended under the GSA’s Environmentally Preferable Purchasing (EPP) program for determining biodegradability. In carefully controlled side-by-side biodegradability tests using the same method, the Exxsol LVP fluids biodegraded at a rate similar to *d*-limonene while the Norpar and Exxate LVP fluids biodegraded considerably faster (Exxon, 1999b).

Other solvents that qualify as LVP-VOCs and can be used in engine degreasers include some compounds known as alkyl biphenyls. Arrison reports a starting engine degreaser formula using alkyl biphenyls (NUSOLV[™] series) that has less than 20 percent VOC (Arrison, 1993). He cites the good K-B solvency values (KB=55-65), good biodegradability, and thermal stability

even on a very hot engine as desirable properties for a successful engine degreaser formulation (*Id.*, at 2-3).

Use of Highly Water-Compatible VOC Solvents

Microemulsion systems and terpene-based formulations have also been identified in the literature as potentially useful approaches to comply with the proposed limit. Dow Chemical specifically identifies aerosol engine degreasers as a potential application for its INVERT line of products (Dow Chemical, 1994). Dow Chemical reports that its INVERT solvent-continuous microemulsions (“tiny droplets of water suspended in a sea of solvent”) allow up to 50 percent water in a product while providing performance superior to aromatic and high-flash hydrocarbons and comparable performance to a 1,1,1-trichloroethane based cleaner (3-minute cold cleaning comparison of commercial brake cleaners; *Id.*).

Terpenes have been available to the consumer products industry for many years; one in particular, *d*-limonene, is used in many existing engine degreaser formulations, as noted previously. Gallagher notes that engine degreasing can be done very effectively with low-VOC terpene emulsions (Gallagher, 1993, at 7). He also points out that, like PCBTF, terpenes’ relatively low solubility in water can be an advantage to commercial and institutional users, since the terpenes floating on top of the water can be more easily removed, thereby reducing wastewater disposal and treatment costs (*Id.*, at 5).

Replacement of Hydrocarbon Propellants with Non-VOC Liquefied Propellants

Dr. Lynn Applegate of DuPont reports two prototype engine degreaser formulations developed by DuPont (Applegate, 1995). As shown below, the formulations developed have a reportable VOC content of less than 20 percent, giving formulators additional flexibility to develop products with even higher solvent content while still meeting the proposed limit of 35 percent. It should also be noted that, because propellant content in engine degreasers is relatively low compared to other categories, the replacement of hydrocarbon propellants with some dimethyl ether (DME) or HFC-152a should not result in a significant adverse impact on raw material costs for these products.

DuPont-developed Engine Degreaser Formulations
 Prototype Engine Cleaner Prototype Foaming Engine Cleaner

Prototype Engine Cleaner				Prototype Foaming Engine Cleaner			
Ingredient	A	B	C	Ingredient	A	B	C
Kerosene	10	10	8	Kerosene	10	10	8
Xylene	---	---	2				
G-3300	10	10	10	G-3300	10	10	10
Hi Sil T-600	2	3	3				
				CMC	1	0.5	1
DI Water	70.5	69.5	69.5	DI Water	71.5	72	74
Dimethyl Ether	5	5	5	Dimethyl Ether	5	5	---
A-108 (Propane)	2.5	2.5	2.5	A-108 (Propane)	2.5	2.5	---
				HFC-152a	---	---	5
Actual VOC	17.5	17.5	17.5	Actual VOC	17.5	17.5	8

Source: *Spray Tech. & Marketing*, July 1995, p.30.

Patents

A search of the USPTO database revealed several patents which suggest different approaches manufacturers can pursue to develop complying formulations. *U.S. Patent 4,302,365*, "Engine Degreaser Composition," issued to Holmgren, William C. and Charles E. Hiddema, American Grease Stick Company, filed February 11, 1980.

This patent describes a foamy type engine degreaser composition consisting of an opaque, viscous emulsion having a high water content. A controlled amount of water is added to middle distillate degreasers such as kerosene, naphtha, fuel oil and/or heavy naphtha to form an emulsion which thickens the solvent and causes foaming. A sample complying aerosol engine degreaser formulation encompassed by the patent is as follows:

<u>80% concentrate</u>	<u>In the Can</u>
Sodium lauryl sulfate	2.4%
Triethanolamine	0.8%
Xylene	10.4%
Butylcellosolve	0.8%
Water	65.6%
<u>20% HC propellant</u>	<u>20.0%</u>
Total VOC	32%

It is important to note that, not only will this formulation comply with the proposed limit,

but it will become publicly available before the effective date of the new limit (patent expires Feb. 11, 2000, nearly four years prior to proposed effective date).

U.S. Patent 4,483,783, “Solvent Preparation,” Albanese, James J., United Industries Corporation, filed April 15, 1982.

This patent describes a dispersion comprised of a water-soluble solvent and codiethanolamide as the dispersal agent. Like the patent discussed previously, this patent expires in 2002, one and a half years before the proposed limit’s effective date, thereby giving manufacturers a royalty-free formulation to further develop. A sample aerosol engine degreaser formulation encompassed by the patent and which meets the proposed limit is as follows:

<u>80% concentrate</u>	<u>In the Can</u>
Hi-Sol 15 [®] (aromatic solvent)	12%
LVP solvent (e.g., Exxate 1200 [®])	24%
Cocodiethanolamide (disperser)	0.4%
Water	43.6%
<u>20% HC propellant</u>	<u>20.0%</u>
Total VOC	32%

U.S. Patent 4,867,911, “Surface Treating Water-in-Oil Emulsion Composition and Method,” and *U.S. Patent 4,891,073*, “Method of Treating Surface with Water-in-Oil Emulsion Composition,” filed January 19, 1988, and April 13, 1989, respectively, Shortt, Alexandra B. and D.V. Satyanarayana Gupta, Pennzoil Products Company.

This patent describes a surface-treating, low-stability, water-in-oil emulsion particularly adapted for cleaning a surface; the composition is comprised of at least one liquid hydrocarbon oil solvent, water, and an emulsifying agent comprising an N-alkanoyl-2,2'-iminobis (ethyl alkanooate). Sample complying, aerosol engine degreaser formulations encompassed by the patent were shown as follows:

<u>Ingredient</u>	<u>Formula A</u>	<u>Formula B</u>
Kerosene (50% LVP)	15.0%	15.0%
Xylene	15.875%	15.975%
Lauric diethanolamide diester emulsifier	0.125%	0.025%
Water	68.3%	68.3%
Sodium benzoate	0.2%	0.2%
<u>Nitrogen (propellant)</u>	<u>0.5%</u>	<u>0.5%</u>
Total VOC	23.375%	23.475%

Both formulations were reported as exhibiting satisfactory performance.

U.S. Patent 4,772,415, “Heavy Duty Degreaser Composition and Method of Use,” Adone, Donald J., filed December 22, 1986.

This patent describes a water-based, non-toxic, biodegradable, heavy duty degreaser composition which is “particularly useful for cleaning containers, engines, pipes, and processing equipment employed in the marine and refining industries.” A sample complying aerosol engine degreaser formulation encompassed by the patent is as follows:

<u>80% concentrate</u>	<u>In the Can</u>
C ₉ -C ₁₁ primary alcohol ethoxylates	5.6-9.6%
Alkali metal silicate	1.6-4.0%
Alkaline metal hydroxide solution	0.4-1.6%
Isopropanol	1.2-3.2%
Tetraalkaline metal salt of ethylenediaminetetraacetic acid	0.16-0.8%
Water	60.8-71.0%
<u>20% HC propellant</u>	<u>20.0%</u>
Total VOC	26.8-32.8%

U.S. Patent 5,080,822, “Aqueous Degreaser Compositions Containing an Organic Solvent and a Solubilizing Coupler,” and *U.S. Patent 5,419,848*, “Aqueous Degreaser Emulsion Compositions,” VanEenam, Donald N., Buckeye International, Inc., filed on April 10, 1990, and July 2, 1993, respectively.

This patent describes compositions formulated to have “markedly improved degreasing efficacy” relative to existing formulations. A sample complying aerosol engine degreaser formulation encompassed by the patent is as follows:

<u>94.5% concentrate</u>	<u>In the Can</u>
2-phenoxyethanol (Dowanol EPh = LVP)	2.85%
Sodium pelargonate, 45% Monatropo 1250 (assumed LVP)	6.65%
Sodium nitrite	0.2%
Ammonium hydroxide	0.05%
Water	84.75%
<u>5.5% A-55 HC propellant</u>	<u>5.5%</u>
Total VOC	5.5-12.2%

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U.S. Patent 4,891,073, "Method of Treating Surface with Water-in-Oil Emulsion Composition," Shortt, Alexandra B. and D.V. Satyanarayana Gupta, Pennzoil Products Company, filed April 13, 1989.

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H. Flying Bug Insecticides (aerosols)

Product Category Description:

Flying bug insecticides are products intended to be used primarily by consumers in the control of flying household insects or pests such as flies, mosquitos and moths. These products may also be used in janitorial, institutional or commercial settings, but do not include those products designed specifically for use by licensed pest control operators (PCO's).

All insecticides sold within California must be registered with the California Department of Pesticide Regulation (DPR) and with the U.S. EPA under the Federal Insecticide, Fungicide and

Rodenticide Act (FIFRA). Insecticides used by PCO’s generally contain either higher levels of active ingredients than their consumer-use counterparts or use ingredients which are deemed too hazardous for consumer use. These products fall under the authority of the DPR, and are excluded from this regulation since they are not available to the consumer.

Flying bug insecticides were regulated under “Phase II” of the consumer products regulation which was adopted in January of 1992. At that time, the Board adopted a 35 percent VOC limit for these products, effective January 1, 1995. For products subject to registration requirements under FIFRA, an additional year is granted for compliance, so the actual effective date was January of 1996. The staff report for the Phase II regulation contains additional information on these products (ARB, 1991).

Most of the VOC emissions from flying bug insecticides are from aerosol products. Therefore, only the aerosol form is considered for a lower VOC content in this proposal. The non-aerosol forms are typically liquids used to control the flying insect larvae rather than the mature insects. The sales and emissions from the various product forms are presented in the table below.

**Table VI-15
Flying Bug Insecticides***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs/day)**
Aerosols	43	3,960	1,200
Non-aerosols	17	8,640	40

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing

Flying bug insecticides are sold in supermarkets, mass merchandise outlets, hardware stores, nurseries and other locations. These products are used around homes, offices, and commercial and institutional areas to control mosquitos, flies, moths, gnats and other flying bugs. Due to similarities in active ingredients, flying insect killers may also be used to control crawling insects such as ants, earwigs or roaches.

Flying insect killers are typically aerosol products. The aerosol mist is dispensed into the target area, and insects within that area either contact or inhale the insecticide and are rapidly paralyzed and die. If the product is used within an enclosed area, that area is typically vacated after application until the insecticide takes affect, then ventilated prior to use.

The non-aerosol flying insect killers are generally used to kill insect larvae. These include liquids which may be applied to pools of water to kill mosquito larvae, and products which may

be sprayed on trash or other waste to kill maggots. Fly strips are also used to trap flies without dispensing a toxic spray (Trumans, 1997; Dangerous Pests, 1998).

Product Formulation

Flying insect killers typically use pyrethrins and pyrethroids as the active ingredients in the aerosol products (see Section E, Crawling Bug Insecticides, for a discussion of active ingredients). The pyrethrins are usually synergized by piperonyl butoxide or other synergists. Pyrethrins and pyrethroids, while generally less than 1 percent of the product, provide for fast knockdown, and when synergized, are very effective killers.

The current VOC limit for this category is 35 percent by weight. Most products, in complying with this limit, are water-based aerosols which utilize a hydrocarbon propellant to atomize the product. Propellants typically make up about 25 percent of the product. Pyrethrins and hydrocarbon propellant are insoluble in water, so a small amount of surfactant or co-solvent is added to emulsify the immiscible phases. The co-solvent, which may be up to 10 or 15 percent of the product, may also aid in transporting the pyrethrins across the waxy cuticle of the insect, increasing the speed of knockdown. These products generally require some shaking prior to use to ensure adequate mixing.

An alternative approach to comply with the 35 percent VOC limit has been the use of LVP hydrocarbon solvent. Rather than using a water-based formulation, some manufacturers have simply replaced lighter distillates with an LVP distillate. The LVP distillate is completely miscible with both the pyrethrins and hydrocarbon propellant. Hence, these products do not require shaking prior to use. The LVP distillate, along with carrying the actives, may also aid in transporting the active across the insect cuticle. Hydrocarbon distillates also display some insecticidal activity.

The liquid products used to control larvae generally contain little or no VOC's. These products typically are water-based emulsions, containing less than 1 percent of emulsified actives. Likewise, the solvent-based sprays typically have a small amount of active dissolved in an LVP distillate (Survey, 1998; Trumans, 1997; IPM, 1999).

Proposed VOC Limit and Compliance:

The proposed limit for the aerosol product form is 25 percent VOC by weight effective December 31, 2004. Industry associations and several major manufacturers of insecticides have agreed that this limit is both technologically and commercially feasible. Currently, 7 aerosol products already comply with this limit. A summary of the complying products and marketshare is shown below in Table VI-16.

Table VI-16

Flying Bug Insecticides Proposal*

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Aerosols	25	7	13	220

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Manufacturers produce viable flying insect killers by designing their products to achieve fine atomization. The spray must remain suspended for an adequate amount of time to allow insects in the spray area to contact the mist particles. To remain in the air, the mist dispensed must be no more than about 30 microns in diameter (Clorox, 1999). Particle size is a key difference between crawling and flying bug killers, and is generally related to the amount of propellant in the formulation.

Products which currently comply with the proposed 25 percent limit use a number of formulation technologies. Most of the complying products are water-based formulas, using a hydrocarbon propellant, an emulsifier and a light distillate or LVP solvent. Complying solvent-based products utilize exempt solvents such as acetone, exempt propellants such as HFC-152a, LVP petroleum distillates or a combination of these options.

It is expected that manufacturers will reformulate their products using technologies similar to the complying products. Currently, propellant levels in these products tend to be about 25 percent to achieve the desired atomization. With the proposed limit set at 25 percent, a manufacturer may maintain their current hydrocarbon propellant amount and replace their VOC solvent with either an exempt solvent such as acetone or an LVP glycol ether. Alternatively, a portion of the hydrocarbon propellant may be replaced with a non-VOC propellant such as HFC-152a. For solvent-based products using LVP distillates to comply, the substitution of a light exempt solvent such as acetone is also a possibility.

The amount of propellant in the container may also be reduced. Suitable atomization may be achieved through the use of a vapor-tap valve. Hence, manufacturers may decrease the amount of propellant in the product and add more water or LVP solvent.

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I. Furniture Maintenance Products (aerosol)

Product Category Description:

Furniture maintenance products are designed and labeled for the purpose of polishing, protecting or enhancing finished wood surfaces other than floors. Products in this category are applied to wood furniture, and then wiped off with a soft, clean cloth (ARB, 1990). The furniture maintenance product beautifies and enhances natural woodgrain, leaving a clear and shiny surface. The shine is due to the wax in the products (ARB, 1990). Furniture maintenance products leave a protective coating or film on wood surfaces that is designed to be periodically replenished.

Furniture maintenance products do not include dusting aids, which are regulated as a separate category (ARB, 1991). Furniture maintenance products also do not include products designed solely for the purpose of cleaning, and products designed to leave a permanent finish such as stains, sanding sealers and lacquers. However, products designed to both clean and polish are included in this category.

Furniture maintenance products are sold in a variety of forms including aerosol, liquid, gel, and pumps. Furniture maintenance products were first regulated under “Phase I” of the consumer products regulation adopted on October 11, 1990. The current limit for aerosol products is 25 percent by weight, effective January 1, 1994. A further description of these products is included in the staff report for that regulation (ARB, 1990). Aerosol forms comprise about 70 percent of the category sales, by weight (Survey, 1998). Because aerosol forms contribute over 90 percent of the VOC emissions and technology exists to reduce these emissions, we are proposing to lower the VOC limit for aerosol furniture maintenance products.

Table VI-17 below summarizes the sales and emissions from aerosol furniture maintenance products based on the results of the ARB's 1997 Consumer and Commercial Products Survey (Survey, 1998). VOC emissions from aerosol furniture maintenance products are approximately 4,000 pounds per day in California.

**Table VI-17
Furniture Maintenance Products***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Aerosol	52	20,000	4,000

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Furniture maintenance products are used by both household and institutional customers. These products are designed to be used as part of a regimen of routine care for wood furniture, with regular intervals of application (Gold, 1999).

Most aerosol furniture maintenance products, including waxes and polishes, are emulsions. These products are generally applied directly to wood furniture, or to a cleaning cloth, if the wood is next to fabric or other non-wood surfaces. Next, the product is rubbed into or wiped off the wood surface. During the wiping process, the water phase is absorbed by the cloth. This leaves only the solvent/wax/polish phase on the wood surface. As the solvent evaporates, a protective coating is left on the surface. (Reckitt & Colman, 1999)

Furniture waxes and polishes may also be applied to paneling, wood trim, and cabinetry. Most products are designed to leave a shiny, protective coating on the treated wood. Many products are designed to perform more than one function. These products typically both clean and protect wood furniture.

Furniture waxes and polishes are usually sold to the consumer market through supermarkets, grocery stores, discount outlets and marts. Products sold to businesses are supplied through a variety of ways including direct sales, catalogs, and wholesale to cleaning and janitorial services.

Product Formulation:

Aerosol furniture maintenance products are generally formulated as emulsions. The solvent phase contains liquified propellants such as propane, butane and isobutanes, which "act"

as co-solvents (Reckitt & Colman, 1999), as well as other solvents such as mineral spirits, (i.e. naphtha, stoddard). The largest VOC component of furniture maintenance products is the hydrocarbon propellant, typically at 10 to 12 percent by weight. Solvent/water emulsion products also contain oils, waxes and silicones in their solvent phase (ARB, 1990) The other solvents keep the wax in solution. The other phase consists primarily of water. Some solids, such as colorants, may also exist in the water phase.

Some products are designed to perform more than one function. Many products both “clean” and protect wood furniture. To clean, these products generally rely on solvents to dissolve old wax or polish layers. Dissolving previous wax helps to minimize waxy buildup. Some products also contain silicones, which protect wood against water damage. Fragrance is also an ingredient found in many furniture maintenance products, which may add slightly to the overall VOC content of the product.

A small number of furniture maintenance products do not contain any water, and use carbon dioxide as a propellant (1998, Survey). The average VOC content for products using carbon dioxide as a propellant is under the current 25 percent VOC limit (1998, Survey). These products contain a high percentage of oils. These oils penetrate into the wood and help moisturize, condition and protect the wood. These products are not recommended for use on wood coated by polyurethane or other sealant because these products are designed to be absorbed into the wood (Gold, 1999). Products that do not contain water can use alternative propellants such as carbon dioxide (typically 2 to 3 percent carbon dioxide).

Proposed VOC Limit and Compliance:

There are reformulation options available that make reductions in VOC content technically and commercially feasible. Therefore, we are proposing a 17 percent VOC limit for furniture maintenance products, effective December 31, 2004. As shown in Table VI-18 below, there are already 19 products that comply with the proposed limit of 17 percent. Reformulation options include the use of currently available propellants that do not contribute to the VOC content of the products. Propellants such as HFC-152a could be blended with a hydrocarbon propellant which would reduce the VOC content. Also, LVP-VOC solvents are available that can partially replace current VOC solvents. In fact, most products are using LVP-VOC solvents and water to meet the current 25 percent VOC limit. The availability of non-VOC propellants and solvents make reformulation options available to these products. It is expected that most products may reformulate to meet the proposed limit by using a blend of HFC-152a with present hydrocarbon propellants, and increasing the amount of LVP-VOC solvents.

Table VI-18
Furniture Maintenance Products Proposal*

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs/day)**
Aerosol	17	19	13	700

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Patents

A search of the United States Patent Office's (USPTO) database revealed some patents which further suggest that the proposed limit can be met using current technology.

U.S. Patent 5,681,377, "Wax-free furniture polish with silicone components," issued to Lohr, Robert H and Uebe, Phillip J., filed December 20, 1995.

This patent presents a formulation for a wax-free silicone containing furniture polish prepared by using three different strategies: 1) use of a low viscosity silicone fluid and a silicone gum; 2) use of a low viscosity silicone fluid and a polydiorganosiloxane; and 3) use of a low viscosity silicone fluid, a silicone gum, and a polydiorganosiloxane together with water and one or more suitable surfactants. A sample complying aerosol furniture polish formulation encompassed by the patent is as follows:

Ingredient	Percent
Hydrocarbon propellant	10.0
Hydrocarbon Solvent	6.3
Surfactants	0.5
Silicones	7.2
Fragrances	0.3
Preservatives	0.4
Water	75.3
Total VOCs	16.3

The sample formulation shown above adds a hydrocarbon propellant to an oil and water furniture polish mixture based on the first formulation strategy described above. The addition of propellant is explained in the patent and is optional. The patent describes suitable propellants including hydrocarbon propellants, compressed gases, dimethyl ether and non-ozone depleting hydrofluorocarbon propellants. This suggests that HFC-152a is a viable reformulation option for furniture wax and polish. This formula is described as being very easy to use while providing a very high gloss level and low smear levels.

U.S. Patent 4,732,612, "Polish emulsion compositions," Steer, Frank J. and Ferguson, John A., The Drackett Company, filed September 2, 1983.

This patent describes a composition characterized by an internal aqueous phase and an external oil phase. The first claim of the patent, part (e), explains that the formulation can contain up to about 90 percent water. Adding a propellant to this mixture, as explained in the patent, could result in the following formulation:

82.8	percent water (calculated by simple addition of 8 percent hydrocarbon propellant to a 90 percent water formulation as described in the patent)
8.0	percent hydrocarbon Propellant (average of current propellant use in furniture polish)
<u>9.2</u>	percent other VOC compounds (assuming all ingredients excluding water are VOCs)
17.2	percent total VOC's

This total VOC content (17.2 percent) is within about one percent of the proposed 17 percent limit, and is calculated as worst case because not all ingredients (excluding water) are VOCs in the patented formulation. Non-VOC ingredients described in the patent include polysiloxanes and solids such as wax.

It should be noted that neither of the patents described here rely on the use of a non-VOC propellant to produce low VOC furniture maintenance products. However, the patents do not preclude the use of non-VOC propellants such as HFC-152a. In fact, as indicated in an additional patent, the weight percent or concentration of the propellant is not critical in the formulation, and can vary widely (SCJ, 1990). Additionally, no patents for furniture polish or waxes were found that described propellants as part of the patented formulation. If a propellant was mentioned at all, it was always described as optional, and not an integral, or critical ingredient in these formulations. This would seem to suggest that switching between a present hydrocarbon propellant to an HFC-152a/hydrocarbon blend propellant would not be problematic for current furniture wax or polish formulations.

Issue:

1. **Issue:** HFC-152a may be used to reduce hydrocarbon propellants in furniture maintenance products, but is more costly than hydrocarbon propellants.

Response: To meet the proposed limits manufacturers need not completely replace hydrocarbon propellants. This should minimize cost. HFC-152a can be used in a blend with hydrocarbon propellants to reduce the cost.

2. **Issue:** LVP-VOC solvents can cause polishes and waxes to leave a cloudy appearance after application to a wood surface.

Response: There are currently products available at about 20 percent VOC by weight which do not leave a cloudy residue according to the label. These products may be able to substitute 3 percent of their current hydrocarbon propellants for a non-VOC propellant such as HFC-152a. Products, therefore, could meet the proposed VOC limit without additional LVP-VOC solvents. Also, there may be some LVP-VOC solvents that do not contribute to the “cloudy” residue problem.

3. Issue: The solubility of HFC-152a is much different than the current hydrocarbon propellants and will not be suitable as a substitute because of current formulation solvent needs.

Response: Although HFC-152a does have a much lower solubility than the current hydrocarbon propellants, the proposed standard will not require a complete switch from hydrocarbon propellants to HFC-152a. A blend of current hydrocarbon propellant with HFC-152a is the most likely reformulation path, therefore not all the current solubility properties will be lost. Additionally, surfactants may be added to stabilize the reformulated emulsion (DuPont, 1999). Also, as stated previously, the weight percent or concentration of the propellant is not critical in the formulation, and can vary widely (SCJ, 1990), according to some patents.

4. Issue: Reformulating with a new propellant such as HFC-152a will create can corrosion problems for furniture maintenance products.

Response: Corrosion issues are mainly a result of the presence of water in furniture maintenance products. Almost all of currently available furniture maintenance products contain water and have already had to address corrosion problems. Changing the propellant to a hydrocarbon and HFC-152a blend should not effect these issues in any major way. Most likely, whatever scheme currently employed to resolve corrosion concerns will remain appropriate with use of the new propellant blend (DuPont, 1999).

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U.S. Patent 5,112,394, "Furniture polish concentrate and formulations", Miller, Eric J., S.C. Johnson & Sons, Inc, filed August 28, 1990. (SCJ, 1990)

J. General Purpose Cleaners (Non-aerosol)

Product Category Description:

General purpose cleaners are products designed for general all-purpose cleaning. These cleaners include products used for general floor cleaning, kitchen or counter-top cleaning, and products designed to be used on a variety of hard surfaces such as walls. However, the general purpose cleaner category does not include cleaning products designed to cleanse specific substrates in certain situations. For example, metal surface only cleaners are not included in this category. Also excluded from the category are glass cleaners and bathroom and tile cleaners which are regulated separately.

General Purpose Cleaners were initially regulated under the "Phase I" consumer products regulation adopted in 1990 (ARB 1990a). The current limit for general purpose cleaners is 10 percent effective January 1, 1994. Based on the Air Resources Board's (ARB) Consumer and Commercial Products Survey results, the number of products in this category has increased by approximately 80 percent since first regulated (ARB, 1990b; 1998). Survey results and literature data indicate that general purpose cleaners, general purpose degreasers, and glass cleaners are formulated and used similarly (ARB, 1998; Johnsen, 1997). Therefore, we are proposing identical VOC limits for these categories to reflect their similarities.

Table VI-19 below summarizes the Consumer and Commercial Products Survey (ARB, 1998) results for the general purpose cleaner category. As shown in Table VI-19, products are sold in both aerosol and non-aerosol forms. The non-aerosol products can be further divided into liquid, pump spray, gel or paste, powder, and towelettes. Depending on their intended use, dilution may or may not be required. In this regulatory effort, we are proposing to regulate only non-aerosol products because they constitute most of the emissions.

Table VI-19
General Purpose Cleaners*

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Aerosol	39	2,982	309
Concentrated (Non-aerosol)	384	133,630,779 ***	10,516
Ready-to-Use (Non-aerosol)	182	251,292	7,011

* Based on 1997 Consumer and Commercial Products Survey (ARB, 1998).

** Survey emissions adjusted for complete market coverage (see Chapter IV).

*** Adjusted for dilution.

Product Use and Marketing:

General purpose cleaners are used by household and institutional customers for general all-purpose cleaning and for removing soils, stains, or spots from different hard surfaces. In addition to cleaning benefits, some products have a surface conditioning function (e.g. abrasive cleaners), while others make disinfecting claims (Colwell, 1997). For cleaning, products are applied either directly to the surface or indirectly with a mop or sponge to cover large areas; some scrubbing is usually required but rinsing may or may not be necessary after the product is used (ARB, 1990b).

General purpose cleaners are sold in a variety of product forms including aerosol, ready-to-use liquid; pump spray; powder; paste or gel, and towelettes; and concentrated liquids and powders which require dilution before use (Hamilton and Gindling, 1999). Some products are marketed under the name of a specific active ingredient in their formulations such as citrus cleaner, pine cleaner, bleach cleaner, and ammoniated cleaner. Because of their degreasing and glass cleaning abilities, some of the products are also marketed as “general purpose cleaner-degreaser” or “glass and surface cleaners.” General purpose cleaners are available from grocery stores and discount stores etc. and are sold to household consumers, janitors, restaurants, and other commercial or institutional establishments for general cleaning and, to a certain extent for disinfecting duties. Compared to the ready-to-use products, concentrated products are more commonly used for industrial and institutional applications.

Product Formulation:

General purpose cleaners are primarily water-based products designed to clean soils from different surfaces. Typical ingredients used in these products are: propellents (aerosol-form only), solvents, surfactants, builders, antimicrobials, hydrotropes, bleaches, thickeners, fragrance, and particles (powder-form products only) (ARB, 1990b; Dow; Hamilton and Gindling, 1999). Detailed descriptions of each ingredient’s function are given below.

For aerosol-form products, liquified hydrocarbon propellents such as propane and isobutane are used to provide pressure to force the cleaning solution out of the container. These propellents, together with other ingredients (e.g. surface active agents and solvents) in the formulation, are designed to control how the product is discharged (for example, foam) (Sanders, 1987). General purpose cleaners may also include corrosion inhibitors for retarding corrosion-causing electrochemical reactions and fragrance to provide a fresh and pleasant smell to these products (Rocafort, 1995; Shaw, 1998). The sales weighted average VOC content of aerosol products is about nine percent by weight (ARB, 1998).

In general purpose cleaners, solvents such as glycol ethers and alcohols provide efficient active solvency power for most oils, greases, and dirt. This solvency aids in the dissolution mechanism of soil removal. Studies have shown that aqueous formulations containing glycol ethers are more effective than formulations containing only traditional surface active agents (surfactants) for removing soils (Dow). Hence, in addition to surfactants, some products are formulated with glycol ethers. The function of the glycol ether (and surfactant) in a general purpose cleaner is to reduce the surface tension of water and /or to reduce the interfacial tension between two liquids, or between a solid and liquid. In fact, experimental results indicate that approximately a 40 percent reduction in water's surface tension can be achieved through use of 3 percent of 2-butoxyethanol (Dow). Through these processes, soil is held in suspension and prevented from re-depositing on the surface. In addition to glycol ethers, ethanolamines and builders can prevent the redeposition effect (Aboul-Kassim and Simoneit, 1993; Union Carbide). Depending on the performance requirement, solvents such as 2-butoxyethanol can also be used to increase the evaporation rate and hence, the dry-time of the product (Rocklin, 1986; Dow; Hamilton and Gindling, 1999).

As mentioned above, surfactants are included in general purpose cleaner formulations to modify the solution's surface tension characteristics, and allow the active ingredient to spread uniformly over a surface. For aqueous-based general purpose cleaners, the surfactants used have a water soluble group (hydrophilic) which is either electrically neutral (i.e. nonionic) or negatively charged (anionic). The hydrophilic group, together with the non-polar hydrophobic (water insoluble) group allows the surfactant molecule to accumulate at the solid/water or air-water interface. This process allows a new interfacial layer with a lower surface tension to be formed which improves the wetting property of the cleaning solution.

Hydrotropes and builders may also be included in the cleaner's formulation. Hydrotropes increase the solubility of organic compounds, such as surfactants, in general purpose cleaners. The most commonly used hydrotropes are alkyl aryl sulfonates (Karsa, 1987; Aboul-Kassim and Simoneit, 1993). A builder is a substance that increases the effectiveness of a surfactant by functioning as a sequestering agent. Builders bind hard water ions such as calcium or magnesium to form large water-soluble ions. In addition to counteracting the effect of water hardness, builders are also used to control the pH for effective dirt removal. Common examples of builders include inorganic phosphates, carbonates, and organic chelators such as citrates (Aboul-Kassim

and Simoneit, 1993).

Because of consumers' increasing concern about germs spreading from contaminated household surfaces and the objectionable odor caused by bacteria or fungi, some general purpose cleaners also include antimicrobial compounds in the formulation (Colwell, 1997; Roth, 1997; Branna, 1997). In these products, quaternary ammonium compounds (e.g. alkyl dimethyl benzyl ammonium chlorides) are added. For effective disinfecting, only a fraction of one percent of these compounds is required. For some products, antimicrobial properties are also achieved as a "side-effect" of other ingredients such as cationic and anionic surfactants, hypochlorite, or oxygenated bleach in the formulation (Kore and Kiesche-Nesselrodt, 1990; Whalley, 1996). General purpose cleaners that make germ-killing claims are registered with the U.S. EPA under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). They must also register with the California Department of Pesticide Regulation (DPR) prior to being marketed in the State of California. Despite their disinfecting power, general purpose cleaners are excluded from the disinfectant definition (Title 17, California Code of Regulations, Article 2, Consumer Products, section 94508) and, hence, are not subject to the provision of Health and Safety Code section 41712 (j).

Data from the ARB 1997 consumer products survey indicate that liquid-form general purpose cleaners can be divided into VOC-containing and "non-VOC" containing formulations. The VOC-containing formulations rely mainly on glycol ethers, alcohol and/or terpenes in the products for cleaning. Non-VOC based formulations, which contain only a small amount of VOC, employ LVP-VOC ingredients and/or inorganics to perform the cleaning function. Some general purpose cleaners are also formulated with abrasives to smooth, scour, rub, and clean surfaces by mechanical action. Examples of the abrasive powders include silica with different particle sizes (Flick, 1989).

The sales weighted average VOC content of the ready-to-use and concentrated products is 2.3 percent and less than 1 percent, respectively.

Proposed VOC Limit and Compliance:

In this regulatory effort, new VOC limits are proposed only for non-aerosol forms of general purpose cleaners. The proposed VOC limits for ready-to-use and concentrated general purpose cleaners are 3 and 1 percent VOC by weight, respectively. The lower VOC limit proposed for concentrated products is consistent with the lower average VOC content in these products. The proposed limits would be effective December 31, 2004. However, for products that make disinfecting claims, an additional year is allowed to provide time for registration under FIFRA.

According to the ARB 1997 consumer products survey, over 550 non-aerosol form products were sold in California (ARB, 1998). Among these products, 121 ready-to-use products and 329 concentrated products already comply with the proposed limits, representing complying

market shares of 61 and 99 percent, respectively.

The VOC ingredients of general purpose cleaners are mainly solvents such as glycol ethers and alcohols. As mentioned previously, our 1997 consumer product survey shows that large number of complying products exist in the market, and there is no indication that complying products rely mainly on patented technology. These observations show that technologies needed to meet the proposed VOC limits for general purpose cleaners are readily available. In addition, new materials and different reformulation options are currently available for manufacturers to comply with the consumer products regulation. For example, propylene-oxide based glycol ethers (i.e. P-series glycol ethers) such as 1-butoxy-2-propanol has a similar evaporation rate to the widely used 2-butoxyethanol (ethylene-oxide based glycol ether; E-series glycol ethers) but has a higher efficiency in reducing the surface tension of water. Therefore, 1-butoxy-2-propanol could be used in a lower amount for reducing the overall solvent level in the cleaning formulations (Bartos, 1996). If fast drying is not critical to the product performance, a variety of glycol ethers, which qualify as low vapor pressure (LVP)-VOCs are available for reducing the VOC content of cleaners. In fact, preliminary studies have shown that cleaners using P-series glycol ethers perform similarly or even better than several leading commercial hard surface cleaners (Dow).

With respect to other reformulation options, Reynold (1991) reported that LVP-VOC solvents such as mono-ester (Exxate) and isoparaffin (Isopar) synthetic solvents are as effective as 1,1,1-trichloroethane in removing different types of greasy soils. Because of its surface active property, Exxate solvent could potentially be used for replacing glycol ethers as a coupling solvent in aqueous cleaners. For products requiring a shorter dry-time, reformulation strategies using LVP-VOC solvents have been developed (Schrenier, 1994).

**Table VI-20
General Purpose Cleaners Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Concentrated (Non-aerosol)	1	329	>99	904
Ready-to-Use (Non-aerosol)	3	121	61	2315

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Issues:

1. Issue: Industry has suggested that FIFRA registered general purpose cleaners require a higher VOC content than the non-FIFRA registered general purpose cleaners. They also

indicated that to allow for FIFRA registration more time is needed to comply with the proposed VOC limit.

Response: Except for pine oil, isopropanol, and ethanol, the antimicrobial active ingredients used in general purpose cleaners are not VOCs. According to the ARB 1997 consumer products survey, FIFRA-registered products containing similar non-VOC antimicrobial ingredients (dimethyl benzyl ammonium chlorides) have overall VOC contents ranging from 10 percent to less than 1 percent by weight. This observation suggests that VOC content of the cleaners plays only a minor disinfecting role, if any. In addition, we are not aware of any data that suggests that the percentage of “active” VOC (for example, ethanol) contained in general purpose cleaners (approximately 1 percent, on average, for ready-to-use products and less than 1 percent for concentrated products) is effective for killing germs. Instead, these VOCs more likely serve as a mean to provide a fresh and pleasant smell (e.g. pine oil) or as a solvent, which provides the cleaning power needed and/or facilitates the contact between the antimicrobial agents and the surface(s).

To provide enough time for industry to reformulate their products, we are proposing a December 31, 2004, effective date. For consumer products that must register under FIFRA, the regulation allows an extra year to comply with specific VOC limits (see section 94509(d)). This additional year should allow sufficient time for manufacturers to complete the FIFRA registration process.

2. Issue: Industry has suggested that the complying market share for general purpose cleaners is misleading because “specialty products” and powder product forms with little or no VOC content are included in the calculation. They suggest that if these products were not included in the calculation, the data would show that the proposed limit is not feasible for ready-to-use pump products.

Response: Based on the list of products received from industry, we excluded “specialty products” from the database and recalculated the complying market share. The complying market share for the ready-to-use general purpose cleaners changed from 61 percent to 50 percent. However, no change in complying market share was found for the concentrated products. When both “specialty products” and powders were removed, the complying market share was lowered to 33 percent. Furthermore, for pump products only, the data indicate a 14 percent complying marketshare. These data still suggest that the proposed 3 percent limit is technologically feasible.

3. Issue: Industry has indicated that some general purpose cleaners, reported in the 1997 Survey as dilutable, are actually “super concentrates” that are designed to be diluted and used as ready-to-use products. Because of this they have requested that a provision be added to the regulation to allow these “super concentrates” to be defined as ready-to-use products and be subject to the proposed ready-to-use VOC limit. They indicated that these products were a niche market with limited sales, such that there would be a minimal impact on emission reductions if this

provision was included in the regulation.

Response: ARB staff evaluated this request based on information supplied by industry which indicated that “super concentrates” could be defined as dilutable products which had minimum dilution ratios of one-to-five or less. Staff determined that a number of products would potentially qualify as “super concentrates” based on this criterion. The data also show that many of these “super concentrates” are able to comply with the proposed VOC limit of one percent for dilutable general purpose cleaners. Because the proposed VOC limit appears to be technologically feasible, ARB staff determined the provision to be unnecessary.

In those instances where there is a need for a concentrated product for special applications, such as hard-to-removes soils, section 94509 of the regulation allows products to be used in their concentrated form. However, the ARB staff acknowledges that, in some instances, manufacturers may need to reformulate their “super concentrated” products to a ready-to-use product formulation and no longer sell them as dilutables.

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K. General Purpose Degreasers

Product Category Description:

In the current Consumer Products Regulation, general purpose degreasers are defined as products designed to remove grease, grime, oil or other oil-based contaminants from a variety of substrates. At present, general purpose degreaser does not include engine degreaser, general purpose cleaner, metallic parts cleaner, adhesive remover, electronic cleaner, or metal polish/cleanser.

General purpose degreasers were regulated under the consumer products regulation (“Mid-term Measures”) adopted in May 1998 (ARB, 1997b). The current volatile organic compound (VOC) limit for the aerosol forms of general purpose degreasers is 50 percent by weight effective January 1, 2002. The current VOC limit for non-aerosol forms of general purpose degreasers is 10 percent by weight effective January 1, 2001. Descriptions of product use and marketing and product formulations have been described in the technical support document “Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation” (ARB, 1997a) and, hence, are not included in this report. The present regulatory effort is to propose an amendment to the general purpose degreaser definition to include metallic parts cleaners. Additionally, we are proposing to lower the VOC content limit for non-aerosol general purpose degreasers. This change is being proposed to provide for consistency with the VOC limit proposed for general purpose cleaners. As indicated in the 1997 survey results and available literature, these products have similar formulations and uses (ARB, 1998; Johnsen).

We are proposing to modify the definition for “general purpose degreaser” to include products that are designed to clean miscellaneous metallic parts. These products are currently sold and labeled as “solvent parts cleaner” or “metallic parts cleaner,” and have not been subject to the Consumer Products Regulation. However, these products have functions similar to general purpose degreasers in that they are designed to remove or dissolve grease, dirt, grime, and other contaminants (MEMA). Therefore, we believe it is appropriate to include solvent parts cleaners and metallic parts cleaners in the general purpose degreaser category. This amendment would provide consistency in the regulation.

The proposed amendment to the general purpose degreaser definition also would exclude products that are used exclusively in solvent cleaning tanks and related equipment. Most of the non-aerosol metallic parts cleaners and solvent parts cleaners are used in such settings, and are, thus, not subject to the VOC content limits for non-aerosol general purpose degreasers. Emissions from these products are regulated by the local air districts because they are included in the business’ “permit to operate.” For the same reason, products that are (1) sold exclusively to establishments which manufacture or construct goods or commodities and (2) labeled “not for retail sale” are proposed for exclusion from the “general purpose degreaser” definition.

Table VI-21 below summarizes the ARB 1997 Consumer and Commercial Products Survey (survey) results for the general purpose degreaser category (ARB, 1998). Although not shown below in Table VI-21, non-aerosol products can be further divided into liquid, pump sprays, and powders. Depending on their applications, dilution may or may not be needed before

use. Note that the aerosol category includes only metallic parts cleaners and solvent parts cleaners. In the current Consumer Products Regulation, metallic parts cleaner is defined as an organic liquid that is designed to dissolve grease, dirt, or other contaminants solely from miscellaneous metallic parts.

It is reasonable to include the metallic parts cleaners into the definition of general purpose degreaser because the general purpose degreasers are designed primarily to remove grease and other contaminants from substrates. Considering the variety of formulations of general purpose degreasers to remove grease and other contaminants from many different substrates, overlap of the formulations for metallic parts cleaner is inherent (MEMA). Thus, we are proposing to amend the definition of general purpose degreaser to include metallic parts cleaner.

**Table VI-21
General Purpose Degreasers ***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Aerosol	33 (12)***	2,080 (1494)***	595 (1453)***
Dilutable (Non-aerosol)	199	411,193 ****	2,403
Ready-to-Use (Non-aerosol)	95	7,718	2,094

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

*** Number of general purpose degreasers already regulated (Number for metallic parts cleaner to be added to category).

**** Number adjusted for dilution.

Proposed VOC Limit and Compliance:

The proposed VOC limits for ready-to-use and dilutable non-aerosol general purpose degreasers are 3 and 1 percent VOC by weight, respectively. The lower VOC limit for concentrated products is proposed because of the lower average VOC content once they are diluted. The proposed limits would be effective in December 31, 2004.

According to the ARB 1997 survey, over 290 non-aerosol products were sold in California (ARB, 1998). Among these products, 167 have a VOC content at or below the proposed limit. The complying marketshares for ready-to-use and dilutables are 28 percent and 83 percent, respectively.

Because of the similarity in their formulations, the reformulation strategies discussed in Section J for General Purpose Cleaners are applicable to the general purpose degreaser

non-aerosol forms as well. Hence, this discussion is not included in this part of the staff report. General purpose cleaners and general purpose degreasers represent product continuum designed to remove soil with different degree of toughness. Accordingly, the overlap in formulations as well as the VOC contents between the general purpose degreasers and general purpose cleaners are consistent with the similar functions of these products.

With the proposed inclusion of metallic parts cleaner products into the general purpose degreaser definition, aerosol metallic parts cleaner would be subject to the 50 percent-by-weight VOC limit, effective January 1, 2002. The current sales-weighted-average (SWA) VOC content of metallic parts cleaner is 97 percent. VOC emissions from these products are 0.73 tons per day. With the existing 50 percent VOC limit, emission reductions would be 0.36 tons per day.

Compliance with the 50 percent limit for the aerosol metallic parts cleaners can be achieved by reformulating with exempt VOCs and/or using the advanced surfactant technology already being used in currently complying metallic parts cleaners and general purpose degreasers. Exempt VOCs that may be used in aerosol metallic parts cleaners include carbon dioxide as propellant, acetone, parachlorobenzotrifluoride (PCBTF) (OxyChem), LVP-VOCs, or methyl acetate. While there are also products that use chlorinated solvents to comply with the limit, others have relied on aqueous cleaners with advanced surfactant technology (Quitmeyer). In these products, efficient surfactants are used to remove grease and grime in water-based formulations. The compound in the cleaner acts by having a greater attraction to the metallic surface such that it undercuts the attaching foreign particle. The foreign particle is then released from the metallic surface. An example of a mild alkaline surfactant is ethanolamine. Ethanolamines are also corrosion inhibitors and soil anti-redeposition agents (Union Carbide Corporation). Also, recent developments in pH-neutral surfactant technology may prove that pH-neutral surfactant solutions are more advantageous over solvent or alkaline surfactant solutions for certain applications (Forbes and Forbes).

**Table VI-22
General Purpose Degreasers Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Aerosol	50***	2***	1.49***	720***
Dilutable	1	132	83.0	903.9
Ready-to-Use	3	35	28.2	330.7

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

*** Numbers reflect only the metallic/solvent parts cleaners.

Issues:

1. **Issues:** Industry has suggested that general purpose degreasers require a higher VOC content than general purpose cleaners to effectively remove greasy soils.

Response: The ARB staff agrees that the solvent content in general purpose degreasers and general purpose cleaners may affect their cleaning power. If a higher VOC content is needed for general purpose degreasers, as discussed in Section J for General Purpose Cleaners, a variety of LVP-VOC solvents are available for providing the solvency needed.

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L. Glass Cleaners (non-aerosol)

Product Category Description:

Glass cleaners are specialty cleaning products designed primarily for cleaning surfaces made of glass such as windows, mirrors, glass tabletops, and computer screens. However, the glass cleaner category does not include products designed solely for the purpose of cleaning optical materials used in eyeglasses, photographic equipment, scientific equipment and photocopying machines. Products marketed as "Glass and surface cleaner" are also not included in this category. Glass cleaners come in a variety of forms including liquids, solids, aerosols, and concentrated liquid products which require dilution prior to use.

Glass cleaners were first regulated under the "Phase I" consumer products regulation adopted in October of 1990; additional information regarding the glass cleaner category can be found in the Phase I Technical Support Document (ARB, 1990c). Table VI-23 below summarizes our Air Resources Board (ARB) 1997 Consumer and Commercial Products Survey (1997 Survey) results for the glass cleaner category. In this regulatory effort, we are proposing further regulation of non-aerosol products which represent 98 percent of the glass cleaners sold in California. The current volatile organic compound (VOC) limit for non-aerosol glass cleaners is six percent by weight effective January 1, 1996.

**Table VI-23
Glass Cleaners (non-aerosol)***

Product Form	Number of Products	Category Sales (lbs/day)	Adjusted VOC Emissions (lbs/day)**
Ready to Use (RTU)	107	91,510	4,540
Concentrates	73	89,360	2,420
Total	180	180,870	6,960

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

The glass cleaner category consists of cleaning products that are labeled exclusively for use on glass surfaces. In addition to window cleaning, these cleaners are used to remove soils from glass furniture, fixtures, mirrors, or special surfaces such as stained glass. Certain glass cleaners also claim to provide special properties to the cleaned surface. For example, some products claim to provide anti-fogging properties to bathroom mirrors. Other glass cleaners claim to be no-drip or have fragrances added to the formulas. Glass cleaners are available from grocery stores, discount stores, and warehouse stores. Glass cleaners are sold to household consumers, janitors, restaurants, and other commercial or institutional establishments for glass cleaning and, to a certain extent, for disinfection.

Glass cleaners are used by household, commercial and industrial establishments. Depending on the cleaning application, both the delivery method and product form varies. The ready-to-use product is generally used by the household consumer in a spray, or pump bottle. In a household setting glass cleaners need to be able to clean a variety of soils such as food, grease, and oils (including sebum, such as fingerprints) in addition to dust and other particulate. Oily soils and particulate also need to be removed from inside vehicles windows. In addition, consumers use glass cleaners to remove outdoor soils including mineral deposits, hard water stains, dirt, and heavier soils including animal deposits. To clean these household soils, desirable performance characteristics include ease of use, quick drying, and effectiveness in soil removal, such that the product does not produce or leave streaks and/or solids on the glass surface. For heavier soils, some concentrates are also marketed for use by household consumers (Wessels, 1999).

Generally, the concentrated forms are most often used by commercial and industrial establishments. Following dilution these products are applied to mirrors, high-rise exterior and interior windows, “clear-guards” at food establishments, along manufacturing lines, or other glass surfaces. In a manufacturing setting, glass cleaners need to effectively clean greases and oils, as well as smoke from processes and fires, and other contaminants (Wessels, 1999). The product

can be applied to these glass surfaces indirectly through a medium that has been saturated with liquid glass cleaner (such as a sponge), or directly onto the glass surface through aerosol delivery, pump, or hose and removed with a cloth, paper towel, or squeegee tool. There is also a cost and quantity issue for these large jobs. Concentrated products are usually supplied as refill packs, as they offer savings in the amount of water transported and in the amount of plastic packaging required (Dow Chem).

Product Formulation:

Non-aerosol glass cleaners are water-based formulations. A typical formulation includes an alcohol and a glycol ether as active ingredients in water. However, some products contain only an alcohol or glycol ether. The key role of these solvents is to dissolve greases and oil-soluble soils. Glass cleaners also typically contain an LVP-VOC surfactant. Some formulations may also contain ammonia or vinegar. The typical VOC content ranges from zero to three percent in the concentrated products, and from zero to five percent in the ready-to-use products.

The alcohols, typically ethanol or isopropanol, serve to enhance the water solubility and contribute to increasing the evaporation rate, and decreasing the drying time, of the glass cleaner. The alcohol may also serve as a co-solvent to the glycol ether.

The glycol ethers (also known as cellosolves) in glass cleaner formulations are usually 2-butoxyethanol (ethylene glycol monobutyl ether) and/or propylene glycol monomethyl ether (NSC, Nov. 7, 1997). They are widely used in aqueous based solutions due to their high degree of water compatibility. Glycol ethers act as low molecular weight surfactants that reduce the overall surface tension of water even at low concentrations. This is important for achieving proper wetting and cleaning. Glycol ethers also can couple oils into water, to emulsify or hold soil in suspension and not allow the “dirt” to re-deposit on the substrate (Dow Chem). Glycol ethers also affect drying time.

A small quantity of surfactant (other than a glycol ether) is usually added to glass cleaner formulations to wet the surface to be cleaned. Surfactant is short for “surface active agent” and they are generally LVP-VOCs. Without the use of a surfactant, water tends to “bead up” in droplets. Surfactants work at the layer between the soil and the solvent. Each surfactant molecule has two chemical groups; one that is attracted to water (the hydrophile) and one that is attracted to soil/oil (the hydrophobe). In a cleaning solution, the hydrophobic end of the surfactant molecule orients toward the soil (Dawn). Anionic surfactants, for example sodium lauryl sulfate, are effective in removing particulate and oily soils (SDA). In addition, they also have a high affinity for water (Dow Chem).

Ammonia affects the pH level of the formula, because it is a moderately alkaline substance. Alkalies are soluble salts that are effective in removing dirt without excessive rubbing. They are good grease removers, because the alkalies form an emulsion where the oil or

particulates are held in suspension in the aqueous solution. Because they are emulsified they are not redeposited on the surface being cleaned (Walker).

Proposed VOC Limit and Compliance:

The proposed VOC limit for ready-to-use non-aerosol glass cleaners is four percent by weight VOC. As shown in Table VI-24, there is currently a 13 percent complying market share for ready-to-use glass cleaners. The proposed VOC limit for concentrated glass cleaners is one percent by weight VOC. As shown in Table VI-24, there is currently a thirty-one percent complying market share for concentrated glass cleaners. Both limits would become effective December 31, 2004.

To reformulate the noncomplying products to meet the non-aerosol glass cleaner limits, manufacturers can lower the levels of alcohol/solvents, and/or may increase the surfactant concentration. Some products can maintain their evaporative qualities and still be effective at cleaning by increasing the level of surfactant and maintaining the current alcohol content. To avoid streaking problems, different surfactants may need to be used. Additionally, low vapor pressure glycol ethers may be used as solvents with the additional benefit that many of these also have surfactant-like qualities.

The proposed bifurcation of VOC limits for the non-aerosol glass cleaners is appropriate because the average VOC content in ready-to-use products is 5 percent, and 2 percent in the concentrated products. It is important to note that for concentrated glass cleaner products the VOC limit would apply to the minimum dilution.

**Table VI-24
Glass Cleaners (non-aerosol)* Proposal**

Product Form	Proposed VOC Limit (wt.%)	Complying Products	Complying Market Share (%)	Emission Reductions (lbs./day)**
Read-to-use	4	29	13	720
Concentrates	1	22	31	1,640
Total		51	44	2,360

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emission reductions adjusted for complete market coverage (see Chapter IV).

Issues:

1. **Issue:** Industry has indicated that some glass cleaners, reported in the 1997 Survey as dilutable, are actually “super concentrates” that are designed to be diluted and used as ready-to-use products. Because of this they have requested that a provision be added to the regulation to allow these “super concentrates” to be defined as ready-to-use products and be subject to the proposed ready-to-use VOC limit. They indicated that these products were a niche market with limited sales, such that there would be a minimal impact on emission reductions if this provision was included in the regulation.

Response: ARB staff evaluated this request based on information supplied by industry which indicated that “super concentrates” could be defined as dilutable products which had minimum dilution ratios of one-to-five or less. Staff determined that a number of products would potentially qualify as “super concentrates” based on this criterion. The data also show that many of these “super concentrates” are able to comply with the proposed VOC limit of one percent for dilutable glass cleaners. Because the proposed VOC limit appears to be technologically feasible, ARB staff determined the provision to be unnecessary.

In those instances where there is a need for a concentrated product for special applications, such as hard-to-removes soils, section 94509 of the regulation allows products to be used in their concentrated form. However, the ARB staff acknowledges that, in some instances, manufacturers may need to reformulate their “super concentrated” products to a ready-to-use product formulation and no longer sell them as dilutables.

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Wessels, B. B., Glass Cleaner, presentation to the Consumer Products Working Group of the Air Resources Board, May 18, 1999, (Wessels, 1999)

<http://www.sdahq.org/sdalatest/html/houseclean5.htm>, Soap and Detergent Association, Facts about Housecleaning (SDA)

<http://www.nsc.org/ehc/ew/chems/glycethe.htm> National Safety Council, Environmental Health Center (NSC, Nov. 7, 1997)

<http://129.8.104.30:8080/projects98/557.html>, Why is Ammonia a Component of Cleaning Products?, Crystal Walker, 1998 (Walker)

<http://www.riponcomputer.com/dawnchemical/chemistryofcleaning.htm>, Dawn Chemical Incorporated Presents - The Chemistry of Cleaning (Dawn)

M. Hair Mousses

Product Category Description:

Hair mousses are foaming aerosol hair care products used for the primary purpose of styling a coiffure and providing limited holding power.

Hair mousse products may also perform a secondary function ranging from conditioning to sun protection to slightly modifying the color of the hair. Those products with dual uses are included in this category only if their primary purpose is to facilitate styling and provide a limited hold to the hair style. This category does not include hairsprays, hair styling gels, or hair shines, which are also currently subject to the consumer products regulation.

Hair mousse products were regulated under "Phase I" of the consumer products regulation adopted in August of 1990, and a description of these products is also included in the staff report for that item (ARB, 1990a). At that time, the Board adopted a 16 percent VOC limit for these products effective January 1, 1994.

Table VI-25 summarizes the sales and emissions from hair mousse products based on the results of the ARB's 1997 Consumer and Commercial Products Survey (ARB, 1998). As indicated, 136 products were sold in 1997 by 39 companies. The survey also indicates that approximately 16,000 pounds of hair mousse products were sold daily in California, emitting a total of 1,460 pounds per day of VOC.

**Table VI-25
Hair Mousses***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs./day)**
Aerosol	136	16,000	1,460

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Hair mousse products are available for personal use in the home, and are also used in commercial establishments such as hair styling salons. Hair mousse products are sold in discount, department, drug, and grocery stores and are available for purchase on the Internet. They can also be purchased in hair styling salons and beauty supply stores.

Typical hair mousse product instructions direct the user to shake the product prior to turning the container upside down and dispensing the product. For those products not packaged in containers employing hydrocarbon and/or HFC-152a propellants (i.e. a self-pressurized dispensing system, discussed in further detail below), there is no need to shake or invert the product container. The product labels reviewed either direct the user to dispense varying amounts of the product into the palm of the hand and then apply to dry or damp hair, or apply the product directly to the hair. Some product labels indicate an approximate amount of hair mousse to be used. The hair mousse is then worked through the hair prior to styling by the consumer's preferred method.

Product Formulation:

The VOC content of products in this category ranges from 0 to 16.3 percent by weight, with a sales weighted average of 9.1 percent VOC by weight. All products in this category are aerosol products.

Since the cost of HFC-152a is higher than that of hydrocarbon propellants, consumer product formulators typically use the minimum amount needed to meet VOC requirements, then fulfill any additional propellant requirements through the use of hydrocarbons (Applegate). However, in the hair mousse product category, many manufacturers are producing products with quantities of HFC-152a sufficient to yield a product far below the current 16 percent VOC limit. Several manufacturers reported hair mousse products formulated with HFC-152a as the sole propellant, resulting in near-zero VOC products. The following hydrocarbon propellants, listed in order of descending volume, were reported to be used in hair mousses: isobutane, propane, butane, dimethyl ether, isopentane, and pentane.

The solvent for hair mousses is typically water, present in the range of 74 to 92 percent by weight for all products in the category, with an average water content of 82 percent.

Resins, which provide the desired level of hold, may be either water soluble or alcohol soluble. Polyquaternium-4, polyquaternium-46, PVP/VA, and PVP are among the polymer/resins found in hair mousse products.

Conditioners such as polyquaternium-46, cocamidopropyl PG-dimonium chloride phosphate, and polyquaternium-11 improve wet and dry combing, luster and feel, reduce flyaway and enhance foam stability (ARB, 1990b).

Emulsifiers are present in hair mousses to insure a good dispersion of propellant in the concentrate and good foam formation with the valve actuation. Emulsifiers must provide initial stability upon application of the foam, and collapse when worked into the hair (ARB, 1990b). Emulsifiers commonly found in hair mouse products include, but are not limited to: oleth-20, steareth-21, isosteareth-20, and isosteareth-10.

In addition to propellant, solvent, resins, emulsifiers, and conditioners, hair mousse products may also contain ultraviolet absorbers such as benzophenone-4 or octyl salicylate, which act as a sunscreen. Hair mousse products may also contain preservatives such as DMDM hydantion, methylchloroisothiazolinone, and methylisothiazolinone in small amounts. Of those products reported to contain fragrances, none reported greater than 0.5 percent by weight fragrance. Most hair mousse products are white, but a small number of products were found to contain a colorant.

Proposed VOC Limit and Compliance:

As shown in Table VI-26 below, the proposed VOC limit for hair mousses is 6 percent by weight. We believe that manufacturers will be able to comply with this limit using currently available chemicals, and the limit does not rely on any new technologies. There were 136 hair mousse products reported in our Survey; 39 of these products, representing 27 percent of the market, would currently comply with the proposed 6 percent VOC limit. The proposed limit would result in VOC emission reductions of approximately 600 pounds per day.

As previously mentioned, manufacturers are using HFC-152a in amounts greater than that which is necessary to comply with the current standard of 16 percent by weight VOC. Because of their surface properties, fluorocarbons offer a finer cell structure with a resulting smooth product feel (Daly). HFC-152a yields foams creamier than those made with only hydrocarbon propellants, and HFC-152a/hydrocarbon propellant blends yield aesthetically pleasing foams. By adjusting the ratio of HFC-152a to hydrocarbons, either a creamier or a more brittle foam can be obtained (Applegate). HFC-152a has a vapor pressure in the intermediate range and is miscible with hydrocarbons (e.g., propane, isobutane and n-butane) as well as common aerosol solvents, including alcohols. Higher or lower vapor pressure can be obtained, if required, when HFC-152a is blended with hydrocarbon propellants or low-boiling solvents (Applegate). Fourteen products reported in the Survey use an HFC-152a/hydrocarbon propellant blend. All products reported to use an HFC 152a/hydrocarbon propellant blend comply with the proposed 6 percent VOC limit.

Although HFC-152a imparts desirable properties to hair mousse products and many manufacturers are over-complying through the use of this propellant, manufacturers are not dependent upon it's use to comply with the proposed limit. In addition to those hair mousse products reported in our Survey that comply with the proposed limit through the use of HFC-152a or HFC-152a/hydrocarbon blends, there were 21 products reported that comply with the proposed limit using only hydrocarbon propellants. Of those hydrocarbon propellant hair

mousse products that comply with the proposed limit, some contained a single hydrocarbon propellant, and others used a hydrocarbon propellant blend.

Department of Transportation (DOT) regulations pertaining to container pressure specify that the metal container in which the product is packaged must be capable of withstanding, without bursting, a pressure of one and one-half times the equilibrium pressure of the can content at 130 degrees Fahrenheit. DOT 2Q metal containers must be used if the pressure in the container exceeds 160 psig at 130 degrees Fahrenheit. (49 CFR, Chapter 1, Subsection 173.306). Hair mousse products, including those without HFC 152a, are typically packaged in DOT 2Q cans, so it is not anticipated that manufacturers will incur any additional costs for cans able to withstand greater equilibrium pressures brought about by the use of additional HFC-152a.

In addition to the use of HFC-152a to replace a portion of the hydrocarbon propellants, manufacturers have the option of using aerosol systems that do not require the use of propellants. A self-pressurized dispensing system is currently in use which consists of a thin-walled inner polyethylene terephthalate (PET) bottle with an integrated valve assembly, surrounded by a natural rubber sleeve. Instead of using propellants, the rubber sleeve expands when the bottle is filled with product, and when the user pushes the valve, the rubber sleeve's natural tendency to return to its normal size provides the dispensing power for the package (Sherwood). The system is available in sizes typically used for shaving gels, and dispenses liquids, gels, creams and post-foaming products (Exxel). At least one product reported in the Survey (Vertu Trans Foam by Tressa, Inc.) is packaged in this type of self-pressurized dispensing system.

Compressed gases offer manufacturers yet another avenue for meeting the proposed limit. While the Survey did not gather information specific to packaging systems, the literature indicates that many hair mousses are packaged in the Advanced Barrier System, or ABS, in which compressed air or nitrogen is often used to provide the required pressure against the bag needed for dispensing. The ABS system separates the product in a hermetically sealed pouch. Regis Mousse, Kenra Mousse, and Trade Secret Mousse are among the hair mousse products using the ABS (Spray Technology & Marketing).

Approximately one quarter of the hair mousse products reported in our Survey listed ethanol as an ingredient in quantities ranging from approximately 2 to 10 percent by weight. In addition to the above reformulation options, manufacturers have the option of lowering the VOC content of these ethanol-containing products by replacing alcohol soluble resins with water soluble resins.

**Table VI-26
Hair Mousses Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Aerosol	6	39	27	600

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

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Air Resources Board, Staff Report, Proposed Regulation to Reduce Volatile Organic Compound Emissions from Consumer Products, August, 1990. (ARB, 1990a)

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Spray Technology & Marketing. "A Look at Barrier Packs." April, 1997. (Spray Technology & Marketing)

N. Lawn and Garden Insecticides (non-aerosol)

Product Category Description:

Lawn and garden insecticides are products intended to be used primarily by consumers in the control of plant-attacking insects or pests such as ants, caterpillars, aphids, and beetles. These products may also be used in janitorial, institutional or commercial settings, but do not include

those products designed specifically for use by licensed pest control operators (PCO's).

All insecticides sold within California must be registered with the California Department of Pesticide Regulation (DPR) and with the U.S. EPA under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Insecticides used by PCO's generally contain either higher levels of active ingredients than their consumer-use counterparts or use ingredients which are deemed too hazardous for consumer use. These products fall under the authority of the DPR, and are excluded from this regulation since they are not available to the consumer.

Lawn and garden insecticides were regulated under "Phase II" of the consumer products regulation which was adopted in January of 1992. The Board adopted a 20 percent VOC limit for these products, effective January 1, 1995. For products subject to registration requirements under FIFRA, an additional year is granted for compliance, so the actual effective date was January of 1996. Therefore, the proposal to reduce the VOC content of lawn and garden insecticides is limited to non-aerosol products. The staff report for the Phase II regulation contains additional information on these products (ARB, 1991).

Lawn and garden insecticides are typically ready to use emulsions, emulsifiable concentrates or solid powders and granules. These products are all residual insecticides, designed to provide slow acting but long lasting control. Bait stations are available for the control of certain pests, including snails, grasshoppers, earwigs, ants, slugs, and others. A few aerosol products are sold, but their use is limited, and 1 of the 4 aerosol products listed has since been discontinued. Therefore, the proposal to reduce the VOC content of lawn and garden insecticides is limited to non-aerosol products. The sales and emissions from the various product forms are presented in the table below. The sales from baits are excluded to protect the confidentiality of the data (less than four products).

**Table VI-27
Lawn and Garden Insecticides***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs./day)**
Aerosols	4	380	80
Liquids/Pumps	111	577,000	3,420
Solids (no Baits)	41	48,800	360
Baits	***	***	0

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

*** Data excluded to protect confidentiality.

Product Use and Marketing

Lawn and garden insecticides are sold in supermarkets, mass merchandise outlets, hardware stores, nurseries and other locations. These products are used around homes, offices, and commercial and institutional areas to control ants, aphids, grasshoppers and other bugs which may damage plants. Control of garden bugs is necessary to prevent damage to garden and ornamental plants.

Lawn and garden insecticides are primarily residual killers. The solid granules or powdered insecticide, bound to an inert carrier such as clay, are sprinkled on the soil surrounding the plants. Due to their low volatility, these products may provide protection for months after application. The liquids and pump sprays are also used to distribute residual insecticide, but are frequently sprayed directly on the plants. These products may also immediately kill the bugs, since residual killers such as chlorpyrifos are also contact killers.

Because crawling bugs may be garden pests as well as household pests, there is some potential overlap between the crawling bug and lawn and garden insecticide categories. Of the four aerosol products reported in the Survey, two are house and garden products. The aerosol products tend to be contact killers.

The pest baits are effective in long term control of slugs, snails, earwigs, ants and other garden pests. These products are frequently sold in plastic housings, which make them safe for use in areas where children or pets may tamper with them (Dangerous Pests, 1998; Trumans, 1997).

Product Formulation

Lawn and garden killers typically use diazinon, chlorpyrifos or carbaryl as their active ingredient. Malathion, acephate and a few other actives are used, but on a more limited scale (see Section E, Crawling Bug Insecticides, for a discussion of active ingredients). These actives are all insoluble in water, so they are generally formulated as emulsions or dusts. The average VOC content for the category is less than 1 weight percent, which indicates that almost all products are water-based or solids.

The current VOC limit for this category is 20 percent by weight. The aerosol products are typically water-based, using about 15 percent hydrocarbon propellant to atomize the product. Since the actives and hydrocarbon propellant are insoluble in water, a small amount of surfactant or co-solvent is added to emulsify the immiscible phases. The co-solvent, which may be up to 5 percent of the product, may also aid in transporting the actives across the waxy cuticle of the insect, increasing the speed of knockdown. These products generally require some shaking prior to use to ensure adequate mixing.

As stated above, the liquid and pump products in this category are nearly all water-based formulations. When diluted at their minimum recommended dilution ratios, these products typically have a VOC content of less than 1 percent. The active ingredient is typically an organophosphate or carbamate which is emulsified. A few products are solvent-based, using both VOC and LVP distillate rather than water. In these products, the actives are dissolved directly into the LVP distillate (Survey, 1998; Trumans, 1997; IPM, 1999).

Please see Section E, Crawling Bug Insecticides, for a discussion on baits.

Proposed VOC Limit and Compliance:

The proposed VOC limit for the category is 3 percent by weight. This limit will only apply to non-aerosol products. The current limit of 20 percent will remain in affect for the aerosol products. The reductions and complying marketshare are shown below.

**Table VI-28
Lawn and Garden Insecticides Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs/day)**
Non-aerosols	3	139	99	700

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Several major manufacturers and associations have agreed that the proposed 3 percent limit is feasible. Manufacturers can reformulate to meet the 3 percent limit following the strategies of the complying products. Emulsion technology, currently used by the majority of the liquid/pump products in the category, is proven effective by the complying marketshare of over 99 percent. The active ingredients, which in this category are insoluble in water, can either be impregnated onto a solid carrier such as clay, or combined with an emulsifier in an aqueous solution. Alternatively, manufacturers may reformulate their products in solvent-based formulas using LVP distillates or exempt solvents such as acetone. Complying solvent-based products are currently marketed using these options.

REFERENCES

Air Resources Board, Technical Support Document, “Proposed Amendments to the Statewide Regulation to Reduce Volatile Organic Compound Emissions from Consumer Products - Phase II”, October, 1991b. (ARB, 1991)

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O. Nail Polish Removers

Product Category Description:

The nail polish remover category consists of products which are designed and labeled primarily for the purpose of removing nail polish or other nail coatings from the surface of fingernails and toenails. These products generally consist of a solvent or mixture of solvents which act to dissolve the nitrocellulose present in nail polish. Depending upon formulation, nail polish removers may have a secondary function of removing artificial nails, wraps, and tips.

Nail polish removers were regulated under "Phase I" of the consumer products regulation adopted in August of 1990, and a description of these products is also included in the staff report for that item (ARB, 1990a). At that time, the Board adopted a tiered limit for these products, with an 85 percent VOC limit effective on January 1, 1994, and a 75 percent VOC limit effective on January 1, 1996.

Table VI-29 summarizes the adjusted California sales and emissions for nail polish remover products based on the ARB's 1997 Consumer and Commercial Products Survey (ARB, 1998). As indicated, our Survey shows that 54 products were sold in 1997 by 22 companies. In addition, major manufacturers that did not respond to our initial Survey were contacted for additional information, and our market coverage factor is adjusted to reflect the sales of those additional products. This equates to 8,120 pounds per day of nail polish remover products sold in California, emitting a total of 1,700 pounds per day of VOC.

Per our Survey, liquid nail polish removers are the most common product form. With the exception of one product, a towelette, all products reported in the Survey were liquids. An

informal shelf survey of nail polish removers sold in Sacramento, California area stores and a review of products available on the Internet indicates that in addition to the liquid and towelette product forms reported in our Survey, cream and gel product forms are also available to the consumer.

**Table VI-29
Nail Polish Removers***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs./day)**
All forms	54	8,120	1,700

* Based on 1997 Consumer and Commercial Products Survey (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

To remove nail polish, product use instructions for liquid nail polish removers generally indicate that the nail polish remover is to be applied to a cotton ball, and the moistened cotton ball wiped across the surface of the nail polish until the nail polish is removed (Revlon, IQ,a). If the liquid is packaged in a jar with a sponge, the user is instructed to insert the fingernail into a pre-cut hole in the sponge and rotate the finger (Del). Towelettes, which are pre-moistened with product, are wiped across the surface of the nail polish until the nail polish is removed. Many products bear no use directions (Albertson's, Carson, Dayton Hudson, Famis).

Some acetone-based nail polish remover products indicate on the primary display panel that they are intended to remove artificial nails and wraps and dissolve nail glue. A portion of these products, although labeled as nail polish remover, provide directions for artificial nail removal but not nail polish removal. In order to remove nail tips, wraps, or artificial nails, the user is instructed to soak nails in the product. It may be necessary to file any additional residue and clean the nail bed before applying any new nail products (IQ,b).

Nail polish removers are used in the home and in beauty salons by professional nail technicians. Nail polish removers are sold in a variety of retail outlets, including grocery stores, drug stores, beauty supply stores, discount stores, and department stores. They are also sold through catalogs and over the Internet.

Product Formulation:

The nail polish remover product category consists of two main formulation types, those products whose solvent is acetone, and products containing nonacetone solvents. The primary solvent reported was acetone, and the primary nonacetone solvent was ethyl acetate. There were a few products reported to use a blend of acetone and ethyl acetate. Of those products reporting the use of an acetone/ethyl acetate blend, acetone was the primary solvent. In order to maintain

data confidentiality, the sales and emissions attributable to the acetone/ethyl acetate products are combined with the sales and emissions of the nonacetone nail polish remover products. A few of the products reported in our Survey and reviewed during our shelf survey were found to contain methyl ethyl ketone, a federal hazardous air pollutant and identified by the ARB as a Toxic Air Contaminant in April 1993.

The VOC content of all products reported in this category ranges from 0 to 86 percent by weight, with a sales weighted average of 22 percent by weight. The VOC content of acetone finger nail polish remover products ranges from 0 to 9.8 percent by weight, with a sales weighted average of 0.34 percent by weight. Because acetone is a primary constituent of these products and is exempt from consideration as a VOC, these products have nearly zero emissions. The VOC content of nonacetone products ranges from 18 to 86 percent by weight, with a sales weighted average of 68 percent by weight.

Nail polishes, including base coats and top coats, form a coating on the nail plate. The majority of the ingredients in nail polishes are volatile solvents. As the solvents evaporate, a smooth polymer film is left behind (Schoon, 1996). The primary and active ingredient in nail polish remover products is a solvent, and in some cases a mixture of solvents, which functions to dissolve the polymer film of nail polish. The polymers in the nail polish are not cross-linked, so they dissolve easily in solvents, requiring only brief contact with the nail polish remover in order to be removed.

In contrast to nail polish, most artificial nail enhancements are formed using cross linking monomers which join polymer chains together. This results in a three-dimensional structure of great strength and flexibility. In addition to increasing the strength, cross-linking causes the nail enhancement to be impervious to nail polish removers, making removal difficult (Schoon, 1996). Our shelf survey indicates that many of the acetone finger nail polish remover products currently on the market indicate they are safe for all nail types and/or bear no caution against using them on artificial nail systems (also referred to as enhancements) for removal of nail polish (Albertson's, Carson, Dayton Hudson, Del, OPI, Revlon). In some instances, such as when gel nail enhancements are used, the product can not be entirely removed with acetone, and the product must be removed from the nail plate by filing (Schoon, 1996; IQ,b). Artificial nail enhancements formulated with ethyl methacrylate, the most widely used monomer in the nail industry, require soaking in acetone for 30 minutes for removal. Artificial nails formulated with methyl methacrylate, a much less widely used monomer, require soaking for more than one hundred and ninety minutes in acetone for removal (Schoon, 1999a).

All solvents used in nail polish removers, including ethyl acetate, methyl ethyl ketone, and acetone, can remove water from the nail plate. However, the drying effect of these solvents is only temporary because water continually flows up from the nail bed to the surface of the nail plate, replacing water removed by solvents. Normal use of these solvents is unlikely to damage

the nail plate, but the temporary drying effects can be offset by the addition of water and moisturizing agents to the product. (Schoon, 1996).

Our Survey indicates several acetone-based products containing only solvent, and many containing only solvent and water. All reported nonacetone nail polish remover products, which as previously indicated are predominantly ethyl acetate based, contained alcohol (ethanol or isopropanol) in quantities that ranged from approximately 10 to 29 percent by weight.

Nail polish removers may also contain emollients and moisturizers, such as lanolin, aloe extract, vitamin E, or jojoba oil to offset the drying effects of solvents and soften the skin; denaturants, such as denatonium benzoate, to render the product unpalatable; sunscreens, such as benzophenone-1, for product protection; and colorants and fragrances.

Proposed VOC Limit and Compliance:

As shown in Table VI-30 below, the proposed VOC limit for nail polish removers is 0 percent by weight. We believe that manufacturers will be able to comply with this limit using currently exempt chemicals, and the limit does not rely on any new technologies. Of the 54 nail polish remover products reported in our Survey, 19 of these products, representing 35 percent of the market, would comply with the proposed limit. The proposed limit would result in VOC emission reductions of approximately 1,700 pounds per day.

The proposed limit of 0 percent VOC would preclude the use of VOC solvents such as ethyl acetate. It is anticipated that manufacturers would achieve compliance through the use of exempt solvents, such as acetone. The ARB approved the exemption of acetone as a VOC due to its low reactivity (potential to form tropospheric ozone) on September 28, 1995. When this exemption became legally effective on February 29, 1996, all nail polish removers formulated with acetone as the only solvent became compliant with the limit set for this product category, regardless of the amount of acetone in the product.

Since the exemption of acetone, some products have appeared in the market place that are greater than 75 percent acetone, but the majority have remained with the 75 percent acetone formulation produced to meet the existing VOC limit (ARB, 1998). Many of the acetone nail polish removers reported in our Survey are between 65 and 75 percent acetone, and 25 to 35 percent water. Those artificial nail enhancement products that do not contain cross-linked polymers, such as wraps and tip adhesives, are susceptible to damage or removal by acetone (Schoon, 1996). Acetone nail polish removers can be used to remove nail polish applied over these nail enhancement products, but it should be diluted with water (Schoon, 1999b), as are most of the products in our Survey.

As with previous consumer product limits, the proposed limit shall not apply to fragrances up to a combined level of 2 percent by weight, so the proposed limit will allow for the use of fragrances.

**Table VI-30
Nail Polish Removers Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
All forms	0	19	35	1,700

* Based on 1997 Consumer and Commercial Products Survey. (ARB, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Issues

- Issue:** Acetone will dry out and damage the natural nail and the surrounding cuticle.

Response: Acetone can absorb some water from the natural nail plate, as can solvents used in nonacetone nail polish removers. Normal moisture levels are restored quickly because water is constantly flowing upward and evaporating from the surface of the nail plate. The temporary dryness caused by these solvents causes no damage to the nail plate. Some nail polish removers offset the drying effects of the solvent to the nail bed and surrounding cuticle by adding water and/or moisturizing agents (Schoon, 1996).

- Issue:** Acetone is damaging to artificial nail enhancements.

Response: To remove nail polish from the surface of a natural or artificial nail, the nail is not soaked in nail polish remover. The nail polish remover is applied to an applicator, such as a cotton ball, and wiped across the surface of the nail polish only until removal is complete. The majority of artificial nail enhancements are formed using cross-linking monomers which join polymer chains together, creating a strong structure that is impervious to nail polish removers. For those artificial nail enhancements that do not contain cross-linked polymers and are, therefore, more susceptible to degradation by acetone, a dilute acetone nail polish remover product should be used. The short length of time the dilute acetone nail polish remover is in contact with the non cross-linked artificial nail enhancement during nail polish removal is not a sufficient length of time to result in degradation.

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Carson Products Company. Product label for “Quick & Gentle Cutex Nail Strengthening Polish Remover.” (Carson)

Dayton Hudson Corporation. Product label for “Trend Basics Non-Smear/Non-Smudge Nail Polish Remover.” (Dayton Hudson)

Del Laboratories, Inc., Sally Hanson Division. Product label for “Kwik Off Moisturizing Nail Color Remover.” (Del)

Famis Manufacturing, Inc. Product label for “Deluxe Nail Polish Remover.” (Famis)

IQ Products Company. Product label for “Envi Professional Strength Nail Enamel Remover.” (IQ,b)

IQ Products Company. Product label for “Envi Acetone Free Nail Enamel Remover.” (IQ,a)

OPI Products Incorporated. Product label for “Polish Remover.” (OPI)

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P. Sealants and Caulking Compounds

Product Category Description:

Sealant and caulking compounds are products with adhesive properties that are designed to fill, seal, waterproof, or waterproof gaps or joints between two surfaces. These products are used to prevent air infiltration, heat loss, water penetration, insect entry, or to improve appearance while being flexible and resistant to substrate movement. Sealant and caulking compounds do not include roof cements/sealants, insulating foams, removable caulking products, clear/paintable/water resistant caulking products, products designed exclusively for automotive uses, and sealers that are applied as continuous coatings. Sealants and caulking compounds do not include units of product, less packaging, which weigh more than one pound and consist of

more than 16 fluid ounces.

While sealants and caulking compounds come in several forms, ten to eleven fluid ounce disposable cartridges that fit in half-barrel caulking guns are the most common. Pressurized caulking cartridges that do not require caulking guns and smaller squeeze tubes are available. Some types of sealants are available in aerosol cans. Caulking compounds vary in their ability to adhere to different materials and in their resilience, durability, cost, and ease of clean-up. Some caulking compounds have special properties, such as mildew resistance, high flexibility, temperature resistance, abrasion resistance, paintability, and the ability to self-level.

As shown in Table VI-31, according to our Survey, 361 products that are 16 fluid ounces or less were sold in California in 1997. Also, based on the Survey, over 108,000 pounds of sealants and caulks that are 16 fluid ounces or less were sold daily in California during 1997. According to the Survey, these products emitted 3,740 pounds of volatile organic compounds (VOCs) per day for products that are 16 fluid ounces or less in California. The sales weighted average VOC content for these products is 3.4 percent (Survey, 1998).

Many local districts have adopted rules to reduce emissions of VOCs for sealants which apply to industrial and commercial applications. However, there are variations between the definitions, exemptions, and VOC limits found in the sealant rules adopted by each district. In December 1998, the “Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Adhesives and Sealants” (RACT/BARCT) was approved to aid districts in establishing consistent VOC limits for adhesives and sealants used in commercial and industrial processes.

**Table VI-31
Sealants and Caulking Compounds***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs/day)**
Liquid, Gel, and Other	361	108,340	3,740

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Sealant and caulking compounds are used extensively in the construction, remodeling, and maintenance of houses and other structures in order to further weatherize and protect the structure. There are many different types and uses for sealants and caulks, including: exterior caulks, all-purpose indoor/outdoor caulks, removable caulks, roof repair sealants, elastomeric caulks, high temperature caulks, and waterproof (submerged) caulks. Caulking is used for filling gaps and cracks in the foundation, around windows and doors, vents, faucets, pipes, wiring, outlets, ceiling fixtures, drains, bathtubs, and other uses around the house.

There are 6 basic types of caulks and sealants on the market today: oil-based, acrylic latex, butyl rubber, silicone-based, siliconized latex caulks, and polyurethanes (NebGuide).

1. **Oil-based Sealants** - Usually inexpensive, low durability caulks composed of drying oils, such as linseed oil, and fillers. The oils slowly dry out and the caulk will show significant hardening and cracking within a year. They also can discolor and stain the surface to which they are applied when those surfaces are not primed (Klosowski).
2. **Acrylic Latex Caulks** - Often chosen for general use because of their low price, durability, convenience, low odor, low toxicity, and effectiveness on both inside and outside surfaces. Acrylic latex compounds will also last up to 10 years. These compounds also remain durable and flexible after they have been applied, and are not affected by the sun's ultraviolet (UV) rays, alkali surfaces, or water. Acrylic latex sealants will also adhere well to concrete, ceramic tile, paint, wood, sheet rock, plaster, bricks, plastic, and glass. However, they are not recommended for use in extreme temperatures, continuously damp areas, or for high-movement areas (Klosowski).
3. **Butyl Caulks** - Used to seal exterior metal and masonry surfaces. They are solvent-based with a life expectancy of 2 to 5 years. Although butyl caulks can be painted, they usually take from 3 to 7 days to dry. Advantages of butyl caulks include their relatively low cost, good water resistance, and good adhesion without primers. Disadvantages include limited joint movement tolerance, a tendency for shrinkage, and difficulty in forming a neat bead. However, butyl caulks will not become brittle and have good resiliency. Clean up can be difficult because they require special chemical solutions (Colombo).
4. **Silicone-based Caulks** - Have a wide variety of performance characteristics. They are good for joints that move extensively, can be used at very low and high temperatures, and have a fast cure rate. Silicone caulks also have excellent adhesion to most materials, very little shrinkage, high flexibility, and are available in a clear formula. Although this type of sealant will last for 10 years or more, most silicone-based compounds cannot be painted and have low tear resistance. But, overall, silicone sealants are the best all-purpose caulk (Klosowski).
5. **Siliconized Latex Caulks** - Have similar performance characteristics to silicone-based caulks. Silicone is added to latex for increased durability, better adhesion, and increased flexibility. Application is easy, clean-up is with water, and the cost is lower than pure silicone. This caulk is paintable and comes in a variety of colors. Cure time is between 12-24 hours and the caulk should not be exposed to water in this period of time (Hardware).
6. **Polyurethanes** - Have highly versatile properties and are used in a wide range of

commercial applications. Isocyanates are a major resin used in polyurethane sealant and caulking compounds. They are available in tubes and easy-to-use aerosol cans. Polyurethanes are able to fill larger cracks because they expand when curing and can act as both an insulation and an air barrier. They also have excellent adhesion to most materials, are flexible, and can be applied at variable temperatures. However, polyurethanes are usually high in cost and must be protected from UV radiation (Wirpsza).

Sealants and caulks are sold in hardware stores, home supply stores, paint stores, hobby and craft stores, and by mass merchandisers. Sealants are also sold to industrial or institutional users through distributors or through direct sales by the manufacturer.

Product Formulation:

Sealants and caulking compounds generally have low solvent levels, high concentrations of fillers, and are thick and nonpourable. Sealants and caulking compounds are either water-based or solvent-based. Water-based caulking compounds can be cleaned up with water prior to curing. Solvent-based compounds must be cleaned up with solvents. Each type of sealant or caulking compound formulation offers its own particular strength and weakness depending on how it is used. Many products are formulated to meet the performance requirements described in ASTM C-920, the “Standard Specification for Elastomeric Joint Sealants.” A typical formulation might consist of the following:

1. **Polymer** - The most important contributing factor to the caulk or sealant’s performance. It provides elastomeric and adhesive properties. Different types of resins include oil-based, butyl, solvent-borne acrylic, block copolymer, polyvinyl acetate, waterborne acrylic, polysulfide, polyurethane, silicone, and hybrid polymers (Elmer’s).
2. **Plasticizer** - Improves sealant flexibility, extrudability of uncured product, and can reduce cost. The plasticizer must be compatible with the polymer system being used. As the plasticizer content increases, adhesion decreases. Types of plasticizers include phthalate, benzoate, and epoxidized oils (Elmer’s).
3. **Fillers** - Provides reinforcement to the product, can reduce product raw material cost, adds desired color to the product, and can impart a sag or slump resistance. Types of fillers include calcium carbonate (chalk), aluminum silicate (clay),

magnesium silicate (talc), fumed silica, cellulosic fiber, organic clays, titanium dioxide, carbon blacks, and metal oxides (Elmer's).

4. **Specialty Additives** - Used to improve and enhance specific aspects of the sealant such as weatherability, adhesion, package stability, and cure rate. Examples of specialty additives are adhesion promoters, UV absorbers, catalysts, and waterborne additives. Adhesion promoters, such as organotitanates and silane coupling agents, provide adhesion to specific substrates. UV absorbers, which include hindered amines and benzotriazoles, provide long term stability of the cured product and eliminate surface cracking, chalking, or discoloration. Catalysts are another type of specialty additive used to accelerate the cure rate. Types of catalysts include peroxides, tertiary amines, and compounds based on nickel, tin, or platinum. Finally, waterborne additives, such as freeze thaw stabilizers, are used to preserve the integrity of latex particles. Examples of common waterborne additives are: ethylene glycol, propylene glycol, urea, and isopropanol (Elmer's).

5. **Diluents** - Reduce the viscosity and aid in the application of the caulk. For water-based formulations, water is the primary diluent, however, some VOC co-solvents are used including: acetates (acetic acid, butyl acetate, vinyl acetate, etc.), alcohols (ethanol, methanol, isopropanol, etc.), and glycols (ethylene glycol, propylene glycol, diethylene glycol methyl ether, etc.). Diluents used in solvent-based formulations include: mineral spirits, hexane, Stoddard solvent, toluene, and xylene. Manufacturers limit the amount of diluents to control shrinkage resulting from the evaporation of the diluent during curing.

Proposed VOC Limit and Compliance:

The recommended limit for caulks and sealants is four percent by weight VOC effective December 31, 2002. As determined by the ARB 1997 Survey, there is a 69 percent complying market share, where 259 products have VOC contents below the proposed limit. Most or all of the complying products are water-based formulations. Solvent-based caulks, such as the butyl caulks and the polyurethanes, may reformulate by increasing the amount of non-diluents, using lower concentrations of higher solvency VOCs, using low vapor pressure or exempt solvents, or switching to a different polymer system. Over 55 percent of all caulks and sealants are 2 percent VOC by weight or less (Survey, 1998).

**Table VI-32
Sealants and Caulking Compounds Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Liquids, Gels, and Others	4	259	69	1,580

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Issues:

1. **Issue:** Aerosol insulating polyurethane and latex foams, which are sold in hand held pressurized containers, should not be included under the caulk and sealant definition.

Response: Aerosol insulating foams are self-pressurized products designed to fill wider gaps than regular caulking. They expand to fill the gap and can act as both an insulator and an air barrier. Aerosol insulating foams vary from caulking compounds in that they contain very low amounts of filler material, such as calcium carbonate. According to the ARB 1997 Survey, the VOC emissions from these products are about 0.03 tons per day (tpd) statewide. These aerosol insulating foams are specialized products and are not used like a caulking compound. Therefore, we are proposing to exclude these products from this regulatory action. However, they may be reviewed in future regulatory efforts.

2. **Issue:** Some manufacturers have stated that removable caulking products should not be included under the caulk and sealant definition.

Response: Removable caulks are specialized products that use a solvent release technology and are designed to be removed cleanly after 3-6 months. They are used to temporarily seal around doors or storm windows. We have identified two removable caulking products in the ARB 1997 Survey with emissions of 0.01 tpd statewide. We currently are not aware of any available technology that will meet the proposed limit for this specialized use, so we have proposed to exclude these products from the proposed definition.

3. **Issue:** A VOC limit of 7 percent is more feasible than the proposed VOC limit set by ARB due to difficulties in reformulating polyurethane sealants. These difficulties include: higher viscosities, performance characteristics, self-leveling, and shortened shelf life.

Response: Staff believes that the nonaerosol polyurethane caulks can comply with the 4 percent VOC limit. The sales weighted average VOC content is 5 percent for the 18 nonaerosol polyurethane caulks included in the ARB 1997 Survey. Over one-third of these nonaerosol polyurethane caulks in the Survey had a VOC content of 4 percent or lower.

4. **Issue:** The proposed VOC limit of 4 percent will eliminate new types of high performance silicone sealants which have substituted a neutral cure system for an acetic acid leaving group which reduces corrosive properties and is less odorous to consumers. A VOC limit of 5-6 percent was recommended for these high performance sealants.

Response: We believe that silicone sealants can comply with the 4 percent VOC limit. The sales weighted average VOC content for silicone sealants was 2 percent in the ARB 1997 Survey. Over three-quarters of the silicone sealants have a VOC content of 4 percent or lower. Product literature and labels for many of these same silicone sealants indicate that they are high performance sealants.

5. **Issue:** Roof cements and sealants should not be included under this category.

Response: The roof cements and sealants are not included under this category. They are included in a separate survey category under Cold Process Roof Cements. Almost all sales in California are large sizes subject to district regulation. However, the products sold in small containers meet the same VOC limits as larger sizes. These products are asphalt-based and require nonpolar solvents such as mineral spirits or hydrocarbon solvents.

6. **Issue:** The category is too broad for a single VOC limit because there are too many end uses. Industry suggested 11 specialty subcategories.

Response: ARB staff worked with industry to narrow down the suggested number of specialty subcategories. Based upon the 1997 survey data, there are products in almost every suggested subcategory that comply with the proposed limits. We have proposed a single category with a VOC limit that will allow for formulation of the wide variety of available products.

7. **Issue:** Clear/paintable/water resistant caulks should be exempted from the regulation.

Response: Clear/paintable/water resistant caulks are based on a solvent-based synthetic block co-polymer rubber, such as styrene-ethylene/butylene-styrene. These caulks cannot meet the proposed VOC limit with currently available technology in order to satisfy all three performance attributes. Because the VOC emissions for this type of caulk are 0.03 tpd statewide, we have proposed exempting these caulks. We intend to monitor this exemption to determine if lower VOC technologies are developed in the future.

8. **Issue:** Floor seam sealers should be exempted from the regulation.

Response: Floor seam sealers are products used in small quantities to fuse, bond, or seal (coat) minute gaps or seams between adjoining edges of flexible sheet flooring (i.e., vinyl). Both hot melt and solvent-based products are used depending upon the type of flooring installed. Solvent-based products contain up to 90 percent VOC to weld or fuse the wear layers of adjoining sheets. As with other types of solvent welding cements for plastics (i.e., plastic pipe

cements), there are limited reformulation options. Although these products have a high VOC content, the total statewide emissions are less than 0.04 tpd. We intend to monitor this exemption to determine if lower VOC technologies are developed in the future or if a separate VOC limit needs to be established.

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Q. Tire Sealants and Inflators

Product Category Description:

"Tire Sealant and Inflators" are aerosol products designed to temporarily inflate and seal a leaking tire. These products work by first inflating the tire with a propellant and then sealing punctures in the tire with latex rubber or a related compound. This category does not include products that are designed only to seal a tire or those products that seal and inflate with the aid of pressurized air from a compressor or similar source. Products that are intended to prevent punctures from occurring are also not included (e.g., sealant applied to an intact but empty tire, which is then inflated with air from a compressor).

Table VI-33 below summarizes the sales and emissions from tire sealant and inflators based on the ARB's 1997 Consumer and Commercial Products Survey. As shown in Table VI-33, these products account for sales of about 8,500 pounds per day (4.25 tons per day) and VOC emissions of 0.89 tons per day (1,800 pounds per day).

**Table VI-33
Tire Sealants and Inflators***

Product Form	Number of Products	Category Sales (lbs./day)	Adjusted VOC Emissions (lbs/day)**
Aerosol	13	8,500	1,800

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

Product Use and Marketing:

Tire sealants and inflators are used by drivers to temporarily fix a flat tire until a permanent repair can be made. These products can fix a flat tire faster and more easily than replacing a flat tire with a spare (an advantage in dangerous areas). However, they do not work on large holes or on the sidewalls of a tire. For example, one manufacturer recommends their product for punctures up to three sixteenths of an inch (Radiator Specialty product label).

To use these products, the driver typically attaches the flexible plastic hose or cone-shaped applicator on the product to the valve stem of the flat tire and depresses the actuator button. The propellant temporarily inflates the tire and carries the product, including sealants, into the tire. The driver is then instructed to drive the car without delay at low speed to help distribute the sealant material on the inside of the tire, ensuring that it can seal the puncture. Users are also instructed to permanently repair the tire as soon as possible and to make the repair facility aware that the tire has been repaired with an inflator and sealant product. This last step is particularly important when the consumer uses a flammable tire inflator and sealant product that may cause an explosion if a spark or other ignition source is inadvertently applied by the repair facility (e.g., sparks resulting from contact of a puncture reamer with the steel belts inside the tire; Mary Kay O'Connor Process Safety Center, Oct. 1, 1998).

Product Formulation:

There are several different types of formulations used in tire sealants and inflators, which can be generically categorized into flammable and nonflammable formulations. The flammable formulations tend to be older-technology, hydrocarbon propellant-based products that are non-aqueous (e.g., those using propane, butane, or isobutane). Because of several recent explosions and a product withdrawal by a major manufacturer (Pennzoil-Quaker State, 1999), most marketers and retailers are now requiring manufacturers to provide nonflammable formulations (Link, 1999).

For the propellant system, nonflammable formulations typically use

1,1,1,2-tetrafluoroethane (HFC-134a) (Radiator-Specialty, Prestone labels); dimethyl ether modified by trichloroethylene and nitrogen gas (Snap Products, U.S. Patent 5,500,456); or a mixture of carbon dioxide, dimethyl ether (DME), and nitrogen gas (IQ Products, U.S. Patent 5,284,895). While DME is normally flammable, when combined with a high amount of water and the compressed gases as used in the Snap and IQ products, DME's flammability is minimized in the spray and is suppressed in the tire (*Id.*; Snap Products patent, *op cit.*).

In addition to the propellant, tire sealants and inflators contain other ingredients which are critical to their functionality and efficacy. Latex, polyvinyl acetate, styrene-butadiene polymer, cellulosic or asbestos fibers, and other substances are used as sealant materials. These solids are carried in solution with various solvents, including water, acetone, medium aliphatic naphtha, and perchloroethylene. In aqueous formulations, a corrosion inhibitor such as ammonium hydroxide or triethanolamine is used as a pH stabilizer (IQ Products patent, *op cit.*). To allow the use of these products in frigid conditions, manufacturers use freeze-point depressors such as propylene glycol (*Id.*) or ethylene glycol (Prestone, *op cit.*). Because of the moderately high vapor pressure of HFC-134a, manufacturers use ingredients such as 2-butoxyethanol (Radiator Specialty, U.S. Patent 5,124,395) or acetone (Pennzoil, U.S. Patent 5,705,604) as vapor pressure depressants so that products containing HFC-134a can be packaged in conventional DOT 2P or 2Q aerosol cans (Radiator Specialty patent, *op cit.*).

Proposed VOC Limit and Compliance:

We are proposing a 20 percent VOC limit for tire sealants and inflators effective December 31, 2002. As shown in Table VI-34, four aerosol products would meet the proposed limit if it were in effect today. These four products represented approximately half of the market in California during 1997; as discussed below, it is likely these products and similarly nonflammable, complying products comprise an even larger portion of the current market.

**Table VI-34
Tire Sealants and Inflators Proposal***

Product Form	Proposed VOC Limit (wt. %)	Complying Products	Complying Market Share (%)	Adjusted Emission Reductions (lbs./day)**
Aerosol	20	4	50	640

* Based on 1997 Consumer and Commercial Products Survey. (Survey, 1998)

** Survey emissions adjusted for complete market coverage (see Chapter IV).

The proposed VOC limit of 20 percent by weight is technically and commercially feasible for several reasons. First, it is the minimum amount of VOC which representatives from the Chemical Specialties Manufacturers Association (CSMA) and the Automotive Chemical Manufacturers Council (ACMC) support as technically feasible for this category. Second, as noted earlier, the four complying products which comprised half of the market in 1997 are all

labeled and advertised as nonflammable. Because of liability concerns about the potential for explosions, most marketers and retailers are now requiring nonflammable formulations from their suppliers (Chemical Market Reporter, 1999, *op cit.*). Thus, it is highly probable that the complying market share for these and other similar nonflammable products is even greater than 50 percent in today's market.

We expect manufacturers and marketers to comply with the proposed limit by making products similar to those that already comply. Since the four complying products are based on different patents, we expect manufacturers to either develop and market non-infringing formulations or enter into licensing agreements with the patent holders. At least one manufacturer has indicated that it would make a flammable product rather than enter into a licensing agreement, but this approach would seem to limit that company's market potential given the overall trend toward nonflammable formulations. In any case, manufacturers are free to choose for their own reasons whether to comply using flammable or nonflammable formulations.

Two of the patented complying formulations that are currently marketed are discussed below in more detail. A third, recently-patented formulation based on methylene chloride, is also discussed as another option that will be available to marketers and manufacturers.

U.S. Patent 5,124,395 (Abramowski, Horst and James D. Wells, Radiator Specialty; filed April 25, 1991)

This patented formulation is marketed under various brand names, including "Solder Seal-Gunk Puncture Seal," "Prestone Tire Jack," and others. Its distinguishing feature is the use of HFC-134a as a propellant to provide nonflammability. While HFC-134a is considered a greenhouse gas (Johnsen, 1997; U.S.EPA, 1998), the U.S. EPA lists HFC-134a as an acceptable substitute for ozone-depleting propellants under its Significant New Alternatives Policy (SNAP) Program (*Id.*, as of 5/25/99). DuPont, a major supplier of HFC-134a, has also stated that the use of HFC-134a in tire inflators for its nonflammable properties is an acceptable, emissive use of this greenhouse gas (Guidemal, 1999). In contrast, the U.S. EPA with DuPont's support recently prohibited the emissive use of HFC-134a in a noncritical application (self-chilling soft drink container), due to the potentially significant impact on global warming (64 FR 10373, 10375, March 3, 1999).

The patent describes a preferred sealant composition that yields a product for use in a DOT 2P can as follows:

<u>Ingredient</u>	<u>Weight Percent</u>
Water	42.5
Ammonium hydroxide	0.4
Vinyl acetate copolymer	4.2
Ethylene glycol	2.5
Butyl cellosolve	12.4
HFC-134a	38

As this preferred formulation shows, a manufacturer which makes this or a similar formulation could easily meet the proposed limit with a VOC content of 12.4 percent (from the butyl cellosolve, also known as 2-butoxyethanol). Ethylene glycol qualifies as a non-regulated LVP-VOC, and HFC-134a is exempt as non-ozone forming under the VOC definition (section 94508, title 17, CCR).

One manufacturer has stated that, in its legal opinion, the recent reexamination of the Abramowski and Wells patent by the U.S. Patent Office (U.S. PTO Reexamination Certificate 3787th, issued June 22, 1999) precludes essentially all formulations using HFC-134a (until the patent expires in April 2011) (McDonald and Raymond telecon, 1999). However, this manufacturer provided no written legal analysis, which ARB counsel could evaluate on its merits, of the patent reexamination to support this claim. Indeed, the reexamination seems to confirm as patentable those formulations containing 20 to 80 percent by weight HFC-134a, rather than all formulations containing any amount of HFC-134a (see Claims 5, 6, 20, 28-33, 44-46, and 48; Radiator Specialty patent, *op cit.*). Moreover, if the reexamination achieved the result as claimed, the U.S. PTO would have invalidated 4 different patents based on HFC-134a, which it issued subsequent to the Abramowski and Wells patent (see U.S. Patents 5,705,604, Pennzoil Products Co.; 5,338,776, Aerosol Systems, Inc.; 5,618,912, Pennzoil Products Co.; and 5,648,406, Specialty Chemical Resources). It is unlikely that the U.S. PTO would have intended such a result, given the potential liability the federal government would have to the affected companies that detrimentally relied on the U.S. PTO's issuance of their patents.

The issue of possible retroactive patent infringements because of the claimed implications of the reexamination has not yet been tried in court. However, even in the unlikely scenario that the claim discussed above were true, manufacturers would still be able to market complying products based on HFC-134a by entering into a licensing agreement with the patent holders (for example, see Prestone Tire Jack product label, *op cit.*). In any case, manufacturers have over three years until the end of 2002 to develop and market a non-infringing product, license the above patented formulation, or license one of the following alternative formulations that are not based on HFC-134a.

U.S. Patent 5,284,895 (Pradeep Y. Gupta, c/o IQ Holdings, Inc.)

This patented formulation is marketed under various brand names, including “AirUp,” “RepairSafe,” and “Primis” tire sealants and inflators. Its distinguishing feature is the use of an azeotropic blend of dimethyl ether, carbon dioxide, and nitrogen gas as the propellant to provide a nonflammable product to the consumer. The dimethyl ether also serves as the solvent carrier (along with water) to solubilize and transfer the latex sealant into the tire. The patent does not provide a single preferred composition, but one can infer from the patent a product composition that yields a nonflammable, non-ozone depleting product as follows:

<u>Ingredient</u>	<u>Weight Percent</u>
Water	56
Ammonium hydroxide	0.5
Polyvinyl acetate	20
Propylene glycol	3.0
Mineral oil (anti-foam)	0.5
Carbon dioxide + nitrogen	3.0
Dimethyl ether	17

As this preferred formulation shows, a manufacturer which makes this or a similar formulation could meet the proposed limit with a VOC content of 20 percent (from the dimethyl ether and propylene glycol). If ethylene glycol is used in place of propylene glycol, the calculated VOC content would be less than 20 percent, since ethylene glycol qualifies as a non-regulated LVP-VOC as noted previously.

U.S. Patent 5,834,534 (Adams, Lawrence J. and Paul D. Hughett, Engine Fog Inc., filed November 4, 1996)

Because this patent was issued in 1998, we do not know if the patented formulation was marketed in California during 1997. Nevertheless, the formulation has the potential for use as a complying tire sealant and inflator because of its low VOC content and virtual nonflammability. Unlike the previous patent, the distinguishing feature of this patent is its complete reliance on compressed gas (preferably carbon dioxide) as the sole propellant needed to inflate the tire. The formulation accomplishes this feat by using the high solubility of carbon dioxide in methylene chloride (MEC), a non-VOC solvent under section 94508 (title 17, CCR), supplemented by methylene chloride’s relatively high vapor pressure. While MEC is considered a Toxic Air Contaminant, it remains a legally-available ingredient in consumer products. Indeed, the U.S. EPA lists MEC as an acceptable substitute for ozone-depleting substances under its SNAP Program. The U.S. EPA specifically identified the acceptability of MEC when it is used as an alternative solvent in aerosols in which nonflammability is a critical factor (Spray Tech. & Marketing, Jan. 1997, citing 59 FR 13044-13161).

The patent describes a preferred sealant composition as follows:

<u>Ingredient</u>	<u>Weight Percent</u>
Deionized Water	30.55
“Hycar” nitrile latex	7.174
IGEPAL CA-897 (surfactant)	1.739
Triethanolamine (99%)	0.500
“Mazon RI-6”	0.300
“Epoxol 9-5”	0.300
“Fibra-Cel SW-10”	0.587
Methylal	11.00
Methylene Chloride	43.50
Carbon dioxide	4.350

Of these ingredients, only methylal (dimethoxymethane) would be counted as a VOC, giving this compliant preferred composition a VOC content of 11 percent by weight. Like methylene chloride, methylal is used in this composition because of its relatively high vapor pressure and its high degree of solubility of carbon dioxide, effectively serving as a gas reservoir (Beaujean, 1993). For similar reasons, acetone could be substituted in place of methylal for its high vapor pressure and high degree of solubility of carbon dioxide, further reducing the VOC content. As this preferred formulation shows, a manufacturer which makes this or a similar formulation could easily meet the proposed limit.

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VII.

ENVIRONMENTAL IMPACTS

A. SUMMARY OF ENVIRONMENTAL IMPACTS

Air Resources Board (ARB) staff have investigated the potential environmental impacts of the proposed amendments to the Consumer Products Regulation (Regulation). This analysis shows that the proposed amendments would reduce volatile organic compound (VOC) emissions statewide. It is anticipated that the resulting reduction in VOCs will reduce the formation of ground level ozone and particulate matter with diameters less than ten micrometers (PM₁₀). In accordance with California Environmental Protection Agency policy, we conducted a health risk assessment, which concludes that public health would be improved by reducing VOC emissions. Moreover, ARB staff has determined that no significant adverse environmental impacts should occur as a result of the proposed amendments, with one exception that is discussed below in Section C (i.e. a temporary increase in VOC emissions from general purpose degreasers). The following environmental analysis provides the basis for our findings.

B. LEGAL REQUIREMENTS APPLICABLE TO THE ANALYSIS

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Because the ARB's program involving the adoption of regulations has been certified by the Secretary of Resources (see Public Resources Code section 21080.5), the CEQA environmental analysis requirements are allowed to be included in the ARB Initial Statement of Reasons in lieu of preparing an environmental impact report or negative declaration. In addition, the ARB will respond in writing to all significant environmental points raised by the public during the public review period or at the Board hearing. These responses will be contained in the Final Statement of Reasons for the proposed amendments to the Regulation.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following: (1) an analysis of the reasonably foreseeable environmental impacts of the methods of compliance, (2) an analysis of reasonably foreseeable feasible mitigation measures, and (3) an analysis of reasonably foreseeable alternative means of compliance with the Regulation.

Our analysis of the reasonably foreseeable environmental impacts of the methods of compliance is presented in Sections C through F below. Regarding reasonably foreseeable mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis. The ARB staff has identified only one significant adverse environmental impact: a temporary increase in VOC emissions from general purpose degreasers,

occurring between 2001 and 2004. This impact, and the one mitigation measure identified by the ARB staff, is discussed below in Section C.

Two alternative means of compliance with the Regulation have been developed. A current compliance alternative for manufacturers of consumer products is the Alternative Control Plan (ACP). The ACP regulation, Title 17, California Code of Regulations, sections 94540-94555, is a voluntary market-based regulation that utilizes the concept of an aggregate emission cap, or “bubble.” An emissions bubble places an overall limit on the VOC content of emissions from each individual product. To be approved, an ACP must demonstrate that the total VOC emissions under the bubble would not exceed the emissions that would have resulted had the products been formulated to meet the VOC limit established for each product. In other words, some products in the ACP could exceed the established VOC limits in the Regulation as long as those increased emissions were offset by additional products that over-comply with the established VOC limits. The ACP provides manufacturers with flexibility, but preserves the overall environmental benefits of emission reductions (ARB, 1994a).

Another compliance alternative that is available for manufacturers is the Innovative Products Provision specified in Title 17, California Code of Regulations, section 94511. This provision allows a manufacturer to formulate products that exceed the mass-based limit specified in the Regulation for a particular product category. The manufacturer must demonstrate that, through some characteristic of the higher VOC product, its use will result in less VOC emissions compared to a representative complying product. This alternative is also specifically designed to allow manufacturers flexibility, while preserving the emission benefits of the regulation.

C. VOC EMISSIONS REDUCTIONS AND POTENTIAL ENVIRONMENTAL IMPACTS

Impact on Ground Level Ozone

The primary intent of the proposed amendments to the Regulation is to reduce the formation of tropospheric, or ground-level, ozone by reducing the VOC emissions from unregulated and previously regulated consumer products. The formation of tropospheric ozone requires a mix of VOCs, nitrogen oxides, oxygen and sunlight (Seinfeld and Pandis, 1998). Therefore, the reduction in VOC emissions from these amendments is expected to provide a beneficial environmental impact on air quality and public health by reducing tropospheric ozone formation. The proposed amendments contain VOC limits for 17 product categories. The limits are designed to achieve the maximum VOC reductions that are commercially and technically feasible at this time for each category. Based on the results of the 1997 Consumer and Commercial Products Survey (Survey), these products emitted about 48 tons per day (tpd) of VOCs in California in 1997. Because market coverage was less than 100 percent in most product categories, the emissions were adjusted upwards to account for under-reporting in these categories. The estimated actual emissions from these categories is about 54 tpd (see Chapter IV for more details). The reduction in VOC emissions from the proposed limits is expected to be

about 21 tpd based on 1997 sales data. The product categories, their emissions, and expected emission reductions as a result of the proposed amendments are shown in Table VII-1. Depending on the product category, the limits will become effective as early as December 31, 2002, or as late as December 31, 2004.

**Table VII-1
Summary of Emissions and Emission Reductions from the Proposed Limits**

Product Category	1997 VOC Emissions Adjusted (Tons/day)	Adjusted 1997 Emission Reductions (Tons/Day)	Percent Emission Reduction
Automotive Brake Cleaners			
Aerosols	5.26	0.29	6
Non-Aerosols	0.34	0.02	6
Automotive Windshield Washer Fluids (Non-Type A Areas)	8.30	7.42	89
Carburetor or Fuel-Injection Air Intake Cleaners			
Aerosols	6.25	2.14	34
Non-Aerosols	0.23	0.05	22
Construction, Panel and Floor Covering Adhesive	1.00	0.44	44
Crawling Bug Insecticides			
Aerosols	3.81	0.49	13
Double Phase Aerosol Air Fresheners	4.57	1.54	34
Engine Degreasers			
Aerosols	1.67	0.37	22
Non-aerosols	0.08	0.05	63
Flying Bug Insecticides			
Aerosols	0.60	0.11	18
Furniture Maintenance Products			
Aerosols	1.98	0.35	18
General Purpose Cleaners (non-aerosols)			
Ready-to-Use	3.18	1.05	33
Dilutables	4.77	0.41	9

Product Category	1997 VOC Emissions Adjusted (Tons/day)	Adjusted 1997 Emission Reductions (Tons/Day)	Percent Emission Reduction
Solvent Parts Cleaners (included under aerosol general purpose degreasers)	0.73	0.36	49
General Purpose Degreasers (non-aerosols)			
Ready-to-Use	0.95	0.15	16
Dilutables	1.09	0.41	38
Glass Cleaners (non-aerosols)			
Ready-to-Use	2.27	0.36	16
Dilutables	1.21	0.82	68
Hair Mousses	0.76	0.33	43
Lawn and Garden Insecticides Non-Aerosols	1.35	0.35	26
Nail Polish Removers	0.85	0.85	100
Sealant and Caulking Compounds	1.87	0.79	42
Tire Sealants and Inflators	0.89	0.32	36
Total Emissions	54.01	19.47	36
Acetone Credit-Nail Polish Remover		1.51	
Total Combined Reduction	54.01	20.98	39

While the proposed amendments to the Regulation will provide an overall reduction in VOC emissions, there will be a temporary negative environmental impact due to excess VOC emissions from the general purpose degreaser category. The proposed amendments will result in more stringent VOC limits for non-aerosol degreasers, but will also repeal the 10 percent limit scheduled to become effective on January 1, 2001. The more stringent VOC limits would become effective on December 31, 2004. Hence, a four year temporary negative impact will result. The four year lead time for the more stringent VOC limits is needed to preserve the commercial and technological feasibility of the VOC limits and ensure that basic market demand can be met. However, we are also proposing to increase the reductions from aerosol general purpose degreasers, beginning January 1, 2002, by including solvent parts cleaners in the general purpose degreaser definition. Therefore, the greatest impact of repealing the existing VOC limit will occur in 2001, when the excess emissions will be 0.77 tpd statewide. From 2002 to 2004, the inclusion of solvent parts cleaners in the aerosol general purpose degreaser definition, together with the 50 percent VOC standard for aerosol general purpose degreasers (which becomes effective on January 1, 2002), will partially offset the excess emissions resulting from repealing the VOC limit.

Consequently, the statewide average annual excess emissions from 2001 to 2004 will be 0.49 tpd for this four-year period. This amendment to the general purpose degreaser definition is the only feasible mitigation measure that the ARB staff has been able to identify. No adverse environmental impacts are expected from this mitigation measure, for the same reasons that no adverse impacts are expected from the adoption of the other VOC limits specified in this regulatory action.

Beginning in 2005, when the proposed amendments are fully implemented, the total emission reductions from general purpose degreasers will be 1.1 tpd greater than under the existing limits. Repealing the existing VOC limit for nonaerosol general purpose degreasers will allow additional time for manufacturers to improve the emerging technologies that may be needed to develop commercially viable products that meet the more stringent 2004 VOC limits in this proposal. The proposed amendments will also avoid the implementation of two separate VOC limits for nonaerosol general purpose degreasers within a relatively short period of time, which would result in significant cost impacts to many manufacturers. Finally, with the proposed amendments, we will still meet and exceed our SIP commitments in 2002. Overall, we believe that these considerations override any adverse impacts that may occur as a result of the proposed amendments. Further discussion of the ARB's rationale for the proposed amendments is contained in the discussion of the general purpose degreaser category in Chapter VI.

Impact on Particulate Matter

By reducing VOCs, the proposed amendments would also have an additional positive environmental impact by reducing the amount of particulate matter (PM) in the atmosphere. Of importance here are secondary particles, i.e., particles that are formed in the atmosphere as a result of chemical reactions that involve low vapor pressure organic gases and reactive oxygen species, such as ozone (Seinfeld and Pandis, 1998; Godish, 1990). Organic aerosols formed by gas-phase photochemical reactions of hydrocarbons, ozone, and nitrogen oxides have been identified in both urban and rural atmospheres (Seinfeld and Pandis, 1998). Secondary particles generally have aerodynamic diameters less than 10 micrometers (PM_{10}), and particularly 2.5 micrometers ($PM_{2.5}$), which is the particle diameter range most likely to be inhaled deep into lungs and lead to respiratory injury (U.S. EPA, 1997a). In addition, carcinogenic polycyclic aromatic hydrocarbon compounds and heavy metals may be concentrated in these secondary particles (Godish, 1991). For a further description of the effects of PM on health and the environment, refer to Chapter IV of this report. Therefore, by reducing the VOC content of consumer products, as proposed in these amendments, fewer VOCs would be emitted leading to less PM formed in the atmosphere. This outcome will result in a positive environmental impact on air quality and public health.

Risk Assessment for Reduced Exposure to Ozone and PM₁₀

The actual health risk reductions that would result from the adoption of this regulation cannot be quantified due to lack of appropriate data. However, the VOC reductions from the proposed amendments represent a partial fulfillment of the State Implementation Plan (SIP), which when fully implemented by 2010, will allow all non-attainment regions of the State to reach attainment for ozone (ARB, 1994b). The proposed amendments will also reduce PM_{2.5} and PM₁₀, albeit in an indirect way as explained earlier. Further measures outside the scope of these proposed amendments will be needed to fully address the PM₁₀ health concerns. The health risks associated with ozone and PM exposure have been known for many years. With regard to ozone, studies have shown that when inhaled, even at relatively low levels, ozone can cause:

1) inflammation of lung tissue; 2) aggravation of asthma; 3) significant decreases in lung capacity of 15 to over 20 percent in some healthy adults; 4) increased hospital admissions and emergency room visits; 5) impairment of the body's immune system defenses; and 6) increased susceptibility to respiratory illnesses (U.S. EPA, 1996a; U.S. EPA, 1997b).

Similar health effects have been associated with PM exposure. These health effects include: 1) premature mortality; 2) aggravation of respiratory and cardiovascular disease; 3) changes in lung function and increased respiratory symptoms; 4) changes in lung structure; and 5) altered respiratory defense mechanisms (U.S. EPA, 1997a). Although it is not easily quantified, recent information made available by U.S. EPA clearly shows a correlation between ozone and PM reduction and improved public health (U.S. EPA, 1996a). Based on an analysis of 86 PM studies and 185 recent ozone studies, U.S. EPA could quantitatively estimate the health benefits that result from lower ozone and PM₁₀ concentrations. These estimates indicate that there would be significant reductions in breathing problems, hospital admissions, premature mortality, and missed school and work days (U.S. EPA, 1996a). Illnesses in children, such as lung inflammation and severe asthmatic episodes, would also be significantly reduced (U.S. EPA, 1996a).

Due to lack of appropriate data, we are unable to directly compare the estimated health risk reductions resulting from the proposed regulation with the health risk reductions from similar regulations. However, we are able to compare the VOC emission reductions from the proposed regulation with other consumer product regulations adopted by the ARB. The proposed regulation is designed to achieve the maximum feasible VOC emission reductions from the categories proposed for regulation at this time. Based on the 1997 data, these reductions equate to a total of about 21 tpd from the 17 product categories. This represents a 39 percent reduction in VOC emissions from these categories. This compares favorably with other consumer product regulations adopted by ARB. The Phase II consumer products regulation reduces VOC emissions from over 28 tpd to about 19 tpd, a 35 percent reduction (ARB, 1991a). The Mid-term Measures consumer products regulation reduces VOC emissions from 32 tpd to about 16 tpd, a 50 percent reduction (ARB, 1997). The ARB has also adopted an Aerosol Coating Regulation that, when fully implemented, will reduce VOC emissions by 42 percent, from 30 tpd to 17.4 tpd (ARB, 1998). At the federal level, the U.S. EPA has adopted and implemented a national consumer

product regulation to reduce VOC emissions from 24 consumer product categories by 20 percent (U.S. EPA, 1998a).

In summary, our health risk analysis shows that, by achieving these reductions, this regulation would reduce health risks by a similar magnitude as other regulations adopted by the ARB and other environmental agencies. To what extent this regulation would reduce ozone and PM₁₀ concentrations is difficult to quantify and contingent on many factors. It is clear, however, that by reducing ozone and PM₁₀ concentrations, this regulation would reduce the health risks posed by exposure to these pollutants.

D. POTENTIAL ENVIRONMENTAL IMPACTS ON GLOBAL WARMING AND STRATOSPHERIC OZONE DEPLETION

Impact on Global Warming

Currently, there is much concern over the impact of human activities that are altering the amount of heat, or infrared, radiation that can escape the Earth's surface. Global warming is the theory that increases in carbon dioxide (CO₂) and other anthropogenically-produced "greenhouse gases" decrease the amount of infrared energy that escapes the earth's atmosphere (Godish, 1991). The result would be a gradual increase in the average temperature at the earth's surface.

CO₂ has been the main focus of greenhouse concerns. It is estimated that the largest source of greenhouse gas emissions in the United States (U.S.) is CO₂ from fossil fuel combustion, which accounted for 81 percent of all greenhouse gases in 1996 (U.S. EPA, 1998b). CO₂ and water vapor limits the transmission of infrared radiation to space in many wavelength regions, particularly in much of the 8-20 um region. However, almost 80 percent of infrared radiation emitted by the surface of the earth escapes to space through an atmospheric, or infrared, window in the electromagnetic spectrum region of 7-13 um, where infrared absorption by CO₂ and water vapor are very weak (Godish, 1990; Graedel and Crutzen, 1993). Synthetic gases such as chlorofluorocarbons (CFC) and hydrofluorocarbons (HFC) absorb strongly in the window region and are therefore much more effective as greenhouse gases than CO₂; on a molecule-for molecule basis, they can be thousands of times more efficient in absorbing infrared energy (Godish, 1990). Worldwide, the global warming impact of trace gases such as CFCs, HFCs, methane, and nitrous oxide combined is nearly equivalent to the importance of CO₂ (Graedel and Crutzen, 1993). However, the California emissions of these trace gases represents only 14 percent of the global warming impact within the State (U.S. EPA, 1998i). The remaining global warming impact is due to CO₂. Therefore, CO₂ emissions in California have a much bigger role than trace greenhouse gas emissions with regard to global warming.

For aerosol products to meet the VOC limits in the proposed amendments, manufacturers may choose to replace some or all the typical hydrocarbon propellents with HFC-152a or HFC-134a. These compounds are exempted as VOCs under the Regulation. However,

HFC-152a is the chief HFC alternative for hydrocarbon propellents in consumer products due to its significantly lower global warming potential and atmospheric lifetime compared to HFC-134a (Du Pont, 1992; Applegate, 1995). The global warming potential is the ratio of the warming caused by a substance to the warming caused by a similar mass of CO₂. HFC-152a has no ozone depletion potential, does not contribute to the formation of ground-level ozone, is low in toxicity, and is only mildly flammable (U.S. EPA, 1999). The primary area of concern for HFC-152a is its potential to contribute to increased greenhouse gas emissions. However, with a global warming potential roughly 7-9 times less than HFC-134a and an atmospheric lifetime of 1.5 years, HFC-152a has one of the lowest potentials for global warming among all HFCs. By comparison, HFC-134a has an atmospheric lifetime of 14.6 years.

Only one category under consideration for regulation, hair mousses, currently has a significant number of products containing HFC-152a. Based on the results from the 1997 Survey, the total emissions of HFC-152a from this category was 0.08 tpd (Survey). Based on a worst case scenario using the 1997 Survey results, we have estimated that emissions of HFC-152a from categories that may use it as a reformulation option, including aerosol furniture waxes and polishes, double phase aerosol air fresheners, and hair mousses, would be a maximum of 1.60 tpd. This is equivalent to 0.020 million metric tons of carbon equivalents (MMTCE) per year. MMTCE takes into account the global warming potential of a greenhouse gas and its molecular weight relative to CO₂, and is therefore a more accurate unit of measure when comparing various greenhouse gases. The 1996 U.S. emissions of HFCs, perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆) from all sources equates to 34.7 MMTCE (U.S. EPA, 1998b). Based on the California proportion of the U.S. population (13 percent), the emissions of HFCs, PFCs, and SF₆ in California is estimated at 4.5 MMTCE. Thus, emissions of HFC-152a from categories that can use the propellant as a reformulation option may increase the California emissions of all HFCs, PFCs and SF₆ compounds by 0.5 percent.

When the contribution of all greenhouse gas emissions are factored in, HFC, PFC and SF₆ emissions accounted for only 1.9 percent of the total MMTCE from U.S. greenhouse gas emissions in 1996 (U.S. EPA, 1998b). Therefore, maximal emissions of HFC-152a due to the Regulation represent a 0.01 percent increase in global warming potential for California. Other factors that contribute to the negligible environmental impact of HFC-152a is its short atmospheric lifetime of 1.5 years, and its relatively high price among propellents. Unlike CFCs which have atmospheric lifetimes measured in tens to hundreds of years, only small amounts of HFC-152a would remain in the atmosphere after 1.5 years if all emissions of HFC-152a were discontinued. In addition, when cost considerations are factored in (HFC-152a is about \$1.80 per pound, versus hydrocarbon propellents at \$0.25 per pound), it is anticipated that manufacturers will use as little HFC-152a as possible, or none at all, when reformulating their aerosol products. ARB staff do not expect the price of HFC-152a to change appreciably in the near future. Therefore, the anticipated HFC-152a emissions as a result of implementation of the Regulation will have a negligible impact on global warming.

Based on discussions with manufacturers, HFC-134a will be used as a propellant reformulation option in one category considered for regulation, tire sealants and inflators. HFC-134a is a nonflammable gas and is a good alternative for HCFC propellents, which are being phased-out in this category in accordance with U.S. EPA policy (U.S. EPA, 1995a). While other propellant systems exist for reformulation of tire sealants and inflators, including HFC-152a and dimethyl ether/water systems, they all have some degree of flammability and may present a potential explosion hazard. In the absence of this proposed regulation, manufacturers are using HFC-134a due to liability concerns about potential explosions. Based on a worst case scenario using the 1997 Survey results, we have estimated that increased emissions of HFC-134a from products that may use the propellant as a reformulation option to meet the proposed Regulation would be a maximum of 0.2 tpd. This is equivalent to 0.024 MMTCE per year, which is roughly equal to the maximal estimated MMTCE from increased emissions of HFC-152a from consumer products considered for regulation. Overall, this will represent a 0.01 percent increase in global warming potential for California. This percentage is likely overestimated because HFC-134a is replacing HCFC propellents, themselves global warmers, in some formulations. So until the minimal global warming issue overrides the safety issue, HFC-134a will remain a reformulation option for tire sealants and inflators.

To a limited extent, CO₂ may also replace hydrocarbon propellents in some products. As mentioned above, CO₂ is the primary man-made greenhouse gas of concern. The 1997 Survey data indicate that CO₂ is used in certain consumer products considered for regulation, such as automotive brake cleaners, carburetor and fuel-injection air intake cleaners, engine degreasers, and general purpose degreasers (Survey). Although CO₂ has found some use as a replacement propellant in these consumer products, it is not considered a likely replacement for hydrocarbon propellents in other product categories. Therefore, its use in aerosols due to the proposed Regulation would have a negligible impact on global warming. In addition, most CO₂ used as a propellant is a recycled by-product of existing processes and, therefore, does not increase global warming (ARB, 1995a).

Impact on Stratospheric Ozone

The ARB staff has determined that the proposed amendments will have no discernable impact on stratospheric ozone depletion. Stratospheric ozone shields the earth from harmful, high energy ultraviolet (UV) radiation. CFCs and other hydrocarbons containing chlorine and/or bromine are the primary substances that cause stratospheric ozone depletion, leading to increased harmful UV radiation reaching the troposphere (Godish, 1991; U.S. EPA, 1995b). CFCs and other ozone-depleting substances (ODS) are released from anthropogenic sources, where they can eventually reach the stratosphere due to their extreme stability. In the stratosphere, incoming high energy UV radiation release the chlorine and bromine atoms from the ODS molecule. The chlorine and bromine atoms then act as catalysts in a reaction that destroys stratospheric ozone. Increased exposure to harmful UV radiation has been linked to skin cancer, cataracts, damage to materials such as plastics, and harm to certain crops and marine organisms (U.S. EPA, 1995b). Because the reactions which form ground-level ozone are driven by UV radiation, it is

conceivable that a reduction in stratospheric ozone may also result in an increase in photochemical smog formation due to the increased UV radiation (ARB, 1995b).

Based on the 1997 Survey, staff is not aware of any ozone-depleting materials other than 1,1,1-trichloroethane (TCA) and a few hydrochlorofluorocarbons (HCFCs) that are used in the consumer product categories being considered for regulation. These compounds are considered exempt VOCs under the Regulation. U.S. EPA has classified TCA as a Group V ozone-depleting compound, which indicates that TCA has a low ozone-depletion potential relative to CFCs (U.S. EPA, 1995a). However, according to the Montreal Protocols and the 1990 Federal Clean Air Act amendments, all ozone depleting compounds, including TCA, were scheduled for production phase-out by 1995. Discussions with manufacturers that reported consumer products containing TCA in the 1997 Survey indicated that production of formulations containing TCA were almost entirely phased out in 1995. The TCA use reported in the Survey represented the sell-through of existing stock containing the compound. Therefore, ARB staff expect very few consumer products currently being considered for regulation to contain TCA. In addition, manufacturers do not plan to reformulate with TCA to meet the proposed limits due to the TCA production phase-out.

Only one category being considered for regulation, tire sealants and inflators, contained some products that were formulated with HCFCs. In general, the ozone-depletion potential of HCFCs is less than TCA. However, all HCFCs are included in group II and all are scheduled for phase-out by U.S. EPA between 2004 and 2030 (U.S. EPA, 1998c ; U.S. EPA, 1995a). Upon discussion with manufacturers of these products, use of HCFCs has been essentially phased out in preference for other propellents.

E. POTENTIAL ENVIRONMENTAL IMPACTS FROM INCREASED USE OF TOXIC AIR CONTAMINANTS

Background

Pursuant to Health and Safety Code section 39650 et seq., the ARB is required to identify and control toxic air contaminants (TAC). The Health and Safety Code defines a TAC as "...an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a hazard to human health." A number of chemicals currently used in the consumer product formulations considered for regulation have been identified as TACs (ARB, 1997b; Survey). An increased use of TACs in any of the consumer products considered for regulation could lead to a potential adverse environmental impact. ARB staff has evaluated this potential and has concluded that an increased use of TAC's will not occur as a result of these regulatory amendments. The basis for this conclusion is explained below.

Solvents commonly used in consumer products that have been identified as TACs, such as ethylene-based glycol ethers and methyl ethyl ketone, are also VOCs (Survey, ARB, 1997b). This regulation is designed to reduce the VOC content of consumer products which should lead to a

reduction in the use of TACs that are also VOCs. This would be a positive environmental impact of the Regulation. However, two TACs used in some consumer products, methylene chloride (MeCl) and perchloroethylene (PCE), are specifically exempted from the VOC definition (section 94508 of the Regulation) in recognition of their very low ozone-forming capability. This also provided needed conformity with the federal VOC definition (U.S. EPA, 1998a). Below, we provide some general information about MeCl and PCE, and discuss why staff believes that the proposed amendments will not result in any increased use of these compounds.

Methylene Chloride (MeCl)

MeCl, also known as dichloromethane, is a volatile, nonflammable, colorless liquid with a sweetish chloroform-like odor (ARB, 1997b). MeCl is used in some aerosol consumer products, including some of the automotive products covered by the proposed amendments. However, paint removers and strippers account for the largest use of MeCl in California. Based primarily on toxicology studies in experimental animals, MeCl was formally identified as a toxic air contaminant in 1989 (ARB, 1989). In 1990, U.S. EPA designated MeCl as a hazardous air pollutant (HAP) pursuant to section 112(b) of the Federal Clean Air Act because it was known to have, or possibly have, adverse effects on human health or the environment.

Health Effects

The major routes of human exposure to MeCl are inhalation, which can be high near sources of emissions, and ingestion from contaminated water (U.S. EPA, 1998d). Acute exposure to MeCl can cause central nervous system depression and gastrointestinal upset. Symptoms at low to moderate concentrations include dizziness, incoordination, impaired vision, headache, and nausea. At very high concentrations, pulmonary edema, cardiac arrhythmias, and loss of consciousness can occur (U.S. NTP, 1991; ARB, 1997b). MeCl is also a mild irritant to the nose, throat, and eyes. Chronic non-cancer effects include bone marrow, hepatic, and renal toxicity (ARB, 1997b). The acute non-cancer Reference Exposure Level (REL) is $1.4 \times 10^4 \mu\text{g}/\text{m}^3$ for an average exposure time of 1 hour (OEHHA, 1999a). A chronic non-cancer REL of $3.0 \times 10^3 \mu\text{g}/\text{m}^3$ has been developed under the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program (CAPCOA, 1993).

Inhalation of MeCl has been shown to increase liver and lung cancer and benign mammary gland tumors in animal studies (U.S. EPA, 1998e). However, there was inadequate human evidence of carcinogenicity. Thus, MeCl was declared a B2 substance, probable human carcinogen, by U.S. EPA (U.S. EPA, 1998e). An inhalation potency factor of $1 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1}$ is used as the basis for regulatory action in California (OEHHA, 1999b). This number estimates that the potential excess cancer risk for a person exposed over a lifetime to $1 \mu\text{g}/\text{m}^3$ of MeCl is no greater than one in a million. Lifetime exposure of laboratory animals to MeCl in their drinking water caused a significant increase in liver cancer (U.S. EPA, 1998e).

Because additional scientific data clearly showed that the established OSHA permissible exposure limit (PEL) of 500 ppm (8-hour time-weighted average) was inadequate to protect workers, OSHA adopted a revised PEL of 25 ppm in 1997 to protect worker health (OSHA, 1997).

Perchloroethylene (PCE)

PCE, also known as tetrachloroethylene, is a non-flammable, colorless, dense liquid with an ether-like odor (ARB, 1997b). PCE is used primarily in the dry cleaning and textile industry, as a chemical intermediate in the production of other chemicals, and as an industrial degreaser for metals (U.S. EPA, 1998f). PCE is found in consumer products such as auto brake cleaners, which are subject to our proposed amendments (U.S. EPA, 1996b). Based on toxicology studies in experimental animals and its wide use, U.S. EPA designated PCE as a HAP pursuant to section 112(b) of the Federal Clean Air Act in 1990 (ARB, 1993). In 1991, the State of California formally identified PCE as a TAC (ARB, 1991b).

Health Effects

The most common routes of exposure are inhalation and dermal contact (NTP, 1999). Acute effects due to inhalation of high levels of PCE include intense irritation of upper respiratory tract and eyes, kidney dysfunction, and neurological effects such as reversible mood and behavioral changes, impairment of coordination, and anesthetic effects (U.S. EPA, 1996b). Chronic exposure to PCE can result in liver toxicity, kidney dysfunction, cardiac arrhythmia, and neurological effects, including headaches, and impairment of memory, concentration, and intellectual function (U.S. EPA, 1996b). The U.S. EPA established an oral Reference Dose (RfD) for PCE of 0.01 mg/kg/day based on hepatotoxicity in mice and weight loss in rats (U.S. EPA, 1998g). The acute non-cancer REL is $2 \times 10^4 \mu\text{g}/\text{m}^3$ for an average exposure time of 1 hour (OEHHA, 1999a). A chronic non-cancer REL of $35 \mu\text{g}/\text{m}^3$ has been used in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program (CAPCOA, 1993), and was approved by the Scientific Review Panel during the TAC identification process (ARB, 1991b).

Long-term inhalation exposure to PCE by experimental rodent species resulted in an increase of liver and kidney tumors and mononuclear cell leukemia (ARB, 1997b). Long-term oral exposure of mice to PCE resulted in liver tumors. However, there was inadequate human evidence of carcinogenicity. Thus, PCE was declared a B2/C substance, probable human carcinogen, by U.S. EPA (ARB, 1997b). An inhalation potency factor of $5.9 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1}$ is used as the basis for regulatory action in California (OEHHA, 1999b). The oral potency factor used as the basis for regulatory action in California is $5.1 \times 10^{-2} (\text{mg}/\text{kg}/\text{day})^{-1}$ (OEHHA, 1999b).

Potential for Increased Use of PCE and MeCl

Because both PCE and MeCl are TACs that have been exempted from the VOC definition in the Regulation, manufacturers have the option to reformulate with these compounds, or increase

their use in currently marketed products, to meet the proposed VOC limits. However, we believe manufacturers will not rely on MeCl or PCE to reformulate their products. The reasons are: 1) every VOC limit proposed by the ARB staff was intentionally set at a level that would be achievable without the increased use of either PCE or MeCl; 2) manufacturers will be discouraged from reformulating products with PCE or MeCl, or any other TAC, by the need for additional labeling under Proposition 65 (Prop 65); 3) corporate policies exist that prevent the use of TACs due to health and safety concerns; and 4) there are low permissible exposure limits set by OSHA. For these reasons, we do not believe that the regulatory amendments will result in any increased use of these compounds.

The ARB has been tracking the use of PCE in regulated consumer products since 1996 to ensure increased use does not occur. Proposed amendments to the current reporting requirements will require manufacturers to report both PCE and MeCl use. The reporting requirements would extend 6 years beyond the final implementation date of the proposed limits to 2010. This will ensure that new technology and reformulation developments that may include MeCl or PCE are not overlooked following implementation of the last proposed VOC limits in 2004. Of the 17 consumer product categories currently considered for regulation, MeCl and/or PCE is/are used extensively only in brake cleaners (Survey). However, some categories, including carburetor or fuel-injection air intake cleaners, engine degreasers, general purpose degreasers, and tire sealants and inflators contain some products with one or both TACs (Survey). The ARB is currently evaluating an Airborne Toxic Control Measure (ATCM) that would limit the use of chlorinated compounds such as PCE and MeCl in automotive products. Below is a discussion of reformulation options for each product category considered for regulation that have products containing PCE and/or MeCl.

Automotive Brake Cleaners

Currently, automotive brake cleaners can be divided into two distinct groups: the chlorinated brake cleaners, which contain PCE and/or MeCl, and the nonchlorinated brake cleaners, which contain exempt and non-exempt VOC solvents. The chlorinated brake cleaners are nonflammable but have toxicity and waste disposal issues, while the nonchlorinated brake cleaners have relatively minor toxicity issues but are usually flammable. The proposal would drop the VOC limit for this category from 50 percent to 45 percent. As discussed in Chapter VI, manufacturers of nonchlorinated brake cleaners have endorsed this proposed limit and plan to meet it primarily by adding more acetone, an exempt VOC. In addition, nearly all of the chlorinated brake cleaner products already meet the proposed limit so there is no reason to assume this subcategory of brake cleaners will use more PCE and/or MeCl. Because the proposed VOC limit is relatively close to the current limit, it is not anticipated that this amendment will cause increased use of chlorinated brake cleaners over the non-chlorinated brake cleaners. Also, the recent downward revision of the OSHA PEL (OSHA, 1997) for MeCl will likely prevent the increased use of MeCl in automotive brake cleaners.

Carburetor or Fuel-Injection Air Intake Cleaners

Most of the products in this category are aerosols and are regulated by U.S. EPA as fuel additives. While some of the aerosols currently contain either PCE or MeCl, U.S. EPA no longer registers fuel additives that contain chlorinated hydrocarbons (U.S. EPA, 1998h). The existing

carburetor or fuel-injection air intake cleaners that contained PCE or MeCl prior to the ban on chlorinated hydrocarbons will not have to reformulate if they already meet the proposed VOC limit. However, any reformulation change in these products will be allowed only with complete removal of all chlorinated hydrocarbons in the formulation. The liquid carburetor or fuel-injection air intake cleaners are not subject to this ban, but there are relatively few of these products and the majority do not contain PCE or MeCl. Due primarily to the additional labeling requirements and toxics issues, we do not expect manufacturers to reformulate the liquid form of these products with PCE or MeCl.

General Purpose Degreasers

Amendments to the Regulation will include solvent parts cleaners under the general purpose degreaser category. Prior to this category consolidation, the general purpose degreasers contained a small number of products that were formulated with PCE and/or MeCl. The general purpose degreasers with PCE and/or MeCl have specific uses in industrial applications and are exempt from the Regulation. The remainder of the general purpose degreasers are for household use and are not anticipated to reformulate using TACs such as PCE and MeCl. However, some of the solvent parts cleaners contain MeCl and/or PCE. Nearly all these TAC-containing products already meet the proposed VOC limits. For the non-TAC-containing solvent parts cleaners, it is expected that reformulation will be similar to general purpose degreasers that are already compliant without the use of TACs.

Tire Sealants and Inflatators

Currently, PCE is used in some tire sealant and inflator formulations. Based on conversations with manufacturers, MeCl may also become a reformulation option. Because flammability is such a critical issue in this category, the use of the nonflammable solvents PCE and MeCl would have played a role in reformulation whether or not we developed VOC limits for tire sealants and inflators. Therefore, our proposed VOC limits are expected to have little or no effect on the use of TACs in this category.

Summary

Overall, ARB staff anticipates that the amendments to the Regulation will have a positive environmental impact by reducing the amount of TACs that are VOCs. The amendments to the Regulation are designed to reduce the VOC content of consumer products. It is likely that a reduction of TACs would also occur because most TACs are also VOCs. In addition, ARB staff anticipates that use of exempt VOCs that are TACs should not increase as a result of the proposed amendments. MeCl and PCE are TACs that were specifically exempted from the VOC definition in recognition of their very low ozone-forming capability and to provide conformity with the federal VOC definition. For the reasons discussed in this Initial Statement of Reasons, we do not anticipate that the proposed amendments would lead to increased use of MeCl and PCE as consumer products are reformulating to the VOC limits. ARB staff intentionally proposed VOC limits that are achievable without an increased use of TACs. In addition, the Proposition 65 labeling requirements dissuade manufacturers from reformulating consumer products with TACs. Long lead times before the limits become effective should also provide manufacturers time to investigate reformulation options that do not include TAC usage.

Currently, the ARB tracks the use of PCE in all regulated consumer products through manufacturer reporting requirements. Proposed amendments to the Regulation will require manufacturers to report usage of all regulated products that contain PCE or MeCl. In the event that the available data indicate an increase in PCE or MeCl usage, additional measures would be taken or the proposed limits would be reevaluated. Also, the ARB is currently evaluating an ATCM that may limit the use of PCE and MeCl in automotive products.

F. OTHER POTENTIAL ENVIRONMENTAL IMPACTS

Impacts on Water Quality and Solid Waste Disposal

We do not expect an adverse impact on water quality or solid waste disposal from the proposed amendments to the Regulation. The Regulation is designed so that all current product forms will be available. Because of this, we do not anticipate any changes in packaging or disposal due to the Regulation. With regard to water quality, the yearly reporting requirement for PCE use (see Section E above) is available for inspection by publicly-owned treatment works authorities, if they suspect that increased PCE in wastewater is related to household disposal of PCE-containing consumer products to sewers. Under the proposed amendments, reporting requirements will be extended to all regulated products that contain PCE and/or MeCl. Mitigation measures will be implemented by the ARB if a significant presence of consumer product-related PCE is detected in wastewater.

G. IMPACTS ON THE STATE IMPLEMENTATION PLAN FOR OZONE

Background

The Federal Clean Air Act amendments of 1990 require an ozone attainment plan from every state unable to meet the national ambient air quality standard for ozone. California's 1994 SIP for ozone fulfills this requirement (ARB, 1994b). State law provides the legal authority to ARB to develop regulations affecting a variety of mobile sources, fuels, and consumer products. The regulations that are already adopted, and measures proposed for adoption constitute the ARB's portion of the SIP. The SIP serves as a "road map" to guide California to attain and maintain the national ambient air quality standard for ozone. The SIP was submitted to the U.S. EPA on November 15, 1994, and the consumer products element was formally approved on August 21, 1995.

The consumer products element of the SIP is comprised of near-term, mid-term, and long-term measures. The near-term measures are comprised of the antiperspirant and deodorant regulation, the "Phase I and II" consumer product regulations, and the aerosol coatings regulation. Of the 265 tpd (including aerosol paints) available for regulation from this category, the near-term measures are designed to achieve a 30 percent reduction from the 1990 baseline emissions, by 2000. Our commitment regarding the mid-term measures is to achieve an additional 25 percent reduction from the 1990 baseline, by 2005. The Mid-term Measures, or Phase III amendments to the consumer products regulation, partially fulfilled this commitment under the current SIP. The long-term measures will rely on new technologies, market incentives and consumer education to achieve an additional emission reduction of 30 percent from the 1990 baseline emissions by 2010

(ARB, 1994b). However, following the comprehensive SIP update in 2000-2001, the emission reduction commitment for the long-term measures may be reduced.

Mid-term Measures II

In 1997, an environmental group filed a complaint with the U. S. District Court against the ARB, SCAQMD, and U. S. EPA related to California's progress in meeting the 1994 commitments. A supplemental complaint was filed in 1998 to include the shortfall in achieving the mid-term measures commitment in the SIP. Under the terms of a settlement agreement reached in 1998, ARB must adopt measures in 1999 that will achieve a 12 tpd reduction of ROG in the South Coast Air Basin (SCAB) in 2010 (in "1994 SIP currency" as discussed in Chapter IV). Also under the agreement, the ARB must adopt measures to achieve a total of 42 tpd of ROG reductions in the SCAB in 2010. Overall, the ROG emission reductions from the Mid-term Measures II consumer product categories will be about 11 tpd (9 tpd in 1994 SIP currency) in the SCAB in 2010. Therefore, the proposed amendments to the Regulation will help achieve most of the emissions reductions committed to in the SIP lawsuit agreement. In addition, the amendments to the Regulation will also assist in fulfilling the ARB's mid-term measures SIP commitments. For more information on the SIP lawsuit agreement, see Chapter I.

Summary of Findings

We believe that the mid-term measures II proposal will achieve the maximum reduction in VOC emissions that is technologically and commercially feasible at this time from the categories proposed for regulation. However, as stated above, the aerosol coatings regulation, mid-term measures and the proposed mid-term measures II regulations do not completely fulfill the consumer products commitments in the 1994 SIP.

Table VII-2 presents the 1994 SIP commitments for the mid-term measures and aerosol coatings, which are combined in the SIP. As shown in the table, the combined emission reductions from the mid-term measures, the aerosol coatings regulation, and the proposed mid-term measures II achieve the emission reduction commitment for 2002. However, the emission reduction commitments for 2005 and 2010 are not achieved. This table does not include the long-term consumer products commitment, which we will re-assess in the next comprehensive SIP revision. We expect to obtain the necessary emission reductions from alternative measures in time to demonstrate that rate-of-progress and attainment requirements will still be met.

**TABLE VII-2
Mid-term Measures and Aerosol Coatings Reduction Requirements**

SIP Reductions for 2002 (tons per day)

	<u>South Coast</u>	<u>Sacramento</u>	<u>SE Desert</u>	<u>Ventura</u>
<u>SIP Commitment</u>				
aerosol coatings & mid-term	8	1.1	.6	.4
<u>Current Proposal</u>				
aerosol coatings	5.4	.8	.5	.3
mid-term I	<u>3.1</u>	<u>.4</u>	<u>.3</u>	<u>.2</u>
Total	8.5	1.2	.8	.5

SIP Reductions for 2005 (tons per day)

	<u>South Coast</u>	<u>Sacramento</u>	<u>SE Desert</u>	<u>Ventura</u>
<u>SIP Commitment</u>				
aerosol coatings & mid-term	39.2	5.6	3.5	2.2
<u>Current Proposal</u>				
aerosol coatings	5.4	.8	.5	.3
mid-term I	7.2	1.0	.7	.4
mid-term II	<u>8.3</u>	<u>1.2</u>	<u>.8</u>	<u>.5</u>
Total	20.9	3.0	2.0	1.2

SIP Reductions for 2010 (tons per day)

	<u>South Coast</u>
<u>SIP Commitment</u>	
aerosol coatings & mid-term	43.2
<u>Current Proposal</u>	
aerosol coatings	5.4
mid-term I	7.8
mid-term II	<u>9.0</u>
Total	22.2
	(21 tpd shortfall in South Coast)

A complete update to the SIP inventory for consumer products will be incorporated in the next comprehensive revision to the statewide control strategies in the SIP. The results from the 1997 Consumer and Commercial Products Survey and the 1997 Aerosol Coatings Survey will be used to update the SIP inventory in 2000-2001. The up-to-date consumer product inventory will be used as a basis for re-evaluating our consumer product SIP commitments.

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VIII.

ECONOMIC IMPACTS

A. INTRODUCTION

This chapter discusses the estimated economic impacts we anticipate from implementation of the 21 proposed new limits. In general, economic impact analyses are inherently imprecise by nature, especially given the unpredictable behavior of companies in a highly competitive market such as consumer products. While we quantified the economic impacts to the extent feasible, some projections are necessarily qualitative and based on general observations and facts known about the consumer products industry. This impacts analysis, therefore, serves to provide a general picture of the economic impacts typical businesses subject to the proposed limits might encounter; we recognize individual companies may experience different impacts than projected.

The overall impacts are first summarized, followed by a more detailed discussion of specific aspects of the economic impacts in the sections listed below:

- (B) Economic Impacts Analysis on California Businesses as required by the California Administrative Procedure Act (APA);
- (C) Analysis of Potential Impacts to California State or Local Agencies;
- (D) Analysis of the Cost-Effectiveness (C.E.) of the Proposed Limits;
- (E) Analysis of the Impacts to Raw Materials Cost;
- (F) Analysis of the Combined Impacts on Per-Unit Cost from Recurring and Nonrecurring Costs; and
- (G) Mitigation of Potential Impacts through Additional Regulatory Flexibility.

It is important to note that we conducted the economic impacts analysis shown in this report to meet the current legal requirements under the APA. The analysis uses essentially the same methodology and assumption used in the last major consumer products rulemaking, the “Mid-Term Measures” regulation adopted by the Board in 1997. The analysis, both here and in the 1997 rulemaking, represents a significant update to and expansion of the methodology we used to conduct the cost-effectiveness analyses for the original Phase I-II consumer products rulemaking (ARB, 1990; ARB, 1991).

The economic impacts analysis was prepared in consultation with ARB’s Economic Studies Section (section) of the Research Division. The section is staffed with professionals who carry out a broad range of assignments for the ARB and other organizations, including the Governor’s Office; Cal/EPA boards, offices and departments; and local air pollution control agencies. The section manages extramural research contracts; develops methodologies; collects, analyzes and distributes economic and financial data; conducts economic and financial analyses, including the economic impact analyses of the Board’s regulations; oversees the economic impact analyses of the regulations promulgated by all Cal/EPA boards, offices and departments; and

carries out other related tasks as needed by the ARB. The staff hold Ph.D, J.D., M.B.A., M.A., and B.S. degrees in economics, business, chemical engineering, microbiology, and environmental resource science. Members of the section have taught economics, accounting, finance, and computer science at the university level; have given invited talks and presented technical papers to major universities, academic associations, and government agencies; and have worked in the private sector in credit analysis, accounting, auditing, production control, environmental consulting, and business law.

Summary of Findings

Overall, most affected businesses will be able to absorb the costs of the proposed limits and requirements with no significant adverse impacts on their profitability. This finding is indicated by the staff's estimated change in "return on owner's equity" (ROE) analysis. The analysis found that the overall change in ROE ranges from negligible to a decline in ROE of about 4 percent, with an average change in ROE of about 1.4 percent. However, the proposed measures may impose economic hardship on some businesses with small or no margin of profitability. These businesses, if hard pressed, can seek relief under the variance provision of the consumer products regulation for extensions to their compliance dates. Such extensions may provide sufficient time to minimize the cost impacts to these businesses. Because the proposed measures would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment; business creation, elimination or expansion; and business competitiveness in California. We also found no significant adverse economic impacts to any local or State agencies.

Our analysis shows that the cost-effectiveness of the proposed requirements is similar to the cost-effectiveness of the existing consumer product regulations (Phase I-II and the first Mid-Term Measures), as well as other existing ARB regulatory programs. We estimate the individual cost-effectiveness of the proposed limits, with each limit effectively considered as a separate and standalone regulation, range from no cost (net savings or no cost) to about \$6.30 per pound of VOC reduced (in 1999 dollars). These ranges are comparable in magnitude to those reported for other ARB consumer product regulations and measures, which generally have fallen within an overall range of no cost to about \$7.10 per pound of VOC reduced.

While determining the maxima and minima cost-effectiveness values is useful for establishing boundaries, it is also useful to determine the average cost-effectiveness of the proposed limits. To this end, an estimate of the average cost-effectiveness as an emissions reduction-weighted value provides more insight into the overall cost-effectiveness of the limits than a simple arithmetic mean of the calculated individual values. Unlike a simple arithmetic mean, a weighted average accounts for the relative efficiency as well as the relative magnitude of the emission reductions for each limit. Overall, the emission reductions-weighted average (ERWA) cost-effectiveness for the proposed limits is about \$0.40 per pound of VOC reduced. That is, the average cost to reduce one pound of VOCs averaged across all the categories subject to the proposed new limits is less than half a dollar. This estimated average cost-effectiveness

compares favorably with the cost-effectiveness of the ARB programs mentioned previously.

One way to project the potential change in product prices is to determine the potential change in raw materials cost, which generally has the biggest influence on product cost for most product categories. Our analysis indicates that reformulations to comply with the proposed limits can result in raw material changes ranging from negligible cost (net savings or no cost) up to a cost increase of about \$0.25 per unit. Again, this range compares favorably to the change in per unit cost projected for the Phase I-II and Mid-Term Measures regulations. The analysis assumed the present cost for raw materials; depending on the formulations chosen by manufacturers and the future price of raw materials, this range may be lower or higher at the actual compliance dates. To the extent that the projected cost savings or increases are ultimately passed on to the consumer, the actual retail price of products after the proposed limits become effective may be higher or lower than suggested by this analysis.

Even if all annualized nonrecurring costs (research and development, capital equipment purchases, etc.) and recurring raw material cost increases are factored into the affected products manufacturing costs, the potential increase in production per-unit costs are comparable to previous ARB consumer product rulemakings. The estimated per-unit cost increases from both annualized nonrecurring and annual recurring costs range from negligible cost (net savings or no cost) to about \$0.30 per unit. When averaged over the total number of unit sales in California of regulated products, the unit sales-weighted average cost increase is about \$0.02 per unit. As noted before, these per unit cost increases compare favorably to the change in per unit cost projected for previous ARB consumer product rulemakings.

B. ECONOMIC IMPACTS ANALYSIS ON CALIFORNIA BUSINESSES AS REQUIRED BY THE CALIFORNIA ADMINISTRATIVE PROCEDURE ACT (APA)

Legal Requirements

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California jobs, business expansion, elimination or creation, and the ability of California business to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any state or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any nondiscretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Findings

Potential Impact on California Businesses - Overall, most affected businesses will be able to absorb the costs of the proposed measures with no significant adverse impacts on their profitability. However, the proposed measures may impose economic hardship on some businesses with small or no margin of profitability. These businesses, if hard pressed, can seek relief under the variance provision of the consumer products regulation for extensions to their compliance dates. Such extensions may provide sufficient time to minimize the cost impacts to these businesses. Additional mitigation may be achieved by taking advantage of the compliance flexibility offered by the existing Innovative Products Provision and the Alternative Control Plan (ACP) regulation (see section G of this chapter). Because the proposed measures would not alter significantly the profitability of most businesses, we do not expect a noticeable change in employment; business creation, elimination or expansion; and business competitiveness in California.

Discussion

This portion of the economic impacts analysis is based on a comparison of the return on owners' equity (ROE) for affected businesses before and after inclusion of the cost to comply with the proposed requirements. The data used in this analysis are obtained from publicly available sources, the ARB's 1997 Consumer and Commercial Products Survey (Survey), and the staff's cost-effectiveness analysis discussed later in this chapter.

Affected Businesses

Any business which manufactures or markets consumer products subject to the proposed new limits and requirements can be directly affected. Also potentially affected are businesses which supply raw materials or equipment to these manufacturers or marketers and distribute or retail consumer products. The focus of this analysis, however, will be on manufacturers or marketers because these businesses would be directly affected by the proposed measures.

The consumer products subject to the proposed measures are manufactured or marketed by a large number of companies worldwide. According to the ARB's Consumer Products Registration Database, there are over 160 manufacturers or marketers which market the affected products in California. These companies manufacture and market a broad range of automotive, household, and personal care products and pesticides, including an estimated total of 1,464 complying and 1,279 noncomplying products (based on reported figures and adjusted for possible survey underreporting). Of these manufacturers or marketers, about 50 firms (mostly medium- or small-sized firms) are located in California.

These 50 California companies fall primarily into five standard industrial classifications (SICs). A list of these industries which we have been able to identify is provided in Table VIII-1. The industry with the most noncomplying products is specialty cleaning, polishing and sanitation preparation (SIC 2842); soap and detergents (SIC 2841); pesticides and agricultural chemicals (SIC 2879); perfume, cosmetics and other toilet preparation (SIC 2844);

and adhesives and sealants (SIC 2891).

Table VIII-1. Industries with Businesses Potentially Affected by the Proposed Limits

SIC*	Industry	Number of Product Categories	Number of Noncompliant Products
2841	Soap and Other Detergents, Except Specialty Cleaners	7	525
2842	Speciality Cleaners, Polishing, and Sanitation Preparations	8	326
2844	Perfume, Cosmetics and Other Toilet Preparations	1	118
2879	Agricultural Chemicals, Not Elsewhere Classified	3	124
2891	Adhesives and Sealants	3	187

* SIC 2841 includes product category codes 2202, 2203, 2208, 5202, 5204
 SIC 2842 includes product category codes 2204, 5203, 5405, 5602, 6503
 SIC 2844 includes product category code 6402
 SIC 2879 includes product category codes 4302, 4304, 4305
 SIC 2891 includes product category codes 1104, 1201, 2206

Study Approach

This study covers 5 industries with at least 160 affected businesses. The approach used in evaluating the potential economic impact of the proposed measures on these businesses is outlined as follows:

- (1) Affected businesses which responded to the Survey were classified by the size of their sales in each industry in order to select a typical business for each industry.
- (2) Compliance cost was estimated for each of these businesses.
- (3) Estimated cost was adjusted for federal and state taxes.
- (4) The three-year average ROE was calculated for each of these businesses by averaging their ROEs for 1996 through 1998. ROE is calculated by dividing the net profit by the net worth. The adjusted cost was then subtracted from net profit data. The results were used to calculate an adjusted three-year average ROE. The adjusted ROE was then compared with the ROE before the subtraction of the adjusted cost to determine the potential impact on the profitability of the business. A reduction of more than 10 percent in profitability is considered to indicate a potential for significant adverse economic impacts.

The threshold value of 10 percent has been used consistently by the ARB staff to determine impact severity (ARB, 1990; ARB, 1991; ARB, 1995; ARB, 1997). This threshold is consistent with the thresholds used by the United States Environmental Protection Agency and others.

Assumptions

The ROEs before and after the subtraction of the adjusted compliance costs were calculated for a typical business in each industry listed in Table VIII-1 using financial data for 1996 through 1998. The calculations were based on the following assumptions:

- (1) A typical business on a nationwide basis in each industry is representative of a typical California business in that industry;
- (2) All affected businesses were subject to federal and state tax rates of 35 percent and 8.835 percent respectively; and
- (3) Affected businesses are not able to increase the prices of their products, nor can they lower their costs of doing business through short-term cost-cutting measures.

Given the limitation of available data, staff believes these assumptions are reasonable for most businesses at least in the short run; however, they may not be applicable to all businesses.

Results

Typical California businesses are affected by the proposed new limits to the extent that the implementation of these requirements would change their profitability. Based on our assessment of the proposed limits' cost-effectiveness (see Section D of this Chapter), we estimate the per-business compliance costs to range from \$2,600 (low cost for typical non-aerosol engine degreaser manufacturer) to about \$326,000 per year (high cost for typical aerosol crawling bug insecticide manufacturer), as shown in Table VIII-2.

INSERT Table VIII-2 here

Using ROE to measure profitability, we found that the average ROE of sample businesses in affected industries declined by about 1.37 percent as shown in Table VIII-3. This represents a minor change in the average profitability of typical businesses in California.

Table VIII-3. Changes in Return on Owner’s Equity (ROEs) for Typical Businesses in Affected Industries

SIC*	Industry	ΔROE
2841	Soap and Other Detergents, Except Specialty Cleaners	4.07%
2842	Speciality Cleaners, Polishing, and Sanitation Preparations	0.18%
2844	Perfume, Cosmetics and Other Toilet Preparations	0.32%
2879	Agricultural Chemicals, Not Elsewhere Classified	1.32%
2891	Adhesives and Sealants	0.98%
Average		1.37%

Note: “Δ” means change or difference; all ΔROEs shown are negative (i.e., shows a decline in profitability).

As shown in Table VIII-3, the projected change in profitability of typical businesses in the five affected industries varied widely. Within the SICs shown, the predicted change (decline) in profitability of a typical business ranged from a high of about 4.07 percent to a low of 0.18 percent. This variation in the impact of the proposed measures can be attributed mainly to two factors. First, some businesses incur higher costs due to the type of products or the number of noncompliant products they manufacture or market. For instance, the estimated annualized costs for sample businesses ranged from a high of about \$326,000 to a low of about \$2,600. Second, the performance of businesses may differ from year to year. Hence, the average 1996 through 1998 financial data used may not be representative of an average-year performance for some businesses.

The estimated potential impacts to businesses’ ROEs may be high for the following reasons. First, annualized costs of compliance are estimated using, in part, the current prices of raw materials. Raw material prices usually tend to fall as higher demand for these materials induces economy of scale production in the long run. Second, affected businesses probably would not absorb all of the increase in their costs of doing business. They might be able to either pass some of the cost on to consumers in the form of higher prices, reduce their costs, or do both.

Potential Impact on Consumer - The potential impact of the proposed measures on consumers depends upon the ability of affected businesses to pass on the cost increases to consumers. In the short run, competitive market forces may prevent businesses from passing their cost increases on to consumers. Thus, we do not expect a significant change in retail prices in the short run. In the long run, however, if businesses are unable to bring down their costs of doing business they would pass their cost increases on to consumers.

If we assume manufacturers will pass all compliance costs directly on to consumers, we can estimate the price increase using at least two methods. One is a macroeconomic projection, in which we express the price increase due to the total compliance cost to industry being passed on as a percent increase relative to the existing shipment value of the products that will be subject to the new limits. Under this analysis, we estimate a maximum increase of less than 0.03 percent in product prices. Price increases, however, would vary from industry to industry. They would range from a low of about 0.005 percent in the toilet preparation industry to a high of about 0.05 percent in the agricultural chemical industry.

On the other hand, we can also conduct a microeconomic analysis, in which we assume all increases in raw material costs are passed on to the consumer. Under this analysis, we found that the change in per-unit raw materials cost may range from no change (no cost or cost savings) to a cost increase of up to about \$0.30 per unit. It should be noted that this range may be lower under actual implementation of the proposed limits, depending on the reformulation and marketing strategies adopted by the manufacturers and actual market prices of the product ingredients at the compliance dates.

The proposed measures may also affect consumers adversely if they result in reduced performance attributes of the products. However, this scenario is unlikely to occur for the following reasons. First, for nearly every proposed limit, there are already complying products in the market that have acceptable performance attributes; indeed, complying products represent significant shares in many of their respective categories. Thus, the industry already has the technology to manufacture compliant products that meet consumer expectation. Second, marketers are unlikely to introduce a product which does not meet their consumers' expectations. This is because such an introduction would be damaging not only to the product sale, but also to the sale of other products sold under the same brand name (impairing so-called "brand loyalty"). Finally, the Board has provided flexibility, under the existing consumer products program, to businesses whose situations warrant an extension to their compliance dates. For companies which can justify such variances, the additional time may afford more opportunity to explore different formulation, cost-cutting, performance-enhancing, or other marketing strategies which can help make the transition to new complying products nearly transparent to consumers.

Potential Impact on Employment - The proposed measures are not expected to cause a noticeable change in California employment and payroll. According to *U.S. Department of Commerce*, California employment in the industries affected by the proposed measures was less than 14,000 in 1996, as shown in Table VIII-4, or about 10 percent of national employment in the affected industries. This represents about 0.7 percent of total manufacturing jobs in California. These employees working in the 160 establishments generated over \$500 million in payroll, or about 9 percent of national payroll in the affected industries. This also accounts for about 0.7 percent of the total California manufacturing payroll in 1996. Only two establishments had over 500 employees; 28 establishments had between 100 to 500 employees; the rest had less than 100 employees each.

Table VIII-4. California Employment and Payroll in Affected Industries

SIC	Number of Employees*		Payroll*	
	California	CA Share as % of US	California (\$ million)	CA Share as % of US
2841	1,752	6.0	63.1	5.4
2842	1,688	7.5	55.0	7.2
2844	7,630	12.6	274.7	13.1
2879	933	5.4	31.6	3.9
2891	1,715	8.0	74.7	8.8
Total	13,718	9.1	499.1	8.8

Source: 1996 County Business Patterns: The U.S. Department of Commerce, Bureau of the Census.

Potential Impact on Business Creation, Elimination or Expansion - The proposed measures would have no noticeable impact on the status of California businesses. This is because the reformulation costs are not expected to impose a significant impact on the profitability of businesses in California. However, some small businesses with little or no margin of profitability may lack the financial resources to reformulate their products on a timely basis. Should the proposed measures impose significant hardship on these businesses, temporary relief in the form of a compliance date extension under the variance provision may be warranted.

On the other hand, the proposed measures may provide business opportunities for some California businesses or result in the creation of new businesses. California businesses which supply raw materials and equipment or provide consulting services to affected industries may benefit from increased industry spending on reformulation.

Potential Impact on Business Competitiveness - The proposed measures would have no significant impact on the ability of California businesses to compete with businesses in other states. Because the proposed measures would apply to all businesses that manufacture or market certain consumer products regardless of their location, the staff's proposal should not present any economic disadvantages specific to California businesses.

Nonetheless, the proposed measures may have an adverse impact on the competitive position of some small, marginal businesses in California if these businesses lack resources to develop commercially acceptable products in a timely manner. As stated above, such impacts can be mitigated to a degree with a justifiable compliance extension under the variance provision of the consumer products regulation, or through additional regulatory flexibility afforded by the Innovative Products provision or the Alternative Control Plan (ACP) regulation (see Section G).

C. ANALYSIS OF POTENTIAL IMPACTS TO CALIFORNIA STATE OR LOCAL

AGENCIES

We have identified no State or local agency that would be affected by the proposed new limits. The California Prison Industry Authority (PIA), which manufactures or markets some products for use in State service, is the only agency we are aware of that makes consumer products. However, the PIA manufactures none of consumer products which are subject to the proposed new limits. While we previously reported that the PIA made a line of general purpose degreasers (ARB, 1997, VII-ChVIII-p.11), the only chemically-formulated products the PIA currently sells are several lines of liquid and powder laundry detergents, none of which are subject to the proposed new limits (PIA, 1999). Based on these facts, we have determined that the proposed limits will not create costs or savings, as defined in Government Code section 11346.5(a)(6), to any State agency or in federal funding to the State, 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 savings to local agencies.

D. ANALYSIS OF THE COST-EFFECTIVENESS (C.E.) OF THE PROPOSED LIMITS

Introduction

In the following analysis, we evaluate the anticipated cost-effectiveness of the proposed new limits. Such an evaluation allows us to compare the efficiency of the proposed limits in reducing a pound of VOC relative to other existing regulatory programs. To do this, we applied a well-established methodology for converting compliance costs, both nonrecurring and recurring, to an annual basis. We then report the ratio of the annualized costs to the annual emission reductions in terms of “dollars (to be) spent per pound of VOC reduced.” For perspective, we compare the estimated cost-effectiveness of the proposed limits to the cost-effectiveness of other ARB regulations and control measures.

Methodology

The cost-effectiveness of a limit is generally defined as the ratio of total dollars to be spent to comply with the limit (as an annual cost) to the mass reduction of the pollutant(s) to be achieved by complying with that limit (in annual pounds). Annual costs include annualized nonrecurring fixed costs (e.g., total research and development (R&D), product and consumer testing, equipment purchases/modifications, etc.) and annual recurring costs (e.g., raw materials, labeling, packaging, etc.).

In this analysis, we essentially treated each proposed limit as a separate, stand-alone regulation. This approach, approved by the Board when the Mid-Term Measures were approved in 1997, represents an expansion and upgrade of previous analyses conducted by ARB staff in which groups of product categories were evaluated collectively for cost-effectiveness. The

approach used in this rulemaking is also significantly different from standardized cost-effectiveness analyses conducted for stationary sources, mobile sources, and other regulated entities; in the typical analysis for those sources, only the cost-effectiveness for the entire regulation is reported (i.e., the ratio of the total annual cost of the regulation to the total annual emission reductions), rather than the cost-effectiveness for separate requirements of the regulation (See ARB, Oct. 1998, Proposed Amendments to the California On-Road Motorcycle Regulation, p. VI-15).

We believe treating each proposed limit as a separate regulation is appropriate for several reasons. First, this approach prevents very cost-effective limits (e.g., those with large emission reductions coupled with low costs) from “masking” relatively cost-ineffective limits. Such cost-ineffective limits can then be evaluated for possible elimination or substitution by other proposed limits that are more cost-effective. Another reason for treating each limit independent of the other limits is that each limit is essentially independent of all the other limits. For example, the limit for windshield washer fluids does not depend on the limits for tire inflators or for nail polish remover in order to be technologically and commercially feasible. For these reasons, we believe our approach of treating each limit separately for cost-effectiveness calculations provides a more conservative and reality-based analysis.

It is possible that this approach may actually overestimate the costs because it does not account for potential savings in nonrecurring costs from intracompany technology/R&D transfers between product lines, using the same filling lines for different product lines, and other cost mitigating efforts. While we know companies undertake these types of efforts and similar efforts to reduce costs whenever possible, it is very difficult to quantify such cost savings, given the complexity and high degree of competitiveness in this industry. Quantifying such cross-line technology transfers and similar cost mitigation techniques is beyond the scope of this rulemaking and will therefore be ignored in our conservative analysis.

In determining the fixed and recurring costs for each category and subcategory with a proposed limit, we conducted a total of 22 individual cost-effectiveness analyses. This includes 21 cost analyses for each new proposed limit; an additional analysis for the existing general purpose aerosol degreaser limit was conducted because aerosol solvent parts cleaners would be subject to this limit under the staff’s proposal. With the level of detail presented and the treatment of each limit’s cost-effectiveness independently from the other proposed limits, the cost-effectiveness analysis in this report represents the most comprehensive analysis ARB staff have conducted to date on a proposed consumer products rulemaking.

We annualized nonrecurring fixed costs using the Capital Recovery Method, as recommended under guidelines issued by the California Environmental Protection Agency (Cal/EPA). Using this method, we multiply the estimated total fixed costs to comply with each limit by the Capital Recovery Factor (CRF) to convert these costs into equal annual payments over a project horizon (i.e., the projected useful life of the investment) at a discount rate (Cal/EPA, 1996). We then sum the annualized fixed costs with the annual recurring costs and

divide that sum by the annual emission reductions to calculate the cost-effectiveness of each limit, as shown by the following general equation (example shown is for calculating cost-effectiveness from pre-regulatory to the proposed limit):

Cost-Effectiveness

$$= \frac{(\text{Annualized Fixed Costs})_{\text{Tier 1 Limit}}^{\text{Pre-Reg VOC}} + (\text{Annual Recurring Costs})_{\text{Tier 1 Limit}}^{\text{Pre-Reg VOC}}}{(\text{Annual Mass Reduction in VOC})_{\text{Tier 1 Limit}}^{\text{Pre-Reg VOC}}} \quad (1)$$

where:

$$\text{Annualized Fixed Costs} = (\text{Fixed Costs}) \times \frac{i(1+i)^n}{(1+i)^n - 1} \quad (2)$$

$$\begin{aligned} \frac{i(1+i)^n}{(1+i)^n - 1} &= \text{Capital Recovery Factor (CRF)} \\ i &= \text{discount interest rate over project horizon, \%} \\ n &= \text{number of years in project horizon} \\ \text{Fixed Costs} &= \text{total nonrecurring cost per product category} \\ &= (\text{Nonrecurring Cost per Product}) \times (\text{Total Noncompliant Products in the Category}) \end{aligned}$$

As shown by the 22 raw materials cost analyses in Appendix E, a convenient method for estimating the annual recurring cost portion of overall cost-effectiveness is to separate Equation (1) into two fractions, one for the nonrecurring costs and one for the recurring costs. It can then be shown that the C.E. fraction for recurring costs can be simplified and calculated as follows:

$$\text{Annual Recurring Costs C.E.} = \frac{(\text{Compliant Materials Cost}) - (\text{Baseline Materials Cost})}{(\text{Baseline VOC Content}) - (\text{Compliant VOC Content})} \quad (3)$$

where,

$$\begin{aligned} \text{Baseline Materials Cost} &= \text{cost of raw materials for product before reformulation to the proposed limit (Tier 1), \$/lb product} \\ \text{Baseline VOC Content} &= \text{product VOC weight fraction before reformulation to Tier 1 limit, lb VOC/lb product} \\ \text{Compliant Materials Cost} &= \text{cost of raw materials for Tier 1-compliant product, \$/lb product} \\ \text{Compliant VOC Content} &= \text{product VOC weight fraction of Tier 1-compliant product, lb VOC/lb product.} \end{aligned}$$

To use Equation (3), we determined the sales-weighted average VOC contents of both compliant and noncompliant products in each of the 22 product categories/subcategories, based on sales data and the speciated formulations as reported by manufacturers in the ARB's 1997 Consumer and Commercial Products Survey. To the extent feasible, we then determined the

detailed formulations which most closely reflect the “typical” (i.e., sales-weighted average) compliant and noncompliant VOC contents. These formulations, in turn, were designated as compliant and baseline formulations, respectively.

For most ingredients, we used the most recent, distributor-level bulk prices from *Chemical Market Reporter* (July 12, 1999), or from discussions with industry representatives, to calculate the baseline and compliant material costs based on these designated formulations. However, for *p*-chlorobenzotrifluoride and HFC-134a, we used excerpts from recent issues of *Chemical Market Reporter* (CMR) published by the Internet-based Northern Light Special Collections® (CMR-2, 1999; CMR-3, 1999). Also, for glycol ether ingredients, we used prices published by the Dow Chemical Company on their Internet site (Dow, 1999). Unspecified ingredients or ingredients for which prices were unknown were grouped into an “all others” classification and assigned a default low and high cost of \$3.50 and \$7.00 per pound, respectively (ARB, 1997, *op cit.* at Volume II, p.56). These analyses are shown in Appendix E and discussed in more detail in “Analysis of Impacts to Raw Materials Cost” later in this section.

Assumptions

We calculated the cost-effectiveness with an assumed project horizon of 10 years, a commonly cited period for an investment’s useful lifetime in the chemical processing industry. We also assumed a fixed interest rate of 10 percent throughout the project horizon. These assumptions are conservative and constitute standard practice in cost-effectiveness analyses of air pollution regulations, including previous consumer product rulemakings. Based on these assumptions, the CRF is 0.16274.

In the first Mid-Term Measures rulemaking, we assumed products reformulated to meet the proposed limits will be marketed throughout the U.S. by national marketers (ARB, 1997, VII-Ch-VIII, p.13). Except for the aerosol coatings regulation (Title 17, CCR, §§94520-94528), we found that businesses generally formulate for and distribute to the entire nation products compliant with the Phase I-II, antiperspirant/deodorant, and Mid-Term Measures regulations, rather than incurring the additional cost of setting up a California versus 49-state product distribution system. We believe the same strategy will be employed by companies subject to the proposed new limits; we therefore assumed in this analysis that, for the annualized fixed cost portion of Equation (1), it is appropriate to use the fixed cost for national production divided by the national emission reductions.

However, an alternative but equivalent approach which we also used, is to report the California-apportioned (by population) annualized fixed cost divided by the California-apportioned emission reductions. To illustrate, a manufacturer may need to install \$10 million worth of equipment to produce its national sales volume of products compliant with the proposed limits. However, if the company were to produce a California and 49-state product, the company may only need to install \$1 million worth of equipment to produce unit sales sufficient for the smaller California market. Using this alternative approach, we discounted the total fixed costs for

producing national sales volumes by the California-apportionment factor (i.e., the current ratio of California to U.S. population, or 13%), which we then divided by the California-only emission reductions. It is important to note that, while both of the approaches described above -- the national marketing and California-only approaches -- reach the same conclusion, they do so for different reasons as discussed above.

For the annual recurring costs, we assumed compliant reformulations would result in cost changes as a result of changes in a product's raw materials and their associated prices. Changes in packaging, labeling, distribution and other recurring costs were assumed to be negligible relative to baseline levels of these costs. This assumption is based on our previous regulatory experiences. To illustrate, we conducted a comprehensive technical assessment of the 55 percent VOC hairspray limit, which required extensive reformulations and revolutionary changes to existing products (ARB, 1997). The hairspray limit is generally considered to be among the most challenging of the consumer product limits; it likely resulted in more changes to the regulated product, relative to pre-regulatory products, than any other VOC limit. However, our assessment found that changes to recurring costs other than hairspray raw material costs were expected to be negligible (*Id*, Vol-II, p.54). Based on this finding and because the proposed new limits are designed to preserve product forms, we believe our assumptions regarding the recurring costs are reasonable.

Results

A review of relevant technical literature and industry trade journals provided little information that we could use to estimate costs directly. This is not surprising, because the consumer products industry is very competitive, and production cost data specific to a company are closely-guarded trade secrets. In addition, we have had very limited success with cost surveys in the past and did not expect one to provide much useful information in this rulemaking (e.g., during the Phase II rulemaking, cost survey responses from only three manufacturers were received out of several hundred that were mailed; ARB, 1991). We therefore developed estimates for the nonrecurring costs based on analogous costs reported by ARB staff for the Phase II consumer products rulemaking (*Id*, Appendix D1). The Phase II nonrecurring costs are applicable for this analysis since they were based on staff's detailed estimates of labor, R&D, equipment purchase, and other costs involved in product reformulations for generic household, automotive, and personal care categories, all of which are included in proposed limits. This is the same approach we used for the 1997 Mid-Term Measures rulemaking.

The Phase II nonrecurring investment costs, reported in 1991 dollars, were adjusted to 1999 dollars using a well-established method of ratioing chemical engineering plant cost indices as follows (Peters and Timmerhaus, 1980):

$$\text{Non - Recurring Costs (in 1997 dollars)} = \text{Non - Recurring Costs (in 1991 dollars)} \times \frac{\text{C.E. 1997 index}}{\text{C.E. 1991 index}}$$

where,

$$\begin{aligned} \text{C.E. 1999 index} &= 1999 \text{ Chemical Engineering Plant Cost Index} = 388.6 \\ \text{C.E. 1991 index} &= 1991 \text{ Chemical Engineering Plant Cost Index} = 357.6 \\ & \text{(Chemical Engineering, July 1999).} \end{aligned}$$

We believe the original Phase II cost estimates were beneficial at the time of rulemaking for predicting the costs to comply with those limits. However, having recently completed a detailed technical assessment of the hairspray second-tier limit, we believe those original cost estimates grossly overestimated true nonrecurring costs for Phase II by about a factor of ten. The aforementioned hairspray technical assessment projects industry will spend on average, based on real-world expenditures to date, an estimated \$100,000 per noncompliant hairspray product to meet the second-tier limit (\$20MM-\$50MM total cost divided by an estimated 350 noncompliant hairspray products; ARB, 1997, *op cit.* at Vol.II, page 54). Because the hairspray category arguably represents a worst-case scenario, with its two-tier limits requiring extensive reformulations, R&D, and consumer/safety testing, we believe the \$100,000 per product nonrecurring costs for hairsprays is a reasonable, order-of-magnitude upper boundary for average per-product reformulation costs under most of the proposed new limits. We therefore estimated the nonrecurring costs for most of the proposed new limits by adjusting the Phase II estimates to be consistent (same order of magnitude) as the \$100,000 per product real-world average expenditures for hairsprays.

While we used the approach discussed above for most of the proposed limits, it is important to note that we made a significantly different adjustment for the three insecticide categories: crawling bug, flying bug, and lawn and garden insecticides. We changed our approach for these categories based on a manufacturers' cost survey recently conducted by the Chemical Specialties Manufacturers Association (CSMA). From its survey, CSMA reports that its members estimate most of the proposed limits would have nonrecurring costs ranging from \$25,000 to \$75,000 per noncomplying product, which are well within the upper boundaries of \$90,000 to \$120,000 we used in our analysis. The CSMA's survey therefore validates most of the nonrecurring costs we assumed in our analysis.

On the other hand, the CSMA reports significantly higher nonrecurring costs for the three insecticide categories: \$550,000 per product for the crawling bug and flying bug categories, and \$275,000 for the lawn and garden category. These are nearly 5 times and 2.5 times the nonrecurring costs which we normally would have used for these categories, respectively, based on the Phase II estimates and adjusted with our hairspray regulation experience as described previously. Further evaluation of CSMA's cost estimates for these three categories suggests that

CSMA's estimates may be more applicable to these categories than our previous estimates, at least for this rulemaking. This is because pesticide products subject to the proposed new limits have already been recently regulated (in 1995 for lawn and garden and for flying bug products, in 1995 and 1998 for crawling bug products); each reformulation potentially requires significant and costly FIFRA re-registration, efficacy, and toxicity studies if the active ingredients are changed or if the product is substantially changed; and some products are expected to be substantially changed as products are reformulated to meet the proposed near-zero VOC limits. Based on these reasons, we adjusted our nonrecurring costs for these three categories to be consistent with CSMA's estimates (i.e., we used a per-product, upper boundary, nonrecurring cost of about \$575,000 for crawling bug and flying bug products, and about \$250,000 for the lawn and garden products).

It should be noted that CSMA also reported a nonrecurring cost for double-phase air fresheners (\$200,000 per product) that was significantly higher than our upper-bound estimate (about \$120,000 per product). However, unlike the pesticide categories, we found no compelling reasons to explain why double-phase aerosol air fresheners should cost significantly more to reformulate in nonrecurring costs than hairsprays or other household care products subject to the proposed new limits. There are no FIFRA-based re-registration requirements or other regulatory or statutory requirements that would significantly increase the nonrecurring costs for these products beyond our estimated costs. We therefore adjusted our nonrecurring cost estimates only for the pesticide products and used our own upper-bound estimate for double-phase air fresheners based on the Phase II estimates as discussed previously.

Table VIII-5 shows our estimates for per-product and total annualized nonrecurring costs for each of the 22 product categories/subcategories subject to the proposed limits. As shown, we project a per-product annualized nonrecurring cost ranging from a low of about \$8500 to a high of about \$600 thousand dollars. With nearly 1280 noncompliant products that would need to be reformulated, the overall total annualized fixed cost to industry is projected to range from about \$3.2 million to nearly \$33 million dollars per year, with a general breakdown of this range as follows: household care products (43%), automotive care products (16%), personal care products (7%) and pesticides (34%).

Table VIII-6 shows the overall results of our cost-effectiveness analysis, with separate cost-effectiveness fractions representing the annualized nonrecurring and annual recurring costs. In general, Table VIII-6 shows that the annualized nonrecurring fixed costs (i.e., R&D, product testing, etc.) have a relatively small impact on overall cost-effectiveness for the affected categories, except for the pesticides. For the most part, the raw materials cost (i.e., annual recurring cost) has the most significant impact on overall cost-effectiveness. Table VIII-6 shows that the estimated cost-effectiveness ranges from a low of \$0.00 (net savings or no cost for several categories) to a high of about \$6.30 per pound VOC for the flying bug insecticide limit.

Another useful quantity to report is the emission reductions-weighted average (ERWA) cost-effectiveness. This value is the sum of the products of the emission reductions for each limit

and its associated cost-effectiveness, divided by the sum of the total emission reductions for all the proposed limits. In contrast to a simple arithmetic mean of the reported cost-effectiveness values, the ERWA cost-effectiveness accounts for the relative magnitude of emission reductions and the relative efficiency of each limit in achieving those reductions. Thus, the ERWA cost-effectiveness is, in theory, a better indicator of the true average cost-effectiveness for achieving a pound of reduction under the proposed limits. As shown in Table VIII-6, the ERWA cost-effectiveness is about \$0.40 per pound of VOC reduced. This reflects the relatively cost-effective and large emission reductions in the automotive and household categories. Thus, the average cost to reduce one pound of VOCs under the proposed limits is less than half a dollar, indicating that total industry-wide annual compliance costs to achieve 21 tons per day VOC reductions statewide in 1997 should be about \$6 million per year.

[INSERT TABLE VIII-5]
Estimated Total Non-Recurring Fixed Costs to Comply with Proposed
Mid-Term Measures II Limits

[INSERT TABLE VIII-6]
Estimated Cost-Effectiveness for Proposed Mid-Term Measures II Limits

Table VIII-7 shows a comparison of the cost-effectiveness for the proposed limits relative to other ARB consumer product regulations and control measures. As shown, the cost-effectiveness range of the staff's proposal is consistent with the cost-effectiveness of other ARB regulations and programs.

Table VIII-7. Comparison of Cost-Effectiveness for Phase III and Other ARB Consumer Product Regulations/Measures (adjusted to 1998 dollars)

Regulation/Control Measure	Cost-Effectiveness (Dollars per Pound VOC Reduced)
Mid-Term Measures II Consumer Products	\$0.00 to \$6.30 (\$0.40 avg.)
Mid-Term Measures Consumer Products ¹	\$0.00 to \$7.10 (\$0.25 avg.)
Hairsprays ²	\$2.10 to \$2.50 (\$2.25 avg.)
Aerosol Coating Products ³	\$2.85 to \$3.20
Phase II Consumer Products Regulation ⁴	<\$0.01 to \$1.10
Phase I Consumer Products Regulation ⁵	net savings to \$1.80
Antiperspirants and Deodorants ⁶	\$0.54 to \$1.30
Architectural and Industrial Maintenance Coatings ⁷	net savings to \$6.90

Cost-effectiveness values for previous years adjusted to 1997 dollars using the following *Chemical Engineering* Plant Cost indices: 383.4 (1997), 381.1 (1995), 361.3 (1991), and 357.6 (1989-1990); *Chem. Eng.*, April 1996/1997.

¹ Range reported as min./max. for each individual Phase III limit; average C.E. of \$0.25/lb reduced reported as an emission reductions-weighted average cost-effectiveness

² Reported as sales-wtd average, incremental 2nd-tier cost-effectiveness (80% VOC to 55% VOC); ARB, 1997.

³ ARB, 1995.

⁴ ARB, 1991.

⁵ ARB, 1990.

⁶ ARB, 1989.

⁷ Suggested Control Measure, developed with the California Air Pollution Control Officers Association; ARB, 1989.

E. ANALYSIS OF THE IMPACTS TO RAW MATERIALS COST

Introduction

In this analysis, we evaluated the anticipated cost impacts from the proposed limits on raw material costs. As stated previously, the raw material costs generally constitute the major portion of the compliance costs for most categories. However, evaluating the impacts to raw

material costs provides only an indicator of possible impacts to the retail prices of the affected products (assuming the cost impacts are passed on partially or fully to consumers). Because of unpredictable factors such as the highly competitive nature of the consumer products market, it is not possible to accurately predict the final retail price of products that will comply with the proposed limits when they become effective. To the extent the cost impacts are passed on to consumers, the final retail prices may be lower or higher than suggested by this analysis.

Methodology

As discussed previously, we determined the detailed formulations which most closely reflect the “typical” (sales-weighted average) compliant and noncompliant VOC contents. These formulations, in turn, were designated as compliant and baseline formulations, respectively. Distributor-level ingredient prices from *Chemical Market Reporter* (July 12, 1999) or from discussions with industry representatives were used to calculate the baseline and compliant material costs for these formulations. Other sources of cost information were used for selected ingredients as discussed previously. Unspecified ingredients or ingredients for which prices were unknown were grouped into an “all others” classification and assigned a default low and high cost of \$3.50 and \$7.00 per pound, respectively (ARB, 1997, *op cit.* at Volume II, p.56). These analyses and the detailed formulations evaluated (with individual weight fractions and unit prices per pound) are shown as cost spreadsheets in Appendix F. While these formulations may not reflect the exact composition of existing noncompliant products and compliant products that will be marketed, we believe they are reasonably representative for the purposes of this analysis.

Assumptions

As noted previously, we assumed changes in packaging, labeling, distribution and other recurring costs to be negligible relative to baseline levels of these costs (ARB, 1997). Worst-case formulations using HFC-152a or HFC-134a as propellants were assumed for compliant aerosol products if no other, less costly propellant systems were considered to be likely used in “typical” compliant formulations; despite this assumption, alternative formulations using other non-VOC propellants, compressed gases, or dimethyl ether (DME), or some combination with these or existing propellant systems may allow lower-cost compliant products than shown in our analysis.

Results

As shown in Table VIII-10, the anticipated raw materials cost changes range from no cost (net savings or no cost) to about \$0.25 increase per unit (tire inflator and sealants).

[INSERT TABLE VIII-8]
**Estimated Impacts to Raw Materials Cost (\$/Unit of Product) for Proposed Mid-Term
Measures II Limits**

Table VIII-9 shows a comparison of the impacts to raw materials cost under the proposed limits relative to those of other ARB consumer product regulations. As shown, the raw materials cost impacts under the proposed limits are comparable to those of other ARB regulations.

Table VIII-9. Comparison of Raw Materials Cost Impacts for the Proposed Limits and Other ARB Consumer Product Regulations (unadjusted dollars)

Regulation	Cost Impacts (Dollars per Unit of Product)
Mid-Term Measures II	\$0.00 to \$0.25
Phase III (Mid-Term Measures 1) Consumer Products Regulation ¹	\$0.00 to \$0.60
Hairsprays ²	(\$0.10) to \$0.45
Aerosol Coating Products ³	\$0.30 to \$0.34
Phase II Consumer Products Regulation ⁴	<\$0.01 to \$0.60
Phase I Consumer Products Regulation ⁵	net savings to \$0.25
Antiperspirants and Deodorants ⁶	\$0.25

¹ Phase III Staff Report; ARB, 1997.

² \$0.45/unit reported as a worst-case scenario using high-level of HFC-152a as propellant in “premium” products.

³ ARB, 1995.

⁴ ARB, 1991.

⁵ ARB, 1990.

⁶ Estimate based on assumption of using HFC-152a to replace HC propellants and meet the 0% HVOC limit.

F. ANALYSIS OF THE COMBINED IMPACTS ON PER-UNIT COST FROM RECURRING AND NONRECURRING COSTS

Introduction

In this analysis, we evaluated the combined impacts of both recurring (i.e., raw materials costs) and nonrecurring costs from the proposed limits on per-unit costs. Although the raw material costs generally constitute the major portion of the compliance costs, in some categories, particularly the pesticides, the nonrecurring (fixed) cost was the major contributor. In performing this analysis, we used the fixed costs, raw material costs, assumptions, and other facts discussed previously.

Methodology

This method differs from the raw materials cost-only analysis in the previous section in that the nonrecurring cost in this analysis is assumed to be “spread out” (i.e., recouped) through the entire California sales volume of each product category. Thus, the total annual recurring and annualized nonrecurring costs reported previously is divided by the number of units sold in California per year to estimate the per-unit cost increase. The California sales volume for a product category is estimated by dividing the total VOC emissions (pounds of VOC per year) for that category by the category’s sales-weighted average VOC content (pounds of VOC per pound of product).

Results

As shown in Table VIII-10, the combined fixed and raw material cost changes to per-unit production costs ranged from no cost increase (net savings or no cost for various categories) to about \$0.30 per unit (tire inflator and sealants, flying bug insecticides). Averaged over the sales volume for each category, the unit sales-weighted average cost increase is about \$0.02 per unit. This is similar to the unit sales-weighted average cost increase of \$0.03 we estimated for the first Mid-Term Measures regulation adopted by the Board in 1997.

[INSERT TABLE VIII-10 HERE]

G. MITIGATION OF POTENTIAL IMPACTS THROUGH ADDITIONAL REGULATORY FLEXIBILITY

If adopted by the Board, the proposed limits will be incorporated in section 94509 of the consumer products regulation (Title 17, California Code of Regulations, §§94507-94517). To complement the mandatory VOC limits specified in section 94509, the existing consumer products program provides a very high degree of compliance flexibility to mitigate cost impacts as much as possible, through two voluntary, market-based programs: the Innovative Products Provision and the Alternative Control Plan (ACP) regulation. The Innovative Products Provision (IPP), established under section 94511 (Title 17, CCR), allows qualified manufacturers to sell products that have VOC contents greater than the applicable VOC limit, provided they demonstrate that such products actually emit less VOCs than representative products that comply with the VOC limit. Using the emissions trading approach, the ACP is a voluntary regulation (Title 17, CCR, §§94520--94528) designed to allow multi-product VOC averaging as an alternate means of complying with the VOC limits.

Various manufacturers have formulated technologically-advanced, IPP products that are more concentrated, higher in efficacy, or have some other chemical or physical properties that permit users to release less VOCs when using such products. To date, 13 manufacturers have obtained IPP approvals for 23 products. Based on their participation in the program, it is reasonable to conclude that manufacturers are using this program to provide consumers with products that meet their needs, while lowering costs, improving the “market value” of their products, or otherwise maintaining profit margins.

The potential benefits of emissions averaging or “bubbling” for consumer product manufacturers under the ACP regulation have been documented by ARB staff (ARB, 1994). In general, emissions averaging under approved ACP plans allows manufacturers to choose the least-cost or other advantageous reformulation options for its product lines. Rather than directly complying with each and every VOC limit, manufacturers can choose to “overcomply” with some reformulations in order to offset the “undercompliance” of other product lines. The ACP regulation requires the net resulting emissions from products under such averaging plans to be no greater than the level which would have resulted had all the products under the ACP bubble directly complied with the applicable limits. In short, the same emission reductions are achieved while providing a high degree of formulation and marketing flexibility to manufacturers. To date, three manufacturers have implemented approved ACP averaging programs, reducing VOC emissions by over 2 million pounds more than would have occurred under the mandatory VOC limits. We anticipate that such emissions averaging will also benefit manufacturers subject to the proposed limits.

Overall, most affected businesses will benefit from the Innovative Products Provision and the ACP regulation. Both programs are completely voluntary and impose no additional costs to businesses to meet their requirements other than testing and reporting requirements. Manufacturers who take advantage of these market-based programs presumably do so because it costs less than direct compliance with the limits or it provides some other market benefits.

According to previous staff analyses, the potential cost differential which might result from competition under the ACP between small and large firms would not necessarily cause extreme hardship on small firms (*Id.* at Vol.II, X-13). However, inclusion of the proposed limits in the ACP regulation may increase the level of competition for some products and may lead to the elimination of some marginal producers for those products. Such competition may also have minor impacts on California employment and payroll. However, the impact is expected to be positive in the long term. Any potential impacts on the ability of California businesses to compete with businesses in other states are also expected to be minimal.

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California Air Resources Board (ARB); Initial Statement of Reasons for a Proposed Statewide Regulation to Reduce Volatile Organic Compound Emissions from Aerosol Coating Products and Amendments to the Alternative Control Plan for Consumer Products; February 3, 1995; Volume II, pp. VIII.1-VIII.20, X.1-X.13 and Appendix G (ARB, 1995).

California Air Resources Board (ARB); Initial Statement of Reasons for Proposed Amendments Pertaining to Hairspray in the California Consumer Products Regulation; February 7, 1997; Volume II, pp. 44-59 (ARB, 1997).

IX.

FUTURE ACTIVITIES

In the fall of 1999 staff will be working on two major projects: a reactivity-based compliance alternative for aerosol coatings (the California Low Emissions and Reactivity (CLEAR) Regulation), and an update to the consumer products element of the State Implementation Plan (SIP).

A. REACTIVITY-BASED REGULATION FOR AEROSOL COATINGS

Staff began working on a photochemical reactivity-based compliance option for aerosol coatings in 1998. The proposed CLEAR Regulation is based on the theory that volatile organic compounds (VOC) react in the atmosphere at different rates and through different chemical reactions. Because of this, each VOC has a different potential to form ozone once emitted. This ozone formation potential can be quantified, and a scale developed to compare reactivities. As the basis for this regulation, we are proposing to use the maximum incremental reactivity (MIR) scale, developed by Dr. William Carter at the University of California at Riverside. While the current aerosol coatings regulation limits the total mass of VOCs, using the MIR scale, limits can be established that restrict the total ozone formation potential of products.

During development of the regulation, industry and the Reactivity Scientific Advisory Committee (RSAC) suggested that the basis for Dr. Carter's MIR scale be peer-reviewed. We agreed. To allow time for the review, however, development of the regulation was postponed. To conduct the review, the ARB contracted with Dr. William Stockwell at the Desert Research Institute. As of this writing, the review is complete and we expect to submit the final report to the RSAC for discussion at their fall 1999 meeting. After RSAC approval, staff will continue their efforts on regulation development.

During the fall of 1999 staff will focus efforts on ensuring that the CLEAR limits provide equivalent ozone reductions as achieved through the mass-based VOC limits, and will work on proposals to address MIR uncertainty and hydrocarbon solvent reactivities. Staff will also continue development of the computer program that is being designed to assist industry in calculating a product's reactivity. A prototype of the program was shared with industry early in 1999. The goal is to bring the CLEAR Regulation for Aerosol Coatings to the Board for their consideration in the spring of 2000.

B. STATE IMPLEMENTATION PLAN UPDATE

Over the next year, ARB will be working on a comprehensive update to the statewide strategies in the 1994 Ozone SIP. The motor vehicle emission inventory model is currently being updated, as is the off-road mobile source emissions inventory. The consumer products emissions inventory is also being updated using the 1997 Consumer Products Survey, and the South Coast

Air Quality Management District is pursuing similar efforts for stationary sources in the region. These revised inventories, in combination with new ozone episode data from the Southern California Ozone Study, will be used to refine the air quality model for the South Coast Air Basin to determine the revised emission reduction target needed to attain federal and state health-based ozone standards in the Basin.

To kick off the development of new statewide strategies, on October 5-7, 1999, ARB will host Exploring New Technologies for Clean Air, a symposium to highlight technologies capable of achieving zero and near-zero emissions. We will follow up the symposium with workshops to discuss the comprehensive statewide emission reduction strategy. Throughout this process, we will continue to work closely with the regulated industry, government agencies, academia, environmental groups and the public as we develop plans for achieving the health-based ambient air quality standards. We will continue to work closely with the Consumer Products Working Group and other representatives of the consumer products industry to re-evaluate the appropriate level for long-term commitments for consumer products.

We anticipate presenting a revised control plan for the Board's consideration and adoption in 2000 or 2001. The revised statewide strategy will also be incorporated into the South Coast Air Quality Management District's updated Air Quality Management Plan (AQMP). Upon adoption of the AQMP by the District Board and the Air Resources Board, we will submit the revised emission inventories, attainment demonstration, and control plan to the U.S. Environmental Protection Agency (U.S. EPA) as a SIP revision. The 1994 Ozone SIP will continue to apply until U.S. EPA approves the SIP revision.

APPENDIX A:

**PROPOSED AMENDMENTS TO THE CONSUMER PRODUCTS
REGULATION.**

**Proposed Regulation Order
REGULATION FOR REDUCING
VOLATILE ORGANIC COMPOUND
EMISSIONS FROM CONSUMER PRODUCTS**

[Note: The proposed amendments to Sections 94508, 94509, and 94513, Title 17, California Code of Regulations, for this rulemaking action are shown in ~~strikeout~~ to indicate proposed deletions and underline to indicate proposed additions. In the interests of clarity and completeness, the regulation text below shows other recent amendments that have been proposed or approved by the Board, but have not yet been submitted to the Office of Administrative Law and are not yet legally effective. The recent amendments appear only in section 94508(a)(78), and are identified by underlined italics to indicate additions and by *italicized strikeouts* to indicate deletions. These recent amendments are not part of the present proposal. They were made in connection with a rulemaking action considered by the Board at a November 19, 1998, public hearing.]

Amend Title 17, California Code of Regulations, Sections 94508, 94509, and 94513 to read as follows:

SUBCHAPTER 8.5 CONSUMER PRODUCTS

Article 2. Consumer Products

94507. Applicability

Except as provided in Sections 94509(i) and 94510, this article shall apply to any person who sells, supplies, offers for sale, or manufactures consumer products for use in the state of California.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94508. Definitions

- (a) For the purpose of this article, the following definitions apply:
- (1) “Adhesive” means any product that is used to bond one surface to another by attachment. “Adhesive” does not include products used on humans and animals, adhesive tape, contact paper, wallpaper, shelf liners, or any other product with an adhesive incorporated onto or in an inert substrate. For “Contact Adhesive,” “Construction, and Panel, and Floor Covering Adhesive,” and “General Purpose Adhesive” only, “adhesive” also does not

include units of product, less packaging, which weigh more than one pound ~~or~~ and consist of more than 16 fluid ounces. This limitation does not apply to aerosol adhesives. For the purpose of this article, “Aerosol Adhesive” means an aerosol product in which the spray mechanism is permanently housed in a nonrefillable can designed for hand-held application without the need for ancillary hoses or spray equipment.

- (2) “Adhesive Remover” means a product designed exclusively for the removal of adhesives, caulk and other bonding materials from either a specific substrate or a variety of substrates.
- (3) “Aerosol Cooking Spray” means any aerosol product designed either to reduce sticking on cooking and baking surfaces or to be applied on food, or both.
- (4) “Aerosol Product” means a pressurized spray system that dispenses product ingredients by means of a propellant or mechanically induced force. “Aerosol Product” does not include pump sprays.
- (5) “Agricultural Use” means the use of any pesticide or method or device for the control of pests in connection with the commercial production, storage or processing of any animal or plant crop. “Agricultural Use” does not include the sale or use of pesticides in properly labeled packages or containers which are intended for: (A) Home use, (B) Use in structural pest control, or (C) Industrial or Institutional use. For the purposes of this definition only:

“Home use” means use in a household or its immediate environment.

“Structural pest control” means a use requiring a license under Chapter 14 (commencing with Section 8500), Division 3, of the Business and Professions Code.

“Industrial use” means use for or in a manufacturing, mining, or chemical process or use in the operation of factories, processing plants, and similar sites.

“Institutional use” means use within the lines of, or on property necessary for the operation of buildings such as hospitals, schools, libraries, auditoriums, and office complexes.

- (6) “Air Freshener” means any consumer product including, but not limited to, sprays, wicks, powders, and crystals, designed for the purpose of masking odors, or freshening, cleaning, scenting, or deodorizing the air. “Air Freshener” includes dual purpose air freshener/disinfectant products. “Air Freshener” does not include products that are used on the human body, or products that function primarily as cleaning products as indicated on a product label or advertisement.

- (7) “All Other Carbon-Containing Compounds” means all other compounds which contain at least one carbon atom and are not a “Table B” or a “LVP-VOC.”
- (8) “All Other Forms” means all consumer product forms for which no form-specific VOC standard is specified. Unless specified otherwise by the applicable VOC standard, “all other forms” include, but are not limited to, solids, liquids, wicks, powders, crystals, and cloth or paper wipes (towelettes).
- (9) “Antimicrobial Hand or Body Cleaner or Soap” means a cleaner or soap which is designed to reduce the level of microorganisms on the skin through germicidal activity, and is regulated as an over-the-counter drug by the U.S. Food and Drug Administration. “Antimicrobial Hand or Body Cleaner or Soap” includes, but is not limited to, (A) antimicrobial hand or body washes/cleaners, (B) foodhandler hand washes, (C) healthcare personnel hand washes, (D) pre-operative skin preparations and (E) surgical scrubs. “Antimicrobial Hand or Body Cleaner or Soap” does not include prescription drug products, antiperspirants, “Astringent/Toner,” deodorant, “Facial Cleaner or Soap,” “General-use Hand or Body Cleaner or Soap,” “Hand Dishwashing Detergent” (including antimicrobial), “Heavy-duty Hand Cleaner or Soap,” “Medicated Astringent/Medicated Toner,” and “Rubbing Alcohol.”
- (10) “Architectural Coating” means a coating applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.
- (11) “ASTM” means the American Society for Testing and Materials.
- (12) “Astringent/Toner” means any product not regulated as a drug by the United States Food and Drug Administration (FDA) which is applied to the skin for the purpose of cleaning or tightening pores. This category also includes clarifiers and substrate-impregnated products. This category does not include any hand, face, or body cleaner or soap product, “Medicated Astringent/Medicated Toner”, “Personal Fragrance Product”, cold cream, lotion, or antiperspirant.
- (13) “Automotive Brake Cleaner” means a cleaning product designed to remove oil, grease, brake fluid, brake pad material or dirt from motor vehicle brake mechanisms.
- (14) “Automotive Hard Paste Wax” means an automotive wax or polish which is: (A) designed to protect and improve the appearance of automotive paint surfaces; and (B) a solid at room temperature; and (C) contains 0% water by formulation.
- (15) “Automotive Instant Detailer” means a product designed for use in a pump spray that is applied to the painted surface of automobiles and wiped off prior to the product being allowed to dry.

- (16) “Automotive Rubbing or Polishing Compound” means a product designed primarily to remove oxidation, old paint, scratches or “swirl marks”, and other defects from the painted surfaces of motor vehicles without leaving a protective barrier.
- (17) “Automotive Wax, Polish, Sealant or Glaze” means a product designed to seal out moisture, increase gloss, or otherwise enhance a motor vehicle’s painted surfaces. “Automotive Wax, Polish, Sealant or Glaze” includes, but is not limited to, products designed for use in autobody repair shops and “drive-through” car washes, as well as products designed for the general public. “Automotive Wax, Polish, Sealant or Glaze” does not include “Automotive Rubbing or Polishing Compounds”, automotive wash and wax products, surfactant-containing car wash products, and products designed for use on unpainted surfaces such as bare metal, chrome, glass, or plastic.
- (18) “Automotive Windshield Washer Fluid (Dilutable)” means any liquid sold in a 1 quart container or less, and designed for use in a motor vehicle windshield washer fluid system either as an anti-freeze or for the purpose of cleaning, washing, bug removal, or wetting the windshield(s). “Automotive Windshield Washer Fluid (Dilutable)” does not include any fluid which is placed in a new motor vehicle at the time the vehicle is manufactured.
- (19) “Automotive Windshield Washer Fluid (Pre-Mixed)” means any liquid sold in a container greater than 1 quart in volume and designed for use in a motor vehicle windshield washer fluid system either as an anti-freeze or for the purpose of cleaning, washing, bug removal, or wetting the windshield(s). “Automotive Windshield Washer Fluid (Pre-Mixed)” does not include any fluid which is placed in a new motor vehicle at the time the vehicle is manufactured.
- ~~(20)~~ “Bathroom and Tile Cleaner” means a product designed to clean tile or surfaces in bathrooms. “Bathroom and Tile Cleaner” does not include products specifically designed to clean toilet bowls or toilet tanks.
- ~~(21)~~ “Bug and Tar Remover” means a product designed to remove either or both of the following from painted motor vehicle surfaces without causing damage to the finish: (A) biological-type residues such as insect carcasses and tree sap and, (B) road grime, such as road tar, roadway paint markings, and asphalt.
- ~~(22)~~ “California Sales” means the sales (net pounds of product, less packaging and container, per year) in California for either the calendar year immediately prior to the year that the registration is due or, if that data is not available, any consecutive 12 month period commencing no earlier than 2 years prior to the due date of the registration. If direct sales data for California is not available, sales may be estimated by prorating national or regional sales data by population.

- (2322) ~~“Carburetor-Choke Cleaner or Fuel-Injection Air Intake Cleaners”~~ means a product designed to remove fuel deposits, dirt, or other contaminants from a carburetor, choke, throttle body of a fuel-injection system, or associated linkages. ~~“Carburetor-Choke Cleaner or fuel-injection air intake cleaners”~~ does not include products designed exclusively to be introduced directly into the fuel lines or fuel storage tank prior to introduction into the carburetor or fuel injectors.
- (2423) “Carpet and Upholstery Cleaner” means a cleaning product designed for the purpose of eliminating dirt and stains on rugs, carpeting, and the interior of motor vehicles and/or on household furniture or objects upholstered or covered with fabrics such as wool, cotton, nylon or other synthetic fabrics. “Carpet and Upholstery Cleaner” includes, but is not limited to, products that make fabric protectant claims. “Carpet and Upholstery Cleaner” does not include “General Purpose Cleaners”, “Spot Removers”, vinyl or leather cleaners, dry cleaning fluids, or products designed exclusively for use at industrial facilities engaged in furniture or carpet manufacturing.
- (2524) “Charcoal Lighter Material” means any combustible material designed to be applied on, incorporated in, added to, or used with charcoal to enhance ignition. “Charcoal Lighter Material” does not include any of the following: (A) electrical starters and probes, (B) metallic cylinders using paper tinder, (C) natural gas, (D) propane, and (E) fat wood.
- (2625) “Colorant” means any pigment or coloring material used in a consumer product for an aesthetic effect, or to dramatize an ingredient.
- (2726) ~~“Construction, and Panel, and Floor Covering Adhesive”~~ means any one-component adhesive having gap filling capabilities, and which distributes stress uniformly throughout the bonded area, resulting in a reduction or elimination of mechanical fasteners: that is designed exclusively for the installation, remodeling, maintenance, or repair of: (A) structural and building components that include, but are not limited to, beams, trusses, studs, paneling (drywall or drywall laminates, fiberglass reinforced plastic (FRP), plywood, particle board, insulation board, pre-decorated hardboard or tileboard, etc.), ceiling and acoustical tile, molding, fixtures, countertops or countertop laminates, cove or wall bases, and flooring or subflooring; or (B) floor or wall coverings that include, but are not limited to, wood or simulated wood covering, carpet, carpet pad or cushion, vinyl-backed carpet, flexible flooring material, nonresilient flooring material, mirror tiles and other types of tiles, and artificial grass. ~~“Construction, Panel, and Floor Covering Adhesive”~~ does not include “Floor Seam Sealer”.
- (2827) “Consumer” means any person who seeks, purchases, or acquires any consumer product for personal, family, household, or institutional use. Persons acquiring a consumer product for resale are not “consumers” for that product.

- (2928) “Consumer Product” means a chemically formulated product used by household and institutional consumers including, but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; aerosol paints; and automotive specialty products; but does not include other paint products, furniture coatings, or architectural coatings.
- (3029) “Contact Adhesive” means an adhesive that: (A) is designed for application to both surfaces to be bonded together, and (B) is allowed to dry before the two surfaces are placed in contact with each other, and (C) forms an immediate bond that is impossible, or difficult, to reposition after both adhesive-coated surfaces are placed in contact with each other, and (D) does not need sustained pressure or clamping of surfaces after the adhesive-coated surfaces have been brought together using sufficient momentary pressure to establish full contact between both surfaces. “Contact Adhesive” does not include rubber cements that are primarily intended for use on paper substrates.
- (3130) “Container/Packaging” means the part or parts of the consumer or institutional product which serve only to contain, enclose, incorporate, deliver, dispense, wrap or store the chemically formulated substance or mixture of substances which is solely responsible for accomplishing the purposes for which the product was designed or intended. “Container/Packaging” includes any article onto or into which the principal display panel and other accompanying literature or graphics are incorporated, etched, printed or attached.
- (3231) “Crawling Bug Insecticide” means any insecticide product that is designed for use against ants, cockroaches, or other household crawling arthropods, including, but not limited to, mites, silverfish or spiders. “Crawling Bug Insecticide” does not include products designed to be used exclusively on humans or animals, or any house dust mite product. For the purposes of this definition only:
- “House dust mite product” means a product whose label, packaging, or accompanying literature states that the product is suitable for use against house dust mites, but does not indicate that the product is suitable for use against ants, cockroaches, or other household crawling arthropods.
- “House dust mite” means mites which feed primarily on skin cells shed in the home by humans and pets and which belong to the phylum Arthropoda, the subphylum Chelicerata, the class Arachnida, the subclass Acari, the order Astigmata, and the family Pyroglyphidae.
- (3332) “Device” means any instrument or contrivance (other than a firearm) which is designed for trapping, destroying, repelling, or mitigating any pest or any other form of plant or animal life (other than man and other than bacteria, virus, or other microorganism on or

in living man or other living animals); but not including equipment used for the application of pesticides when sold separately therefrom.

- ~~(3433)~~ “Disinfectant” means any product intended to destroy or irreversibly inactivate infectious or other undesirable bacteria, pathogenic fungi, or viruses on surfaces or inanimate objects and whose label is registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA, 7 U.S.C. 136, et seq.). “Disinfectant” does not include any of the following: (A) products designed solely for use on human or animals, (B) products designed for agricultural use, (C) products designed solely for use in swimming pools, therapeutic tubs, or hot tubs, (D) products which, as indicated on the principal display panel or label, are designed primarily for use as bathroom and tile cleaners, glass cleaners, general purpose cleaners, toilet bowl cleaners, or metal polishes.
- ~~(3534)~~ “Distributor” means any person to whom a consumer product is sold or supplied for the purposes of resale or distribution in commerce, except that manufacturers, retailers, and consumers are not distributors.
- ~~(3635)~~ “Double Phase Aerosol Air Freshener” means an aerosol air freshener with the liquid contents in two or more distinct phases that requires the product container be shaken before use to mix the phases, producing an emulsion.
- ~~(3736)~~ “Dry Cleaning Fluid” means any non-aqueous liquid product designed and labeled exclusively for use on: (1) fabrics which are labeled “for dry clean only”, such as clothing or drapery; or (2) “S-coded” fabrics. “Dry Cleaning Fluid” includes, but is not limited to, those products used by commercial dry cleaners and commercial businesses that clean fabrics such as draperies at the customer’s residence or work place. “Dry Cleaning Fluid” does not include “Spot Remover” or “Carpet and Upholstery Cleaner”. For the purposes of this definition, S-coded fabric means an upholstery fabric designed to be cleaned only with water-free spot cleaning products as specified by the Joint Industry Fabric Standards Committee.”
- ~~(3837)~~ “Dual Purpose Air Freshener/Disinfectant” means an aerosol product that is represented on the product container for use as both a disinfectant and an air freshener, or is so represented on any sticker, label, packaging, or literature attached to the product container.
- ~~(3938)~~ “Dusting Aid” means a product designed to assist in removing dust and other soils from floors and other surfaces without leaving a wax or silicone based coating. “Dusting Aid” does not include products which consist entirely of compressed gases for use in electronic or other specialty areas.
- ~~(4039)~~ “Electronic Cleaner” means a product designed specifically for the removal of dirt, grease or grime from electrical equipment such as electric motors, circuit boards, electricity panels, and generators.

- (4140) “Engine Degreaser” means a cleaning product designed to remove grease, grime, oil and other contaminants from the external surfaces of engines and other mechanical parts.
- (4241) “Executive Officer” means the Executive Officer of the Air Resources Board, or his or her delegate.
- (4342) “Existing Product” means any formulation of the same product category and form sold, supplied, manufactured, or offered for sale in California prior to the following dates, or any subsequently introduced identical formulation:
- (A) October 21, 1991, for all products listed in section 94509(a) that have initial effective dates of January 1, 1993, or January 1, 1994; subject to the Phase I VOC standards specified in section 94509(a);
 - (B) January 6, 1993, for all products listed in section 94509(a) that have initial effective dates of January 1, 1995, or January 1, 1997, and charcoal lighter materials subject to section 94509(h); subject to the Phase II VOC standards specified in section 94509(a);
 - (C) ~~the operative date of the Phase III VOC standards (i.e., 30 days after the Phase III rulemaking action is approved by the Office of Administrative Law), for products subject to the Phase III VOC standards specified in section 94509(a).~~ August 18, 1998, for all products listed in section 94509(a) that have initial effective dates of January 1, 2001, January 1, 2002, January 1, 2003, or January 1, 2005;
 - (D) the operative date of the “Mid-term Measures II” amendments (i.e. 30 days after the “Mid-term Measures II” rulemaking action is approved by the Office of Administrative Law), for all products in the following product categories listed in section 94509(a): “Non-aerosol General Purpose Degreaser,” “Sealant and Caulking Compound,” and “Tire Sealant and Inflator.”
- (4443) “Fabric Protectant” means a product designed to be applied to fabric substrates to protect the surface from soiling from dirt and other impurities or to reduce absorption of water liquid into the fabric's fibers. “Fabric Protectant” does not include ~~silicone-based products whose function is to provide water repellency; waterproofers, products designed for use solely on leather,~~ or products designed for use solely on fabrics which are labeled “for dry clean only” and sold in containers of 10 fluid ounces or less.
- (4544) “Facial Cleaner or Soap” means a cleaner or soap designed primarily to clean the face. “Facial Cleaner or Soap” includes, but is not limited to, facial cleansing creams, gels, liquids, lotions, and substrate-impregnated forms. “Facial Cleaner or Soap” does not include prescription drug products, “Antimicrobial Hand or Body Cleaner or Soap,” “Astringent/Toner,” “General-use Hand or Body Cleaner or Soap,” “Medicated

Astringent/Medicated Toner,” or “Rubbing Alcohol.”

- (4645) “Fat Wood” means pieces of wood kindling with high naturally-occurring levels of sap or resin which enhance ignition of the kindling. “Fat wood” does not include any kindling with substances added to enhance flammability, such as wax-covered or wax-impregnated wood-based products.
- (4746) “Flea and Tick Insecticide” means any insecticide product that is designed for use against fleas, ticks, their larvae, or their eggs. “Flea and Tick Insecticide” does not include products that are designed to be used exclusively on humans or animals and their bedding.
- (4847) “Flexible Flooring Material” means asphalt, cork, linoleum, no-wax, rubber, seamless vinyl and vinyl composite flooring.
- (4948) “Floor Polish or Wax” means a wax, polish, or any other product designed to polish, protect, or enhance floor surfaces by leaving a protective coating that is designed to be periodically replenished. “Floor Polish or Wax” does not include “spray buff products”, products designed solely for the purpose of cleaning floors, floor finish strippers, products designed for unfinished wood floors, and coatings subject to architectural coatings regulations.
- (50) “Floor Seam Sealer” means any product designed and labeled exclusively for bonding, fusing, or sealing (coating) seams between adjoining rolls of installed flexible sheet flooring.
- (5149) “Floor Wax Stripper” means a product designed to remove natural or synthetic floor polishes or waxes through breakdown of the polish or wax polymers, or by dissolving or emulsifying the polish or wax. “Floor Wax Stripper” does not include aerosol floor wax strippers or products designed to remove floor wax solely through abrasion.
- (5250) “Flying Bug Insecticide” means any insecticide product that is designed for use against flying insects or other flying arthropods, including but not limited to flies, mosquitoes, moths, or gnats. “Flying Bug Insecticide” does not include “wasp and hornet insecticide”, products that are designed to be used exclusively on humans or animals, or any moth-proofing product. For the purposes of this definition only, “moth-proofing product” means a product whose label, packaging, or accompanying literature indicates that the product is designed to protect fabrics from damage by moths, but does not indicate that the product is suitable for use against flying insects or other flying arthropods.

- (5351) “Fragrance” means a substance or complex mixture of aroma chemicals, natural essential oils, and other functional components with a combined vapor pressure not in excess of 2 mm of Hg at 20°C, the sole purpose of which is to impart an odor or scent, or to counteract a malodor.
- (5452) “Furniture Maintenance Product” means a wax, polish, conditioner, or any other product designed for the purpose of polishing, protecting or enhancing finished wood surfaces other than floors. “Furniture Maintenance Product” does not include dusting aids, products designed solely for the purpose of cleaning, and products designed to leave a permanent finish such as stains, sanding sealers and lacquers.
- (5553) “Furniture Coating” means any paint designed for application to room furnishings including, but not limited to, cabinets (kitchen, bath and vanity), tables, chairs, beds, and sofas.
- (5654) “Gel” means a colloid in which the disperse phase has combined with the continuous phase to produce a semisolid material, such as jelly.
- (5755) “General Purpose Adhesive” means any non-aerosol adhesive designed for use on a variety of substrates. “General Purpose Adhesive” does not include (A) contact adhesives, (B) construction, and panel, and floor covering adhesives, (C) adhesives designed exclusively for application on one specific category of substrates (i.e., substrates that are composed of similar materials, such as different types of metals, paper products, ceramics, plastics, rubbers, or vinyls), or (D) adhesives designed exclusively for use on one specific category of articles (i.e., articles that may be composed of different materials but perform a specific function, such as gaskets, automotive trim, weather-stripping, or carpets).
- (5856) “General Purpose Cleaner” means a product designed for general all-purpose cleaning, in contrast to cleaning products designed to clean specific substrates in certain situations. “General Purpose Cleaner” includes products designed for general floor cleaning, kitchen or countertop cleaning, and cleaners designed to be used on a variety of hard surfaces.
- (5957) “General Purpose Degreaser” means any product designed to remove or dissolve grease, grime, oil and other oil-based contaminants from a variety of substrates, including automotive or miscellaneous metallic parts. “General Purpose Degreaser” does not include “Engine Degreaser”, “General Purpose Cleaner”, “~~Metallic Parts Cleaner~~”, “Adhesive Remover”, “Electronic Cleaner”, ~~or~~ “Metal Polish/Cleanser”, products used exclusively in “solvent cleaning tanks or related equipment,” or products that are (A) sold exclusively to establishments which manufacture or construct goods or commodities; and (B) labeled “not for retail sale”. “Solvent cleaning tanks or related equipment” includes, but is not limited to, cold cleaners, vapor degreasers, conveyORIZED degreasers, film cleaning machines, or products designed to clean miscellaneous metallic parts by immersion in a container.
- (6058) “General-use Hand or Body Cleaner or Soap” means a cleaner or soap designed to be

used routinely on the skin to clean or remove typical or common dirt and soils. “General-use Hand or Body Cleaner or Soap” includes, but is not limited to, hand or body washes, dual-purpose shampoo-body cleaners, shower or bath gels, and moisturizing cleaners or soaps. “General-use Hand or Body Cleaner or Soap” does not include prescription drug products, “Antimicrobial Hand or Body Cleaner or Soap”, “Astringent/Toner”, “Facial Cleaner or Soap”, “Hand Dishwashing Detergent” (including antimicrobial), “Heavy-duty Hand Cleaner or Soap”, “Medicated Astringent/Medicated Toner”, or “Rubbing Alcohol.”

- (6159) “Glass Cleaner” means a cleaning product designed primarily for cleaning surfaces made of glass. Glass cleaner does not include products designed solely for the purpose of cleaning optical materials used in eyeglasses, photographic equipment, scientific equipment and photocopying machines.
- (6264) “Hair Mousse” means a hairstyling foam designed to facilitate styling of a coiffure and provide limited holding power.
- (6362) “Hair Shine” means any product designed for the primary purpose of creating a shine when applied to the hair. “Hair Shine” includes, but is not limited to, dual-use products designed primarily to impart a sheen to the hair. “Hair Shine” does not include “Hairspray”, “Hair Mousse”, “Hair Styling Gel” or spray gel, or products whose primary purpose is to condition or hold the hair.
- (6463) “Hair Styling Gel” means a high viscosity, often gelatinous, product that contains a resin and is designed for the application to hair to aid in styling and sculpting of the hair coiffure.
- (6560) “Hairspray” means a consumer product designed primarily for the purpose of dispensing droplets of a resin on and into a hair coiffure which will impart sufficient rigidity to the coiffure to establish or retain the style for a period of time.
- (6664) “Heavy-Duty Hand Cleaner or Soap” means a product designed to clean or remove difficult dirt and soils such as oil, grease, grime, tar, shellac, putty, printer’s ink, paint, graphite, cement, carbon, asphalt, or adhesives from the hand with or without the use of water. “Heavy-duty Hand Cleaner or Soap” does not include prescription drug products, “Antimicrobial Hand or Body Cleaner or Soap”, “Astringent/Toner”, “Facial Cleaner or Soap”, “General-use Hand or Body Cleaner or Soap”, “Medicated Astringent/Medicated Toner” or “Rubbing Alcohol.”
- (6765) “Herbicide” means a pesticide product designed to kill or retard a plant’s growth, but excludes products that are: (A) for agricultural use, or (B) restricted materials that require a permit for use and possession.
- (6866) “Household Product” means any consumer product that is primarily designed to be used

inside or outside of living quarters or residences that are occupied or intended for occupation by individuals, including the immediate surroundings.

- ~~(67)~~ “Household Sealants and Caulking Compounds” means any product designed to fill in cracks, close or secure an object, or to prevent seepage of moisture or air.
- (~~69~~68) “Insect Repellent” means a pesticide product that is designed to be applied on human skin, hair or attire worn on humans in order to prevent contact with or repel biting insects or arthropods.
- (~~70~~69) “Insecticide” means a pesticide product that is designed for use against insects or other arthropods, but excluding products that are: (A) for agricultural use, or (B) for a use which requires a structural pest control license under Chapter 14 (commencing with Section 8500) of the Business and Professions Code, or (C) restricted materials that require a permit for use and possession.
- (~~71~~70) “Insecticide Fogger” means any insecticide product designed to release all or most of its content, as a fog or mist, into indoor areas during a single application.
- (~~72~~71) “Institutional Product” or “Industrial and Institutional (I&I) Product” means a consumer product that is designed for use in the maintenance or operation of an establishment that: (A) manufactures, transports, or sells goods or commodities, or provides services for profit; or (B) is engaged in the nonprofit promotion of a particular public, educational, or charitable cause. “Establishments” include, but are not limited to, government agencies, factories, schools, hospitals, sanitariums, prisons, restaurants, hotels, stores, automobile service and parts centers, health clubs, theaters, or transportation companies. “Institutional Product” does not include household products and products that are incorporated into or used exclusively in the manufacture or construction of the goods or commodities at the site of the establishment.
- (~~73~~72) “Label” means any written, printed, or graphic matter affixed to, applied to, attached to, blown into, formed, molded into, embossed on, or appearing upon any consumer product or consumer product package, for purposes of branding, identifying, or giving information with respect to the product or to the contents of the package.
- (~~74~~73) “Laundry Prewash” means a product that is designed for application to a fabric prior to laundering and that supplements and contributes to the effectiveness of laundry detergents and/or provides specialized performance.
- (~~75~~74) “Laundry Starch Product” means a product that is designed for application to a fabric, either during or after laundering, to impart and prolong a crisp, fresh look and may also

act to help ease ironing of the fabric. “Laundry Starch Product” includes, but is not limited to, fabric finish, sizing, and starch.

(7675) “Lawn and Garden Insecticide” means an insecticide product designed primarily to be used in household lawn and garden areas to protect plants from insects or other arthropods.

(7776) “Liquid” means a substance or mixture of substances which is capable of a visually detectable flow as determined under ASTM D-4359-90. “Liquid” does not include powders or other materials that are composed entirely of solid particles.

(7877) “Lubricant” means a product designed to reduce friction, heat, noise, or wear between moving parts, or to loosen rusted or immovable parts or mechanisms. “Lubricant” does not include automotive power steering fluids; products for use inside power generating motors, engines, and turbines, and their associated power-transfer gearboxes; two cycle oils or other products designed to be added to fuels; products for use on the human body or animals or products that are (1) sold exclusively to establishments which manufacture or construct goods or commodities, and (2) labeled “not for retail sale”.

(7978) “LVP-VOC” means *any compound a chemical “compound” or “mixture” that which* contains at least one carbon atom and ~~has either~~ meets one of the following:

(A) has a vapor pressure less than 0.1 mm Hg at 20°C, ~~or~~ as determined by ARB Method 310; or

(B) ~~more than 12 carbon atoms, if the vapor pressure is unknown. is a chemical~~ “compound” with more than 12 carbon atoms, or a chemical “mixture” comprised solely of “compounds” with more than 12 carbon atoms, and the vapor pressure is unknown; or

(C) is a chemical “compound” with a boiling point greater than 216°C, as determined by ARB Method 310; or

(D) is the weight percent of a chemical “mixture” that boils above 216°C, as determined by ARB Method 310.

For the purposes of the definition of LVP-VOC, chemical “compound” means a molecule of definite chemical formula and isomeric structure, and chemical “mixture” means a substrate comprised of two or more chemical “compounds”.

(8079) “Manufacturer” means any person who imports, manufactures, assembles, produces, packages, repackages, or relabels a consumer product.

(8180) “Medicated Astringent/Medicated Toner” means any product regulated as a drug by the Food and Drug Administration (FDA) which is applied to the skin for the purpose of cleaning or tightening pores. “Medicated Astringent/Medicated Toner” includes, but is not limited to, clarifiers and substrate-impregnated products. “Medicated

Astringent/Medicated Toner” does not include hand, face, or body cleaner or soap products, “Personal Fragrance Products”, “Astringent/Toner,” cold cream, lotion, antiperspirants, or products that must be purchased with a doctor’s prescription.

- (81) ~~“Metallic Parts Cleaner” means any organic liquid that is designed to dissolve grease, dirt and other contaminants solely from miscellaneous metallic parts. “Metallic Parts Cleaner” does not include “Metal Polish/Cleanser”.~~
- (82) “Metal Polish/Cleanser” means any product designed primarily to improve the appearance of finished metal, metallic, or metallized surfaces by physical or chemical action. To “improve the appearance” means to remove or reduce stains, impurities, or oxidation from surfaces or to make surfaces smooth and shiny. “Metal Polish/Cleanser” includes, but is not limited to, metal polishes used on brass, silver, chrome, copper, stainless steel and other ornamental metals. “Metal Polish/Cleanser” does not include “Automotive Wax, Polish, Sealant or Glaze”, wheel cleaner, “Paint Remover or Stripper”, products designed and labeled exclusively for automotive and marine detailing, or products designed for use in degreasing tanks.
- (83) “Multi-purpose Dry Lubricant” means any lubricant which is: (A) designed and labeled to provide lubricity by depositing a thin film of graphite, molybdenum disulfide (“moly”), or polytetrafluoroethylene or closely related fluoropolymer (“teflon”) on surfaces, and (B) designed for general purpose lubrication, or for use in a wide variety of applications.
- (84) “Multi-purpose Lubricant” means any lubricant designed for general purpose lubrication, or for use in a wide variety of applications. “Multi-purpose Lubricant” does not include “Multi-purpose Dry Lubricants”, “Penetrants”, or “Silicone-based Multi-purpose Lubricants”.
- (85) “Multi-purpose Solvent” means any organic liquid designed to be used for a variety of purposes, including cleaning or degreasing of a variety of substrates, or thinning, dispersing or dissolving other organic materials. “Multi-purpose Solvent” includes solvents used in institutional facilities, except for laboratory reagents used in analytical, educational, research, scientific or other laboratories. “Multi-purpose Solvent” does not include solvents used in cold cleaners, vapor degreasers, conveyORIZED degreasers or film cleaning machines, or solvents that are incorporated into, or used exclusively in the manufacture or construction of, the goods or commodities at the site of the establishment.
- (86) “Nail Polish” means any clear or colored coating designed for application to the fingernails or toenails and including but not limited to, lacquers, enamels, acrylics, base coats and top coats.
- (87) “Nail Polish Remover” means a product designed to remove nail polish and coatings from fingernails or toenails.

- (88) “Non-Carbon Containing Compound” means any compound which does not contain any carbon atoms.
- (89) “Nonresilient Flooring” means flooring of a mineral content which is not flexible. “Nonresilient Flooring” includes terrazzo, marble, slate, granite, brick, stone, ceramic tile and concrete.
- (90) “Non-Selective Terrestrial Herbicide” means a terrestrial herbicide product that is toxic to plants without regard to species.
- (91) “Oven Cleaner” means any cleaning product designed to clean and to remove dried food deposits from oven walls.
- (92) “Paint” means any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer which is converted to an opaque solid film after application and is used for protection, decoration or identification, or to serve some functional purpose such as the filling or concealing of surface irregularities or the modification of light and heat radiation characteristics.
- (93) “Paint Remover or Stripper” means any product designed to strip or remove paints or other related coatings, by chemical action, from a substrate without markedly affecting the substrate. “Paint Remover or Stripper” does not include “Multi-purpose Solvents”, paint brush cleaners, products designed and labeled exclusively to remove graffiti, and hand cleaner products that claim to remove paints and other related coatings from skin.
- (94) “Penetrant” means a lubricant designed and labeled primarily to loosen metal parts that have bonded together due to rusting, oxidation, or other causes. “Penetrant” does not include “Multi-purpose Lubricants” that claim to have penetrating qualities, but are not labeled primarily to loosen bonded parts.
- (95) “Person” shall have the same meaning as defined in Health and Safety Code Section 39047.
- (96) “Personal Fragrance Product” means any product which is applied to the human body or clothing for the primary purpose of adding a scent or masking a malodor, including cologne, perfume, aftershave, and toilet water. “Personal Fragrance Product” does not include: (A) products exclusively for human axillae; (B) medicated products designed primarily to alleviate fungal or bacterial growth on feet or other areas of the body; (C) mouthwashes, breath fresheners and deodorizers; (D) lotions, moisturizers, powders or other skin care products used primarily to alleviate skin conditions such as dryness and irritations; (E) products designed exclusively for use on human genitalia; (F) soaps, shampoos, and products primarily used to clean the human body; and (G) fragrance products designed to be used exclusively on non-human animals.

- (97) “Pesticide” means and includes any substance or mixture of substances labeled, designed, or intended for use in preventing, destroying, repelling or mitigating any pest, or any substance or mixture of substances labeled, designed, or intended for use as a defoliant, desiccant, or plant regulator, provided that the term “pesticide” will not include any substance, mixture of substances, or device which the United States Environmental Protection Agency does not consider to be a pesticide.
- (98) “Principal Display Panel or Panels” means that part, or those parts of a label that are so designed as to most likely be displayed, presented, shown or examined under normal and customary conditions of display or purchase. Whenever a principal display panel appears more than once, all requirements pertaining to the “principal display panel” shall pertain to all such “principal display panels”.
- (99) “Product Brand Name” means the name of the product exactly as it appears on the principal display panel of the product.
- (100) “Product Category” means the applicable category which best describes the product as listed in this Section 94508.
- (101) “Product Form”, for the purpose of complying with Section 94513 only, means the applicable form which most accurately describes the product's dispensing form as follows:
- A = Aerosol Product
 - S = Solid
 - P = Pump Spray
 - L = Liquid
 - G = Gel
 - O = Other
- (102) “Propellant” means a liquefied or compressed gas that is used in whole or in part, such as a cosolvent, to expel a liquid or any other material from the same self-pressurized container or from a separate container.
- (103) “Pump Spray” means a packaging system in which the product ingredients within the container are not under pressure and in which the product is expelled only while a pumping action is applied to a button, trigger or other actuator.
- (104) “Responsible Party” means the company, firm or establishment which is listed on the product's label. If the label lists two companies, firms or establishments, the responsible party is the party which the product was “manufactured for” or “distributed by”, as noted on the label.
- (105) “Restricted Materials” means pesticides established as restricted materials under Title 3, California Code of Regulations, section 6400.

- (106) “Retailer” means any person who sells, supplies, or offers consumer products for sale directly to consumers.
- (107) “Retail Outlet” means any establishment at which consumer products are sold, supplied, or offered for sale directly to consumers.
- (108) “Rubber and Vinyl Protectant” means any product designed to protect, preserve or renew vinyl, rubber, and plastic on vehicles, tires, luggage, furniture, and household products such as vinyl covers, clothing, and accessories. “Rubber and Vinyl Protectant” does not include products primarily designed to clean the wheel rim, such as aluminum or magnesium wheel cleaners, and tire cleaners that do not leave an appearance-enhancing or protective substance on the tire.
- (109) “Rubbing Alcohol” means any product containing isopropyl alcohol (also called isopropanol) or denatured ethanol and labeled for topical use, usually to decrease germs in minor cuts and scrapes, to relieve minor muscle aches, as a rubefacient, and for massage.
- (110) “Sealant and Caulking Compound” means any product with adhesive properties that is designed to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. “Sealant and Caulking Compound” does not include roof cements and roof sealants; insulating foams; removable caulking compounds; clear/paintable/water resistant caulking compounds; floor seam sealers; products designed exclusively for automotive uses; or sealers that are applied as continuous coatings. “Sealant and Caulking Compound” also does not include units of product, less packaging, which weigh more than one pound and consist of more than 16 fluid ounces. For the purposes of this definition only, “removable caulking compounds” means a compound which temporarily seals windows or doors for three to six month time intervals, and “clear/paintable/water resistant caulking compounds” means a compound which contains no appreciable level of opaque fillers or pigments; transmits most or all visible light through the caulk when cured; is paintable; and is immediately resistant to precipitation upon application.
- (~~111~~110) “Semisolid” means a product that, at room temperature, will not pour, but will spread or deform easily, including gels, pastes, and greases.

- (112+11) “Shaving Cream” means an aerosol product which dispenses a foam lather intended to be used with a blade or cartridge razor, or other wet-shaving system, in the removal of facial or other bodily hair.
- (113+12) “Silicone-based Multi-purpose Lubricant” means any lubricant which is:
(A) designed and labeled to provide lubricity primarily through the use of silicone compounds including, but not limited to, polydimethylsiloxane, and (B) designed and labeled for general purpose lubrication, or for use in a wide variety of applications. “Silicone-based Multi-purpose Lubricant” does not include products designed and labeled exclusively to release manufactured products from molds.
- (114+13) “Single Phase Aerosol Air Freshener” means an aerosol air freshener with the liquid contents in a single homogeneous phase and which does not require that the product container be shaken before use.
- (115+14) “Solid” means a substance or mixture of substances which, either whole or subdivided (such as the particles comprising a powder), is not capable of visually detectable flow as determined under ASTM D-4359-90.
- (116+15) “Spot Remover” means any product designed to clean localized areas, or remove localized spots or stains on cloth or fabric such as drapes, carpets, upholstery, and clothing, that does not require subsequent laundering to achieve stain removal. “Spot Remover” does not include “Dry Cleaning Fluid”, “Laundry Prewash”, “Carpet and Upholstery Cleaner”, or “Multi-purpose Solvent”.
- (117+16) “Spray Buff Product” means a product designed to restore a worn floor finish in conjunction with a floor buffing machine and special pad.
- (118+17) “Table B Compound” means any carbon-containing compound listed as an exception to the definition of VOC in Section 94508.
- (119+18) “Terrestrial” means to live on or grow from land.
- (120) “Tire Sealant and Inflator” means any pressurized product that is designed to temporarily inflate and seal a leaking tire.
- (121+19) “Type A Propellant” means a compressed gas such as CO₂, N₂, N₂O, or compressed air which is used as a propellant, and is either incorporated with the product or contained in a separate chamber within the product's packaging.
- (122+20) “Type B Propellant” means any halocarbon which is used as a propellant including chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs).

- (~~123~~+21) “Type C Propellant” means any propellant which is not a Type A or Type B propellant, including propane, isobutane, n-butane, and dimethyl ether (also known as dimethyl oxide).
- (~~124~~+22) “Undercoating” means any aerosol product designed to impart a protective, non-paint layer to the undercarriage, trunk interior, and/or firewall of motor vehicles to prevent the formation of rust or to deaden sound. “Undercoating” includes, but is not limited to, rubberized, mastic, or asphaltic products.
- (~~125~~+23) “Usage Directions” means the text or graphics on the product's principal display panel, label, or accompanying literature which describes to the end user how and in what quantity the product is to be used.
- (~~126~~+24) “Volatile Organic Compound (VOC)” means any compound containing at least one atom of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, and excluding the following:
- (A) methane,
 methylene chloride (dichloromethane),
 1,1,1-trichloroethane (methyl chloroform),
 trichlorofluoromethane (CFC-11),
 dichlorodifluoromethane (CFC-12),
 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113),
 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114),
 chloropentafluoroethane (CFC-115),
 chlorodifluoromethane (HCFC-22),
 1,1,1-trifluoro-2,2-dichloroethane (HCFC-123),
 1,1-dichloro-1-fluoroethane (HCFC-141b),
 1-chloro-1,1-difluoroethane (HCFC-142b),
 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124),
 trifluoromethane (HFC-23),
 1,1,2,2-tetrafluoroethane (HFC-134),
 1,1,1,2-tetrafluoroethane (HFC-134a),
 pentafluoroethane (HFC-125),
 1,1,1-trifluoroethane (HFC-143a),
 1,1-difluoroethane (HFC-152a),
 cyclic, branched, or linear completely methylated siloxanes,
 the following classes of perfluorocarbons:
1. cyclic, branched, or linear, completely fluorinated alkanes;
 2. cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
 3. cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
 4. sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds to carbon and fluorine, and
- (B) the following low-reactive organic compounds which have been exempted by the

U.S. EPA:

acetone,
ethane,
methyl acetate,
parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene),
perchloroethylene (tetrachloroethylene).

- (~~127~~+25) “VOC Content” means the total weight of VOC in a product expressed as a percentage of the product weight (exclusive of the container or packaging), as determined pursuant to sections 94515(a) and (b).
- (~~128~~+26) “Wasp and Hornet Insecticide” means any insecticide product that is designed for use against wasps, hornets, yellow jackets or bees by allowing the user to spray from a distance a directed stream or burst at the intended insects, or their hiding place.
- (129) “Waterproofer” means a product designed and labeled exclusively to repel water from fabric or leather substrates. “Waterproofer” does not include “Fabric Protectants”.
- (~~130~~+27) “Wax” means a material or synthetic thermoplastic substance generally of high molecular weight hydrocarbons or high molecular weight esters of fatty acids or alcohols, except glycerol and high polymers (plastics). “Wax” includes, but is not limited to, substances derived from the secretions of plants and animals such as carnuba wax and beeswax, substances of a mineral origin such as ozocerite and paraffin, and synthetic polymers such as polyethylene.
- ~~131~~+28) “Wood Floor Wax” means wax-based products for use solely on wood floors.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94509. Standards for Consumer Products

- (a) Except as provided in Sections 94510 (Exemptions), 94511 (Innovative Products), 94514 (Variances), 94540 through 94555 (Alternative Control Plan), and 94567(a)(1) (Hairspray Credit Program), Title 17, California Code of Regulations, no person shall sell, supply, offer for sale, or manufacture for sale in California any consumer product which, at the time of sale or manufacture, contains volatile organic compounds in excess of the limits specified in the following Table of Standards after the specified effective dates.

[NOTE: In the interest of clarity we have redesigned the Table of Standards. Previously, the product categories subject to regulation were separated into three groups (Phase I, Phase II, and Phase III) based on the rulemaking actions in which standards were first adopted for each category. In the redesigned Table of Standards shown below, the product categories subject to regulation are presented in alphabetical order. All text shown in underline and ~~strikeout~~ are new amendments that are being made to the Table of Standards for the first time in the current, Mid-term Measures II rulemaking action.]

**Table of Standards
Percent Volatile Organic Compound by Weight**

Product Category	Effective Date ¹	VOC Standard ²
Adhesives *: aerosol [See 94509(i) for additional requirements that apply to aerosol adhesives.] **	1/1/95 1/1/2002	75 25
----- -- construction, and panel, and floor covering***	1/1/95 <u>12/31/2002</u>	40 <u>15</u>
----- -- contact	1/1/95 1/1/95	80 10
----- -- general purpose	=====	=====
* See section 94510(i) for an exemption that applies to adhesives sold in containers of one fluid ounce or less.		
** The Board will hold a public hearing by June 1, 2000, to review and consider any appropriate modifications to the 25 percent VOC limit for aerosol adhesives.		
*** See section 94509(k) for the effective date of the VOC limit for certain types of “construction, panel, and floor covering adhesives.”		
Aerosol Cooking Sprays	1/1/95	18

Product Category	Effective Date¹	VOC Standard²
Air Fresheners*: double phase aerosols ----- -- single phase aerosols ----- -- dual purpose air fresheners/disinfectant aerosols ----- -- liquid/pump sprays ----- -- solids/gels ===== <u>* See sections 94510(f) and 94510(g) for exemptions that apply to certain air fresheners.</u>	1/1/93 <u>12/31/2004</u> ----- 1/1/93 1/1/96 ----- 1/1/94 ----- 1/1/93 ----- 1/1/93 ===== =====	30 <u>20</u> ----- 70 30 ----- 60 ----- 18 ----- 3 ===== =====
Automotive Brake Cleaners	1/1/97 <u>12/31/2002</u>	50 <u>45</u>
Automotive Rubbing or Polishing Compounds	1/1/2005	17
Automotive Wax/Polish/Sealant/Glaze: all other forms ----- -- hard paste waxes ----- -- instant detailers	1/1/2005 ----- 1/1/2005 ----- 1/1/2001	15 ----- 45 ----- 3

Product Category	Effective Date ¹	VOC Standard ²
Automotive Windshield Washer Fluids: Type "A" areas* ----- -- All other areas (all forms) <u>Dilutable</u> ----- -- <u>Pre-Mixed</u> ===== * Type "A" areas include only the following: Del Norte, Shasta and Trinity Counties; the Great Basin Valley, Lake Tahoe, Mountain Counties, and Northeast Plateau Air Basins, as defined in Title 17, California Code of Regulations, Sections 60105, 60108, 60111, and 60113.	1/1/93 ----- - 1/1/93 <u>12/31/2002</u> ----- <u>12/31/2002</u> =====	35 ----- 10 <u>1</u> [after dilution <u>as specified in</u> <u>section</u> <u>94509(b)(1)</u> ----- <u>1</u> (as packaged in <u>container)</u> =====
Bathroom and Tile Cleaners: aerosols ----- -- all other forms	1/1/94 ----- 1/1/94	7 ----- 5
Bug and Tar Remover	1/1/2002	40
Carburetor Choke Cleaners or Fuel-injection Air Intake Cleaners ** ===== ** See section 94509(k) for the effective date of the VOC limit for fuel-injection air intake cleaners.	1/1/95 <u>12/31/2002</u>	75 <u>45</u>
Carpet and Upholstery Cleaner: aerosols ----- -- non-aerosols (dilutables) ----- -- non-aerosols (ready-to-use)	1/1/2001 ----- 1/1/2001 ----- 1/1/2001	7 ----- .1 ----- 3

Charcoal Lighter Material	See 94509(h)	
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Product Category	Effective Date ¹	VOC Standard ²
Dusting Aids: aerosol ----- -- all other forms	1/1/95 1/1/97 ----- 1/1/95	35 25 ----- 7
Engine Degreasers (<u>all forms</u>): ----- -- <u>aerosols</u> ----- -- <u>non-aerosols</u>	1/1/93 1/1/96 ----- <u>12/31/2004</u> ----- <u>12/31/2004</u>	75 50 ----- <u>35</u> ----- <u>5</u>
Fabric Protectants	1/1/95 1/1/97	75 60
Floor Polishes/Waxes: products for flexible flooring <u>materials</u> ----- -- products for nonresilient flooring ----- -- wood floor wax	1/1/94 ----- 1/1/94 ----- 1/1/94	7 ----- 10 ----- 90
Floor Wax Stripper: non-aerosols	See Section 94509(j)	
Furniture Maintenance Products: aerosols ----- -- all other forms (except solid/paste forms)	1/1/94 <u>12/31/2004</u> ----- 1/1/94	25 <u>17</u> ----- 7

General Purpose Cleaners (<u>all forms</u>):	1/1/94	10
-----	-----	-----
--	-	<u>1</u>
<u>non-aerosols (dilutables)</u>	<u>12/31/2004</u>	-----
-----	-----	<u>3</u>
--	-	
<u>non-aerosols (ready-to-use)</u>	<u>12/31/2004</u>	

Product Category	Effective Date ¹	VOC Standard ²
General Purpose Degreasers: aerosols ----- -- <u>non-aerosols (dilutables)</u> ----- -- <u>non-aerosols (ready-to-use)</u>	1/1/2002 ----- 1/1/2001 <u>12/31/2004</u> ----- - 1/1/2001 <u>12/31/2004</u>	50 ----- 10 <u>1</u> ----- 10 <u>3</u>
Glass Cleaners: aerosols ----- -- all other forms ----- -- <u>non-aerosols (dilutables)</u> ----- -- <u>non-aerosols (ready-to-use)</u>	1/1/93 ----- 1/1/93 1/1/96 ----- - <u>12/31/2004</u> ----- - <u>12/31/2004</u>	12 ----- 8 6 ----- <u>1</u> ----- <u>4</u>
Hair Mousses	1/1/94 <u>12/31/2002</u>	16 <u>6</u>
Hair Shine	1/1/2005	55
Hair Styling Gels	1/1/94	6
Hairsprays	1/1/93 6/1/99	80 55
Heavy-duty Hand Cleaners or Soap	1/1/2005	8
Insect Repellents: aerosols	1/1/94	65

Product Category	Effective Date ¹	VOC Standard ²
Insecticides*: crawling bug (all forms): aerosol crawling bug insecticides ----- -- flea and tick ----- -- flying bug (all forms): aerosols ----- -- foggers ----- -- lawn and garden (all forms) non-aerosol lawn and garden insecticides ===== * See sections 94510(g) and 94510(k) for exemptions that apply to certain insecticides.	1/1/95 1/1/98 12/31/2004 ----- 1/1/95 ----- 1/1/95 12/31/2003 ----- 1/1/95 ----- 1/1/95 12/31/2003 ===== =====	40 20 15 ----- 25 ----- 35 25 ----- 45 ----- 20 3 ----- ----- -----
Laundry Prewash: aerosols/solids ----- -- all other forms	1/1/94 ----- 1/1/94	22 ----- 5
Laundry Starch Products	1/1/95	5
Metal Polish/Cleanser	1/1/2005	30
Multi-purpose Lubricant: (excluding solid or semisolid products)	1/1/2003	50
Nail Polish Removers	1/1/94 1/1/96 12/31/2004	85 75 0
Non-selective Terrestrial Herbicide: non-aerosols	1/1/2002	3

Product Category	Effective Date ¹	VOC Standard ²
Oven Cleaners: aerosols/pump sprays ----- -- liquids	1/1/93 ----- - 1/1/93	8 ----- 5
Paint Remover or Stripper	1/1/2005	50
Penetrant	1/1/2003	50
Personal Fragrance Products*: products with 20% or less fragrance ----- -- products with more than 20% fragrance ===== *See sections 94510(h), 94510(j), and 94510(l) for exemptions that apply to personal fragrance products.	1/1/95 1/1/99 ----- 1/1/95 1/1/99 =====	80 75 ----- 70 65 =====
Rubber and Vinyl Protectant: aerosols ----- -- non-aerosols	1/1/2005 ----- 1/1/2003	10 ----- 3
<u>Sealants and Caulking Compounds</u>	<u>12/31/2002</u>	<u>4</u>
Shaving Creams	1/1/94	5
Silicone-based Multi-purpose Lubricant: (excluding solid or semisolid products)	1/1/2005	60
Spot Remover: aerosols ----- -- non-aerosols	1/1/2001 ----- 1/1/2001	25 ----- 8

Product Category	Effective Date ¹	VOC Standard ²
Tire Sealants and Inflators	12/31/2002	20
Undercoating: aerosols	1/1/2002	40
Wasp and Hornet Insecticide	1/1/2005	40

¹ See section 94509(d) for the effective date of the VOC standards for products registered under FIFRA, and section 94509(c) for the “Sell-through” allowed for products manufactured prior to the effective date of standards.

² See section 94510(c) for an exemption that applies to fragrances in consumer products, and section 94510(d) for an exemption that applies to LVP-VOCs.

**Table of Standards
(Phase I)
Percent Volatile Organic Compounds by Weight**

Product Category	1/1/93	1/1/94	Future Effective (Date)
Air Fresheners			
Single Phase Aerosols	70		30 (1/1/96)
Double Phase Aerosols	30		
Liquids/Pump Sprays	18		
Solids/Gels	3		
Dual Purpose Air Freshener/ Disinfectant Aerosols		60	
Automotive Windshield Washer Fluids:			
Type A Areas*	35		
All Other Areas	10		
Bathroom and Tile Cleaners			
Aerosols		7	
All Other Forms		5	
Engine Degreasers	75		50 (1/1/96)
Floor Polishes/Waxes			
Products for Flexible Flooring Materials		7	
Products for Nonresilient Flooring		10	
Wood Floor Wax		90	
Furniture Maintenance Products			
Aerosols		25	
All Other Forms Except Solid or Paste Forms		7	
General Purpose Cleaners		10	

Glass Cleaners		
Aerosols	12	
All Other Forms	8	6
		(1/1/96)
Hairsprays	80	55
		(6/1/99)
Hair Mousses		16
Hair Styling Gels		6
Insect Repellents		
Aerosols		65
Laundry Prewash		
Aerosols/Solids		22
All Other Forms		5

* Type A Areas include only the following: Del Norte, Shasta and Trinity Counties; the Great Basin Valley, Lake Tahoe, Mountain Counties, and Northeast Plateau Air Basins, as defined in Title 17, California Code of Regulations, Sections 60105, 60108, 60111, and 60113.

Table of Standards (Phase I)			
(continued)			
Percent Volatile Organic Compounds by Weight			
Product Category	1/1/93	1/1/94	Future Effective (Date)
Nail Polish Removers	85	75	(1/1/96)
Oven Cleaners			
Aerosols/Pump Sprays	8		
Liquids	5		
Shaving Creams		5	

Table of Standards (Phase II)			
(continued)			
Percent Volatile Organic Compounds by Weight			
Product Category	1/1/95		Future Effective (Date)
Adhesives			
Aerosol [See 94509(i)]	75		25 (1/1/2002)*
Contact	80		
Construction and Panel	40		
General Purpose	10		
Aerosol Cooking Sprays	18		
Automotive Brake Cleaners			50 (1/1/97)
Charcoal Lighter Material	See 94509(h)		
Carburetor-Choke Cleaners	75		
Dusting Aids			

Aerosol	35	25	(1/1/97)
All Other Forms	7		
Fabric Protectants	75	60	(1/1/97)
Insecticides			
Crawling Bug	40	20	(1/1/98)
Flea and Tick	25		
Flying Bug	35		
Foggers	45		
Lawn and Garden	20		
Laundry Starch Products	5		
Personal Fragrance Products			
Products with 20% or less fragrance	80	75	(1/1/99)
Products with more than 20% fragrance	70	65	(1/1/99)

* The Board will hold a public hearing by June 1, 2000, to review and consider any appropriate modifications to the 25 percent VOC standard for aerosol adhesives.

**Table of Standards
(Phase III)**

Percent Volatile Organic Compounds by Weight

Product Category	1/1/2001	1/1/2002	1/1/2003	1/1/2005
Automotive Rubbing or Polishing Compound				17
Automotive Wax, Polish, Sealant or Glaze				
Hard Paste Waxes				45
Instant Detailers	3			
All Other Forms				15
Bug and Tar Remover		40		
Carpet and Upholstery Cleaner				
Aerosols	7			
Non-aerosols (dilutables)	.1			
Non-aerosols (ready-to-use)	3			
Floor Wax Stripper (non-aerosols)			(See 94509(j))	
General Purpose Degreaser				
Aerosols			50	
Non-aerosols	10			
Hair Shine				55
Heavy-duty Hand Cleaner or Soap				8
Metal Polish/Cleanser				30

Multi-purpose Lubricant (excluding solid or semisolid products)	50
Non-selective Terrestrial Herbicide, Non-aerosols	3
Paint Remover or Stripper	50
Penetrant	50
Rubber and Vinyl Protectant Non-aerosols	3
Aerosols	10
Silicone-based Multi-purpose Lubricant (excluding solid or semisolid products)	60
Spot Remover Aerosols	25
Non-aerosols	8
Undercoating Aerosols	40
Wasp and Hornet Insecticide	40

(b) *Products that are diluted prior to use*

- (1) For consumer products for which the label, packaging, or accompanying literature specifically states that the product should be diluted with water or non-VOC solvent prior to use, the limits specified in subsection (a) shall apply to the product only after the minimum recommended dilution has taken place. For purposes of this subsection (b), “minimum recommended dilution” shall not include recommendations for incidental use of a concentrated product to deal with limited special applications such as hard-to-remove soils or stains. The provisions of this subsection (b)(1) shall not apply to automotive windshield washer fluid products sold in containers with a capacity greater than one quart.
- (2) For consumer products for which the label, packaging, or accompanying literature states that the product should be diluted with any VOC solvent prior to use, the limits specified in subsection (a) shall apply to the product only after the maximum recommended dilution has taken place.
- (c) *Sell-through of products.* Notwithstanding the provisions of Section 94509(a) or 94509(j), a consumer product manufactured prior to each of the effective dates specified for that product in the Table of Standards may be sold, supplied, or offered for sale for up to three years after each of the specified effective dates. This subsection (c) does not apply to any consumer product which does not display on the product container or package the date on which the product was manufactured, or a code indicating such date.
- (d) *Products registered under FIFRA.* For those consumer products that are registered under

the Federal Insecticide, Fungicide, and Rodenticide Act, (FIFRA; 7 U.S.C. Section 136-136y), the effective date of the VOC standards specified in subsection (a) is one year after the date specified in the Table of Standards. For those consumer products that are registered under FIFRA, the three year period provided in subsection (c) shall also begin one year after the date specified in the Table of Standards.

- (e) *Products containing ozone-depleting compounds.* For any consumer product for which standards are specified under subsection (a), no person shall sell, supply, offer for sale, or manufacture for sale in California any consumer product which contains any of the following ozone-depleting compounds:
CFC-11 (trichlorofluoromethane), CFC-12 (dichlorodifluoromethane),
CFC-113 (1,1,1-trichloro-2,2,2-trifluoroethane),
CFC-114 (1-chloro-1,1-difluoro-2-chloro-2,2-difluoroethane),
CFC-115 (chloropentafluoroethane), halon 1211 (bromochlorodifluoromethane),
halon 1301 (bromotrifluoromethane), halon 2402 (dibromotetrafluoroethane),
HCFC-22 (chlorodifluoromethane), HCFC-123 (2,2-dichloro-1,1,1-trifluoroethane),
HCFC-124 (2-chloro-1,1,1,2-tetrafluoroethane),
HCFC-141b (1,1-dichloro-1-fluoroethane), HCFC-142b (1-chloro-1,1-difluoroethane),
1,1,1-trichloroethane, and carbon tetrachloride.
- (f) The requirements of section 94509(e) shall not apply to any existing product formulation that complies with the Table of Standards or any existing product formulation that is reformulated to meet the Table of Standards, provided the ozone depleting compound content of the reformulated product does not increase.
- (g) The requirements of section 94509(e) shall not apply to any ozone depleting compounds that may be present as impurities in a consumer product in an amount equal to or less than 0.01% by weight of the product.
- (h) *Requirements for charcoal lighter materials.* The following requirements shall apply to all charcoal lighter material products as defined in section 94508(a)(24):
 - (1) *Regulatory Standards*
 - (A) In all areas of California except the South Coast Air Quality Management District, no person shall sell, supply, or offer for sale after January 1, 1993 any charcoal lighter material product unless at the time of the transaction:
 1. the manufacturer or distributor of the charcoal lighter material has been issued a currently effective certification pursuant to subsection (h)(2).
 2. the charcoal lighter material meets the formulation criteria and other conditions specified in the applicable Executive Order issued pursuant to subsection (h)(2).
 3. the product usage directions for the charcoal lighter material are the same as

those provided to the Executive Officer pursuant to subsection (h)(2)(C).

- (B) In the South Coast Air Quality Management District, the regulatory standards specified in subsection (h)(1)(A) shall be applicable upon the effective date of this subsection.

(2) *Certification Requirements*

- (A) No charcoal lighter material formulation shall be certified under this subsection unless the applicant for certification demonstrates to the Executive Officer's satisfaction that the VOC emissions from the ignition of charcoal with the charcoal lighter material are less than or equal to 0.020 pound of VOC per start, using the procedures specified in the South Coast Air Quality Management District Rule 1174 Ignition Method Compliance Certification Protocol, dated February 27, 1991 (the "SCAQMD Rule 1174 Testing Protocol"). The provisions relating to LVP-VOC in sections 94508(a)(78) and 94510(d) shall not apply to any charcoal lighter material subject to the requirements of sections 94509(a) and (h).
- (B) The Executive Officer may approve alternative test procedures which are shown to provide equivalent results to those obtained using the SCAQMD Rule 1174 Testing Protocol.

The application shall be in writing and shall include, at a minimum, the following:

1. the results of testing conducted pursuant to the procedures specified in SCAQMD Rule 1174 Testing Protocol.
2. the exact text and/or graphics that will appear on the charcoal lighter material's principal display panel, label, and any accompanying literature. The provided material shall clearly show the usage directions for the product. These directions shall accurately reflect the quantity of charcoal lighter material per pound of charcoal that was used in the SCAQMD Rule 1174 Testing Protocol for that product, unless:
 - i) the charcoal lighter material is intended to be used in fixed amounts independent of the amount of charcoal used, such as certain paraffin cubes, or
 - ii) the charcoal lighter material is already incorporated into the charcoal, such as certain "bag light," "instant light" or "match light" products.
3. For a charcoal lighter material which meets the criteria specified in subsection (h)(2)(C)2.i, the usage instructions provided to the Executive Officer shall accurately reflect the quantity of charcoal lighter material used in the SCAQMD Rule 1174 Testing Protocol for that product.
4. Any physical property data, formulation data, or other information required by

the Executive Officer for use in determining when a product modification has occurred and for use in determining compliance with the conditions specified on the Executive Order issued pursuant to section (h)(2).

- (D) Within 30 days of receipt of an application, the Executive Officer shall advise the applicant in writing either that it is complete or that specified additional information is required to make it complete. Within 30 days of receipt of additional information, the Executive Officer shall advise the applicant in writing either that the application is complete, or that specified additional information or testing is still required before it can be deemed complete.
- (E) If the Executive Officer finds that an application meets the requirements of this subsection (h)(2), then he or she shall issue an Executive Order certifying the charcoal lighter material formulation and specifying such conditions as are necessary to insure that the requirements of this subsection (h) are met. The Executive Officer shall act on a complete application within 90 days after the application is deemed complete.

(3) *Notice of Modifications*

For any charcoal lighter material for which certification has been granted pursuant to subsection (h)(2), the applicant for certification shall notify the Executive Officer in writing within 30 days of: (i) any change in the usage directions, or (ii) any change in product formulation, test results, or any other information submitted pursuant to subsection (h)(2) which may result in VOC emissions greater than 0.020 pound of VOC per start.

(4) *Revocation of Certification*

If the Executive Officer determines that any certified charcoal lighter material formulation results in VOC emissions from the ignition of charcoal which are greater than 0.020 pound of VOC per start, as determined by the SCAQMD Rule 1174 Testing Protocol and the statistical analysis procedures contained therein, the Executive Officer shall revoke or modify the certification as is necessary to assure that the charcoal lighter material will result in VOC emissions of less than or equal to 0.020 pound of VOC per start. The Executive Officer shall not revoke or modify the prior certification without first affording the applicant for the certification an opportunity for a hearing in accordance with the procedures specified in Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 1, Article 4 (commencing with section 60040), to determine if the certification should be modified or revoked.

- (5) Notwithstanding any other provision of this subsection 94509(h), charcoal lighter material products manufactured prior to January 1, 1993, may be sold, supplied, or offered for sale until July 1, 1994, in all areas of California except the South Coast Air Quality Management District. Charcoal lighter material products subject to SCAQMD Rule 1174 and sold, supplied, or offered for sale in the South Coast Air Quality Management District

shall meet the requirements of section 94509(h) upon the effective date of this subsection, regardless of the date on which the products were manufactured.

(i) *Requirements for aerosol adhesives.* As specified in Health and Safety Code section 41712(h)(2), the 75 percent VOC standard for aerosol adhesives applies to all uses of aerosol adhesives, including consumer, industrial, and commercial uses. Except as otherwise provided in sections 94510, 94511, and 94514, no person shall sell, supply, offer for sale, use or manufacture for sale in California any aerosol adhesive which, at the time of sale, use, or manufacture, contains VOCs in excess of 75 percent by weight.

(j) *Requirements for Floor Wax Strippers.* After an effective date of January 1, 2002, no person shall sell, supply, offer for sale, or manufacture for use in California any floor wax stripper unless the following requirements are met:

(1) The label of each non-aerosol floor wax stripper must specify a dilution ratio for light or medium build-up of polish that results in an as-used VOC concentration of 3 percent by weight or less.

(2) If a non-aerosol floor wax stripper is also intended to be used for removal of heavy build-up of polish, the label of that floor wax stripper must specify a dilution ratio for heavy build-up of polish that results in an as-used VOC concentration of 12 percent by weight or less.

(3) The terms “light build-up”, “medium build-up” or “heavy build-up” are not specifically required, as long as comparable terminology is used.

(k) *Effective dates of the VOC limits for “Carburetor or Fuel-injection Air Intake Cleaners” and “Construction, Panel, and Floor Covering Adhesives.”* The definitions for the product categories of “Carburetor or Fuel-injection Air Intake Cleaners” and “Construction, Panel, and Floor Covering Adhesives” were modified as part of the “Mid-term Measures II” rulemaking action that was considered by the Board in October 1999. As a result of these modifications, certain types of consumer products were included in these definitions that had not previously been included. For those consumer products that were included in these definitions for the first time as a result of the “Mid-term Measures II” rulemaking action, the VOC limits (in section 94509(a)) applicable to these newly included products shall not become legally effective until December 31, 2002.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.

Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94510. Exemptions

- (a) This article shall not apply to any consumer product manufactured in California for shipment and use outside of California.
- (b) The provisions of this article shall not apply to a manufacturer or distributor who sells, supplies, or offers for sale in California a consumer product that does not comply with the VOC standards specified in Section 94509, as long as the manufacturer or distributor can demonstrate both that the consumer product is intended for shipment and use outside of California, and that the manufacturer or distributor has taken reasonable prudent precautions to assure that the consumer product is not distributed to California. This subsection (b) does not apply to consumer products that are sold, supplied, or offered for sale by any person to retail outlets in California.
- (c) The VOC limits specified in Section 94509(a) shall not apply to fragrances up to a combined level of 2 percent by weight contained in any consumer product.
- (d) The VOC limits specified in Section 94509(a) shall not apply to any LVP-VOC.
- (e) The requirements of Section 94512(b) shall not apply to consumer products registered under the Federal Insecticide, Fungicide, and Rodenticide Act, (FIFRA; 7 U.S.C. Section 136/136y).
- (f) The VOC limits specified in Section 94509(a) shall not apply to air fresheners that are comprised entirely of fragrance, less compounds not defined as VOCs under Section 94508 or exempted under Section 94510(d).
- (g) The VOC limits specified in Section 94509(a) shall not apply to air fresheners and insecticides containing at least 98% paradichlorobenzene.
- (h) The VOC limits specified in Section 94509(a) shall not apply to:
 - (1) existing personal fragrance products or personal fragrance products in development on or before April 1, 1992, provided that both (i) the registration data specified in section 94513 is submitted for every such product by the date specified in section 94513(a), or prior to July 1, 1993, whichever date occurs later, and (ii) such product is sold in California prior to January 1, 1994. For the purposes of this subsection, a product “in development” means:
 - (A) a product which a fragrance materials manufacturer is designing at the request of a personal fragrance product manufacturer, or
 - (B) a product which is the subject of a written marketing profile or other documentation authorizing the creation and marketing of the product.

(2) Personal fragrance products in development may be registered to qualify for this exemption under hypothetical trade names or pseudonyms, provided that the actual trade name is supplied to the Executive Officer within 30 days of marketing such products, or January 1, 1994, whichever occurs first.

- (i) The VOC limits specified in Section 94509(a) shall not apply to adhesives sold in containers of 1 fluid ounce or less.
- (j) The VOC limits specified in Section 94509(a) shall not apply to any VOC which is a fragrance in a personal fragrance product.
- (k) The VOC limits specified in Section 94509(a) shall not apply to bait station insecticides. For the purpose of this section, bait station insecticides are containers enclosing an insecticidal bait that is not more than 0.5 ounce by weight, where the bait is designed to be ingested by insects and is composed of solid material feeding stimulants with less than 5 percent (%) active ingredients.
- (l) The 1/1/99 VOC limits specified in Section 94509(a) for personal fragrance products shall not apply to such products which have been sold in California prior to 1/1/99.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.

Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94511. Innovative Products

- (a) The Executive Officer shall exempt a consumer product from the VOC limits specified in Section 94509(a) if a manufacturer demonstrates by clear and convincing evidence that, due to some characteristic of the product formulation, design, delivery systems or other factors, the use of the product will result in less VOC emissions as compared to:
 - (1) the VOC emissions from a representative consumer product which complies with the VOC limits specified in Section 94509(a), or
 - (2) the calculated VOC emissions from a noncomplying representative product, if the product had been reformulated to comply with the VOC limits specified in section 94509(a). VOC emissions shall be calculated using the following equation:

$$E_R = E_{NC} \times \text{VOC}_{STD} \div \text{VOC}_{NC}$$

where:

E_R = The VOC emissions from the noncomplying representative product, had it been reformulated.

E_{NC} = The VOC emissions from the noncomplying representative product in its current formulation.

VOC_{STD} = the VOC limit specified in 94509(a).

VOC_{NC} = the VOC content of the noncomplying product in its current formulation.

If a manufacturer demonstrates that this equation yields inaccurate results due to some characteristic of the product formulation or other factors, an alternative method which accurately calculates emissions may be used upon approval of the Executive Officer.

- (b) For the purposes of this section, “representative consumer product” means a consumer product which meets all of the following criteria:
- (1) the representative product shall be subject to the same VOC limit in Section 94509(a) as the innovative product.
 - (2) the representative product shall be of the same product form as the innovative product, unless the innovative product uses a new form which does not exist in the product category at the time the application is made.
 - (3) the representative product shall have at least similar efficacy as other consumer products in the same product category based on tests generally accepted for that product category by the consumer products industry.
- (c) A manufacturer shall apply in writing to the Executive Officer for any exemption claimed under subsection (a). The application shall include the supporting documentation that demonstrates the emissions from the innovative product, including the actual physical test methods used to generate the data and, if necessary, the consumer testing undertaken to document product usage. In addition, the applicant must provide any information necessary to enable the Executive Officer to establish enforceable conditions for granting the exemption including the VOC content for the innovative product and test methods for determining the VOC content. All information submitted by a manufacturer pursuant to this section shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022.
- (d) Within 30 days of receipt of the exemption application the Executive Officer shall determine whether an application is complete as provided in section 60030(a), Title 17, California Code of Regulations.

- (e) Within 90 days after an application has been deemed complete, the Executive Officer shall determine whether, under what conditions, and to what extent, an exemption from the requirements of Section 94509(a) will be permitted. The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision, and additional supporting documentation may be submitted by the applicant before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and specify such terms and conditions that are necessary to insure that emissions from the product will meet the emissions reductions specified in subsection (a), and that such emissions reductions can be enforced.
- (f) In granting an exemption for a product the Executive Officer shall establish conditions that are enforceable. These conditions shall include the VOC content of the innovative product, dispensing rates, application rates and any other parameters determined by the Executive Officer to be necessary. The Executive Officer shall also specify the test methods for determining conformance to the conditions established. The test methods shall include criteria for reproducibility, accuracy, sampling and laboratory procedures.
- (g) For any product for which an exemption has been granted pursuant to this section, the manufacturer shall notify the Executive Officer in writing within 30 days of any change in the product formulation or recommended product usage directions, and shall also notify the Executive Officer within 30 days if the manufacturer learns of any information which would alter the emissions estimates submitted to the Executive Officer in support of the exemption application.
- (h) If the VOC limits specified in Section 94509(a) are lowered for a product category through any subsequent rulemaking, all innovative product exemptions granted for products in the product category, except as provided in this subsection (h), shall have no force and effect as of the effective date of the modified VOC standard. This subsection (h) shall not apply to those innovative products which have VOC emissions less than the applicable lowered VOC limit and for which a written notification of the product's emissions status versus the lowered VOC limit has been submitted to and approved by the Executive Officer at least 60 days before the effective date of such limits.
- (i) If the Executive Officer believes that a consumer product for which an exemption has been granted no longer meets the criteria for an innovative product specified in subsection (a), the Executive Officer may modify or revoke the exemption as necessary to assure that the product will meet these criteria. The Executive Officer shall not modify or revoke an exemption without first affording the applicant an opportunity for a public hearing held in accordance with the procedures specified in Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 1, Article 4 (commencing with Section 60040), to determine if the exemption should be modified or revoked.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.

Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94512. Administrative Requirements

- (a) **Most Restrictive Limit.** Notwithstanding the definition of “product category” in Section 94508, if anywhere on the principal display panel of any consumer product, any representation is made that the product may be used as, or is suitable for use as a consumer product for which a lower VOC limit is specified in Section 94509(a), then the lowest VOC limit shall apply. This requirement does not apply to general purpose cleaners.
- (b) **Code-Dating.** Each manufacturer of a consumer product subject to Section 94509 shall clearly display on each consumer product container or package, the day, month, and year on which the product was manufactured, or a code indicating such date. This date or code shall be displayed on each consumer product container or package no later than twelve months prior to the effective date of the applicable standard specified in Section 94509. No person shall erase, alter, deface or otherwise remove or make illegible any date or code-date from any regulated product container without the express authorization of the manufacturer.

The requirements of this provision shall not apply to:

- (1) personal fragrance products of 2 milliliters or less, which are offered to consumers free of charge for the purpose of sampling the product; or
 - (2) products containing no VOCs (as defined in section 94508), or containing VOCs at 0.10% by weight or less.
- (c) If a manufacturer uses a code indicating the date of manufacture, for any consumer product subject to section 94509 an explanation of the code must be filed with the Executive Officer of the ARB no later than twelve months prior to the effective date of the applicable standard specified in section 94509.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code.

Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94513. Reporting Requirements

- (a) Upon 90 days written notice, the Executive Officer may require any responsible party to report information for any consumer product or products the Executive Officer may specify including, but not limited to, all or part of the following information:
 - (1) the name of the responsible party and the party's address, telephone number, and

designated contact person;

- (2) any claim of confidentiality made pursuant to Title 17, California Code of Regulations, Section 91011;
- (3) the product brand name for each consumer product subject to registration and upon request by the Executive Officer, the product label;
- (4) the product category to which the consumer product belongs;
- (5) the applicable product form(s) listed separately;
- (6) an identification of each product brand name and form as a “Household Product”, “I&I Product”, or both;
- (7) separate California sales in pounds per year, to the nearest pound, and the method used to calculate California sales for each product form;
- (8) for registrations submitted by two companies, an identification of the company which is submitting relevant data separate from that submitted by the responsible party. All registration information from both companies shall be submitted by the date specified in Section 94513(a);
- (9) for each product brand name and form, the net percent by weight of the total product, less container and packaging, comprised of the following, rounded to the nearest one-tenth of a percent (0.1%):
 - (A) Total Table B Compounds
 - (B) Total LVP-VOCs that are not fragrances
 - (C) Total All Other Carbon-Containing Compounds that are not fragrances
 - (D) Total All Non-Carbon-Containing Compounds
 - (E) Total Fragrance
 - (F) For products containing greater than two percent by weight fragrance, but excluding “personal fragrance products”:
 - (i) the percent of fragrance that are LVP-VOCs, and
 - (ii) the percent of fragrance that are all other carbon-containing compounds
 - (G) For “personal fragrance products”, the density of the fragrance
 - (H) Total Paradichlorobenzene
- (10) for each product brand name and form, the identity, including the specific chemical name and associated Chemical Abstract Services (CAS) number, of the following:
 - (A) Each Table B Compound
 - (B) Each LVP-VOC that is not a fragrance

- (11) if applicable, the weight percent comprised of propellant for each product;
 - (12) if applicable, an identification of the type of propellant (Type A, Type B, Type C, or a blend of the different types);
- (b) In addition to the requirements of section 94513(a)(10), the responsible party shall report or shall arrange to have reported to the Executive Officer the net percent by weight of each ozone-depleting compound which is (1) listed in section 94509(e) and (2) contained in a product subject to registration under section 94513(a) in any amount greater than 0.1 percent by weight.
- (c) All information submitted by responsible parties pursuant to Section 94513 shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022.
- (d) *Special Reporting Requirements for Aerosol Adhesives*

On or before March 31, 1999, all responsible parties for aerosol adhesives shall report to the Executive Officer the following information for products sold or offered for sale in California:

- (1) data regarding product sales and composition for the year 1998, including the information listed in Section 94513(a), and any other information that the Executive Officer may specify; and
 - (2) a written update of the research and development efforts undertaken to achieve the January 1, 2002, VOC limit. The written update must include detailed information about the raw materials (solvents, propellants, resins, and polymers) and hardware (valves, actuators, cans) used in product reformulation, the testing protocols used, the results of the testing, and the cost of reformulation efforts.
- ~~(e) Special Reporting Requirements for Perchloroethylene-Containing Consumer Products that are subject to the Phase I or Phase II VOC Standards~~
- ~~—(1) The requirements of this subsection shall apply to all responsible parties for perchloroethylene-containing consumer products that are subject to the Phase I or Phase II VOC Standards Specified in Section 94509(a), and are sold or offered for sale in California on or after January 1, 1996.~~
- (e) *Special Reporting Requirements for Consumer Products that Contain Perchloroethylene or Methylene Chloride Perchloroethylene-Containing Consumer Products that are subject to the Phase I or Phase II VOC Standards*

(1) The requirements of this subsection shall apply to all responsible parties for consumer products that are subject to section 94509(a) and contain perchloroethylene or methylene chloride. For the purposes of this subsection, a product “contains perchloroethylene or methylene chloride” if the product contains 1.0 percent or more by weight (exclusive of the container or packaging) of either perchloroethylene or methylene chloride. ~~perchloroethylene-containing consumer products that are subject to the Phase I or Phase II VOC Standards Specified in Section 94509(a), and are sold or offered for sale in California on or after January 1, 1996. For the purposes of this subsection, “perchloroethylene-containing consumer product” means any consumer product that is required to comply with any Phase I or Phase II VOC standard specified in section 94509(a) and contains 1.0 percent or more by weight (exclusive of the container or packaging) of perchloroethylene (tetrachloroethylene).~~

(2) Reporting Requirements to Establish Baseline For each consumer product that contains perchloroethylene or methylene chloride, the responsible party shall report the following information for products sold in California during each calendar year, beginning with the year 2000, and ending with the year 2010. ~~Within 60 days after the effective date of this subsection (e), all responsible parties for perchloroethylene-containing consumer products shall report to the Executive Officer the following information for each product:~~

- ~~—— (A) the product brand name and a copy of the product label with legible usage instructions;~~
- ~~—— (B) the product category to which the consumer product belongs;~~
- ~~—— (C) the applicable product form(s) (listed separately);~~
- ~~—— (D) for each product form listed in (C), the total amount of the consumer product sold in California between January 1, 1996 and December 31, 1996, to the nearest pound (exclusive of the container or packaging), and the method used for calculating the California sales;~~
- ~~—— (E) the weight percent, to the nearest 0.10 percent, of perchloroethylene in the consumer product;~~

~~—— (3) Reporting Requirements for New Perchloroethylene-Containing Products Sold in California On or After January 1, 1997. Within 60 days after the effective date of this subsection (e), all responsible parties for perchloroethylene-containing consumer products shall report to the Executive Officer the following information for each product:~~

- ~~(A) the product brand name and a copy of the product label with legible usage instructions;~~

- (B) the product category to which the consumer product belongs;
 - (C) the applicable product form(s) (listed separately);
 - (D) for each product form listed in (C), the total sales amount of the consumer product sold in California during the calendar year between January 1, 1996 and December 31, 1996, to the nearest pound (exclusive of the container or packaging), and the method used for calculating the California sales;
 - (E) the weight percent, to the nearest 0.10 percent, of perchloroethylene and methylene chloride in the consumer product;
- (3) The information specified in subsection 94513(e)(2) shall be reported for each calendar year by March 1 of the following year. The first report shall be due on March 1, 2001, for calendar year 2000. A new report is due on March 1 of each year thereafter, until March 1, 2011, when the last report is due. Reporting Requirements for New Perchloroethylene-Containing Products Sold in California On or After January 1, 1997. Responsible parties for new perchloroethylene-containing consumer products sold or offered for sale in California in 1997, 1998, 1999, 2000, or 2001 shall provide the information specified in subsections (e)(2)(A) through (e)(2)(E) by March 1st of the year immediately after the year in which the product is first sold or offered for sale in California. For products introduced after January 1, 2002, responsible parties are not required to submit this information unless specifically requested to do so by the Executive Officer.
- (4) Annual Reporting Requirements. On or before March 1, 1998, March 1, 1999, March 1, 2000, March 1, 2001, and March 1, 2002, all responsible parties subject to the requirements of this subsection shall provide to the Executive Officer an update which reports, for the previous calendar year, any changes in the annual California sales, perchloroethylene content, or any other information provided pursuant to subsections (e)(2)(A) through (e)(2)(E). After March 1, 2005, responsible parties are not required to submit this information unless specifically requested to do so by the Executive Officer.
- (4)(5) Upon request, the Executive Officer shall make the perchloroethylene information submitted pursuant to this subsection available to publicly owned treatment works in California, in accordance with the procedures for handling of confidential information specified in Title 17, California Code of Regulations, sections 91000-91022.
- (A) On or before July 1, 2002, the Executive Officer shall evaluate the information, along with data on influent and effluent levels of perchloroethylene as reported by publicly-owned treatment works personnel and any other relevant information, to determine if it is likely that publicly-owned treatment works are experiencing increased levels of perchloroethylene, relative to 1996 levels, that can be attributed to consumer products which contain perchloroethylene.

- (B) If the Executive Officer determines that it is likely that increased perchloroethylene levels at the publicly-owned treatment works are caused by increased levels of perchloroethylene in consumer products subject to this regulation, then the Executive Officer shall, in conjunction with the publicly-owned treatment works and other appropriate parties, implement measures which are feasible, appropriate, and necessary for reducing perchloroethylene levels at the publicly-owned treatment works.

~~(f) Special Reporting Requirements for Hairsprays~~

~~— This subsection (f) applies to each responsible party for any hairspray product that has greater than a 55 percent VOC content, if the responsible party intends to sell, supply, offer for sale, or manufacture the product for sale in California after January 1, 1998. Each such responsible party shall submit to the Executive Officer the following information:~~

- ~~— (1) On or before January 1, 1998, a compliance plan shall be submitted that details the responsible party's schedule for achieving compliance with the June 1, 1999 55 percent VOC standard for hairsprays.~~
- ~~— (2) Program updates for each compliance plan shall be submitted by the following dates: April 1, 1998, July 1, 1998, October 1, 1998, January 1, 1999, March 1, 1999 and May 1, 1999; except that the obligation to submit updates shall cease when the responsible party achieves compliance with the 55 percent VOC standard.~~
- ~~— (3) Each compliance plan and update shall include the projected sequence and dates of all key events pertaining to the development of 55 percent VOC hairspray formulas including, at a minimum, the following information: information on the types of formulations to be tested; formulation data; prototype testing; toxicity, corrosion, and stability tests; packaging and valve testing; safety and efficacy testing; consumer market testing and consumer acceptance testing; schedule for plant modifications and large scale production; the expected date of production of hairsprays that meet the June 1, 1999 standard; and a back-up plan that describes the manufacturer's intended actions should the chosen compliance method or technology not succeed.~~

~~(g) Special Reporting Requirements for Consumer Products that Contain Methylene Chloride or Perchloroethylene, and are Subject to the Phase III VOC Standards~~

- ~~— (1) The requirements of this subsection apply to all responsible parties for consumer products that: (A) are subject to the Phase III VOC standards specified in section 94509, and~~
- ~~— (B) are sold or offered for sale in California after the effective date of this subsection (g); and (C) contain methylene chloride or perchloroethylene. For the purposes of this subsection, a product "contains methylene chloride or perchloroethylene" if the product contains 1.0 percent or more by weight (exclusive of the container or packaging) of either~~

~~methylene chloride or perchloroethylene.~~

- ~~(2) For each consumer product meeting all of the criteria specified in subsection (g)(1), the responsible party shall report the following information to the Executive Officer:~~
 - ~~(A) the product brand name and a copy of the product label with legible usage instructions;~~
 - ~~(B) the product category to which the consumer product belongs;~~
 - ~~(C) the applicable product form(s) (listed separately);~~
 - ~~(D) for each product form listed in (C), the total amount of the consumer product sold in California in the previous calendar year, to the nearest pound (exclusive of the container or packaging), and the method used for calculating the California sales;~~
 - ~~(E) the weight percent, to the nearest 0.10 percent, of methylene chloride and perchloroethylene in the consumer product;~~
- ~~(3) The information specified in subsection (g)(2) shall be reported on or before the following dates:~~
 - ~~(A) For those Phase III product categories with initial effective dates of January 1, 2001, the first report is due on or before March 1, 2000, and shall cover products sold or offered for sale in California during the previous calendar year. Subsequent reports covering the previous calendar year are due on or before each March 1 thereafter until March 1, 2006, when the last report is due.~~
 - ~~(B) For those Phase III product categories with initial effective dates of January 1, 2002, the first report is due on or before March 1, 2001, and shall cover products sold or offered for sale in California during the previous calendar year. Subsequent reports covering the previous calendar year are due on or before each March 1 thereafter until March 1, 2006, when the last report is due.~~
 - ~~(C) For those Phase III product categories with initial effective dates of January 1, 2003, the first report is due on or before March 1, 2002, and shall cover products sold or offered for sale in California during the previous calendar year. Subsequent reports covering the previous calendar year are due on or before each March 1 thereafter until March 1, 2006, when the last report is due.~~
 - ~~(D) For those Phase III product categories with initial effective dates of January 1, 2005, the first report is due on or before March 1, 2004, and shall cover products sold or offered for sale in California during the previous calendar year. Subsequent reports~~

~~covering the previous calendar year are due on or before each March 1 thereafter until March 1, 2006, when the last report is due.~~

NOTE: Authority cited: Sections 39600, 39601, 41511, and 41712, Health and Safety Code.
Reference: Sections 39002, 39600, 40000, 41511, and 41712, Health and Safety Code.

[Note: no modifications are proposed to sections 94514 - 94517.]

APPENDIX B:
MID-TERM MEASURES II MEETING NOTICES
(SUBGROUPS AND WORKSHOPS).

APPENDIX C:
1997 CONSUMER AND COMMERCIAL PRODUCTS SURVEY.

APPENDIX D:

**SUMMARY OF THE REGULATIONS ADOPTED AND DATES
OF REGULATORY AMENDMENTS.**

APPENDIX E:
SUMMARY OF COST CALCULATIONS.

APPENDIX F:
LAWSUIT SETTLEMENT AGREEMENT.