

State of California
California Environmental Protection Agency

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Final Staff Report:
Update to the
Toxic Air Contaminant List

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Released: December 1999

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Acknowledgments

The authors of this report wish to express their sincere appreciation for the participation by numerous individuals from the Air Resources Board, the Office of Environmental Health Hazard Assessment, the Department of Pesticide Regulation, the Scientific Review Panel on Toxic Air Contaminants, the local air pollution control districts, and interested stakeholders, in discussing, reviewing and providing valuable comments on the content of this report.

Definitions

Acute Exposure - One or a series of short-term exposures generally lasting less than 24 hours.

Bioaccumulation - The progressive increase in the amount of a chemical in an organism that occurs because the rate of intake exceeds the organism's ability to remove the substance from the body.

Chronic Exposure - Long-term, exposure usually lasting one year to a lifetime.

Emitted - Means emissions from stationary source facilities reported under the Assembly Bill (AB) 2588 Air Toxics "Hot Spots" Program or the California Toxic Release Inventory.

Exposure Assessment - Measurement or estimation of the magnitude, frequency, duration and route of exposure to a substance for the populations of interest.

Full Set - A full set of health values refers to a set of three approved health values for cancer potency, chronic noncancer, and/or acute noncancer endpoints. In some cases, a substance may not cause effects at all endpoints. In this case, a full set may only include two approved health values.

Health Value - Refers to cancer potency values and inhalation Reference Exposure Levels designed to protect the public from lifetime exposure to hazardous airborne substances. These potency values and exposure levels are primarily used for risk characterization of routine industrial emissions.

Hazardous Air Pollutant or HAP - Means a substance that the U.S. Environmental Protection Agency (U.S. EPA) has listed in, or pursuant to, Section 112 subsection (b) of the federal Clean Air Act Amendments of 1990 (42 U.S. Code, Section 7412(b)).

Identified - Means a substance that has been determined to be a Toxic Air Contaminant by the Air Resources Board, and/or is a federal Hazardous Air Pollutant (listed in section 112(b) of the federal Clean Air Act Amendments of 1990) added to the list of toxic air contaminants by AB 2728 in 1992.

Inhalation Reference Concentration (RfC) - An estimate, derived by the U.S. EPA (with an uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population, (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. The RfC is derived from a no or lowest observed adverse effect level from human or animal exposures, to which uncertainty or "safety" factors are applied.

Reference Exposure Level (REL) - RELs are used by the California Environmental Protection Agency (Cal/EPA) as indicators of potential adverse health effects other than cancer. A REL is a concentration level ($\mu\text{g}/\text{m}^3$) or dose ($\text{mg}/\text{kg}/\text{day}$) at (or below) which no adverse health effects are anticipated for a specified time period. RELs are generally based on the most sensitive adverse health effect reported in the medical and toxicological literature. RELs are designed to protect the most sensitive individuals in the population by the inclusion of margins of safety.

Risk Assessment - An evaluation of risk which estimates the relationship between exposure to a harmful substance and the likelihood that harm will result from that exposure. Risk assessments are generally expressed as the estimated chance per million that a person, exposed over some period of time (e.g. a 70 year lifetime) and some specified concentration of exposure, will experience a certain effect.

Scientific Review Panel on Toxic Air Contaminants or SRP - A nine-member panel appointed to advise the Air Resources Board and the Department of Pesticide Regulation in their evaluation of the adverse health effects toxicity of substances being evaluated as Toxic Air Contaminants.

Stationary Source - A non-mobile source of air pollutants which can be either a point or area source.

Toxic Air Contaminant or TAC - As defined in section 39655 of the Health and Safety Code, “an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.” Toxic Air Contaminants that are pesticides are regulated in their pesticidal use by the Department of Pesticide Regulation.

Acronyms

AB - Assembly Bill

APCD - Air Pollution Control District

ARB/Board - Air Resources Board

DPR - Department of Pesticide Regulation

HAP - Hazardous Air Pollutant

IARC - International Agency for Research on Cancer

OEHHA - Office of Environmental Health Hazard Assessment

PAH - Polycyclic Aromatic Hydrocarbon

PEF - Potency Equivalency Factor

REL - Reference Exposure Level

RfC - Reference Concentration

SB - Senate Bill

SRP - Scientific Review Panel on Toxic Air Contaminants

TAC - Toxic Air Contaminant

U.S. EPA - United States Environmental Protection Agency

Summary

This report presents changes to the Air Resources Board's (ARB/Board) Assembly Bill (AB) 1807 Toxic Air Contaminant List. The Toxic Air Contaminant List is used by the ARB to identify substances of potential concern as toxic air contaminants in California. The list categorizes by priority, the substances for review under the AB 1807 Toxic Air Contaminant Program. The Toxic Air Contaminant List has been updated eight times since 1985.

A. Overview

Under the State's Toxic Air Contaminant Program (Health and Safety Code sections 39650-39675), the ARB identifies and controls substances as Toxic Air Contaminants (TACs). In setting priorities for which substances should enter the identification process, the ARB must consider factors relating to "the risk of harm to the public health, the amount or potential amount of emissions, the manner of usage of the substance in California, persistence in the atmosphere, and ambient concentrations in the community" (Health and Safety Code section 39660 (f)). Taking these factors into account, the ARB maintains and periodically updates the Toxic Air Contaminant List.

The list serves a number of important functions. It identifies substances of potential concern as TACs in California, and fulfills the requirements of state law by setting priorities for the review of these substances. Publication and periodic review of the list serves to inform the public of the substances under evaluation, and provides the public with an opportunity to comment on the priorities of the Toxic Air Contaminant Program.

Once a substance is identified as a TAC, it then enters the risk management, or control, phase. In the risk management phase, the ARB staff investigates the need for, and appropriate degree of control for the substance. If reductions in exposure are needed, the ARB must design control measures to reduce emissions to the lowest level achievable through the application of best available control technology or a more effective control method. Public outreach is an essential element in the development of any control measures.

B. Summary of Changes

The previous Toxic Air Contaminant List (Appendix A) was divided into three categories, and was last updated in June 1996. The new December 1999 Toxic Air Contaminant List is included in Appendix B and is presented in two formats (*Quick Reference* and *Substances By Category*). The first format is a quick reference guide which is similar to the June 1996 list and can be used to easily determine if a substance is on the Toxic Air Contaminant List and in what category it can be found on the *Substances by Category* version of the list. The substances by category format is divided into six new categories and is designed to supply information on 1) whether a substance is emitted in California; 2) if a substance has health numbers developed,

or being developed, under the AB 2588 Air Toxics “Hot Spots” Information and Assessment Act (Air Toxics “Hot Spots” Program) of 1987 (Chapter 1252, statutes of 1987, Health and Safety Code sections 44300-44393); and 3) the status of the substance in the identification process. (The rest of the discussion of the list pertains to the substances by category version. See Table 3 on page 15 for List headings.)

During the identification process a substance will be chosen from the potential candidate list in Category IV and move up through the list to Category I. The substance will be moved into Category I once health values for all endpoints (cancer, noncancer chronic, noncancer acute) have been reviewed by the Scientific Review Panel (SRP) on Toxic Air Contaminants. Category I may also include a substance that has only two reviewed health values because the substance does not cause all three types of health endpoints.

Categories I and II provide information on which substances have health values reviewed by the SRP and which have health values currently being developed by the Office of Environmental Health Hazard Assessment (OEHHA). Category III lists the substances that have been nominated for the development of health values. Category IV lists the substances that received a lower prioritization score during our evaluation, and is the pool of candidates for Categories II and III. Categories V and VI contain substances identified as TACs, but are not known to be emitted in California from stationary sources. Of these substances, Category VI contains the substances that are active ingredients in pesticides and are regulated as TACs by the Department of Pesticide Regulation (DPR).

We are adding three new substances to the group of non-identified TACs. These substances are chloropicrin, ethylene, and Michler’s ketone and will be placed in Category IIb. These substances are listed in the Air Toxics “Hot Spots” Program list of “Substances For Which Emissions Must Be Quantified.” They each have emissions reported in the Air Toxics “Hot Spots” emissions inventory from the chemical, electrical and petroleum refining industries. These substances also have a draft health value being developed by OEHHA under the Air Toxics “Hot Spots” Program.

We have also made some streamlining changes. These include consolidating California and federal definitions of certain metal compounds. We have also listed the individual substances with Toxicity Equivalency Factors for the chlorinated dibenzo-*p*-dioxins and dibenzofurans, and substances with Potency Equivalency Factors for polycyclic aromatic hydrocarbons.

C. Plan Through 2000

When developing the draft list we examined the available data on over 300 substances to determine the order in which these substances should enter the Toxic Air Contaminant Identification process for review. The prioritization of substances was done using a point system, or scheme. The scheme was presented to the SRP for review in 1990 and revised in 1993 after consultation with the SRP lead persons on prioritization (Drs. Stanton A. Glantz and

James N. Seiber). The criteria used in the scheme includes the availability of health, exposure, and atmospheric chemistry information. An explanation of the scheme is found in Chapter II of this report.

As a result of our prioritization process we nominated four substances to be reviewed for the possible development of health values and exposure assessments. These four substances are: crystalline silica; methyl tertiary butyl ether (MTBE); polycyclic aromatic hydrocarbons (PAHs); and styrene. These substances can be found in Categories IIa and III of the December 1999 list (Appendix B). In Category IIa, the nominated substances are marked with the symbol “‡”.

We are planning in 2000 to: 1) begin efforts to augment the previously SRP approved benzo[a]pyrene risk assessment to add more Potency Equivalency Factors if data are available for selected polycyclic aromatic hydrocarbons; 2) review the expected new health studies on styrene; and 3) enter crystalline silica into the identification process and begin a comprehensive AB 1807 TAC risk assessment. We have already asked OEHHA to begin development of a noncancer chronic Reference Exposure Level for crystalline silica under the Air Toxics “Hot Spots” Program.

As part of this update, we had earlier recommended developing a health assessment for MTBE. This work was expedited during 1999 in consideration of the Governor’s Executive Order D-5-99 directing that MTBE in gasoline be phased-out by the end of 2002. OEHHA completed the health assessment on MTBE in mid-1999 and the SRP approved it at its November 1999 meeting.

D. Sunset Review of Regulations

Executive Order W-144-97, signed by the Governor on January 10, 1997, directs all state agencies to complete a sunset review of all existing regulations by 1999 in order to improve the cost effectiveness of each regulation. For the Toxic Air Contaminant Program this order pertains to sections 93000-93001 of Title 17 of the California Code of Regulations. Our review of the regulation has shown that there is a continued necessity for these regulations and no changes are being proposed at this time.

E. Conclusion

The ARB staff concludes that the proposed revisions to the June 1996 Toxic Air Contaminant List are appropriate. In addition, the staff reviewed sections 93000-93001, Title 17 of the California Code of Regulations and determined that no changes are necessary at this time.

I. History and Background

1. What is the Air Resources Board's Toxic Air Contaminant Identification and Control Program?

The California Toxic Air Contaminant Identification and Control Program (program) was established under California law by AB 1807, Tanner, Chapter 1047, statutes of 1983, and is set forth in Health and Safety Code sections 39650-39675. The program is designed to protect public health by reducing emissions of TACs that pose the highest risks. This program consists of two phases: risk assessment (identification) and risk management (control). Under this program, a substance is first identified as a TAC by the Board. Once it has been identified as a TAC, the ARB staff investigates the need for, and appropriate degree of, control for the substance. If necessary, the Board adopts a toxic control measure to reduce TAC emissions. Both identification and control of TACs occur in an open and public process which includes public comment periods and workshops. Identification and control of TACs are regulatory actions taken by the Board in compliance with procedures outlined in the California Administrative Procedure Act (Government Code § 11340 *et seq.*). The list of substances identified by the Board as TACs are in Title 17 of the California Code of Regulations, sections 93000 and 93001.

2. What is a “toxic air contaminant”?

A “toxic air contaminant,” as defined in state law (section 39655 of the California Health and Safety Code), “means an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.” Included in the definition are substances listed as Hazardous Air Pollutants (HAPs) in section 112 of the federal Clean Air Act (section 7412 of Title 42 of the United States Code). The HAPs were designated by the State Board as TACs in accordance with section 39657(b) of the California Health and Safety Code on April 8, 1993 (Title 17, California Code of Regulations, section 93001). Toxic air contaminants that are pesticides are regulated in their pesticidal use by DPR.

3. What is the purpose of the list of substances?

The purpose of the Toxic Air Contaminant List of substances is to assist the ARB staff with the selection of pollutants for review as TACs. In addition, the list: identifies the substances of potential concern in California as TACs; fulfills the requirements of state law by setting priorities for the review of listed substances (Health and Safety Code section 39660(f)); informs the public of the substances under evaluation; and provides the public with the opportunity to comment on the priorities of the Toxic Air Contaminant Program.

4. Why is it necessary to update the list of substances?

The list is being reorganized at this time to: 1) better reflect what we know about the emissions in California of the federal HAPs identified as TACs in 1993; 2) note which TACs have health values under development as part of the Air Toxics “Hot Spots” Program; and 3) reflect the substances nominated for review as a result of our prioritization work.

5. How are substances selected for review as a toxic air contaminant?

In setting priorities for the substances being evaluated as TACs, the ARB staff approach is consistent with Health and Safety Code section 39660(f) which requires that the following criteria be used to prioritize compounds for evaluation as possible TACs: 1) risk of harm to public health; 2) amount or potential amount of emissions; 3) manner of, and exposure to, usage of the substance in California; 4) persistence in the atmosphere; and 5) ambient concentrations in the community. These evaluation activities are done in consultation with OEHHA, the SRP, and local air pollution control districts (APCDs).

6. How are substances identified as toxic air contaminants?

Prior to listing a substance as a TAC, the ARB and OEHHA staffs develop a comprehensive report on the candidate TAC. The report includes estimates of outdoor, indoor and total air exposure, estimated emissions, atmospheric persistence of the candidate substance, health effects, and the potential health risks to the public.

After public review and comment and public workshops, the report is revised as appropriate before being submitted to the SRP (Health and Safety Code section 39670 et seq.). This prestigious panel of experts, representing a range of scientific disciplines, reviews the report to determine whether sound scientific knowledge, methods, and practice were used.

Based on the SRP’s comments, the report may require revisions. When the report is complete, the SRP is required to submit written findings to the Board regarding the document. As part of their findings, the SRP makes a recommendation as to whether the substance should be identified by the Board as a TAC. The next step in the process is formal submittal of the report to the Board for consideration.

The final decision regarding the listing of a candidate substance as a TAC is made by the Board at a public hearing. If the Board approves the ARB staff’s recommendation that the candidate substance meets the criteria for identification as a TAC, it is listed as a TAC in the California Code of Regulations.

7. What happens after a substance is identified as a toxic air contaminant?

Once a substance is identified as a TAC, the ARB staff in consultation with local air pollution control districts, affected sources and the interested public, evaluates the need, feasibility and cost of reducing emissions of the substance. If controls are identified which are available and needed to protect public health, the ARB adopts a control measure. The local APCDs then adopt and enforce equivalent or more restrictive measures to reduce emissions of the TAC.

8. What is the history of past list updates?

The first Toxic Air Contaminant List was approved by the Board on January 27, 1984, and contained 47 substances. Since that time, the list has been updated eight times and has grown to 244 substances. Under the AB 1807 TAC Identification process, 20 substances have undergone a thorough assessment in California of emissions, exposure, and health risk, and subsequently have been identified as TACs by the Board. The SRP has reviewed risk assessments for 22 substances. In 1992, AB 2728 required the identification of all the federal HAPs as TACs (53 of the federal HAPs were already on the AB 1807 Toxic Air Contaminant List). The Toxic Air Contaminant List was last updated in June 1996 when acetone (a candidate TAC) was removed.

9. Are the federal hazardous air pollutants identified as toxic air contaminants?

Yes. In 1992, AB 2728 (Tanner, Chapter 1161, statutes of 1992) amended the AB 1807 Air Toxics Program by requiring that the Board identify, as TACs, the federal HAPs listed in section 112(b) of the federal Clean Air Act Amendments of 1990. The Board officially identified the HAPs as TACs on April 8, 1993. The intent of AB 2728 was to save the state the time and expense of individually identifying each of the 189 HAPs as TACs, in recognition of the fact that the Congress and U.S. Environmental Protection Agency (U.S. EPA) have already conducted an extensive process to evaluate and identify these substances. However, not all of the federal HAPs have California emissions, or peer reviewed health values to use in risk assessment and later in risk management.

II. Process Used to Develop the List Update

The process the ARB staff used to update the Toxic Air Contaminant List and to nominate substances for entry into the AB 1807 TAC program included using a prioritization scheme, evaluating the results from the scheme, consulting with the local APCDs, OEHHA, SRP, and DPR, and providing two public review periods.

A. Prioritization Scheme

The prioritization scheme (Appendix C) was approved by the SRP in 1990 and then modified, with approval by the SRP, in 1993, after consulting with the subcommittee on prioritization (Drs. Stanton A. Glantz and James N. Seiber). It is a point scoring scheme that depends on the information available and is designed as a screening tool. It is the first step in the prioritization process. The point values are for prioritization purposes only and are not meant to “quantify” the substances in any way. The prioritization scheme consists of scoring points for each substance in eight different categories. These categories are:

- International Agency for Research on Cancer (IARC) or U.S. EPA cancer classifications;
- Number of known organ systems affected;
- Cancer unit risk value multiplied by California emissions;
- California emissions divided by chronic Reference Exposure Level;
- Noncancer health effects (includes chronic, acute, and reproductive/developmental);
- Atmospheric persistence, bioaccumulation, and photochemical generation;
- Ambient monitoring data availability; and
- Air Toxics “Hot Spots” Program risk assessment considerations.

The information used in the scheme is primarily from the report, *Toxic Air Contaminant Identification List Summaries, September 1997*.

B. Consultations with the Air Pollution Control Districts, Office of Environmental Health Hazard Assessment, Department of Pesticide Regulation, and Scientific Review Panel

In addition to using the prioritization scheme, we consulted with the local APCDs, OEHHA, and DPR on the list update. The APCDs reviewed the June 1996 Toxic Air Contaminant List and informed us of any substances that are of concern to the district. Table 1 shows the substances listed by the districts. The ARB staff also consulted with OEHHA to determine if additional health information was needed in the prioritization scheme, and which substances would have information available to conduct a review. The ARB staff also worked

Table 1
List of Air Pollution Control Districts' Substances Of Concern

Substance	District(s)
1,4-Dioxane	Mojave Desert AQMD San Diego APCD
Acrylamide	Bay Area AQMD
Acrylonitrile	San Diego APCD
Arsenic & compounds	San Diego APCD
Carbon disulfide	Bay Area AQMD
Chlorine	Mojave Desert AQMD Bay Area AQMD
Copper	San Diego APCD
Crystalline silica	San Diego APCD Santa Barbara APCD
Dibenzofurans	Mojave Desert AQMD
Diethanolamine	San Diego APCD
Dimethyl sulfate	Bay Area AQMD
Ethylbenzene	Bay Area AQMD
Ethylene glycol	Bay Area AQMD
Fine mineral fibers	Bay Area AQMD
Glycol ethers	Bay Area AQMD San Diego APCD
Hexane	Bay Area AQMD
Hexavalent chromium	Monterey Bay UAPCD San Diego APCD
Hydrogen fluoride	Bay Area AQMD
Methanol	Bay Area AQMD
Methyl bromide	Bay Area AQMD
Methyl ethyl ketone	Mojave Desert AQMD
Methyl tertiary butyl ether	San Diego APCD Bay Area AQMD
Naphthalene	Bay Area AQMD
Nickel	San Diego APCD
PCB's	Bay Area AQMD
Phenol	Bay Area AQMD
Propylene oxide	San Diego APCD
Radionuclides (Thorium 232 & Potassium 40) and radon	Mojave Desert AQMD Monterey Bay UAPCD
Selenium compounds	Mojave Desert AQMD
Sodium hydroxide	San Diego APCD
Styrene	Bay Area AQMD San Diego APCD Mojave Desert AQMD
Tertiary butyl formate	Monterey Bay UAPCD
Toluene	Bay Area AQMD Mojave Desert AQMD
Trivalent chromium	San Diego APCD
Xylenes	Bay Area AQMD Mojave Desert AQMD

with DPR to specify substances that are primarily active ingredients in pesticides since the licensing and regulation of pesticides for sale and use in California, and the evaluation, identification, and regulation of pesticides as TACs are the responsibility of DPR.

At the June 19, 1997, and December 10, 1997, meetings of the SRP, we presented our plans to update the June 1996 Toxic Air Contaminant List and presented a working-draft of the list. All changes were previously discussed with Drs. Glantz and Seiber. Staff explained the prioritization scheme, the new draft category definitions, and how work currently being conducted by OEHHA for the Air Toxics “Hot Spots” Program would be reflected in the reorganization of the categories.

C. Results of the Prioritization Scheme

The scores for each substance from the prioritization scheme were sorted from highest to lowest, and each substance was given a rank. Several substances can be within the same rank. The ARB staff selected the substances in the top 40 ranks as the pool of candidate substances to nominate for the development of health values for Categories II and III. The latest ranking of the top 40 are shown in Table 2. The results of the prioritization scheme are based on information available and are subject to change. The ARB staff periodically updates the scheme with new information or data.

The top 40 ranks were then analyzed to see which had health values already reviewed by the SRP, which had health values under development by OEHHA for the Air Toxics “Hot Spots” Program, or had health endpoints addressed under another program. Exposure information was then examined for those substances that are in need of health values. (All but four substances suggested by the APCDs fell in the top 40 ranks. These four substances were analyzed along with the substances in the top 40 ranks). The result was a candidate list of the following fourteen substances:

Antimony and compounds	Fine mineral fibers
Carbon black extracts	Gasoline vapors
Chlorophenols	Hydrogen fluoride
Crystalline silica	Methyl chloride (Chloromethane)
Dimethyl formamide	Methyl tertiary butyl ether
1,1-Dimethyl hydrazine	2-Nitropropane
Ethyl acrylate	Styrene

Table 2

ARB Prioritization Results Substances in the Top 40 Ranks*

SUBSTANCE	RANK	SUBSTANCE	RANK	SUBSTANCE	RANK
Benzene	1	Hydrazine	25	Dimethyl formamide	35
Chromium (VI)	1	Potassium bromate	25	Ethyl chloride	35
Perchloroethylene	2	1,1,2-Trichloroethane	25	Methyl ethyl ketone	35
Formaldehyde	3	Copper and compounds *	26	Nitrobenzene	35
Nickel and compounds	4	Chlorophenols	27	Chlorinated fluorocarbons	36
Methylene chloride	5	Hexachlorobenzene	27	4,4-Methylene bis(2-chloroaniline)	36
Arsenic and compounds (inorganic) *	6	Hexachlorocyclohexanes	27	N-Nitrosodimethylamine	36
Cadmium and compounds	6	4,4-Methylenedianiline	27	Zinc and compounds *	36
Dioxins	7	Mercury and compounds	28	Carbon disulfide	37
Beryllium compounds	8	Antimony and compounds	29	Chloroprene	37
Carbon tetrachloride	8	Propylene dichloride	29	Chromium and compounds	37
Chloroform	8	Toluene	29	Crystalline silica	37
Trichloroethylene	9	Methyl Chloroform	29	Methyl chloride	37
Lead and compounds	10	Chlorine *	30	Aluminum and compounds *	38
Particulate emissions from diesel-fueled engines	10	Dimethyl sulfate	30	o-Anisidine	38
Vinyl chloride	11	Methanol *	30	Benzo[b]fluoranthene	38
p-Dichlorobenzene *	12	Ammonia	31	Benzo[k]fluoranthene	38
Propylene oxide *	12	Bromine and compounds	31	Cyanide and compounds *	38
Ethylene dibromide	13	Cobalt and compounds	31	Ethyl acrylate	38
Ethylene dichloride	13	Manganese and compounds *	31	Hydrogen fluoride	38
2,3,7,8-Tetrachlorodibenzo-p-dioxin	13	Phosphorus	31	Methyl tertiary butyl ether	38
1,4-Dioxane	14	Xylenes	31	Molybdenum trioxide	38
Ethylene oxide	14	Creosotes *	32	Napthalene	38
Gasoline Vapors	15	Allyl chloride	33	Thiourea	38
Acrylonitrile	16	Benzyl chloride	33	Vinylidene chloride	38
Acetaldehyde	17	1,1-Dimethyl hydrazine	33	Acrolein *	39
Selenium and compounds	17	Ethyl carbamate	33	Carbon Black Extracts	39
Benzo[a]pyrene	18	Ethylene thiourea	33	Chrysene	39
Asbestos	19	Ethylidene dichloride	33	Dimethyl phthalate	39
Chlorobenzene	19	Lindane (all isomers) *	33	Ethyl benzene	39
1,3-Butadiene	20	Methyl bromide *	33	Fine mineral fibers	39
Styrene	20	Dibenz[a,h]anthracene	34	Hexane	39
PCBs	21	Phenol	34	Indeno[1,2,3-cd]pyrene	39
2-Nitropropane	22	Acrylamide	35	Methylene diphenyl diisocyanate	39
Epichlorohydrin	23	Aniline	35	Pentachlorophenol *	39
Toluene-2,4-diisocyanate	24	1,2-Dibromo-3-chloropropane	35	Sodium hydroxide *	39
Bis(2-ethylhexyl)phthalate (DEHP)	25	3,3-Dichlorobenzidene	35	Hydrochloric acid *	40

* - The top 40 ranks are based on information available and are subject to change.

⚙ - Substance is an active ingredient in pesticides in California. For further information regarding the pesticidal uses of this compound, please contact the Department of Pesticide Regulation.

D. Public Comment

In September 1997, a draft Toxic Air Contaminant List was released for public review asking for input on whether the above fourteen substances should be nominated for entry into the TAC identification process. Twenty-two comment letters were received from various state, county, APCD, industry and interest groups. The draft list and the list of nominated substances were then revised based on these comments.

After further analysis of the available resources, emissions and health effects information, and comments from the public, the list of fourteen was reduced to four. The four nominated substances are: methyl tertiary butyl ether, polycyclic aromatic hydrocarbons (PAHs), styrene and crystalline silica.

In December 1998, a revised draft Toxic Air Contaminant List and draft staff report were released for a second 60-day public comment period. Eighteen comment letters were received (Appendix D). The Toxic Air Contaminant List has been revised a third time based on comments received. A summary of comments received during the second comment period and ARB/OEHHA responses are included in Appendix E.

E. Plan Through 2000

From the original list of fourteen substances that were candidates for entry into the TAC identification process, we plan to begin work in 1999-2000 on four of these substances, methyl tertiary butyl ether (MTBE), polycyclic aromatic hydrocarbons, styrene and crystalline silica. Fact sheets from the report, *Toxic Air Contaminant Identification List Summaries, September 1997*, are included in Appendix F for the four substances.

Methyl tertiary butyl ether (MTBE):

MTBE is already an identified TAC under the AB 1807 program because it is a federal HAP. On March 25, 1999, Governor Gray Davis signed Executive Order D-5-99 finding that “on balance, there is a significant risk to the environment from using MTBE in gasoline in California” and directed that a phase-out of MTBE be completed by the end of 2002. Even though it is to be phased out, a full set of health values for MTBE from exposure to the air pathway are needed to assess viable groundwater clean-up technology that may have air emissions, assist local air pollution control districts in their risk assessment programs, and to provide a comparison of the relative risks between MTBE and ethanol. In April 1999, OEHHA was requested to do an AB 1807-type health assessment for MTBE. OEHHA has completed the risk assessment and the SRP approved it at its November 1999 meeting.

OEHHA is currently working on a draft chronic noncancer Reference Exposure Level (REL) for MTBE under the Air Toxics “Hot Spots” Program. Mobile sources are the primary source of MTBE emissions in California. According to the “Hot Spots” emission inventory, there are about 0.3 tons per day of MTBE emitted from 125 stationary source facilities. Forty-three tons per day were reported to be emitted from mobile sources in 1996. MTBE was listed by two APCDs as a substance that is of concern in their districts.

Polycyclic aromatic hydrocarbons (PAHs):

PAHs are already identified as a TAC under the AB 1807 program because they are federal HAPs under the chemical group Polycyclic Organic Matter. PAHs were added to the group of nominated substances for the development of new Potency Equivalency Factors (PEFs). PEFs were developed for 24 PAHs in the July 1994 report *Benzo[a]pyrene as a Toxic Air Contaminant*. We plan to ask OEHHA to review the health literature and, if data are available, to begin work to augment the previously SRP approved benzo[a]pyrene risk assessment to add additional PEFs.

Many PAH and PAH-derivatives have been found to be potent mutagens and carcinogens. In a recent study, researchers identified a new class of potent mutagenic compounds in the organic extracts of both diesel exhaust and airborne particles. The results showed that the mutagenicity of this new class of compounds (nitrobenzanthrones), specifically, 3-nitrobenzanthrone, compared similarly with that of 1,8-dinitropyrene, which is one of the strongest direct acting mutagens previously discovered. The total emissions of PAHs from stationary sources in California are estimated to be about 185 tons per year, based on data reported under the Air Toxics "Hot Spots" Program. There are also approximately 1.3 tons of unspecified polycyclic organic compounds and 125 tons of unspecified PAHs in addition to those listed individually.

Styrene:

Styrene is already an identified TAC under the AB 1807 program because it is a federal HAP. However, a comprehensive risk assessment has not been completed for the inhalation cancer potency value. We understand new health studies on styrene were completed in 1998. We plan to ask OEHHA to review these studies and all other related literature to determine if it would be possible to develop a cancer potency value. OEHHA is currently working on a draft noncancer chronic REL for the Air Toxics "Hot Spots" Program and has an SRP-reviewed noncancer acute REL. The IARC classifies styrene in Group 2B: possible human carcinogen. According to the "Hot Spots" emission inventory, there are over 1,250 tons of styrene emitted per year from 421 stationary source facilities. Styrene has also been detected, but not quantified in motor vehicle exhaust by the ARB. Styrene was listed by three APCDs as a substance that is of concern in their districts.

Crystalline silica:

Crystalline silica is not on the federal HAP list, and has not been identified as a TAC under the AB 1807 program. We have received requests from local APCDs to provide health values for respirable crystalline silica. Last summer, we asked OEHHA to begin development of a noncancer chronic REL under the Air Toxics "Hot Spots" Program. (This chronic REL will not be included in OEHHA's current draft technical support document for non-cancer chronic RELs, but will be included as a future addendum to the document.) The ARB is also initiating a research study to conduct near source monitoring of crystalline silica sources, with a preliminary report due in 2000.

In early 2000 we plan to enter crystalline silica into the TAC identification process and begin a comprehensive AB 1807 TAC risk assessment for the development of a cancer potency value. Approximately 1,700 tons per year are reported to be emitted from 426 stationary source facilities in California. Crystalline silica can potentially cause both cancer and noncancer endpoints. The IARC has found that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1 in the IARC classification). The State of California under Proposition 65 lists crystalline silica (airborne particles of respirable size) as a chemical known to the State to cause cancer. Crystalline silica was listed by one APCD as a substance that is of concern in their district.

III. Changes to the Framework and Category Definitions of the Toxic Air Contaminant List

A. Rearrange into New Groups According to Available Emission and Health Information

To better reflect the information that is available for the substances on the Toxic Air Contaminant List, the existing categories have been redefined and the substances have been rearranged. The prioritization process took into account California emission inventories, and the existence of health values, or health values under development by the OEHHA as part of the Air Toxic “Hot Spots” Program. This information was the basis for the reorganization. Appendix A contains the June 1996 Toxic Air Contaminant List and Appendix B contains the November 1999 Toxic Air Contaminant List.

The November 1999 Toxic Air Contaminant List is presented in two formats (*Quick Reference* and *Substances By Category*). The first format is a quick reference guide which can be used to easily determine if a substance is on the Toxic Air Contaminant List and what category it can be found on the substances by category version of the list. The substances by category version format is designed to supply information on 1) whether a substance is emitted in California; 2) if a substance has health numbers developed, or if numbers are being developed, under the AB 2588 Air Toxics “Hot Spots” Information and Assessment Act (Air Toxics “Hot Spots” Program) of 1987 (Chapter 1252, statutes of 1987, Health and Safety Code sections 44300-44393); and 3) the status of the substance in the identification process. Table 3 lists the headings for the substances by category version of the list.

B. Explanation of Categories

Listed below are the general descriptions of the revised categories for the Substances By Category version of the list. During the identification process, a substance will be chosen from the potential candidate list in Category IV and move up through the list to Category I.

Category I: Substances identified as TACs will be moved into Category I when a full set of health values have been reviewed by the SRP for the substance. A full set means that a health value has been developed for cancer, noncancer chronic, and noncancer acute endpoints. This may also include a substance that has only two numbers because the substance does not cause all three (cancer, chronic, and acute) health effects.

Table 3
New Headings for Toxic Air Contaminant List
Substances By Category Version
December 1999

- I. Substances identified as Toxic Air Contaminants, known to be emitted in California, with a full set of health values reviewed by the Scientific Review Panel.
- II. Substances known to be emitted in California, with one or more health values reviewed by the Scientific Review Panel or under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
 - a. Identified as Toxic Air Contaminants
 - b. NOT Identified as Toxic Air Contaminants
- III. Substances known to be emitted in California, and are NOMINATED for development of health values.
 - a. Identified as Toxic Air Contaminants
 - b. NOT Identified as Toxic Air Contaminants
- IV. Substances known to be emitted in California, and are TO BE EVALUATED for entry into Category III.
 - a. Identified as Toxic Air Contaminants
 - b. NOT Identified as Toxic Air Contaminants
- V. Substances identified as Toxic Air Contaminants, NOT KNOWN TO BE EMITTED from stationary source facilities in California based on information from the Air Toxic “Hot Spots” Program and the California Toxic Release Inventory.
- VI. Substances identified as Toxic Air Contaminants, NOT KNOWN TO BE EMITTED from stationary source facilities in California, and are active ingredients in pesticides in California. Please contact the Department of Pesticide Regulation for further information regarding pesticides as Toxic Air Contaminants.

Category II: Substances in Category II are reported to be emitted from stationary sources by the Air Toxics “Hot Spots” emission inventory or the California Toxic Release Inventory (required by federal law). Work on developing health values is currently being done by OEHHA for the Air Toxics “Hot Spots” Program. The status of this work is denoted by a “ ” if the health value has been reviewed by the SRP, and an “ ” if the OEHHA is working on a draft number. The literature was also reviewed to determine if toxicity data are available to develop future health values. We are adding the following codes and notes to Category II to show the availability of toxicity data:

- Cancer Potency Value: Substances without a draft or SRP-reviewed cancer potency value were divided into three groups, depending on their U.S. EPA or IARC cancer classifications (the classifications are explained in the prioritization scheme on page C-4 of the appendices to this report).
 - i - Classified by U.S. EPA and/or IARC as a probable or possible human carcinogen (Group B1, B2, C, 2A, or 2B substances);
 - ii - Classified by U.S. EPA and/or IARC as insufficient/inadequate data exist to classify as to carcinogenicity to humans (Group 3 or D substances), or no data or value available at this time;
 - iii - Considered not likely to be carcinogenic to humans by U.S. EPA and/or IARC (Group 4 or E substances).

Of the substances in Categories IIa and IIb that have not been reviewed by the SRP as to their carcinogenicity in humans, none were classified as known human carcinogens (Group 1 or A) by U.S. EPA and/or IARC. When both agencies independently investigated and classified the same substance, both agencies generally agreed on the adequacy of the data and the potential for human carcinogenicity for the given substance. However, there were significant deviations between the agencies for the classification of four substances: acrolein, hexachloroethane, methyl methacrylate, and nitrobenzene. U.S. EPA considered acrolein and hexachloroethane as possible human carcinogens and methyl methacrylate as not likely to be carcinogenic in humans, whereas IARC considered the data as insufficient/inadequate to classify all three substances to their carcinogenicity in humans. While both agencies based their findings on the same primary studies, the U.S. EPA classifications were chosen as the most relevant for this Toxic Air Contaminant List. On the other hand, the IARC classification for nitrobenzene as possibly carcinogenic to humans (Group 2B) was deemed more relevant for this list because U.S. EPA is presently re-reviewing their carcinogenicity assessment for nitrobenzene, currently listed as Group D.

- Chronic Reference Exposure Level: “*Limited data available*” was added to the column if some chronic toxicity data were found in the literature for substances without a draft or SRP-reviewed chronic Reference Exposure Level.
- Acute Reference Exposure Level: “*Limited data available*” was added to the column if some acute toxicity data were found in the literature for substances without a draft or SRP-reviewed acute Reference Exposure Level.

Category IIa: Substances in Category IIa have been identified as TACs by 1) having an ARB/OEHHA exposure and health risk assessment approved by the Board and the SRP,

and/or 2) are listed on the federal Clean Air Act list of HAPs. Substances in Category IIa either have approved health values and/or have health values being developed by the OEHHA under the Air Toxics “Hot Spots” Program. In this category, two of the substances nominated for the development of an additional health value are listed and marked with the symbol “‡”. These two substances are also listed in Category III. Once a substance has a full set of health values reviewed by the SRP, it will be moved to Category I.

Category IIb: Substances in Category IIb have not been identified as TACs, but have health values being developed by the OEHHA under the Air Toxics “Hot Spots” Program. In order to be listed as a TAC, a regulatory action would need to be taken by the ARB. Once identified, and a full set of health values has been reviewed by the SRP, the substance will move to Category I.

Category III: Substances in Category III are known to be emitted in California, and are nominated for the development of health values.

Category IIIa: Substances Identified as Toxic Air Contaminants

Category IIIb: Substances Not Identified as Toxic Air Contaminants

Category IV: Category IV is the potential candidate pool of substances known to be emitted from stationary sources in California. The substances in this category have a lower prioritization score, but will be periodically evaluated for entry into Categories II and III. New candidate substances will be added to this category.

Category IVa: Substances Identified as Toxic Air Contaminants

Category IVb: Substances Not Identified as Toxic Air Contaminants

Category V and VI: Substances in Categories V and VI are identified TACs, but have no reported emissions from stationary source facilities in California based on information reported under the Air Toxic “Hot Spots” Program and the California Toxic Release Inventory (TRI). Of these non-emitted substances, Category VI contains the substances that are active ingredients in pesticides and are regulated as TACs by the DPR.

C. Addition of New Compounds

We included in the prioritization scheme substances from the Air Toxics “Hot Spots” list of “Substances for Which Emissions Must Be Quantified.” From this review we found three substances not currently on the Toxic Air Contaminant List that are emitted in California, have health values under development by the OEHHA, and may warrant further evaluation under the Toxic Air Contaminant Program.

We are proposing to add the following three substances to Category IIb (Substances not identified as Toxic Air Contaminants, known to be emitted in California, with one or more health

values under development by the Office of Environmental Health Hazard Assessment) for review at a later date:

Chloropicrin (CAS No. 76-06-2):

IARC Cancer Classification: None

ARB 1996 Emissions Inventory: 1.23 tons/year

Sources: Chemical and electrical industries

1995 California TRI: 0.25 tons/year

Sources: Chemical industry

OEHHA Health Number: Draft noncancer chronic Reference Exposure Level and SRP-reviewed acute Reference Exposure Level

Noncancer Effects: Chronic and acute

Ethylene (CAS No. 74-85-1):

IARC Cancer Classification: Group 3 - Unclassifiable as to carcinogenicity to humans

ARB 1996 Emissions Inventory: 6.5 tons/year

Sources: Chemical, electrical, petroleum refining industries

1995 California TRI: 64.03 tons/year

Sources: Chemical, and petroleum refining industries

OEHHA Health Number: Draft noncancer chronic Reference Exposure Level

Noncancer Effects: Chronic

Michler's ketone (4,4'-Bis(dimethylamino)benzophenone) (CAS No. 90-94-8):

IARC Cancer Classification: None

ARB 1996 Emissions Inventory: 0.0815 tons/year

Sources: Electrical and petroleum refining industry

1995 California TRI: None

OEHHA Health Number: SRP-reviewed cancer potency value

Noncancer Effects: Acute

D. Environmental Tobacco Smoke

Environmental tobacco smoke (ETS or secondhand smoke) is a complex mixture formed from the escaping smoke of tobacco products and smoke exhaled by the user. Its characteristics change as it ages and combines with other compounds in ambient air. ETS has been found to be a critical source of exposure to TACs indoors.

ETS was nominated for review on the June 1996 Toxic Air Contaminant List (Appendix A). The OEHHA has completed a report entitled, *Health Effects of Exposure to Environmental Tobacco Smoke*. On June 19, 1997, the SRP approved the report and on October 23, 1997, the Board accepted the report at a public meeting. Because the ARB does not have the authority to regulate indoor air, the report was forwarded to the California Department of Health Services' Tobacco Control Program for appropriate action under their mandate as the

state's lead agency for addressing public health impacts related to tobacco use. ETS is listed in Category IVb (Substances not identified as TACs, known to be emitted in California, and are to be evaluated for entry into Category III).

E. Other Miscellaneous Changes

In order to further streamline the list of substances, a few miscellaneous changes and additions were made. These changes are as follows:

- Consolidated the state and federal definitions of cadmium with cadmium compounds which were listed separately on the June 1996 Toxic Air Contaminant List;
- Consolidated the state definition of inorganic arsenic with the federal definition of arsenic compounds (inorganic including arsine) which were listed separately on the June 1996 Toxic Air Contaminant List;
- Consolidated the state definition of nickel compounds (metallic nickel and inorganic nickel compounds) with the federal definition of nickel compounds which were listed separately on the June 1996 Toxic Air Contaminant List;
- Modified the listing of carbon black extracts to include carbon black;
- 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (a HAP) is listed under chemical class of chlorinated dibenzo-*p*-dioxins;
- Listed the chlorinated dibenzo-*p*-dioxins and dibenzofurans having International Toxicity Equivalency Factors.

The cancer potency value for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin was approved by the SRP and the ARB in 1986 during the identification of chlorinated dioxins and dibenzofurans as TACs. At that time, the Board identified dibenzo-*p*-dioxins and dibenzofurans chlorinated in the 2,3,7, and 8 positions and containing 4,5,6, or 7 chlorine atoms as toxic air contaminants. Since 1986, International Toxicity Equivalency Factors (ITEFs) have been developed which are used to evaluate the cancer risk due to exposure to samples containing mixtures of chlorinated dibenzo-*p*-dioxins and dibenzofurans. ITEFs are numerical factors that express the toxicity of an individual chlorinated dibenzo-*p*-dioxin or dibenzofuran relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. ITEFs are listed for 16 chlorinated dibenzo-*p*-dioxins and dibenzofurans.

- Benzo[a]pyrene is listed under the chemical class polycyclic organic matter.

- Listed the polycyclic aromatic hydrocarbons under polycyclic organic matter having Potency Equivalency Factors.

By using benzo[a]pyrene as a reference compound, a weighting scheme for PAHs was developed for the 1994 ARB document entitled, *Benzo[a]pyrene as a Toxic Air Contaminant*. Potency Equivalency Factors (PEFs) were developed by OEHHA for twenty PAHs and PAH-derivatives. In addition expedited potency factors were developed for four other PAHs and PAH-derivatives under Proposition 65 (California's Safe Drinking Water and Toxic Enforcement Act of 1986). These PEFs are listed under the chemical class of Polycyclic Organic Matter. Once a potency value is developed for a specific PAH, it would be used in place of the PEF.

F. Caprolactam

On June 18, 1996, the U.S. EPA amended the list of HAPs in Clean Air Act Section 112(b)(1) by removing the compound caprolactam. Their decision was based on a determination that "there are adequate data on the health and environmental effects of caprolactam to determine that emissions, ambient concentrations, bioaccumulation, or deposition of caprolactam may not be reasonably anticipated to cause any adverse effects to human health or environmental effects" (Federal Register, vol. 61, no. 118, 30816) (Appendix G). "In order to address public concern, on March 13, 1995, U.S. EPA executed two detailed agreements with AlliedSignal concerning the Irmo, South Carolina manufacturing facility and another facility located in Chesterfield, Virginia. AlliedSignal agreed that, if caprolactam was delisted pursuant to the proposal, AlliedSignal would install emissions controls which U.S. EPA believed would be equivalent to the controls which would have been required had U.S. EPA issued a standard to control these sources under Section 112 of the federal Clean Air Act. The agreed emissions controls are incorporated in federally enforceable operating permits for the affected facilities, and will be in place years earlier than controls would have otherwise been required. In addition, AlliedSignal has agreed to establish a citizen advisory panel concerning the Irmo facility in order to improve communications with the community and to assure that citizens have an ongoing role in implementation of the agreed emission reductions" (U.S. EPA Internet publication, *Modifications to the 112(b)(1) Hazardous Air Pollutants, 1997*) (Appendix H to this report).

On December 30, 1996, the ARB received a request from the BASF Corporation (Appendix I) to remove caprolactam from the AB 1807 Toxic Air Contaminant List based on U.S. EPA's removal of the compound. Since caprolactam was a HAP identified in 1993 as a TAC under AB 2728, a regulatory action would be required to remove it from the list.

After a review of the available emission inventories and health effect information, we believe it is appropriate to leave caprolactam on the Toxic Air Contaminant List even though it is not currently emitted in California. This decision is based primarily on its noncancer health effects and its potential to be used in the nylon, plastic, or paint and coatings industry in California at

some point in the future. Since no facilities have reported emissions of caprolactam under the Air Toxics “Hot Spots” Program or the California Toxic Release Inventory, caprolactam has been moved to Category V (Substances identified as TACs, and not known to be emitted from stationary source facilities in California based on information from the AB 2588 Air Toxic “Hot Spots” Program and the California Toxic Release Inventory).

According to the available literature, “occupational exposures (high level) to caprolactam have been reported to lead to respiratory irritation, contact dermatitis and eczema, headaches, malaise, loss of normal touch sensation in fingertips, loss of control and some confusion, irregular menstruation and pregnancy/birth complications. When administered in large doses to animals, caprolactam is a convulsant poison, a powerful respiratory stimulant, and a mild circulatory depressant. When administered to growing animals over long periods, caprolactam tends to cause a mild but reversible growth depression. Caprolactam is considered to have a relatively low toxicity to humans at low levels, attributed in part to its rapid elimination. The IARC has determined that caprolactam is probably not carcinogenic to humans (class 4). However, the toxicologic database has substantial gaps. A major data gap is the absence of a lifetime study by the inhalation route. The longest animal inhalation experiment lasted four months. The only lifetime animal cancer study used the oral route. The U.S. EPA has not been able to find appropriate data to set a inhalation Reference Concentration (RfC) for ambient exposure of humans to caprolactam. No other Reference Exposure Levels are available to ascertain the potential noncancer hazard of likely exposure scenarios. Thus there is uncertainty about the health effects due to chronic inhalation of caprolactam.” Appendix J contains a memorandum, dated January 8, 1998, from OEHHA to the ARB summarizing the health effects of caprolactam.

IV. Sunset Review of Regulations

This review and update of the Toxic Air Contaminant List also fulfills the Governor's Executive Order W-144-97. This Executive Order specifies that each agency shall conduct a sunset review of all existing regulations by 1999 in order to improve cost effectiveness of each regulation. This review shall include the following provisions:

- a: *“A review of the authority and continued necessity for and cost effectiveness of each regulation, along with a determination to retain, modify, or repeal the regulation, including development of recommended legislation if required to implement the determination; ...”*
- The Toxic Air Contaminant Program is defined by two statutes (AB 1807, statutes 1983, chapter 1047, Health and Safety code section 39650 et seq., and AB 2728, statutes 1992, chapter 1161, Health and Safety code section 39655 et seq.). A review of the regulation and update of the Toxic Air Contaminant List has shown that there is a continued necessity for the Toxic Air Contaminant Program in order to protect public health.
 - The update to the Toxic Air Contaminant List began with a review of the available data for over 300 substances to determine the order in which these substances should enter the AB 1807 Toxic Air Contaminant Program for review. The prioritization of these substances was done using a point system, or scheme. The scheme was developed under the guidance of the SRP. The update incorporated work currently being done by the OEHHA for the Air Toxics “Hot Spots” Program. Input from the local APCDs was included on chemicals of concern to the districts. Review of the draft list has included review by DPR, OEHHA, two meetings with the SRP, and two public comment periods.
- b: *“An updated estimate of the fiscal and economic impacts of the regulation on all levels of government, consumers, and the regulated community; ...”*
- The Board's identification of substances as TACs has no direct economic impact on private persons, businesses or other governmental entities. Identification alone imposes no direct compliance costs, alters no permit condition and affects no fee.

Once health values have been developed by the OEHHA and endorsed by the SRP for individual formally identified TACs, these substances become candidates for the establishment of control measures. Control measures must be adopted by regulation. If and when a control measure is proposed for a substance, its impact on businesses, and government will be fully assessed by

the ARB and the APCDs in public forums where the need, degree, cost and other impacts of control will be evaluated.

c: *“Changes to the regulation to minimize overlap and conflicts with comparable federal and local regulations, unless the differences in state requirements can be shown to provide additional benefits that exceed the additional costs; and ...”*

- In 1993, AB 2728 modified the TAC Program by requiring that the Board identify the 189 federal HAPs as TACs. The purpose of this change was to eliminate overlap between the state and federal programs.
- On June 18, 1996, the U.S. EPA amended the list of HAPs in Clean Air Act Section 112(b)(1) by removing the substance caprolactam. On December 30, 1996, the ARB received a request from the BASF Corporation to remove caprolactam from the AB 1807 Toxic Air Contaminant List based on U.S. EPA’s removal of the substance. After a review of the available emission inventories, and review of the health information by OEHHA, it was deemed most appropriate to leave caprolactam on the Toxic Air Contaminant List even though it is not currently emitted in California. This decision is based primarily on its noncancer health effects and its potential to be used in the nylon, plastic, or paint and coatings industry in California at some point in the future.
- The ARB will continue to monitor activities of U.S. EPA relating to the list of HAPs and make changes to the Toxic Air Contaminant List when appropriate.

d: *“Changes to the regulation to consider alternative approaches that are less intrusive or more cost effective.”*

- No changes are required at this time.

Appendix A

June 1996 Toxic Air Contaminant List

Appendix B

December 1999 Toxic Air Contaminant List

Appendix C

Prioritization Scheme

Appendix C
ARB Prioritization Scheme
Categories and Point Distribution

	<u>Point distribution</u>
1. IARC/U.S. EPA cancer classifications (The definitions of each IARC or U.S. EPA classification are attached.):	
IARC Group 1 or U.S. EPA Group A	4
IARC Group 2A or U.S. EPA Group B1	3.5
IARC Group 2B or U.S. EPA Group B2	3
IARC Group 3 or U.S. EPA Group C	1
IARC Group 4 or U.S. EPA Group D	0
2. Number of known organ systems affected:	
4 or more	4
3	3
2	2
1 or Unknown	1
No effect on an organ system considered significant	0
3. Cancer unit risk (approved unit risk value) ($\mu\text{g}/\text{m}^3$) ⁻¹ multiplied by California emissions (primarily emissions reported under the AB 2588 “Hot Spots” program were used) ($\mu\text{g}/\text{year}$):	
$\geq 10^{10}$	8
$\geq 10^9$ but $< 10^{10}$	7
$\geq 10^8$ but $< 10^9$	6
$\geq 10^7$ but $< 10^8$	5
$\geq 10^6$ but $< 10^7$	4
$\geq 10^5$ but $< 10^6$	3
$\geq 10^4$ but $< 10^5$	2
$\geq 10^3$	1
No California emissions data or cancer unit risk value	0
4. California emissions divided by chronic Reference Exposure Level:	
$\geq 10^{15}$	4
$\geq 10^{12}$ but $< 10^{15}$	3
$\geq 10^{10}$ but $< 10^{12}$	2
$< 10^{10}$	1
No Reference Exposure Level or California emissions data	0

Appendix C (continued)
ARB Prioritization Scheme
Categories and Point Distribution

5. Chronic, acute, reproductive or developmental toxicity (noncancer effects):		
Substance has 2 of the 3 listed effects		4
Substance has only chronic effects		2
Substance has only acute effects		2
Substance has only reproductive or developmental toxicity effects		2
No noncancer effects known		0
6. Availability of ambient monitoring data:		
6 or more months of monitoring data		4
Less than 6 months of monitoring data or monitoring to begin within 6 months	3	
At least 6 month needed to develop monitoring method		2
At least 1 year needed to develop monitoring method		1
Difficulties in developing monitoring method		0
7. Atmospheric persistence, bioaccumulation, and photochemical generation:		
Substance bioaccumulates/persists in the environment and is photochemically generated		4
Substance bioaccumulates/persists in the environment	3	
Substance is photochemically generated		2
Substance does not bioaccumulate/persist in the environment nor is photochemically generated		0
8. AB 2588 risk assessment considerations:		
<u>Cancer considerations</u>		
Compound drives 50% or more of the cancer risk in:		
Over 5% of the risk assessments		2
3% to 5%		1.5
1% to 2% (or is the driver in at least 1)		1
None		0
Compound contributes to the overall cancer risk in:		
Over 25% of the risk assessments		2
5% to 25%		1.5
1% to 4% (or contributes to at least 1)		1
None		0

Appendix C (continued)
ARB Prioritization Scheme
Categories and Point Distribution

Noncancer considerations

Compound has the highest hazard index in:		
Over 5% of the risk assessments	2	
3% to 5%		1.5
1% to 2% (or has the highest hazard index in at least 1)	1	
None	0	
Compound contributes to the overall noncancer risk in:		
Over 20% of the risk assessments	2	
5% to 20%	1.5	
1% to 4%	1	
None	0	

Attachment
**Explanation of International Agency for Research on Cancer (IARC) and
United States Environmental Protection Agency (U.S. EPA)
Cancer Group Classifications**

IARC

U.S. EPA

Group 1 - Carcinogenic to humans

Group A - Human carcinogen
(sufficient epidemiological evidence)

Group 2A - Probably carcinogenic to humans

Group B1 - Probable human carcinogen
(sufficient animal and limited human evidence)

Group 2B - Possibly carcinogenic to humans

Group B2 - Probable human carcinogen
(sufficient animal and inadequate or no human
evidence)

Group C - Possible human carcinogen
(limited animal and no human evidence)

Group 3 - Unclassifiable as to carcinogenicity
to humans

Group D - Not classifiable as to human carcinogenicity
(insufficient evidence, or no data available, in
animals and humans)

Group 4 - Probably not carcinogenic to humans

Group E - Evidence of non-carcinogenicity for humans

Appendix D

Public Comment Letters from the December 15, 1998 and
January 20, 1999 Comment Periods

Appendix E

Responses to Comments Received During
December 1998-February 1999 Comment Period

Appendix F

Fact Sheets for the Substances Nominated for Review

(excerpted from ARB Report, *Toxic Air Contaminant
Identification List Summaries*, September 1997)

Appendix G

Federal Register Notice on Caprolactam

(61(118)FR30816-30823, June 18, 1996)

Appendix H

U.S. Environmental Protection Agency
*Modifications to the Section 112(b)1
Hazardous Air Pollutants*

Appendix I

December 30, 1996 Letter from
BASF Corporation Regarding Caprolactam

Appendix J

Memorandum from
Office of Environmental Health Hazard Assessment
to ARB on Health Effects of Caprolactam
(January 8, 1998)