BAY AREA AIR QUALITY MANAGEMENT DISTRICT

TOXIC AIR CONTAMINANT CONTROL PROGRAM
ANNUAL REPORT 1998

VOLUME ONE

Toxic air contaminants:

-- Health implications

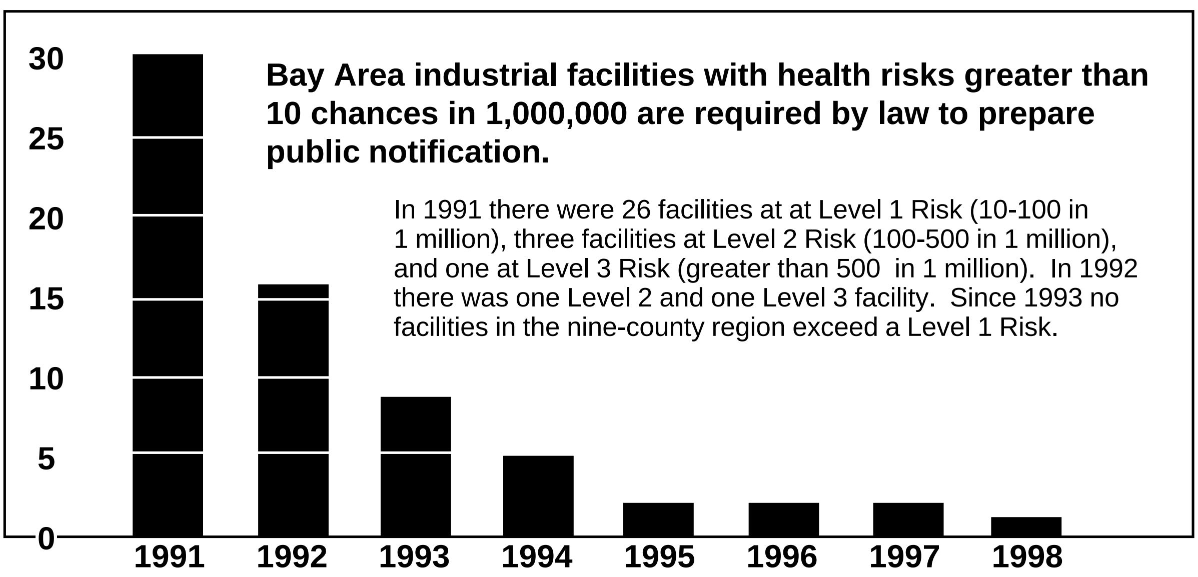
-- How we monitor and control them

-- Progress made toward reducing the public's exposure

About this report...

The 1998 Toxic Air Contaminant Control Program Annual Report is the eighth in a series of reports to the public describing the current state of the Air District's Toxic Air Contaminant Program. In it you will find descriptions of the various aspects of a program that actually started in the mid-1980's when this agency began to monitor the Bay Area for specific airborne compounds that potentially may produce cancer and other chemically-induced adverse health conditions over a lifetime of exposure.

Air Toxics are an ever-increasing public concern as we learn more about their potential to do harm and as industrial mishaps become the staple for front-page headlines and the nightly news. Dire as the consequences of Air Toxics contamination remain, the good news is: *levels of exposure from industrial sources in the Bay Area have radically declined since the program's inception*. Thanks to federal and state laws as implemented in the Air District's control program, the number of facilities with toxic air emissions great enough to warrant public notification on the basis of health risk assessment (a process detailed in this report) has dropped from thirty facilities to a single plant.



Although technical in nature, this report is intended for the public and is easily understood by those who have an interest in the subject.

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The Toxic Air Contaminant Control Program Annual Report is published to provide the public with information regarding the Bay Area Air Quality Management District's programs to reduce ambient concentrations of toxic air contaminants (TACs). The 1998 report summarizes the status of the programs that are used to identify and control ambient levels of TACs from stationary sources, and contains summaries of the TAC emissions inventory and ambient monitoring network for 1998.

Air Toxics New Source Review: New and modified source permit applications have been reviewed for air toxics concerns since 1987, in accordance with the Risk Management Policy approved by the District's Board of Directors. This policy continued in 1998, as District staff completed health risk screening analyses for approximately 200 permit applications.

Air Toxics "Hot Spots" Program: The Air Toxics "Hot Spots" (ATHS) Program involves the evaluation of health risks due to routine TAC emissions from industrial and commercial facilities. The District has established specific public notification measures for various levels of risk identified under the program (Levels 1, 2, and 3). In 1991, the first year of the risk assessment phase of the program, 30 facilities were identified with health risks of Level 1 or greater which triggered public notification requirements. The number of facilities requiring public notification has steadily decreased in recent years as industries continue efforts to reduce emissions and refine estimates of risk. There is currently only one industrial facility in the Bay Area that requires public notification under the ATHS Program as is shown in Table 1. This facility is at Level 1, indicating that the maximum cancer risk resulting from the facility’s emissions is greater than 10 in one million but less than 100 in one million. The notification list does not contain any dry cleaners or gasoline stations, some of which have Level 1 risks, but which are being evaluated in an industrywide risk assessment on a statewide basis.

In addition to public notification requirements, the ATHS Program requires facilities to reduce their health risks below levels determined by the air districts to be significant within a certain timeframe. The District requires mandatory risk reduction measures for facilities with health risks of Level 2 or greater (maximum cancer risks of 100 in one million or greater). Now that all of the perchloroethylene dry cleaning facilities in the Bay Area have complied with mandatory risk reduction requirements established by the District, there are currently no known facilities in the Bay Area that have risks of Level 2 or greater.

Control Measures for Categories of Sources: Eight Air Toxic Control Measures (ATCMs) have been fully implemented in the Bay Area through the State Toxic Air Contaminant Control Program. In the year 2000, a new ATCM for automotive consumer products is expected to be adopted, along with amendments that would significantly strengthen the existing ATCM governing sources of serpentine asbestos. A regulatory needs assessment (that is likely to result in the development new control measures) for diesel engines is also scheduled to be adopted in 2000.

National Emission Standards for Hazardous Air Pollutants (NESHAPs) being developed by U.S. EPA in accordance with Title III of the 1990 federal Clean Air Act Amendments have also become an important source of new air toxics control measures in California. These rules require that emissions be reduced using the Maximum Achievable Control Technology (MACT). Under State law, the District must implement and enforce all MACT Standards, or rules that are at least as stringent. This work will continue as a significant number of new MACT Standards are scheduled for adoption by U.S. EPA over the next several years. Table 2a shows the NESHAPs that have already been adopted or proposed by U.S. EPA under Title III, and Table 2b shows the next group of rules that are scheduled for adoption.

Emissions Inventory: The 1998 emissions inventory continues to show decreasing emissions of many TACs in the Bay Area. The most dramatic emission reductions in recent years have been for certain chlorinated compounds that are used as solvents including 1,1,1-trichloroethane, perchloroethylene, and methylene chloride.

Ambient Monitoring Network: Table 3 contains a summary of average ambient concentrations of TACs measured at monitoring stations in the Bay Area by the District in 1998. Table 4 and Figure 2 show the calculated cancer risks associated with lifetime exposure to average 1998 ambient concentrations of these measured TACs. Of the pollutants for which monitoring data are available, 1,3-butadiene and benzene (which are emitted primarily from motor vehicles) account for over one half of the average calculated cancer risk.

Benzene levels declined dramatically in 1996 with the advent of Phase 2 reformulated gasoline. The use of reformulated gasoline also appears to have led to decreases in ambient 1,3-butadiene levels. Due largely to these observed reductions in ambient benzene and 1,3-butadiene levels, the calculated average cancer risk has been significantly reduced in recent years. Based on 1998 ambient monitoring data, the calculated cancer risk is 199 in one million (about the same as the 1997 figure); this is over 40 percent less than what was observed five years earlier.

The Bay Area Air Quality Management District has had, since 1987, a program to describe, control, and where possible, eliminate public exposure to airborne toxic compounds. This report updates the status of program activities and summarizes data collected during 1998.

The air toxics program is distinct from the District's efforts to control ambient levels of the "criteria" pollutants (e.g., carbon monoxide, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide). Health-based ambient air quality standards have been set for criteria pollutants by the State and federal government. The air toxics program was established as a separate and complementary program designed to evaluate and reduce adverse health effects resulting from exposure to toxic air contaminants (TACs).

The District works to understand and to control both locally elevated concentrations ("Hot Spots") and ambient background concentrations of TACs. This approach is delineated in the program adopted by the District's Board of Directors in November of 1990. The major elements of the District's air toxics program are:

- **Preconstruction review of new and modified sources** for potential health impacts, and the requirement for significant new/modified sources to use the Best Available Control Technology to minimize TAC emissions.

- **The Air Toxics "Hot Spots" Program**, designed to identify industrial and commercial facilities that may result in locally elevated ambient concentrations of toxic air contaminants, to report significant emissions to the affected public, and to reduce significant health risks.

- **Control measures** designed to reduce emissions from categories of sources of TACs, including rules originating from the State Toxic Air Contaminant Act (AB-1807) and the federal Clean Air Act.

- **The toxic air contaminant emissions inventory**, a data base that contains the most recent and accurate information concerning emissions of TACs from permitted stationary sources.

- **Ambient monitoring** of toxic air contaminant concentrations at a number of sites throughout the Bay Area.

This report describes the elements of the District's air toxics program and discusses what changes have occurred during the past year. The Appendices contain the District's 1998 annual air toxics emissions inventory and data from the District's air toxics monitoring network collected in 1998.

The urban background of toxic air contaminants is the combined result of many diverse human activities. In general, the stationary sources for which the District has primary jurisdiction contribute less significantly to health risks than do mobile sources. The District's program therefore focuses not only on reduction strategies for stationary sources, but also on promotion of similar strategies for mobile sources and other types of sources not directly influenced by District regulations and policies.

The District evaluates permit applications for new and modified stationary sources of air pollutants. Since 1987, that review has included an analysis of potential health risks resulting from emissions of TACs, as directed by the Risk Management Policy approved by the District's Board of Directors. The goal of this program is to ensure that the health risks associated with TAC emissions from proposed projects are acceptable. In addition, net health risk benefits are realized when older, more highly polluting sources are replaced with new sources that must meet more stringent control requirements.

The requirements of air toxics new source review are based on the results of Health Risk Assessment (HRA), an analysis that describes the possible adverse health effects which may result from public exposure to routine emissions of toxic air contaminants. These HRAs do not address the possibility of, or adverse health effects resulting from, accidental releases of toxic materials such as a fire or major spill. In California, review of industry's preparation for, and protection from, accidental releases is performed by Certified Unified Program Agencies (CUPA) or Administering Agencies (AA), which are typically local fire or health departments, or local offices of emergency services.

All permit applications for new and modified sources are screened for emissions of TACs. If any TAC is emitted in amounts that exceed specified de minimus levels, an HRA is completed by District staff using computer-modeled estimates of atmospheric dispersion. An HRA may be a conservative screening-level analysis, or a more refined analysis involving the use of various site-specific data (e.g., the use of actual meteorological data).

Where the predicted health risks from a proposed project exceed specified threshold levels, the new/modified source(s) must use the Best Available Control Technology to minimize TAC emissions (TBACT). If the residual health risks, after TBACT is applied, result in risks that exceed significance levels established for the overall acceptability of a project, then other risk reduction measures may be required, or the permit(s) for the proposed source(s) may be denied.

The District completes HRAs for about 200 permit applications each year. For the vast majority of these, the use of emissions control technology and other available risk reduction measures are effective in reducing the health risks associated with a proposed project's emissions to acceptable levels.

AIR TOXICS HOT SPOTS PROGRAM

Assembly Bill 2588, the Air Toxics "Hot Spots" Information and Assessment Act, was enacted by the State legislature in 1987. AB-2588 requires companies throughout California to provide information to the public about emissions of TACs, and the impact that those emissions may have on public health.

There are four steps to implementing the Air Toxics Hot Spots (ATHS) Program established under AB-2588. In the first step, an air toxics emissions inventory is prepared for each facility in the Bay Area that has operating permits from the District. This inventory lists the emissions of TACs from each source based upon information supplied to the District by the affected facility and reviewed by District engineers.

In the second step of the ATHS Program, the District prioritizes facilities for additional scrutiny. The prioritization procedure considers the quantity and toxicity of pollutants emitted, and the proximity of persons that may live or work nearby. Each facility is categorized as high, medium or low priority. High priority facilities are required to prepare an HRA. The fact that a facility has been identified as "high priority" does not necessarily mean that nearby persons are at increased risk from the facility's air emissions. Rather, a designation of "high priority" indicates that the facility emissions need to be analyzed in more detail.

The third step of the ATHS Program provides this additional analysis by means of completion and review of a comprehensive facility-wide HRA. An HRA is an analysis that estimates the probability of adverse health effects that may result from exposure to routine emissions of TACs.

In the fourth step, the ATHS Program requires that exposed persons be notified regarding the results of an HRA if, in the judgment of the District, the calculated risks warrant such notification. Affected facilities are required to notify their neighbors of the results of an HRA through direct mail to households and through public meetings in accordance with notification procedures developed by the District. The District established specific public notification measures for various levels of risk identified under the program (Levels 1, 2, and 3).

The first cycle of the District's ATHS Program was completed in January 1991, with the submission of risk assessment documents by the first group of "high priority" facilities identified during the inventory phase of the program. Of the 123 HRAs submitted, 30 were Level 1 or greater (maximum cancer risks greater than or equal to 10 in one million), and therefore were required to engage in the public notification. In 1992, the number of Level 1 or greater facilities was reduced to 16. Continued efforts to reduce emissions and to refine estimates of risk reduced the number of facilities requiring public notification to nine in 1993, to five in 1994, and to two in 1995. All Level 2 and 3 risks (100 in one million or greater) were reduced to Level 1 or lower by 1993. There is currently only one facility requiring public notification under the ATHS Program in the Bay Area, as is indicated in Table 1.

The ATHS Program requires air districts to maintain their toxics inventories, revising them on at least a quadrennial basis. In the Bay Area, emission inventories are updated annually through the District's ongoing permit renewal process. This annual update is used to re-prioritize all the facilities in the program, thus allowing for identification of any new facilities or significant increases in emissions at existing facilities. In this way, an additional 16 facilities have been identified as “high priority” since the first cycle of health risk assessments were completed in 1991. The HRAs prepared for all of these facilities indicate that the maximum health risks are below the public notification thresholds.

Dry cleaning facilities were removed from the public notification list in 1994. These sources, as well as gasoline dispensing facilities, are currently being evaluated in an “industrywide” HRA on a statewide basis as a part of the ATHS Program. The industrywide HRA completed to date for these facilities indicates that some of these facilities have Level 1 health risks.

In 1992, the ATHS Program was amended with the passage of SB-1731. This legislation requires facilities to implement measures to reduce risks below levels determined by the District to be significant within a certain timeframe. The District requires mandatory risk reduction measures under the authority of SB-1731 for facilities with health risks of Level 2 or greater (maximum cancer risks of 100 in one million or greater). In 1994, the District adopted Regulation 11, Rule 16, Perchloroethylene and Synthetic Solvent Dry Cleaning Operations, which incorporated the risk reduction requirements of SB-1731 for dry cleaners because many of these facilities had been identified as having risks of Level 2 or greater. The risk reduction measures required by this rule have now been fully implemented, and the health risks from all permitted dry cleaners have been reduced to Level 1 or lower. There are currently no facilities in the Bay Area (including dry cleaners and gasoline dispensing facilities) that have been identified as having risks of Level 2 or greater requiring mandatory risk reduction measures under the ATHS Program.

SB-1731 also directed the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) to prepare new risk assessment guidelines for use in the ATHS Program. The guidelines, in several sections, are currently being developed by OEHHA. The sections include guidelines for assessing the impacts of acute and chronic exposures, guidelines for estimating risks due to carcinogens, and guidelines for inclusion of stochastic modeling in risk assessments. The draft documents must receive public review and examination by the Scientific Review Panel before being adopted by OEHHA. The OEHHA risk assessment guideline revisions are expected to be completed during the year 2000.

CONTROL MEASURES FOR CATEGORIES OF SOURCES

The primary mechanism for the development of retrofit air toxics control measures in California has been through the Toxic Air Contaminant Act, which was enacted in 1983 with the passage of AB-1807. Under this legislation, control measures called Airborne Toxic Control Measures (ATCMs) are adopted by the California Air Resources Board (CARB) and implemented and enforced by the local air districts. To date, eight statewide ATCMs have been developed by CARB and implemented in the Bay Area covering the following source categories: chrome plating and anodizing, cooling towers, commercial and hospital sterilizers, medical waste incinerators, paving operations that use serpentine materials, gasoline stations, perchloroethylene dry cleaners, and non-ferrous metal melting operations.

Several TAC control projects are currently being developed by CARB under the authority of AB-1807. A new ATCM for automotive consumer products was recently proposed. This ATCM would require manufacturers of brake cleaning products, carburetor cleaners, and automotive degreasers to remove any perchloroethylene, methylene chloride, and trichloroethylene from these products by the end of 2003. CARB has also recently proposed additional control measures to minimize the public's exposure to airborne asbestos. The proposed revisions to this ATCM include further restrictions on the use of serpentine aggregate for surfacing applications, and dust mitigation measures for construction, grading, and surface mining activities in areas with naturally-occurring asbestos deposits. Another project that is expected to be completed by CARB during the year 2000 is the preparation of an assessment of the need to further control TACs from diesel-fueled engines.

In addition to the ATCMs, another source of new air toxics control measures are the NESHAPs developed by the U.S. EPA. These federal rules are also commonly referred to as MACT Standards, because they reflect the Maximum Achievable Control Technology. A large number of MACT Standards are due to be promulgated on a schedule extending through the year 2000. Table 2a lists the MACT Standards that have been proposed or already adopted by U.S. EPA, and Table 2b lists the remaining MACT Standards scheduled for adoption. The District is required to implement and enforce all MACT Standards, or rules that are at least as stringent. Although the MACT Standards are expected to provide some additional TAC emission reductions in the Bay Area, their benefits are limited because the District has already implemented rules that cover many of the same source categories.

Another source of future air toxics control measures may be the Clean Water Act (CWA), which requires implementation of control actions needed to restore and protect individual waterbodies that do not meet water quality standards. The Regional Water Quality Control Board (RWQCB) has begun evaluating the degree to which air emissions of mercury contribute to pollutant loadings into San Francisco Bay, which has been designated as impaired for this persistent bioaccumulative toxin. It is possible that the RWQCB will determine that control measures to reduce the air emissions of mercury are necessary under the CWA to achieve water quality standards for mercury in the Bay.

The air toxics emissions inventory is a database that contains the most recent and accurate information concerning emissions of TACs from permitted stationary sources in the Bay Area. The inventory includes routine or predictable releases, and is not intended to describe the potential for acute hazards from accidental releases. Information submitted by industry is reviewed for accuracy by District staff prior to inclusion in the inventory. This inventory, and a similar inventory for mobile and area sources compiled by CARB, are used to plan strategies to reduce public exposure to TACs.

The detailed emissions inventory data for 1998 are provided in Volume II of this Report. The data are sorted by county and city (Appendix B-1), and also alphabetically by pollutant (Appendix B-2). These are the District's best estimates of emissions of TACs, based on the information that facilities submitted in their most recent annual update reports that were entered into the District's Data Bank prior to December 31, 1998.

Emission thresholds above which emissions are reported have been established individually for each TAC based on relative toxicity. The reporting thresholds reflect the emission level that is estimated to result in a de minimus level of health risk based on a series of conservative risk assessment assumptions (e.g., lifetime exposure, screening modeling methods, low-level stack release located in close proximity to receptors). For carcinogens, the threshold reporting levels have been set at the emission level that corresponds to a cancer risk of 1 in one million. Non-carcinogen trigger levels represent the amount estimated to result in a hazard index of one.

In recent years, the usage of a number of industrial and commercial solvents has changed due to regulatory controls, and these changes are reflected in the District's emissions inventories. For example, the 1998 emissions of perchloroethylene in the Bay Area are 58 percent less than emissions that were reported five years earlier. These emission reductions reflect the efforts of Bay Area dry cleaners to comply with the District's perchloroethylene dry cleaning rule. Similarly, the emissions of methylene chloride, another heavily regulated solvent, have been reduced by 69 percent over the last five years. Reductions in 1,1,1-trichloroethane (TCA) emissions are even more dramatic over this five year period, with emissions from permitted sources declining 83 percent. The production of TCA was banned on January 1, 1996 under national stratospheric ozone protection regulations.

The emissions of one chlorinated solvent, trichoroethylene (TCE), have increased somewhat in recent years despite being heavily regulated. The 1998 emissions of TCE are 28 percent higher than the emissions that were reported in 1996 (the 1998 emission levels are, however, about the same as the 1993 levels). TCE is a solvent that has been used, to a limited extent, as a substitute for trichloroethane (TCA). The emissions of TCE from permitted sources in the Bay Area remains relatively low, however (e.g., the 1998 emissions of TCE are only about 3 percent of the 1993 emissions of TCA).

AIR TOXICS AMBIENT MONITORING NETWORK

Monitoring is considered the definitive method for establishing ambient pollutant concentrations. One limitation of air monitoring is that it is spatially limited to specific monitoring locations. This problem has been minimized to a great extent in the Bay Area by the operation of an extensive air toxics monitoring network. The locations of the air toxics monitoring sites operating in 1998 are shown in Figure 1.

The air monitoring network operated by the District includes gaseous sampling collected over 24-hour periods on a 12-day sampling frequency. The network began in 1986 with six sites, and has gradually been expanded to its present size of 17 sites. The sampling sites in the network are generally community oriented, and are most directly influenced by areawide sources. The network includes a non-urban background site located at Fort Cronkhite on the Pacific Ocean coastline. The analytical protocol includes the following gaseous compounds: benzene, 1,3-butadiene, carbon tetrachloride, chloroform, ethylene dibromide, ethylene dichloride, methyl tert butyl ether (MTBE), methylene chloride, perchloroethylene, toluene, trichloroethane, trichloroethylene, and vinyl chloride.

The 1998 monitoring data for each individual station in the District's network are presented in Volume II. The data are sorted both by monitoring station (Appendix C-1) and by pollutant (Appendix C-2). The average 1998 TAC concentrations calculated from all of the measurements taken by the BAAQMD in the entire District monitoring network are given in Table 3. [The following data were not included in calculating the 1998 average levels: (1) the Fort Cronkhite background site, (2) one of the two co-located samplers at the San Francisco site, and (3) the Santa Rosa site, for which most of the 1998 data was invalidated due to sampling equipment problems].

CARB also conducts routine air toxics monitoring at five of the District's sites. The monitoring conducted by CARB includes several additional gaseous compounds including formaldehyde, acetaldehyde, and dichlorobenzenes, as well as particulate-based TACs including a number of trace metals and several species of polycyclic aromatic hydrocarbons (PAHs).

Table 4 shows the lifetime cancer risks associated with annual average TAC concentrations measured in the Bay Area for the calendar year 1998. Figure 2 depicts the same data in graphic form. The ambient concentrations used to calculate cancer risk are the average for all sites in the monitoring network (excluding the Fort Cronkhite and Santa Rosa sites). The cancer risks were calculated based on inhalation exposures using the Unit Risk Factors and exposure assumptions included in the <u>Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines</u> (CAPCOA, 1993). All of the carcinogenic TACs measured in the District and CARB monitoring networks are included, except for ethylene dibromide, ethylene dichloride, and vinyl chloride, which were excluded because these compounds were not detected in any of the air samples taken. In calculating average concentrations for other TACs, samples less than the limit of detection (LOD) of the analytical method used were assumed to be equal to one half the LOD concentration.

The calculated cancer risk due to lifetime exposure to average ambient concentrations of TACs measured in the Bay Area in 1998 was 199 in one million, which is nearly the same as what was observed during 1997 (194 in one million). The average cancer risk has decreased in recent years; this same calculation was 212 in one million based on 1996 data, 303 in one million based on 1995 data, 315 in one million based on 1994 data, 339 in one million based on 1993 monitoring data, 342 in one million based on 1992 data, and 356 in one million based on 1991 data.

Of the pollutants for which monitoring data are available, 1,3-butadiene and benzene, which are primarily emitted from mobile sources, contribute most significantly to the inhalation cancer risk. These two pollutants together account for over one half of the total risk. Other pollutants with contributions to the average inhalation cancer risk of two percent or more are carbon tetrachloride, formaldehyde, hexavalent chromium, para-dichlorobenzene and perchloroethylene.

The average ambient levels of benzene dropped significantly in 1996 due to the widespread marketing of Phase 2 reformulated gasoline, which began in the Bay Area in the second quarter of 1996. The average benzene levels for 1998 were about one half of those observed in 1995. A number of control measures already adopted by CARB should provide additional, although more gradual, reductions in mobile source related emissions of benzene and 1,3-butadiene in the future. These include the Low-Emission Vehicle/Clean Fuels (LEV) program and requirements for utility engines and off-road vehicles/engines.

Carbon tetrachloride accounts for about 14 percent of the 1998 average calculated cancer risk. Carbon tetrachloride exists at background levels in the air of about 0.10 to 0.13 parts per billion nearly uniformly on a global basis. It is believed that the emissions from stationary sources have globally accumulated in the atmosphere due to this compound's very long residence time (about 60 years). The production of carbon tetrachloride in the United States was banned beginning in 1996.

Formaldehyde accounts for about seven percent of the 1998 average calculated cancer risk for the Bay Area. Formaldehyde is emitted directly from vehicles and other combustion sources, and is also created during photochemical reactions in the atmosphere. The District-wide average formaldehyde levels for 1998 were similar to those observed in 1997, but were only about two thirds of the average levels observed during 1996 (the highest observed in the Bay Area since the late 1980s).

Hexavalent chromium accounts for about seven percent of the average cancer risk calculated for 1998. The average 1998 levels of hexavalent chromium in the Bay Area were slightly lower than those observed in 1997 and 1996. These observed concentrations are much lower than what had been observed in prior years; for example, the 1998 District-wide average concentration is over 50 percent lower than what it was in 1995. The reason for these decreased hexavalent chromium levels is not known; the levels that exist in the ambient air are clearly much greater than can be accounted for in the District's permitted stationary source inventory. The relatively uniform geographic distribution of ambient hexavalent chromium levels suggests that emissions occur primarily on an areawide, rather than a point source, basis.

Para-dichorobenzene contributes about four percent to the average cancer risk calculated for 1998. Para-dichlorobenzene emissions in the Bay Area are believed to be primarily due to the volatilization of household deodorant products and moth flakes.

Perchloroethylene contributes about three percent to the average cancer risk calculated for 1998. Perchloroethylene emissions are primarily associated with dry cleaning shops, but also occur at automotive repair facilities. The District-wide average perchloroethylene levels for 1998 were slightly lower than those observed in 1997.

There is growing evidence that indicates that exposure to emissions from diesel-fueled engines (about 95 percent of which come from diesel-fueled mobile sources) may result in cancer risks that exceed those attributed to other measured TACs. In 1998, OEHHA issued a health risk assessment that included estimates of the cancer potency of diesel particulate matter (PM). Because diesel PM cannot be directly monitored in the ambient air, however, estimates of cancer risk resulting from diesel PM exposure must be based on concentration estimates made using indirect methods (e.g., derivation from ambient measurements of a surrogate compound). Based an estimates of ambient diesel PM concentration made by CARB, and the "best-estimate" cancer potency factor adopted by OEHHA, the average cancer risk associated with exposure to diesel PM in the Bay Area is about 500 in one million.

One group of pollutants that are not routinely monitored in ambient air are polychlorinated dioxins and furans (generally referred to as "dioxin"). In an effort to improve our understanding of the levels of dioxin in the ambient air in the Bay Area, and their deposition onto land and water surfaces, the District is seeking funding from several other agencies to conduct an ambient dioxin monitoring program.

TABLES & FIGURES

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Table 1. Bay Area Facilities with Health Risks Requiring Public Notification Under the Air Toxics "Hot Spots" Program in 1998

Facility	City	County	Maximum Cancer Risk (Chances in One million)
Level 3 Risks (Greater than 500-in-one-million)			
None	n/a	n/a	n/a
Level 2 Risks (Between 100 and 500-in-one-million)			
None	n/a	n/a	n/a
Level 1 Risks (Between 10 and 100-in-one-million)			
Dow Chemical Company	Pittsburg	Contra Costa	14

NOTES:

This table summarizes the facilities currently requiring public notification under the Air Toxics "Hot Spots" (ATHS) Program (AB-2588) in the Bay Area. Dry cleaners and gasoline stations are not included on this list because both of these source categories are currently being evaluated in an industrywide health risk assessment under the ATHS Program.

Public notification requirements under the ATHS Program are based on the health risks associated with a facility's routine toxic air contaminant (TAC) emissions as determined in a Health Risk Assessment. The "individual cancer risk" is the likelihood that a person exposed to concentrations of TACs from a facility over a 70-year lifetime will contract cancer, based on the use of standard risk assessment methodology established for AB-2588. These cancer risks are based on "best estimates" of plausible cancer potencies, as determined by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA). The actual degree of risk cannot be determined, and may approach zero. The individual cancer risk at the location of the maximum exposed individual (MEI) is given. The cancer risk at other locations near the facility may be substantially lower.

Table 2a. MACT Standards Adopted or Proposed Under Title III of the 1990 Amendments to the Federal Clean Air Act

Source Category	Type of Facility Affected
ADOPTED STANDARDS	
Acetal Resins Production	Major
Acrylic Fibers/Modacrylic Fibers Production	Major
Acrylonitrile-Budadiene-Styrene Production	Major
Aerospace Industries	Major
Amino Resins Production	Major
Chromium Electroplating and Anodizing	Area
Coke Oven Batteries (Charging, Top Side, and Door Leaks)	Major
Commercial Sterilization Facilities	Area
Epichlorohydrin Elastomers Production	Major
Epoxy Resins Production	Major
Ethylene-Propylene Rubber Production	Major
Ferroalloys Production	Major
Flexible Polyurethane Foam Production	Major
Gasoline Distribution (Stage I)	Major
Halogenated Solvent Cleaners	Area
Hydrogen Fluoride Production	Major
Hypalon ™ Production	Major
Industrial Process Cooling Towers	Major
Magnetic Tape Manufacturing	Major
Marine Vessel Loading Operations	Major
Methyl Methacrylate- Butadiene-Styrene Terpolymers Production	Major
Methyl Methacrylate-Acrylonitrile-Butadiene-Styrene Production	Major
Mineral Wool Production	Major
Natural Gas Transmission and Storage	Major
Neoprene Production	Major
Nitrile Budadiene Rubber Production	Major
Non-Nylon Polyamides Production	Major
(continued)	

Table 2a. MACT Standards Adopted or Proposed Under Title III of the 1990 Amendments to the Federal Clean Air Act (cont.)

Source Category	Type of Facility Affected
Off-Site Waste and Recovery Operations	Major
Oil and Natural Gas Production	Major
Perchloroethylene Dry Cleaning	Area
Pesticide Active Ingredient Production	Major
Petroleum Refineries	Major
Pharmaceuticals Production	Major
Phenolic Resins Production	Major
Phosphoric Acid/Phosphate Fertilizer Production	Major
Polybutadiene Rubber Production	Major
Polycarbonates Production	Major
Polyether Polyols Production	Major
Polyethylene Terephthalate Production	Major
Polystyrene Production	Major
Polysulfide Rubber Production	Major
Portland Cement Manufacturing	Major
Primary Aluminum Production	Major
Primary Lead Smelting	Major
Printing and Publishing	Major
Publicly Owned Treatment Works	Major
Pulp and Paper Production (Non-combustion)	Major
Secondary Aluminum Production	Major
Secondary Lead Smelting	Area
Shipbuilding and Ship Repair (Surface Coating)	Major
Steel Pickling Facilities and Hydrochloric Acid Regeneration Plants	Major
Styrene-Acrylonitrile Production	Major
Styrene-Butadiene Rubber and Latex Production	Major
Synthetic Organic Chemical Manufacturing	Major
Tetrahydrobenzaldehyde Production	Major
(continued)	

Table 2a. MACT Standards Adopted or Proposed Under Title III of the 1990 Amendments to the Federal Clean Air Act (cont.)

Source Category	Type of Facility Affected
Wood Furniture Manufacturing	Major
Wool Fiberglass Manufacturing	Major
PROPOSED STANDARDS	
Nutritional Yeast Manufacturing	Major
Petroleum Refineries (3 Vents)	Major
Primary Copper Smelting	Major
Pulp and Paper Production (Combustion)	Major

NOTES:

This table lists the MACT Standards that are adopted, or that have been proposed, by U.S. EPA under Section 112(d) of the 1990 Amendments of the Clean Air Act as of December 28, 1999. "Major" means the MACT Standard applies only to major sources of hazardous air pollutants (HAPs). A major source of HAPs is a facility that emits, or has the potential to emit considering controls, 10 tons per year or more of any individual HAP or 25 tons per year or more of any combination of HAPs. "Area" means the rule applies to both major sources of HAPs and area sources as well (i.e., facilities with HAP emissions below the major source thresholds). Area sources are subject to MACT Standard if U.S. EPA makes a finding that emissions from affected area sources present a threat of adverse effects to human health or the environment.

Table 2b. 10-Year MACT Standards to be Adopted Under Title III of the 1990 Amendments to the Federal Clean Air Act

Source Category	Type of Facility Affected
Alkyd Resins Production	Major
Alumina Processing	Major
Ammonium Sulfate Production-Caprolactam By-Product Plants	Major
Asphalt Concrete Manufacturing	Major
Asphalt Processing	Major
Asphalt Roofing Manufacturing	Major
Asphalt/Coal Tar Application-Metal Pipes	Major
Auto and Light Duty Truck (Surface Coating)	Major
Benzyltrimethylammonium Production	Major
Boat Manufacturing	Major
Carbon Black Production	Major
Carbonyl Sulfide Production	Major
Carboxymethylcellulose Production	Major
Cellophane Production	Major
Cellulose Ethers Production	Major
Cellulose Food Casing and Sponge Manufacturing	Major
Chelating Agents Production	Major
Chlorinated Paraffins Production	Major
Chlorine Production	Major
Clay Products Manufacturing	Major
Coke By-Product Plants	Major
Coke Ovens (Pushing, Quenching, and Battery Stacks)	Major
Combustion Turbines	Major
Cyanide Chemicals Manufacturing	Major
Dry Cleaning (Petroleum Solvent)	Major
Engine Test Facilities	Major
Ethylene Processes	Major
Ethylidene Norbornene Production	Major
(continued)	

Table 2b. 10-Year MACT Standards to be Adopted Under Title III of the 1990 Amendments to the Federal Clean Air Act (cont.)

Source Category	Type of Facility Affected
Explosives Production	Major
Flexible Polyurethane Foam Fabrication Operations	Major
Friction Products Manufacturing	Major
Fumed Silica Production	Major
Hydrazine Production	Major
Hydrochloric Acid Production	Major
Industrial, Institutional and Commercial Boilers	Major
Integrated Iron and Steel Manufacturing	Major
Large Appliance (Surface Coating)	Major
Leather Tanning and Finishing Operations	Major
Lime Manufacturing	Major
Maleic Anhydride Copolymers Production	Major
Manufacture of Paints, Coatings, and Adhesives	Major
Metal Can and Coil (Surface Coating)	Major
Metal Furniture (Surface Coating)	Major
Methylcellulose Production	Major
Miscellaneous Metal Parts Products (Surface Coating)	Major
Municipal Landfills	Major
OBPA/1,3-Diisocyanate Production	Major
Organic Liquids Distribution (Non-Gasoline)	Major
Paint Stripping Operations	Major
Paper and Other Webs (Surface Coating)	Major
Photographic Chemicals Production	Major
Phthalate Plasticizers Production	Major
Plastic Parts and Products (Surface Coating)	Major
Plywood and Composite Wood Products	Major
Polyester Resins Production	Major
Polymerized Vinylidene Chloride Production	Major
(continued)	

Table 2b. 10-Year MACT Standards to be Adopted Under Title III of the 1990 Amendments to the Federal Clean Air Act (cont.)

Source Category	Type of Facility Affected
Polymethyl Methacrylate Resins Production	Major
Polyvinyl Acetate Emulsions Production	Major
Polyvinyl Alcohol and Polyvinyl Butyral Production	Major
Polyvinyl Chloride and Copolymers Production	Major
Primary Copper Smelting	Major
Primary Magnesium Refining	Major
Printing, Coating, and Dyeing of Fabrics	Major
Process Heaters	Major
Quaternary Ammonium Compounds Production	Major
Rayon and Spandex Production	Major
Reciprocating Internal Combustion Engines	Major
Refractories Manufacturing	Major
Reinforced Plastic Composites Production	Major
Rocket Testing Facilities	Major
Rubber Chemicals Manufacturing	Major
Rubber Tire Manufacturing	Major
Semiconductor Manufacturing	Major
Sewage Sludge Incineration	Major
Site Remediation	Major
Iron and Steel Foundries	Major
Symmetrical Tetrachloropyridine Production	Major
Taconite Iron Ore Processing	Major
Uranium Hexafluoride Production	Major
Vegetable Oil Production	Major
Waste Treatment and Disposal: Hazardous Waste Incineration	Major
Wood Building Products (Surface Coating)	Major

NOTES:

This table lists the MACT Standards that are scheduled for adoption by U.S. EPA under Section 112(d) of the 1990 Amendments of the Clean Air Act by November 15, 2000 (the so-called "10-year standards"), and which have not been finalized as of December 28, 1999.

Table 3. Summary of 1998 BAAQMD Ambient Air Toxics Monitoring Data

Compound	LOD[1] (ppb)	% of Samples < LOD[2]	Maximum Conc.[3] (ppb)	Minimum Conc.[4] (ppb)	Mean Conc.[5] (ppb)
Benzene	0.10	0	2.80	0.10	0.62
1,3-Butadiene	0.30	43	1.20	<0.30	0.35
Chloroform	0.02	95	0.16	<0.02	0.01
Carbon Tetrachloride	0.01	0	0.54	0.09	0.10
Ethylene Dibromide	0.02	100	<0.02	<0.02	0.01
Ethylene Dichloride	0.10	100	<0.10	<0.10	0.05
Methyl Tert Butyl Ether	0.50	15	9.00	<0.50	1.41
Methylene Chloride	0.50	71	13.1	<0.50	0.45
Perchloroethylene	0.01	0	8.42	0.01	0.15
Toluene	0.20	0	7.60	0.20	1.65
1,1,1,-Trichloroethane	0.05	0	2.29	0.05	0.12
Trichloroethylene	0.08	94	0.22	<0.08	0.05
Vinyl Chloride	0.30	100	<0.30	<0.30	0.15

NOTES:

This table summarizes the results of the BAAQMD gaseous toxic air contaminant monitoring network for the year 1998. Data from the Fort Cronkhite "clean-air" background site, one of the two co-located samplers in San Francisco, and the Santa Rosa site (75 percent of 1998 data invalidated due to sampling equipment problems) were not included.

(1) "LOD" is the limit of detection of the analytical method used.
(2) "% of samples < LOD" is the percent of the total number of air samples collected in 1998 that had pollutant concentrations less than the LOD.
(3) "Maximum Conc." is the highest daily concentration measured at any of the 16 monitoring sites.
(4) "Minimum Conc." is the lowest daily concentration measured at any of the 16 monitoring sites.
(5) "Mean Conc." is the arithmetic average of the air samples collected in 1998 at the 16 monitoring sites. In calculating the mean, samples with concentrations less than the LOD were assumed to be equal to one half the LOD concentration.

Table 4. Cancer Risk Due to Average Ambient Concentrations of Toxic Air Contaminants Measured in the Bay Area in 1998

Gaseous TACs	Concentration		Unit Risk	Cancer Risk
	ppb	µg/m³	(µg/m³)⁻¹	Chances in one million
1,3-Butadiene[2,4]	0.17	0.39	1.7E-04	65.7
Benzene[1]	0.62	2.00	2.9E-05	58.1
Carbon Tetrachloride[1]	0.10	0.65	4.2E-05	27.2
Formaldehyde[2]	1.79	2.24	6.0E-06	13.4
p-Dichlorobenzene[2,6]	0.11	0.68	1.1E-05	7.4
Perchloroethylene[1,3]	0.15	1.04	5.9E-06	6.1
Acetaldehyde[2]	0.66	1.21	2.7E-06	3.3
Methylene Chloride[1]	0.45	1.61	1.0E-06	1.6
Chloroform[1]	0.01	0.06	5.3E-06	0.3
Trichloroethylene[2,4]	0.02	0.12	2.0E-06	0.2
Particulate TACs	**ng/m³**	**µg/m³**	**(µg/m³)⁻¹**	**Chances in one million**
Chromium (hexavalent)[2]	0.10	1.03E-04	1.40E-01	14.4
PAHs[2,5]	0.11	1.10E-04	1.70E-03	0.2
Nickel[2]	3.04	3.04E-03	2.60E-04	0.8
Total for all TACs				**199**

NOTES:

This table summarizes the cancer risks associated with exposure to average ambient (outdoor) toxic air contaminant (TAC) levels measured at a number of sites in the Bay Area during 1998. Cancer risks are calculated for the inhalation pathway using the Unit Risk Factors given in the CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, and assuming 70-year continuous exposure. Risks are calculated for the carcinogenic TACs for which routine sampling was performed by the BAAQMD or CARB in 1998, except for ethylene dibromide, ethylene dichloride, and vinyl chloride, which were excluded because none of these were detected in any of the air samples taken. In calculating average concentrations, samples less than the limit of detection (LOD) were assumed to be equal to one half the LOD concentration.

(1) The concentration used is the mean of all daily samples taken for the BAAQMD network in 1998, excluding those taken at: (1) the Fort Cronkhite "clean air" background site, (2) one of the two co-located samplers in San Francisco, and (3) the Santa Rosa site which had 75 percent of it's data for the year invalidated due to sampling equipment problems.
(2) The concentration used is the mean of all daily samples taken for the five Bay Area sites in the CARB network in 1998.
(3) The mean perchloroethylene concentration is heavily influenced by a single site, San Rafael, which is located in close proximity to a dry cleaning shop and which had an annual concentration of 1.1 ppb. The mean network concentration, excluding the San Rafael site is 0.08 ppb (cancer risk of 3.3 in one million).
(4) CARB data are used for this TAC because an analytical method with a lower LOD was used by CARB.
(5) The PAH concentration represents the sum of the following species collected as PM10: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.
(6) CARB p-dichlorobenzene data only available through the end of May 1998.

Figure 1. Bay Area Ambient Air Toxics Monitoring Network

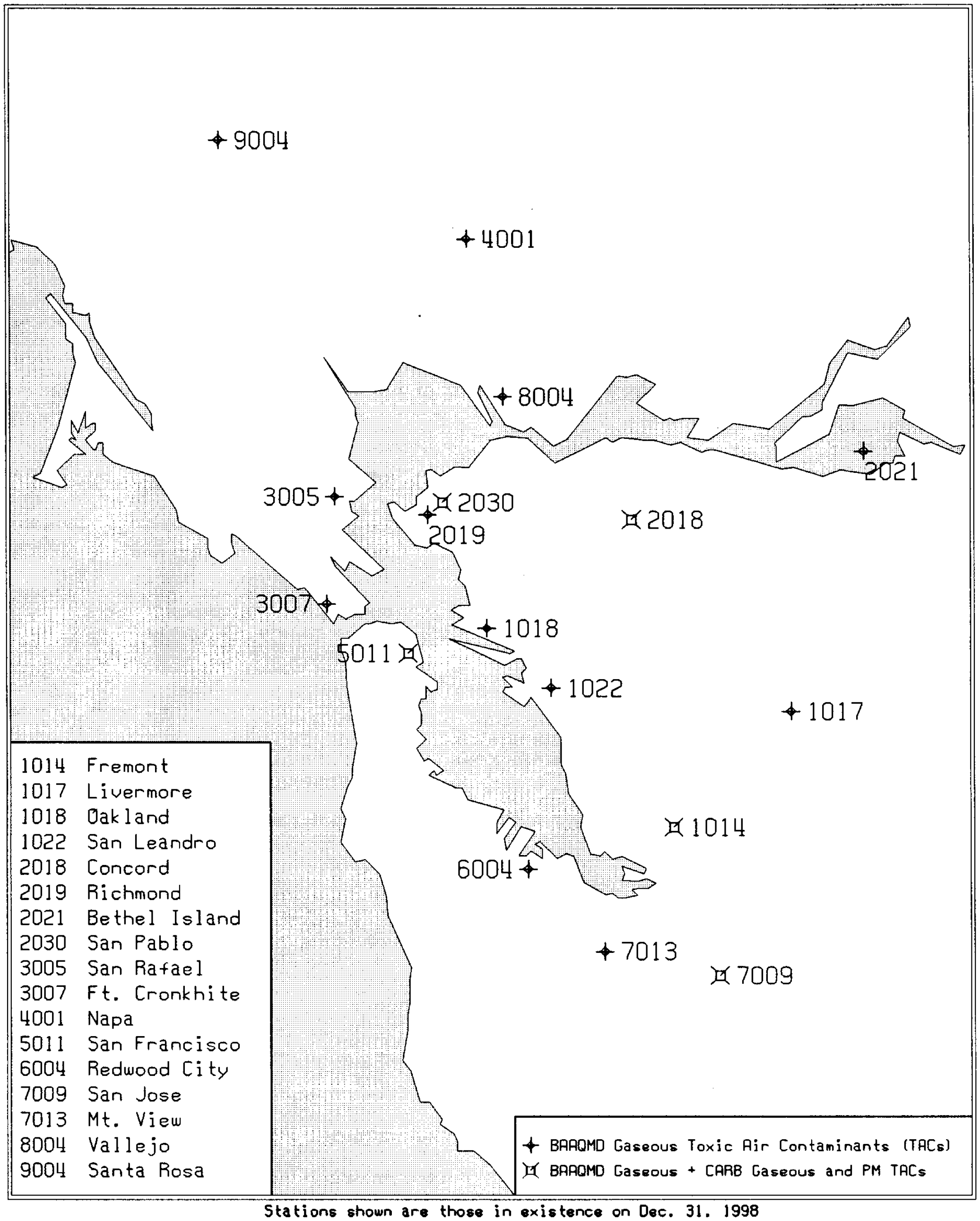
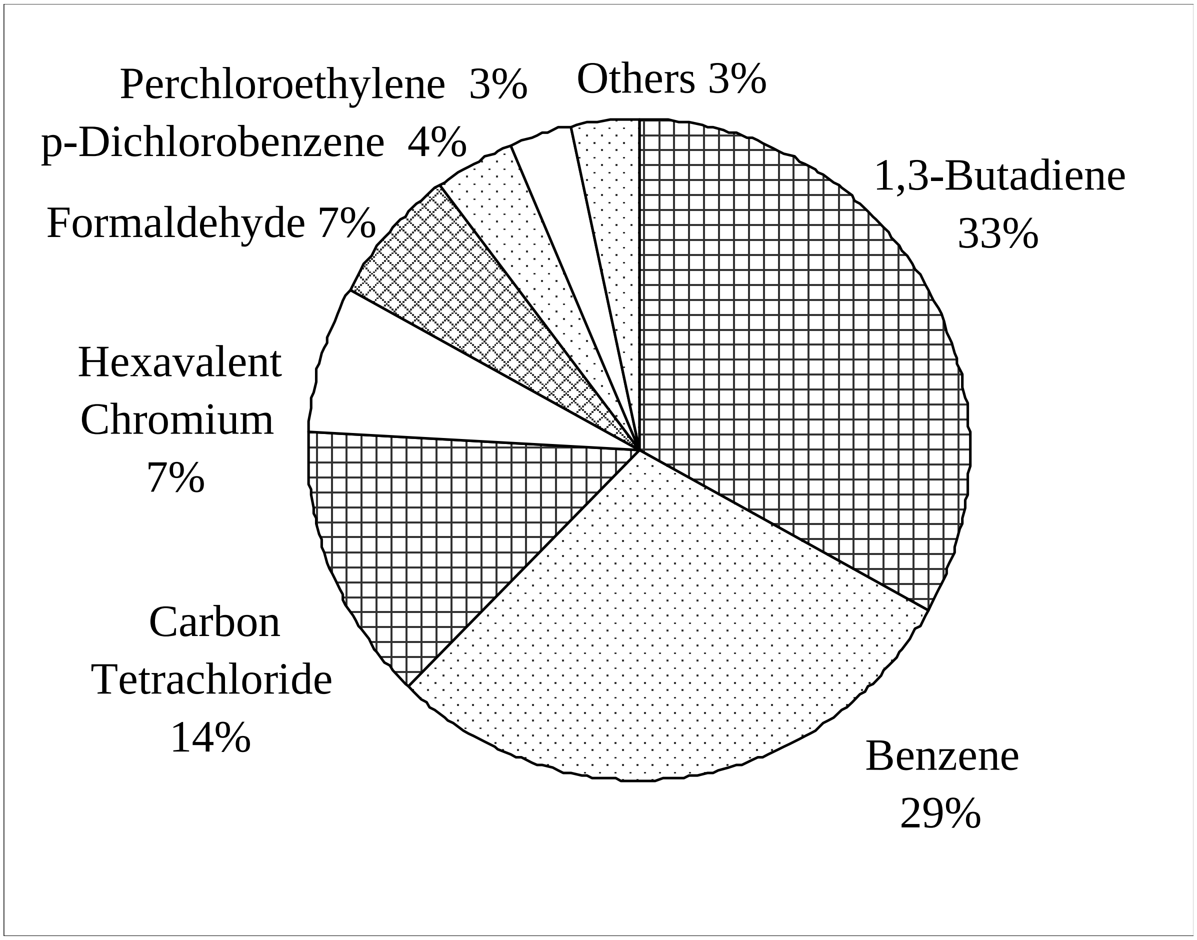


Figure 2. Pollutant Contribution to Cancer Risk Due to Average Ambient Concentrations of Toxic Air Contaminants Measured in the Bay Area in 1998



NOTES:

This chart summarizes the pollutant contribution to the cancer risk associated with inhalation exposure to average ambient toxic air contaminant levels measured at a number of sites in the Bay Area during 1998, based on data provided in Table 4. Cancer risks are calculated for the inhalation pathway using the Unit Risk Factors given in the CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, and assuming 70-year continuous exposure. The total average cancer risk for all of the measured TACs was 199 in one million for the inhalation pathway. "Others" are acetaldehyde, chloroform, methylene chloride, nickel, PAHs, and trichloroethylene.