BAY AREA

2000 CLEAN AIR PLAN

and Triennial Assessment

Adopted by the Board of Directors

December 20, 2000

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

939 Ellis Street
San Francisco, CA 94109
(415) 771-6000
Fax: (415) 749-4741
www.baaqmd.gov

TABLE OF CONTENTS

TABLES AND FIGURES

TABLE

FIGURE

ATTACHMENTS

Introduction

This is the Bay Area Air Quality Management District's (herein "District" or "BAAQMD") triennial assessment of and revision to the Bay Area *Clean Air Plan (CAP)*, as required by State law. The goal of the CAP is to reduce emissions of certain air pollutants – Reactive Organic Gases (ROG) and Nitrogen Oxides (NOx) – that lead to the formation of ozone, or "smog", in the lower atmosphere.

Ozone is a strong oxidizing agent with the potential to damage living and inanimate things with which it comes in contact. When present in the lower atmosphere, even at low concentrations, ozone is harmful to human health and property. Impaired respiratory function and cardiac stress are the most common health impacts of ozone pollution, but ozone also impairs the body's immune system. Children are most at risk from exposure to ozone because they are active outside, playing and exercising, during the summertime when ozone levels are at their highest. Adults who are outdoors and moderately active during the summer months, such as construction workers and other outdoor workers, are also among those most at risk. These individuals, as well as those with respiratory illnesses, such as asthma, can experience a reduction in lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during periods of moderate exertion.

At harmful levels, ozone aggravates asthma, emphysema and bronchitis and leads to increased hospital admissions and emergency room visits. Healthy adults may experience symptoms of impaired respiratory function and cardiac stress during periods of intense exercise. There is new evidence of chronic effects from long-term exposure. Repeated exposure to ozone can make people more susceptible to respiratory infection and lung inflammation, and can aggravate preexisting respiratory diseases. Long-term exposures to ozone can cause repeated inflammation of the lung, impairment of lung defense mechanisms, and irreversible changes in lung structure, which could lead to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis. Ozone also damages trees and other natural vegetation, reduces agricultural productivity, reduces visibility and causes or accelerates deterioration of building materials, surface coatings, rubber, plastic products and textiles.

The California Air Resources Board (ARB) has established a state, health-based air quality standard for ozone and determined which areas in the state do not comply with the standard. The ARB set the ozone standard at a level of 9 parts per hundred million (pphm) for a one-hour average, significantly more stringent than the national standard of 12 pphm. Under the California Clean Air Act of 1988 (CCAA), areas not complying with the standard – and no major metropolitan area in the state complies with the standard – must prepare plans to reduce ozone. The CAP was originally adopted in 1991 to satisfy this requirement. This update is the third triennial update to the CAP. Prior updates were completed in 1994 and 1997. The update focuses on near term (three years) actions that can be taken to reduce ozone precursor emissions. A comprehensive revision is anticipated in 2003, utilizing the results of major air quality studies currently underway (e.g., Central California Ozone Study).

Since 1991, control measures in the CAP have served as the blueprint for the development of District regulations intended to reduce emissions of ozone precursors. However, the District began adopting its now extensive ozone precursor regulations in 1967 under air pollution laws that predated the CCAA. Most CAP control measures are implemented through amendments to the existing regulations or through new District regulations. Each update to the CAP adds new control measures and deletes some existing control measures that have not yet been implemented. Deletion of a measure from the CAP only means that a regulation or regulation change that was proposed has been determined to be infeasible for any of a number of reasons. Addition of a new measure does not immediately add a new regulation to the District's body of regulations. Instead, regulations that implement CAP measures must go through a

public review process required by state law before they can be adopted by the District's Board of Directors. Each CAP control measure has a proposed regulation adoption date and implementation date.

The District — the state's first regional air pollution agency — was created by the California Legislature in 1955. Its jurisdiction encompasses all of seven counties—Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara and Napa, and portions of two others—southwestern Solano and southern Sonoma. The District is governed by a 20-member Board of Directors, made up of elected officials apportioned according to the population of the represented counties. The Board has the authority to develop and enforce regulations for the control of air pollution within its jurisdiction.

Legal Requirements

This CAP update is prepared and submitted to the ARB to comply with all applicable requirements of the California Clean Air Act (CCAA) of 1988 and subsequent amendments. The Act requires specific content and schedules for the CAP. Section 40925 of the Health and Safety Code requires an update to the CAP every three years, including:

- Review of the control strategy to ensure the plan contains "all feasible measures" (see *Control Strategy*)
- Incorporation of available new data and analysis (e.g., significant changes in emission inventory, see *Sources of Air Pollution*)

Section 40924 of the Health and Safety Code requires that the triennial plan revision also incorporate a triennial progress report, including:

- Assessment of air quality improvement (see *Ozone Trends*)
- Estimate of emission reductions from control measures adopted in the preceding three year period (see *Adopted Control Measures for Ozone*)

The District continues to comply with all legal requirements outlined in the CCAA. The 2000 CAP serves as the triennial plan revision and progress report.

Organization / Contents of this Document

The CAP update consists of the following sections: (1) Sources of Air Pollution, (2) Ozone Trends, (3) Particulate Matter, (4) Adopted Control Measures for Ozone – which detail progress made on implementing stationary, area, mobile source and transportation control measures since the *1997 Clean Air Plan* was adopted, and (5) Control Strategy – which specifies a schedule for District Board of Directors' consideration of CAP control measures for 2001 - 2003. The ozone trends and adopted control measures sections constitute the triennial assessment, and the control strategy for 2001 - 2003 constitutes the triennial revision. Other sections of the update discuss future air quality planning. The *1997 Clean Air Plan* provides additional information about how the District has complied with the California Clean Air Act. With this update, the District continues to meet all requirements of the California Clean Air Act, as amended.

Sources of Air Pollution

The source inventory summary in Table 1 provides the estimated emissions of ozone precursors (ROG and NOx) and particulate matter (PM_{10}) for past and future years. Figures 1 and 2 provide estimates of current ROG and NO_x emissions by major categories. The inventory projections are based on expected

Table 1
Bay Area Baseline [1] Emission Inventory Projections : 1990 - 2006
Planning Inventory [2] (Tons/Day) [3]

Source Category	Reactive Organic Gases [4]					Oxides of Nitrogen [5]					Particulate Matter (PM_{10}) [6,7]				
	1990	1997	2000	2003	2006	1990	1997	2000	2003	2006	1990	1997	2000	2003	2006
Industrial/Commercial Processes															
Petroleum Refining Facilities	18	16	13	14	14	3	2	1	1	1	1	1	1	1	1
Chemical Manufacturing Facilities	3	3	2	2	2	2	2	2	2	2	1	1	1	1	1
Other Industrial/Commercial Processes	14	13	11	10	10	2	1	1	1	1	15	13	14	14	15
Petroleum Products/Solvent Evaporation															
Petroleum Refinery Evaporation	10	10	6	6	6	---	---	---	---	---	---	---	---	---	---
Fuels Distribution	32	44	41	39	37	---	---	---	---	---	---	---	---	---	---
Other Organic Compounds Evaporation	118	90	89	89	89	---	---	---	---	---	---	---	---	---	---
Combustion - Stationary Sources															
Fuels Combustion	5	4	5	5	5	141	105	86	56	55	39	40	40	41	42
Burning of Waste Material	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
Banked Emissions [8]	0	0	10	10	10	0	0	8	8	8	0	0	1	1	1
Alternative Compliance Allowance [9]	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0
Sub-Total (District Jurisdiction)	200	181	178	175	176	148	111	101	70	70	58	57	59	61	62
Combustion - Mobile Sources															
On-Road Motor Vehicles(ARB Jurisdiction)	428	282	243	210	176	388	288	272	240	207	12	9	9	9	9
Other Mobile Sources (ARB/Federal Jur.)	75	75	70	62	54	198	181	177	167	154	10	9	9	9	9
Aircraft(Federal Jurisdiction)	11	10	11	11	12	16	19	21	23	25	3	2	2	2	3
Consumer Products and Other Sources	58	53	49	49	49	---	---	---	---	---	84	96	96	100	103
GRAND TOTAL	**772**	**600**	**551**	**507**	**467**	**751**	**598**	**571**	**500**	**456**	**167**	**173**	**175**	**180**	**185**

1 Inventory and projections assume implementation of all control measures adopted as of December 31, 1999.

2 The planning inventory represents average seasonal operating day emissions.

3 Entries are rounded to nearest whole number, totals may not equal to sums of column entries.

4 Photochemically reactive organic compounds for average summer day; excludes methane and other non-reactives, and excludes biogenic emissions (est. 300 tons/day).

5 Oxides of nitrogen (nitric oxide and/or nitrogen dioxide), NOx as NO2, for average summer day.

6 Particulate matter emissions (PM_{10}) for average winter day.

7 PM_{10} emissions reported under "Other Sources" include entrained road dust, construction and farming operations and wind blown dust.

8 Banked Emissions show the total current deposits in the District's emissions banking program as allowed by BAAQMD Regulation 2, Rules 2 and 4. These emissions were reduced (beyond regulations) and banked, but may be withdrawn from the bank and emitted in future years.

9 Surplus emissions, voluntarily reduced, available for alternative compliance with BARCT requirements of selected rules, as prescribed by State law and BAAQMD Regulation 2, Rule 9.

FIGURE 1
2000 Summer Emissions: Ozone Precursors
Reactive Organic Gases (ROG)
551 tons/day

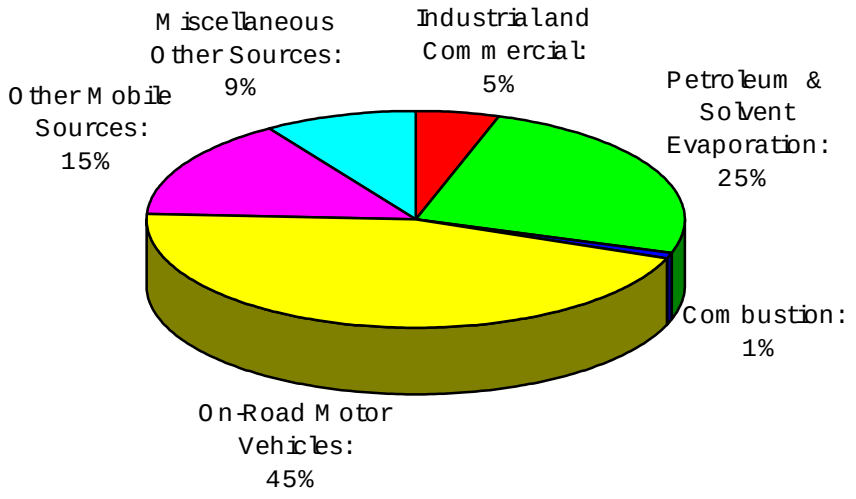
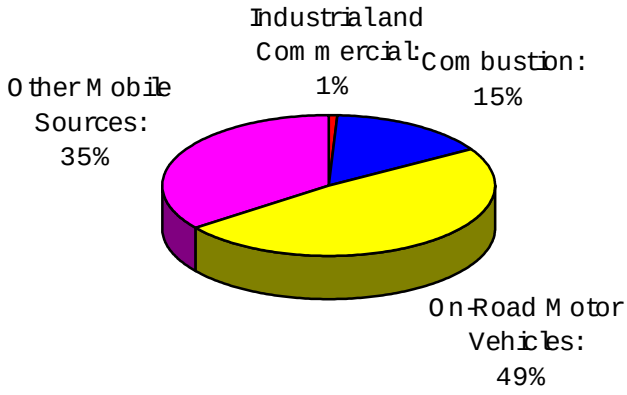


FIGURE 2
2000 Summer Emissions: Ozone Precursors
Oxides of Nitrogen (NOx)
571 tons/day



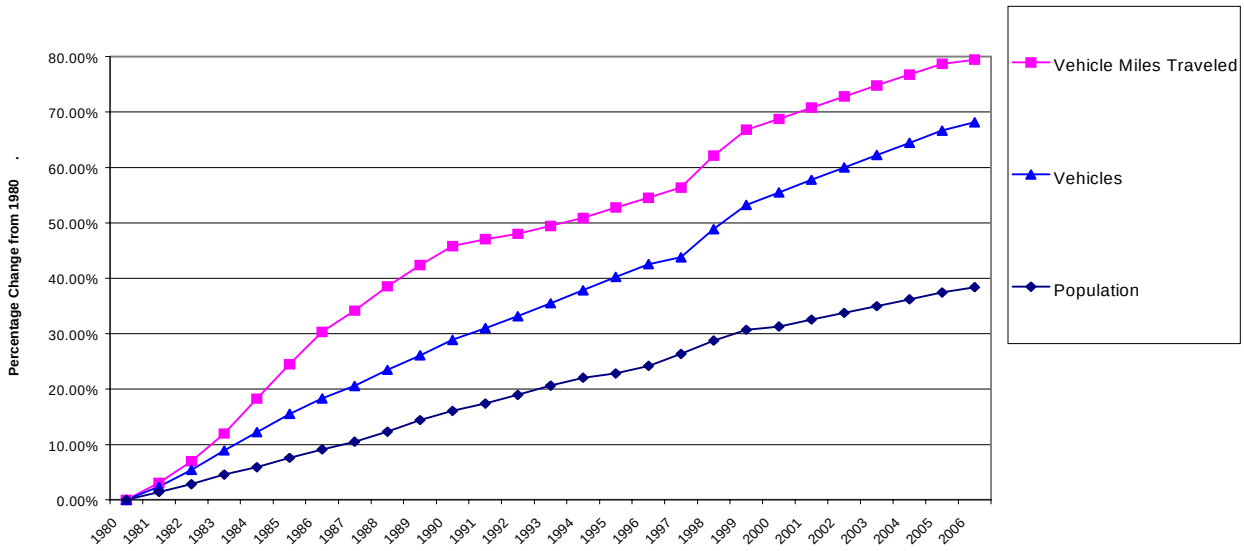
growth rates in population, employment, industrial/commercial activity, travel and energy use and also take into account the effect of all control measures adopted as of December 31, 1999. They do not include the control measures proposed in the 2000 CAP.

Some sources of air pollution are measured directly, but most are estimated, based on source characteristics, throughput rates, partial sampling, and scientific or engineering calculations. The source inventory in this plan, as in the previous iterations of the *Clean Air Plan*, is a planning inventory, a compilation of best estimates of emissions from a vast array of sources of air pollution. This planning inventory, though prepared with best available data and procedures, is not intended to be a precise record of the emissions from each individual source in the Bay Area.

The emission inventory in Table 1 includes a new entry, entitled Alternative Compliance Allowance, in the "Source Category" column. Previous CAP inventories have not included this category. It is included to comply with provisions of state law and corresponding District regulations regarding interchangeable emission reduction credits. Facilities subject to certain District NOx control requirements (e.g. Valero, Martinez Refining Company, Pacific Gas and Electric) have voluntarily reduced emissions from certain sources beyond regulatory requirements. Those emission reductions, if found to be surplus, may be claimed by the companies as emission reduction credits, as long as the District does not rely on the reductions in its air quality plans. Several companies have requested that the District not rely on these voluntary reductions so that they may claim the credits. The Alternative Compliance Allowance in the planning inventory makes it clear that the District is not relying on these voluntary reductions to achieve the goals of the CAP. Note that facilities must still apply for and be granted interchangeable emission reduction credits (IERCs) per requirements of Regulation 2, Rule 9. Inclusion of the Alternative Compliance Allowance does not imply or guarantee approval of an application for IERCs.

Motor vehicle emission calculations include consideration of the fleet mix (vehicle type, model year, and accumulated mileage), miles traveled, ambient temperatures, vehicle speeds, and vehicle emission factors, as developed from comprehensive ARB testing programs. The on-road motor vehicle emission estimates in this plan are based on the latest available emissions model from ARB, EMFAC2000 – Version 2.01. Figure 3 illustrates both historic and projected growth in the Bay Area's population, vehicles and vehicle miles traveled (VMT) over the 1980 – 2006 period. Growth rates of both the number of vehicles and VMT have outpaced the population growth rate, and are projected to continue to do so. The large percentage gain in VMT can be attributed to a greater share of the region's population commuting suburb-to-suburb, with a related decline in mass transit's share of total travel. In spite of growing VMT, total on-road vehicle emissions will decline significantly in future years, due to new control technologies, cleaner fuels, and fleet turnover. But the full potential of technology-based controls is eroded by increasing VMT.

Figure 3: Growth in Population, Vehicles and Vehicle Miles Traveled



Sources:
1980 - 1999 Population - California Dept. of Finance.
2000 - 2006 Population - interpolated from Projections '98, Association of Bay Area Governments.
Vehicles - EMFAC2000, California Air Resources Board.
Vehicle Miles Traveled - EMFAC2000, California Air Resources Board.

Compared with previously-published inventories, the emissions estimates shown in this Plan have shifted for all years – past, present and future – due to methodology changes (improvements in test data and calculation procedures). The estimates for Reactive Organic Gases (ROG) are higher than the previous estimates shown in the '97 CAP. As mentioned in the '97 CAP (Page 4), it was believed at that time that ROG emissions from on-road motor vehicles were underestimated. The increases shown in the ROG emissions in Table 1 are based on the latest vehicle test results and improved modeling techniques.

The inventory for off-road mobile sources, including utility, construction, commercial and agricultural equipment, is based on ARB's OFF-ROAD model results. These too produce an increase in the estimates for ROG emissions, due to a major revision to the inventory procedures.

Our estimates of fuels distribution emissions have also increased, reflecting maintenance problems with some gasoline vapor recovery systems.

Readers should note that the ROG emission increases shown for all years compared to the '97 CAP ROG inventory represent changes in calculation procedures. This does not imply an actual increase in the release of pollutants into the atmosphere; these emissions were previously underestimated.

Ozone Trends

The Bay Area has an extensive network of monitoring stations to measure ambient air quality. Twenty-two stations measure ozone. Ambient ozone levels are in compliance with state and national standards more than 99% of the time. This analysis is focused on those days and hours when the standards are exceeded. In 1998, the Bay Area recorded excesses of the national one-hour standard on 8 days and

excesses of the state standard on 29 days. In 1999, the region recorded excesses of the national one-hour standard on 3 days and excesses of the state standard on 20 days. In 2000, excesses of the national one-hour ozone standard were recorded on 3 days and excesses of the state standard were recorded on 12 days.

ARB requires that several measures of monitored air quality data be analyzed. One such measure is the "design value,"[1] a measure of peak pollutant concentrations. Other measures include population- and area-weighted exposure to unhealthy ozone levels. Each of these measures has been computed for the Bay Area, illustrating changes from a three-year base period (1986-88) to the current three-year period (1997-99). The analysis of each measure documents significant progress in improving the region's air quality – over the 11 year timeframe, the design value has been reduced 1.2 percent per year on average, population exposure to unhealthy levels of ozone has been reduced 70 percent, and area-weighted exposure has been reduced 55 percent.

Design value. In the period since the passage of the California Clean Air Act, the Bay Area has experienced significant reductions in peak ozone levels. As shown in Table 2, peak concentrations have diminished 1.2 percent per year, on average, since the 1986-88 base period.

Table 2

Ozone Design Value (DV) Estimates and Trends: 1986/88 – 1997/99

	Design Value Estimates (pphm)[a]			Annual Percentage DV Change[b]	
Monitoring Site[c]	**1986-88**	**1991-93**	**1997-99**	**86-88 to 91-93**	**86-88 to 97-99**
San Francisco[c]	7.4	5.9	5.9	-4.1	-2.0
Oakland[c]	8.2	6.6	6.1	-3.9	-2.6
Redwood City[c]	9.7	7.4	7.1	-4.8	-2.6
Richmond[c]	8.3	7.8	8.0	-1.3	-0.4
San Rafael[c]	9.3	7.5	8.5	-3.8	-0.9
Santa Rosa[c]	8.7	8.0	8.6	-1.6	-0.2
Pittsburg	11.7	10.3	9.5	-2.4	-1.9
Vallejo	10.9	9.5	9.8	-2.5	-1.0
Napa	10.7	9.8	10.6	-1.7	-0.1
Mountain View	14.0	9.7	10.6	-6.1	-2.4
San Jose	13.1	10.8	10.7	-3.5	-1.9
Fremont	13.2	11.1	10.7	-3.2	-1.9
San Jose E. (Alum Rk)	14.7	11.7	10.9	-4.1	-2.6
Hayward	12.9	8.9	11.2	-6.2	-1.3
Gilroy	14.2	11.6	11.3	-3.7	-2.1
Los Gatos	13.9	12.0	11.3	-2.8	-1.9
Bethel Island	11.1	10.9	11.7	-0.4	0.5
Fairfield	11.1	10.4	12.2	-1.3	1.0
Concord	12.8	10.7	12.7	-3.3	-0.1
Livermore	14.5	12.7	14.3	-2.4	-0.1
Averages	***11.5***	***9.7***	***10.1***	***-3.2***	***-1.2***

[a] Design value estimates computed using ARB's *RECRATE* computer program. Each estimate is based on 3 years of daily high hour ozone data, with *RECRATE* calculating a value roughly equivalent to the 4th highest daily maximum 1-hour concentration over the 3-year period.

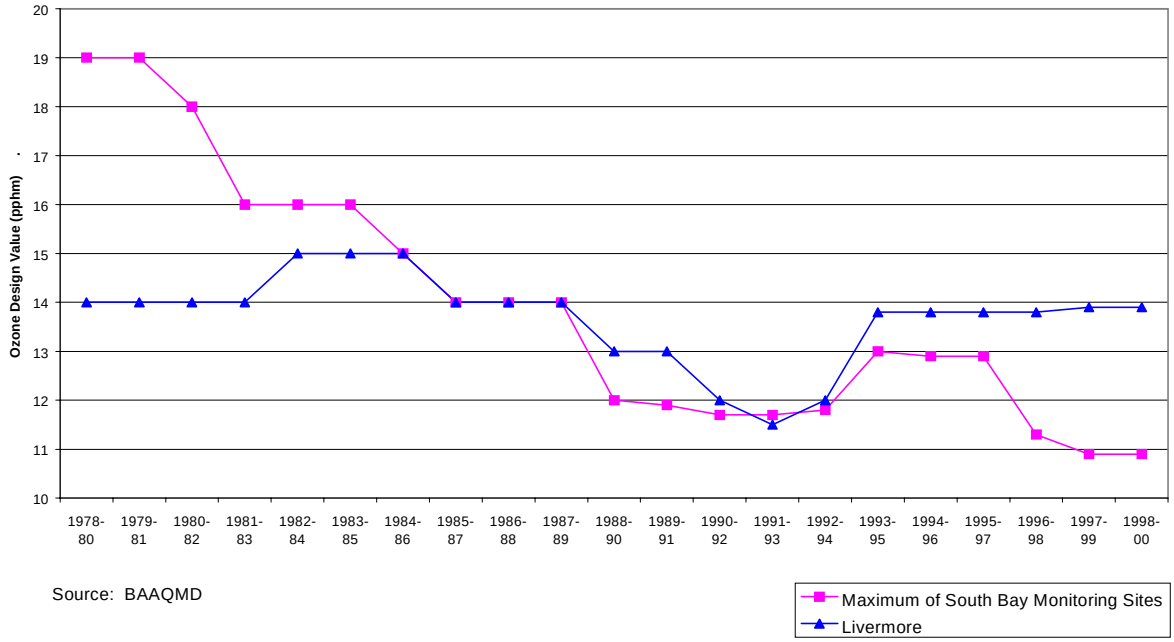
[b] Estimated annual percentage change equals 100(a-b)/(nb), where "a" is the more recent design value, "b" is the earlier value and "n" is the number of years between them.

[c] Shaded sites met the California standard during 1997-99. Sites with values labeled with a "c" met the California state standard during 1986-88.

[1] The term *design value* is used instead of a California air quality planning term, *expected peak day concentration.* The calculation used to derive design value is consistent with ARB's methodology for calculating expected peak day concentration.

This improvement is due to reductions in emissions of ozone precursors from stationary and mobile sources. The air quality improvements are widespread, although some areas show greater progress than others do. The South Bay region appears to have shown the greatest improvement, while the far eastern and far northern parts of the Bay Area have shown the least. Figure 4 illustrates the change in design value in the South Bay region and in Livermore over the past 20 years. Livermore is now the controlling station for the District's ozone design value, and achieving attainment of state and national ozone standards will likely depend on reductions in precursor emissions that help lower Livermore ozone readings.

Figure 4: Change in South Bay and Livermore Ozone Design Values: 1980 - 2000

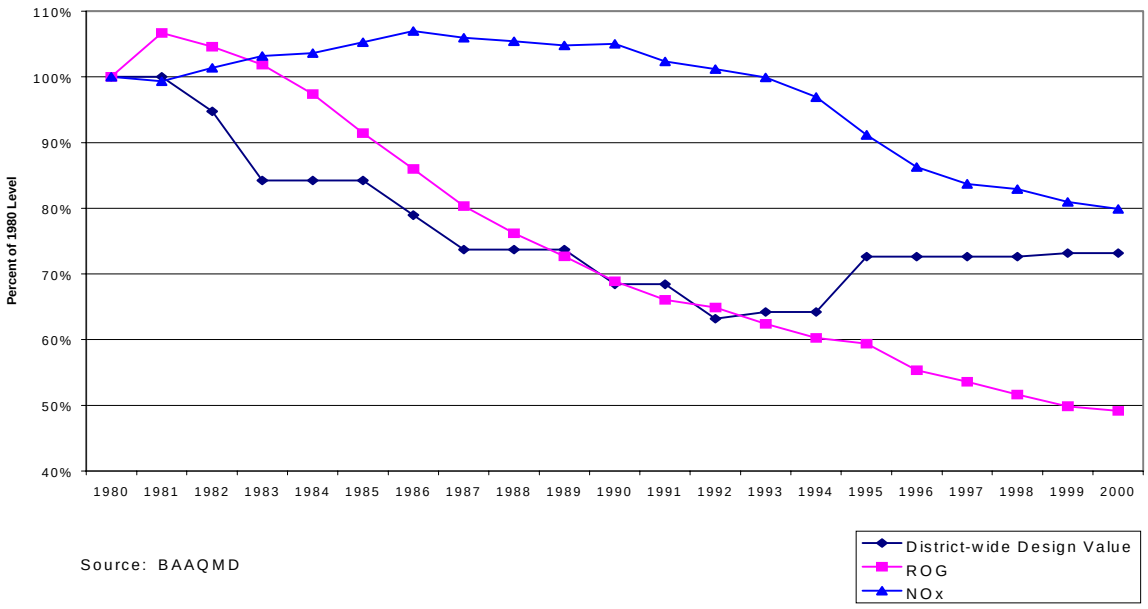


Source: BAAQMD

Air quality trends are difficult to discern because ambient pollutant concentrations are highly dependent on weather conditions. One summer day may be hot with calm winds, another summer day may be cool and windy throughout the region. And one year may include a large number of ozone-conducive days, and the following year relatively few. Ozone concentrations vary considerably based on such weather factors, and thus design value estimates, which are based on these concentrations, will also vary. Table 2 shows large decreases in design values from 1986-88 to 1991-93, but less improvement from 1986-88 to 1997-99. The 1991-93 period was less conducive to ozone formation than either 1986-88 or 1997-99. The 1997-99 period is roughly comparable to the 1986-88 period. Over the long term, the considerable progress in the South Bay, and limited progress in the eastern part of the Bay Area, do very likely reflect underlying ozone potential, and not just meteorology.

Figure 5 contrasts the change in the Bay Area's design value with the ROG and NOx reductions that have been achieved over the same period. Since the early 1990's, the region's design value has not appreciably changed, whereas precursor emissions have declined significantly. This is a function of both meteorology (e.g., hot summers in 1995 and 1996) and modelers' finding that contemporaneous ROG and NOx reductions do not yield ozone reductions in the Bay Area (although ozone reductions would be seen in downwind areas). Furthermore, natural biogenic sources of emissions are not represented in the emissions inventory data but do impact ozone formation.

Figure 5: Comparison of Ozone Design Value with Precursor Emissions



Source: BAAQMD

Population-weighted exposure. The design value provides information only on highest expected ozone levels, and does not reflect whether a small or large part of the region's population was exposed to levels above the standard. Population exposure provides a better indication of the extent and severity of the ozone problem for human health. Table 3 lists estimated per capita exposures for the 1986-88 base period, the 1991-93 period calculated for the *1994 Clean Air Plan*, and the current 1997-99 period by county. Also listed are the percentage reductions in estimated exposure.

Table 3
Population Exposure to Ozone

County	Per Capita Exposure (person-pphm-hours above 9.5 pphm/total population)			Percent Decrease	
	1986-88	1991-93	1997-99	1986-88 to 1991-93	1986-88 to 1997-99
Alameda	18.2[a]	4.7	7.4	74	61
Contra Costa	20.0	5.7	15.7	72	20
Marin	0.6	0.2	1.0	65	-54
Napa	2.6	2.2	5.9	16	-124
San Francisco	0.0	0.1	0.0	not applicable	not applicable
San Mateo	4.3	0.5	0.5	87	88
Santa Clara	48.9	6.7	6.9	86	86
Solano[b]	8.1	2.9	9.1	64	-11
Sonoma[b]	1.2	0.3	1.2	78	-2
Bay Area Weighted Average	20.1	3.8	6.1	81	70

[a] Includes a correction to the 1987 monitoring data for the Livermore station. Suspect Livermore values were scaled up to be consistent with historical relationships with nearby monitors.

[b] Only that portion of the county within the Air District jurisdiction is included.

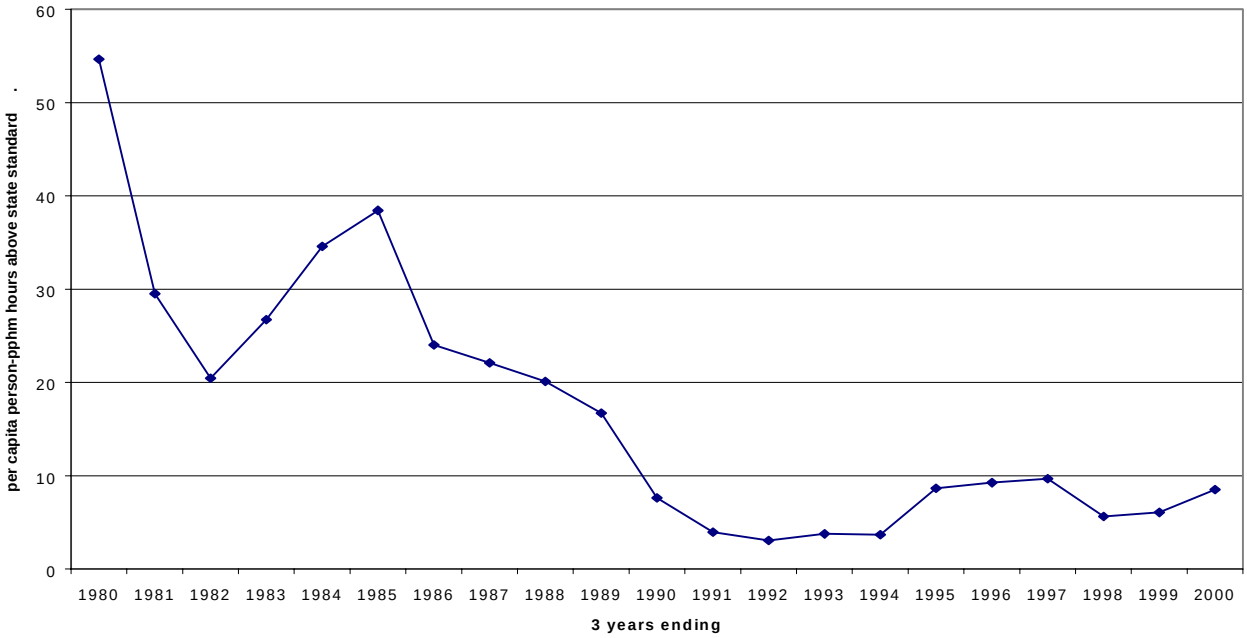
Since the 1986-88 base period, population exposure to unhealthy levels of ozone has been reduced by 70 percent as a weighted average for the region. Even larger reductions have been achieved since 1978, as shown in Figure 6. The variation in exposure since the early 1990s is not indicative of an upward trend, given that the aggregate level of exposure over three years has gone up (e.g., in the mid-90's) and down (e.g., in the early- and late-90's) – commensurate with the number of very hot days recorded in the region. The general downward trend in exposure to ozone levels above the standard is expected to continue, given more normal summer weather and the large decline in precursor emissions – 84 tpd for ROG and 117 tpd for NOx, not counting measures still to be adopted – expected over the next six years.

The 70 percent reduction in exposure since 1986-88[2] is a much larger rate of decrease than the rate of decrease in peak ozone concentrations, because many ozone exceedances in the Bay Area are only marginally above the ozone standard. A small reduction in peak ozone levels of, for example, 10 percent (e.g., from 15 pphm to 13.5 pphm) can reduce the number of hours exceeding the ozone standard (9 pphm) by 40 percent or 50 percent. In other words, even a modest reduction in peak ozone levels can eliminate many hours when concentrations might have exceeded the standard and thus greatly reduce impacts on human health. Changes of 1-person-pphm-hour or less are not statistically significant; that is, the increases for Marin, Solano and Sonoma may represent meteorological variation and not changes in underlying ozone potential.

When the '91 CAP was prepared, the California Clean Air Act mandated that Bay Area population exposure be reduced by 25% from 1986-88 levels by December 1994 and 50% by December 2000. A 1992 amendment to the CCAA removed this requirement by reclassifying the Bay Area from a "severe" to a "serious" ozone nonattainment category. Nevertheless, the reduction in Bay Area population exposure has achieved and continues to exceed the 50% reduction target.

[2] The 70 percent reduction is calculated based on the change from 1986-88 (represented by the 1988 data point in Figure 6) to 1997-99 (represented by the 1999 data point in Figure 6). This period was selected by the California Air Resources Board to represent progress since adoption of the California Clean Air Act.

Figure 6: Population Exposure to Unhealthy Ozone Levels* in the Bay Area -- 1980-2000



* Person-pphm hours above the 9.5 pphm California ozone standard for 3-year periods divided by population during that period. Exposures estimated as inverse-distance-weighted average concentrations from nearby monitoring sites to residence census tract.

Area-weighted exposure. Area-weighted exposure is defined similarly to population exposure except that census tract area replaces census tract population. Thus it is the summation of the products of census tract areas (in square kilometers) and local ozone excess above the standard. Table 4 presents area-weighted exposure by county.

Table 4

Area-Weighted Exposure to Ozone

County	Area-Weighted Exposure[a]			Percent Decrease	
	1986-88	1991-93	1997-99	1986-88 to 1991-93	1986-88 to 1997-99
Alameda	33.8	8.7	13.9	74	59
Contra Costa	25.2	6.8	18.4	73	27
Marin	0.6	0.2	0.7	67	-16
Napa	3.1	1.8	5.5	43	-78
San Francisco	0.0	0.1	0.0	not applicable	not applicable
San Mateo	5.4	0.7	0.6	87	89
Santa Clara	51.8	11.2	10.7	78	79
Solano[b]	10.6	3.6	10.7	66	-1
Sonoma[b]	1.7	0.4	2.0	74	-17
Bay Area Weighted Average	20.1	5.0	9.0	75	55

[a] Units are km^2-pphm-hours above 9.5 pphm/km^2.

[b] Only that portion of the county within the Air District's jurisdiction is included.

The estimated decrease in District-wide area exposure between the 1986-88 base period and the 1991-93 period is 75%. Between 1991-93 to 1997-99, area exposure increased, but still there has been a net decrease of 55% overall from 1986-88 to 1997-99.

Particulate Matter

This 2000 CAP is an ozone plan. This section on particulate matter (PM) is not required, but is included as an informational item because the health effects of PM can be serious and many of the measures that reduce ozone precursor emissions will also serve to reduce ambient PM.

Particulate matter has been implicated in a wide range of health effects from asthma attacks and chronic respiratory disease to deaths. The Bay Area has met national PM_{10} standards since 1992, although the region may not meet the new national $PM_{2.5}$ standards. Monitoring of $PM_{2.5}$ levels is underway to determine the Bay Area's attainment or nonattainment status. The Bay Area does not meet California PM_{10} standards, which are much stricter than the national PM_{10} standards. However, the California Clean Air Act does not require a plan to attain the state PM_{10} standard as it does for ozone.

The Bay Area experiences its highest PM concentrations in the winter, especially during evening and night hours. Based on analysis of the chemical composition of airborne PM_{10}, the main sources are wood smoke, combustion of fossil fuels, and airborne dust entrained (propelled into the air) by motor vehicles and construction. Woodburning largely occurs in winter, representing about a third of total PM_{10} emissions. Fossil fuel combustion by motor vehicles (gasoline and diesel) is a major contributor. And although fossil fuels are burned year-round, winter weather conditions convert much more of the NO_x produced into particulate ammonium nitrate, representing another third of PM_{10} emissions. Finally, the lower levels of solar radiation in the winter lead to stronger temperature inversions that are conducive to the buildup of particulate matter in ambient air near ground level.

The Bay Area has seen significant reductions in PM_{10} levels, with peak values down more than thirty percent since 1990. But, as with ozone, the values are greatly influenced by weather conditions, and the degree of improvement depends upon the location and time interval examined. The BAAQMD is supporting local (city and county) adoption of woodburning ordinances to reduce woodsmoke, and NO_x emissions continue to decline. Although less PM is emitted from tailpipes, we remained concerned that more PM is being entrained by motor vehicle tires as the total number of miles driven in the Bay Area increases.

Implemented Control Measures for Ozone

The District, in cooperation with its partner regional and local agencies, continues to make significant progress in reducing emissions through stationary, area, transportation and mobile source control measures.

Stationary and Area Source Measures

As shown in Table 5, fifteen of the '97 CAP ozone precursor control measures have been adopted as regulations by the District Board of Directors or have been implemented through other actions as of November 2000. Table 5 also shows the emission reductions expected due to implementation of these measures.

Table 5

Implemented Control Measures: 1998 to 2000

Control Measure		Emission Reduction After Implementation (tons per day)		District Regulation #
		ROG	NOx	
A. Surface Coating and Solvent Use				
A 16	Improved Semiconductor Manufacturing Rule (a) Abate emissions from positive photoresist operations (b) Abate emissions from solvent cleaning performed with coating-type applicators	unknown	0.00	8-30
A 17	Reduced Emissions from Household Solvent Disposal	unknown	0.00	Local hazardous waste and recycling programs now accept household solvents, reducing evaporative emissions from improper disposal.
A 18	Substitute Solvents Used for Surface Preparation / Clean-Up of Coatings (a) Set ROG / volatility limits for surface preparation solvents (b) Set ROG / volatility limits for clean-up solvents	2.90	0.00	8-16, 8-20 & 8-45
A 20	Control of Emissions from Products Manufactured from Polystyrene Foam, Polyethylene and Polypropylene	0.25	0.00	8-52
B. Fuels / Organic Liquids Storage and Distribution				
B 2	Improved Storage of Organic Liquids Rule (h) Low emitting retrofits for slotted guide poles	0.87	0.00	8-5
B 8	Improved Gasoline Dispensing Facility Rule	3.78	0.00	8-7
C. Refinery and Chemical Plant Processes				
C3	Equipment Leaks at Refineries and Chemical Plants (b) Control of Fittings	1.20	0.00	8-18
F. Other Stationary Source Measures				
F3	Promotion of Energy Efficiency	unknown	unknown	District conducted outreach on new software from Dept. of Energy that quantifies payback period for new low-emission motors.
F5	Emission Reduction Credits to Mitigate Emissions from Violations and Variances	unknown	unknown	Existing District authority allows use of credits for mitigation. No further regulatory action necessary.

Control Measure		Emission Reduction After Implementation (tons per day) ROG	NOx	District Regulation #
F6	Enhanced Compliance through Parametric Monitoring	unknown	unknown	1
F9	High Albedo Roofing and Road Surfacing Materials	unknown	unknown	San Jose Green Building Work Group recommended high albedo roofing to reduce energy use.
M. Mobile Source Measures				
M2	Airport Ground Support Equipment	unknown	unknown	Electric GSE has been included as a mitigation measure in airport EIRs.
M3	Ground Power Systems at Airport Terminals	unknown	unknown	400 Hz power is being installed at Oakland, San Jose and San Francisco airports.
M4	Low Emission Vehicle Fleet Operations	unknown	unknown	LEVs have been purchased for fleets using District, other public & private funds.
Measure Not Included in '97 Plan[3]				
	Prohibit Aeration of Petroleum Contaminated Soil	2.68	0.00	8-40
TOTAL EMISSIONS REDUCED		**11.7**	**unknown**	
1997 CLEAN AIR PLAN PROJECTED FOR MEASURES LISTED ABOVE		**10.1**	**0.75**	

Staff has determined, based on careful review and analyses, that a number of control measures included in the *1997 Clean Air Plan* are not feasible or cost effective, and should be removed from the CAP. These measures are shown in Table 6, along with the reason they are recommended for deletion.

Table 6

'97 CAP Control Measures Recommended for Deletion

CM#	Measure	Reason for Deletion
A8	Improved Magnet Wire Coating Operations Rule	ROG emissions subject to control found to be 0.03 tons/day. Potential emission reductions are insignificant and do not warrant new rule amendment.
A9	Improved Auto Assembly Coating Operations Rule	Since A9 was proposed, 90% of the sources at the District's sole auto assembly facility, NUMMI, have had to comply with Rule 2-2: New Source Review (NSR). Remaining potential emission reductions are less than 0.1 ton/day and do not justify new rule amendment.
A14	Improved Coating and Ink Manufacturing Rule	Plant closures, NSR, and 1992 amendments to Rule 8-35 have reduced printing ink inventory by 75%. Remaining potential emission reductions are negligible and do not justify new rule amendment.
A15	Improved Resin Manufacturing Rule	ROG emissions subject to control found to be 0.013 tons/day. Potential emission reductions are insignificant and do not warrant new rule amendment.
A19	Ultra Low ROG Coatings	Control measure is based on the development of *verononia galamensis* coatings. No technical developments have been reported; no commercial availability.

[3] This control measure was not known when the *1997 Clean Air Plan* was prepared. It was developed and adopted pursuant to the 1999 (federal) Ozone Attainment Plan.

CM#	Measure	Reason for Deletion
B5	Limitations on Marine Vessel Tank Purging	Emissions greatly reduced due to changes in vessel equipment and practices. Insufficient emissions to warrant further regulation.
B6	Reduced Emissions from Cleaning Up Organic Liquids	Not deemed cost effective at $46,000/ton ROG reduced.
C5	Improved Wastewater Separators Rule	C5a: Potential ROG reduction overestimated in 1991 CAP; now estimated at only 0.05 tons/day; does not warrant new rule amendment. C5b: Only 0.025 tons/day inventory; not deemed cost effective at $60,000/ton ROG reduced.
C6	Further Reduction of Emissions from Wastewater Treatment at Refineries	C6a: Biodegradation techniques now used at most sources; potential emission reductions insignificant. C6b: National standards for benzene have reduced emissions in this category; costs to control remaining emissions are greater than $30,000/ton. C6c: Source category (wastewater ponds) no longer exists, as all refinery wastewater is now held in enclosed tanks.
D5	Control of Emissions from Cement Plant Kilns	Emissions from District's only cement kiln have already been controlled to BARCT levels. Technologies for further control unproven for cement kilns.
E1	Reduction of Emissions from Rubber Products Manufacturing	Emissions from adhesive application now controlled by Rule 8-51. Plant closure and existing controls have reduced emissions subject to control to 0.004 tons/day. Potential emission reductions are insignificant.
E3	Reduction of Emissions from Commercial Charbroiling	Not cost effective as an ozone control measure at $38,000/ton ROG reduced.
M1d	Remote Sensing of Gross Emitters	Interchangeable Emission Reduction Credits (IERC) rule does not allow use of mobile source credits, and there is a lack of demand for the credits. Also, use of remote sensing by Smog Check program may make surplus nature of credits difficult to establish.
M1e	Credit for Scrapping Lawn and Garden Equipment	Lack of demand for credits / IERC rule does not allow use of mobile source credits
M1f	Credit for Scrapping Recreational Boat Engines	Lack of demand for credits / IERC rule does not allow use of mobile source credits

Transportation Measures

Many of the nineteen transportation control measures in the *1997 Clean Air Plan* were partially implemented during 1998 to 2000. The following list highlights significant TCM implementation efforts during the three-year period:

TCM 1: Support Voluntary Employer-Based Trip Reduction Programs

- MTC continued to administer the regional ridesharing program. (RIDES for Bay Area Commuters currently holds the contract for trip reduction services.)
- BAAQMD's Transportation Fund for Clean Air (TFCA) funds regional and local ridesharing programs. TFCA funded $12.6 million in trip reduction projects during FY 97/98 – FY 99/00 [Trip reduction category includes funding for transit use incentives (TCM 13), vanpool incentives (TCM 14), and educational programs (TCM 16).]

TCM 3: Improve Areawide Transit Service

- MTC programmed $1.02 billion for transit operations and $854 million for transit capital during FY 96/97 – FY 98/99
- TFCA funded $3.6 million in clean fuel transit projects during FY 97/98 – FY 99/00
- SF MUNI extended N-Judah line from the Embarcadero Station to the Caltrain terminus at 4th and Townsend
- AC Transit augmented Transbay bus service, and announced plans to restore local bus service
- Livermore – Amador Valley Transit increased service to Santa Clara Valley
- Santa Clara VTA increased express bus service

TCM 4: Improve Regional Rail Service

- Tasman Corridor LRT West Extension began operation in December 1999

TCM 5: Improve Access to Rail and Ferries

- TFCA funded $7.2 million for feeder bus and shuttle service to rail and ferries during FY 97/98 – FY 99/00
- Electric vehicle charging stations have been installed at 4 BART stations
- TFCA and TEA-21 Enhancements have funded bicycle access and parking at rail stations. Attended bicycle parking facilities have been provided at the Palo Alto Caltrain station and the Berkeley BART station.

TCM 6: Improve Intercity Rail Service

- Three additional (for a total of 7) Capitol trains began operation between the Bay Area and Sacramento
- Two peak-period Altamont Commuter Express trains began operation between Stockton and San Jose, with an additional train (AM peak only) from Pleasanton to San Jose

TCM 7: Improve Ferry Service

- Two additional (for a total of 3) peak-period round trips now operating on the Vallejo – San Francisco route
- High speed catamaran added to Larkspur – San Francisco route
- New service (2 round trips) from Richmond – San Francisco

TCM 8: Construct Carpool / Express Bus Lanes on Freeways

- New HOV lanes were opened on I-80 from SR 4 to the Bay Bridge Toll Plaza. New lanes were also opened on two segments of I-880, from 16th Street to the Bay Bridge and from the Alameda County line to Mowry Avenue. Lanes were also opened on several Santa Clara County expressways.

TCM 9: Improve Bicycle Access and Facilities

- MTC has funded $11 million in bicycle and pedestrian projects (97/98 State TDA & 1999 TIP)
- TFCA has funded $10.3 million in bicycle projects during FY 97/98 – FY 99/00
- Bicycle access to buses and trains has been greatly expanded

TCM 10: Youth Transportation

- TFCA has funded $12.9 million in clean fuel school bus projects during FY 97/98 – FY 99/00

TCM 11: Install Freeway / Arterial Metro Traffic Operations System

- The Freeway Service Patrol now operates 59 trucks on approximately 339 miles of the most congested Bay Area freeways

TCM 12: Improve Arterial Traffic Management

- MTC has funded $3.7 million in signal timing projects (1999 TIP)
- TFCA has funded $6.5 million in signal prioritization and timing projects during FY 97/98 – FY 99/00

TCM 13: Transit Use Incentives

- Purchase of Commuter Checks® increased almost 100% from 1998 to 1999
- 58 employers (93,000 employees) participate in Santa Clara Valley Transit Agency's EcoPass (monthly pass) program
- See TCM 1 for TFCA funding

TCM 14: Improve Rideshare / Vanpool Services and Incentives

- See TCM 1 for TFCA funding

TCM 15: Local Clean Air Plans Policies and Programs

- MTC established Transportation for Livable Communities Program in 1998. Funding set at $9 million/year for 6 years. Eligible activities include technical planning assistance, community based planning assistance, and capital improvements.
- Legislation signed into law to permit TFCA to fund "smart growth" projects

- ABAG, BAAQMD, BCDC, MTC, RWQCB and Bay Area Alliance for Sustainable Development initiated a regional smart growth strategy. Public workshops will identify desired land use changes and associated incentives to promote more compact and infill development.

TCM 16: Intermittent Control Measure / Public Education

- 1,021 employers (1 million employees) now participate in BAAQMD's Spare the Air program, an increase of approximately 400 employers (370,000 employees) from 1997
- CMAQ grant used for expanded program outreach

TCM 17: Construct Demonstration Projects

- TFCA funded $13.1 million clean fuel demonstration projects during FY 97/98 – FY 99/00 (not incl. school buses – see TCM 10)
- Electronic toll collection was activated on the Carquinez Bridge

TCM 18: Transportation Pricing Reform

- Parking cash out programs were implemented using TFCA funds during FY 97/98 – FY 99/00

TCM 19: Pedestrian Travel

- MTC has funded $11 million in bicycle and pedestrian projects (97/98 State TDA & 1999 TIP)
- Legislation signed into law to permit TFCA to fund planned pedestrian projects that support Smart Growth development

TCM 20: Traffic Calming

- Legislation signed into law to permit TFCA to fund traffic calming projects designated in a local traffic calming plan

It is estimated that TCMs implemented over the past three years (1998-2000) have provided an additional 2 tons per day reduction in ROG and 2 tons per day reduction in NOx.

Mobile Source Measures

The District also continues to implement and expand two important mobile source programs – the Vehicle Buy-Back Program, funded at $5 million for the three-year period FY 97/98 – 99/00, and the Smoking Vehicles Program, funded at $1.4 million for the three-year period FY 97/98 – 99/00. Furthermore, in March 2000, the District approved $4.4 million in Carl Moyer Program funding to replace diesel engines in marine vessels and locomotives with new, low emission engines. The District has also sponsored gas-powered lawnmower buy-backs, where the price of a new rechargeable electric mower is reduced by approximately 40% (funded at $250,000, including manufacturer and utility company contributions).

Control Strategy

Consistent with California Clean Air Act requirements, the strategy for this air quality plan is to implement all feasible measures on an expeditious schedule in order to reduce ozone precursor pollutant emissions as quickly as possible. As in previous iterations of the *Clean Air Plan*, this update defines feasible measures as "those control measures which are: 1) reasonable and necessary for the San Francisco Bay Area; 2) capable of being implemented in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors; and 3) approved or approvable by the California Air Resources Board, based upon state law and ARB policies."

The regulations that are ultimately developed and adopted to implement control measures included in the plan must meet state requirements intended to ensure that emission reductions are real and quantifiable.

The California Clean Air Act requires ARB to review plans and regulations for effectiveness. In addition, in conducting its triennial review of attainment plans, ARB must examine the actual emission reductions achieved by a plan. As a result, only measures that can be translated into regulations that produce real and enforceable emission reductions have been included in the plan.

Each regulation is developed through a public process mandated by the California Clean Air Act. The starting point is research and discussion with representatives of the affected industry, members of community and environmental groups, makers of pollution control equipment, and staff from other agencies. Through a public workshop, the District discusses draft regulatory language with interested parties and then takes written comments on the proposal. The District produces a final draft and analyzes environmental and economic impacts of the proposal as required by state law. Once this work is completed, the District Board of Directors conducts a public hearing at which the public and industry may make further comments. The Board may adopt the regulation as proposed or ask staff to make changes before adopting the regulation at a subsequent hearing. (See Health and Safety Code Section 40725 et. seq.). Once adopted, a regulation is enforced through District source tests, through incorporation of requirements into air quality permits, and through District inspections.

The focus of this plan update is on measures that can be developed and adopted as regulations in the next three years (2001, 2002 and 2003). To update the plan, staff examined measures from the *1997 Clean Air Plan* that have not yet been implemented. In addition, staff evaluated possible new control measures, through an extensive review of rules adopted or proposed in other jurisdictions. In conducting this review, staff evaluated the following information:

- Regulations adopted or proposed by the South Coast AQMD and by other California air districts
- SIP submittals by various states
- ARB guidance on feasible control measures
- BAAQMD BACT guidance
- EPA guidance documents

In addition to reviewing the above sources of information, staff polled District engineers and enforcement staff for suggestions about potential control measures. All potential control measures were then evaluated based on emission reduction potential, technological feasibility, enforceability, cost-effectiveness, and public acceptability to determine whether measures would be feasible for the Bay Area. The measures that appeared feasible were added to the regulatory agenda. This review showed that the following new measures should be added to the CAP:

- A21 Improved Automobile Refinish Coatings Rule
- A22 Improved Wood Products Coatings Rule
- A23 VOC limits for Concrete Coating Operations
- D8 Improved Residential Water Heaters Rule

Descriptions of these new control measures as well as control measures carried forward from the *1997 Clean Air Plan* are included in Attachment A.

This CAP update, like the updates in 1994 and 1997, increases CAP effectiveness by increasing expected emission reductions. The net effect of the 2000 update in adding new control measures while deleting the old measures listed in Table 3 is to increase expected emission reductions by 3.7 tons per day. By comparison, the 1994 update added three and deleted five stationary source measures, while adding five mobile source measures. The net effect of the 1994 update was to increase expected emission reductions by 3.8 tons per day. The 1997 update added six and deleted two stationary source measures. The net effect of the 1997 update was to increase expected emission reductions by 2.2 tons per day. Though it is not possible or meaningful to compare the 1991 estimate for total emission reductions expected from the plan against current estimates because many emission factors used to make emission inventory and

emission reduction estimates have changed since 1991, the total emission reduction attributable to the plan has increased with each update.

Table 7 shows the proposed schedule for regulation adoption during 2001, 2002 and 2003. The schedule is as expeditious as practicable given the resources and time necessary to develop regulation amendments, take them through the public review process and bring them to the District Board for adoption. This schedule is presented so that affected parties may anticipate regulatory activity, recognizing that any particular control measure may be advanced or delayed. During the regulation development process, the District may determine that some measures may not provide sufficient emission reductions to warrant regulation or may not be cost effective. The control measures show in Table 7 will reduce ROG by approximately 9.5 tons per day and NOx by 3.5 tons per day.

Table 7

Annual Regulatory Agenda: 2001 to 2003

2001

A1	Improved Architectural Coatings Rule
B2	Improved Storage of Organic Liquids Rule
D8	Improved Residential Water Heater Rule

2002

A5	Surface Preparation and Cleanup Standards for Metal Parts Coating
A21	Improved Automobile Refinish Coatings Rule
A23	VOC Limits for Concrete Coating Operations

2003

A22	Improved Wood Products Coatings Rule
C4	Improved Process Depressurization Rule
G3	Seasonal Limitations on Organic Liquid Storage Tank and Wastewater Separator Cleaning and Refinery Shutdowns

The nineteen transportation control measures in the *1997 Clean Air Plan* remain an important part of the control strategy and will provide additional ROG and NOx reductions. No changes to the TCMs are proposed for this planning cycle. The Metropolitan Transportation Commission, the District and the Association of Bay Area Governments will continue to pursue the TCMs as expeditiously as funding allows.

No new mobile source measures are being added to the control strategy in the 2000 CAP, but significant emission reductions will be achieved in future years. Many existing mobile source regulations and other programs will continue or expand. The California ARB has adopted regulations affecting both on- and off-road vehicle emission standards and fuels. These programs are described in California's federal air quality plan, known as the *State Implementation Plan*, or "SIP". The Air District will continue to assist with efforts to reduce on- and off-road emissions through programs that are best managed at the regional level – Transportation Fund for Clean Air, Vehicle Buy-Back, Smoking Vehicle Program, the Carl Moyer Program and a new clean school bus program.

Over the next 6 years, state, federal and District efforts will reduce total Bay Area mobile source emissions by 67 tons per day of ROG and 65 tons per day of NOx. Although on road motor vehicles currently comprise a large share of the region's ozone precursor emission inventory – 44% of ROG

emissions and 48% of NOx emissions – the share for ROG is expected to decline significantly by 2006 – to 38%. On road motor vehicles' share for NOx is expected to decline modestly by 2006 – to 45%.

Future Air Quality Planning

State Requirements

The CAP is prepared to meet requirements of California air quality laws. The 2000 update is a revision to previously adopted strategies. It is focused on identifying new feasible measures and specifying the regulatory agenda for the next three years. A comprehensive update is expected in 2003. By then, the BAAQMD and neighboring districts will benefit from comprehensive air quality field studies, and use the new data to improve ozone modeling capabilities. This technical analysis will help identify the emissions reductions needed to attain the State ozone standard.

As part of future air quality planning, the following areas may be studied to determine whether significant additional emission reductions could be achieved, and whether implementation is feasible. These measures are not included in the 2000 CAP control strategy. If further study indicates these measures may be feasible and yield significant emission reductions, they may be added to the control strategy in the 2003 or subsequent plan updates.

A3	Improved Aerospace Coatings
A6	Improved Surface Coating of Plastic Parts and Products
C7	Petroleum Refinery Flare Monitoring
C8	Control of VOC Emissions from Process Drains, Improved Wastewater (Oil – Water) Separators Rule
F7	Easing of Administrative Requirements for Use of Lower Emitting Technology
F8	Limitations on Solvents Based on Relative Reactivity

Brief descriptions of these six future study areas are provided in Attachment B.

Federal Requirements

In July 1997, EPA promulgated changes to the national ambient air quality standards (NAAQS) for ozone. During 1997, 1998 and 1999, some Bay Area monitoring sites recorded concentrations that exceeded the proposed standards. Therefore, in March 2000, the Air Resources Board recommended a nonattainment designation for the Bay Area for the proposed national 8-hour ozone standard. The BAAQMD expects to prepare a plan to address the proposed national standard, but the schedule and requirements depend on the outcome of litigation before the U. S. Supreme Court.

EPA also promulgated changes to the NAAQS for particulate matter and proposed a new regional haze standard. Legal challenges to the proposed particulate standards have delayed the designation of nonattainment areas and the preparation of attainment plans. At this time, the District's efforts are focused on monitoring local ambient particulate levels. EPA will review the particulate NAAQS again in 2002.

Attachment A

Control Measure Descriptions

CONTROL MEASURE # A1 (Revised)

Measure Name: **Improved Architectural Coatings Rule (8-3)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Buildings and Structures Coating	25	n/a
Subject to Control	25	n/a
Potential Reduction	2.9	n/a

Cost Effectiveness: $1100 / ton ROG

Year of Adoption: 2001

Implementation Date: 2003/2004

Description:

District Regulation 8, Rule 3 controls the volatile organic compound (VOC) content of architectural coatings, which are those coatings used on stationary structures, appurtenances and pavement. The 1991 CAP had a control measure for architectural coatings based on lower VOC limits for some categories of coating and elimination of the small container exemption. In 1998, staff of the Air Resources Board (ARB) and local districts, under guidance from the California Air Pollution Control Officers Association, began working on a Suggested Control Measure (SCM) for architectural coatings. The SCM is based on South Coast's Rule 1113 revisions adopted in 1996, 1998 and 1999 and survey data of available coatings and is intended to be adopted by the ARB to give local districts guidance, a regulatory template and technical, economic and environmental justification for VOC limits proposed in the SCM. Subsequent to ARB's hearings (expected in June, 2000), districts are to take the SCM to local boards within 12 to 18 months for adoption. The proposed SCM will reduce allowable VOC emissions from the largest volume categories of architectural coatings, will redefine and add some categories of coatings and may provide flexibility options for manufacturers of architectural coatings. This control measure proposes to adopt the provisions of the SCM into Rule 3.

Economic Impacts:

Staff expects no significant socioeconomic impacts associated with this proposal.

Other Impacts:

None expected.

CONTROL MEASURE # A5 (Revised)

Measure Name: **Surface Preparation and Cleanup Standards for Metal Parts Coating Rule (8-19)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Misc. Metal & Small Appliance Clean-up / Large Appliance & Metal Furniture Clean-up	0.49	n/a
Subject to Control	0.49	n/a
Potential Reduction	0.34	n/a

Cost Effectiveness: $1100 / ton VOC

Year of Adoption: 2002

Implementation Date: 2003

Description:

District Regulation 8, Rule 14 limits the VOC content of coatings applied to large appliances. Regulation 8, Rule 19 applies similar limits for the coating of metal parts. Neither rule includes VOC limits or composite partial pressure limits for cleanup and surface preparation solvents. The South Coast and a few other districts have adopted limits for solvents. Some districts also allow, as an alternative, the use of an enclosed solvent cleaner for clean up of spray equipment. The district rules typically include a VOC limit for surface preparation and clean-up solvent of about 70 g/l VOC, which is consistent with the BAAQMD limit for surface preparation solvents for the auto refinishing industry (Regulation 8, Rule 45). Many low-VOC solvents are currently available to meet such a limit. Emission reductions are not expected to be large because the metal parts coating industry already uses aqueous solutions like phosphate rinses or anodizing baths for many surface preparation tasks.

Economic Impacts:

Staff expects no significant socioeconomic impacts associated with this proposal.

Other Impacts:

None expected. Because this industry already uses many aqueous solutions and has containment in place to meet existing discharge limitations, no impacts on water quality are expected.

CONTROL MEASURE # A21

Measure Name: **Improved Automobile Refinish Coatings Rule (8-45)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Industrial and Commercial Coating/Auto Refinish Coating	5.55	n/a
Subject to Control	5.55	n/a
Potential Reduction	0.8	n/a

Cost Effectiveness: $35,000 / ton ROG*

Year of Adoption: 2002

Implementation Date: 2003

Description:

This control measure is new for the 2000 CAP. Bay Area Regulation 8, Rule 45 was last amended to address volatile organic compound (VOC) limits in 1999. Currently, BAAQMD Rule 8-45 VOC limits are equal to South Coast adopted limits except in three coating categories. The South Coast VOC limits that are more stringent than the Bay Area limits are those for primer sealers and multi-stage topcoats. The South Coast also eliminated the precoat category. Manufacturers have been able to address the South Coast elimination of precoats and meet the more stringent primer limits by using either a direct-to-metal primer-surfacer or a pretreatment wash primer in lieu of a precoat. These primers use exempt solvent technology, and the South Coast limits for the primer categories now appear feasible, although at some increase in cost. However, the more stringent limit for multi-stage topcoats, which would produce most of the emission reductions for this measure, appears to be less cost effective, as noted above. That cost may be lowered by possible reductions in the cost of the exempt solvent parachlorbenzotrifluoride (PBCTF) and possible EPA findings of negligible photochemical reactivity (exemption) for other VOCs useful as solvents for automotive refinish coatings.

Economic Impacts:

The current price differential between multi-stage topcoats able to comply with the more stringent South Coast limits and those that comply with the Bay Area limits is such that the measure does not justify the cost. However, if the price differential decreases, it is expected that economic impacts to the industry could be minimized.

Other Impacts:

None expected. Although exemptions for negligibly reactive solvents may allow for increases in these compounds, District policy would prohibit increases in solvents with toxic or ozone depletion effects. Existing regulation effectively mitigates potential impacts on water quality from spills or illegal disposal and on fire hazard potential from improper storage.

* Cost effectiveness for multi-stage topcoat category.

CONTROL MEASURE # A22

Measure Name: **Improved Wood Products Coatings Rule (8-32)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Wood Furniture and Cabinet Mfg. Coating and Clean-up	2.81	n/a
Subject to Control	2.25	n/a
Potential Reduction	.35	n/a

Cost Effectiveness: $1100 / ton ROG

Year of Adoption: 2003

Implementation Date: 2004

Description:

District Regulation 8, Rule 32 sets VOC limits for coatings applied in cabinet and wood furniture manufacturing. Ventura County Air Pollution Control District has recently implemented a VOC limit for clear topcoats used in wood coating operations (Ventura Rule 74.30) that is more stringent than the BAAQMD limit in this category. Ventura's limit, which was 550 g/l and is now 275 g/l, requires a technological leap from solvent borne coatings to waterborne or exempt solvent coatings. The Ventura rule applies to facilities that emit over 200 lbs VOC per 12-month period.

Economic Impacts:

Cabinetmakers subject to the current BAAQMD limit of 550 g/l have already complained that they have lost business to cabinetmakers that apply coatings at homes and businesses where cabinets are installed. Field application of these coatings is subject to the 680 g/l standard for lacquer coatings in BAAQMD Regulation 8, Rule 3 (architectural coatings). Although the limit in Rule 8-3 may be reduced to 550 g/l to conform to forthcoming ARB guidance, this control measure would re-institute the disparity between the limits.

Other Impacts:

None expected.

CONTROL MEASURE # A23

Measure Name: **VOC Limits for Concrete Coating Operations**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Industrial and Commercial Coating/Other Coating	0.5	n/a
Subject to Control	0.5	n/a
Potential Reduction	0.2	n/a

Cost Effectiveness: $1,000 / ton ROG

Year of Adoption: 2002

Implementation Date: 2002

Description:

Bay Area Regulation 8, Rule 3: Architectural Coatings, regulates the coating of concrete as part of a structure when coated at the site of installation. However, there are a significant number of concrete product operations where coating is not subject to Rule 3 (not coated at the installation site) and is therefore subject to Regulation 8, Rule 4: General Coating Operations. These facilities produce concrete piles, traffic barriers and underground vaults, among other products. There are typically two emission sources at concrete coating facilities, the application of form release compounds to molds for casting concrete, and the application of coating to the concrete product. Under Rule 4, these facilities are subject to an emission limit of 5 tons per year per source or, for coating, 420 grams volatile organic compounds (VOC) per liter. Lower VOC alternatives for both form release compounds and concrete coating are available This control measure would require the use of form release compound and coatings with a lower VOC content than are allowed under Rule 4. Requirements for coating may be able to reduce allowable emissions by 65% and for form release compounds, by 80%.

Economic Impacts:

Staff expects no significant socioeconomic impacts from this proposal.

Other Impacts:

None expected.

CONTROL MEASURE # B2

Measure Name: **Improved Storage of Organic Liquids Rule (8-5)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Storage tanks	9.4	n/a
Subject to Control	9.4	n/a
Potential Reduction	4.8	0

Cost Effectiveness: $6,350 to $11,900 / ton ROG

Year of Adoption: 2001

Implementation Date: 2001

Description:

Regulation 8, Rule 5 requires vapor loss controls for tanks storing organic liquids. The degree of control required depends upon the size of the tank and the true vapor pressure of the tank contents. This measure proposed new control requirements for Rule 8-5, several of which have now been implemented by amendments to the rule. The remaining control options would extend controls to large tanks containing lower vapor pressure organic liquids, lower the tank size exemptions, require better seals or upgrades upon replacement, require more frequent inspections of seals and fittings, and require vapor recovery retrofits for certain tanks.

Economic Impacts:

Some aspects of this proposal will be more cost effective than others, but costs of all options appear to be within the District's cost effectiveness guidelines for BACT. The ultimate cost of the measure will depend on which control options are adopted. Staff expects no significant socioeconomic impacts associated with this proposal.

Other Impacts:

This control measure may reduce refinery odor impacts and emissions of benzene, a toxic air contaminant.

CONTROL MEASURE # C4

Measure Name: **Improved Process Vessel Depressurization Rule (8-10)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Fugitive emissions - vessel depressurization	0.14	n/a
Subject to Control	0.14	n/a
Potential Reduction	0.07	0

Cost Effectiveness: $1000 / ton ROG

Year of Adoption: 2003

Implementation Date: 2004

Description:

This measure originated in the 1991 CAP. The current requirement in Regulation 8, Rule 10 for refinery vessel depressurization is to abate emissions until the internal atmosphere reaches 1000 mm Hg. Then, the vessel may be vented to the atmosphere even if saturated with hydrocarbon vapors. The measure would require that emissions be abated to a more stringent standard, until the atmosphere reaches a lower internal pressure or until the hydrocarbon concentration inside the vessel reaches a minimal point. Depressurizations are infrequent events. Consequently, the daily emissions prorated over a year are small. However, this control measure may help reduce significant releases of pollutants, including toxic compounds, on those infrequent occurrences.

Economic Impacts:

Staff expects no significant socioeconomic impacts associated with this proposal.

Other Impacts:

None expected.

CONTROL MEASURE # D8

Measure Name: **Improved Residential Water Heater Rule (9-6)**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Domestic Natural Gas – Water Heating	0.04	7.33
Subject to Control	n/a	7.33
Potential Reduction	n/a	3.5 (by 2012)

Cost Effectiveness: $3,400 to $11,400 / ton NOx

Year of Adoption: 2001

Implementation Date: 2002-2012

Description:

Approximately 75% of household water heaters in the Bay Area are fired by natural gas. In 1992, the BAAQMD adopted Regulation 9, Rule 6, which required that new water heaters meet an emission standard of 40 nanograms of NOx per joule of heat output. This standard was the same as a South Coast AQMD standard that went into effect in 1982.

The SCAQMD has now lowered its NOx standard for residential water heaters to 20 nanograms per joule effective in 2002 and to 10 nanograms per joule effective in 2005. The limits are based on new burner technologies that are expected to be available when the new standards take effect. The implementation of a 20 ng/J standard in the Bay Area would produce an emission reduction of approximately 3.5 tons per day over a ten-year period as current water heaters are replaced with lower-emitting units. Implementation of a 10 ng/J standard would produce an emission reduction of approximately 4.7 tons per day over a 10 year period.

Economic Impacts

The slightly higher cost of lower-NOx water heaters is expected to have no significant socioeconomic impact.

Other Impacts:

New lower-NOx water heaters may be more efficient and may reduce natural gas consumption. One low-NOx technology relies on a forced draft produced by a combustion air blower. Use of this technology could offset increases in efficiency or lead to an overall increase in energy demand for domestic water heating.

CONTROL MEASURE # G3

Measure Name: **Seasonal Limitations on Organic Liquid Storage Tank and Wastewater Separator Cleaning and Refinery Shutdowns**

Emission Reduction Estimates:

	1999 Reactive Organic Gases (tons/day)	1999 Nitrogen Oxides (tons/day)
Source Category: Storage tanks - cleaning, wastewater (oil - water) separators (part), vessel depressurization	unknown	n/a
Subject to Control	unknown	n/a
Potential Reduction	unknown	n/a

Cost Effectiveness: n/a

Year of Adoption: 2003

Implementation Date: 2004

Description:

This measure, developed for the 1997 CAP, addresses activities involving emission sources covered by several BAAQMD rules. The measure would require that discretionary activities such as organic liquid storage tank cleaning, wastewater separator cleaning, and refinery unit shutdowns be controlled or conducted outside the summer ozone season. Emissions from these activities are infrequent but significant. However, the measure may prove less effective than originally projected because refineries maximize production during the summer, which is the peak driving season, and tend to schedule shutdowns at other times. In addition, some of the other measures proposed in this plan, such as measure C4 concerning process vessel depressurization, may reduce emissions originally sought to be reduced by this measure.

Economic Impacts:

Staff expects no significant socioeconomic impacts associated with this proposal.

Other Impacts:

Although "moving" emissions from the ozone season to another part of the year may reduce peak ozone formation, it may slightly increase emissions, and exposure of nearby populations to toxic compounds, in other parts of the year. Controlling emissions during the ozone season would not have this potential effect.

Attachment B

Further Study

FURTHER STUDY

A3: Improved Aerospace Coatings Rule (8-29)

Bay Area Rule 8-29 was last amended to address VOC limits in February 1993. The corresponding South Coast rule now has more stringent limits for several categories: fuel tank coating, surface prep and cleanup solvent, and paint stripping. In addition, the South Coast rule includes VOC limits for some components that Rule 29 exempts: electronic components, PC boards, and high temperature adhesive bonding primer. On the other hand, though the South Coast has a more stringent limit for paint stripping, the Bay Area rule required a methylene chloride reduction plan in 1995.

However, there is now some uncertainty about the total aerospace emission inventory. With the closure of Bay Area military bases and the transfer of much of United Airlines' maintenance work to facilities outside the Bay Area, total aerospace coating industry emissions appear to be about 0.1 ton of per day. Further study is necessary to refine inventory estimates and determine whether controls are warranted.

A6: Improved Surface Coating of Plastic Parts and Products Rule (8-31)

Bay Area Rule 8-31 contains VOC limits that differ in numerous minor respects from limits in the corresponding South Coast rule. The South Coast specialty limits in many categories are less stringent than the Bay Area limits. On the other hand, the South Coast standard for one component coatings is 275 g/l, and the Bay Area general coating limit is 340 g/l. But adoption of the South Coast limit in the Bay Area would not result in any actual emission reductions because water borne coatings with VOC content less than 275 g/l are already used to comply with the Bay Area limit.

The most significant difference between the South Coast and Bay Area rules is that the South Coast rule also extends to coating of glass and rubber products. Under Rule 8-4, Bay Area facilities that coat glass or rubber must either limit emissions to 5 tons per year or use coatings with a VOC content of 420 g/l or less. To determine whether adoption of the South Coast standards for glass and rubber would reduce or increase emissions in the Bay Area would require case-by-case examination of individual facilities.

C7: Control of Emissions from Petroleum Refinery Flares

This control measure from the 1991 CAP was intended to reduce emissions from petroleum refinery flares, either by improving combustion efficiency or capturing and controlling gases before flaring. Since that time, amendments to Regulation 8, Rule 28 have required control of repeated episodic emissions from pressure relief valves and have probably slightly increased gases routed to flares. Although flares are themselves control devices, they primarily function as safety devices, usually to control gases from processes that are unstable and undergoing emergency shutdown. Control of flare emissions therefore raises significant safety concerns, given its potential to restrict pre-flare gases that are being released to reduce pressures.

Although visible and particulate matter emissions from flares are currently controlled by District regulation, ROG and NOx emissions are unregulated. South Coast Rule 1118 now requires monitoring of flares and reporting of flaring incidents. Data developed through monitoring and reporting and further study of the safety issues are necessary before it can be determined whether controls are feasible, warranted, and safe.

C8: Draining of Liquid Products / Sumps and Pits

Numerous refinery processes produce wastewater containing organic compounds. The 1997 CAP included three control measures (C5, C6, and C8) proposing control of various components of refinery wastewater

systems. Over time, however, EPA's National Emission Standard for Benzene Waste Operations has reduced benzene and other organic compound emissions from wastewater operations at petroleum refineries. The CAP wastewater control measures have been reevaluated in preliminary staff reports and in preparing the Bay Area Ozone Attainment Plan (June 1999). As a result of this analysis, measures C5 and C6 were found to offer little potential for emission reductions.

Control measure C8 proposed control of VOC emissions from process drains. In its 1999 analysis of refinery wastewater systems, the District concluded that it made little sense to focus on control of anything short of the entire refinery wastewater system. Although control of the process drains alone could possibly reduce Bay Area emissions by about 0.3 tons per day, the District analysis found that controlling one emission point in a system may cause increased emissions at other emission points. Because the wastewater system at each refinery is unique, further study of refinery wastewater paths and existing controls is necessary to determine whether additional emission reductions can be achieved by control of these systems.

F7: Easing of Administrative Requirements for Use of Lower Emitting Technology

This control measure was added by the 1997 update to the CAP. It proposed that the District would ease administrative requirements, typically recordkeeping or monitoring requirements, for facilities that use technology with emissions lower than other technologies allowed by a particular rule. The measure primarily contemplated coating facilities that might use lower-emitting water borne coatings when the applicable rule sets limits that would allow use of solvent borne coatings. However, this control measure is constrained by EPA policies regarding recordkeeping. In addition, it is impossible to quantify emission reduction potentials or enforce reductions made, as sources have the option of returning to higher emitting technology and adopting administrative procedures commensurate with the appropriate rule standards. Further study and discussion with EPA is necessary to determine whether this proposal could be implemented.

F8: Limitations on Solvents Based on Relative Reactivities

This control measure was added by the 1997 update to the CAP. It proposed replacing existing mass limitations on emissions from surface coating or other processes involving solvent evaporation with limits based on the relative contribution of the solvents in ozone formation (called "relative reactivity"). Although ARB is working to incorporate a relative reactivity approach into its Consumer Products Regulation, it is a significant departure from the long-standing approach of limiting VOC emissions based on total mass, regardless of reactivity. Implementation of this measure will require considerable inter-agency policy consensus among ARB, EPA, and local air districts. Though it is unlikely that the District will be able to implement these kinds of regulations in the near term, it is a promising approach that the District intends to continue to study.