

# CHAPTER 7

## EMISSION FORECASTS

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### 7.1 INTRODUCTION

Emission forecasts are estimates of future year emissions. These estimates are developed by examining the effects of economic growth, existing regulations, and proposed control measures on future year emission inventories. The resulting projections can be used for a variety of purposes, including modeling of future air quality, assessing the effectiveness of proposed control measures, analyzing new source impacts, and tracking progress towards clean air.

The 1991 annual and planning emissions inventories presented in Chapter 4 represent the most up-to-date, comprehensive data available to forecast future year emissions. Since this Plan primarily addresses ozone, only emission forecasts of ROG and NO<sub>x</sub>, the precursors to ozone, are presented. The 1991 planning inventory was used as the reference year from which emission forecasts were generated for the years 1997, 2000, 2003, 2006, and 2015. Two different regulatory scenarios were used in developing the emission forecasts for this Plan:

- The first forecast scenario is presented in Table 7-1 and reflects projected future emissions assuming none of the control measures described in this Plan are implemented. This forecast accounts for future year socioeconomic growth and the emission reductions anticipated from District rules adopted prior to 1989. Emission reductions from existing and anticipated future control measures adopted by the state ARB for consumer products, utility engines, on-road and off-road motor vehicles, and other mobile sources are also included in this forecast.
- The second forecast is a projection of future emissions assuming all control strategies adopted since 1989, and those proposed for adoption in this Plan, are fully implemented. Table 7-2 displays these projections, which integrate the estimated emission reductions from the proposed controls and recently adopted rules into the forecast described above. Emission reductions from measures recommended for further study or deletion from consideration are not included in this forecast.

### 7.2 FORECAST METHODS AND ASSUMPTIONS

Emission forecasts are generated by applying emission growth and control estimates to the reference year emissions inventory. Emission growth estimates are derived by estimating the relationship between economic growth and sources of ROG and NO<sub>x</sub> emissions; developing or compiling economic projections; and applying these economic activity data to the emissions inventory. Emission control estimates were developed through the control strategy evaluation process described in Chapters 5 and 6. The following sections provide an overview of how economic growth and emission controls are used in developing the emission forecasts, as well as the uncertainties associated with the methodology.

#### **Economic Growth**

The inventory consists of individual emission categories, each with its own socioeconomic activity indicator and emission-generating characteristics. To account for future growth, each of the baseyear emission categories is assigned a related activity indicator for which there are known future estimates. For example, the emission category "Residential Fuel Combustion" is an aggregation of fuel burning devices from residential units, such as water heaters, furnaces and woodstoves. The emissions in this category are directly proportional to the number of residences in the county. Thus, a dwelling unit activity indicator is assigned to these emissions. It is assumed that future growth in the number of dwelling units is a reasonable indicator of future growth in residential fuel usage. Each emission inventory category is assigned a similar activity indicator to predict the change in ROG and NO<sub>x</sub> emissions in relation to projected future socioeconomic conditions.

For most emission categories, socioeconomic trends are the driving force behind the growth assumptions used in the forecasts. Some categories, however, such as on-road motor vehicles, oil production, electric utilities and others, may use more specific trend assumptions. For example, vehicle emissions were projected using the information in ARB's own mobile source data bank. Their forecast methodology for motor vehicle emissions is probably the most comprehensive in the world; it includes changes resulting from new emission controls, ongoing turnover in the vehicle fleet, changes in fuel characteristics and other considerations, along with socioeconomic growth factors. On the other hand, emissions from utility boilers were projected based on forecast energy needs over the next two decades. Thus, in addition to population growth, fuel prices, conservation and other factors are accounted for in these estimates. Most of the socioeconomic trend data used here was developed for ARB by Data Resources Inc. (DRI) through a study which concentrated on employment data for 77 industry sectors. Some growth projections were also developed by ARB based on population and dwelling unit forecasts by the Department of Finance (DOF), and forecasts by Caltrans of vehicle miles traveled. A detailed description of the activity indicators used and their application to each source category is presented in Appendix B, Reference Year Projected Planning Emissions Inventory.

### **Emission Controls**

In addition to changes in socioeconomic conditions, emissions will change over time due to the implementation of control measures. This can occur if an existing control measure is strengthened or if uncontrolled emission sources are affected by new control measures. In order to quantify the emission reductions associated with the implementation of control measures, the effectiveness of each measure needs to be evaluated.

For example, using the emission category of 'Residential Fuel Combustion' again, control measures N-12 (Residential Natural Gas Combustion) and MP-1 (Residential Wood Combustion) affect the future emissions in this category. To account for these controls, the portion of emissions due to residential water heaters and wood combustion devices is determined. Next, the implementation schedule of the control measure is evaluated to estimate the rate at which it will affect emissions in future years. For instance, the implementation schedule for residential water heaters is dependent upon the rate at which new residences are added, and the rate at which homeowners replace old water heaters with new, less polluting units. The emission reduction efficiency of the control equipment is then taken into account. For residential water heaters, the control efficiency is based on combustion modifications to new models. Finally, the overall compliance rate for the control measure is estimated.

The estimated overall effectiveness of each control measure, the documentation of how the control measures are applied to emission activities, and projected emission reductions by control measure are presented in Appendices B, C, and D.

### **Uncertainties in Forecasting**

As with any forecasting scheme, the one used for the emission projections presented in this Plan can only be a best estimate. The economy may not be as healthy in the future as was forecast at the time DRI performed their analysis. This may translate into less of an employment increase in one sector or another, which could result in fewer emissions than projected. Conversely, if the actual effectiveness of control measures proposed in the Plan is less than was assumed in the emission forecasts, then future emissions would be higher than the forecast for that source category. Also, unforeseen technology changes could alter the accuracy of the emission forecasts.

Likewise, population projections prepared by city and county officials are only best estimates of future growth patterns. They are based on DOF projections of past growth trends, as well as potential resource constraints or other limitations to growth, but the assumptions used are general by nature. Thus, the projected future emissions for source categories that are population-dependent may be underestimated or

overestimated if population grows faster or slower than the forecast rate. Chapter 2 presents the population projections used in this Plan.

Development of the reference year and forecast inventories is a dynamic process. Changes in emission factors for individual sources or source categories occur periodically and must be incorporated in the inventory. Also, the effectiveness of the control measures must be evaluated after they are implemented, and the inventory revised as needed to reflect actual performance. Activity indicators (population, fuel consumption, etc.) must also be adjusted occasionally to reflect current socioeconomic conditions. Thus, refinement of the emission estimates is an ongoing process as new and better data become available. This third update to the 1991 CAP includes revised estimates for both the reference year and forecast emissions. The original baseline emissions data for 1987 is no longer included, as described in Chapter 4.

### 7.3 COMPARISON OF FORECAST EMISSION SCENARIOS

Tables 7-1 and 7-2 present the projected future ROG and NO<sub>x</sub> emissions for the two forecast scenarios described above: future emissions without implementing the Clean Air Plan, and future emissions when the Plan is fully implemented. This data was used for the graphical comparison of the two scenarios presented in Figures 7-1 through 7-4.

#### Forecasts By Source Category

Projected ROG and NO<sub>x</sub> emissions for the two forecast scenarios are presented in Table 7-3 and graphically displayed in Figures 7-1 and 7-2 for the major source category groups. Table 7-3 and Figure 7-1 shows that, without the controls proposed in the Clean Air Plan, ROG emissions will decrease from about 41 tons/day in 1991 to 37 tons/day in the year 2006. Most of this decrease is due to a substantial reduction in ROG emissions expected from the state motor vehicle control program during this period. ROG emissions from most of the other source categories are projected to remain relatively constant or increase slightly during this period, with the exception of solvents and surface coatings. Anticipated population growth is predicted to cause a considerable increase in emissions from these sources.

After accounting for measures already implemented or proposed for retention and adoption in this Plan, ROG emissions are expected to further decrease to about 30 tons/day in the year 2006. As shown in Table 7-3 and Figure 7-1, most of the reductions will occur in the on-road motor vehicles and petroleum processing source categories. Emissions from petroleum production and marketing operations in particular will be reduced by 79% from 1991 levels. This is due primarily to reformulated fuels combined with evaporative controls on service stations, storage tanks, bulk transfer plants and marine tanker loading. The substantial reductions in motor vehicle emissions previously discussed will also be enhanced through implementation of several transportation control measures. Other control measures, such as those requiring reformulation and increased transfer efficiency for solvent-based products, will help reduce the expected increase in emissions from sources directly affected by population growth.

NO<sub>x</sub> emissions overall were projected to remain relatively constant at about 50 tons/day from 1991 through the year 2006 if the measures in the Plan had not been implemented. Table 7-3 and Figure 7-2 show that in the absence of the CAP, significant NO<sub>x</sub> reductions are from implementation of the state motor vehicle control program would be offset by increased NO<sub>x</sub> emissions from other mobile sources, as well as increased emissions from utility fuel combustion.

NO<sub>x</sub> controls already implemented and those proposed for retention and adoption in this Plan will provide substantial additional reductions in future emissions levels. As shown in Table 7-3 and Figure 7-2, implementation of the Clean Air Plan is expected to further reduce NO<sub>x</sub> emissions to about 35 tons/day in the year 2006. The bar chart shows that most of the projected reductions will occur in the stationary source fuel combustion category, as well as the on-road motor vehicle reductions previously

discussed. Existing and projected future controls on the Morro Bay power plant account for the majority of the reductions achieved through CAP control strategies. However, NO<sub>x</sub> emissions from industrial boilers, process heaters, utility engines and residential fuel combustion will also be significantly reduced in future years by the measures described in this Plan.

It is important to note that the 1990 Amendments to the federal Clean Air Act pre-empt state and local control of many of the sources in the 'other mobile sources' emission category. In particular, new construction equipment, farm equipment and locomotives are specifically exempt from California regulatory authority. As shown in Figures 7-1 and 7-2, emissions from this source category represent a significant portion of both the ROG and NO<sub>x</sub> reference year and forecast inventories for this county. These emissions are projected to remain relatively constant during the forecast period due to the uncertainty of the federal rulemaking schedule and the lack of regulatory control at the state and local level. Grant programs have been implemented by the District in recent years to fund voluntary emission reduction projects targeting these uncontrolled sources. These efforts are beginning to provide substantial emission reductions that have not been accounted for in the CAP. Those reductions will be described and tabulated in the next update to this Plan.

### **Countywide Emission Forecasts**

Figures 7-3 and 7-4 present a comparison between the emission reduction targets set by ARB, and the future ROG and NO<sub>x</sub> emission levels expected after implementation of this Plan. As shown in Figure 7-3, the 41 tons/day of total ROG emissions in 1991 are projected to decline steadily to about 28 tons/day in the year 2015 by implementing the ROG controls described in this Plan. This represents an overall reduction of about 32% compared to ROG emissions in 1991. As shown in the graph, this reduction will more than meet the targets set by the ARB, thus providing a buffer for contingencies.

Figure 7-4 compares the projected future NO<sub>x</sub> emissions after CAP implementation to the ARB emission reduction goals for our area. As shown in this chart, implementing the proposed NO<sub>x</sub> controls will provide a substantial decrease in NO<sub>x</sub> emissions, falling from 50 tons/day of NO<sub>x</sub> in 1991 to about 33 tons/day in the year 2015. This represents a 34% reduction in NO<sub>x</sub> emissions overall compared to 1991 levels. As shown in the graph, this reduction also exceeds the targets established by the CCAA.

## **7.4 SUMMARY**

Implementation of the 2001 Clean Air Plan will produce a steady decline in ROG and NO<sub>x</sub> emissions through the year 2015. These emission reductions will result primarily from existing and proposed application of controls on motor vehicles, electric utilities and other fuel combustion, the petroleum industry, and various types of solvent use. NO<sub>x</sub> emissions from stationary and area-wide sources are expected to be reduced approximately 64% compared to 1991 levels. However, ROG emissions from stationary and area-wide sources are projected to remain static over that same period due to increased emissions from population growth offsetting the emission reductions achieved by CAP controls.

Emissions from mobile sources are expected to decline 47% for ROG and 20% for NO<sub>x</sub> compared to 1991 emission levels. It is interesting to note that stationary source NO<sub>x</sub> reductions overshadow mobile source NO<sub>x</sub> reductions while the opposite is true for ROG, where mobile source reductions are significantly greater than those expected from stationary sources. This further supports the need to realize reductions from both source types to achieve the overall balance required to reduce ozone levels throughout the county.

Cumulatively, overall emissions by the year 2015 from all sources countywide are expected to be reduced approximately 32% for ROG and 34% for NO<sub>x</sub> compared to 1991 levels.

**Table 7-1**  
**UNCONTROLLED PROJECTED ROG AND NO<sub>x</sub> EMISSIONS**  
**(tons per day)**

revised 12-26-00

	1991	1997	2000	ROG			1991	1997	NO <sub>x</sub>			
				2003	2006	2015			2000	2003	2006	2015
<b>STATIONARY SOURCES</b>												
<b>FUEL COMBUSTION</b>												
Electric Utilities	0.322	0.330	0.333	0.340	0.349	0.383	13.230	13.570	13.708	13.998	14.341	15.753
Cogeneration	0.001	0.002	0.001	0.001	0.001	0.001	0.144	0.166	0.144	0.144	0.144	0.144
Oil and Gas Production	0.013	0.035	0.044	0.050	0.055	0.064	0.457	1.203	1.443	1.610	1.789	2.068
Petroleum Refining	0.027	0.039	0.042	0.042	0.042	0.042	0.383	0.555	0.599	0.609	0.608	0.598
Manufacturing and Industrial	0.012	0.015	0.016	0.017	0.018	0.021	0.558	0.631	0.651	0.667	0.681	0.743
Food and Agriculture Processing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Services and Commercial	0.079	0.100	0.109	0.116	0.124	0.145	1.101	1.323	1.416	1.494	1.576	1.798
<b>Fuel Combustion Subtotal</b>	<b>0.454</b>	<b>0.521</b>	<b>0.546</b>	<b>0.567</b>	<b>0.589</b>	<b>0.656</b>	<b>15.873</b>	<b>17.447</b>	<b>17.961</b>	<b>18.522</b>	<b>19.140</b>	<b>21.104</b>
<b>WASTE DISPOSAL</b>												
Sewage Treatment	0.002	0.002	0.002	0.002	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Landfills	0.028	0.030	0.033	0.036	0.038	0.046	0.000	0.000	0.000	0.000	0.000	0.000
Incinerators	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001
Soil Remediation	0.003	0.003	0.003	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Waste Disposal Subtotal</b>	<b>0.033</b>	<b>0.035</b>	<b>0.038</b>	<b>0.041</b>	<b>0.044</b>	<b>0.052</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>
<b>CLEANING AND SURFACE COATING</b>												
Laundering and Dry Cleaning	0.027	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Degreasing	0.360	0.506	0.567	0.618	0.672	0.835	0.000	0.000	0.000	0.000	0.000	0.000
Coatings and Related Process Solvents	1.419	2.053	2.309	2.534	2.766	3.773	0.000	0.000	0.000	0.000	0.000	0.000
Printing	0.103	0.151	0.173	0.191	0.206	0.267	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.365	0.531	0.597	0.656	0.719	1.007	0.000	0.000	0.000	0.000	0.000	0.000
<b>Cleaning/Surface Coating Subtotal</b>	<b>2.274</b>	<b>3.270</b>	<b>3.646</b>	<b>3.999</b>	<b>4.364</b>	<b>5.882</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>PETROLEUM PRODUCTION/MARKETING</b>												
Oil and Gas Production	0.216	0.562	0.661	0.737	0.819	0.947	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum Refining	0.650	0.769	0.805	0.818	0.816	0.802	0.103	0.122	0.127	0.129	0.129	0.127
Petroleum Marketing	2.513	2.550	2.555	2.565	2.575	2.620	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Petroleum Prod./Marketing Subtotal</b>	<b>3.380</b>	<b>3.881</b>	<b>4.021</b>	<b>4.119</b>	<b>4.210</b>	<b>4.368</b>	<b>0.103</b>	<b>0.122</b>	<b>0.127</b>	<b>0.129</b>	<b>0.129</b>	<b>0.127</b>
<b>INDUSTRIAL PROCESSES</b>												
Chemical	0.059	0.087	0.098	0.108	0.119	0.166	0.000	0.000	0.000	0.000	0.000	0.000
Food and Agriculture	0.098	0.134	0.146	0.156	0.166	0.204	0.000	0.000	0.000	0.000	0.000	0.000
Mineral Processes	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.026	0.027	0.029	0.031	0.039
Metal Processes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood and Paper	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Industrial Processes Subtotal</b>	<b>0.157</b>	<b>0.221</b>	<b>0.245</b>	<b>0.264</b>	<b>0.285</b>	<b>0.370</b>	<b>0.017</b>	<b>0.026</b>	<b>0.027</b>	<b>0.029</b>	<b>0.031</b>	<b>0.039</b>
<b>TOTAL STATIONARY SOURCES</b>	<b>6.298</b>	<b>7.929</b>	<b>8.496</b>	<b>8.990</b>	<b>9.492</b>	<b>11.329</b>	<b>15.994</b>	<b>17.596</b>	<b>18.116</b>	<b>18.681</b>	<b>19.301</b>	<b>21.271</b>

Table 7-1, continued

	1991	1997	2000	ROG 2003	2006	2015	1991	1997	NOx 2000	2003	2006	2015
<b>AREA-WIDE SOURCES</b>												
<b>SOLVENT EVAPORATION</b>												
Consumer Products	2.357	2.517	2.734	2.965	3.184	3.847	0.000	0.000	0.000	0.000	0.000	0.000
Architectural Coatings/Related Proc. Solv.	0.848	1.007	1.088	1.173	1.261	1.549	0.000	0.000	0.000	0.000	0.000	0.000
Pesticides/Fertilizers	1.036	1.150	1.179	1.201	1.224	1.348	0.000	0.000	0.000	0.000	0.000	0.000
Asphalt Paving	0.293	0.422	0.438	0.464	0.502	0.567	0.000	0.000	0.000	0.000	0.000	0.000
Refrigerants	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Solvent Evaporation Subtotal</b>	<b>4.534</b>	<b>5.096</b>	<b>5.439</b>	<b>5.803</b>	<b>6.171</b>	<b>7.310</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>MISCELLANEOUS PROCESSES</b>												
Residential Fuel Combustion	0.121	0.144	0.155	0.167	0.180	0.221	0.270	0.321	0.346	0.373	0.401	0.493
Farming Operations	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Construction and Demolition	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Paved Road Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Unpaved Road Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fugitive Wind Blown Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fires	0.004	0.004	0.004	0.004	0.004	0.005	0.001	0.001	0.001	0.001	0.001	0.001
Waste Burning and Disposal	1.250	1.353	1.414	1.472	1.529	1.742	0.005	0.006	0.006	0.007	0.007	0.009
Other	0.024	0.033	0.036	0.038	0.041	0.050	0.000	0.000	0.000	0.000	0.000	0.000
<b>Miscellaneous Processes Subtotal</b>	<b>1.399</b>	<b>1.533</b>	<b>1.609</b>	<b>1.682</b>	<b>1.754</b>	<b>2.017</b>	<b>0.276</b>	<b>0.327</b>	<b>0.353</b>	<b>0.381</b>	<b>0.410</b>	<b>0.503</b>
<b>TOTAL AREA-WIDE SOURCES</b>	<b>5.933</b>	<b>6.630</b>	<b>7.049</b>	<b>7.485</b>	<b>7.924</b>	<b>9.328</b>	<b>0.276</b>	<b>0.327</b>	<b>0.353</b>	<b>0.381</b>	<b>0.410</b>	<b>0.503</b>
<b>MOBILE SOURCES</b>												
<b>ON-ROAD VEHICLES</b>												
Light-Duty Passenger	11.861	7.777	6.583	5.444	4.197	1.424	7.293	5.219	4.672	3.927	3.265	1.610
Light Duty Trucks	5.030	3.735	3.452	3.150	2.784	1.279	4.988	4.176	4.020	3.547	3.185	1.737
Medium Duty Trucks	1.879	1.721	1.506	1.322	1.151	0.529	1.388	1.658	1.606	1.439	1.319	0.758
Light Heavy Duty Gas Trucks	1.403	1.281	1.049	0.743	0.661	0.267	1.160	1.014	0.941	0.729	0.698	0.454
Medium Heavy Duty Gas Trucks	0.995	0.831	0.641	0.374	0.352	0.102	0.731	0.593	0.500	0.338	0.299	0.122
Heavy Heavy Duty Gas Trucks	0.370	0.256	0.145	0.100	0.060	0.012	0.223	0.151	0.088	0.070	0.040	0.012
Light Heavy Duty Diesel Trucks	0.011	0.016	0.019	0.020	0.020	0.016	0.166	0.205	0.250	0.240	0.213	0.159
Medium Heavy Duty Diesel Trucks	0.025	0.033	0.036	0.037	0.036	0.029	0.717	0.767	0.829	0.800	0.711	0.485
Heavy Heavy Duty Diesel Trucks	0.301	0.242	0.175	0.186	0.124	0.072	3.402	2.960	2.332	2.548	1.720	0.999
Motorcycle	0.549	0.302	0.233	0.197	0.166	0.082	0.064	0.037	0.035	0.035	0.038	0.033
Heavy-Duty Diesel Urban Buses	0.006	0.006	0.007	0.007	0.007	0.008	0.144	0.132	0.134	0.131	0.129	0.122
Heavy Duty Gas Urban Buses	0.017	0.017	0.016	0.017	0.017	0.017	0.020	0.025	0.025	0.027	0.028	0.032
School Buses	0.039	0.027	0.023	0.022	0.020	0.013	0.163	0.157	0.167	0.167	0.165	0.160
Motor Homes	0.095	0.097	0.101	0.106	0.107	0.074	0.181	0.226	0.241	0.261	0.280	0.303
<b>On-Road Vehicle Subtotal</b>	<b>22.581</b>	<b>16.341</b>	<b>13.986</b>	<b>11.725</b>	<b>9.702</b>	<b>3.924</b>	<b>20.640</b>	<b>17.320</b>	<b>15.840</b>	<b>14.259</b>	<b>12.090</b>	<b>6.986</b>
<b>OTHER MOBILE</b>												
Aircraft	0.376	0.512	0.544	0.589	0.646	0.752	0.066	0.087	0.092	0.099	0.109	0.127
Trains	0.064	0.076	0.076	0.077	0.077	0.076	2.152	2.554	2.554	2.582	2.582	2.554
Ships and Commercial Boats	0.068	0.077	0.078	0.078	0.077	0.064	0.946	1.238	1.265	1.265	1.265	1.118
Recreational Boats	3.196	4.049	4.480	4.902	5.311	6.474	0.385	0.483	0.534	0.585	0.633	0.773
Off-Road Recreational Vehicles	0.284	0.285	0.303	0.322	0.339	0.387	0.034	0.036	0.038	0.040	0.043	0.049
Commercial/Industrial Mobile Equipment	1.572	2.069	2.200	2.327	2.461	2.752	4.363	6.151	6.490	6.887	7.328	8.959
Farm Equipment	0.623	0.671	0.699	0.722	0.752	0.831	5.062	5.394	5.596	5.748	5.955	6.471
<b>Other Mobile Subtotal</b>	<b>6.183</b>	<b>7.739</b>	<b>8.380</b>	<b>9.016</b>	<b>9.663</b>	<b>11.336</b>	<b>13.008</b>	<b>15.943</b>	<b>16.569</b>	<b>17.206</b>	<b>17.915</b>	<b>20.050</b>
<b>TOTAL MOBILE SOURCES</b>	<b>28.764</b>	<b>24.080</b>	<b>22.366</b>	<b>20.741</b>	<b>19.365</b>	<b>15.260</b>	<b>33.648</b>	<b>33.263</b>	<b>32.409</b>	<b>31.465</b>	<b>30.005</b>	<b>27.036</b>
<b>TOTAL UNCONTROLLED SOURCES</b>	<b>40.995</b>	<b>38.639</b>	<b>37.910</b>	<b>37.216</b>	<b>36.782</b>	<b>35.917</b>	<b>49.918</b>	<b>51.186</b>	<b>50.879</b>	<b>50.528</b>	<b>49.716</b>	<b>48.810</b>

**Table 7-2**  
**CONTROLLED PROJECTED ROG AND NO<sub>x</sub> EMISSIONS**  
**(tons per day)**

revised 12-26-00

	ROG						NO <sub>x</sub>					
	1991	1997	2000	2003	2006	2015	1991	1997	2000	2003	2006	2015
<b>STATIONARY SOURCES</b>												
<b>FUEL COMBUSTION</b>												
Electric Utilities	0.322	0.323	0.326	0.333	0.341	0.375	13.230	5.277	5.329	2.541	2.541	2.543
Cogeneration	0.001	0.002	0.001	0.001	0.001	0.001	0.144	0.058	0.056	0.056	0.056	0.056
Oil and Gas Production	0.013	0.031	0.039	0.044	0.049	0.056	0.457	0.912	0.647	0.722	0.802	0.927
Petroleum Refining	0.027	0.018	0.020	0.021	0.021	0.020	0.383	0.182	0.205	0.208	0.208	0.204
Manufacturing and Industrial	0.012	0.013	0.013	0.014	0.015	0.019	0.558	0.493	0.285	0.299	0.314	0.379
Food and Agriculture Processing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Services and Commercial	0.079	0.078	0.086	0.093	0.101	0.122	1.101	0.861	0.895	0.970	1.049	1.261
<b>Fuel Combustion Subtotal</b>	<b>0.454</b>	<b>0.465</b>	<b>0.486</b>	<b>0.506</b>	<b>0.528</b>	<b>0.594</b>	<b>15.873</b>	<b>7.782</b>	<b>7.417</b>	<b>4.795</b>	<b>4.970</b>	<b>5.370</b>
<b>WASTE DISPOSAL</b>												
Sewage Treatment	0.002	0.002	0.002	0.002	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Landfills	0.028	0.021	0.020	0.022	0.023	0.028	0.000	0.000	0.000	0.000	0.000	0.000
Incinerators	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001
Soil Remediation	0.003	0.003	0.003	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Waste Disposal Subtotal</b>	<b>0.033</b>	<b>0.026</b>	<b>0.025</b>	<b>0.027</b>	<b>0.029</b>	<b>0.034</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>	<b>0.001</b>
<b>CLEANING AND SURFACE COATING</b>												
Laundering and Dry Cleaning	0.027	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Degreasing	0.360	0.506	0.567	0.618	0.672	0.835	0.000	0.000	0.000	0.000	0.000	0.000
Coatings and Related Process Solvents	1.409	1.912	2.102	2.308	2.523	3.472	0.000	0.000	0.000	0.000	0.000	0.000
Printing	0.103	0.151	0.173	0.191	0.206	0.267	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.365	0.531	0.597	0.656	0.719	1.007	0.000	0.000	0.000	0.000	0.000	0.000
<b>Cleaning/Surface Coating Subtotal</b>	<b>2.274</b>	<b>3.129</b>	<b>3.439</b>	<b>3.774</b>	<b>4.121</b>	<b>5.581</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>PETROLEUM PRODUCTION/MARKETING</b>												
Oil and Gas Production	0.216	0.222	0.245	0.274	0.304	0.351	0.000	0.000	0.000	0.000	0.000	0.000
Petroleum Refining	0.650	0.164	0.171	0.174	0.174	0.171	0.054	0.064	0.067	0.068	0.068	0.067
Petroleum Marketing	2.513	1.251	0.181	0.184	0.187	0.202	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Petroleum Prod./Marketing Subtotal</b>	<b>3.380</b>	<b>1.637</b>	<b>0.597</b>	<b>0.631</b>	<b>0.665</b>	<b>0.724</b>	<b>0.054</b>	<b>0.064</b>	<b>0.067</b>	<b>0.068</b>	<b>0.068</b>	<b>0.067</b>
<b>INDUSTRIAL PROCESSES</b>												
Chemical	0.059	0.087	0.098	0.108	0.119	0.166	0.000	0.000	0.000	0.000	0.000	0.000
Food and Agriculture	0.098	0.134	0.146	0.156	0.166	0.204	0.000	0.000	0.000	0.000	0.000	0.000
Mineral Processes	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.026	0.027	0.029	0.031	0.039
Metal Processes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wood and Paper	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Industrial Processes Subtotal</b>	<b>0.157</b>	<b>0.221</b>	<b>0.245</b>	<b>0.264</b>	<b>0.285</b>	<b>0.370</b>	<b>0.017</b>	<b>0.026</b>	<b>0.027</b>	<b>0.029</b>	<b>0.031</b>	<b>0.039</b>
<b>TOTAL STATIONARY SOURCES</b>	<b>6.288</b>	<b>5.478</b>	<b>4.792</b>	<b>5.203</b>	<b>5.627</b>	<b>7.304</b>	<b>15.945</b>	<b>7.873</b>	<b>7.512</b>	<b>4.894</b>	<b>5.070</b>	<b>5.477</b>



Table 7-2, continued

	ROG						NOx					
	1991	1997	2000	2003	2006	2015	1991	1997	2000	2003	2006	2015
<b>AREA-WIDE SOURCES</b>												
<b>SOLVENT EVAPORATION</b>												
Consumer Products	2.357	2.215	1.859	1.660	1.783	1.231	0.000	0.000	0.000	0.000	0.000	0.000
Architectural Coatings/Related Proc. Solv.	0.848	1.007	1.088	0.938	1.009	1.239	0.000	0.000	0.000	0.000	0.000	0.000
Pesticides/Fertilizers	1.036	1.150	1.179	1.201	1.224	1.348	0.000	0.000	0.000	0.000	0.000	0.000
Asphalt Paving	0.293	0.221	0.230	0.244	0.264	0.298	0.000	0.000	0.000	0.000	0.000	0.000
Refrigerants	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Solvent Evaporation Subtotal</b>	<b>4.534</b>	<b>4.594</b>	<b>4.356</b>	<b>4.043</b>	<b>4.279</b>	<b>4.116</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>MISCELLANEOUS PROCESSES</b>												
Residential Fuel Combustion	0.121	0.144	0.155	0.167	0.180	0.221	0.270	0.286	0.283	0.293	0.315	0.387
Farming Operations	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Construction and Demolition	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Paved Road Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Unpaved Road Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fugitive Wind Blown Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fires	0.004	0.004	0.004	0.004	0.004	0.005	0.001	0.001	0.001	0.001	0.001	0.001
Waste Burning and Disposal	0.799	0.852	0.901	0.668	0.693	0.789	0.005	0.006	0.006	0.003	0.004	0.004
Other	0.024	0.033	0.036	0.038	0.041	0.050	0.000	0.000	0.000	0.000	0.000	0.000
<b>Miscellaneous Processes Subtotal</b>	<b>0.948</b>	<b>1.033</b>	<b>1.096</b>	<b>0.877</b>	<b>0.918</b>	<b>1.065</b>	<b>0.276</b>	<b>0.292</b>	<b>0.290</b>	<b>0.297</b>	<b>0.319</b>	<b>0.392</b>
<b>TOTAL AREA-WIDE SOURCES</b>	<b>5.482</b>	<b>5.627</b>	<b>5.453</b>	<b>4.921</b>	<b>5.197</b>	<b>5.181</b>	<b>0.276</b>	<b>0.292</b>	<b>0.290</b>	<b>0.297</b>	<b>0.319</b>	<b>0.392</b>
<b>MOBILE SOURCES</b>												
<b>ON-ROAD VEHICLES</b>												
Light-Duty Passenger	11.861	7.777	6.583	5.444	4.197	1.424	7.293	5.219	4.672	3.927	3.265	1.610
Light Duty Trucks	5.030	3.735	3.452	3.150	2.784	1.279	4.988	4.176	4.020	3.547	3.185	1.737
Medium Duty Trucks	1.879	1.721	1.506	1.322	1.151	0.529	1.388	1.658	1.606	1.439	1.319	0.758
Light Heavy Duty Gas Trucks	1.403	1.281	1.049	0.743	0.661	0.267	1.160	1.014	0.941	0.729	0.698	0.454
Medium Heavy Duty Gas Trucks	0.995	0.831	0.641	0.374	0.352	0.102	0.731	0.593	0.500	0.338	0.299	0.122
Heavy Heavy Duty Gas Trucks	0.370	0.256	0.145	0.100	0.060	0.012	0.223	0.151	0.088	0.070	0.040	0.012
Light Heavy Duty Diesel Trucks	0.011	0.016	0.019	0.020	0.020	0.016	0.166	0.205	0.250	0.240	0.213	0.159
Medium Heavy Duty Diesel Trucks	0.025	0.033	0.036	0.037	0.036	0.029	0.717	0.767	0.829	0.800	0.711	0.485
Heavy Heavy Duty Diesel Trucks	0.301	0.242	0.175	0.186	0.124	0.072	3.402	2.960	2.332	2.548	1.720	0.999
Motorcycle	0.549	0.302	0.233	0.197	0.166	0.082	0.064	0.037	0.035	0.035	0.038	0.033
Heavy-Duty Diesel Urban Buses	0.006	0.006	0.007	0.007	0.007	0.008	0.144	0.132	0.134	0.131	0.129	0.122
Heavy Duty Gas Urban Buses	0.017	0.017	0.016	0.017	0.017	0.017	0.020	0.025	0.025	0.027	0.028	0.032
School Buses	0.039	0.027	0.023	0.022	0.020	0.013	0.163	0.157	0.167	0.167	0.165	0.160
Motor Homes	0.095	0.097	0.101	0.106	0.107	0.074	0.181	0.226	0.241	0.261	0.280	0.303
<b>On-Road Vehicle Subtotal</b>	<b>22.581</b>	<b>16.341</b>	<b>13.986</b>	<b>11.725</b>	<b>9.702</b>	<b>3.924</b>	<b>20.640</b>	<b>17.320</b>	<b>15.840</b>	<b>14.259</b>	<b>12.090</b>	<b>6.986</b>
<b>OTHER MOBILE</b>												
Aircraft	0.376	0.512	0.544	0.589	0.646	0.752	0.066	0.087	0.092	0.099	0.109	0.127
Trains	0.064	0.076	0.076	0.077	0.077	0.076	2.152	2.554	2.554	2.582	2.582	2.554
Ships and Commercial Boats	0.068	0.077	0.078	0.078	0.077	0.064	0.946	1.238	1.265	1.265	1.265	1.118
Recreational Boats	3.196	4.049	4.480	4.902	5.311	6.474	0.385	0.483	0.534	0.585	0.633	0.773
Off-Road Recreational Vehicles	0.284	0.285	0.303	0.322	0.339	0.387	0.034	0.036	0.038	0.040	0.043	0.049
Commercial/Industrial Mobile Equipment	1.572	2.069	2.200	2.327	2.461	2.752	4.363	6.151	6.490	6.887	7.328	8.959
Farm Equipment	0.623	0.671	0.699	0.722	0.752	0.831	5.062	5.394	5.596	5.748	5.955	6.471
<b>Other Mobile Subtotal</b>	<b>6.183</b>	<b>7.739</b>	<b>8.380</b>	<b>9.016</b>	<b>9.663</b>	<b>11.336</b>	<b>13.008</b>	<b>15.943</b>	<b>16.569</b>	<b>17.206</b>	<b>17.915</b>	<b>20.050</b>
<b>TOTAL MOBILE SOURCES</b>	<b>28.764</b>	<b>24.080</b>	<b>22.366</b>	<b>20.741</b>	<b>19.365</b>	<b>15.260</b>	<b>33.648</b>	<b>33.263</b>	<b>32.409</b>	<b>31.465</b>	<b>30.005</b>	<b>27.036</b>
<b>TOTAL CONTROLLED SOURCES</b>	<b>40.534</b>	<b>35.185</b>	<b>32.611</b>	<b>30.864</b>	<b>30.190</b>	<b>27.745</b>	<b>49.870</b>	<b>41.429</b>	<b>40.212</b>	<b>36.656</b>	<b>35.395</b>	<b>32.906</b>

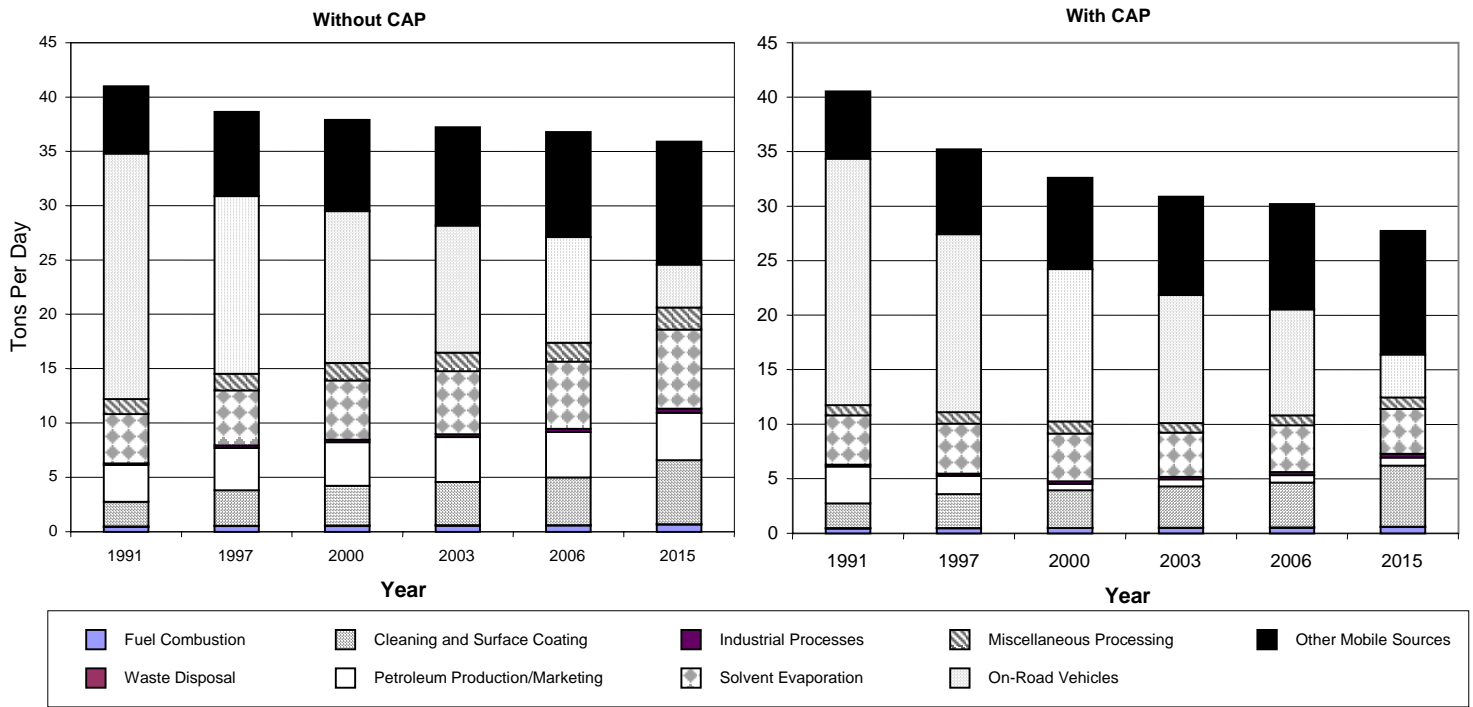
**Table 7-3**  
**CLEAN AIR PLAN EMISSION PROJECTIONS**  
**(tons per day)**

	1991	1997	2000	ROG			1991	1997	NOx			
				2003	2006	2015			2000	2003	2006	2015
<b>STATIONARY SOURCES</b>												
<b>Fuel Combustion</b>												
Without CAP Reductions	0.454	0.521	0.546	0.567	0.589	0.656	15.873	17.447	17.961	18.522	19.14	21.104
With CAP Reductions	0.454	0.465	0.486	0.506	0.528	0.594	15.873	7.782	7.417	4.795	4.970	5.370
<b>Gross Emission Reductions</b>	0.000	0.056	0.059	0.060	0.061	0.062	0.000	9.666	10.544	13.727	14.170	15.734
<b>Waste Disposal</b>												
Without CAP Reductions	0.033	0.035	0.038	0.041	0.044	0.052	0.001	0.001	0.001	0.001	0.001	0.001
With CAP Reductions	0.033	0.026	0.025	0.027	0.029	0.034	0.001	0.001	0.001	0.001	0.001	0.001
<b>Gross Emission Reductions</b>	0.000	0.009	0.013	0.014	0.015	0.018	0.000	0.000	0.000	0.000	0.000	0.000
<b>Cleaning and Surface Coating</b>												
Without CAP Reductions	2.274	3.270	3.646	3.999	4.364	5.882	0.000	0.000	0.000	0.000	0.000	0.000
With CAP Reductions	2.264	3.129	3.439	3.774	4.121	5.581	0.000	0.000	0.000	0.000	0.000	0.000
<b>Gross Emission Reductions</b>	0.010	0.141	0.208	0.225	0.244	0.301	0.000	0.000	0.000	0.000	0.000	0.000
<b>Petroleum Production/Marketing</b>												
Without CAP Reductions	3.380	3.881	4.021	4.119	4.210	4.368	0.103	0.122	0.127	0.129	0.129	0.127
With CAP Reductions	3.380	1.637	0.597	0.631	0.665	0.724	0.054	0.064	0.067	0.068	0.068	0.067
<b>Gross Emission Reductions</b>	0.000	2.245	3.424	3.488	3.545	3.644	0.048	0.057	0.060	0.061	0.061	0.060
<b>Industrial Processes</b>												
Without CAP Reductions	0.157	0.221	0.245	0.264	0.285	0.370	0.017	0.026	0.027	0.029	0.031	0.039
With CAP Reductions	0.157	0.221	0.245	0.264	0.285	0.370	0.017	0.026	0.027	0.029	0.031	0.039
<b>Gross Emission Reductions</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>TOTAL STATIONARY SOURCES</b>												
Without CAP Reductions	6.298	7.929	8.496	8.990	9.492	11.329	15.994	17.596	18.116	18.681	19.301	21.271
With CAP Reductions	6.288	5.478	4.792	5.203	5.627	7.304	15.945	7.873	7.512	4.894	5.070	5.477
<b>Gross Emission Reductions</b>	0.010	2.452	3.704	3.788	3.865	4.025	0.048	9.723	10.604	13.788	14.230	15.794
<b>AREA-WIDE SOURCES</b>												
<b>Solvent Evaporation</b>												
Without CAP Reductions	4.534	5.096	5.439	5.803	6.171	7.310	0.000	0.000	0.000	0.000	0.000	0.000
With CAP Reductions	4.534	4.594	4.356	4.043	4.279	4.116	0.000	0.000	0.000	0.000	0.000	0.000
<b>Gross Emission Reductions</b>	0.000	0.502	1.083	1.760	1.892	3.195	0.000	0.000	0.000	0.000	0.000	0.000
<b>Miscellaneous Processing</b>												
Without CAP Reductions	1.399	1.533	1.609	1.682	1.754	2.017	0.276	0.327	0.353	0.381	0.410	0.503
With CAP Reductions	0.948	1.033	1.096	0.877	0.918	1.065	0.276	0.292	0.290	0.297	0.319	0.392
<b>Gross Emission Reductions</b>	0.451	0.500	0.513	0.805	0.835	0.953	0.000	0.035	0.063	0.084	0.090	0.111
<b>TOTAL AREA WIDE SOURCES</b>												
Without CAP Reductions	5.933	6.630	7.049	7.485	7.924	9.328	0.276	0.327	0.353	0.381	0.410	0.503
With CAP Reductions	5.482	5.627	5.453	4.921	5.197	5.181	0.276	0.292	0.290	0.297	0.319	0.392
<b>Gross Emission Reductions</b>	0.451	1.002	1.596	2.564	2.727	4.147	0.000	0.035	0.063	0.084	0.090	0.111
<b>MOBILE SOURCES</b>												
<b>On-Road Vehicles</b>												
Without CAP Reductions	22.581	16.341	13.986	11.725	9.702	3.924	20.640	17.320	15.840	14.259	12.090	6.986
With CAP Reductions	22.581	16.341	13.986	11.725	9.702	3.924	20.640	17.320	15.840	14.259	12.090	6.986
<b>Gross Emission Reductions</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Other Mobile Sources</b>												
Without CAP Reductions	6.183	7.739	8.380	9.016	9.663	11.336	13.008	15.943	16.569	17.206	17.915	20.050
With CAP Reductions	6.183	7.739	8.380	9.016	9.663	11.336	13.008	15.943	16.569	17.206	17.915	20.050
<b>Gross Emission Reductions</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>TOTAL MOBILE SOURCES</b>												
Without CAP Reductions	28.764	24.080	22.366	20.741	19.365	15.260	33.648	33.263	32.409	31.465	30.005	27.036
With CAP Reductions	28.764	24.080	22.366	20.741	19.365	15.260	33.648	33.263	32.409	31.465	30.005	27.036
<b>Gross Emission Reductions</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>TOTAL ALL SOURCES</b>												
Emissions Without CAP Reductions	40.995	38.639	37.910	37.216	36.782	35.917	49.918	51.186	50.879	50.528	49.716	48.810
Emissions With CAP Reductions	40.534	35.185	32.611	30.864	30.190	27.745	49.870	41.429	40.212	36.656	35.395	32.906
<b>Net Emission Reductions</b>	0.461	3.454	5.299	6.352	6.592	8.172	0.048	9.758	10.667	13.872	14.321	15.905
*CAP Emission Target		32.796	32.796	32.796	32.796	32.796		39.934	39.934	39.934	39.934	39.934
**Percent Emission Reductions	1.1%	14.2%	20.5%	24.7%	26.4%	32.3%	0.1%	17.0%	19.4%	26.6%	29.1%	34.1%

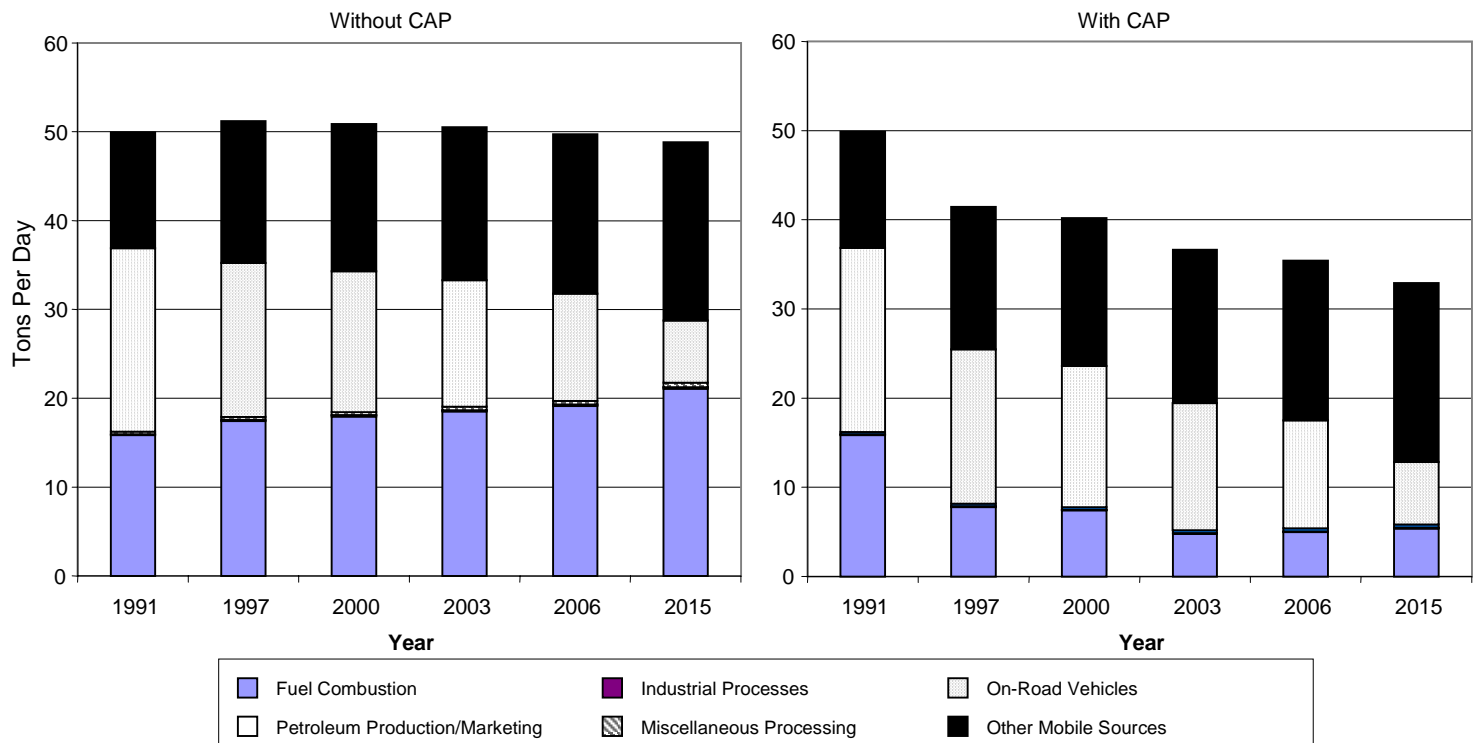
\* Assumes 15% reduction by 1994; 20% reduction for subsequent years

\*\* 100 x (1991 emissions without CAP reductions - year of interest emission with CAP reductions)/1991 emissions without CAP reductions

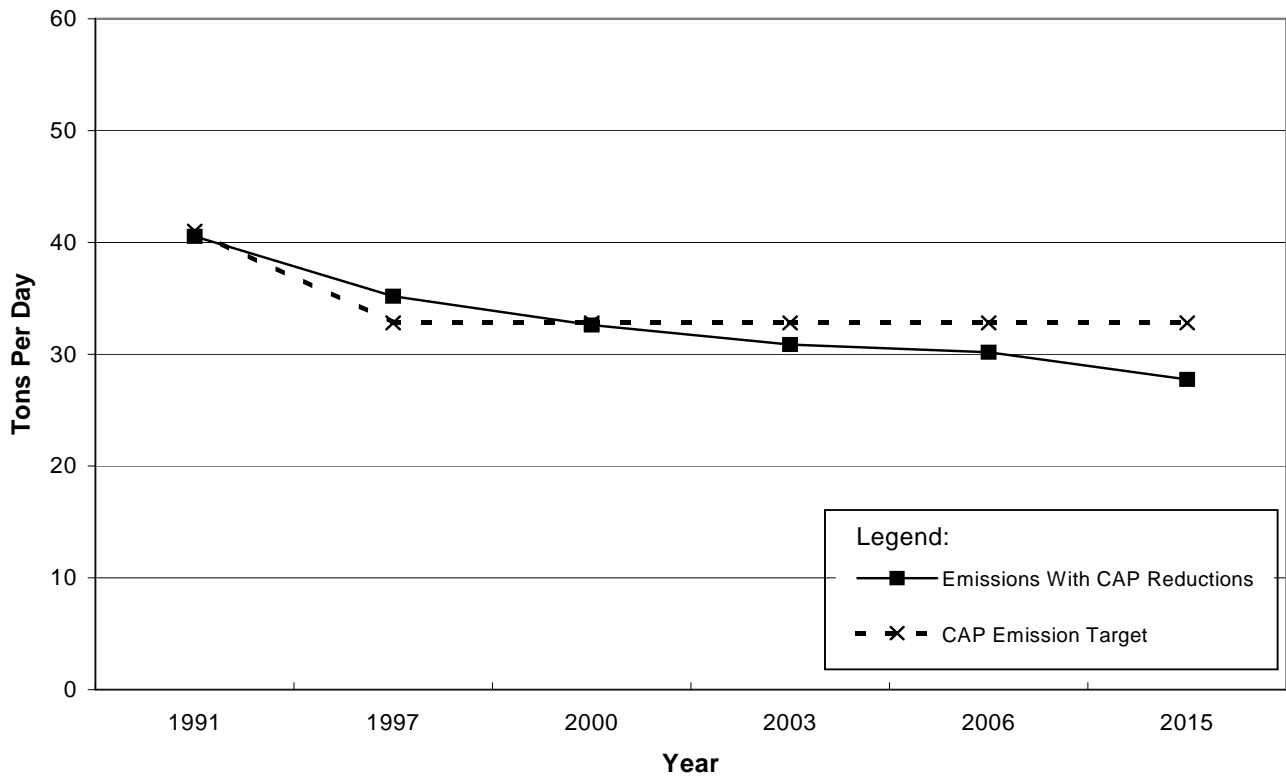
**Figure 7-1  
FORECAST ROG EMISSIONS BY SOURCE GROUP**



**Figure 7-2  
FORECAST NO<sub>x</sub> EMISSIONS BY SOURCE GROUP**



**Figure 7-3  
FORECAST ROG EMISSIONS COUNTYWIDE**



**Figure 7-4  
FORECAST NO<sub>x</sub> EMISSIONS COUNTYWIDE**

