

Findings:

The Clean Air Act as amended in 1977 required the identification of air quality with respect to the National Ambient Air Quality Standards in all areas of the State. This requirement led to the designation of Pulaski County as a nonattainment area for ozone. This designation required that the State Implementation Plan be revised to describe and implement a control strategy to reduce the emissions of volatile organic compounds (VOC or hydrocarbons) to the extent that the standard for ozone would be attained.

The methods used to evaluate air quality data and thereby establish the reductions of VOC emissions necessary to attain the Ozone Standard in Pulaski County were based on those suggested in the Environmental Protection Agency (EPA) guidance documents and correspondence with EPA personnel and the assumption that there is a proportional relationship between VOC emissions and ozone concentrations. Based on the methods contained in the guidance documents and after consultation with EPA, it was determined that Pulaski County would need a 20% reduction in VOC emissions by December 31, 1982 to attain the .12 ppm National Primary Ambient Air Quality Standard for Ozone. A method of demonstrating Reasonable Further Progress (RFP) toward the attainment of the standard and an extensive air monitoring program was also required to be contained in the plan. The purpose of the RFP is to demonstrate that each year from the baseline year (1977), reduction in VOC emissions are greater than additions such that the standard may be attained by the required date. The Department has maintained an accurate emission inventory such that Reasonable Further Progress could be calculated on an annual basis. Based on the evaluation of emissions and air monitoring data, the county is on target with the required reductions in VOC emissions. From the baseyear, 1977, to the end of 1981, the county has averaged a 4.5% decrease per year in overall VOC emissions, which indicates that Pulaski County will meet the required 20% reduction necessary to attain the standard. The ambient air quality data generally tracks the emission reductions over the past three years.

Although ozone concentrations were reported in excess of the standard in 1980 for a total of 4 hours, no exceedances were measured in 1981 and 1982. The staff, along with officials of EPA, are reviewing all the data collected during the past three years to verify the Department's contention that the air quality in Pulaski County complied with the requirements of 40 CFR 50.9.

The relationship between air quality data and the Reasonable Further Progress line is important but not necessarily precise. The Reasonable Further Progress line, for example, was based upon an equation which assumed that the maximum background concentration would be 0.8 ppm. If background concentrations higher than 0.8 ppm actually occur, then exceedances could be expected even though the emissions within Pulaski County fall below the Reasonable Further Progress line.

Therefore, in view of the emissions reduction achieved relative to the RFP line and in view of air quality data which reflects the attainment of the Ozone Standard, redesignation of Pulaski County to attainment status is justified.

COMMISSIONERS

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John P. Sutton  
CHAIRMAN

SUBMITTED BY Wilson Tolefree DATE PASSED 1-28-83

ARKANSAS DEPARTMENT OF  
POLLUTION CONTROL AND ECOLOGY

MINUTE ORDER NO. \_\_\_\_\_

LOCATION - SUBJECT: Redesignation

of Pulaski County to Attainment

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On January 17, 1983, a public hearing was held to receive comments on the proposed redesignation. No comments were reviewed which opposed the redesignation.

Order:

The staff is hereby authorized to submit to EPA the Department's request that Pulaski County's nonattainment status, with respect to the National Ambient Air Quality Standard for Ozone, be redesignated as attainment.

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CHAIRMAN

SUBMITTED BY

Wilson Tolefree

DATE PASSED

1-28-83

OZONE MONITORING REVIEW  
FOR  
PULASKI COUNTY, ARKANSAS  
1977 THRU 1982

ARKANSAS DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY

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## 1. SUMMARY AND CONCLUSIONS

The Arkansas Department of Pollution Control and Ecology has operated ozone monitors in Pulaski County since 1977. After the first summer of monitoring in 1977, the county was classified as non-attainment with respect to the national ambient air quality standard for ozone which was 0.08 parts per million in 1977 and changed to 0.12 ppm in 1979.

Maximum hourly concentrations in 1977, 1978, and 1979 exceeded the 0.12 ppm standard on several occasions annually. For 1980, 1981, and 1982 the hourly concentrations are considerably lower. These lower concentrations are attributed to reductions in hydrocarbon emissions from transportation and to a change in the method of calibrating ozone monitors. The lower concentrations of the past three years indicate that Pulaski County should now be reclassified to show attainment of the ozone standard.

The attainment demonstration described in the "Code of Federal Regulations" requires that the average number of days exceeding the standard for a period of three consecutive years be less than or equal to one. No standard exceedances have been recorded for 1981 and 1982 and in 1980, three days of exceedances were reported. Using reported data for the three year period, the average number of exceedances would be equal to one and, therefore, attainment is demonstrated.

## 2. BACKGROUND

In 1977, Pulaski County, Arkansas was classified as non-attainment with respect to the national ambient air quality standard for ozone (0.080 ppm hourly average prior to 1979). This classification was based on monitoring performed under EPA contract at the North Little Rock Municipal Airport and on monitoring performed by the State in Southwest Little Rock. The monitoring project was for a period of sixty days and yielded a project high of 0.160 ppm.

Under the Clean Air Act (1977 Amendments), this classification required a State Implementation Plan (SIP) revision which would cause the standard to be attained by December 31, 1982. In January, 1979 the standard was changed to 0.120 ppm and in March, 1979 the SIP was revised to bring about a December 31, 1982 attainment of the standard.

Had the ozone monitoring which was performed subsequent to the SIP revision and prior to December 31, 1982, shown continued exceedances of the ozone standard, another SIP revision featuring strict control of industrial growth and other measures to control hydrocarbon emissions would have been necessary to bring about attainment of the standard by December 31, 1987.

To prepare for the possibility of a second SIP revision, a more intensive ambient monitoring project was carried out during the summer and fall months of 1981. This project which was based on a set of EPA guidelines referred to as "Level III" is described under that title in this report.

### 3. OZONE

Ozone ( $O_3$ ) is a three atom molecule of oxygen and is formed in the atmosphere as a result of reactions between hydrocarbons and nitrogen oxides in the presence of sunlight. Ozone is one of a group of compounds generated in this manner (collectively referred to as photochemical oxidants). However, it is generally accepted that ozone makes up over 90 percent of the atmospheric concentration of these compounds and is also the only one which can, in a practical manner, be monitored on a continuous basis.

Ozone affects both health and material at fairly low concentrations and for this reason both primary and secondary standards have been set at 0.120 ppm.

#### 4. OZONE MONITORING PRINCIPLES

The measurement principle listed in 40 CFR, Part 50, Appendix D is based on the reaction of ozone with ethylene resulting in a light emission which is detected and amplified. The amount of light emitted is proportional to the concentration of ozone. An approved equivalent method involves the absorption of UV light by ozone which is measured and amplified. Prior to 1979, the calibration method for either of these monitoring methods involved either a reaction of ozone with potassium iodide in solution and subsequent analysis on a spectrophotometer or a gas phase titration between ozone and a certified standard of nitric oxide (NO) gas. This method relied on the destruction of O<sub>3</sub> by the NO gas to produce O<sub>2</sub> and NO<sub>2</sub>. In 1979, a calibration principle based on the photometric assay of ozone in a dynamic flow system was approved. This method has now removed the wide variations in calibration settings which were common under the previous methods and has caused ambient ozone determinations in general to be somewhat lower.

## 5. DETERMINING COMPLIANCE WITH THE OZONE STANDARD

40 CFR, Part 50, Appendix H contains directions for determining whether or not an area can demonstrate attainment based on ozone air quality measurements.

Basically, the procedure requires three years of data which demonstrate that the average number of days with hourly concentrations of ozone exceeding the 0.120 ppm standard is not greater than one. The procedure also provides a means of interpreting missing data by use of the following formula:

$$e = v + \left[ \frac{v}{n} (N-n-z) \right]$$

Where

e = Estimated number of exceedances for a year

N = The number of required monitoring day in a year

n = The number of valid daily maxima

v = The number of daily values above the level of the standard

z = The number of days assumed to be less than the standard level

It should be noted that if no valid measurements in a given year exceed the standard, "e" will be zero regardless of the amount of missing data. A good case for assuming missing data to be below the standard is a demonstration that data preceding and following the missing data have no hourly concentrations exceeding 0.090 ppm.

## 6. LEVEL III AND SLAMS AMBIENT OZONE MONITORING

Ozone monitoring began in Pulaski County during the summer of 1977. Radian Corporation, an EPA Contractor, reported concentrations above 0.15 ppm at the North Little Rock Municipal Airport and the Department of Pollution Control and Ecology reported concentrations above 0.15 ppm with one hourly average above 0.16 ppm at the Department of Pollution Control and Ecology office building in 1977. In the years between 1977 and 1980, the highest one hour concentration was 0.166 ppm which was measured at the North Little Rock Municipal Airport on August 23, 1978. With exception of this one hourly concentration, no levels as high as 0.15 were recorded.

In 1979, EPA approved a new calibration method for ozone monitors which has reduced the wide variations in monitor adjustments which were prevalent from one calibration period to the next under the previous method. In 1979, the Department purchased the necessary primary calibration instrument and began use of the method in 1980. In 1980, the number of ozone concentrations approaching and exceeding the standard dropped considerably.

In addition to the change in calibration method, in 1979 EPA also published requirements for an extensive quality assurance plan which resulted in this Department purchasing additional equipment which permits ozone calibration at the monitoring site. The Quality Assurance Program also requires precision checks of the ozone monitors every two weeks at the monitoring sites. This requirement has resulted in a very high percentage of valid data. The first

quality assurance report under this system was submitted covering the first calendar quarter of 1981.

In view of the requirement that non-attainment areas still showing exceedances of the standard in 1982 would have to submit a new SIP revision to show attainment by December 31, 1987, EPA published guidelines for studies of non-attainment areas which would yield adequate monitoring information upon which a new attainment program could be based. The most practical study method for the Pulaski County area was described in guidelines referred to as "Level III".

Basically, Level III suggests the collection of ozone data at three sites. One site should be upwind of the urbanized area, one on the downwind edge of the urbanized area, and one site 15-40 kilometers downwind of the urbanized area. Additionally, nitrogen oxides and non-methane organics should be monitored at the site just downwind of the urbanized area.

The Department's Level III project consisted of monitoring at four sites. The sites and the parameters monitored are listed below:

BAUXITE:

This site was located just south of the Reynolds Metals Company Hurricane Creek Plant on mining property controlled by Alcoa, Inc. Data collection began on July 9, 1981 and ended on October 31, 1981.

In addition to the continuous monitoring of ozone, wind direction and wind velocity data were collected along with a hydrocarbon sample which was collected between 6 A.M. and 9 A.M.

weekdays. The hydrocarbon sample was analyzed for non-methane organic compounds by cryogenic isolation and analyzed by flame ionization detection.

NORTH LITTLE ROCK RIVERFRONT:

This site is located next to the Arkansas River inside Riverside Park in North Little Rock. Data collection for ozone began in January, 1981, and has continued through 1982. Nitrogen oxides and hydrocarbon monitoring began July 1, 1981 and continued through October 31, 1981. Wind direction and wind velocity were collected at Adams Field or at Riverfront throughout this period. The hydrocarbons were sampled and analyzed as explained for the Bauxite sampler site.

NORTH LITTLE ROCK MUNICIPAL AIRPORT:

This site has been located on North Little Rock Airport property since July, 1977 and ozone has been monitored since that time. In addition to ozone, nitrogen oxides, and hydrocarbons were monitored. The hydrocarbons were analyzed by the same method described for the Bauxite site. Both ozone and nitrogen oxides have been monitored through 1982.

JACKSONVILLE:

This site was located at a city water department tower located between Marshall and Redmond Roads and just south of General Samuels Road. Ozone, wind direction and wind velocity, and hydrocarbons were monitored at the site from July 8, 1981 through October 31, 1981. Hydrocarbons were sampled and analyzed by the same methods described for the Bauxite site.

The monitoring for ozone at the above sites was subject to the quality assurance precision and audit requirements mentioned above. The precision checks were performed every two weeks during the study period and over 90 percent of possible ozone data was collected at each site.

The purpose of collecting data at the four sites was for use in modeling ozone standard exceedances along with nitrogen oxide and hydrocarbon concentrations in order to determine the hydrocarbon reduction necessary to comply with the standard by 1987. Obviously, since the standard was not exceeded during 1981, no modeling effort was necessary.

Monitoring after the 1981 Level III effort has continued at the North Little Rock Riverfront and Airport sites. All monitoring performed after the beginning of calendar year 1981 has been subject to the required quality assurance procedures.

## 7. ATTAINMENT DEMONSTRATION

As stated in Section 5, it must be demonstrated that over a consecutive three year period, the average number of days in which exceedances occur is equal to or less than one.

Since no exceedances of the standard were observed in 1981 or 1982, the exceedances of 1980 are the last measured concentrations which are over the standard. An evaluation of all ozone standard violations for years prior to 1981 using present data reduction criteria indicates that many hourly averages which were reported above the standard should not have been due to averaging errors or failure to reduce the hourly high reading by the amount of the zero offset. In 1980, all exceedances except one hourly average are below the standard due to this reason alone. Only the concentration reported as 0.140 ppm on July 18 , 1980 may be considered a violation at an adjusted value of 0.128 ppm. Even this concentration appears in doubt when a maximum instrument calibration number is applied to the data.

Attainment is considered demonstrated by the fact that the average number of days of exceedances over three years is equal to one using 1980 data as reported. Using corrected data, it is 0.333. Using adjusted data, it is zero.

## 8. OZONE DATA

The following computer printouts present ozone data in three forms. The first is a data summary show quarterly highs and second highs and the date of occurrence.

The second is a daily high printout for all sites. This printout is limited to the months of May through October inclusive, and only the high values that occur between 9 A.M. and 9 P.M. Presumably, this includes the months and hours when maximum are most likely to occur due to sunlight intensity.

The third is the complete daily records (hourly averages) of all ozone data since 1977.



YEARLY SUMMARY OF OZONE

DESCRIPTION YEAR QUARTER NUM AMITH 1ST MEAN HIGH DATE 2ND HIGH DATE 3RD DATE 4TH DATE OVER

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1978 2ND 1495 .043 .116 6/19 .112 6/19 0  
 1978 3RD 1701 .048 .156 8/23 .148 8/23 10  
 1978 4TH 1494 .024 .084 10/22 .083 10/22 0  
 SUMMARY 1978 6564 .038 .156 8/23 .148 8/23 10

NLR AIRPORT  
 1979 1ST 1470 .030 .072 3/17 .070 3/17 0  
 1979 2ND 1771 .051 .137 6/12 .135 6/12 17  
 1979 3RD 1451 .045 .144 8/ 8 .140 7/19 24  
 1979 4TH 1468 .026 .098 10/12 .087 10/12 0  
 SUMMARY 1979 7160 .036 .144 8/ 8 .140 7/19 41

NEW AIRPORT  
 1980 1ST 1868 .025 .058 2/14 .058 2/20 0  
 1980 2ND 1771 .031 .090 5/29 .074 6/14 0  
 1980 3RD 2020 .048 .140 7/18 .138 7/30 4  
 1980 4TH 1760 .028 .100 11/ 3 .092 11/ 3 0  
 SUMMARY 1980 7419 .033 .140 7/18 .138 7/30 4

NLR AIRPORT  
 1981 1ST 1762 .027 .075 3/24 .075 3/24 0  
 1981 2ND 1875 .040 .095 5/ 3 .095 5/ 3 0  
 1981 3RD 1912 .035 .110 8/18 .110 8/18 0  
 1981 4TH 2005 .023 .080 10/15 .078 10/15 0  
 SUMMARY 1981 7554 .031 .110 8/18 .110 8/18 0

NEW AIRPORT  
 1982 1ST 1885 .026 .067 3/24 .066 3/24 0  
 1982 2ND 1984 .039 .086 6/26 .084 6/23 0  
 1982 3RD 2069 .033 .119 7/14 .112 7/14 0  
 1982 4TH 5938 .033 .119 7/14 .112 7/14 0  
 SUMMARY 1982 5938 .033 .119 7/14 .112 7/14 0

NEW RIVERFRONT  
 1981 1ST 1671 .019 .058 3/24 .065 3/24 0  
 1981 2ND 1489 .022 .080 4/30 .080 4/30 0  
 1981 3RD 1968 .042 .103 8/14 .103 8/23 0  
 1981 4TH 2061 .015 .075 10/30 .070 10/ 1 0  
 SUMMARY 1981 7189 .025 .103 8/14 .105 8/23 0

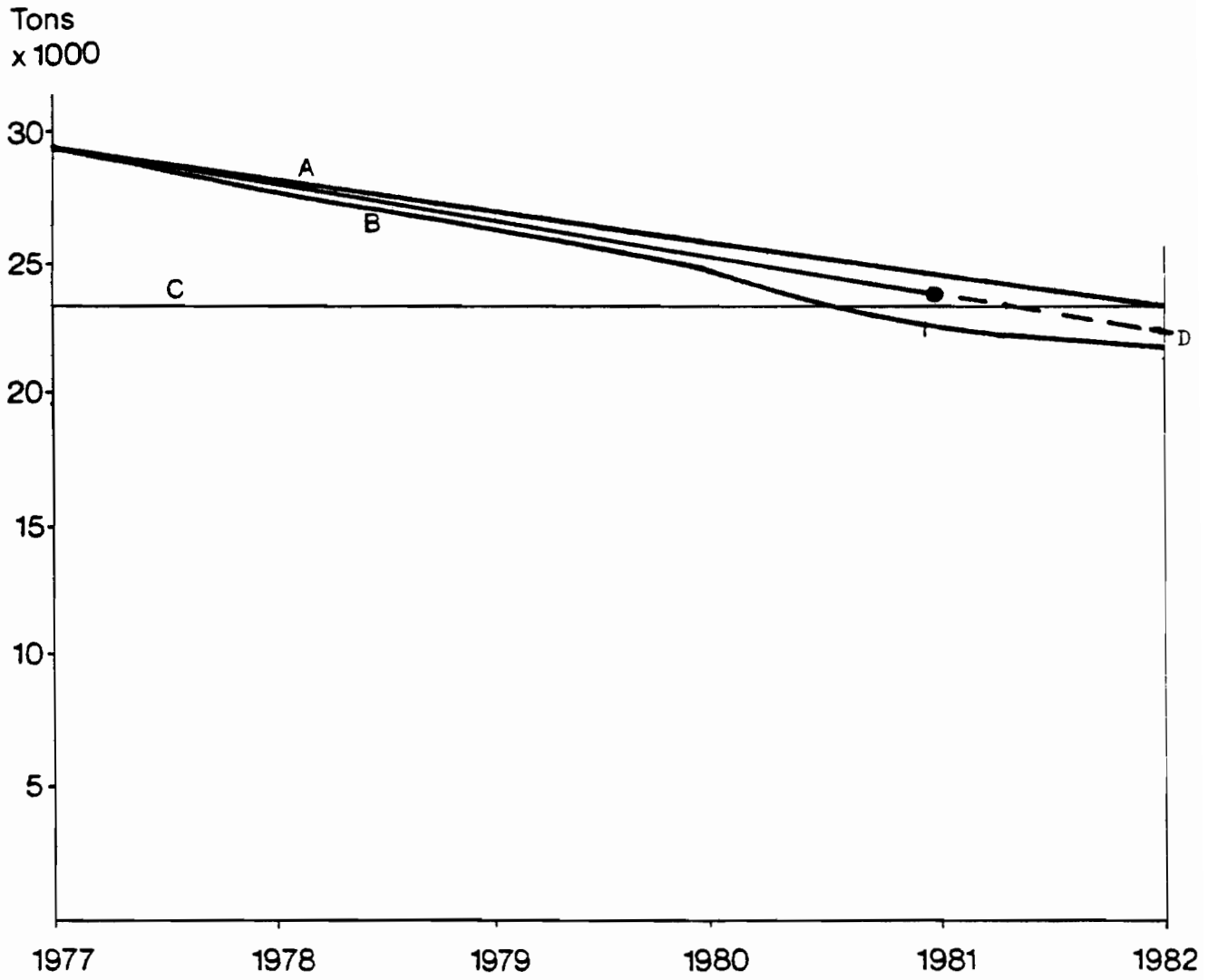
NLR RIVERFRONT  
 1982 1ST 1900 .016 .056 3/ 1 .053 3/ 2 0  
 1982 2ND 1885 .026 .090 6/18 .090 6/18 0  
 1982 3RD 1889 .027 .100 7/21 .090 7/14 0  
 1982 4TH 5674 .023 .100 7/21 .090 6/18 0  
 SUMMARY 1982 5674 .023 .100 7/21 .090 6/18 0



STATIONARY SOURCES		1977 VOC EMISSIONS (TONS/YEAR)				1981 VOC EMISSIONS (TONS/YEAR)			
		STATION-ARY POINT SOURCE EMISSIONS	STATION-ARY AREA SOURCE EMISSIONS	MOBILE SOURCE EMISSIONS	TOTAL BASE YEAR EMISSIONS	STATION-ARY POINT SOURCE EMISSIONS	STATION-ARY AREA SOURCE EMISSIONS	MOBILE SOURCE EMISSIONS	TOTAL BASE YEAR EMISSIONS
PETROLEUM REFINERIES	REFINERY FUGITIVES (LEAKS)					0	0		
	MISCELLANEOUS SOURCES								
	A. PROCESS DRAINS AND WASTE								
	B. VACUUM PRODUCING SYSTEMS								
	C. PROCESS UNIT BLOWDOWN								
	OTHER					0	0		
STORAGE, TRANSPORTATION & MARKETING OF PETROLEUM PRODUCTS	OIL & GAS PRODUCTION FIELDS					0	0		
	NATURAL GAS AND NATURAL GASOLINE PROCESSING PLANTS					0	0		
	GASOLINE & CRUDE OIL STORAGE					0	0		
	SHIP AND BARGE TRANSFER OF GASOLINE, CRUDE OIL, AND CHEMICALS		0.2			0	0		
	BULK GASOLINE TERMINALS <sup>2</sup>	829				909.9			
	GASOLINE BULK PLANTS <sup>3</sup>	120.7				94.6			
	SERVICE STATION LOADING		987.1				543.5		
	SERVICE STATION UNLOADING		766.0				664.5		
	AVIATION GASOLINE HANDLING		110.0				109.5		
INDUSTRIAL PROCESS	ORGANIC CHEMICAL MANUFACTURE								
	PAINT MANUFACTURE	7.0				4.0			
	VEGETABLE OIL PROCESSING	151.2				245.0			
	PHARMACEUTICAL MANUFACTURE								
	PLASTIC PRODUCTS MANUFACTURE	335.6				393.0			
	RUBBER PRODUCTS MANUFACTURE	62.8				58.7			
	TEXTILE POLYMERS MANUFACTURE	43.6				0			
	OTHERS	1.9				4.0			
INDUSTRIAL SURFACE COATING	LARGE APPLIANCES		5.7			9.0	0		
	MAGNET WIRE						0		
	AUTOMOBILES		41.2				0		
	CANS		14.1				0		
	METAL COILS						0		
	PAPER	22.4	358.0			6.0	343.7		
	FABRIC		163.7				157.1		
	METAL FURNITURE						0		
	WOOD FURNITURE	144.0	44.1			0	42.3		
	FLAT WOOD PRODUCTS	1.2	51.1			6.2	49.0		
	OTHER METAL PRODUCTS	300.6	382.4			325.3	367.1		
	OTHERS	1.2	353.8			6.2	339.6		
NON-INDUSTRIAL SURFACE COATINGS	ARCHITECTURAL COATINGS		113.0				115.2		
	AUTO REFINISHING	7.4	90.7			3.6	92.5		
	OTHERS								
OTHER SOLVENT USE	DEGREASING	5.7	182.1			2.5	227.6		
	DRY CLEANING		132.2				165.2		
	GRAPHIC ARTS	34.2	950.6			22.9	1188.2		
	ADHESIVES								
	CUTBACK ASPHALT		0.0				0.0		
	OTHER SOLVENT USE		3726.5				4658.1		
OTHER MISCELLANEOUS	FUEL COMBUSTION								
	SOLID WASTE DISPOSAL								
	FOREST, AGRICULTURAL, AND OTHER OPEN BURNING		105.1				105.1		
TOTAL VOC EMISSIONS FROM STATIONARY SOURCES		2068.5	8597.4			2090.9	9168.2		
MOBILE SOURCES	HIGHWAY VEHICLES			16,657.3				10,648.0	
	OFF-HIGHWAY VEHICLES			195.5				215.6	
	RAIL			74.0				81.6	
	AIRCRAFT			749.0				866.0	
	VESSELS AND PLEASURE CRAFT			1,001.6				1,013.1	
TOTAL VOC EMISSIONS FROM MOBILE SOURCES				18,682.7				12,824.3	
TOTAL VOLATILE ORGANIC COMPOUND EMISSIONS		2068.5	8597.4	18,682.7	29,348.6	2090.9	9168.2	12,824.3	24,083.4

Figure 1

# 20% Reduction



- A. Reasonable Further Progress Line
- B. Expected Progress Line
- C. VOC Emissions Target, TONS/YR
- D. Progress line, 1977 through 1981