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Air Pollution in Monroe County*

*By: Mark J. McClements & Gerald A. Takacs
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Summary

Air in the Rochester area was generally cleaner in 1973 than in 1972; in fact, the quality of air has been improving since 1970. Some kinds of air pollution in urban areas, however, are still worse than allowed by Federal and State air pollution control standards. Only the pollution with photochemical oxidants (ozone) showed a trend for the worse; ozone exceeded the maximum hourly standard in Monroe County air in 1973 on 60 occasions. Most of the photochemical oxidants are generated in air indirectly from other air pollutants emitted both by industry and by automobiles.

Airborne particulates (dust, soot, and chemical fog) were the major air pollutant. Measurements in June 1973 - June 1974 show a marked improvement compared to previous years, but their concentration still exceeded air purity standards in the industrial center of Rochester north of Main Street and in Irondequoit. Air in center city has improved largely because local industry invested in improved equipment needed to meet new Federal standards. For example, the Rochester Smelting and Refining Co. has recently installed a most advanced pollution control system. It is the first of its kind in use in the United States.

Air quality in Monroe County is checked at a network of monitoring stations operated by the County of Monroe (Department of Health) and the State (Department of Environmental Conservation). At the same time, the major sources of pollution are monitored and their emissions are reported by their operators who are required to monitor their own smokestacks and report the results to the U.S. Environmental Protection Agency (EPA)(1,2). All this information is used to make decisions on how to bring air quality up to standards set by the EPA. The monitoring set-up in the County is good, but it would be better if there were a State station in center city, because the State uses constant monitors and monitors for more pollutants than the County.

This report summarizes the complete results of air pollution monitoring in Monroe County in 1973 and a part of the results for the first half of 1974. A comparison between the winter of 1972-73 and the winter of 1973-74 showed no significant change that could be attributed to the fuel shortage of the winter of 1973-74.

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Air Pollution Monitors in Monroe County

In June, 1970, the State Department of Environmental Conservation installed a Continuous Air Monitor at Farmington Road east of Rochester near the Irondequoit Town line. This monitor presently measures both air pollutants and meteorological parameters: sulfur dioxide (SO₂), nitric oxide (NO), nitrogen dioxide (NO₂), ozone (O₃), carbon monoxide (CO), total hydrocarbons, particulate matter (soiling), resultant wind direction, wind speed, wind sigma-horizontal, wind sigma-vertical, ultraviolet radiation, total radiation, atmospheric pressure, precipitation, temperature, and relative humidity. Until February 1, 1973, "total oxidants" were also measured. Data from this monitor are sent directly to a central computer in Albany and then to the Environmental Alert Room at the Department of Environmental Conservation in Albany. An abstract of this data is reported in our local newspapers. This report will discuss the published hourly, daily, monthly, and annual averages for all major air pollutants (4-7) from this monitor over the time period June, 1970 to June 30, 1974. The reports are available fairly quickly. RCSI received the readout for November on Dec. 27, just as this bulletin went to press.

In January, 1975, the Air Pollution Control office of the Monroe County Department of Health was maintaining 16 sampling stations throughout the County. In addition to the 15 stations listed in Table 1, a new station was just opened in Fairport. Five of the stations in Table 1 have been in operation since 1971 (the date of RCSI Bulletin #126 (3)). These were established at: School 25, 965 North Goodman Street, Rochester; Jefferson Senior High School, Edgerton Park, Rochester; 12 Corners Middle School, Elmwood Avenue, Brighton; Britton Road School, 800 Britton Road, Greece; and Rogers Middle School, 219 Northfield Road, Irondequoit. The E.W. Spry School station in Webster commenced operation in 1971. The previous Webster station at South Avenue High School was discontinued in 1971 because the data obtained (3, 8) were well below air quality standards. These stations monitor primarily particulate (suspended and settleable) and sulfur dioxide emissions over a twenty-four hour period every sixth day.

The Record of Air Pollution

1. Particulate Matter (4-8)

The data for particulates from all the reporting stations are summarized in Table 1, Appendix. Data before 1971 have been reported in an RCSI bulletin (3) and a Department of Environmental Conservation (DEC) report (8).

Two monitoring stations - the Firehouse on North Street and the Kodak Park site - have been consistently above the New York State Ambient Air Quality Standard (AAQS) for suspended particulates - although they come closer to standard each time they are measured. The yearly average at the North St. station for the year ending in Aug., 1974 was 72 micrograms per meter³ (72µg/m³). The standard is 65µg/m³. The large sources affecting the North St. station in downtown Rochester are Rochester Gas & Electric (RG & E) Power Generation Facilities, Stations 3 and 9; General Railway Signal Co., and Rochester Smelting and Refining Co., Inc. Ed Yurkstas of the Air Pollution Control office of the Monroe County Department of Health has supplied RCSI with a progress report on the efforts of these three to bring their stacks into compliance with the law. RG & E stacks are presently being tested and are expected to be in compliance because they have stopped using coal as a fuel and now use lower sulfur containing oils. In spite of this conversion to oil, RG & E Station 9 has at infrequent intervals been responsible for large amounts of soot fallout on areas near its location. General Railway Co. has recently installed an induction melting system which put its emissions in compliance with State regulations. Rochester Smelting and Refining Co., Inc. has also recently put in a one-half million dollar giant bag house (called the Teller System) which is a chromatographic adsorber for removal of alkali and acid gases as well as other contaminants. This system is the first of its kind in the United States (one is in

operation in Toronto). Automobile traffic, construction, and demolition are other contributors to suspended particulate matter at this site. The reading should go down further when construction is finished and should be close to compliance with air purity standards.

Suspended particulates at the sampling station at Kodak Park were considerably above standard ($83 \mu\text{g}/\text{m}^3$) in 1973, and just about at standard ($66 \mu\text{g}/\text{m}^3$) in August, 1974. The Kodak Park sampling station monitors mainly the emission from the waste disposal facilities of Kodak Park in Building 138. This source was not in compliance with State regulations in 1973 when a consent order was being prepared by the Department of Environmental Conservation (DEC) (8). Building 31, the power generation facilities, and Building 321, the power plant, are in compliance with State regulations, and further reductions may be realized if coal is replaced by low sulfur containing oil. Paper, used to burn at Building 138, is now burned in Building 145. This may explain, in part, the reduction in the annual average for suspended particulates. Auto traffic and activity on Ridge Road West and in the Route 104 traffic corridor may also contribute to the suspended particulate levels measured at this station.

The Bishop Kearney High School station in Irondequoit was the only other station which violated State standards in 1973. This site predominately records Kodak Park emissions which are carried by the prevailing West-Southwest winds of Rochester. The Division of Air Resources of the DEC anticipates that this site will not exceed the AAQS in the near future (8). The other site in Irondequoit at Rogers Middle School is also affected by the Kodak Park emissions; however, its levels are below the State's standards.

Settleable particulates are caused by activity near the sites such as traffic, general population movement, construction, and demolition.

The State reports particulate matter as "soiling". Soiling is measured from the reflectance of light off of the dirt shaded filter paper.^a The monthly soiling averages obtained from the continuous monitoring site remained relatively constant over the period of study (4-6). The monthly averages ranged from 0.2 to 0.6 and the annual soiling averages for the years 1970-1973 were all 0.4 RUDS/1000 ft (4-6) while the twelve month average ending in June 30, 1974, was 0.3 RUDS/1000 ft (7). Investigation of the maximum hourly average and maximum 24 hour average (5) show higher levels of soiling during the winter months. There is no AAQS for soiling.

2. Sulfur Dioxide (SO₂) (4-8)

The amount of sulfur dioxide measured at each of the County stations from 1967-73 is compared with the AAQS standards in Table 2, Appendix. SO₂ levels complied with the SO₂ standards in 1973 at all the stations. The North Street station, after reaching a high in 1971 (8), is now in compliance. Compliance undoubtedly reflects a major change from coal (with high sulfur content) to oil (with a lower sulfur content).

The monthly SO₂ averages obtained from the Continuous Monitoring System (Table 3, Appendix) show a downward trend in the sulfur dioxide levels. The annual averages for 1970-1973 were 0.03, 0.031, 0.020, and 0.018 ppm, respectively (4-6), while the twelve month average ending June 30, 1974 was 0.020 ppm (7). These values are now below the Federal maximum primary standard of 0.03 ppm. The winter averages are higher, as might be expected, because fossil fuel is burned for heating purposes.

^a The units used to express soiling are RUDS (Reflectance Units of Dirt Shade) which is defined as an optical reflectance of 0.01 caused by ten thousand linear feet of air passing through 0.786 square inches of filter paper.

Recognizing that weather conditions may affect the SO₂ levels in the air, the New York State AAQS requires that 99% of the values obtained as a 24 hour average are not to exceed 0.10 ppm, and a maximum of 0.14 ppm should never be exceeded. These standards are more stringent than the federal EPA standard of 0.14 ppm for a 24 hour average. In Monroe County, the 0.14 level was not exceeded in the 1971-1973 period, while the 0.10 limit was exceeded three times in 1971 (98.76% of values were not exceeded) and once during 1973 (99.67% of values were not exceeded)(4-6). Over the period January 1 to June 30, 1974 there were no violations of the 24 hour average (7).

For a one hour average, the New York State standard requires that 0.25 ppm of SO₂ should not be exceeded 99% of the time, and the value of 0.50 ppm should never be exceeded. These State standards are more stringent than the Federal standard of 0.50 ppm for a one hour average. During 1971, the air measured at the continuous monitoring station exceeded the 0.25 ppm limit only four times (99.94% compliance) and never exceeded the 0.50 limit. For the years 1972 and 1973, both limits were never exceeded (4-6). Over the 12 month period ending June 30, 1974 there were no violations of the one hour average at the Rochester continuous monitoring site (7).

3. Carbon Monoxide (CO)

The monthly averages for carbon monoxide recorded by continuous air monitoring showed a general downward trend in 1970-1973 (Table 4, Appendix) with few contraventions of the air quality standards at the Rochester continuous monitoring site. The annual averages for the years 1970-1973 were 4.0, 2.1, 1.7, and 1.5 ppm, respectively (4-6), while for the twelve month period ending June 30, 1974 the average was 2.0 ppm (7). The New York State AAQS for CO requires a one hour average not to exceed 35 ppm more than once. Rochester had a 100% compliance with this regulation over the 1971 - June 30, 1974 period (4-7). The maximum one hour average during 1973 was 23.3 ppm (6) and during January 1 to June 30, 1974 was 11.1 ppm (7).

For an eight hour average, the State requires the CO levels not to exceed 9 ppm. This level was attained once in 1971 (8), not exceeded during 1972 (5), exceeded once during January - June, 1973 (4), exceeded twelve times during December, 1972 through March 31, 1973 (6), exceeded ten times during 1973 (6) and not exceeded during January 1 - June 30, 1974 (7). These reported values are not consistent with each other and need to be re-evaluated by the DEC. The maximum eight hour average during 1973 was 13.4 ppm (6) while over the period January 1 - June 30, 1974, it was 7.8 ppm (7). Carbon monoxide emissions result primarily from combustion sources in Monroe County (8) and high CO readings occur during short term periods of poor atmospheric ventilation (5). CO should be tested in center city at nose level, and not just at roof level, as done by the monitoring machines now in use.

4. Nitric Oxide (NO)

The monthly averages for the nitric oxide levels at the continuous monitoring system are reported in Table 5, Appendix.

The annual averages for NO concentration in Rochester from 1971-1974 (0.04, 0.031, and 0.024 ppm respectively(4-6)while it was 0.024 for the twelve month period ending June 30, 1974 (7)) indicate a gradual downward trend. The maximum hourly and twenty-four hour averages show peaks during October through December. There is no ambient air quality standard for NO, but this pollutant is controlled by the same measures that control other oxides of nitrogen, such as NO₂ (below). However, the Federal Registry does have a standard for total oxides of nitrogen, of 100µg/m³.

5. Nitrogen Dioxide (NO₂)

The annual averages for NO₂ concentrations during 1971-1973 were 0.04, 0.032, and 0.024 ppm, respectively (4-6), while the twelve month average ending June 30, 1974 was 0.026 ppm (7). The monthly averages for NO₂ are shown in Table 6, Appendix. These values show a downward trend and are well below the Federal and State AAQS of 0.05 ppm for an annual average determined from twenty-four hour concentrations over twelve consecutive months.

6. Total Oxidant and Ozone (O₃)

Prior to February 1, 1973, total oxidants were being recorded at the continuous monitoring station. These total oxidants include such substances as ozone, peroxyacetyl nitrates (PAN), nitrogen oxides, chlorine, hydrogen peroxides, and organic peroxides. In July, 1972, the continuous monitoring system at Rochester commenced use of the EPA photochemical oxidant reference chemiluminescent method for ozone. In general, the ozone values from the chemiluminescent procedure were found to be higher than from the total oxidant method (Table 7, Appendix).

The maximum hourly Federal and State AAQS which is not to be exceeded for total oxidants or ozone is 0.08 ppm. This standard was exceeded four times in 1971 (8) but not exceeded during 1972 (5) for total oxidants. From July, 1972 to June 30, 1973, the maximum hourly ozone concentration for each month exceeded the standard for six of the twelve months (4). The maximum one hour average recorded during 1973 was 0.12 ppm (6). The standard was exceeded 60 times during 1973 (6) and five times over the period from January 1 - June 30, 1974 (7). The annual averages for total oxidants and ozone over the 1971-1973 period were 0.01, 0.006, and 0.018 ppm, respectively (4-6), while over the twelve month period ending June 30, 1974 it was 0.018 ppm (7), so ozone in the air is rising. From this data it appears that Rochester has a significant photochemical oxidant problem.

7. Hydrocarbons

Examples of hydrocarbons in air are gasoline and oil vapors, and industrial solvent. They are measured as equivalent methane concentrations (methane is the smallest hydrocarbon molecule), by a device that measures the ionization of all hydrocarbons in a hydrogen flame.

The monthly averages for 1973 showed some improvement over 1972 (Table 8, Appendix).

These measurements cannot be compared directly with Federal Ambient Air Quality Standards, which specify a gas chromatographic method. The AAQS specifically exclude methane, and apply only to larger molecules, which give a better measure of pollution by gasoline and oil vapors. According to these standards, the average (non-methane) hydrocarbon concentration in air during the three hours from 6 am to 9 am must not exceed 0.24 ppm. This timing was chosen to sample the morning peak traffic and the preceding period of cleaner air. Allowing for all the differences in sampling and in measuring, the local air samples appeared to be cleaner than the prescribed standard. The Department of Environmental Conservation predicts that gas chromatographic methods of analysis will be available at state sites in the near future (5).

Sources of Air Pollution in Monroe County

The most recent inventory of air contaminant emission sources for the major pollutants in Monroe County was conducted in 1971. Table 9 summarizes these estimated emissions. This Bulletin explains that in 1972-1974, particulates and sulfur dioxide have decreased in Monroe County as various air pollution control devices have been put into use. We hope that the Health Department will update this report.

Table 9. Emission Sources - Monroe County, 1971 (8)

Source	Particulate		SO ₂		NO ₂		Hydrocarbons		CO	
	T/Y(a)	%	T/Y	%	T/Y	%	T/Y	%	T/Y	%
Industrial Fuel	12,715	59	101,752	90	20,093	32	522	1	1,084	-
Industrial Process	4,367	20	61	-	39	-	12,442	13	-	-
Commercial and Government Fuel	1,645	8	6,914	6	2,621	4	182	-	1,932	-
Transportation	1,702	8	1,178	1	37,297	60	81,871	86	492,172	99
Residential Fuel	<u>1,057</u>	<u>5</u>	<u>3,432</u>	<u>3</u>	<u>1,822</u>	<u>3</u>	<u>326</u>	<u>-</u>	<u>2,853</u>	<u>1</u>
Totals	21,486	100	113,337	100	61,872	100	95,343	100	498,047	100

(a) Tons/Year

Industry accounted for 79% of particulate emission - 59% from industrial fuel and 20% from industrial processes. The major contributors of the particulate emissions were the coal fired boilers of Rochester Gas and Electric and Eastman Kodak Companies. About 15,764 tons of the particulate emissions fall in the immediate vicinity of Rochester with heavy concentrations throughout Kodak Park and the downtown area. The high population densities in Rochester also receive the higher concentrations of particulates due to the location of the power plants near the central city.

R G & E and Eastman Kodak were also the most significant sources of SO₂ in Monroe County. These sources, however, are located in the northwest section of Rochester rather than the densely populated downtown areas.

The greatest amounts of NO₂ are emitted in the downtown area. In addition to transportation emissions, industrial fuels contribute to the NO₂ concentration in the air, because fossil fuel is burning at high enough temperatures to produce NO₂ from the chemical reaction between atmospheric nitrogen and oxygen.

The highest concentrations of hydrocarbon emissions are located in the heavily travelled downtown areas. Hydrocarbons are emitted from both the crankcase and exhaust of internal combustion engines. Eastman Kodak, which is the major contributor of hydrocarbon emissions from industrial processes, is under a compliance schedule to reduce their emissions. For example, Building 140 is to completely eliminate its emission of hydrocarbons (forecast as 1,300 tons for 1974) by July 30, 1976, by converting from organic to water solvent systems. They are meeting this schedule and have reduced the emission level at this Building by 58% by the end of 1974 and expect to have a 93% reduction by July 1, 1975 (9). Photochemical smog is produced from hydrocarbons in the presence of NO₂, oxidants, and sunlight.

Most carbon monoxide comes from incomplete combustion of hydrocarbon fuel in the internal combustion engine. Reductions are possible either through engine change and/or modification or through use of better exhaust controls (10).

The Air Pollution Control Office of the Monroe County Department of Health have just tabulated a number of minor sources of air pollutants in Monroe County and these are listed in Table 10.

Table 10. Minor Sources of Air Pollutants in Monroe County^(a)

	<u>Tons/Day</u>	<u>Tons/Year</u>
Smoke/cigarettes	2.3	829
Smoke/cigar	0.4	158
Rubber particulates from vehicle tires	3.05	1114
Aerosols and vapor from aerosol cans	3.8	1399
Organic compounds from perfume	0.36	130
Footwear use	0.55	200
Napthalene from moth balls	0.05	18
<u>Natural Sources:</u>		
Ground dust	305.0	111,434
Organic compounds (vegetation)	71.7	26,167
Cosmic dust fallout	0.01	5

(a) Data supplied to us January, 1975 by Ed Yurkstas of the Air Pollution Control Office of the Monroe County Department of Health.

Concluding Remarks

A. Overall trends

The overall trend for the pollutants SO₂, CO, NO, and NO₂ over this period of study was downward. The greatest reduction occurred during 1972. This reduction may be due to meteorological conditions as well as to the control at sources of pollution. Unusually high rainfall coupled with minimum air stagnation and rapidly changing weather occurred throughout New York State in 1972 and may have helped to clean the air (5). Some of the data reported here were obtained during the energy crisis period of winter 1973-74, and it is interesting to note the effect of this crisis on the pollutant concentrations. The Division of Air Resources of the DEC studied this effect by comparing both the monthly and seasonal levels and the conditions for atmospheric dispersion for the two time spans of December 1, 1972 to March 31, 1973, and December 1, 1973 to March 14, 1974 for SO₂, soiling, NO, NO₂, and CO. The Rochester continuous monitoring system showed no significant increases in pollutants attributable to the energy crisis (6), even though coal was burned in some places that had previously used oil.

The continuous monitoring site in Rochester is judged quite suitable for measuring oxidant concentrations, since these substances show up after a delay. Studies of ozone have shown that maximum values occur about one hour downwind from emission points. For other pollutants, however, the measured concentrations are diluted by distance from the source. Consequently, a continuous monitoring station ought to

be placed in downtown Rochester. Indeed, this has been proposed (4) by the DEC for continuous sampling of NO, NO₂, O₃, and CO.

B. The Problem of Ozone

Ozone is monitored continuously in Monroe County but it was not included in the County survey of emission sources. Its sources and effects on health, and chemical properties are generally known (11). Ozone is an unstable blue gas which has a strong oxidizing effect. This property is utilized for purification of water and sugar and for control of fungi and bacteria in cold storage plants. Ozone has a pungent odor which is detected instantaneously at concentrations between 0.05 and 0.20 ppm. It is a component in photochemical oxidant smog created by the interaction of sunlight, hydrocarbons, and nitrogen oxides. In Los Angeles smog, levels of ozone up to 0.9 ppm have been reached. Ozone is frequently called "electrical odor" since it is the "fresh" odor which appears after electrical storms and around high voltage electrical equipment. Less known is the production by electrostatic air cleaners of 0.001 and 0.002 ppm in stack gases. A defective unit can produce as much as 1 ppm or more of ozone (11).

Ozone is recognized as one of the most dangerous irritants to eyes, throat, and lungs. Like sulfur dioxide, it acts upon the respiratory tract and is not absorbed in the general circulation. About three quarters of the inhaled ozone is destroyed in the upper respiratory structures, where it reacts rapidly in contact with organic substances. Ozone also acts as a depressant to nerve endings in the portion of the brain that controls the rate of respiration and in this manner interferes with the ventilation of the lungs and the exchange of oxygen and carbon dioxide in the blood. At the levels 0.05 to 0.1 ppm, a disturbance of the eye muscle-balance, a decrease in visual activity, and difficulty in adjusting the eyes to darkness become noticeable. Ozone also damages plants and cracks rubber (11). These hazards of ozone apply to its presence in air which we normally breathe.

C. The Benefits of Ozone and the Problem of Freon Aerosols

At high altitudes, considerable ozone is produced by photochemical dissociation of molecular oxygen. Therefore, fear has been expressed for the health of passengers of supersonic airplanes in which outside air is used for cabin pressurization. At 80,000 feet, ozone concentrations are 10 to 12 ppm. Inside the plane, the air would contain about 2.5 ppm. If the air concentration in the cabin reached 10 to 12 ppm of ozone, it would be deadly to people.

The ozone produced high up in the ionosphere is a vitally important component of earth's gaseous envelope. This ozone layer shields the earth from the short-wave ultraviolet rays of the sun. The danger of exposure to short-wave UV (ultraviolet) is well known. For example, "sterilamps" emitting this kind of radiation are used to kill living cells.

About 1399 tons of aerosols and vapors from aerosol cans are emitted into Monroe County's air per year (Table 10). The propellants of aerosol cans and the refrigerants used in refrigerator units are chemicals called chlorofluorocarbons, commonly known as freons. These freons, when emitted into the atmosphere, can diffuse upward to the ozone layer and be dissociated by solar radiation into chlorine atoms. These chlorine atoms may react with and reduce the concentration of the ozone layer that protects us from solar radiation (12, 13). This is not a local problem, but the global releases of fluorocarbons may pose a serious threat to our environment. The National Academy of Sciences is presently investigating this problem, to decide whether it will be necessary to set a limit on the world-wide production of freons.

Acknowledgement

We would like to acknowledge the assistance of three individuals who helped to make this report possible. Don Jones, head of the laboratory for the Monroe County Department of Health, explained some of the techniques which are used to monitor air pollutants in the County. David Sterns, who is in charge of the continuous monitoring station on Farmington Road, described the various chemical and instrumental methods which are used by New York State to monitor air pollutants and showed us the station. Ed Yurkstas, who works for the Air Pollution Control Office of the Monroe County Department of Health, supplied us with the most recent data from the County's monitoring sites.

References

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- (2) A. Illies, M. J. McClements, and G. A. Takacs, "*The Clean Air Act of 1970: A National Debate*", RCSI Bulletin #174, August 1974
- (3) Olga Berg, "*Measurement of Ambient Air Quality in Monroe County*", RCSI Bulletin #126, August 1971
- (4) *New York State Air Quality Report, Continuous Monitoring System*, New York State Department of Environmental Conservation, BAQS-50, June 1973
- (5) *New York State Air Quality Report, 1972 Annual Report, Continuous Monitoring System*, New York State Department of Environmental Conservation, April 1973
- (6) *New York State Air Quality Report, 1973 Annual Report, Continuous Monitoring System*, New York State Department of Environmental Conservation, BAQS-54, 1974
- (7) *New York State Air Quality Report, Continuous Monitoring System*, New York State Department of Environmental Conservation, BAQS-57, June 1974
- (8) "*Air Pollution, Monroe County*", New York State Department of Environmental Conservation, February 1973
- (9) Data supplied to us by Ed Yurkstas of the Air Pollution Control Office of the Monroe County Department of Health
- (10) Robert E. Lee, "*Automobile Engine Alternatives*", RCSI Bulletin #169, April 1974
- (11) George L. Waldbott, "*Health Effects of Environmental Pollutants*", C. V. Mosby Company, 1973
- (12) M. J. Molina and F. S. Rowland, *Nature*, 249, 810 (1974)
- (13) S. C. Wofsy and M. B. McElroy, *Canadian Journal of Chemistry*, 52, 1582 (1974)

Appendix: Air Pollution Measurements in Monroe County

Table 1. Particulates^(a)

<u>Station</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>New York State Standard^(b)</u>
Fire House, North Street	85 (1.04)	84 (1.08)	76 (1.08)	65 (0.4)
East High, Rochester	63 (0.42)	60 (0.35)	65 (0.32)	65 (0.4)
Building 135, Kodak Park	90 (0.41)	90 (0.39)	83 (0.36)	65 (0.4)
Continuous Monitor, Farmington Road	58 (0.24)	51 (0.29)	51 (0.23)	65 (0.4)
School 44, Rochester	58 (0.38)	52 (0.44)	51 (0.32)	65 ^(c) (0.4)
School 25, Rochester		60 (0.38)	59 (0.40)	65 (0.4)
Jefferson Sr. High School, Rochester		70 (0.59)	59 (0.55)	65 (0.4)
Honeoye Falls	41 (0.16)	38 (0.19)	39 (0.20)	45 (0.30)
Hilton	40 (0.17)	40 (0.18)	37 (0.16)	45 (0.3)
E. W. Spry School, Webster	43 (0.23)	42 (0.24)	38 (0.22)	65 (0.35)
12 Corners Middle School, Brighton		55 (0.37)	50 (0.30)	55 (0.3)
Britton Road School, Greece		57 (0.36)	50 (0.41)	55 (0.3)
Bishop Kearney High School, Irondequoit	60 (0.46)	60 (0.43)	60 (0.36)	55 (0.3)
Rogers Middle School, Irondequoit		52 (0.37)	51 (0.35)	55 (0.3)
Churchville, Riga	43 (0.30)	38 (0.26)	37 (0.23)	65 (0.35)

(a) Data in parentheses are the annual arithmetic means of settleable particulates in units of milligrams per centimeter² per 30 days while data without parentheses are annual geometric means of suspended particulates in units of micrograms per meter³. These data were supplied to us by Ed Yurkstas of the Air Pollution Control Office of the Monroe County Department of Health. Data before 1971 has been reported in References (3) and (8).

(b) There are different New York State Standards for stations at different locations.

(c) For example, higher values are permitted in the inner city as compared to rural areas. The New York State Standard at School 44 has been incorrectly reported as 75 in Reference (8).

Table 2. County Measurements of Sulfur Dioxide Contamination^(a)

Site	Annual Average, Parts per Million (ppm)							AAQS
	1967	1968	1969	1970	1971	1972	1973	
North Street	.024	.04	.041 ^(b)	.031	.025	.022	.018	.03
East High School	.019	--	.023	.024	.018	.015	.010	.03
Kodak Park	.020	.020 ^(c)	.020 ^(d)	.018	.019	.018	.014	.03
School 44						.012	.009	.03
Jefferson H.S.							.014 ^(e)	.03
Honey Falls							.008	.03
Hilton							.009	.03
E.W. Spry School							.008 ^(f)	.03
12 Corners						.009	.006	.03
Britton Rd. School						.012	.010	.03
Bishop Kearney H.S.						.014	.012	.03
Rogers Middle School						.020	.014	.03
Riga							.009	.03

(a) Data up to and including 1971 were obtained from page 45 of Reference (8). Data for 1972 and 1973 were obtained from Ed Yurkstas of the Air Pollution Control Office of the Monroe County Department of Health

(b) Reported as 0.036 in RCSI Bulletin #126 (from data available from Health Dept. at that time)

(c) Reported as 0.021 in RCSI Bulletin #126 " " " " " " " " " " " "

(d) Reported as 0.019 in RCSI Bulletin #126 " " " " " " " " " " " "

(e) Obtained from measurements of only 15 samples

(f) Obtained from measurements of only 21 samples

Table 3. Sulfur Dioxide Levels from Continuous Air Monitoring System (4-6)

	J	F	M	A	M	Monthly Averages, ppm						
						J	J	A	S	O	N	D
1970								0.03	0.03	0.03	0.03	0.05
1971	0.07	--	0.05	0.03	0.02	0.01	0.02	0.02	0.02	0.03	0.03	0.02
1972	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.031	0.031
1973	0.031	0.032	0.017	0.011	0.013	0.01	0.013	0.014	0.02	0.019	0.027	0.02

Table 4. Carbon Monoxide Levels from Continuous Air Monitoring System (4-8)

	J	F	M	Monthly Averages, ppm					S	O	N	D
				A	M	J	J	A				
1970									4.2	4.2	4.0	4.0
1971	2.5	2.1	2.6	3.2	3.0	1.4	1.8	1.1	1.5	2.1	1.7	1.6
1972	2.0	2.1	1.8	1.8	1.8	1.3	1.2	1.2	1.2	1.3	1.8	2.6
1973	1.6	1.3	1.8	1.0	1.2	0.9	1.8	1.3	1.2	2.1	2.6	1.8

Table 5. Nitric Oxide Contamination from Continuous Air Monitoring System (4-6)

	J	F	M	Monthly Averages, ppm					S	O	N	D	
				A	M	J	J	A					
1970									0.05	0.03	0.03	0.04	0.04
1971	0.05	--	0.04	0.03	0.05	0.02	0.05	0.05	0.057	0.06	0.04	0.04	
1972	0.03	0.04	0.03	0.04	0.04	0.018	0.009	0.02	0.034	0.02	0.034	0.03	
1973	0.026	0.023	0.034	0.014	0.018	0.009	0.02	0.034	0.02	0.034	0.02	0.03	

Table 6. Nitrogen Dioxide Levels from Continuous Air Monitoring System (4-6)

	J	F	M	Monthly Averages, ppm					S	O	N	D	
				A	M	J	J	A					
1970									0.03	0.07	0.03	0.03	0.03
1971	0.04	--	0.03	0.02	0.03	0.03	0.05	0.05	0.04	0.05	0.03	0.03	
1972	0.03	0.04	0.04	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	
1973	0.024	0.03	0.027	0.022	0.022	0.02	0.02	0.015	0.02	0.04	0.03	0.03	

Table 7. Total Oxidants and Ozone^(a) Levels from Continuous Monitoring System (4-6)

	J	F	Maximum Hourly Averages for Each Month, ppm					S	O	N	D						
			M	A	M	J	J					A					
1970									0.18	0.05	0.08	0.04	0.06	0.18	0.12		
1971	0.10	0.02	0.06	0.03	0.06	0.06	0.046	0.20	0.08	0.05	0.027	0.03					
1972	0.02	0.01	0.01	0.04	0.06	0.05	0.08	0.03	0.03	0.03	0.03	0.04	(0.11)	(0.058)	(0.058)	(0.048)	(0.11)
1973	(0.10)	(0.104)	(0.061)	(0.077)	(0.054)	(0.087)	(0.12)	(0.11)	(0.10)	(0.05)	(0.03)	(0.04)	0.02				

(a) Ozone levels are in parentheses

Table 8. Total Hydrocarbon Levels from Continuous Monitoring System (5, 6)

	J	<u>Maximum Hourly Averages for Each Month, ppm</u>										D
		F	M	A	M	J	J	A	S	O	N	
1972	4.5	2.4	2.1	4.3	7.0	3.1	3.8	5.5	3.8	10.0	6.0	--
1973	--	--	--	2.0	1.9	2.1	--	--	5.0	5.5	3.1	7.5

