STATE OF NEW JERSEY

DEPARTMENT OF ENVIRONMENTAL PROTECTION

NEW JERSEY CLEAN AIR COUNCIL

Raymond M. Manganelli, Ph. D., Chairman
Report of the 1974
Annual Public Hearing
on

PHOTOCHEMICAL OXIDANTS AND THEIR RELATIONSHIP TO THE NEW JERSEY IMPLEMENTATION PLAN FOR MEETING FEDERAL STANDARDS

1976
New Jersey Clean Air Council
Department of Environmental Protection
John Fitch Plaza
Trenton, New Jersey 08625

State of New Jersey
Department of Environmental Protection
Division of Environmental Quality
John Fitch Plaza, P. O. Box 1390, Trenton, N. J. 0825

May 17, 1976

Honorable David J. Bardin, Commissioner
New Jersey Department of Environmental Protection
Trenton, New Jersey 08625

Dear Commissioner Bardin:

The New Jersey Clean Air Council is pleased to forward its long-delayed report on the 1974 public hearing held pursuant to Title 26:2C-3.3:(h), which states that the Council shall:

> "Hold public hearings at least once a year in regard to existing air pollution control statutes, codes, rules and regulations and upon the state of the art and technical capabilities and limitations in air pollution control and report its recommendations thereon to the commissioner . . . ".

The 1974 public hearing was held on May 30, 1974 to enable the Council to understand the state of the then-current knowledge about an important secondary air pollutant, photochemical oxidants, and to make recommendations as to the probable effectiveness of certain sections of New Jersey's State Implementation Plan.

The Council's report has been delayed because the many facets of this complicated issue made it difficult for the Council to reach conclusions which it felt were valid. Much of the uncertainty still exists, and additional technical information, leading to a better understanding of this national problem is still being generated.

The Council's study of the available data supports your action in the Fall, 1975, when you asked the U. S. Environmental Protection Agency, in its programs to reduce oxidants by controlling hydrocarbons, to take corrective measures on a broad regional basis rather than by state or by air-quality control region.

Sincerely yours,

CLEAN AIR COUNCIL

Raymond M. Manganelli, Ph. D.
Chairman

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CLEAN AIR COUNCIL PUBLIC HEARING REPORT 1974

Introduction

The State of New Jersey faces severe problems with regard to the attainment and maintenance of Federally-promulgated air quality standards. This is due in part to the great densities of both population and industry within the State and in part to the highly developed nature of surrounding areas. Of the six pollutants for which standards have been established, photochemical oxidants pose perhaps the most difficult control problem. Despite intensive research conducted in the past few years, large gaps remain in our knowledge of the fundamental sources and reactions which result in the formation and dispersal of these compounds.

The 1974 public hearing was, therefore, an attempt by the Clean Air Council to survey the state of current knowledge about the photochemical oxidant situation, and to make recommendations regarding the probable effectiveness of provisions contained in the State Implementation Plan. The primary source of information used to prepare this report was testimony presented to the Council at the May 30, 1974 hearing, which was entitled "Photochemical Oxidants and Their Relationship to the New Jersey Implementation Plan for Meeting Federal Standards." Testimony, both oral and written, was presented by speakers representing regulatory agencies, scientific research organizations, private industry, and concerned citizens groups. This wide range of interests resulted in a comprehensive look at the varying points-of-view concerning the subject. While all participants seemed to agree that there is a problem, wide disagreement was evident as to a workable definition of the problem and possible solutions thereto.

Photochemistry

The first step in resolving such conflicts is to define the pollutant itself. Unlike other major contaminants, such as carbon monoxide and sulfur dioxide, photochemical oxidants are not emitted in the form which is recognized as a health hazard. Rather they are end products of a series of complex atmospheric reactions. The inputs to these reactions are nitric oxide, reactive hydrocarbons and sunlight. To date, Bell Labs (Murray Hill) have determined a non-exhaustive list of over one-hundred-thirty chemical reactions involving some seventy compounds which influence oxidant levels.[1] However, the primary end products of concern are ozone (O_3), nitrogen dioxide (NO_2) and peroxyacetyl nitrate (PAN). There are two distinct phases which are identifiable. In the first phase, nitric oxide (NO) is oxidized to nitrogen dioxide (NO_2) while the formation of ozone (O_3) is suppressed. The second phase occurs when most of the NO has been converted to NO_2 and results in a decrease in the concentration of the latter as the formation of O_3 and PAN takes place.[2]

Since some hydrocarbons, notably methane, acetylene, and benzene, were found to be unreactive, the term "non-methane hydrocarbons" (NMHC) has been adopted to mean reactive hydrocarbons. Unless otherwise specified, the term "hydrocarbon" will be used interchangeably with "reactive hydrocarbon" for the purpose of this paper.

Laboratory smog chamber studies conducted at Research Triangle Park, North Carolina, led the United States Environmental Protection Agency to conclude that the quantity of oxidants formed is dependent upon the initial amounts of nitric oxide and hydrocarbons present but is most heavily dependent upon the type of hydrocarbons and is directly proportional to both the initial hydrocarbons-to-nitric-oxide ratio and the intensity of solar radiation.

Since oxidants are a result of chemical changes which occur after the release of precursor compounds, direct control over the secondary pollutants is impossible. It is necessary to reduce concentrations indirectly by limiting the available amounts of input elements. Current theory dictates that a reduction in any of the formative substances will result in lower oxidant concentrations. Since no reduction of insolation - that is, solar radiation received by the earth- is practicable, controls must be established to inhibit the release of hydrocarbons and/or nitric oxide into the atmosphere.[3]

The EPA, based on its smog chamber findings, has formulated four general strategies for oxidant control:

1. Reduce NMHC and NO emissions and thereby limit oxidant formation.
2. Design control programs with emphasis on control of hydrocarbons of higher reactivity, to decrease the reaction rate.
3. Reduce NMHC emissions in greater proportion than NO emissions to reduce the NMHC/NO ratio and further delay the oxidant-forming reactions.
4. Give priority to control of morning NMHC emissions to delay the second-stage reaction until late afternoon when solar radiation decreases.[4]

Unfortunately, no firm relationships have been established to relate the levels of hydrocarbons to the ultimate production of oxidants. Complications are caused by widely varying reaction rates, differing methods of measurement (all non-specific) and a lack of knowledge of transport mechanisms.

Ozone and its Sources

Much atmospheric photochemistry involves reactions which produce (and other reactions which consume) ozone, a naturally-occuring compound and a basic oxidant, whose chemical structure consists of three atoms of oxygen: O_3. Sources of ozone include lightning discharges and other strong electrical fields, but the largest source of non-manmade ozone is the air itself. The ozonosphere, a layer of the earth's atmosphere extending from roughly ten to twenty miles above sea level, is vital to man's existence in that it absorbs deadly ultraviolet radiation against which terrestrial life has no other natural defense. Downward transport of ozone from this layer is thought to be one possible cause of high ozone concentrations recorded over rural areas.[6] However, this is an assumption based upon limited knowledge. Further natural sources considered to be beyond technological control are hydrocarbon releases from plants and from fossil fuel deposits. These releases occur at an undetermined rate and add another uncertainty factor to any control plans.

Man-made precursors of oxidants in general and ozone in particular are emitted primarily from the less - than - complete combustion of fossil fuels, the basis of the energy structure in this country. Few, if any, combustion sources result in one-hundred-per-cent oxidation of fuels. Both stationary and mobile sources contribute to the emission of hydrocarbons and oxides of nitrogen. Other sources include evaporation of solvents from storage tanks, and painting and surface-coating operations. However, source inventories show the large majority (73%) of hydrocarbon emissions as resulting from mobile sources.[7]

Health Effects of Ozone

Testimony presented by Dr. Carl Shy, Director, Institute of Environmental Studies, University of North Carolina, emphasized the hazardous nature of ozone. The primary targets of ozone, in the physiological sense, are the lungs and the senses - eye irritation and odor. Lung effects include the development of disease with changes in chemistry and enzymology, breath capacity, and cytology. Secondary targets include blood (enzyme effects and oxygen release) and other organs. A summary of health epidemiology would include effects on athletic performance at concentrations as low as 0.07 ppm, eye irritation at 0.10 ppm, respiratory irritation at 0.20 to 0.30 ppm, and asthma attacks at 0.25 ppm. Ozone enhances the formation of biologically - reactive sulfates from the less reactive SO_2, and sharp increases in airway resistance have been measured with combinations of SO_2 and O_3, whereas each contaminant, individually, at the same concentration, shows little or no increase in airway resistance (0.37 ppm SO_2, 0.37 ppm O_3). It is claimed that ozone can cause breakage of carbon-carbon double bonds in unsaturated molecules in the body, e.g. cell membranes, forming free radicals with resultant mutagenesis. Furthermore, significant chromosome damage was reported after prolonged exposure.

Dr. Shy stated that there are no data that any level of ozone in the atmosphere is <u>not</u> hazardous to health.

Methods of Measurement

Two primary systems have been used to measure oxidant levels. Analytical devices using neutral potassium iodide (KI) have been the standard for many years. KI measures the total oxidation potential of the sample. However, such data does not indicate the specific compounds involved and is subject to interference from sulfur dioxide and other reducing agents.

A more recent development, the chemiluminescent technique, measures only ozone and is considered to be less susceptible to interference from other compounds than is the KI method.

These two methods, used in regions outside the New Jersey area, seemed to give comparable results with regard to peak concentrations and have been used interchangeably. However, this relationship is considered suspect in light of measurements made within the Northeast United States. At a conference held by the Interstate Sanitation Commission in 1973, it was determined that no health studies have been reported on the effects of ozone as measured by chemiluminescence and disagreement arose as to the suitability of inter-method substitutions.[8]

Reductions Required

In accordance with the Federal law, New Jersey's Implementation Plan to achieve National Ambient Air Quality Standards was submitted to EPA on January 26, 1972. The Plan for photochemical oxidants and carbon monoxide which was originally approved by EPA on May 31, 1972, included a time extension for the achievement of the standards for these pollutants by 1977 in the N. J. - N. Y. - Conn. Air Quality Control Region and the Metropolitan Philadelphia Air Quality Control Region. The data base on which the approved plan was predicated was air quality for oxidants as measured at Bayonne.

As a result of a federal court action of January 31, 1973, EPA was directed to require the states to submit plan revisions to comply with the "Transportation Sources" by April 15, 1973. New Jersey was asked by EPA to conclusively demonstrate why it could not meet national air quality standards for carbon monoxide and oxidants by May 31, 1975. In its reevaluation for 1975, EPA further required New Jersey to change its original data base and maximum impact receptor site for photochemical oxidants to Welfare Island. The consequence was a considerable change in the reduction in ambient photochemical oxidant concentration needed to meet the national air quality standards. The hydrocarbon emission reduction needed to meet national air quality standards for oxidants (reference Federal Register August 14, 1971) increased from 21% in the 1972 New Jersey Implementation Plan to 67% in the newly mandated "New Jersey Plan To Meet National Air Quality Standards for Carbon Monoxide and Photochemical Oxidants".

Since New Jersey has not yet officially submitted a transportation plan, EPA's transportation plan for New Jersey became effective on November 13, 1973. EPA has stated that upon approval of the New Jersey Transportation Plan, EPA would withdraw in total or in part its plan for New Jersey.

Attainment of air quality standards under the EPA plan is based upon reduction of emissions of hydrocarbons; the extent of this reduction is in turn based upon an EPA study which produced Appendix J as published in the Federal Register of August 14, 1971. Under the provisions of this docoment, New Jersey must reduce hydrocarbon emissions by sixty-seven percent in the nine northern counties and by forty-seven percent in the five counties adjacent to the Philadelphia area. The assumptions and methodology used to develop Appendix J have received widespread criticism and deserve discussion at this point.

Using the smog chamber studies and general strategies mentioned previously, EPA decided to determine the emission reductions required for each area based upon a linear proportional model. The basic assumption of such models is that a given reduction in emissions will result in a directly proportional reduction in ambient concentrations. Because of the complex reactions involved, the linear nature of the model was not used, and was set aside as an oversimplification of the situation.

In EPA's effort to estimate the quantitative relationship between hydrocarbon emissions and oxidant concentrations, air monitoring data from Denver, Los Angeles, Philadelphia and Washington, D. C., was collected with maximum daily one-hour oxidant levels plotted as a function of the 6 a. m. to 9 a. m. average hydrocarbon concentrations. An "envelope curve" was then drawn through the approximate upper limit of oxidant levels for each point along the hydrocarbon axis. The distinctly convex shape of this curve resulted in EPA's conclusion that a more-than-proportionate reduction in emissions is necessary to achieve a given decrease in oxidant concentrations. From the envelope curve, Appendix J was constructed, still using a type of proportional model.

Among the criticisms levelled at Appendix J:

1. It is a composite curve that is not precisely representative of any particular region.
2. It is not useful in regions where measured concentrations exceed 0.28 ppm.
3. The most critical upper portions of the envelope curve are based almost solely on Los Angeles data.
4. No allowance is made for stated EPA goals of disproportionate reduction of highly-reactive hydrocarbons or morning emissions or a reduction in the NMHC/NO ratio.[9]

Control Strategies

At the time of this public hearing, EPA had proposed a number of different control strategies. Each strategy was considered from the standpoints of its effectiveness in controlling hydrocarbon emissions, and of its effect on the social and economic fabric of our society.

There were three major controls applied to the State in general.

The Federal Motor Vehicle Control Program (FMVCP) requires that automobile manufacturers gradually reduce emissions from their products through engineering modifications. By setting specific limits to be achieved by given dates, EPA hopes to reduce eventual automotive emissions to a small fraction of their present levels.

The New Jersey Inspection/Maintenance System (I/M) is designed to ensure that vehicles registered within the State emit no more than a set limit of hydrocarbons. This too is a gradual process.

In conjunction with the Federal program previously described, EPA had proposed that vehicles manufactured prior to the start of the plan be fitted with pollution control devices--either exhaust gas recirculation systems or oxidizing catalytic converters. This "retrofit" program would presumably have resulted in drastic reductions in the emissions of "pre-controlled" vehicles.

With regard to control of stationary sources, major emphasis has been placed upon evaporation from storage tanks as EPA feels that available technology and economics dictate maximum control over these sources.

Assuming that all of the above controls function to the limit of their scopes, emissions must still be reduced by an additional fifty thousand tons per year. Some of the Federal proposals to prohibit these releases may have severe repercussions upon the State, while others would have minimum adverse social effect. Since per-mile vehicle emissions will be controlled to the fullest extent through the Federal FMVCP and State I/M programs, the remaining decreases would have to be achieved through limitations placed upon the use of the private automobile. These regulations as originally promulgated by EPA include:

1. Mandated management of parking supplies.
2. Incentives designed to encourage use of mass transit and car pools.
3. Exclusive bus lanes on highways and local roads.
4. Vehicle-free zones in center-cities.
5. Prohibition of truck pickup and delivery between 6 a.m. and 11 a.m.

Accurate estimates of the effectiveness of these programs and the reductions attributable to them have yet to be determined. Therefore, EPA developed a contingency measure to be implemented in the event that the photochemical oxidant standard is not achieved by the attainment date. This measure consists of limitations placed upon the sale of gasoline to the extent that the above strategies fail to limit vehicle miles travelled (estimated at a required 57% reduction in northern New Jersey). In light of the delays experienced to date in the three major control plans, as well as a general lack of implementation of the VMT-reduction systems, some degree of sales ban will in all likelihood come about.[10]

These measures have proven highly controversial and some revisions have been made, some proposals have been cancelled or deferred, while still others are under consideration. Newark, Trenton, and Camden have taken some tentative steps to limit parking supply, the New Jersey Department of Transportation has commissioned a study to determine the feasibility of an express bus lane on Route 3, and EPA has promoted voluntary car-pool plans at places with large numbers of employees. These steps, and the aforementioned FMVCP and I/M, are the only measures taken so far to control hydrocarbon emissions from motor vehicles.

Failing promulgation by the State of New Jersey of regulations considered effective by EPA, any or all of the above originally-promulgated strategies could have been enforced to the possible detriment of social and economic concerns. However, as of this submittal (mid-1976) neither formalized plan nor concrete action nor enforcement had taken place.

Problems and Recommendations

1. Problem -- The hydrocarbon emissions inventory which forms the basis of the overall photochemical oxidant control program was created in large part through the application of motor vehicle emission factors which became obsolete with the publication of Supplement 5 to "Compilation of Air Pollutant Emission Factors" (USEPA Publication AP-42). This document presents an entirely different methodology for the determination of automotive emissions and may cause great alterations in the New Jersey hydrocarbon emissions inventory.

> Recommendation -- Hydrocarbon inventories for those areas designated as Air Quality Maintenance Areas, seventeen of the State's twenty-one counties, are currently under revision by contract with EPA. Upon completion of these updates, the resultant inventories should be carefully analyzed to determine whether or not proposed strategies will in truth control sufficient emissions to achieve the goals set by air quality standards.

2. Problem -- Very little has been published on background levels of photochemical oxidants. Natural emissions of ozone and hydrocarbons are believed to result in oxidant concentrations ranging from ten to fifty parts per billion while EPA's National Ambient Air Quality Standard (one hour) is eighty parts per billion. Air monitoring data for New Jersey shows that the standard is routinely exceeded in both urban and rural sites. It is entirely possible that these violations may be the result of emissions utterly beyond technological control. Further, aerometric data in the past has shown higher chemiluminescent measurements for ozone than the level for total oxidants determined by neutral potassium iodide equipment at the same site. Since the health-effects studies cited in the establishment of standards were based upon KI readings, doubts may be raised as to the validity of the standard.

> Recommendation -- Further health-effect studies should be instituted to determine if the oxidant concentrations thought to adversely influence respiratory function were actually different than those measured. These should include investigation into synergistic effects with an eye toward possible revision of the standard as well as the promulgation of multi-pollutant criteria, such as a combination of SO_2 and particulates (or coefficient of haze), if appropriate.)

3. Problem -- Automotive emissions represent the bulk of New Jersey hydrocarbon releases. Reduction of these discharges is highly dependent upon both the FMVCP and the State I/M system. The Federal Government has delayed the FMVCP for 1977-year automobiles and still further revisions are being considered.

Lacking effective application of these two programs, it may become necessary to impose drastic restrictions on vehicular movement which would have serious impact on economic activity and the public's mobility. It should also be pointed out that the retrofit of older cars with catalytic devices has never been adopted because of questionable cost effectiveness and anticipated public antagonism.

> Recommendation -- Since photochemical oxidants pose a problem in many areas of the nation, and since atmospheric transport is so important a consideration (Bell Labs [1]), EPA must address itself to the oxidant problem as one affecting all Air Quality Control Regions, not merely New Jersey. An oxidant control program, embodying the FMVCP, I/M, stationary-source control (as for example, recovery of vapors from gasoline storage tanks at filling stations), and sensible measure aimed at reducing vehicle miles travelled, should be implemented across the nation. This program demands effective action; the alternative is even greater restriction of private travel.

4. Problem -- Determination of the effectiveness of proposed oxidant controls is limited by the lack of suitable models designed to incorporate such variables as source location and atmospheric transport. The development of such models is hampered by fluctuations of emissions with time, vehicle speed, and solar radiation. In the absence of modelling data, it is most difficult, if not impossible, to establish viable plans to attain (and maintain) oxidant standards.

Recommendation -- The New Jersey Department of Environmental Protection should be directed to establish a multi-discipline group with the sole responsibility of developing a photochemical oxidant model specific to the meteorology, atmospheric transport, topography, emission sources and related factors of this region.

5. Problem -- Rule 66, promulgated by the Los Angeles Air Pollution Control District, specifies hydrocarbon controls based upon the rate of reactivity of the various compounds. The purpose of this regulation was to delay the formation of oxidants until the precursors had been transported out of the control district. The use of any similar regulation in New Jersey would contradict federal determinations which make Welfare Island, New York, the monitoring control point for the New Jersey-New York-Connecticut Air Quality Control Region. However, measures similar to the Los Angeles program have been suggested for use in this area.

Recommendation -- Rates of reactivity should not be considered in formulating New Jersey control measures (with the exception that non-reactive compounds such as methane be excluded) and limitations to emissions should be applied uniformly to all reactive hydrocarbons in an effort to prevent the transport of oxidants around and beyond the State. The improvements in air quality to be realized by the recent promulgation of sub-chapter 16 of the New Jersey Air Pollution Control Code should begin to be realized in 1977, and should be a measurable contribution, if only a partial answer to the reduction of hydrocarbon emissions in New Jersey. This reduction, incidentally, may be of more benefit to downwind states -- e.g., Connecticut and Massachusetts -- than to New Jersey itself (see Bell Labs [1]).

6. Problem -- It has been the position of the EPA that the oxidant levels experienced in southern New York State and Connecticut are in part attributable to hydrocarbon emissions originating within New Jersey. Carrying this argument still further, it is entirely likely that emissions upwind influence contaminant levels within and beyond this State. The Interstate Sanitation Commission [8] and more recently Bell Laboratories [1] , in work of significant technical achievement, have concluded that distinct ozone plumes can be detected downwind of urban centers and that emissions from Philadelphia during a given day may be transported by southwesterly winds, resulting in elevated oxidant levels in New York City the following day. As yet, no upper limit to the transport distance has been determined.

Recommendation -- Air masses frequently traverse the country from west to east during period of peak photochemical oxidant formation. Given a fast-moving air mass containing slow-reacting compounds, it is possible that oxidants may be created in New Jersey from precursors emitted at great distances from the State. Commissioner Bardin has taken a leading role in advocating uniform hydrocarbon emission control regulations to be applicable throughout the nation, and EPA should adopt this broad area-wide concept in its overview of the photochemical oxidant problem.

7. Problem -- Oxidant formation is dependent upon the ratio of hydrocarbons to nitric oxide as well as the initial amounts of each. While reduction of ambient hydrocarbons through current regulations might result in delaying the formation of oxidants and might allow the transport of precursors beyond State borders before the end products are formed, it does not solve the problem of oxidants transported into New Jersey from elsewhere.

> Recommendation -- Measures to control hydrocarbons should be coupled with regulations, carefully and intelligently promulgated, to limit the emission of oxides of nitrogen. In this manner, the possibility of localizing and isolating problem areas will be enhanced.

8. Problem -- EPA control measures designed to reduce New Jersey hydrocarbon emissions are based upon the total decrease required under the methodology of Appendix J. Limitations on 6 a.m. to 9 a.m. concentrations of hydrocarbons are used to establish the percent reduction necessary to meet standards. However, the Interstate Sanitation Commission and Bell Labs (op. cit.) have found little correlation between morning hydrocarbon and afternoon oxidant levels at the same site. Further, the envelope curve used to establish Appendix J is almost solely dependent upon Los Angeles data for its upper--and most critical--values. The meteorology and topography of the Los Angeles area are enormously different from those of the East Coast and the climate is such that Southern

California uses different types and amounts of fuels, resulting in the release of different hydrocarbon compounds. Los Angeles lies considerably nearer the equator than New Jersey and experiences a great deal less cloud cover. This results in more intense solar radiation reaching Los Angeles for longer periods of time than that which occurs in New Jersey. Finally, transport from the Pacific Ocean into the Los Angeles basin is undoubtedly far different than transport into New Jersey from adjoining states.

> Recommendation -- Appendix J is inapplicable to New Jersey because of substantially different conditions in all categories of applicability. The basic principles used to develop it have some merit and a somewhat similar methodology should be developed using data from areas representative of East Coast conditions. Pending this determination, Appendix J should be rescinded as inappropriate in regions outside of Los Angeles.

SUMMARY

Photochemical oxidants pose a unique problem with regard to attainment of National Ambient Air Quality Standards in New Jersey.

Lack of knowledge concerning such basic data as background levels, natural sources of emissions, present inventories, chemical reactions involved in oxidant formation, transport mechanisms, and effectiveness of control strategies will greatly hamper efforts to achieve mandated emission reductions.

This information gap, combined with current delays in implementation of major control measures, make it highly unlikely that the standards will be met by the attainment data of May 31, 1977.

Implementation of the Federal Motor Vehicle Control Program, of Inspection-Maintenance Programs of all of the States, and of control programs for hydrocarbon emissions over broad areas, not merely the State of New Jersey, will be most significant in the control of photochemical oxidants.

REFERENCES

All references are made in regard to testimony presented at the Clean Air Council's Public Hearing (see Bibliography).

1. Dr. Kenneth B. McAfee, Bell Labs, Murray Hill, N. Y.
2. Roger Morris, US EPA, North Carolina.
3. Vincent Marchesani, New Jersey Bureau of Air Pollution Control, Trenton, New Jersey.
4. op. cit.
5. Dr. Carl Shy, University of North Carolina (ex- US EPA).
6. Dr. Peter Coffey, New York State Department of Environmental Conservation, Albany, New York.
7. V. Marchesani
8. Dr. George Wolff, Interstate Sanitation Commission.
9. R. Morris
10. Timothy Dwyer, US EPA, New York City, New York.

BIBLIOGRAPHY

1. Transcript of the Public Hearing in the Matter of "Photochemical Oxidants and Their Relationship to the New Jersey Implementation Plan for Meeting Federal Standards," New Jersey Clean Air Council, May 30, 1974.
2. Federal Register, Volume 36, Number 84, April 30, 1971.
3. Federal Register, Volume 36, Number 158, August 14, 1971.
4. "Compilation of Air Pollutant Emission Factors," US EPA, Office of Air Quality Planning & Standards, Research Triangle Park, North Carolina, March, 1975.
5. "Air Quality Criteria for Photochemical Oxidants," US Department of HEW, National Air Pollution Control Administration, Washington, D. C., March, 1970.

APPENDIX A

TESTIMONY SUBMITTED TO THE CLEAN AIR COUNCIL AT ITS 1974 PUBLIC HEARING - MAY 30, 1974

A. The Photochemical Oxidant Problem in New Jersey; Mr. Vincent Marchesani, Bureau of Air Pollution Control, N. J. Department of Environmental Protection

B. The Photochemical Oxidant Problem in New York State; Dr. Peter Coffey, Senior Research Scientist, Division of Air Resources, N. Y. State Dept. of Environmental Conservation, Alabany, N. Y.

C. The Federal Clean Air Act and Administrative Background for Oxidant Control; Mr. Roger Morris, General Engineer, Source Receptor Analysis Branch, Monitoring and Data Analysis Div., Office of Air Quality Planning and Standards, EPA, Research Triangle Park, Durham, N.C. 27711

D. Air Quality Assessment and Techniques Applied by EPA for Calculating Control Requirements As Set Forth in Appendix J; Mr. Timothy Dwyer Transportation Region II, New York, N. Y.

E. Health Effects and Ambient Air Quality Standards for Oxidants; Dr. Carl Shy, Director, Institute of Env. Studies, University of North Carolina, 311 Pittsboro St., Chapel Hill, N. C. 27514

F. Atmospheric Hydrocarbon Reactivity and Its Application to the N. Y. - N. J. Area; Dr. Raymond J. Campion, Research Associate, Esso Research and Engineering Co., Linden, N. J.

G. Stationary Source Hydrocarbon Control Alternatives and Their Impact; Dr. Allen Clamen, Esso Research and Engineering Co., Linden, N. J.

H. Implication of Photochemical Oxidant Transport in the N. J. - N. Y. Air Quality Region; George T. Wolff, Senior Air Pollution Engineer, Interstate Sanitation Commission, New York, N. Y.

I. Statistical Analyses and Phenomenological Interpretation of the Atmosphere in N. Y. - N. J. Metropolitan Region; Dr. Kenneth B. McAfee and Ram Gnanadesikan, Bell Laboratories, Murray Hill, N. J.

J. Comments on Photochemical Oxidents and Chapter 16; Louis A. Ruckgaber, Jr., National Paint and Coatings Association.

APPENDIX A

Sheet No. 2

K. Mrs. Gordon Gibson, V. P., N. J. Citizens for Clean Air Inc.

L. Mrs. Carol Ann Wolff; American Lung Association of N. J.

M. Matthew M. Custer; American Lung Association of South N. J.

N. W. B. Cosden, Chairman, Environment Committee; National Coil Coaters Association.

P. Morris Hershon, President; National Barrel & Drum Association, Inc.

Q. David Lloyd, New Jersey Manufacturers Association.

R. Mrs. Holloway, Kearny Environmental Committee of Concerned Citizens, Kearny, N. J.

APPENDIX B

BACKGROUND OF CLEAN AIR COUNCIL

The Clean Air Council was created in the New Jersey State Department of Health by the enactment of Titles 26: 2C-3.1 to 2C-3. 3, which amended the Air Pollution Control Act of 1954.

Title 26: 2C-3.1 abolished the Air Pollution Control Commission and transferred its functions to the Department of Health. The Air Pollution Control Commission, functioning from 1954 to 1967, promulgated New Jersey Air Pollution Control Code Chapters I through VIII, which codes now are enforced by the Bureau of Air Pollution Control in the Department of Environmental Protection.

Title 26: 2C-3. 2 established the 17 member Clean Air Council and prescribed its composition. The members of the Clean Air Council at the time of the Public Hearing in 1974 were:

Irwin S. Zonis, Chairman

Roslyn Barbash, M. D.
Joseph R. Bezzone
Joseph E. Buckelew
Richard D. Chumney
Franklin W. Church, P. E.
James W. Conlon, P. E.
John Davidson
Barbara Eisler
Eugene P. Gillespie
Robert J. Haefeli, P. E.
John Kunze
Raymond M. Manganelli, Ph. D.
Samuel Perro
James H. Rook
Raymond A. Taylor, M. D.

At the time of this submittal of the Council's report (May 1976), the membership of the Council was as follows:

Raymond M. Manganelli, Ph. D., Chairman

Ronald Altman, M. D.
Roslyn Barbash, M. D.
Joseph R. Bezzone
Richard Binetsky
Joseph E. Buckelew
Richard D. Chumney
John P. Davidson
Barbara Eisler
Eugene P. Gillespie
Robert J. Haefeli, P. E.
John Kunze
James H. Rook
William J. Schreibeis
William Stack
Joseph Yeager
Irwin S. Zonis

APPENDIX B

Sheet No. 2

Title 26:2C-3.3 sets forth the duties and powers of the Clean Air Council. The council's basic function is to assist the State of New Jersey in the prevention and elimination of air pollution by reviewing the performance of the Department of Environmental Protection and by acting to stimulate public concern in air pollution matters. The Council's members are commissioned to investigate all aspects of New Jersey's Air Pollution Control Program and to report their findings and recommendations to the Commissioner of Environmental Protection.

The Clean Air Council held its first meeting in September, 1968. Since that time, the Council has been actively involved in carrying out its mandated functions. Accordingly, under Title 26:2C-3.3(h), which states that the Clean Air Council shall: "Hold public hearings at least once a year in regard to existing air pollution control statutes, codes, rules and regulations and upon the state of the art and technical capabilities and limitations in air pollution control and report its recommendations thereon to the commissioner...", public hearings have been held each year since 1969.

Acknowledgement

Mr. Richard J. Katz, then a graduate student at Cook College, Rutgers, the State University of New Jersey, prepared a report in 1975 on the 1974 public hearing of the Clean Air Council. Mr. Katz submitted this report to the College in partial fulfillment of the requirements leading to the degree of Master of Environmental Science.

Mr. Katz' report in large part served as the basis for this public hearing report of the Council, and the Council wishes to acknowledge Mr. Katz' work and thank him for his assistance. However, it should be emphasized that any opinions or conclusions in the Council's report are those of the Council, and not necessarily those of Mr. Katz or of the Department of Environmental Protection, Mr. Katz' present employer.