Air Pollution in Portland

City Club of Portland (Portland, Or.)

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REPORT

on

AIR POLLUTION IN PORTLAND

TO THE BOARD OF GOVERNORS
THE CITY CLUB OF PORTLAND:

Your Committee was assigned to study the problem of air pollution in Portland, such a study to include, to the extent the Committee found appropriate and feasible:

1. The causes and seriousness of the air pollution problem in Portland and Multnomah County.
2. How the problem is being met in other cities, such as Pittsburgh and Los Angeles.
3. Needed legislation, if any, in order to help solve the problem.
4. How the problem can be met when contributing factors may lie outside the legal jurisdiction of the city and/or the county.

ORGANIZATION OF STUDY

The membership of your Committee was arranged to be representative of the many technical fields which are associated with air pollution control, and to include as widely varying personal occupations as possible. Members of your Committee are: Dr. Max Simons, physician; David J. Lewis, engineer; Kenneth Klarquist, chemical engineer and attorney; Irwin Harrowitz, graduate chemist and retail merchant; Eckley Ellison, meteorologist in charge of the Portland office, U. S. Weather Bureau; Dr. David Charlton, bacteriologist and president of Charlton Laboratories, and Carleton Whitehead, alumni secretary of Reed College.

Your Committee as a whole interviewed the former Mayor's Advisory Committee on Air Pollution; Richard Hachard, engineer in charge of the State Air Pollution Authority; Dr. Frank Perlman, physician specializing in allergies; Robert R. McKean, manager of Columbia Empire Industries, and their committee on air pollution; the present Mayor's Committee on Air Pollution, and George Ruby of Jantzen Knitting Mills. Subcommittees interviewed Dr. Charles Meador, City Health Officer and Mayor Fred L. Peterson. Special reports for the Committee were prepared by Eckley Ellison on "Meteorological Factors Affecting Air Pollution in Portland," and by David Charlton on the "History of Air Pollution Control Legislation in Portland." In addition, a wide variety of publications relating to air pollution control were utilized.*

INTRODUCTION TO AIR POLLUTION

The present century has seen increasing concern about the possibly serious effects of atmospheric contamination. Public attention was focused on the potential dangers of air pollution with the widespread publicity which accompanied the disasters in the Meuse Valley, Belgium (1930), Donora, Pa. (1948), Poza Rico, Mexico (1950) and London, (1952). In all of these areas a substantial increase in sickness and death rates accompanied a severe condition of air pollution.

*These publications included the Oregon Air Pollution Control Act; City of Portland Ordinance for the Regulating, Controlling, and Abating pollution of the Air; the air pollution control ordinance proposed for Portland; an outline of Air Pollution Control Information prepared for the League of Oregon Cities by the State Air Pollution Authority; three research reports on air pollution appearing in California's Health; "Some Important Aspects of Air Pollution" by Paul Magill, Stanford Research Institute, "The Nature of Air Pollution in Los Angeles" by Dr. A. J. Haagen-Smit, California Institute of Technology, and "Air Pollution and Lung Cancer" by Dr. Paul Kotin, School of Medicine, U. S. C.; "The Evolution of an Air Pollution Control Program for Tacoma" by John Rosene; Smoke Control Ordinance of Allegheny County, Pennsylvania; Fourth and Fifth Annual Reports by the Bureau of Smoke Control for the County of Allegheny; Rules and Regulations of the Los Angeles County Air Pollution Control District; Second Technical and Administrative Report of the Los Angeles County Air Pollution Control District; Public Health Aspects of Atmospheric Pollution by Dr. Frank Princie; "Clean Air For California," Initial report of the Air Pollution Study Project of the Department of Public Health, State of California; Air Pollution Abatement Manual, Manufacturing Chemists Association; A Rational Approach to Air Pollution Legislation, Manufacturing Chemists Association; Transcript of the Hearing of the Council of the City of Portland on the proposed Air Pollution Control Ordinance; Analysis of the proposed Air Pollution Control Ordinance for the City of Portland by Mr. T. C. Wurts, President, Air Pollution Control Association, Pittsburgh; First Biennial Report, Oregon State Air Pollution Authority; Monthly Report of the Oregon State Air Pollution Authority together with a large file of newspaper clippings, magazine clippings and Committee correspondence.
The objectionable effects of air pollution are of three kinds: (1) esthetic or nuisance effects, (2) economic effects, (3) health effects.

Esthetic or nuisance effects include eye, nose and throat irritation; unpleasant odors; the deposit of dust, dirt and grime which may not cause a direct monetary loss to many people, but which creates a thoroughly objectionable environment; and the substantial reduction of visibility, together with the destruction of those living conditions which are considered desirable.

Economic effects include financial losses directly attributable to the effect of air pollution on vegetation and property. It is estimated that losses in excess of $3,000,000 due to crop damage were sustained in 1953 in Southern California.

While estimates of property damage vary widely, all investigations agree that substantial financial losses can be caused by air pollution.

Contaminants in the air can cause the corrosion of metal, discoloration and deterioration of paint, soiling of buildings and wearing apparel, and many other physical effects which are both objectionable and expensive to correct. Various estimates by different agencies have placed the yearly national loss at about $1.5 billion.

Three different investigations have placed the cost of air pollution in Chicago at $20 a year per person. The annual loss in Pittsburgh is estimated to be $10 million; in Cincinnati, $8 million; and in Cleveland, $6 million. A study by the Stanford Research Institute covering the 15 largest cities in the country indicates a direct annual loss to twenty large department stores of from $4,000 to $20,000 each; and an annual loss for 35 office buildings of from $11,000 to $35,000 each.

A state which obtains a substantial income from tourist trade might well consider the possible financial loss which would result from a substantial decrease in the visibility and a general deterioration of those conditions which are considered pleasant surroundings.

While the health effects of the great air pollution disasters of the twentieth century are obvious, the long range health effects of daily exposure to more normal conditions of air pollution are difficult to determine. Standards of exposure for the general public for various contaminants have not yet been established, although an increasing amount of work is being devoted toward this goal. It is certain that the permissive levels of contamination will have to be a great deal lower than in industrial plants because: (1) the exposure is continuous rather than for an eight hour period; (2) there is no relief from exposure, thus permitting the body to recuperate; (3) the public contains elderly and sick people, as well as the healthy factory worker; (4) and the presence of many different contaminants may produce chemical combinations of far greater severity than the separate contaminants themselves.

A growing number of medical men believe that atmospheric pollution is the cause of the increasing frequency of lung cancer in urban areas.

UNDERSTANDING AIR POLLUTION

The first fact that every person concerned with air pollution must realize is the extreme complexity of the subject. While a great deal has been developed in recent years about the causes of air pollution and methods of control, much is still to be learned. Before an analysis can be made of air pollution in Portland, there must be some appreciation of the facts which create an air pollution problem.

In understanding air pollution we must deal with two main factors; the condition of the atmosphere which receives the pollutants, and the nature of the pollutant itself. To a large degree the severity of air pollution is directly related to the ability of the atmosphere to distribute the pollutant throughout its area.

WEATHER CONDITIONS CONDUCIVE TO AIR POLLUTION

Our atmosphere is so vast that it can absorb a tremendous quantity of pollutants without creating objectionable conditions, if there is an opportunity for dispersion. Winds and turbulence in the air will spread pollutants over great areas. Rains will wash pollutants out of the air. Pollution generally becomes an area problem only when the distribution of pollutants becomes restricted. The more restricted the distribution, the greater the concentration of the pollutants and the more serious the air pollution problem. A special case involving concentration of pollutants occurs immediately downwind from a source of air pollution since the full effect of the pollutant is received before it has been dissipated.
Although there are other atmospheric conditions which restrict the dispersion of air pollutants, a basic cause of most area air pollution problems is a meteorological condition known as a surface temperature inversion. A temperature inversion is simply a condition where the temperature of the air increases with height. Since cold air is heavier and denser than warm air, it remains close to the ground. In effect, a meteorological lid has been placed over the area which prevents the natural dispersion of air pollutants upward. Such conditions are commonly found during the night hours in natural pockets on the earth's surface, such as the river valley where Portland is located. With this condition in existence, only a wind can then dissipate the pollutants which are being emitted into the local atmosphere beneath the inversion.

A ground fog is an excellent example of a manifestation of the most common form of a temperature inversion. During a clear calm night, the earth cools and the air near the surface becomes increasingly colder, until the water vapor condenses into fog. However, a temperature inversion does not always cause fog, since the formation of fog depends upon both the lowness of the temperature and the amount of moisture in the atmosphere. There are many more days with temperature inversions which restrict the dissipation of air pollutants than there are foggy days.

A temperature inversion of this ground type will form during the night and reach maximum intensity at sunrise. With the warming of the earth and surface air by the sun, the inversion is gradually destroyed, and it is possible for pollutants to be dissipated throughout a greater portion of the atmosphere. However, if fog or clouds prevent this heating by the sun, the inversion will be maintained for a greater period. The longer the inversion lasts, the greater will be the concentration of pollutants per cubic foot of the atmosphere trapped within the temperature inversion.

As long as winds remain light (eight miles per hour or less) the cold air pool in a temperature inversion will maintain its structure. Light winds may drift this cold air pool from one area to another bringing with it the pollutants which may have been trapped within it. Thus one area may have an air pollution problem which is created in another location.

In addition to the ground type inversions, which are seldom more than 700 feet thick, there are other temperature inversions which exist higher in the atmosphere. Since a temperature inversion is nothing more than a body of cold air trapped underneath a warmer mass of air, a temperature inversion can be created by a warmer air mass overrunning a local colder air mass. When this atmospheric lid is within 2500 feet of the ground, the atmosphere available to absorb air pollutants is severely limited. In short, any temperature inversion of 2500 feet or less is a weather condition which is conducive to the creation of an air pollution problem.

Portland Weather and Air Pollution

Portland has meteorological conditions on many days which permit excessive concentrations of air pollutants to accumulate.

Although it would take a detailed and extensive meteorological research program to determine the full contribution of local weather conditions to the creation of an air pollution problem, there is enough statistical information available to make a general analysis of local weather patterns and to determine their relation to air pollution.

Fog studies show that there is relative freedom from serious temperature inversions during the months of May through August, although there are occasions during this period when this condition does exist. During the balance of the year, from September through April, Portland has a significant number of temperature inversions, with January and October being the most critical months.

The figures in Table 1 show that Portland has an average of more than 400 hours a year when there is a fog condition with a ceiling of less than 500 feet at Portland airport. As a rough approximation, the twelve hours between noon and midnight are the most likely to be free from conditions favoring air pollution, permitting a twelve-hour day to be used to approximate the number of days when this degree of fog will cause a potential air pollution condition. On this basis, there will be at least 33 days a year in Portland when the weather is conducive to the excessive concentration of air pollutants.

The number of such days is actually much greater than this figure because:

1. There are many days when the ceiling of the fog or inversion stratus cloud is 500 feet or higher.
2. There are days when a temperature inversion exists although no fog is present.

3. Any temperature inversion at or below 2500 feet will significantly restrict the dispersion of air pollutants.

A more extensive meteorological investigation than this Committee is capable of conducting would be necessary to determine the full extent of weather conditions in Portland favoring air pollution.

The most serious potential air pollution problem exists when there is an extended period of temperature inversion. It is estimated that there will be an average of six situations a year when the temperature inversion in the lower air layers will last for more than 48 hours consecutively and thus permit the most acute concentration of air pollutants.

Since temperature inversions will form and bodies of cold air maintain their identity when the wind is less than eight miles an hour, the wind figures in Table 2 provide another indication of the potential air pollution problem in Portland. Note that there is no month during the year when the mean hourly wind reaches eight miles an hour.

### TABLE 1

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1946</td>
<td>148</td>
<td>46</td>
<td>16</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>9</td>
<td>18</td>
<td>33</td>
<td>67</td>
<td>80</td>
<td>438</td>
</tr>
<tr>
<td>1947</td>
<td>102</td>
<td>61</td>
<td>50</td>
<td>14</td>
<td>0</td>
<td>3</td>
<td>16</td>
<td>12</td>
<td>31</td>
<td>28</td>
<td>84</td>
<td>54</td>
<td>455</td>
</tr>
<tr>
<td>1948</td>
<td>177</td>
<td>17</td>
<td>12</td>
<td>14</td>
<td>7</td>
<td>0</td>
<td>5</td>
<td>28</td>
<td>94</td>
<td>63</td>
<td>2</td>
<td>419</td>
<td></td>
</tr>
<tr>
<td>1949</td>
<td>90</td>
<td>45</td>
<td>35</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>33</td>
<td>155</td>
<td>95</td>
<td>35</td>
<td>496</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>59</td>
<td>9</td>
<td>20</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>48</td>
<td>68</td>
<td>101</td>
<td>71</td>
<td>386</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>576</td>
<td>178</td>
<td>133</td>
<td>47</td>
<td>13</td>
<td>9</td>
<td>17</td>
<td>33</td>
<td>188</td>
<td>378</td>
<td>410</td>
<td>232</td>
<td>2194</td>
</tr>
</tbody>
</table>

**THE NATURE OF AIR POLLUTION**

While no report of this type can begin to detail the myriad forms that air pollution can take, the elements of air pollution can be broken down into the following categories:

1. Particulate matter, which includes dust, cinders, fly ash, smoke, and similar matter.

2. Aerosols and gasses, which includes liquid droplets and mists held in suspension as well as gasses of all sorts.

3. Products resulting from chemical reactions involving one or more chemical compounds in airborne material originally discharged into the air.

A considerable amount is known about the measuring and control of particulate matter. Standards of emission and general levels of community tolerance have been established. The basic engineering techniques necessary to abate this type of contaminant exist, and satisfactory solutions to specific problems can usually be achieved without excessive research.

Desirable standards of tolerance and control for aerosols and gasses are currently under development. While tolerances for some specific situations exist, the whole subject is so complex that individual pollution problems frequently have to be worked out as they manifest themselves. The design and installation of abatement equipment may involve considerable research and expense.

Airborne chemical reactions have only recently received major attention, although their existence has been known for some time. The prize example of this type of air contamination is Los Angeles, where it has been determined that one of the most objectionable features of air pollution in that area is caused by the unburned hydrocarbons from automobile exhaust and evaporation products from petroleum storage tanks undergoing a chemical transformation in the atmosphere. Determining the nature and source of air pollution problems of this type can be an extremely complex and difficult task.
The Extent of Air Pollution in Portland

How does Portland fare with respect to the actual types and quantity of air pollutants in existence here today?

During the year October, 1952 to October, 1953, the State Air Pollution Authority conducted an extensive sampling of the fallout of particulate matter in the city of Portland. Twenty-five fallout sampling stations were established to provide statistics for the various types of neighborhoods (residential, residential-industrial, and business-industrial) and the various areas of the city. Care was taken to locate the sampling stations where they would not be affected by any major local source of contamination.

A summary of the results of this sampling program is shown in Table 6. The generally accepted standard for excessive fallout of particulate matter is 25 tons per square mile per month. Maximum recorded fallouts for a two-month period equalled or exceeded this standard in three widely separated residential areas, one residential-industrial area, and in four business-industrial areas. Altogether eleven out of twenty-five sampling stations recorded a particulate fallout approaching the recognized problem level. An additional three stations of the 25 came within one ton of this category.

**TABLE 2**

<table>
<thead>
<tr>
<th>Month</th>
<th>Direction</th>
<th>Mean Hourly Wind Speed (Miles per Hr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>S</td>
<td>7.3</td>
</tr>
<tr>
<td>February</td>
<td>S</td>
<td>7.3</td>
</tr>
<tr>
<td>March</td>
<td>NW</td>
<td>7.2</td>
</tr>
<tr>
<td>April</td>
<td>NW</td>
<td>6.9</td>
</tr>
<tr>
<td>May</td>
<td>NW</td>
<td>6.8</td>
</tr>
<tr>
<td>June</td>
<td>NW</td>
<td>6.8</td>
</tr>
<tr>
<td>July</td>
<td>NW</td>
<td>6.8</td>
</tr>
<tr>
<td>August</td>
<td>NW</td>
<td>6.3</td>
</tr>
<tr>
<td>September</td>
<td>NW</td>
<td>6.2</td>
</tr>
<tr>
<td>October</td>
<td>NW</td>
<td>6.0</td>
</tr>
<tr>
<td>November</td>
<td>SE</td>
<td>6.9</td>
</tr>
<tr>
<td>December</td>
<td>SE</td>
<td>7.3</td>
</tr>
</tbody>
</table>

Since the greatest percentage of the contaminants in the atmosphere are not measured by gravity fallout stations, the State Authority has undertaken an investigation, in cooperation with the U. S. Public Health Service, to determine what particulate matter is present in Portland. One of the measurements was the amount of acetone soluble material which was present because this would generally reflect the extent of hydro-carbon contamination. Hydro-carbon pollution is generally produced by incomplete combustion of coal, fuel oil and gasoline. The figures in Table 3 show Portland in relation to a number of other large and medium sized cities. Portland has the highest average concentration of acetone soluble material among the cities of comparable size which were investigated.

**TABLE 3.**

<table>
<thead>
<tr>
<th>City</th>
<th>Average acetone soluble material present in micrograms per cubic meter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>57.3</td>
</tr>
<tr>
<td>Detroit</td>
<td>50.9</td>
</tr>
<tr>
<td>Chicago</td>
<td>45.8</td>
</tr>
<tr>
<td>New York</td>
<td>37.7</td>
</tr>
<tr>
<td>Portland</td>
<td>32.1</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>31.4</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>30.0</td>
</tr>
<tr>
<td>Charleston</td>
<td>26.4</td>
</tr>
<tr>
<td>Atlanta</td>
<td>24.2</td>
</tr>
<tr>
<td>San Francisco</td>
<td>19.4</td>
</tr>
</tbody>
</table>
Nationally recognized standards and techniques have long been in existence for measuring smoke emissions. Observations and measurements conducted by the staff of the State Air Pollution Authority have shown a large number of smoke stacks discharging smoke for excessive periods of time in excess of the measurement #2 as established on the Ringlemann chart published by the U. S. Bureau of Mines. Ringlemann #2 is nationally recognized as the standard for maximum permissible intensity of smoke emission for more than very brief periods of time.

While no accepted standards of tolerable concentrations of sulphur dioxide in the atmosphere exist, the comparative concentration of SO$_2$ for Portland and other cities is of interest and is shown in Table 5. It has been found that some agricultural plants are affected by SO$_2$ concentrations of 0.25 parts per million.

The combustion of fuel such as oil and coal result in a discharge of many materials, including fluorides. Tests taken in downtown Portland during June, 1954, to determine the fluoride concentrations in the air indicated concentrations ranging from 0.1 up to 4.0 parts per billion, with the highest concentrations occurring when the wind was from the Northwest. While standards limiting the concentration of fluoride in the general atmosphere have not yet been developed, some plants, such as sensitive species of gladioli, show leaf damage at one to two parts per billion exposure.

An acid mist has been found in the area north of the University of Portland. This mist has been causing substantial plant damage. The fact that the exact nature and source of this acid mist has not been definitely established is evidence of some of the difficulties of air pollution control.

At the present time there are various complaints being investigated relating to objectionable odors, possible health hazards, and property damage in local areas of Portland. Charts prepared by the State Air Pollution Authority show significant groupings of complaints in scattered areas of the city.

While no statistical information is currently available on the possible substantial reduction of visibility in Portland, there are many people who believe that this has taken place in recent years. A detailed meteorological research program would probably be able to produce definite figures on this aspect of air pollution.

The investigation of complaints within Portland by the State Air Pollution Authority's staff has found that the source of troublesome air pollution was from industrial sources in almost every case. This does not mean that the discharges from the residential, commercial and vehicular sources are minor; however, the determination of the contribution to Portland air pollution from non-industrial sources is a complicated problem and cannot be established until an intensive air pollution study has been made.

OREGON'S AIR POLLUTION CONTROL LAW AND ITS RELATION TO PORTLAND

In an effort to control and prevent air pollution, the state of Oregon has adopted a unique statewide law (in contrast to local law) which has drawn attention from all over the country. The state law gives authority to a state board and a state administrative organization, rather than to a local government unit, which is the practice in other states.

Although the state authority has been operating only a relatively short period of time and has a small staff and budget, it has established a comprehensive program throughout the state which has won the respect of all elements of the community with which this committee has come in contact. While it has legal authority to enforce decisions, the state authority has attempted to solve specific problems whenever possible, by identifying the offenders and persuading them to correct their problem. This cooperative approach has been proven an essential element in air pollution control in other areas of the country.

The state authority has a dual program under way. It is investigating complaints which are received and attempting to abate the particular problems which are brought to their attention. In addition, it is carrying on a continuous research program to determine the general nature of air pollution in various parts of the state. At the present time it is conducting tests to determine the chemical elements which make up the contaminants in the atmosphere of Portland. It proposes that future research include a determination of the contribution to air pollution by combustion for space heating, automobiles, trucks and busses, and by private residences.

A good example of the problem of smoke control is the garbage and refuse burning area just north of the city limits (Portland Meadows area). The smoke from this opera-
tion blows into north Portland a good portion of the time. While the state authority took legal action to stop one operator, and the county has recently ordered another operator to cease offensive operation, burning continues in the general area without any significant reduction in the amount of smoke being produced. Since the state authority only takes action on written complaints (the volume of written complaints occupies all the time of its present staff), it is not proceeding against the present nuisance until formally notified of its existence.

### TABLE 4

<table>
<thead>
<tr>
<th>City</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charleston, W. Va.</td>
<td>0.001</td>
<td>0.18</td>
</tr>
<tr>
<td>1951</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detroit, Mich.</td>
<td>0.025</td>
<td>0.17</td>
</tr>
<tr>
<td>1951</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donora, Pa.</td>
<td>0.06</td>
<td>0.70</td>
</tr>
<tr>
<td>1949</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Angeles, Cal.</td>
<td>0.05</td>
<td>0.30</td>
</tr>
<tr>
<td>1951</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portland, Ore.</td>
<td>0.02</td>
<td>0.36</td>
</tr>
<tr>
<td>1952</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 5

- **Odors or Irritation of Eyes, Nose, etc.**
  - approximate area defined
  - complaints only--extent unknown

- **Damage by Chemical Attack on Paint, Vegetation, etc.**
  - approximate area defined
  - complaints only--extent unknown
### PORTLAND PARTICLE

#### Fallout Results
- **OCT, 1952 to OCT, 1953**

<table>
<thead>
<tr>
<th>MAX.</th>
<th>MEAN</th>
<th>MIN.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Residential-Industrial

- **N. Mason St. (N.E.) 410**
- **1500 N. E. Halsey St.**
- **Burnside St.**
- **S.E. Blur St.**
- **Maple St.**
- **Division St.**

#### Business-Industrial

- **S.W. Hamilton St.**
- **S.W. Roberts Ave.**
- **S.E. 28th Ave.**
- **S.E. 24th Ave.**
- **Spring Rd.**
TABLE 7

Fallout—Dusts, cinders, etc.

- Approximate area defined
- Complaints only—extent unknown

TABLE 8

Smoke

- Approximate area defined
- Complaints only—extent unknown
This particular problem emphasizes the need for an effective penalty program which can be applied immediately against willful violators, as well as a cooperative program seeking a solution to difficult control problems. Other cities have found the use of sharp penalties against willful violators to be essential for effective control.

State Attitude Toward Municipal Control

The state authority believes that the larger cities of the state should conduct their own air pollution control because there are so many sources of air pollution within a large city that regulation can only be done effectively by a city agency. In its opinion, operation of an effective air pollution control plan requires the skilled coordination of research on local air pollution problems, review of proposed construction to eliminate new sources of pollution, city planning and zoning so that pollution-contributing operations are located in areas where their pollutants are most readily dissipated, and effective legal enforcement.

The state authority believes that its proper function is to provide technical assistance and advice to the major cities, rather than to assume the primary responsibility for air pollution control in the major cities. In support of its position, the state authority points out that the full investigation of the complaints which have been received from within Portland and conducting area studies within the city limits would utilize all of the present authority's staff and budget, without conducting the review of construction plans, and other phases of operation that an effective metropolitan air pollution control program would require. At the present time the state authority is encouraging the city Bureau of Health, which currently has the municipal responsibility for air pollution control, to enforce necessary control measures and is trying to limit the state's participation to technical advice and research.

When sources of air pollution located outside the city of Portland are contributing to air pollution within the city, it is the policy of the state authority to assume responsibility for the control and to coordinate its efforts with the municipal program.

PORTLAND'S AIR POLLUTION CONTROL ORDINANCE AND ITS OPERATION

While Portland has long had an ordinance dealing with air pollution, there has not been any significant concern over the problem until fairly recently. This ordinance was concerned originally with the prevention of smoke and placed the responsibility for the control of smoke under the jurisdiction of the Bureau of Buildings. In 1950 a section was added to the ordinance which incorporated soot, dust, ashes and cinders as objects of control. Throughout this period there was no significant effort made to effect any control of air pollution. In fact, the opinion was expressed to the Committee that the original ordinance was unenforceable.

In 1950 an Air Pollution Committee was appointed by the Mayor to study the problem of air pollution in the City of Portland. After making a careful study of the problem over a three year period, the committee drafted a proposed ordinance which it thought was necessary to implement adequate control over air pollution in Portland. The proposed ordinance was submitted to the City Council in October 1953 but was not enacted.

In July, 1954, the existing air pollution ordinance was revised by the City Council. A seven man committee* was established to be appointed by the Mayor and to serve in the dual capacity of an advisory committee on air pollution and as a board of appeal from the rulings and interpretations of the enforcing agency. The enforcement of the air pollution ordinance was transferred from the Bureau of Buildings to the Bureau of Health.

The only specific standard of control established in the new ordinance specifies that smoke darker than the shade #3 Ringlemann shall be considered dense smoke and the emission of this shade of smoke shall be restricted to brief periods of time and special circumstances.

The standard of smoke control established (Ringlemann #3) is darker than that

*This Committee is a continuation of the old committee, with its membership increased to seven and with new personnel appointed to replace those who had resigned or whose terms had expired.
permitted under any other modern air pollution control ordinance which has come to this Committee's attention. In no city which has tackled the air pollution problem is a smoke intensity greater than Ringlemann #2 permitted for other than short periods of time.

The present ordinance contains no provisions specifying the establishment of any other specific standards for the control of air contamination, except to declare that the emission of "dust, soot, ashes, cinders or other air contaminants to the injury or manifest inconvenience or annoyance of the public or of persons residing or being in the neighborhood" is a nuisance and is prohibited. There is no statutory authority or direction to engage in a positive and comprehensive program for the control and prevention of air pollution in Portland. No program exists to determine the nature and causes of air pollution or to establish control standards.

At present, air pollution "control" is the responsibility of only one man in the Bureau of Health. This man investigates complaints and reports his findings to the air pollution committee at its monthly meetings. The solutions to pollution problems are sought on a voluntary basis. During recent months there has been an increasing amount of consultation with the state air pollution authority on the general techniques of air pollution control.

There is no program in operation by the City of Portland to seek out sources of air pollution (other than upon complaint), nor is there any program of preventive control which anticipates the possible creation of additional air pollution problems by newly constructed factories and buildings, or to review building plants to make certain the adequate control equipment is included in the design.

All investigations of successful air pollution control programs in other areas have emphasized the need for the control agency to be as completely free from political pressure as possible. The Bureau of Health is the only bureau in the city which is not under civil service.

**Operation of the Advisory Committee on Air Pollution**

The Advisory Committee on Air Pollution, which is appointed by the Mayor, is required by ordinance to contain one representative from the office and commercial building owners, one representative from the manufacturing industries, one member who is a mechanical engineer of experience with power and heating plants and combustion problems, one member who is a sanitary engineer or a physician trained in the field of public health, and three members representative of the public at large. Members of the committee are subject to removal by the Mayor at any time.

One of the "public" members of the present committee is also the manager of an industrial plant of a type which is directly concerned with air pollution control legislation. While an industrial plant manager is a member of the public, it would seem that the business interest of such a person at least raises the possibility of a conflict of interest with the public at large so that such a person would be unqualified to sit as a representative of the "public."

Discussion of the work and objectives of the present Mayor's committee with its members discloses that their approach to the problem of air pollution has been one of undirected study. There have been no specific goals or outline of investigation established, nor has there been any attempt on the part of the chairman to give any specific direction to the work of the committee. Nor is the committee making any attempt to evaluate the air pollution problem or to determine whether additional control measures and implementing legislation will be necessary to keep the situation under control.

**Local Industrial Attitude Toward Air Pollution**

There is evidence that industry as a whole realizes that measures must be taken to control the emission of air pollutants. Hundreds of thousands of dollars have been expended in recent years by various plants to install control equipment. Columbia Empire Industries has a committee on air pollution which states that it is concerned about air pollution problems, and that it does not oppose air pollution control. Concern is expressed, however, over the danger that legislation will be passed which will establish regulations requiring the installation of unnecessary and/or expensive control equipment.

While the air pollution committee of Columbia Empire Industries has not adopted any formal position, individual comments of members indicate a desire to wait for a
more definite state report on air pollution in the Portland area, to have a survey made by an outside agency,* to rely on industry to clean up the air voluntarily, and in general to go slow on any air pollution control program. Some members have questioned whether Portland has any air pollution problem. When asked whether they had any recommendations for legislation, the chairman of their committee stated that they were waiting for the "Mayor's committee to come out with something that we can sink our teeth into."

Investigation of the role of industry in air pollution control in both the Pittsburgh and Los Angeles areas reveals that industrial associations are playing a major and positive role in determining the causes and cures of their local air pollution problems. There are many statements from industrial leaders and public officials emphasizing the need for and success of cooperative efforts.

**Mayor's Attitude on Air Pollution Control**

While this committee does not believe it profitable to delve deeply into an ordinance which was presented to the city council in 1953 by the Mayor's advisory committee on air pollution, we believe that a consideration of the council hearings on the proposed ordinance is important because the hearings provide evidence of the attitude of the Mayor of Portland toward air pollution control.

At the hearings of the ordinance, a citizen spoke in favor thereof and in support of his position displayed damaged plant leaves which he believed had been damaged as a result of an air pollutant which might not have been emitted if adequate control measures were in operation. The Mayor summarily dismissed this evidence supporting the proposed ordinance with the statement "that you can get these kind of leaves any place, and you know that..." Leaves from the same plant damaged in a similar manner had been examined by botanical experts who stated that the damage was not caused by insects but that the injury was caused by an airborne chemical, probably an acid.

An analysis of the council hearing provides evidence of the following general attitudes on the part of the Mayor.

1. Since the state receives a big proportion of its taxes from Portland, he questions whether the city should have to go to the expense of a local air pollution control program.

2. He believes that the control of air pollution is a public health matter and that jurisdiction should be in the Bureau of Health.

3. He states that he "will not be a party to setting up another bureau in the city..."

4. He evinced antagonism to the work of the 1953 advisory committee and the committee members.

The comments of the director of the Allegheny County Bureau of Smoke Control, Pennsylvania, on the proposed ordinance are of interest. In his opinion, the ordinance was "extremely weak in many respects" and susceptible to political control. In addition he states that "the control of air pollutants is seldom a matter of public health" and that if the control of air pollution is justified on this basis "a good lawyer could obtain immunity for one polluting the atmosphere badly by very easily proving that the nuisance being produced was not one which endangered the health of the public."

**EXPERIENCE OF PITTSBURGH AND LOS ANGELES AREAS**

Consideration of the air pollution control programs in the Pittsburgh and Los Angeles areas provides evidence of significant achievement. The Pittsburgh program has been remarkably effective in the reduction of smoke contamination. While Los Angeles still has a serious problem, it has achieved substantial success in reducing many

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*Shortly before this report was sent to the printers, your Committee learned that Columbia Empire Industries has recommended to its members that they finance a preliminary study of Air Pollution in Portland by the Stanford Research Institute. This study is to include information on the quantities of fuel and waste burned, examination of the meteorological records to determine the frequency of weather conditions which are conducive to an Air Pollution problem, and to recommend future studies. Since active industrial cooperation has been an essential part of successful Air Pollution control programs in other parts of the country, your Committee considers this initial effort encouraging.
types of contamination and generally holding the line in the face of industrial and population growth. Analysis of these control programs provides evidence of certain general principles of effective control. These principles are:

1. The realization that the control of air pollution is a highly complicated undertaking.
2. The need for absolute freedom from political control or influence.
3. The need for a comprehensive research program to determine the nature and sources of the local air pollution problem.
4. The importance of a control area which will encompass all sources of local air pollution and not be limited by artificial legal boundaries. Officials are recognizing the need for state regulation in addition to programs carried on in localized areas.
5. Legal authority which will permit a wide ranging attack on all phases of the air pollution problem.

Since so many comments were made to this Committee about the cost of air pollution control and the danger that regulation would drive industry away, the director of the Los Angeles Air Pollution Control District* was asked about the effect of regulation on industry in their area. In reply he stated that he "knew of no industry, large or small, which has left the area due to air pollution control regulations," and he challenges anyone to name one industry which has left the area. Expansion of existing industries and the establishment of new industry in the Los Angeles area each year for the past five years has far exceeded the peak years of World War II.

ARGUMENTS AGAINST FURTHER AIR POLLUTION CONTROL LEGISLATION

While no one was found who objected to the principle of air pollution control, there were many arguments presented against further legislation at the present time. In summary these arguments were:

1. There is no air pollution problem in Portland.
2. The weather in the Portland area is such that no serious air pollution will develop.
3. The state organization is adequate so there is no need for any extensive city control program.
4. The individual citizen is responsible for the majority of the air pollution and therefore no law should be passed which would place the bulk of the responsibility for control on industry.
5. The cost of air pollution control equipment would force many small industries to close their doors and keep other industries from locating in Portland.
6. An air pollution control program of the scope which exists in Los Angeles county is not necessary in Portland.
7. An air pollution control program similar to that proposed by the Mayor's committee in 1953 would be placing too much power in a public body.
8. Any further legislative action to control air pollution should wait on the completion of an exhaustive study of the causes of air pollution in Portland.

ARGUMENTS IN FAVOR OF ADDITIONAL AIR POLLUTION CONTROL LEGISLATION IN PORTLAND

The following opinions were expressed to the Committee in favor of varying degrees of additional air pollution control in Portland:

1. The state air pollution control authority does not have sufficient money or staff adequately to control air pollution in Portland.

*In California, air pollution control is the responsibility of the counties which have the authority to establish the administrative and regulatory organization they desire. This procedure contrasts with the Pittsburgh area where the city and county have separate organizations.
2. The city of Portland should assume the responsibility for controlling local air pollution because only a local agency can cope with the complex problems of a large metropolitan area.

3. There is a pollution problem in Portland now, and it should be corrected before it gets worse.

4. The weather in the Portland area will permit the excessive concentration of air pollutants.

5. Additional legislation is necessary to enable the city to control the installation of equipment which might contribute to air contamination.

6. The major problem in Portland is the control of smoke, dust and other particulate matter. Though methods are known and equipment is available for controlling the emission of particulate matter from most sources thereof, the present ordinance does not require that corrective measures be taken except in extreme instances.

7. Evidence exists that there is a substantial amount of air pollution coming from industrial and commercial sources, and since much of this pollution can be controlled easily, action should be taken.

CONCLUSIONS OF THE COMMITTEE

After analyzing all of the facts and opinions which have been presented, this Committee has come to the following conclusions about the present and potential air pollution problem in the Portland area:

1. Meteorological conditions which permit the excessive concentration of air pollutants occur frequently enough to create an air pollution problem within the City of Portland.

2. While Portland does not have a severe city-wide air pollution problem at the present time, air pollution involving smoke, dust and other particulate matter is present in excess of accepted maximum standards in many parts of the city. A relatively small increase in the general level of air pollution would make the situation critical throughout much of the city.

3. The present level of particulate fallout may contribute substantially to a considerable part of the city's painting and cleaning bill and may result in a heavy economic burden on residential and business property.

4. There is localized air pollution involving objectionable odors, physical damage to plant life and buildings, and possible impairment of health due to various airborne chemical compounds.

5. While the majority of the present sources of air pollution are probably within the city, industries located outside the city limits contribute to air pollution in Portland. As the fringe areas outside the city develop, the amount of pollution originating from outside of Portland will increase.

6. While air pollution pays no attention to legal boundaries, the complex concentration of human activity in the City of Portland requires special solutions which can best be solved by a local organization working within the regular structure of city government.

The Committee believes that action is necessary now to ameliorate the existing level of air pollution in Portland and to prevent the creation of a more serious air pollution problem in the future. Based on the experience of other cities, this Committee believes that more effective control over air pollution will be obtained if effective control measures were implemented now and before the situation is out of hand. It also believes that preventive action which sets standards for new pollution-producing installations will not deter the establishment of new industries in the Portland area and will do much to prevent the more difficult economic adjustments which will become necessary if new plants are constructed without the benefit of established standards. In brief, it is believed that "an ounce of prevention is worth a pound of cure."
RECOMMENDATIONS OF THE COMMITTEE

This Committee believes that an adequate and effective program of air pollution control in the Portland area requires:

1. The state authority to assume the responsibility for establishing general standards for the maximum permissible concentration of air pollutants, the maximum permissible emission of air pollutants from their sources and to carry out a general program of air pollution abatement as required by state law.

2. The City of Portland to assume a positive responsibility for the reduction of and preventive control of air pollutants within the city limits.

3. The passage of the necessary legislation by the city council to establish an administrative organization free from political influence and having the direct responsibility and authority to investigate and require correction on all phases of air pollution problems, and to take such action as experience indicates is necessary to review and control the installation of equipment which may contribute to air pollution.

4. The wholehearted cooperation of all elements of the community to control and prevent air pollution.

This Committee believes that the Mayor's Committee on Air Pollution is the appropriate body to provide the necessary leadership and we recommend therefore that the Mayor's Committee immediately initiate an active and planned program to prepare legislation for submission to the City Council and to secure the active support of all interested members of the community.

Respectfully submitted,

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