

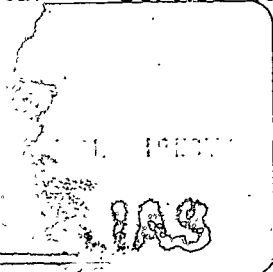


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An Annotated Bibliography of Canadian Air Pollution Literature: Supplement

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Report EPS 3-AP-77-1

Air Pollution
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**AN ANNOTATED BIBLIOGRAPHY OF CANADIAN AIR POLLUTION LITERATURE:
SUPPLEMENT**

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ABSTRACT

Canadian air pollution literature published since mid-1973 has been annotated and classified into a total of twenty-eight subcategories. Author, subject and geographical indexes are also included. This publication supplements Report EPS 3-AP-75-2.

RÉSUMÉ

Les documents canadiens traitant de la pollution de l'air publiés depuis le milieu de 1973 ont été annotés et répartis dans 28 sous-catégories. Des index par noms d'auteurs, par sujets et par régions géographiques ont de plus été établis. Cet ensemble fait suite au rapport EPS 3-AP-75-2.

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INTRODUCTION

In April of 1975, *An Annotated Bibliography of Canadian Air Pollution Literature* was published as Report EPS 3-AP-75-2 by the federal government. The publication of the *Bibliography* represented the culmination of several years of research by C. J. Sparrow and L. T. Foster. The present report is the first supplement to that *Bibliography* and is comprised of material published between mid-1973 and mid-1976. References published prior to this period and omitted in the original publication are also included. In all, over 300 new references have been annotated and categorized in terms of the criteria established for the first report. Geographical, subject and author indexes are also provided.

The new material was collected from several major sources. The first consisted of references gathered in a fairly unsystematic way by Sparrow and Foster since the publication of the first report. Only those references which came to hand through other work, or which had been traced since the *Bibliography* went to press were collected in this way. They did, however, provide a solid starting point for research.

The next step involved a computerized key word search through two major data retrieval systems. These were reference files administered by the Air Pollution Technical Information Center of the U. S. Environmental Protection Agency at Research Triangle Park, North Carolina, and by WATDOC, a Canadian information system administered by Q. L. Systems Limited of Kingston, Ontario. Several Federal and Ontario governmental data files were searched using the WATDOC system. This material was complemented by information provided by agencies such as the Publications and Training Division of the Air Pollution Control Directorate in Ottawa, the Air Resources Branch of the Ontario Ministry of the Environment and the Chemistry Section of the Ontario Research Foundation, at Sheridan Park. Much useful material was also obtained from the *Annual Newsletter* of the Canadian Association of Geographers which listed contemporary research and publications emanating from geographers at universities, colleges and government departments throughout Canada.

A search of *Pollution Abstracts* and *Meteorological and Geostrophysical Abstracts* provided additional annotated references. Fifteen key journals which had contributed a large number of references to the original *Bibliography* were systematically searched for the publication period July 1973 to July 1976 and relevant articles abstracted. Authors' abstracts were used where possible.

Major libraries throughout Metropolitan Toronto were also visited. These were:

Air Resources Branch Library, Ontario Ministry of the Environment;
Atmospheric Environment Service Library, Fisheries and Environment Canada;
James F. MacLaren Limited, Environmental Consultants;
Metropolitan Toronto Science Library;
Ontario Hydro Library;
Ontario Ministry of the Environment Library;
Osgoode Hall Law Library;
Royal Ontario Museum Library;
Ryerson Polytechnical Institute Library;
University of Toronto Libraries

- Botany
- Chemistry
- Engineering
- Forestry
- Geology
- Government Documents
- Institute for Environmental Studies Resource Centre
- John Robarts
- Physics
- Scarborough College
- Sigmund Samuel

In addition, much use was made of the interlibrary loan facilities at Scarborough College to obtain references not available in Metropolitan Toronto.

Finally, individual researchers interested in air pollution problems were contacted at various universities and government departments across Canada. This provided up-to-date information about their own research activities and publications.

Throughout the preparation of this supplement to the *Bibliography*, abstracts from a wide range of journals have been used. The journals which contained relevant articles together with their title abbreviations are listed below. Abbreviations used for already printed abstracts are also included. The fifteen journals systematically searched are italicized.

JOURNAL ABBREVIATION	FULL TITLE OF JOURNAL
<i>Alternatives</i>	<i>Alternatives</i>
Amer. Chem. Soc. Div. Water Air Waste Chem. Gen. Pap.	American Chemical Society, Division of Water, Air and Waste Chemistry, General Papers
Amer. Rev. Respirat. Dis.	American Review of Respiratory Diseases
Arch. Environ. Health	Archives of Environmental Health
Arch. Meteorol. Geophys.	Archiv fr Meteorologie Geo-

Bioklimatol.	physik und Bioklimatologie
Arctic	Arctic
<i>Atmos.</i>	Atmosphere
<i>Atmos. Environ.</i>	Atmospheric Environment
B.C. Med. J.	British Columbia Medical Journal
Boundary Layer Meteorol.	Boundary Layer Meteorology
Bull. Amer. Meteorol. Soc.	Bulletin of the American Meteorological Society
Bull. Environ. Contam. Toxicol.	Bulletin of Environmental Contamination and Toxicology
<i>Can. J. Bot.</i>	Canadian Journal of Botany
<i>Can. J. Earth Sci.</i>	Canadian Journal of Earth Sciences
<i>Can. J. Plant Sci.</i>	Canadian Journal of Plant Science
<i>Can. J. Public Admin.</i>	Canadian Journal of Public Administration
<i>Can. J. Public Health</i>	Canadian Journal of Public Health
<i>Can. J. Soil Sci.</i>	Canadian Journal of Soil Science
<i>Can. Med. Assoc. J.</i>	Canadian Medical Association Journal
<i>Can. Min. Met. Bull.</i>	Canadian Mining and Metallurgical Bulletin
<i>Can. Petrol.</i>	Canadian Petroleum
<i>Can. Plant Dis. Surv.</i>	Canadian Plant Disease Survey
<i>Can. Pulp Paper Ind.</i>	Canadian Pulp and Paper Industry
<i>Can. Res. Develop.</i>	Canadian Research and Development
<i>Chem. Can.</i>	Chemistry in Canada
<i>Chem. Econ. Eng. Rev.</i>	Chemical Economy and Engineering Review
Chemosphere	Chemosphere
<i>Civ. Serv. Rev.</i>	Civil Service Review
<i>Eng. Dig.</i>	Engineering Digest
<i>Eng. J.</i>	Engineering Journal
<i>Eng. Min. J.</i>	Engineering and Mining Journal
<i>Environ. Behav.</i>	Environment and Behavior
<i>Environ. Letters</i>	Environmental Letters
<i>Environ. Pollut.</i>	Environmental Pollution
<i>Environ. Sci. Technol.</i>	Environmental Science and Technology
<i>Experient. Supple.</i>	Experientia Supplementum
Flouride	Flouride
<i>For. Chron.</i>	Forestry Chronicle
<i>Green. Gard. Grass.</i>	Greenhouse-Garden-Grass
<i>Hydrocarb. Process.</i>	Hydrocarbon Processing
<i>Int. Relat.</i>	International Relations
<i>J. Air Pollut Control Assoc.</i>	Journal of the Air Pollution Control Association
<i>J. Allergy Clin. Immunol.</i>	Journal of Allergy and Clinical Immunology (formerly Journal of Allergy)
<i>J. Atmos. Sci.</i>	Journal of the Atmospheric Sciences
<i>J. Biogeogr.</i>	Journal of Biogeography
<i>J. Biosoc. Sci.</i>	Journal of Biosocial Science

J. Fish. Res. Board.	Fisheries Research Board of Canada Journal
J. Inst. Fuel.	Journal of the Institute of Fuel
Kuki Seijo	Kuki Seijo
Lancet	Lancet
Lighter	The Lighter
Mod. Power Eng.	Modern Power and Engineering
Nature	Nature
Oil Gas J.	Oil and Gas Journal
Oilweek	Oilweek
<i>Ont. Hydro Res. Q.</i>	Ontario Hydro Research Quarterly
Optimum	Optimum
Petro. Process. Eng.	Petroleum Processing and Engineering (now Canadian Petroleum)
Pit Quarry	Pit and Quarry
Plant Dis. Rep.	Plant Disease Reporter
Polar Rec.	Polar Record
Proc. Amer. Petrol. Inst.	American Petroleum Institute Proceedings
Pulp Pap. Int.	Pulp and Paper International
Pulp Pap. Mag.	Pulp and Paper Magazine of Canada
Pure Appl. Geophys.	Pure and Applied Geophysics
Radiat. Data Rep.	Radiation Data and Reports
Ressources	Ressources
Science	Science
Sci. Forum	Science Forum
Tellus	Tellus
Toronto Board Trade J.	Toronto Board of Trade Journal
Van. Life	Vancouver Life
Water Air Soil Pollut.	Water, Air and Soil Pollution
<i>Water Pollut. Control</i>	Water and Pollution Control
Water Res.	Water Research
Watersheds	Watersheds
Zephyr	Zephyr
ABSTRACT ABBREVIATION	ABSTRACT SOURCE
(Author's Abstract)	Author's Abstract
(M.G.A. Abstract)	Meteorological and Geostrophysical Abstracts
(P.A. Abstract)	Pollution Abstracts
(USEPA Abstract)	U.S. Environmental Protection Agency Abstract
(WATDOC)	WATDOC Abstract

In compiling both the original *Bibliography* and its supplement, certain emphases may appear. The criteria for inclusion of literature were "that the article, paper, or book should deal substantially with air pollution which emanated within Canada, and/or with the effects which were felt in Canada". (Sparrow and Foster, 1975, p. v.) This automatically excludes papers that deal with theoretical and fundamental research on air pollution. Literature dealing exclusively with technical developments or laboratory experiments has been considered beyond the scope of the bibliographic research on the basis that such research could have been carried out at any location. Other emphases might reflect the geographical and climatological interests of the compilers. Such interest might be translated into biased annotations and affect the subsequent categorization of references. To try to overcome this latter bias, approximately two secondary categories have been allowed for each reference.

As in the original *Bibliography*, the references contained in this *Supplement* cover a wide variety of topics related to air pollution in Canada. Undoubtedly some references will have been overlooked but it is hoped that users of the *Supplement* will bring to the attention of the compilers any additions or errors of which they are aware.

ACKNOWLEDGEMENTS

Many people have cooperated with us in the compilation of this work. Special thanks go to Dr. Jack Donnan of the Ministry of the Environment for his support throughout the project. At the Air Resources Branch of the Ontario Ministry of the Environment much assistance was provided by Dr. John Hewings and Dr. Eva Pal, while Morley Thomas and David Phillips of the Atmospheric Environment Service gave us access to their own bibliographic material. Throughout the compilation period much assistance was provided by the library staff at Scarborough College, University of Toronto, and Ruth Farrow and Pat Yakimov tracked down many references for us. The final manuscript was typed by Barbara Hayes of Ryerson Polytechnical Institute and Heather Cruikshank and Peggy Klausen of the Institute for Environmental Studies at the University of Toronto. Barbara Hayes also assisted in the final checking of the manuscript. Any errors or omissions are, of course, the responsibility of the compilers.

Finally, we wish to thank the authors of the references contained within the *Supplement*, the Ontario Ministry of the Environment for funds to update the work, Terry Grier, Dean of Arts at Ryerson Polytechnical Institute for funds to help prepare the final manuscript, and the Environmental Protection Service of Fisheries and Environment Canada for editing and publishing this *Supplement*.

1 COMPREHENSIVE AND GENERAL ASPECTS

1013. Environment Canada - 1973.

Air Pollution in Canada. Air Pollution Control Directorate, Environment Canada, Ottawa, 48 pages.

A nation-wide inventory of 1970 air pollutant emissions in Canada is presented, with data being tabulated for carbon monoxide, particulates, sulfur dioxide, hydrocarbons, and nitrogen dioxide. Emissions in thousands of tons per year are 17,312 for CO, 2290 for particulates, 7209 for SO₂, 3072 for hydrocarbons, and 1359 for NO₂. Gasoline-powered vehicles contribute the largest share of the CO emissions, accounting for approximately 74%. Industrial processes and solid waste incineration operations account for 8% of the CO emissions. The largest contributor to particulate emissions is industry, accounting for about 58% of the total. Forest fires, fuel combustion, and transportation account for 16, 17 and 3% of the particulates, respectively. Industrial processes are responsible for 76% of the sulfur dioxide emitted, with fuel-burning accounting for another 22%. Transportation sources account for 76.8% of the total hydrocarbons and for 62% of the total NO₂. Fuel combustion by stationary sources is responsible for 32% of the NO₂ emitted. (USEPA Abstract).

1014. Horn, W.R. - 1972.

"Metal Mining and the Environment - Where Does the Industry Stand?" *Can. Min. Met. Bull.*, Vol. 65, No. 718, pp. 56-60. (Also Presented at the Canadian Institute of Mining and Metallurgy, Annual Western Meeting, Vancouver, October 1971.)

The nature and extent of the response of the metals mining industry to control of the environment are considered. The problems of the industry arise from three main points: first, waters from the mine itself, where process and underground waters have contacted sulfide minerals in the presence of air and, usually, sulfur-oxidizing bacteria, which speed up the oxidation and formation of free sulfuric acid and often of water-soluble metal salts. Second, large quantities of finely ground, rejected tailings from the wet concentration process, in the form of a wet slurry, present problems; and thirdly, there are the sulfur dioxide-containing stack gases from the roasting and smelting of the minerals concentrate. The development of improved methods of industrial waste disposal and the construction of tailings impoundment systems are discussed. Then there is the question of the final reclamation of the mined land as wind- and rain-stable, aesthetically acceptable features of the topography. Waste water management and air resource management are considered, as well as an attitude of cooperation of responsibility from the mining and metallurgical industry. (USEPA Abstract)

1015. International Joint Commission - 1972.

Transboundary Air Pollution, Detroit and St. Clair River Areas. International Joint Commission, Windsor, Ontario, 69 pages.

This report is concerned with transboundary air pollution in the Detroit and St. Clair River Areas. On November 30, 1966, the International Joint Commission established the International St. Clair - Detroit River Areas Air Pollution Board to investigate the sources of air pollution, the quantities of air contaminants and if they are detrimental to the public health of citizens or property, remedial or preventive measures that would be most practicable from economic, sanitary and other points of view, and the total cost of implementing the measures. The Board's investigation involved a meteorological study of the two areas, and air quality measurements. A detailed inventory of the quantity of particulates, sulphur oxides, nitrogen oxides, hydrocarbons and carbon monoxide emissions from all sources was compiled for 1967. All of these investigations and data collections were used to evaluate the extent and quantity of air contaminants across the international boundary. Impact studies at eleven locations were carried out, and techniques for reducing particulate and sulphur dioxide emissions were considered. Remedial measures that would achieve the required reduction were also examined including additional equipment, flue gas scrubbing, fuel switching, and fuel substitution. The costs of implementing various measures were estimated. (WATDOC)

1016. Neering, R. and Overend, M. - 1969.

"Pollution". *Van. Life*, Vol. 4, No. 6, pp. 7-9.

This is a magazine article discussing the general but increasing pollution problem in British Columbia. The three major problems discussed are human sewage, industrial pollution of air and water and automobile exhaust, along with the possible solutions in view. Note is made that many causes of minor body reactions possibly caused by various types of pollution do not help provide a concise, enforceable definition of pollution. Examples are taken from Natal, Vancouver and the Lower Fraser Valley. A report from Okanagan is given telling of urbanization, land speculation, water shortages and pollution, lake eutrophication and yet local governments of competing cities fight for industry and government aid in their area, and still are unwilling to control and in some cases to discuss publicly the problem of pollution. (WATDOC)

1017. Ontario, Council of Health - 1973.

"Environmental Quality and Health". Committee on Environmental Quality, Ontario Council of Health, Toronto, 36 pages.

This report contains recommendations on all matters related to the quality of the human environment, with special consideration to the health and well-being of people. Recommendations include public information and education, health studies, legislative revisions, environmental monitoring and research, land-use planning and establishment of criteria for environmental quality. Five appendices include discussions of the development of pollution control in Ontario, environmental monitoring programs in Ontario, the air pollution index, descriptions of major air pollutants and land-use planning for environmental quality.

1018. Ontario Department of Energy and Resources Management - 1970.

Proceedings of the Metropolitan Toronto Region Industrial Waste Symposium, Toronto, 109 pages.

The papers printed in this volume were presented at a Symposium on Industrial Wastes in the Metropolitan Toronto region in 1970. The Symposium was sponsored by the Ontario Department of Energy and Resources Management. Topics treated include land disposal, government-industry cooperation, liquid wastes, industrial air pollution control, waste disposal in Toronto. Regulation of waste disposal, and centralized waste treatment. A question and answer period with the authors of the papers and a discussion among members of polluting industries is also printed. (WATDOC)

1019. Parks, M. - 1972.

The Human Environment, Volume II: Summaries of National Reports on Environmental Problems 1972. Woodrow Wilson International Center for Scholars, Washington, D.C., Environment Series 201, 115 pages.

The reports of more than 70 countries, including Canada, to the United Nations Conference on the Human Environment have been summarized. In preparing the summaries, care has been taken to describe each country in terms of geography, governmental organization, and population, especially in the case of newer nations. Each country has described its main problems, its regional and

internal ecological characteristics, policy, recommendations for international arrangements, and request for assistance. (USEPA Abstract)

1020. Phillips, B.A.M. and Kemp, D.D. - 1974.

"Environmental Quality in Canada". *Int. Relat.*, Vol. 4, No. 6, pp. 585-603 and 608.

The environmental impact of man's activities in Canada is examined. A general discussion of the effects of all types of pollution throughout the whole of Canada is presented. Legislative control measures and the current (1974) status of abatement activities are described. The focus is upon the various geographic regions of Canada and how they are affected by both water and air pollution.

1021. Winthrop, S.O. - 1973.

"Air Pollution in the Urban Environment". Air Pollution Control Directorate, Environment Canada, Ottawa, *Report*, EPS 3-AP-73-6, 27 pages.

Urban air pollution in Canada is reviewed in terms of emission sources, air pollution health effects, present pollution control methods, and economic implications. Transportation accounts for 56.9% of the air pollution, while industrial processes, fuel combustion in stationary sources, solid waste disposal, and miscellaneous sources account for 24.5, 8.3, 2.7, and 7.6%, respectively. Carbon monoxide, the most abundant air pollutant originates primarily from motor vehicle exhaust; while nitrogen oxides arise principally from combustion processes, the most important single source also being motor vehicles. Sulfur dioxide arises mainly from industrial operations and electrical power generation, while particulates are due to several different sources. Sulfur dioxide is capable of irritating the upper respiratory tract, and sulfuric acid, resulting from sulfur trioxide conversion, is capable of producing lung damage. Particulates, aside from exerting deleterious effects in their own right, can accentuate the adverse physiological effects of simultaneously inhaled gases. Carbon monoxide produces its primary biological effect through inactivation of hemoglobin. Present control methods for such pollutants include: electrostatic precipitators, settling chambers, cyclones, filters, scrubbers, desulfurization of fuels, and process modifications. An estimated \$1.5 billion annual loss is attributed to air pollution in Canada. (USEPA Abstract)

2 DATA, A - SOURCES, i) FEDERAL

1022. Canadian Department of National Health and Welfare, Radiation Protection Division - 1973 et seq.

"Canadian Air and Precipitation Monitoring Program, September 1972". *Radiat. Data Rep.*, Vol. 14, No. 1, p. 38.

Canadian radiation data are reported on a monthly basis in this journal. Only general results are recorded, such as the highest reading, and average deposition of over 20 stations.

1023. Canadian Department of National Health and Welfare, Radiation Protection Division - 1963 et seq.

Data from Radiation Protection Programs, Vol. 1, No. 1.

This is the first report of a series issued on a monthly basis. It contains current data from the various programs that are being carried out by the Radiation Protection Division. The most recent analytical results on the fallout monitoring program are included while later numbers contain lists of technical reports and publication. This publication supercedes *Monthly Reports on Radioactive Fallout in Canada*, and only numerical data and factual information that can be presented concisely are included; descriptive and interpretative material will be presented in the Division's *Annual Reports*. Later numbers contain lists of the scientific and technical reports of the Division.

2 DATA, A - SOURCES, ii) PROVINCIAL/MUNICIPAL

1024. City of Toronto Planning Board - 1974.

"Air Pollution Data and Map, City of Toronto". Planning Board Reference 3.6.4 GP 4/71, Item 4-B, March 12, Toronto, 10 pages.

This is a list of 32 sources of pollution in the city of Toronto together with a map illustrating their spheres of influence. The boundaries are based on the knowledge and experience of the Air Management Branch staff and not upon empirical data. The table provides the name of the pollution source, the type of emissions, comments and corrective measures being undertaken and the present and future residential neighbourhood rating.

1025. Davis, S.H. - 1973.

Manitoba Air Pollution Surveillance Program: Soiling Index-Smoke - Brandon, Flin Flon, Metropolitan Winnipeg Area: Basic Data for Period March 1968 to December 1972. Manitoba Department of Mines, Resources and Environmental Management, Environmental Protection Laboratory, Report No. 11, June, 112 pages.

Basic air sampling data for smoke surveys in Manitoba for the period March 1968 to December 1972 are presented. A summary is also provided of the data as related to the Manitoba air quality objectives for smoke. (P.A. Abstract)

1026. Davis, S.H. and Lysyk, M.V. - 1973.

Manitoba Air Pollution Surveillance Program: Suspended Particulates. Starbuck, Flin Flon, Thompson and Metropolitan Winnipeg Areas in Manitoba. Basic Data for Period February 1958 to December 1972. Manitoba Department of Mines, Resources and Environmental Management, Environmental Protection Laboratory, Report No. 6, 52 pages.

Basic air sampling data are presented for suspended particulate surveys in Manitoba for February 1958 - December 1972. Air quality objectives for suspended particulates are described. Monitoring by high volume sampler was conducted in 5 districts: central business, industrial, light industrial, residential, and rural. Graphs of yearly and monthly average suspended particulate levels are included. (P.A. Abstract)

1027. Davis, S.H., Lysyk, M.V. and Ward, W.M. - 1973.

Manitoba Air Pollution Surveillance Program: Dustfall Levels for Brandon, Flin Flon, The Pas, Thompson, Manitoba. Basic Data for Period January 1969 to December 1972, Manitoba Department of Mines, Resources and Environmental Management, Environmental Protection Laboratory, Report No. 14, August, 81 pages.

Air quality objectives for dustfall in the ambient air quality criteria used in Manitoba are listed. The sampling method, dust analytical method, and precise locations of sampling within each title area are given. Data for each location are given for insoluble matter, soluble matter, and combustible matter, and total solids, by the month, and for total solids for each area as annual averages. (P.A. Abstract)

1028. Donnan, J.A. - 1975.

"Selected Statistical Sources Relevant to Social and Economic Aspects of Environmental Problems in Ontario and Canada". Environmental Approvals Branch, Ontario Ministry of the Environment, Toronto, 334 pages.

Research into the social and economic impacts of pollution and pollution abatement requires a wide range of data from very diverse sources. Locating these data can involve much time and effort. Consequently, an investigation was undertaken to identify and locate some of the primary sources of data which could be used in quantitative analyses of the social and economic effects of pollution in Ontario. The present report is an annotated listing of selected data sources and statistical files relevant to such studies.

2 DATA, B - MEASUREMENT AND ANALYSIS, i) AREA STUDIES

1029. Anon. - 1972.

"Air Quality and the New Toronto Airport". Air Management Branch, Ontario Department of Energy and Resources Management and Air Transport Canada, Toronto, 6 pages.

This report is the result of an air quality survey carried out in the vicinity of the Toronto International Airport from November 1968 to November 1969. Particulate matter, hydrocarbons, carbon monoxide, nitrogen oxides and sulphur oxides were measured. It is concluded from the results that aircraft activity was not a major contributor to ground level air pollution during the period of measurement.

1030. Anon. - 1973.

"Air Quality". In *An Appraisal of the Environmental Consequences of the Developments Proposed for Lorneville, New Brunswick*, Canada, Ministry of the Environment, Ottawa.

This report is a complete assessment of the air quality of Lorneville, New Brunswick. It includes discussions and data on air pollution and air pollution meteorology of Lorneville. Special attention is given to sulfur dioxide emissions from industrial sources. Discussions and data also include Saint John, New Brunswick. The Report is 130 pages long and was prepared by Atmospheric Environment Service, Environment Canada.

1031. Barber, G.B. and Megaw, J. - 1974. of "A Report on Aerial Survey of the 'Brown-Haze' Over the City of Toronto". Ontario Ministry of the Environment, Air Management Branch, Toronto, 75 pages.

This report presents a series of measurements of the atmosphere over Toronto obtained by aerial survey using a suitably instrumented aircraft. The purpose of the measurements was to investigate the nature and chemical composition of a "brown-haze" often found over the City of Toronto and the meteorological conditions prevailing on its occurrence. Results are illustrated with many diagrams and tables.

1032. Nguyen, Y.V. and Phillips, C.R. - 1975.

"The Effect of Aniline on Photochemical Reactions in Atmospheric and Synthetic Air Samples". *Chemosphere*, Vol. 4, No. 3, pp. 125-130.

The inhibitory effect of aniline in photochemical smog reactions was studied using actual Toronto, Canada, air samples. An aniline concentration of 0.81 ppm (parts per hundred million) had negligible effect in a light traffic air sample containing negligible nitric oxide (NO), and 20 ppm in a heavy traffic sample caused a 70% decrease in the oxidant dosage, a 50% decrease in the nitrogen dioxide peak, and a 4-fold increase in the NO half-life. In experiments with propylene in synthetic mixtures, the half-life of propylene was increased from 144 min to 192 min by the presence of 20 ppm of aniline. A 30-fold increase in condensation nuclei was produced after a 1-hr induction period. A chemical mechanism is proposed which is consistent with these results. The effect of retained aerosol particles in the lungs and the visibility reduction consequent on growth of the condensation nuclei do not favor the use of aniline as an inhibitor in photochemical smog. (P.A. Abstract)

1033. Nkemdirim, L.C., Lunn, G.R. and Rowe, R.D. - 1975.

"Pollutant Concentration and Stratification in Urban Heat Island". *Water Air Soil Pollut.*, Vol. 4, No. 1, pp. 99-112.

Diurnal variation of oxidants and coefficient of haze (COH) monitored in Calgary correlated with changes in atmospheric stability and surface activity. The data set used in the analyses consists of Department of Environment records on soiling index or COH collected routinely using a 2-hr sampling period and a vertical profile measurement of COH taken at levels of 20, 50 and 80 m. Two Bolex cameras equipped with intervalometers were also used to observe the growth and movement of pollution clouds. Profiles of COH showed that an elevated plume existed in the city in 60% of the summer-fall transition period. Cold air drainage contributed substantially to the high frequency. Observed discontinuity in COH-temperature relationship is partially explained by chinook effects and ice crystallization. (P.A. Abstract)

1034. Resources Research, Inc. - 1968.

"Air Quality Survey in the City of Welland, Ontario". A Report to the Ontario Department of Health by Resources Research, Inc., 54 pages.

A four month air quality monitoring program and an emission inventory have been conducted by Resources Research Inc., under a contract granted by the Ontario Department of Health. The air sampling was done during the months of March, April, May and June 1968. The measured levels of sulphur dioxide and suspended particulates exceed those defined as Ontario Department of Health criteria. Measured dustfall and soiling index are within these same criteria. Industrial activity is the major source of sulphur oxides and suspended particulate emissions in the city of Welland. (Author's Abstract)

1035. Rolston, J.J. - 1964.

"A Study of Air Pollution Sources and Their Significance in Edmonton, Alberta". Government of the Province of Alberta, Department of Public Health. Division of Sanitary Engineering, Edmonton, 41 pages.

In May 1964, a survey of the pollutant sources in the Edmonton area was begun. The survey utilized a questionnaire which was mailed to 210 specific sources. The principal objective of the study was to provide current data on the quantity and types of air pollutant sources, and to evaluate their contribution to air pollution in the Edmonton area. The data obtained indicate that in general the quantities of pollutants emitted to the Edmonton atmosphere per second are not present in great enough quantities to create individual area problems. The only exception is hydrocarbon, which under certain conditions, may achieve concentrations considered adverse. Industrial development in Edmonton has resulted in many industries which process organic materials. The emissions expected from these industries are compounds which are expected to be capable of entering into photochemical reactions which produce smog. Furthermore, the abundance of raw materials such as natural gas, would indicate that future development would include a significant portion of similar industries. As a result the smog formation potential is considered high. Although present emissions appear in general to be low, total quantities are considered high for a city of Edmonton's size. If the accelerated growth of population and industry continues, air pollution problems can be expected in the future because of increasing pollutant emission. (Author's Summary)

1036. Western Research and Development Ltd. - 1973.

"Inventory of Air Pollution Sources and Emissions in the City of Calgary 1971". Summary Report to Alberta Department of the Environment, 61 pages.

This is an initial study in a continuing evaluation of the sources, quantities, and types of air pollutant emission in Calgary. The intent of the inventory is to provide the necessary basis for further air pollution and air quality studies. Included are all industrial, commercial, domestic and mobile sources which may emit air pollutants. A complete inventory has been prepared of emissions of sulphur dioxide, carbon monoxide, oxides of nitrogen, hydrocarbons and particulates. Additional pollutants were included whenever information was available.

1037. Western Research and Development Ltd. - 1973.

"Inventory of Air Pollution Sources and Emissions in the City of Calgary, 1971 (Final Report)". Alberta Department of the Environment, Edmonton, 71 pages.

Data from an air pollution source and an emission inventory (point and area sources) of the City of Calgary for 1971 are presented. The estimated total air pollutant emission from all sources in the city was 177,000 short tons in 1971, with approximately 97% of this being gaseous emissions. The greatest source of emissions was the gasoline-powered motor vehicle. Of approximately 5500 short tons of sulfur dioxide released during the year, industrial sources contributed almost 90%. Carbon monoxide emissions totalled 125,000 tons in 1971, with 97% coming from motor vehicles. Of approximately 16,000 tons of nitrogen oxides emitted, motor vehicles were responsible for almost 70%. Industrial sources and natural gas combustion each contributed about 15%. Gaseous hydrocarbon emissions totalled 25,500 tons, with the major contributor being motor vehicles (70%). The remainder was largely due to evaporative losses of solvents and petroleum products. Approximately 4500 tons of particulates were emitted during the year, with industrial operations accounting for 60% of these. (From USEPA Abstract)

See Also Reference Numbers: 1025, 1026, 1027, 1056, 1060, 1065, 1073, 1081, 1084, 1100, 1107, 1118, 1119, 1120, 1121, 1122, 1123, 1146, 1147, 1148, 1164, 1169, 1197, 1200, 1201, 1211, 1222, 1247.

2. DATA, B - MEASUREMENT AND ANALYSIS, ii) GENERAL

1038. Anon. - 1973.

"Milk Surveillance, June 1973". *Radiat. Data Rep.*, Vol. 14, No. 10, pp. 587-595.

Concentrations of ⁹⁰Sr and ¹³⁷Cs in milk are reported from sampling stations located in the U.S., Canada, and Central and South America. Strontium-90 monthly averages ranged from 0 to 20 pCi/l in the U.S. The highest 12-mo. average was 18 pCi/l (Hartsville-03, South Carolina), representing 9.0% of the Federal Radiation Council radiation protection guide. Cesium-137 monthly averages ranged from 0 to 82 pCi/l in the U.S. The highest 12-mo. average was 45 pCi/l (southeast Florida), representing 1.3% of the value derived from the recommendations given by the Federal Radiation Council. Strontium-90 monthly averages ranged from 2 to 11 pCi/l in Canada and from 0 to 3 pCi/l (Saint John's, Newfoundland) and 2 pCi/l (Montego Bay, Jamaica). Cesium-137 monthly averages ranged from 0 to 17 pCi/l in Canada and from 0 to 11 pCi/l in Central and South America. The highest 12-mo. averages were 21 pCi/l (Saint John's, Newfoundland) and 39 pCi/l (Montego Bay, Jamaica). Strontium-89, ¹³¹I, and ¹⁴⁰Ba were below practical reporting levels. (P.A. Abstract)

1039. Anon. - 1974.

"Milk Surveillance, November 1973". *Radiat. Data and Rep.*, Vol. 15, No. 4, pp. 181-189.

Radionuclide measurements of milk from the U.S., Canada, Central America, and South America are presented. Strontium-90 monthly averages ranged from 0 to 11 pCi/l in the U.S. The highest 12-month (Dec. 1972-Nov. 1973) average was 18 pCi/l (Little Falls, Minnesota) representing 9.0% of the Federal Radiation Council radiation protection guide. Cesium-137 monthly averages ranged from 0 to 32 pCi/l in the U.S., and the highest 12-month average was 49 pCi/l (southeast Florida) representing 1.4% of the value derived from the recommendations given by the Federal Radiation Council. The ⁹⁰Sr monthly average was 0 pCi/l in Canada and in Central and South America. The highest 12-month average was 2 pCi/l (Mandeville, Jamaica, and San Juan, Puerto Rico). Cesium-137 monthly averages ranged from 0 to 14 pCi/l in Canada and were 0 pCi/l in Central and South America. The highest 12-month averages were 16 pCi/l (Saint John's Newfoundland, and Sault Sainte Marie, Ontario) and 23 pCi/l (Mandeville, Jamaica). Strontium-89, ¹³¹I, and ¹⁴⁰Ba were below practical reporting levels. (P.A. Abstract)

1040. Carswell, A.I., Houston, J.D., Pal, S.R. and Peteherych, S. - 1974.

"Lidar Measurements of Stack Plumes in Sudbury". Ontario Ministry of the Environment, Air Resources Branch, Toronto, 40 pages.

The York lidar (laser radar) system has operated as a mobile field unit for two years and has been used for observations at the York campus since 1970. Most of the field work has involved the observation of smoke plumes. This report describes the use of the lidar system in 1974 in the Sudbury area. In addition to the plume from the 1250 ft. stack at Coppercliff, the Falconbridge and iron ore plant stack plumes were studied along with the low level emissions at Coppercliff. Results are summarized to illustrate the capabilities of the lidar to carry out plume diagnostics.

1041. Inhaber, H. - 1975.

"A Canadian View of Monitoring Activities". *Environ. Sci. Technol.*, Vol. 9, No. 3, pp. 206-209.

The author analyzes the various Canadian pollution monitoring programs. They are compared on the basis of parameters observed, medium of pollution, type of coverage, frequency, method of data acquisition and storage method of data. The approaches are analyzed in terms of their strengths and weaknesses. Possible directions for future efforts are noted.

1042. Lukacs, J. - 1975.

"Continuous Source Mass Emissions Monitoring - An Operations Guide". In Air Pollution Control Association (ed.) *Continuous Monitoring of Stationary Air Pollution Sources*. Pittsburgh, pp. 48-53.

Mass emissions monitoring has been used in Alberta at S recovery plants for 4 yr. The monitors record the S emission rate on a continuous basis and help the operators to maintain these emissions within allowable limits. Although such systems were initially installed as a governmental requirement, their greatest asset to the plant operator is as a process optimizer and a means of taking effective action on pollutant emissions before a violation occurs. Ways in which these systems help the operator are discussed. (P.A. Abstract)

1043. Miller, K., Kozak, J.H. and De Koning, H.W. - 1974.

"Orientation Effect of Glass Fiber Filters on Total Suspended Particulate Measurements". *Atmos. Environ.*, Vol. 8, No. 5, pp. 519-520.

A comparative study, using three hi-vol samplers, was run in Windsor, Ontario to determine the effect of glass fiber filter orientation (rough side up or down) on total suspended particulate measurements. Normally the filters are run rough side up. Three samplers were positioned within the fenced-in area at the air pollution monitoring station located at the intersection of Mill and Peter Streets, Windsor. The samplers were run on a 24-hour period starting at midnight. The first sampler was run with the filter installed in a normal position, the other two were equipped with filters in the upside down position. The samplers were calibrated with a calibrating orifice assembly. The glass fiber filters were weighed after conditioning in a humidity-controlled atmosphere for 24 hr., before and after sampling. The study revealed that the orientation of the glass fiber filters does not affect the measurement of total suspended particulate matter under conditions normally employed using the hi-vol sampler. (USEPA Abstract)

1044. Nyborg, M., McKinnon, A., and Associates Limited - 1973.

"Atmospheric Sulphur Dioxide: Effects on the pH and Sulphur Content of Rain and Snow; Addition of Sulphur to Surface Waters Soil and Crops; and Acidification of Soils". *Proceedings, Workshop on Sulphur Gas Research in Alberta, Information Report, NOR-X-72*, Northern Forest Research Centre, Edmonton, Alberta, pp. 79-97.

Two separate studies were initiated to investigate sulphur dioxide emissions in Alberta. One project, supported by Shell Canada Limited, was begun in 1972 with work concentrated in the Pincher Creek-Waterton area. The other, sponsored by the Alberta Environmental Research Trust, was started in 1973 at various locations. Acidity and sulphur content of rain, snow, soil and crops in relation to proximity to the emission sources were measured. Results of these studies are discussed and illustrated with figures and tables.

1045. Ogner, D.J. - 1972.

"Experience with Ontario's Computer-Controlled Air Monitoring System". Paper 72-22 Presented at the 65th Annual Meeting, Air Pollution Control Association, Miami, June 18-22, 1972, 31 pages.

Two years of successful operation of the computer-controlled real-time air-monitoring system used in Ontario are described, and recommendations for the future are made. The system monitors air quality and meteorological conditions at 14 locations throughout the Province. Instruments measuring sulfur dioxide, nitrogen oxides, excess oxygen, carbon monoxide, hydrocarbons, wind speed and direction, ambient temperature, and temperature difference are scanned automatically every 5 minutes and the data are transmitted in digital form over 30 telegraph lines to the computerized central station complex in Toronto. Air quality is computed and reported hourly as a single number index. When the index indicates deteriorating conditions, various levels of abatement are invoked as prescribed by legislated regulations. The system is controlled by a software program written in a unique language. It is operated on a continuous basis by specially trained computer operators. Calibration of the sensors is checked two to three times a week using manual methods. Procedures for testing and debugging the system using the computer software were developed. Numerous problems were located and at least partially corrected to make the system operational. These tests are performed on a routine basis to maintain a continuous check on the telemetering equipment and the sensors. The capital cost of the system was \$750,000; the annual operating expenses amount to \$200,000. Recommendations are made for future systems. An acceptance test procedure and accuracies required should be explicitly stated in a contract. The tests should be performed under field conditions with the entire system operating. If the sensors are not part of the system, care should be exercised to ensure that the various components will be completely compatible. Sensors should be easy to interchange, particularly continuous air-monitoring sensors, since they frequently break down and require extensive servicing. (USEPA Abstract)

1046. Thomson, M. - 1974.

"Study of Two Remote Sensing Techniques for the Detection of Sulphur Dioxide Stress in Forest Vegetation". Unpublished M.A. Thesis, Department of Geography, University of Western Ontario, London, Ontario, 166 pages.

This thesis evaluates the application of multi-spectral photography and thermal infrared imagery to the detection of sulphur dioxide stress in forest vegetation. The theoretical discussion includes a definition of sulphur dioxide stress in vegetation, reflected and emitted radiation from vegetation and the effect of sulphur dioxide on each, and the operational principles of the two remote sensing systems used. Also included is a review of previous studies on the use of remote sensing to detect vegetation stress. The study outline describes the central Alberta study area, and the methodology, instrumentation and logistics of the remote sensing and ground truth surveys. Analyses of ground data provided a basis for the interpretation of remote sensing imagery and infrared temperatures of stressed and healthy vegetation indicated the potential of thermal infrared imagery for stress detection. The remote sensing interpretation shows that multispectral photography is an efficient tool for detection of sulphur dioxide stress; however, problems of scale led to lower accuracy on the thermal infrared imagery. Causes of misinterpretation on all types of imagery are discussed. Recommendations include implementation of multispectral photography for environmental monitoring and continued research into the use of thermal infrared imagery using revised survey methods. Basic data from remote sensing and ground surveys, and imagery analyses are given in appendices. (From Author's Abstract)

1047. Wiebe, H.A. - 1975.

"The Effect of Precipitation Collector Design on the Measured Acid Content of Precipitation", Paper Presented to First International Symposium on Acid Precipitation and the Forest Ecosystem, July 1975, Columbus, Ohio.

An array of 14 precipitation samplers of 5 different designs has been in operation at Woodbridge, Ontario, since Mar. 1974. The collectors are located in an open field near the city of Toronto within 325m. of each other. It is anticipated that the chemical constituents of the precipitation would be uniform across the array for monthly sample collections. Of the 5 different collector designs, 3 have automatic covers which are only open during precipitation events, whereas the other 2 are open to the atmosphere for the entire precipitation collection period. As expected, dry deposition markedly affects the concentration of the chemical constituents in precipitation. Significant errors can also arise from evaporation losses as shown in separate evaporation tests. The measured acid content of precipitation collected at the 6 Canadian WMO regional collection stations are discussed in view of the sampler evaluation program. Further analyses of the acidity of Canadian precipitation, collected during field studies in urban and industrial regions, are also presented. (P.A. Abstract)

See Also Reference Numbers: 1058, 1064, 1074, 1076, 1082, 1083, 1091, 1092, 1093, 1094, 1095, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1106, 1107, 1109, 1110, 1112, 1136, 1137, 1138, 1143, 1144, 1172, 1179, 1194, 1208, 1213, 1219, 1220, 1232, 1233, 1234, 1235, 1264.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, i) STATIONARY

1048. Booth, M.R. - 1971.

"Chemical Analysis and Composition of Flue Gases". *Ont. Hydro Res. Q.*, Vol. 23, No. 2, pp. 1-6.

The analysis of flue gases from a coal-fired generating station has provided information on the identity and concentrations of some of the gases and solids being released in Ontario. Sulphur dioxide is present in the highest concentration of the pollutants identified, at 700 to 1700 parts per million by volume. The concentration of nitrogen oxides varies between 250 and 700 parts per million, depending on load and boiler type. A study of trace pollutants, including polynuclear hydrocarbons and heavy metals, has been initiated for power plants in the province.

1049. Edgeworth, L. - 1973.

"Canada's Approach to Environmental Pollution Control for the Pulp and Paper Industry". *Proceedings*, 15th Conference on Harmonizing Pulp and Paper Industry and the Environment, European Liaison Committee for Cellulose and Paper, Rome, May 7-11, 1973, pp. 103-112.

Environmental air pollution control in Canada for the pulp and paper industry is discussed. The most important characteristic is that it is based on point source control and on best practical technology. Compliance schedules distinguish between the situation of the old and new plants. The standards are uniform across Canada. The Clean Air Act recognizes the direct authority of the provincial governments. National air quality objectives were recently established and define contaminants in various levels ranging from desirable through tolerable. The Act also allows for the regulation of the composition of fuels. Detailed inventories of specific contaminants are being compiled on a national scale. (USEPA Abstract)

1050. Farkas, G.S. - 1973.

"Steam Generating Incinerator Plant for the Urban Community of Quebec". Paper 73-230 Presented at the 66th Annual Meeting, Air Pollution Control Association, Chicago, June 24-28, 23 pages.

The design of the steam raising system employed for the incinerator plant in Quebec is described. The plant consists of four incinerator units, each capable of disposing of 250 tons of refuse per day and producing 81,000 lbs/hr steam at 680 Psig, 600°F. The steam is sold to a paper mill. The system essentially consists of a feedwater accumulator, which can store excess steam in the form of boiler feedwater during periods of over production and release this when a steam shortage exists. A water cooled emergency condenser was selected in preference to the air cooled design. The beneficial effect of replacing conventional boilers at the paper mill and an old incinerator plant in the city with the new plant is examined with regard to overall air pollution. (USEPA Abstract)

1051. Robert, J., Hutchison, D., and DiBartolo, B. - 1975.

"Air Pollution Emissions and Control Technology, Asphalt Paving Industry". Combustion Sources Division, Air Pollution Control Directorate, *Report*, EPS 3-AP-74-2, Environment Canada, Ottawa, 38 pages.

This report examines the present and future contributions to air pollution by the Canadian hot-mix asphalt industry and discusses the equipment and technology available to control these air pollution emissions. There are 357 reported asphalt plants in Canada and their annual production in 1972 was 14.5 million tons of asphalt. Particulate emissions are the largest air pollutant associated with the industry and amount to more than 60,000 tons per year. Methods for controlling these emissions and costs associated with providing pollution control equipment for the industry are discussed in detail. (Authors' Abstract)

See Also Reference Numbers: 1040, 1057, 1058, 1060, 1065, 1070, 1073, 1075, 1077, 1082, 1083, 1085, 1086, 1091, 1092, 1093, 1094, 1096, 1099, 1101, 1102, 1103, 1104, 1108, 1109, 1112, 1118, 1119, 1120, 1121, 1122, 1123, 1129, 1130, 1134, 1155, 1156, 1171, 1174, 1175, 1177, 1179, 1192, 1202, 1207, 1225, 1235, 1237, 1238, 1241, 1242, 1246, 1247, 1252, 1253, 1254, 1258, 1286, 1287, 1289, 1290, 1291, 1294, 1295, 1296, 1300, 1301, 1302, 1303, 1304, 1305, 1307, 1308, 1309, 1326, 1342.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, ii) MOBILE

1052. Dewees, D.N. - 1973.

"Economics of Pollution". Institute of Environmental Sciences and Engineering, University of Toronto, *Report*, EF-15, 16 pages.

The economics of pollution are considered in terms of action necessary to include natural resources such as air and water in the economic system. Although it appears impossible to suggest how much environmental quality should be provided, programs which differentiate among cities and regions of the country based on population density, density of pollution sources, and the ability of the environment to carry off wastes appear superior to uniform national programs. Any program will be better to the extent that it creates incentives for technological change in pollution control devices since this is frequently a very important factor in determining long-run abatement costs. Programs involving effluent charges rather than uniform standards lead to abatement where it is least

expensive, promote technical progress, and minimize feasibility hearings on complex abatement technology. The Canadian automobile pollution policy is discussed in relation to pollution economics and standards being adopted in America. (USEPA Abstract)

1053. Environment Canada - 1973.

"Canadian Automobile Driver Survey". Mobile Sources Division, Air Pollution Control Directorate, *Report*, EPS 3-AP-73-10, Environment Canada, Ottawa, 95 pages.

This report presents information obtained in response to a questionnaire mailed to a random sample of households in four Canadian cities - Vancouver, Edmonton, Toronto and Montreal - chosen to allow comparison of various factors such as geographical distribution, climate and population. The questionnaire was designed to provide preliminary information on characteristics of Canadian drivers and their vehicles, use of the vehicles, and public opinion of automotive pollution control programs. (Author's Abstract)

1054. Environment Canada - 1974.

"Canadian Urban Trucking Study". Mobile Sources Division, Air Pollution Control Directorate, *Report*, EPS 3-AP-74-7, Environment Canada, Ottawa, 114 pages.

This study defines trucking operations in Canadian cities in order that trucking impact on air quality may be evaluated and abatement strategies formulated. A qualitative description of urban trucking is presented as well as quantitative data concerning ownership, fleet composition, annual and daily operations, and maintenance which are provided in the form of a statistical profile. Most of this information was compiled especially for this project from a mail survey of the owners of some 12,000 registered trucks in metropolitan Toronto, Calgary, and Halifax. Limited additional data from Canadian and U.S. sources were used to supplement the survey findings and to provide a basis for comparison. Financial characteristics of urban trucking are presented and the future of the industry is discussed. An annotated bibliography of recent trucking studies is also included.

1055. Environment Canada - 1974.

"Canadian Taxi Survey". Mobile Sources Division, Air Pollution Control Directorate, *Report*, EPS 3-AP-74-4, Environment Canada, Ottawa, 100 pages.

This study defines taxi operations in Canadian cities in order that taxis' impact upon air quality may be evaluated and pollution abatement strategies may be formulated. Types of taxi operators are identified and the regulation of the taxi industry is briefly discussed. Taxi operations data which describe taxicab fleets, annual utilization, daily activities, trip characteristics, and engine maintenance practices are presented. These data were compiled especially for this project from a special mail survey of taxi companies in nine cities. Where possible, the survey findings were supplemented by other data obtained from a limited number of Canadian taxi information sources. Taxi financial characteristics are described in terms of owners' fleet sizes and examples of operating costs, revenues, and earnings for the different types of taxi operators.

See Also Reference Numbers: 1013, 1016, 1021, 1029, 1037, 1056, 1059, 1090, 1101, 1103, 1109, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1130, 1144, 1216, 1221, 1245, 1250, 1258, 1263, 1265, 1268, 1273, 1277, 1285, 1317, 1339.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, iii) GASEOUS

1056. Barton, S.C. and Turner, E.N. - 1974.

"An Automated Instrument for the Continuous Measurement of Reactive Hydrocarbons". Paper Presented at the 167th National Meeting, American Chemical Society, Division of Environmental Chemistry, Los Angeles, April 1-5, 1974, Paper 66, *Preprints*, 14(1), pp. 35-39.

A method for the specific measurement of reactive hydrocarbons was developed based upon the relative reactivity of different hydrocarbons with ozone. An air sample flows through a small photochemical reactor in which all hydrocarbons react in proportion to their photochemical reactivity to form aldehydes and ketones as major reaction products. Colorimetric determination of the total carbonyl products provides a direct measurement of the total photochemical reactivity of the hydrocarbons in the air. The prototype reactive hydrocarbon monitor was operated continuously for 7 weeks in downtown Metropolitan Toronto. The sensitivity of the instrument was adequate for ambient levels, and the reactive hydrocarbons accounted for approximately 2-6% of the total hydrocarbon levels measured by the flame ionization method, using a Beckman Model 400 instrument. The average diurnal variation in reactive hydrocarbon levels showed two distinct maxima corresponding to peak traffic periods. (USEPA Abstract)

1057. Environment Canada - 1975.

"National Inventory of Sources and Emissions of Vinyl Chloride (1973)". *Internal Report*, APCD 75-1, Environment Canada, Ottawa, 13 pages.

Only recently has recognition been given to vinyl chloride hazards. In 1973, there were two vinyl chloride monomer producers and four polyvinyl chloride resin manufacturers in Canada. Because emissions data are scarce, an emission factor approach using values developed by the Environmental Protection Agency of the United States has been used to estimate the vinyl chloride emissions from these plants. Vinyl chloride atmospheric emissions in Canada have been estimated to be 6568 tons for the base year 1973. A breakdown of emissions by type of manufacturing process and by company are given. Of the total emissions, about 89% was released by polyvinyl chloride resin manufacturing plants and about 10% by vinyl chloride monomer manufacturers. In addition, the plastics industry, which processes polyvinyl chloride into end-use plastic products, released about 1% of total vinyl chloride emissions. (Author's Abstract)

1058. Environment Canada - 1976.

"National Inventory of Sources and Emissions of Fluoride (1972)". Pollution Data Analysis Division, Air Pollution Control Directorate, *Report*, APCD 75-7, Environment Canada, Ottawa 31 pages.

Atmospheric emissions of fluoride from various Canadian sources have been estimated at 15,644 tons for the year 1972. The largest contributor is the primary aluminum industry, which accounts for 57% of the total. Emissions from phosphate fertilizer and elemental phosphorus plants account for a further 17% and the primary iron and steel industry for 16%. On a geographic basis the Province of Quebec accounts for 48% of the Canadian total followed by Ontario with 18%. It is estimated that about 70% of nationwide fluoride emissions, close to 11,000 tons, are in the gaseous state. Results are first approximations due to paucity of data.

The inventory serves to place the various emission sources in perspective and the reader is cautioned not to use the emission estimates out of context of this inventory. (Author's Abstract)

1059. Godin, G., Wright, G. and Shephard, R.J. - 1972.

"Urban Exposure to Carbon Monoxide". *Arch. Environ. Health*, Vol. 25, No. 5, pp. 305-313.

In Toronto, 500 grab samples of air were collected during normal urban life and were analyzed for carbon monoxide by infrared spectrometry. Concentrations were correlated with sunshine, rainfall, wind speed, and traffic density using nonparametric and multiple regression techniques. Local traffic density (td) accounted for 63% of the variance; equations based on td describe the CO exposure (Log (chi + 1) ppm) encountered by pedestrians ($0.59 + 0.133 \text{ td}$) and cab drivers ($0.92 + 0.086 \text{ td}$). Attenuation away from busy streets was rapid. In downtown offices, concentrations followed the general atmospheric pattern. Smoking can bring indoor concentrations above permitted 24-hour levels. The effect of vehicle ventilation provided by a heater fan was tested in a new and relatively air-tight car. Carbon dioxide concentrations in crowded subway cars were as high as 0.08-0.18%. The CO concentrations were $3.4 + \text{ or } - 2.66 \text{ ppm}$ on open sections of track and $5.5 + \text{ or } - 3.2 \text{ ppm}$ in the tunnels. Carbon monoxide concentrations were unrelated to sulfur dioxide, total oxidant, and nitrogen oxides concentrations; however, as might be anticipated from their common prime source, there was a significant positive correlation with hydrocarbons; also, suspended particulate matter varied inversely with CO which might reflect thermal inversion effects. Air quality criteria and current air quality standards are discussed. (USEPA Abstract)

1060. Harrison, D. - 1972.

"Air Pollution Surveys". *Proceedings*, Ontario Hydro Thermal Operations Symposium on Environmental Protection - Air, May, Toronto, pp. 51-69.

This is a report on the air quality surveys conducted at Ontario Hydro's fossil-fuel-fired generating stations. The reasons for conducting such surveys are considered and methods for obtaining measurements and for analyzing data are outlined. The findings from the Lakeview generating station survey are given as an example of the type of results the surveys yield. The Lakeview data clearly showed that most of the SO₂ at ground level, during the winter months when the readings are high, was due to space heating installations emitting sulphur dioxide from short chimneys. During the summer months when space heating installations are not operating, and ground level sulphur dioxide concentrations are low, the industrial contribution was evident and the Lakeview generating station was a contributor. High sulphur dioxide readings, exceeding the government's air quality criteria levels, occurred for a very small percentage of the time and only a fraction of this could have been due to the Lakeview generating station.

1061. Hocking, D. - 1973.

"Air Quality Management for Natural Gas Production in Alberta: Background to the Problem and an Application of the Paretian Decision Model". *Information Report*, Environment Canada, Edmonton, Northern Forest Research Centre, NOR-X-69, 74 pages.

The proposed revision of the ambient air quality standards for sulfur dioxide for Alberta by the Alberta Department of the Environment is analyzed using Paretian Environmental Analysis (PEA). Processing of sour natural gas is the source of nearly all SO₂ emissions, in 1973 totalling 500,000 long tons. There is controversy over methods and standards for SO₂ emissions control based on the value of benefits derived from the high costs of improving sulfur recovery. The analysis presented formulates a set of functions expressing the net benefits to each major party affected by a decision on SO₂ standards. The formulation illustrates the informational gaps for fully rational decision-making on the issue. It provides a method to test the sensitivity of the decision on the accuracy of data and the political weights of the participants. (USEPA Abstract)

1062. Hocking, D. - 1973.

"Paretian Environmental Analysis as Applied to Sulfur Dioxide Emissions in Alberta". *Proceedings*, Workshop on Sulphur Gas Research in Alberta, *Information Report*, NOR-X-72, Northern Forest Research Centre, Edmonton, Alberta, pp. 1-17.

Paretian environmental analysis incorporates the interests of the people affected by a decision together with technological and economic data into a set of net benefit functions. This paper describes this method and applies it to sulfur dioxide emissions in Alberta. Results, however, are not conclusive due to scarcity and generality of available data. Solution of net benefit functions developed for Alberta must follow further research to develop estimates of values presently unknown.

1063. Hocking, D. and Nyborg, M. - 1974.

"The Problem of Soil Acidification by Sulphur Dioxide". *Proceedings*, Workshop on Reclamation of Disturbed Lands in Alberta, Northern Forest Centre, Edmonton, Alberta, March 27-28, 1974, *Report*, NOR-X-116, pp. 71-75.

Approximately half a million tons of sulphur dioxide gas are emitted annually in Alberta by gas processing plants and during extraction of oil from oil sands. Sulphur dioxide may be oxidized, either partially in the atmosphere or in the soil to sulphuric acid causing acidification of soil and water where it is deposited. This paper discusses projections into the future of rates of acidification based on current rates of acidification compared with amounts of sulphur dioxide emitted in Alberta. The aim of this work is to provide a basis upon which to determine the amount of land and water reclamation that will be needed to offset the effects of the increased acidity.

1064. Kerr, J.B. - 1973.

"Short-time Period Fluctuations in the Total Ozone". *Pure Appl. Geophys.*, Vol. 106-108, pp. 977-980.

The Toronto spectrophotometer was used to take an extensive series of ozone measurements between September 1971 and April 1972. As a result of these measurements, short-lived variations in ozone were found to occur, sometimes amounting to more than 0.1 cm. The ozone disturbances are advected because the same disturbance was observed on the direct sun and the zenith sky at different times. The general nature of these disturbances are presented. The need for an automated, mesoscale ozone-measuring network capable of measuring in all weather conditions during all daytime hours is stressed. There exists lateral uniformity within a large area of an observing station. Zenith sky observation, rather than direct solar measurement, should be the standard method of ozone measurement because it is less sensitive to ozone disturbances. (USEPA Abstract)

1065. Kerry, C.W. - 1971.

"Sulphur Dioxide Levels Near a Large Coal-Fired Generating Station". *Ont. Hydro Res. Q.*, Vol. 23, No. 2, pp. 17-22 and 48.

An air-monitoring survey has been conducted in the vicinity of Lakeview Generating Station, both before and after the station went into operation, to measure the levels of sulphur dioxide, and wind velocity. Some data are recorded monthly and some continuously. The recorded data are then correlated with operating data obtained from the station log sheets. Analysis of the data indicates that variations in sulphur dioxide levels are due to residential and commercial heating, industrial activity and operation of

the generating station. The chimney design used at the station has had the desired effect in that sulphur dioxide levels in the area have shown no significant increase since the station began operation.

1066. Klemm, R.F. - 1972.

"Air Quality and Human Health". *Environmental Effects of the Operation of Sulfur Extraction Gas Plants in Alberta: Report*, Environment Conservation Authority of Alberta, Edmonton, pp. 80-91.

An investigation is made into air quality and human health in respect to the environmental effects of the operation of sulfur extraction gas plants. Chemicals in general are discussed before the chapter begins a more detailed account of the effects of sulfur dioxide pollution, sulfuric acid and particulate sulfate toxicity and the effects of hydrogen sulfide. Other substances discussed include carbonyl sulfide, carbon disulfide, selenium, lead, phenols, glycols, heavy hydrocarbons, mercaptans, and mercury. Conditions inside a gas plant can also be dangerous to public health and employees' welfare. These factors are also discussed. (WATDOC)

1067. Klemm, R.F. - 1972.

"Recognized Air Pollutants, Their Dispersal and Detection". *Environmental Effects of the Operation of Sulfur Extraction Gas Plants in Alberta: Report*, Environment Conservation Authority of Alberta, Edmonton, pp. 45-56.

This chapter outlines the recognized air pollutants related to the operation of sulfur extraction gas plants in Alberta. The obvious pollutant to begin with is sulfur dioxide, as it is the unavoidable result of less than 100 percent elemental sulfur recovery. The air chemistry of sulfur-containing compounds is described including hydrogen sulfide, and other sulfur compounds. Next a monitoring system is described which helps check any gas flares from the stacks. Other monitoring systems mentioned include sulfur dust fall monitors, mobile air monitoring trailers and exposure cylinders. (WATDOC)

1068. Krouse, H.R. - 1973.

"Sulphur Isotope Abundances and Environmental Assessment, Applications to Sulphur Gas Research in Alberta". *Proceedings, Workshop on Sulphur Gas Research in Alberta, Information Report, NOR-X-72*, Northern Forest Research Centre, Edmonton, Alberta, pp. 57-78.

Since S^{32} and S^{34} differ in their masses, their relative numbers are altered by mass-dependent processes. In Alberta, H_2S from different pools varies considerably in its S^{34}/S^{32} abundance ratios. This provides a means of monitoring gas industry emissions of sulphur compounds and their effects on the environment. Data from Alberta identify industrial contributions of SO_2 to the air and show that these are not readily mixed on a local meteorological scale. Isotopic studies also show that lichens derive sulphur from the atmosphere in a more direct manner than higher plants. Sources of sulphur compounds in streams can also be identified. (Author's Abstract)

1069. Krouse, H.R. - 1974.

"Sulphur Isotope Abundance Studies of the Environment". Paper Presented at the Canadian Sulphur Symposium, Calgary, May 30-June 1, 1974, 11 pages.

The relative abundances of sulfur(32) and sulfur(34) are altered in terrestrial mass dependent processes. Consequently, emissions and effluents from industrial processes have inherent stable isotopic labels and their fates can be traced in our environment. In streams, lateral mixing can be quite slow, in which case individual sources of dissolved sulfate may be recognized in a cross-section. In the air of Alberta, sulfur oxides range widely and their sulfur isotope composition varies (delta S(34) from 7-28%). Although these data represent mainly contributions from the sour gas processing industry, temporal and spatial variations in the delta S(34) value attest to a significant biological component. Delta S(34) variations in vegetation show that lichens interact in a more direct fashion with atmospheric sulfur compounds than is the case for more complex plants. (USEPA Abstract)

1070. Marsh, P.L. and Sullivan, W.H. - 1976.

"Air Pollution Emissions and Control Technology. Chlor-Alkali Industry". Air Pollution Control Directorate, *Report, EPS 3-AP-75-6*, Environment Canada, Ottawa, 46 pages.

The Canadian chlor-alkali industry is examined and the atmospheric mercury emissions from the industry are evaluated together with the technology available to control these emissions. Mercury emissions from the mercury cell process can be eliminated by conversion to either the diaphragm or membrane cell process. The technical and economic aspects of all three processes are discussed in detail. Currently available techniques to contain mercury emissions from plants using the mercury cell process are also examined. (Authors' Abstract)

1071. Ontario, Air Resources Branch - 1974.

"Vinyl Chloride as an Airborne Hazardous Contaminant I". Ontario Ministry of the Environment, Toronto, *Internal Report, No. ARB-TDA-01-74*, 202 pages.

The report investigates the general properties of vinyl chloride monomer, possible sources of emission to the atmosphere, control methods available to abate such emissions and other topics relevant to the protection of the community from a hazardous contaminant. Conclusions are presented with reference to the situation concerning VCM in Ontario and the role of the Air Resources Branch of the Ministry of the Environment. A specific series of recommendations are made to outline the involvement of various sections within the Air Resources Branch of the Ministry of the Environment in the establishment of a suitable standard for VCM levels in the ambient air and suggestions made regarding subsequent involvement by other Branches within the Ministry. (Author's Abstract)

1072. Ontario, Air Resources Branch - 1975.

"Fluorochlorocarbons and the Environment (A Literature Review)". Technology, Development and Appraisal, Ontario Ministry of the Environment, Toronto, *Internal Report, No. ARB-TDA-14-75*, 93 pages.

This is a general presentation of the sources and effects of fluorochlorocarbons in the atmosphere with some emphasis on the Canadian experience. Tables and diagrams include statistics and explanations of a general world-wide scope as well as those that are specifically Canadian.

1073. Ontario, Air Resources Branch - 1975.

"Vinyl Chloride as an Airborne Hazardous Contaminant I." Special Studies Program Planning Unit, Technology Development and Appraisal Section, Ontario Ministry of the Environment, Toronto, *Internal Report, No. ARB-TDA-02-75*, 41 pages.

A survey was conducted by the Air Resources Branch to monitor the concentrations of vinyl chloride monomer in ambient air on the sites and in the vicinity of the Esso Chemical polyvinyl chloride and Dow Chemical vinyl chloride monomer plants in Sarnia,

Ontario, during September, October and November, 1974. Sampling determined that the Esso plant was potentially a more significant source of vinyl chloride monomer. The results of the survey imply that at times and for distances up to 1/2 mile downwind from the Esso plant, the level of emissions can exceed the current air quality guidelines established by the Ministry.

1074. Perry, J. - 1973.

"Fasten Your Seat Belts. No Smoking. (Hazards of Tobacco Smoke)." *B.C. Med. J.*, Vol. 15, No. 10, pp. 304-305.

Determinations were made of the concentration of benzo(a)pyrene and carbon monoxide in the air of indoor areas in Vancouver where people customarily smoke. The levels of these compounds in the outside urban atmosphere were also measured at several locations in Vancouver. In all cases, the CO concentration was less than 10 ppm. In the indoor areas heavily polluted with tobacco smoke, concentrations as high as 760 ng of benzo(a)pyrene/cu m of air were found. These values are many times higher than any of the benzo(a)pyrene levels found in samples of the outside air, and are also much higher than a published figure of 6.6 ng/cu m expressing the median Jan.-March urban benzo(a)pyrene concentration in the U.S. (Author's Abstract)

1075. Saleem, A., Harrison, D. and Sekhar, H. - 1972.

"Sulphur Dioxide Removal by Limestone Slurry in a Spray Tower". *Ont. Hydro Res. Q.*, Vol. 24, No. 2, pp. 7-14.

Ontario Hydro, like most North American Utilities, is faced with the problem of finding ways to control pollutant emissions from fossil-fueled power plants. Considerable research and development work is being directed toward finding a process to control sulphur oxides emissions, and the limestone-slurry process has been selected as the most promising for immediate development. This process has been studied for the past year in a 4000-cfm pilot plant which draws the flue gases from a 300-MW coal-fired boiler, after the electrostatic precipitator. This article describes the results of these tests.

1076. Shenfeld, L. - 1975.

"Report on Oxidants and Their Precursors in Canada". Workshop on Photochemical Oxidant Air Pollution and its Precursors in the Atmosphere, Organization for Economic Co-operation and Development, Delft, Netherlands, September 8-12, 1975, 45 pages.

This comprehensive report on air pollution oxidants throughout Ontario includes a brief history of recording efforts in the province. Analysis of oxidant precursors such as nitrogen oxides and hydrocarbons in relation to specific locations in Ontario is given. Ozone levels in relation to weather conditions are discussed. The data from many sites in Ontario are shown on thirty pages of tables.

1077. Solomon, P. - 1973.

"Continuous Stack Monitoring of Claus Sulfur Recovery Plants". *Proceedings*, American Petroleum Institute, Division of Refining, Vol. 53, pp. 73-86.

The Gulf Oil of Canada program of continuous monitoring of sulfur emissions from stack gases of modified Claus sulfur recovery plants is described. The component selection and location for the system measuring the stack gas flow and the sulfur dioxide concentration, for the computer, and for the system recording the resulting sulfur emission, are explained. The operating experience gained with the four systems now on-stream is described. Emission data can be used to measure plant recovery efficiency and to aid in optimization studies. Some installation problems, operating experience on the analyzer and flow sensors, plant optimization, and advantages of the system are described. The problems encountered so far were typical start-up bugs or due to corrosion attributed to cold spots in the sample lines. In future applications, corrosion-resistant teflon will be used for the sample lines. (USEPA Abstract)

1078. Solomon, P. - 1973.

"Continuous Stack Monitors Installed". *Oil Gas J.*, Vol. 71, No. 35, pp. 85-86, 88, 76.

Continuous stack monitors are described for four modified Claus sulfur-recovery plants of Gulf Oil Canada, Ltd. The monitoring system essentially requires: flow measurement for calculation of the weight of S emission; a temperature sensor to correct flow to standard conditions; a sample probe and S analyzer to obtain a measure of the S content of the stack gas, usually as sulfur dioxide; and on-line data processing to give the calculated S emission. The accepted method of measuring stack gas flow uses a pitot tube to sense differential pressure; this depends on the relationship that the square root of differential pressure is proportional to flow. Stack gas temperature is measured next to the flow sensor so that the calculated flow is temperature-compensated. The sampling probe must resist corrosion at temperatures close to the acid dew point of the stream. The analyzer and differential-pressure transmitter are located in an analyzer building at the base of the stack. The analyzer finally chosen is a process gas chromatograph which can operate above the dew point of the sample. On-line calculation is done by a pneumatic analog computer. (USEPA Abstract)

1079. Varfalvy, L. and Jegier, Z. - 1974.

"Formation of Photochemical Oxidants in the Urban Air of Montreal". (Formation Photochimique d'Oxydants Dans l'Atmosphere Urbaine de Montreal). *Chemosphere*, Vol. 3, No. 1, pp. 35-40.

In a study of the possibility of photochemical smog formation in Montreal, the total oxidant, nitrogen dioxide, nitric oxide, and sulfur dioxide concentrations in the air were measured in air samples taken at three different sampling sites; downtown with heavy traffic, one industrial, and one residential district. The 40 minimum-maximum concentrations of the total oxidants, NO₂, NO, and SO₂ were in the respective ranges of 93-94.9 ppb, 81.8-174.5 ppb, 75.3-138.2 ppb, and 63.5-122.8 ppb. The oxidant and NO levels were in the same order of magnitude in the residential and industrial districts, while the SO₂ concentrations were highest in the industrial area. The downtown featured the highest nitrogen oxides concentrations, and the lowest oxidant concentrations. The oxidant concentrations were highest during periods of intense solar radiation and high temperature. The detection of oxidant concentrations around 100 ppb in the air in Montreal indicated that photochemical smog formation was possible under any climate as soon as the meteorological conditions favorable for such a process and the anthropogenic photochemical precursors are present. (USEPA Abstract)

1080. Vroom, A.H. - 1972.

"New Uses for Sulfur: The Canadian Viewpoint". *Hydrocarb. Process.*, Vol. 51, No. 7, pp. 79-85.

Canadian research is presently directed at new uses for the 6 million long tons of stockpiled sulfur and the ever increasing involuntary production of sulfur from the processing of gas and from petroleum refining. The increasing quantities of elemental sulfur and sulfur dioxide being recovered from petroleum refining, residual fuel oils, and smelter gases could result in an increase of involuntary world sulfur production of 22.5 million long tons/yr by 1975 if recovery were pushed to 90%. Moreover, research is being conducted to develop practical methods of sulfur recovery directly from coal and from stack gases resulting from its combustion;

the present potential here is some 45 million tons/yr on a world basis or about twice the present demand for elemental sulfur. The year 1970 saw 21% of the total potential Canadian sulfur emissions recovered, and it is estimated that by 1980 pollution abatement programs will result in a 76% recovery. Some proposed uses for the growing surplus are: sulfur foam insulation, sulfur concrete, sulfur-asphalt paving materials, traffic paints, sulfur impregnant for porous materials, and surface bond construction. The largest and most immediate market in Canada and for new sulfur uses would appear to lie in road building and repair which could use 600,000 tons per year. (USEPA Abstract)

1081. Wright, G.R., Jewczyk, S., Onrot, J., Tomlinson, P. and Shephard, R.J. - 1974.

"Carbon Monoxide in Downtown Toronto". Department of Environmental Health, School of Hygiene, University of Toronto and York-Toronto Tuberculosis and Respiratory Disease Association, May, Toronto, 123 pages.

The carbon monoxide (CO) concentrations encountered by pedestrians and workers in the streets of downtown Toronto were monitored by a reliable and sensitive portable detector (the "ECO-LYZER"). Up to 1000 observations per day were collected for several months during the summer and fall of 1973. CO levels ranged from 10 to 50 parts per million, the variation being due to such factors as wind-speed and direction, atmospheric stability, traffic density, and height of nearby buildings. Much higher average concentrations were found in such adverse sites as poorly ventilated underpasses and underground garages. Street closures for the Yonge Street Pedestrian Mall reduced the CO concentrations on the Mall to around the general urban background level without causing large increases in readings on adjoining streets. The relevance of these results to pedestrians, motorists, cyclists and planners and designers are discussed. (Authors' Abstract)

See Also Reference Numbers: 1030, 1033, 1044, 1046, 1047, 1048, 1085, 1089, 1104, 1116, 1117, 1124, 1126, 1131, 1133, 1137, 1138, 1142, 1143, 1146, 1147, 1148, 1149, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1159, 1160, 1161, 1163, 1164, 1168, 1169, 1171, 1173, 1175, 1177, 1179, 1180, 1181, 1182, 1189, 1191, 1197, 1200, 1201, 1202, 1204, 1205, 1206, 1207, 1211, 1212, 1215, 1216, 1218, 1219, 1220, 1223, 1224, 1225, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1236, 1237, 1241, 1246, 1247, 1248, 1249, 1251, 1255, 1260, 1262, 1263, 1272, 1294, 1296, 1299, 1304, 1307, 1308, 1310, 1341.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, iv) SOLID, (a) NATURAL

1082. Adamek, E.G. - 1973.

"Benzo(a)pyrene and Benzo(k)fluoranthene in Urban Atmospheres in Ontario". Laboratory Branch, Ontario Ministry of the Environment, Toronto, 60 pages.

Benzo(a)pyrene (BaP) and benzo(k)fluoranthene (BkF) were sampled in the air of 11 urban communities in Ontario during the period July 1971 to July 1972. The highest pollution figures were in the heavy-industrial communities of Welland, Windsor (nearness to Detroit), and Hamilton with BaP and BkF levels ranging 5 to 100 times higher than in the residential and business communities. The levels in Welland exceeded by far those of all other communities investigated and ranged upwards to 116 micrograms BaP and 176 micrograms BkF/1000 cu m air. The main pollution source was a company with a graphite electrode production to supply its large electrolytic smelters and possibly some carbon black manufacture. Very high pollution levels (up to 15 micrograms BaP and 73 micrograms BkF/1000 cu m air) were observed at Windsor where Detroit's steel mills and a coal fired power plant appeared to be the main pollution sources. Similar high levels in Hamilton originate from steel mills and from carbon black manufacture. (USEPA Abstract)

1083. Adamek, E.G. - 1976.

"A Two-Year Survey of Benzo(a)pyrene and Benzo(k)fluoranthene in Urban Atmospheres in Ontario". Ontario Ministry of the Environment, Laboratory Services Branch, Air Quality Laboratory, Toronto, 207 pages.

Two analytical methods suitable for determining and monitoring two important polynuclear aromatic hydrocarbons (PAH) in airborne particulates have been developed. These hydrocarbons are benzo(a)pyrene, a most potent carcinogen, and benzo(k)fluoranthene, a related compound indicative of the presence of other PAH. By using these methods, a two-year program, covering the period from July 1971 to July 1973, was carried out for measuring these compounds in the atmospheres of eleven urban communities. The survey revealed that Welland had by far the highest PAH levels of all communities investigated with the industrialized cities of Hamilton and Windsor (vicinity of Detroit) following next in line. By comparison with certain cities in foreign countries, these levels seemed rather high, while other industrial communities, such as Toronto, Cornwall, Sarnia and Sudbury, showed relatively low PAH levels. With the aim of establishing the underlying causes for the pollution levels observed, attempts were made to correlate these levels with a number of environmental conditions. In industrial areas, certain wind directions were found to coincide with peaks in pollution levels, which suggested or confirmed offending emission sources. Periods of temperature inversions over large areas of Ontario were invariably marked by a surge in PAH levels up to eight times the average levels. Incidences of high PAH levels were also caused by local events, such as city fire, roof and road-tarring operations and downtown traffic. Correlations of the observed PAH levels with coefficient of haze values, with levels of airborne particulates and with annual and seasonal changes were examined for all communities. (Author's Abstract)

1084. Chatterjee, J. and Hargreave, F.F. - 1974.

"Atmospheric Pollen and Fungal Spores in Hamilton in 1972 Estimated by the Hirst Automatic Volumetric Spore Trap". *Can. Med. Assoc. J.*, Vol. 110, pp. 659-663.

A Hirst automatic volumetric spore trap was used to identify the quantitative and seasonal incidence of atmospheric pollen and fungal spores in Hamilton, Ontario, as part of an approach to the diagnosis and management of extrinsic rhinitis and asthma. Tree, grass, and ragweed pollens occurred in short, well defined seasons. Fungal spores greatly outnumbered pollen by 120 to 1 and occurred in long, ill-defined seasons. Included were large numbers of small basidiospores and ascospores which had previously not been detected in Canada. The latter have not been considered as potential allergens, and their clinical importance requires investigation. (USEPA Abstract)

1085. Choquette, P.J. - 1974.

"Air Pollution Emissions and Control Technology, Metallurgical Coke Manufacturing Industry". Mining, Minerals and Metallurgical Division, Air Pollution Control Directorate, *Report*, EPS 3-AP-74-6, Environment Canada, Ottawa, 74 pages.

This study was initiated to evaluate the current and future contributions to air pollution by the Canadian metallurgical coke manufacturing industry and to assess the technology available to control these air pollution emissions. Actual atmospheric emissions of particulate matter from the production of metallurgical coke in Canada during 1972 were 8863 tons and estimated emissions for 1975 are 8816 tons. Emissions of sulphur dioxide to the atmosphere from the consumption of coke oven gas produced in metallurgical coke manufacturing during 1972 were 19,556 tons and estimated emissions for 1975 are 26,093 tons. Virtually all coking coal consumption in Canada is directly related to the primary production of iron and steel. Indeed, the four largest coke manufacturing plants, producing over 90% of the total Canadian coke, are owned and operated by integrated steel companies which not only utilize the coke in blast furnaces but also use the associated coke oven gas in several operations throughout the steel complex. Metallurgical coke manufacturing is, therefore, directly geared to the industrial growth of the Canadian economy. Most of the coke-making plants in Canada are located in industrial or residential communities. This situation has persuaded these plants to endeavour to reduce particulate and sulphur dioxide emissions to acceptable levels. Their effort has demonstrated that application of best practicable technology will result in control of emissions sufficient to satisfy regulatory limits being considered by government agencies. This report serves to provide background information for use in establishing National Emission Guidelines, as set forth in Section 8 of the Clean Air Act, for the Canadian metallurgical coke manufacturing industry. Increases in production planned for 1975 amount to 24% of the total coke produced by the industry in 1972. To achieve this aim, some integrated steel companies will upgrade their coke-making plants to peak capabilities and others will add new facilities. Installation of pollution control equipment and changes in operating practice or technology scheduled by the Canadian coke-making industry for 1975 and beyond should reduce particulate and sulphur dioxide emissions from this industry to a small fraction of the total now emitted by industrial sources. (Author's Abstract)

1086. Gagan, E.W. - 1974.

"Air Pollution Emissions and Control Technology. Cement Industry". Air Pollution Control Directorate, *Report*, EPS 3-AP-74-3, Environment Canada, 50 pages.

This study was initiated to evaluate the present and future contributions to air pollution by the Canadian cement industry and to define the best practicable technology to control these air pollution emissions. Actual atmospheric emissions of particulate matter from the production of cement in Canada during 1970 were 170,544 tons and estimated emissions for 1975 are 89,927 tons. Cement manufacture, a heavy industry associated with all major construction projects, is directly geared to the industrial growth of the Canadian economy. Previously, many cement plants had been established close to the expected markets provided by large urban areas. With subsequent urban development these plants often became incorporated into industrial or residential communities. This situation prompted these plants to strive to reduce particulate emissions to acceptable levels. Their effort has demonstrated that application of best practicable technology will result in excellent control of emissions sufficient to satisfy regulatory limits established or being considered by government agencies. This report serves to provide background information for use in establishing National Emission Guidelines, as set forth in Section 8 of the Clean Air Act, for the Canadian cement industry. Increases in production planned for 1975 amount to 61% of the total clinker produced by the industry in 1970. To achieve this aim, inefficient plants in urban areas will be replaced by new facilities elsewhere and operation of other plants will be upgraded at increased capacities. New improvements in process and pollution control will result in reduced emissions of particulate matter. Installation of pollution control equipment scheduled by the cement industry for 1975 will reduce particulate emissions from this industry in Canada to a small fraction of the total now emitted by heavy industries. (Author's Abstract)

1087. Godson, W.L. and Hunter, D.M. - 1967.

"Upper-Atmospheric Sodium and Stratospheric Warmings at High Latitudes". *J. Atmos. Sci.*, Vol. 24, pp. 80-87.

A cross correlation (by the superposed-epoch method) has been carried out between sodium abundance, measured in twilight at Saskatoon, and stratospheric warmings, observed in temperature data at Churchill and Alert. A significant peak appears to be present in data from four winters. It is suggested that vertical motion, as indicated by the warming events, is raising a source of sodium atoms into the 90 km region. The source is probably in the form of dust (or aerosol) particles, whose origin could be either meteoric or marine. Partial evaporation of these particles in the daytime could explain the additional sodium observed in the dayglow. A natural explanation is also given of the seasonal abundance variation and the very steep sodium distributions often observed. (Authors' Abstract)

See Also Reference Numbers: 1213, 1214.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, iv) SOLID, (b) MANMADE

1088. Albagli, A., Oja, H. and Dubois, L. - 1974.

"Size-Distribution Pattern of Polycyclic Aromatic Hydrocarbons in Airborne Particulates". *Environ. Letters*, Vol. 6, pp. 241-251.

An investigation of the size distribution of the total suspended particulates according to their aerodynamic diameter was conducted in a large Canadian city during the autumn-winter-spring of 1972-73. The particulates collected in each stage of an Andersen sampler were extracted and analyzed for their benzo(a)pyrene and benzo(k)fluoranthene content. The majority of the polycyclic aromatic hydrocarbons sampled were associated with submicron particles which can be deposited deep in the alveoli of the respiratory tract. Mass median diameters for both pyrenes were less than 1 micron. (USEPA Abstract)

1089. Anon. - 1970.

"The Pollution of the Air by Sulphur Dioxide and Airborne Particles in Montreal" ("La Pollution de l'Air par l'Anhydride Sulfureux et Les de Sante de Montreal". *Report*, Board of Health, City of Montreal, 92 pages.

This report is composed of two parts. The first deals with the measures taken by the city of Montreal to purify the air since 1931, and particularly with the intensification of these efforts in the last few years at the request of the municipal administration. This intensification resulted in the establishment of a network of air sampling stations, a well equipped laboratory, an improved set of regulations and a stricter application of these regulations.

The second part, which constitutes the principle concern of this report, deals with two contaminants, sulphur dioxide and airborne dust particles. According to several scientific studies, the results of which are given at the beginning, these contaminants, even in rather weak concentrations, have had negative effects on human health and have even been the cause of death in certain urban centres around the world.

In light of these studies, the doctors of the Board of Health gave their medical opinion. They concluded the following: In order to avoid all danger to humans the average annual concentration and the average daily concentration of sulphur dioxide must not exceed 0.02 ppm and 0.10 ppm respectively; the average annual and average daily concentrations of airborne particles must not exceed 80 micrograms per cubic metre and 250 micrograms per cubic metre. According to a study of the actual concentrations of these contaminants in the air, a study based on data collected in the two preceding years, these limits have been exceeded and in the present situation, the health of Montrealers is in danger.

Energetic measures must be taken to combat this danger by all four governments (municipal, inter-municipal, provincial and federal). These measures are suggested and enumerated at the end of the report.

1090. Dupuis, Y., Allard, R., Boulerice, M. and Brabant, W. - 1972.

"Lead Pollution in the Atmosphere from 1968 to 1971". (Pollution Atmospherique par le Plomb de 1968 à 1971). Report Prepared for Service de l'Assainissement de l'Air et de l'Inspection des Aliments, Montreal Urban Community, Montreal, 78 pages.

Lead in the atmosphere of Montreal is principally caused by automobiles. This report analyzes data which have been collected at major traffic intersections in Montreal over four years, and correlated with certain factors, such as meteorological parameters. Some planning recommendations are made to help reduce lead concentrations in the atmosphere.

1091. Environment Canada - 1974.

"National Inventory of Sources and Emissions of Asbestos, Beryllium, Lead, and Mercury. Summary of Emissions for 1970". Air Pollution Control Directorate, Data Analysis Division, Report, EPS 3-AP-74-1, Environment Canada, Ottawa, 19 pages.

This is a summary report that identifies the major sources of emissions to the atmosphere of the mineral asbestos and the metals beryllium, lead, and mercury. Total amounts emitted in Canada in 1970 are estimated as: asbestos, 16,392 tons; beryllium, 7.8 tons; lead, 21,416 tons; and mercury, 82.2 tons. Percentages of the total attributed to the various sectors named are included in the data given. Properties and uses of each substance are also summarized briefly.

1092. Environment Canada - 1976.

"National Inventory of Sources and Emissions of Arsenic (1972)". Pollution Data Analysis Division, Air Pollution Control Directorate, Report, APCD 75-5, Environment Canada, Ottawa, 33 pages.

Atmospheric emissions of arsenic and its compounds have been estimated for 1972. Total arsenic emissions to the atmosphere in 1972 are estimated at 4073 tons. The largest contributor is the metallurgical gold processing industry which accounts for 48% of the total. Emissions from the primary iron and steel industry account for a further 26%. On a geographic basis the Province of Ontario accounts for 72% of total arsenic emissions which occur primarily from the roasting operations in the gold processing industry and from pellet and sinter operations in primary iron and steel production. Results are first approximations of the actual quantities emitted, due to paucity of data. The inventory serves to place the various emission sources in perspective and the reader is cautioned not to use emission estimates out of context of this inventory. (Author's Abstract)

1093. Environment Canada - 1976.

"National Inventory of Sources and Emissions of Manganese". Pollution Data Analysis Division, Air Pollution Control Directorate, Report, APCD 75-6, Environment Canada, Ottawa, 31 pages.

Atmospheric emissions of manganese from various Canadian sources have been estimated for the year 1972. Total emissions of manganese to the atmosphere in 1972 are estimated at 6,625 tons. The largest contributor is the ferroalloy industry which accounts for 62% of the total. Emissions from the primary iron and steel industry account for a further 37%. On a geographic basis Ontario accounts for 65% of total Canadian manganese emissions followed by Quebec with 23%. Results are first approximations due to paucity of data. The inventory serves to place the various emission sources in perspective and the reader is cautioned not to use emission estimates out of context of this inventory. (Author's Abstract)

1094. Environment Canada - 1976.

"National Inventory of Sources and Emissions of Manganese, Fluoride, and Vanadium. Summary of Emissions for 1972". Pollution Data Analysis Division, Air Pollution Control Directorate, Environment Canada, Ottawa, Report, EPS 3-AP-76-1, 13 pages.

The major sources of atmospheric emissions of manganese, fluoride, and vanadium are identified. Total amounts emitted in Canada in 1972 are estimated at 6625 tons manganese; 15,644 tons fluoride; and 2065 tons vanadium. Percentages of these totals attributed to the various emission sources named are included in the data presented. Sources and uses of each substance are also summarized briefly. Detailed reports of each individual metal are annotated elsewhere. (Author's Abstract)

1095. Gorber, D.M., Koczur, E. and Chambers, D.B. - 1975.

"Air Environment Review of Asbestos, Mercury, and Lead". Proceedings, 22nd Ontario Industrial Waste Conference, pp. 215-243.

The most significant emissions of asbestos, Hg, and Pb in Canada occur in Ontario and Quebec. Although emission factors are suitable for inventory and environmental assessment purposes, the published emission factors are not as accurate as source sampling for design, abatement, or compliance purposes. Quantitative estimates of emissions of asbestos, Hg, and Pb are presented by geographical area and source and include mining, manufacturing, waste disposal, and inadvertent releases. The flow of these materials through the Canadian economy and details of the various physical and chemical forms and uses are discussed. Existing ambient concentration measurements are provided for geographical areas of recent concern. (P.A. Abstract)

1096. Havelock, V.C. - 1975.

"Air Pollution Emissions and Control Technology. Secondary Lead Smelter and Allied Industries". Air Pollution Control Directorate, Report, EPS 3-AP-75-3, Environment Canada, Ottawa, 30 pages.

This report evaluates the contribution to air pollution by the Canadian secondary lead smelter and allied industries in 1970. Secondary lead manufacturing is defined and Canadian operations are reviewed with respect to size, location, products and emissions. Control technology is discussed and its potential for emission reduction is estimated. (Author's Abstract)

1097. Hutchinson, T.C., Czuba, M. and Cunningham, L. - 1974.

"Lead, Cadmium, Zinc, Copper and Nickel Distributions in Vegetables and Soils of an Intensely Cultivated Area and Levels of Copper, Lead and Zinc in the Growers". Trace Substances in Environmental Health - VIII, (ed.) D.D. Hemphill, University of Missouri, Columbia, pp. 81-93.

A study has been made of the Holland Marsh, an intensively cultivated area 35 miles north of Toronto, in production for less than 40 years since the drainage of the marsh from which it was formed. The muck soil varies in depth from 6 to 30 feet. Heavy applications of fertilizer and pesticides maintain high productivity. Crops include onions, carrots, potatoes, lettuce, celery, cabbage, cauliflower, parsnip and beet. Distribution of the trace heavy metals lead, cadmium, nickel, copper and zinc in the soils, crops and people was studied. The effect of cultivation practices on metal accumulation was determined by comparisons with undrained parts of the marsh. Marked soil profile effects were seen for all metals, especially for Cu. Crop levels revealed that Cu was relatively tightly held in the organic soil compared with the other metals, the order being Cu, Ni, Pb, Zn and Cd. Cadmium and Pb occurred at highest levels in the foliage of salad and leaf crops. Blood metal levels and concentrations in hair of the growers and the workers in packing stations were compared. Significant differences occurred for both Pb and Cu. Differences also occurred between males and females and in different age groups. (Authors' Abstract)

1098. Linzon, S.N. - 1974.

"Lead Surveys in Ontario 1972 and 1973". Phytotoxicology Section, Air Resources Branch, Ontario Ministry of the Environment, Toronto, 10 pages.

During the two year period 1972 and 1973 the Phytotoxicology Section of the Air Management Branch investigated a total of 45 individual companies in the Province of Ontario for the presence of lead contamination in their immediate vicinity. Lead contents in soil, native vegetation, home grown fruits and vegetables, street dust and undisturbed dust were determined in a total of 85 surveys. Lead analyses were performed on the collected samples by atomic absorption spectroscopy. Comprehensive reports prepared by Phytotoxicology staff are given for most of the surveys, with the remainder under preparation.

1099. Linzon, S.N., Chai, B.L., Temple, P.J., Pearson, R.G. and Smith, M.L. - 1975.

"Lead Contamination of Urban Soils and Vegetation by Emissions from Secondary Lead Industries". Presented at 68th Annual Meeting of the Air Pollution Control Association, Boston, Massachusetts, June. Paper No. 75-18.2, 13 pages.

During the two year period of 1972 and 1973 the Phytotoxicology Section investigated a total of 45 individual companies in Ontario for the presence of lead contamination in their immediate vicinity. For all the surveys in Ontario, a total of 2627 samples were collected with 3750 lead analyses performed. A number of other metals were analyzed in addition to lead, and specific reference is made to arsenic as a tracer for lead emissions from secondary industrial sources. The results of these tests are analyzed with data compiled in tables and figures.

1100. McCurdy, R.F. and Paulus, H.J. - 1972.

"Prediction of Heavy Metals in Settleable Particulates". *Amer. Chem. Soc. Div. Water, Air, Waste Chem. Gen. Pap.*, Vol. 12, No. 2, pp. 184-191. (Also Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry 164th National Meeting, New York, August 28-September 1, 1972).

Dustfall samples were collected from eight stations in various locations around a steel plant in the Sydney, Nova Scotia, area and analyzed for iron, manganese, and zinc by atomic absorption spectrometry in order to determine whether various statistical models could be applied to determine the statistical distribution of constituents in the samples. The data were checked for linear relationships using a least squares estimator, with dustfall residue as the independent variable and the ash, Fe, Mn, and Zn contents as the dependent variables. Ash or non-volatile content was predicted with certainty, while Fe content was also predicted with a high degree of probability. Models developed for both Mn and Zn were valuable mainly for determining approximate levels. The dustfall residue and ash content was predicted with certainty by analyzing only the Fe content and predicting the other contents. The models were developed to be applicable only to the Sydney area. (USEPA Abstract)

1101. MacLaren, James F., Limited - 1973.

"National Inventory of Sources and Emissions of Asbestos (1970)". Air Pollution Control Directorate, *Report*, APCD 73-4, Environment Canada, Ottawa, 46 pages.

Atmospheric emissions of asbestos from various sectors of the Canadian economy have been estimated for the year 1970. Total emissions were estimated to be 16,392 tons, of which 99.4% was lost during the mining and milling of asbestos fibre, 0.03% during the manufacture of asbestos products, and 0.5% during the consumption of asbestos products, principally automobile brake linings. Provincial emissions and point source locations are given. With its major asbestos production centres in the Eastern Townships, the Province of Quebec had the largest emission total, accounting for 81.5% of the total for Canada.

1102. MacLaren, James F., Limited - 1973.

"National Inventory of Sources and Emissions of Beryllium (1970)". Air Pollution Control Directorate, *Report*, APCD 73-5, Environment Canada, Ottawa, 40 pages.

Atmospheric emissions of beryllium in Canada have been estimated for the year 1970. During this year, no beryllium mining or recovery operations were carried out in Canada, nor were any planned for the near future. Manufacturing industries were found to handle imported beryllium materials with care, and therefore produced negligible emissions. Total emissions of beryllium from manufacturing operations were estimated to be less than one pound annually. Trace amounts of beryllium in coal, coke, and oil, however, produced an estimated atmospheric emission of 7.8 tons from combustion processes. The hazards associated with this release cannot be established unequivocally at this time, since information on the beryllium compounds involved is lacking. Provincial emissions of beryllium are given and point sources are identified.

1103. MacLaren, James F., Limited - 1973.

"National Inventory of Sources and Emissions of Lead (1970)". Air Pollution Control Directorate, *Report*, APCD 73-7, Environment Canada, Ottawa, 110 pages.

Atmospheric emissions of lead from various sectors of the Canadian economy have been estimated for the year 1970. The total lead emissions to the atmosphere for this year are estimated at 21,416 tons, of which 66.7% was emitted through the consumption of lead products, 25.7% through the release of trace amounts of lead in fuels and various raw materials, 7.1% through the recovery of lead, and 0.5% through the manufacture of lead goods. Automobile exhaust is the largest single source of lead emissions, accounting for 65.8% of the total. Provincial figures are estimated and point sources are identified. Both controlled and uncontrolled emission factors are given when applicable. Generally the controlled factor was computed from the uncontrolled by assuming a certain efficiency for control equipment. It became apparent that the efficiency of removal of overall particulate does not always apply to lead particulate, since the relatively small lead particles sometimes encountered are not collected efficiently. Accordingly, some of the uncontrolled emission factors computed may require modification as more data become available. Lead emissions from the iron

and steel industry, ferrous foundries, and cement plants have been estimated using measurements made in the United States. These emissions may also require modification as further data for Canadian sources become available.

1104. MacLaren, James F., Limited - 1973.

"National Inventory of Sources and Emissions of Mercury (1970)". Air Pollution Control Directorate, *Report*, APCD 73-6, Environment Canada, Ottawa, 84 pages.

Atmospheric emissions of mercury from various sectors of the Canadian economy have been estimated for the year 1970. Of the total 82.2 tons of mercury released through human activities into the atmosphere in 1970, 2.2% resulted from the primary and secondary production of mercury, 32.7% from the consumption of mercury metal, 2.7% from the consumption of mercury compounds and 62.4% from the inadvertent release of small amounts of mercury in various fuels, wastes and other materials. The largest single source of mercury emission was the chlor-alkali industry which accounted for 32.1% of total emissions. Generally, mercury vapour losses were uncontrolled, although in such operations as gold recovery and mercury distillation, condensers that formed part of the process acted as partial control equipment. Only in mercury beneficiation, the chlor-alkali industry and alkaline battery production were wash towers and cyclones used specifically to limit mercury vapour and mercury compound dust losses. Provincial mercury emissions are estimated. A map identifying point sources is given.

1105. Ontario, Air Resources Branch - 1975.

"Asbestos as a Hazardous Contaminant II". Special Studies and Program Planning Group Technology, Development and Appraisal Section, Ontario Ministry of the Environment, *Internal Report*, No. ARB-TDA-01-75, 211 pages.

Asbestos is such an ubiquitous mineral in the economy of Ontario that when concern arose about the serious health effects associated with the mineral, it was necessary to evaluate the potential problems posed by its production and use within the province. This report investigates the general properties of asbestos silicates, the sources and control of asbestos emissions, measurement techniques and asbestos-induced health effects, all in relation to the ambient atmosphere of Ontario. Recommendations as to the air quality standard development, overall program design, and the role of the Air Resources Branch of the Ontario Ministry of the Environment have been presented. (Author's Abstract)

1106. Pierce, R.C. and Katz, M. - 1975.

"Dependency of Polynuclear Aromatic Hydrocarbon Content on Size Distribution of Atmospheric Aerosols". *Environ. Sci. Technol.*, Vol. 9, No. 4, pp. 347-353.

Ambient aerosols were collected during 1972-73 using size-fractionating cascade impactors at 5 sites in Toronto, Ontario. The particulate matter was extracted with benzene. Eight polynuclear aromatic hydrocarbons (PAHs) and 2 oxygenated areas were separated by TLC and identified by absorption and fluorescence spectrophotometry. The size distribution of PAH-containing particulates followed approximately a log-normal relationship for suburban and rural sampling sites, with most of the PAH content associated with particles $<3.0\mu\text{m}$ in diameter. Variations were found in PAH content between downtown-urban, urban, suburban, and rural areas. PAH concentration in submicron particles increased in winter. (P.A. Abstract)

1107. Que Hee, S.S., Sutherland, R.G. and Vetter, M. - 1975.

"GLC Analysis of 2,4-D Concentrations in Air Samples from Central Saskatchewan in 1972". *Environ. Technol.*, Vol. 9, No. 1, pp. 62-66.

Atmospheric levels of 2,4-D were estimated as butyl and octyl esters by a 2-column GLC technique and characterized by chemical derivatization. For Saskatoon, mean total daily levels of 2,4-D (as n-butyl ester) for 33 d were 600 ng/m^3 of air and for Naicam for 47 d, 142 ng/m^3 of air. Very little 2,4-D was detected at Rosetown. Measurements were made during heavy (up to 2,000 tons) herbicide spraying in spring and early summer. (P.A. Abstract)

1108. Roberts, T.M., Hutchinson, T.C., Paciga, J., Chattopadhyay, A., Jervis, R.E., VanLoon, J.C. and Parkinson, D.K. - 1974.

"Lead Contamination Around Secondary Smelters. Estimation of Dispersal and Accumulation by Humans". *Science*, Vol. 186, pp. 1120-1124.

A high rate of lead fallout around two secondary lead smelters originated mainly from episodal large-particulate emissions from low-level fugitive sources rather than stack fumes. Lead in dustfall, and consequently soil, vegetation and outdoor dust, decreased exponentially with distance from the two smelters. Between 13% and 30% of children living in the contaminated areas had absorbed excessive amounts of lead (indicated by $>40\text{ }\mu\text{g Pb}/100\text{ ml}$ blood and $>100\text{ }\mu\text{g Pb/g}$ hair) compared to $<1\%$ in a control group. A relationship between blood and hair was established which indicated that absorption was fairly constant for most children examined. It seemed that ingestion of contaminated dirt and dusts rather than "paint pica" was the major route of lead intake. Metabolic changes were found in most of 21 children selected from those with excessive lead absorption. In this group, 10-15% showed subtle neurological disfunctions and minor psychomotor abnormalities. (Authors' Abstract)

1109. Roberts, T.M., Paciga, J.J., Hutchinson, T.C., Jervis, R.E., Chattopadhyay, A., VanLoon, J.C. and Huhn, F. - 1974.

"Lead Contamination Around Two Secondary Smelters in Downtown Toronto. Estimation of Ongoing Pollution and Accumulation by Humans". Institute for Environmental Studies, University of Toronto, Pub. No. EE-1, 74 pages.

This report gives a summary of studies carried out on behalf of the Toronto Board of Health on lead emissions from two secondary lead smelters located in downtown Toronto. It was found that lead in soil and settled dust was very high close to both smelters, due mainly to past emissions, and decreased rapidly with distance. Lead in air was also higher close to both smelters than can be accounted for by automobile exhausts or re-entrainment. Lead in dustfall resulting from current emissions was five times the acceptable criteria of $100\text{ mg/m}^2/30\text{ days}$ 100 m north of one smelter and levels north of the other smelter were only marginally above acceptable levels. It was also found that lead in blood of children decreased exponentially with distance from both smelters. It is suggested that ingestion of soil contaminated by high dustfall and lead in house-dust may be the major cause of the increased blood-leads within 150 metres of the smelters. The lead content of leafy vegetables generally exceeded the Federal standard of $2\text{ }\mu\text{g/g}$ fresh weight within 150 metres of the stack of both smelters. Recommendations are given.

1110. Whelpdale, D.M. - 1974.

"Particulate Residence Times". *Water Air Soil Pollut.*, Vol. 3, No. 3, pp. 293-300. Examination of suspended particulate concentration data from a year-long, regional air-quality study of a portion of the Great Lakes area revealed that depletion of particulates occurred during extended periods of travel over water surfaces. Based on particulate concentrations and meteorological

measurements, residence times of background regional particulate matter were found to be between 5 and 16 H in the region. Using a simple model for the deposition of particulate matter into the lakes, deposition rates ranging from 0.2 to 3.9 micro g/sq. m S were found. This results, for example, in an estimated 150 metric tons of material being deposited into Lake St. Clair, area 1270 sq. km, during a 24 H period. (WATDOC)

1111. Working Group on Lead - 1974.

"Studies of the Relationship of Environmental Lead Levels and Human Lead Intake". Report to the Ontario Minister of the Environment, Toronto, 406 pages.

This is a report of the Working Group on Lead which was set up in 1972 by the Ministry of the Environment to study the problems of lead contamination in Toronto. The report contains assessment of the data collected on lead levels near lead processing plants, discussion of the effects of these levels on public health and recommendations for studies and actions to be taken by the Ministry of the Environment.

1112. Yoshida, K. and Maybank, J. - 1974.

"Atmospheric Grain Dust Contamination in the Vicinity of Prairie Grain Elevators. Part I. Dust Fall Survey". Physics Division, Saskatchewan Research Council, Saskatchewan, 55 pages.

Dust generated in grain elevators was sampled and analyzed using cascade impactors and midget impingers followed by neutron activation analysis. The dust consisted of about 50% water insoluble material of 5 micron mass median diameter, with maximum sizes up to 50 micron. Trace mineral elements in the dust appeared to have originated as follows: aluminum and titanium from harvesting and grain handling equipment, manganese and vanadium from the soil or from combustion of fuel, and silver from pesticide residue on grain. The amount of dust fall in the two communities examined was 35-50% of the total dust generated by the grain elevators. Isoleths of dust deposition density in the two communities studied showed that the highest dust fall density (1.5-2.5 g/sq m/30 days) was produced by light southeast winds. The dispersion pattern of grain dust was delineated by a computer model of a Gaussian type dispersion and with modification of existing formulae to a mathematical model which was subsequently verified by its rough approximation to the dust fall data. (USEPA Abstract)

See Also Reference Numbers: 1013, 1015, 1021, 1025, 1026, 1027, 1029, 1034, 1036, 1037, 1040, 1043, 1048, 1051, 1082, 1083, 1085, 1086, 1134, 1149, 1158, 1162, 1164, 1165, 1166, 1168, 1172, 1173, 1174, 1178, 1187, 1188, 1190, 1191, 1193, 1194, 1198, 1199, 1203, 1204, 1207, 1216, 1217, 1221, 1225, 1235, 1238, 1241, 1242, 1243, 1244, 1245, 1246, 1250, 1264, 1265, 1268, 1272, 1276, 1291, 1294, 1300, 1302, 1304, 1342.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, v) RADIOACTIVE

1113. Anon. - 1973.

"Biology and Health Physics Division Progress Report October 1 to December 31, 1972". Atomic Energy of Canada, Ltd., Progress Report, PR-B-96, March 1973. 107 pages.

Research reports by the Chalk River (Ontario) Nuclear Laboratories on biology, population, environment, and health physics are presented. Specific topics include radiation effects on animals, effects of exposure of large numbers of people to low doses of radiation, use of thermoluminescence dosimeters, and ³H monitoring. The concentration of radionuclides in effluents entering the Ottawa River from laboratory sources is less than half the maximum permitted for drinking water. Geophysical and hydrologic exploration of the Perch Lake Basin is reviewed, with an inventory of plants and trees, measurement of evaporation, and information on transfer of nutrients from bottom sediments through roots. (P.A. Abstract)

1114. Lowdon, J.A. and Dyck, W. - 1974.

"Seasonal Variations in the Isotope Ratios of Carbon in Maple Leaves and Other Plants". Can. J. Earth Sci., Vol. 11, No. 1, pp. 79-88.

A seasonal cycle in $\delta^{13}C$, varying between -22% in early spring and -28% in late fall, has been observed in maple leaves growing under natural conditions. A similar $\delta^{13}C$ cycle, varying between -25% and -30% is indicated for grass growing in the same location as the maple leaves. The seasonal cycle appears to be analogous to the diurnal $\delta^{13}C$ cycle. $^{14}C/^{12}C$ ratios of various plants from different parts of Canada show that the ^{14}C produced by thermonuclear bombs has a half-life of approximately 11 yr. in the atmosphere over Canada. When allowance is made for the isotope fractionation effect produced by plants, no significant variations in the ^{14}C content in plants from different localities across Canada can be detected. The reported ^{14}C peak observed in atmospheric CO_2 in late summer also shows up in maple leaves, but with reduced intensity. ^{14}C levels show clearly that the first leaves in spring are composed primarily of carbon assimilated during the previous fall. (M.G.A. Abstract)

1115. Rothschild, H.C. - 1973.

"A Criteria Digest on Radioactivity in the Environment". National Research Council of Canada, NRCC No. 13566, Ottawa, 53 pages.

This is a general discussion of radioactive contamination in the environment, air, water and soil. Source, transport and effects of radioactive pollutants is discussed along with recommendations for future research. Some Canadian data are presented in tabular form.

See Also Reference Numbers: 1022, 1023, 1038, 1039, 1167, 1184, 1185, 1189.

3 CAUSE, A - SOURCE AND TYPES OF EMISSIONS, vi) GENERAL AND OTHER

1116. Acres Consulting Services, Ltd. - 1973.

"A Nation-Wide Inventory of Air Pollutant Emissions, 1970". Air Pollution Control Directorate, Environment Canada, Ottawa, Report, EPS 3-AP-73-2, 171 pages.

This report summarizes the estimates of nation-wide emissions in 1970 for Canada of the five primary air pollutants in terms of source category. The methodology utilized to generate these estimates is also summarized. The year 1970 has been selected as the base year, since more recent basic data required to prepare these estimates are, in many cases, unavailable for 1973. The accuracy of the estimates presented varies according to pollutant. Detailed studies have been completed for the major sources of

carbon monoxide, sulphur oxides, and nitrogen oxides. Estimates of these pollutants are more accurate than for hydrocarbons and particulates. For the latter two, estimates may be less accurate because of restricted information on emission factors and the extent and degree of control presently utilized for particulate emissions from several source categories.

1117. Anon. - 1973.

"Canada-Wide Inventory Completed on Air Pollutant Emissions". *Water Pollut. Control*, Vol. 111, No. 3, pp. 92-97. 8 refs.

A nation-wide inventory on air pollutant emissions was completed in Canada. The study was based on 1970 data, and is expected to be continually updated at regular intervals. The updating, coupled with ongoing measurements of air pollution levels throughout Canada, should give a clear indication of progress made in controlling air pollution. Pollutants covered in the inventory included: carbon monoxide, particulates, sulfur oxides, hydrocarbons, and nitrogen oxides. Five major categories of sources are outlined: transportation, fuel combustion in stationary sources, industrial processes, solid waste disposal, and miscellaneous sources. Each of these is briefly discussed. Findings showed that, in 1970, transportation accounted for 57% of the total air pollutant emissions (31.2 million tons); one industrial sector -- primary copper and nickel - accounted for 14% (4.5 million tons). Tables are presented for nationwide emissions by pollutant and by source. (USEPA Abstract).

1118. Anon. - 1975.

"City of Estevan, Inventory of Emissions". Air Pollution Control Branch, Environmental Protection Service, Saskatchewan Department of the Environment, Regina, 33 pages.

During the summer of 1973, staff of the Air Pollution Control Branch of the Saskatchewan Department of the Environment carried out an emission inventory of air pollutants for the City of Estevan. The study indicated that a total of 10,077 tons of air pollutants could be discharged per year in the city, an average of 1.12 tons per capita per year. 1972 was used as the base year for calculations of the annual emission rates. Transportation sources account for 93.9 percent of the total. Minor source categories include: industrial sources, 2.3 percent; private consumption of fuel, 1.9 percent; and open burning of refuse, 1.9 percent. The Estevan generating station and Boundary Dam power plants are reported separately in an appendix. (Author's Abstract).

1119. Anon. - 1975.

"City of Melville, Inventory of Emissions". Air Pollution Control Branch, Environmental Protection Service, Saskatchewan Department of the Environment, Regina, 31 pages.

During the summer of 1973, staff of the Air Pollution Control Branch of the Saskatchewan Department of the Environment carried out an emission inventory of air pollutants for the City of Melville. The study indicated that a total of 3,800 tons of air pollutants could be discharged per year in the city, an average of 0.72 tons per capita per year. 1972 was used as the base year for calculations of the annual emission rates. Transportation sources account for 88.4 per cent of the total. Minor source categories include: industrial sources, 3.5 per cent; private consumption of fuel, 5.1 per cent; and open burning of refuse, 3.0 per cent. (Author's Abstract)

1120. Anon. - 1975.

"City of North Battleford, Inventory of Emissions". Air Pollution Control Branch, Environmental Protection Service, Saskatchewan Department of the Environment, Regina, 31 pages.

During the summer of 1973, staff of the Air Pollution Control Branch of the Saskatchewan Department of the Environment carried out an emission inventory of air pollutants for the City of North Battleford. The study showed that a total of 11,632 tons of air pollutants could be discharged per year in the city, an average of 0.82 tons per capita per year. 1972 was used as the base year for calculations of the annual emission rates. Transportation sources account for 92.0 percent of the total. Minor source categories include: industrial sources, 2.6 percent; private consumption of fuel, 3.0 percent; and open burning of refuse, 2.4 percent. (Author's Abstract)

1121. Anon. - 1975.

"City of Swift Current, Inventory of Emissions". Air Pollution Control Branch, Environmental Protection Service, Saskatchewan Department of the Environment, Regina, 31 pages.

During the summer of 1973, staff of the Air Pollution Control Branch of the Saskatchewan Department of the Environment carried out an emission inventory of air pollutants for the City of Swift Current. The study showed that a total of 20,647 tons of air pollutants could be discharged per year in the city, an average of 1.36 tons per capita per year. 1972 was used as the base year for calculations of the annual emission rates. Transportation sources account for 82.4 percent of the total. Minor source categories include: industrial sources, 13.7 percent; private consumption of fuel, 2.3 percent; and open burning of refuse, 1.6 percent. (Author's Abstract)

1122. Anon. - 1975. "City of Weyburn, Inventory of Emissions". Air Pollution Control Branch, Environmental Protection Service, Saskatchewan Department of the Environment, Regina, 31 pages.

During the summer of 1973, staff of the Air Pollution Control Branch of the Saskatchewan Department of the Environment carried out an emission inventory of air pollutants for the City of Weyburn. The study indicated that a total of 7,673 tons of air pollutants could be discharged per year in the city, an average of 0.89 tons per capita per year. 1972 was used as the base year for calculations of the annual emission rates. Transportation sources account for 81.2 percent of the total. Minor source categories include: industrial sources, 9.9 percent; private consumption of fuel, 4.1 percent; and open burning of refuse, 4.8 percent. (Author's Abstract)

1123. Anon. - 1975.

"City of Yorkton, Inventory of Emissions". Air Pollution Control Branch, Environmental Protection Service, Saskatchewan Department of the Environment, Regina, 31 pages.

During the summer of 1973, staff of the Air Pollution Control Branch of the Saskatchewan Department of the Environment carried out an emission inventory of air pollutants for the City of Yorkton. The study showed that a total of 11,754 tons of air pollutants could be discharged per year in the city, an average of 0.89 tons per capita per year. 1972 was used as the base year for calculations of the annual emission rates. Transportation sources account for 91.3 percent of the total. Minor source categories include: industrial sources, 2.8 percent; private consumption of fuel, 3.5 percent; and open burning of refuse, 2.4 percent. (Author's Abstract)

1124. Environment Canada - 1973.

"A Nation-Wide Inventory of Air Pollutant Emissions. Summary of Emissions for 1970 (Final Report)". Environment Canada, Air Pollution Control Directorate, *Report*, EPS 3-AP-73-1, 18 pages.

Estimates for 1970 nationwide (Canada) emissions of the primary air pollutants carbon monoxide, sulfur oxides, nitrogen oxides, hydrocarbons, and particulates are summarized in terms of source categories. Approximately 17.3 million tons of carbon monoxide were emitted in Canada during 1970, with gasoline-powered motor vehicles being the largest single emitter and accounting for approximately 74% of the national total. Industrial processes accounted for approximately 58% of the nation's total particulate emissions of approximately 2.3 million tons. Approximately 7.2 million tons of sulfur oxides were emitted during 1970, with more than 5.4 million tons being produced by industrial processes; the burning of fuels accounted for 22% of the sulfur oxides emitted. Motor vehicles accounted for 2.0 million tons or 65% of the national total of hydrocarbon emissions, and all transportation sources accounted for 76.8% of the total. About 1.4 million tons of nitrogen oxides were emitted in Canada during 1970, with transportation sources producing approximately 62% of the total. Fuel combustion in stationary sources was the second largest source with an emission of 431,000 tons. (USEPA Abstract)

1125. Klemm, R.F. - 1972.

"Detailed Plant Operations". *Environmental Effects of the Operation of Sulfur Extraction Gas Plants in Alberta: Report*, Environment Conservation Authority of Alberta, Edmonton, pp. 18-33.

The actual plant operations are detailed in this chapter on sulfur extraction gas plants in Alberta. The various headings by which these operations are described are as follows: inlet separation, gas sweetening facilities, sulfur recovery operations, operation limitations, incineration, heat generation, drying and liquid recovery, glycol drying system, refrigeration processes, fractionation, condensate stabilization, small gas processing plants, pipeline extraction plants; all of these aspects are discussed in relation to their effects on the environment. (WATDOC)

1126. Lapointe, L. - 1973.

"La Pollution Atmosphérique au Québec". *Ressources*, Vol. 4, No. 4, pp. 6-8.

The sources of atmospheric pollution in the Province of Quebec and the extent of individual pollutants produced, such as SO₂, CO, fluorides, and malodorous substances, are discussed briefly. Federal, provincial, and urban procedures to control atmospheric pollution are outlined. (M.G.A. Abstract)

1127. Linzon, S.N. - 1973.

"The Effects of Air Pollution on Forests". Paper Presented at Fourth Joint Chemical Engineering Conference, Vancouver, September 9-12, 1973, 17 pages.

This paper presents the dosages (concentration and exposure periods) of air contaminants sulphur dioxide and ozone that are required to injure forest tree species. Symptoms of acute and chronic injuries caused by both contaminants are described. Using Canadian examples throughout, results are given on the effects of SO₂ on radial growth of white pine forests and on a number of associated biological systems. Sulphur and heavy metal contamination of snowfall, vegetation, soil, and water and their effects on floristic composition are discussed. New information is provided on controlled and ambient concentrations of oxidant (ozone) required to injure eastern white pine. Ten ppm of ozone for 6 hours in controlled experiments and over 3 ppm of oxidants (ozone) in ambient air for 10 to 15 continuous hours caused chlorotic spotting on new needles of eastern white pine. No fleck symptoms developed on foliage which had been protected by polyethylene bags. Ambient air monitoring of oxidants (ozone) in forests remote from urban or industrialized areas showed that background concentrations reached 6 ppm for 1 to 4 hour periods and that the growing season daily average was 1.14 ppm.

1128. Lock, C.J. - 1967.

"Air and Water Pollution in Hamilton". *Chem. Can.*, Vol. 19, No. 1, pp. 55-56.

In 1967, a panel discussion on Hamilton's air and water pollution problems was held at McMaster University. The panel opinion was split between the advocacy of complete removal of pollution and acceptance of limited pollution in designated areas. Dr. A. Misener argued that pollution was inevitable since completely cleaning up bodies like Lake Erie would mean the removal of 30 million people from the Great Lakes system. The condition of Burlington Bay and the air pollution from Hamilton's industry were discussed. (WATDOC)

1129. Mitchell, E.R. and Friedrich, F.D. - 1970.

"First Addendum to Mines Branch Information Circular IC 211 - Air Pollution in Canada from Fuel Combustion". Department of Energy, Mines and Resources, Mines Branch, 43 pages.

Computations of principal pollutant emissions in Canada and assumptions for such computations, based on many years of pollution measurement from various classes of combustion equipment burning all conventional fuels are presented. Fuel consumption data for 1968 are given in tables. Preliminary estimates of pollutant emission are projected to the year 2000. This addendum was necessary due to the broadening of the Mines Branch environmental improvement program to include pollution from mining, mineral processing, and pyro-and-hydro-metallurgical processes.

1130. Sentis, R.R. - 1972.

"An Emission Inventory of Air Pollutants for the City of Regina". Occupational Health Branch, Saskatchewan Department of Public Health, Regina, Saskatchewan, 24 pages.

During the summer of 1971, staff of the Air Management Division of the Occupational Health Branch of the Saskatchewan Department of Public Health carried out an emission inventory of the City of Regina. The study showed that a total of 52,315 tons of pollutants are discharged per year in the city. 70.54% of this can be attributed to transportation sources, 23.6% due to industrial sources and 4.56% due to the private consumption of heating fuels. Detailed analyses of the emissions are given in one of the appendices.

See Also Reference Numbers: 1013, 1024, 1032, 1034, 1035, 1036, 1037, 1041, 1045, 1135, 1153, 1164, 1187, 1207, 1257, 1258, 1303, 1304, 1313, 1333.

3. CAUSE, B - ATMOSPHERIC AND TOPOGRAPHIC INFLUENCES

1131. Anon. - 1972.

"New Environmental Control Projects at Shell Canada Sarnia Refinery". *Oilweek*, Vol. 23, No. 29, pp. 26, 28, 32, 40.

An oil refinery pollution control program costing \$2.5 million for air quality measures and \$2.7 million for improved waste water quality is described. The sulfur content of the fuel is being reduced to decrease sulfur dioxide emissions. The remaining SO₂ will be dispersed into the atmosphere by three new high stacks. Water pollution is being reduced by biological oxidation and oil separation. Oil spills are also being eliminated. (USEPA Abstract)

1132. Aziz, K., Donnelly, J.K. and Wallis, J.P.A. - 1973.

"Computer Simulation of Pollutant Dispersion: Single Stack and Air Shed Models". *Proceedings*, Workshop on Sulphur Gas Research in Alberta, *Information Report*, NOR-X-72, Northern Forest Research Centre, Edmonton, Alberta, pp. 32-51.

This study compares analytical, Sutton and numerical models on a consistent basis for a single stack. Diffusion coefficients are shown to affect discretization error considerably, small coefficients giving large errors and large coefficients small errors. In both cases the error decreased with increased downwind distance. Turbulent transport models did not compare favourably with the Sutton equation or analytical solutions. It is proposed to extend this work to a simple air shed model for Alberta. Various aspects of an air shed model are discussed. (Authors' Abstract)

1133. Baker, J., Hocking, D. and Nyborg, M. - 1973.

"Effect of Atmospheric Sulphur Dioxide on the pH of Rain Intercepted by Forest Trees". *Proceedings*, Workshop on Sulphur Gas Research in Alberta, *Information Report*, NOR-X-72, Northern Forest Research Centre, Edmonton, Alberta, pp. 98-102.

In this study of acidity of intercepted rain in a lodge-pole pine forest near the Aquitaine Ram River Gas Processing Plant in Alberta, it is demonstrated that throughfall and stemflow precipitation are more acid than open rainfall. It is suggested that sulphur dioxide emissions on the forest vegetation lower the pH of intercepted rainfall through adsorption.

1134. Banfield, C.E. and Thompson, L.K. - 1975.

"The Influence of Local Topographic and Meteorological Factors Upon Suspended Particulate Matter and Gaseous Pollutants Near a Phosphate Reducing Plant". Paper Presented at the Canadian Association of Geographers, Annual Meeting, Vancouver, 14 pages.

The research was carried out with two principal objectives in mind. The first was to investigate the degree to which certain meteorological factors affect concentrations of particulate air pollution near a phosphorus industry at Long Harbour, Newfoundland. Second, the spatial distribution in the soil and vegetation of one of the pollutants emitted from this source, namely fluorides, is mapped and related to local topography and wind conditions. The results illustrate a situation in which a combination of local topography and low heights of emission accentuate the degree to which the immediate area is subjected to relatively heavy air pollution.

1135. Benson, C.S. - 1969.

"The Role of Air Pollution in Arctic Planning and Development". *Polar Rec.*, Vol. 14, No. 93, pp. 783-790.

Air pollution meteorology is discussed. Low temperatures combined with strong surface inversions in wind-sheltered lowlands produce exceptionally stable air masses which are easily polluted. The location of cities, such as Whitehorse, in valley bottoms makes them especially susceptible to air pollution. Coal smoke and gases, specific toxicants, smog and ice fog are Arctic pollutants that are described. Their sources and results are outlined.

1136. Brewer, A.W., Davis, P.A. and Kerr, J.B. - 1972.

"Nitrogen Hydride as a Possible Stratospheric Constituent". *Nature*, Vol. 240, No. 5375, pp. 35-36.

Spectroscopic photometric measurements of light wavelengths taken at Toronto, Ontario, and Kingston, Jamaica, suggest that a layer of nitrogen hydride (NH) is present between 40 and 50 kilometers in height of the stratosphere. The NH seems to be produced by photo-chemical effects but from what precursor or by what radiation cannot be stated.

1137. Brewer, A.W. and Kerr, J.B. - 1973.

"Total Ozone Measurements in Cloudy Weather". *Pure Appl. Geophys.*, Vol. 106-108, pp. 928-937.

Obtaining an accurate value for total ozone under a cloudy sky, especially when the sun is not high, is a major remaining problem associated with total ozone measurements. The Toronto spectrophotometer was designed with this in mind. It was fitted with a polarizing prism, and measured light at four wavelengths simultaneously, so two independent double ratios were obtained. Clouds produce two effects on ozone measurements; the first is purely an optical effect which causes an apparent increase in ozone, the second is most likely a real increase in ozone associated with large cumulus-type clouds. By considering the three following points, it is possible to distinguish between these two cloud effects and probably measure the true total ozone for solar zenith angles less than 80 deg. The multiply scattered component of polarized light is used to reduce optical cloud variance. This makes all skies appear like thick clouds. A double difference similar to the AD method is used but the two ratios of the double difference are weighted inversely with DeltaBeta (DeltaBeta equals Beta₁ - Beta₂ for a pair). This further reduces the optical effects of clouds. Real ozone increases due to large clouds are verified by comparing the increase in ozone obtained from one double difference to that of another. Differences between this multiply polarized curve and the direct sun curve are given, along with a technique to obtain an accurate value of total ozone under all sky conditions, provided that the solar zenith angle is less than 80 deg. (USEPA Abstract)

1138. Brewer, A.W., McElroy, C.T. and Kerr, J.B. - 1973.

"Nitrogen Dioxide Concentrations in the Atmosphere". *Nature*, Vol. 246, No. 5429, pp. 129-133.

Spectrophotometric studies of atmospheric nitrogen dioxide over Canada have revealed the existence of two layers of the gas which have very different properties. Near the ground in relatively unpolluted Canadian air there is a variable amount of NO₂ of the order of 0.001 atm. cm. which is present at night. It tends to be larger at dawn than at sunset and is greatly reduced when the sun is high. The total NO₂ in the upper atmosphere for bright clear days does not seem to change very much from day to day, but it has a strong diurnal variation, with a maximum near noon. There is about 0.00035 atm. cm. overhead at sunrise, about 0.003 atm. cm. when the sun is high, and about 0.00055 atm. cm. at sunset. The concentration of the NO₂ does not change rapidly with height, probably up to 40 km. Expressed as mixing ratio it increases strongly with height, probably at least to 40 km. This distribution results in a very heavy downward transport of the gas and its associated compounds from the upper stratosphere into the troposphere. (USEPA Abstract)

1139. Brown, D.B. and Brown, J.R. - 1972.

"Climate Classification and the Effect of Climate Upon the Past, Present and Future of Cornwallis Island, N.W.T." Institute of Environmental Sciences and Engineering, University of Toronto, EG-5, 15 pages.

Climate is a dominating factor on Cornwallis Island. It has greatly affected its past history and the present and it will almost certainly influence its future. The soil is unsuitable for vegetation and geological studies have shown that while it is basically a sedimentary structure, it is unlikely, owing to faults in certain areas of the island, that gas or oil exist. The climate is, in many ways, not too different from the remainder of the Arctic archipelago. The problems arising are largely those of inversion due to the peculiar circumstances of the water-ice interfaces around the island. If the northern archipelago is developed industrially serious consideration will have to be given to the problem of inversion and the resultant air pollution "smogs" that would arise. (WATDOC)

1140. Chanasyk, V. - 1970.

"Atmospheric Inventory and Air Pollution Analysis". In *The Haldimand-Norfolk Environmental Appraisal, Volume One, Inventory and Analysis*. Ontario Ministry of Treasury, Economics and Intergovernmental Affairs, Toronto, pp. 23-53.

This chapter of the report discusses the air pollution meteorology and climatology of the Haldimand-Norfolk area of Southern Ontario. Data are presented in tabular form and recommendations are presented concerning the location of industry, recreation facilities and urban centres within this area.

1141. Danard, M.B. - 1972.

"Numerical Model for Meso-Scale Orographic Influences on Surface Wind Speed and Direction". Studies on Air Pollution Potential Over British Columbia, Report No. 2, British Columbia Department of Lands, Forests and Water Resources, Water Pollution Control, Victoria, 52 pages.

A primitive equations, one-level, adiabatic, numerical model has been designed to simulate orographic influences on surface wind speed and direction. The model is tested for 12 case studies in the Okanagan Valley and verified with wind data at Vernon, Kelowna and Penticton. Mean absolute errors between computed and observed winds are 28 degrees in direction and 2.5 M sec. to the negative one in speed. Sources of error of the model and applications to air pollution are also discussed. (WATDOC)

1142. Dickson, D.R. and Quickert, N. - 1975.

"The Chemical Composition of Photochemical Air Pollution". In *Photochemical Air Pollution: Formation, Transport and Effects*. Associate Committee on Scientific Criteria for Environmental Quality, National Research Council, Canada, NRCC No. 14096, Ottawa, pp. 27-51.

This paper outlines the types, sources and concentrations of the chemical species which may lead to the formation of photochemical smogs in Canada. While the text of this collection of papers is general in nature, several tables and figures illustrate specific Canadian data.

1143. Fanaki, F.H. - 1975.

"Experimental Observations of a Bifurcated Buoyant Plume". *Boundary, Layer Meteorol.*, Vol. 9, No. 4, pp. 479-495.

During measurement of the plume rise from the 381-m International Nickel Company stack in the Sudbury area, it was observed that on some occasions the plume bifurcated. The bifurcation lasted from a few seconds to tens of minutes. During this time, the plume behaved like two separate plumes, each attached to the chimney, with a relatively clear region between them. The two branches travelled downwind at either the same or different heights, depending on the ambient meteorological conditions. Vertical wind direction shear tended to diffuse the two branches at different rates. In an attempt to explain the initiation and the mechanism of bifurcation, field observations are presented and analyzed. (Author's Abstract)

1144. Fanaki, F.H., and Kovalick, J. - 1974.

"Diffusion of Vehicle Exhaust Fumes". *Atmos.*, Vol. 12, No. 2, pp. 50-61.

Diffusion of motor vehicle exhaust fumes is a function of not only the type of fuel and vehicle age but also of the vehicle movement, atmospheric wind, turbulence and thermal stability. Two methods are used to examine these effects on the diffusion of the exhaust fumes: direct probing by means of road tests using a full-scale system and wind tunnel tests using a model. Field tests have been conducted at the Meteorological Field Station at Woodbridge. The tests include a common stationwagon. A meteorological instrumented tower was used at the test site. Attention was given to the flow of the exhaust fumes by observing and photographically recording their entrainment and modification by the ground, wind speed and thermal stability. Motor vehicle aerodynamics were studied in a specially designed wind tunnel. Streamlines passing over the roof of the vehicle swept down to the ground level and then divided to form a series of vortices. These in turn helped to elevate the exhaust fumes to a height which depends on the vehicle size. (Authors' Abstract)

1145. Grover, R.O. 1974.

"Herbicide Entry into the Atmospheric Environment". *Chem. Can.*, Vol. 26, No. 7, pp. 36-38. (Also Presented at the 2nd Meeting on Herbicide Chemistry and Biochemistry, March 4-5, 1974, Regina.)

The environmental hazards from the drift of herbicides as droplets which occur during application and to the losses by volatility which may occur both during and immediately following an application are discussed. Atmospheric monitoring data collected over the past decade in Saskatchewan show that the high volatile butyl esters constitute the predominant form of 2,4-D in the air. It was detected about 50% of the time at levels between 0.01 to 1 micrograms/cu m of air. It seldom exceeded 5 micrograms/cu m. Conventional field spraying with ground sprayers emit about 5% of herbicides in droplet drift and about 30% in vapor loss. Much greater drift hazards exist from the vapor losses than from the droplet drift. An increase in wind speed increases droplet drift. (USEPA Abstract)

1146. Hodgson, G.W., Krouse, H.R., Mohtadi, M.F., Rowe, R.D. and Nyborg, M. - 1975.

"A Sulphur Budget for Sour Gas Plants". Paper Presented to First International Symposium on Acid Precipitation and the Forest Ecosystem, July 1975.

The effluent from a sour gas plant S recovery unit is considered to be relatively clean in the sense that the only pollutant emitted is sulfur dioxide (SO₂) without a significant loading of particulates or other contaminants. This effluent is markedly different from that emitted from a coal-burning power plant, a smelter, or an oil sands coke-burning power plant, and may have a greater potential to acidify soils and water because there appears to be less opportunity to form neutral sulfates (SO₄⁻²). A mesoscale S budget for the group of sour gas plants near Calgary is currently being investigated, and the plume rise and dispersion for one of the plants has been investigated in detail. A preliminary budget is presented for some summer months during 1973 and 1974, using data

obtained at 30 sites for the pH and SO_4^{-2} content of rainfall, dryfall, water (protected), soils and grasses, and at many hundred locations for total sulfation using lead candles. Plume tracing experiments to test various models of the dispersion and chemical transformation of SO_2 and to refine the S budget from sour gas plants are discussed. (P.A. Abstract)

1147. Kramer, J.R. - 1973.

"Fate of Atmospheric Sulphur Dioxide and Related Substances as Indicated by Chemistry of Precipitation". *Report to Air Management Branch, Ministry of Environment and Water Quality Branch, Ontario Ministry of Environment, Toronto, 231 pages.*

This is a report of research attempting to define the amount of various chemical constituents which can be washed out of the atmosphere by precipitation. The research was carried out between 1970 and 1973 at thirty-four sites in Northern Ontario. Results are analyzed and described in depth with many tables, charts and maps.

1148. Kramer, J.R. - 1975.

"Fate of Atmospheric Sulphur Dioxide and Related Substances as Indicated by Chemistry of Precipitation". *Report to Air Management Branch, Ontario Ministry of the Environment, Toronto, 234 pages.*

This report covers the period of research from June 1973 to October 1974 and is a continuation of research begun in 1970. (See Ref. 1147.) The research was carried out at 44 sites in Northern Ontario. The focus of research is the various chemical constituents which can be washed out of the atmosphere by precipitation. Results are analyzed and described in depth with many tables, charts and maps.

1149. Kramer, J.R. and Muller, E.F. - 1975.

"Precipitation Scavenging in Central and Northern Ontario". *Proceedings, Champaign Symposium on Precipitation Scavenging, Oct. 14-18, 1974, U.S. Atomic Energy Commission, 18 pages.*

Time averaged deposition of SO_4 , Fe, Ni and Cu are presented and discussed in view of the industrial mining and smelting activities and associated atmospheric emissions in Central Ontario for the period 1970 to 1974. Deposition rates compared for the periods after and prior to the installation of a 381 meter stack of a main smelter complex in Sudbury show an increase of depositional area, but less deposition near the source. Deposition rates are shown to be highest in the Sudbury area and decrease with increasing distance from Sudbury. Deposition rates decrease in the following order: Fe, Ni, Cu, and SO_4 . Material balance of emitted versus deposited materials shows removals from 100% to 0.5%. (Authors' Abstract)

1150. Kwizak, M. - 1973.

"Real-time Meteorological Prediction in Support of Air-Quality Control Operations in Canada". North Atlantic Treaty Organization, Committee on the Challenges of Modern Society, *Proceedings, Expert Panel on Air Pollution Modeling, 4th Meeting, Oberursel, West Germany, May 28-30, 1973, pp. XVII-1-XVII-5.*

Routine meteorological forecast support as well as research and development programs of Canada's Atmospheric Environment Service are outlined in relation to air pollution episode control activities. The major air quality prediction support routinely available for the AES at the present time, aside from the prediction of standard meteorological variables (wind, temperature, stability), involves forecasts of so-called stagnation and related indices. These indices give a general qualitative indication of the ability of the atmosphere to move air pollutants vertically or horizontally from their source regions. The approach, however, is limited in that: the indices do not entirely relate to the physical processes involved in the movement of pollutants; the method does not give a quantitative measure of the ventilation capability of the atmosphere; and it does not take into account local variability due to terrain. Research and development projects currently underway to improve air pollution forecasting include: the development of a relative air-pollution potential index which is directly relatable to air pollution build-up for specified areas (100 km to a side); replacement of the indices with actual pollution predictions, pending the availability of pollution source parameters; introduction of terrain influences and special urban models for providing predictions down to a scale of 10 km; and systems to examine and predict the large-scale background pollution. (USEPA Abstract)

1151. Leahey, D.M. - 1974.

"A study of Air Flow Over Irregular Terrain". *Atmos. Environ., Vol. 8, No. 8, pp. 783-791.*

Wind measurements collected in the Battle River Valley of Alberta indicate that air flowing over river banks of moderate slope may parallel the terrain and that turbulence is greater over such features than over regular topography. The higher turbulence levels cause a faster dispersion of plant fumes. Ground level SO_2 concentration which might result from power plant fumes flowing over a river bank was predicted by a Gaussian model. Use of Pasquill's diffusion coefficient did not predict the SO_2 concentration as well as did the use of the larger derived coefficients.

1152. Leahey, D.M. - 1975. "An Application of a Simple Advective Pollution Model to the City of Edmonton". *Atmos. Environ., Vol. 9, No. 9, pp. 817-823.*

This paper describes a study which involves the application of a simple advective model to the City of Edmonton for the prediction of ground-level NO_x concentrations. Routine wind observations and air quality measurements were used to evaluate the model. All calculations were performed by hand. An analysis of over 300 hours of observations showed that the model predicted with errors, on the average, of a factor of one half. (Author's Abstract)

1153. Lunn, G.R. - 1974.

"A Climatological Investigation of Air Pollutants in Calgary's Urban Heat Island". M.A. Thesis, Department of Geography, University of Calgary, Calgary, 1972 pages.

This study investigated the role of climate in controlling the occurrence and the distribution of air pollutants in the City of Calgary, Alberta. The study area is described in relation to its topography and climate. Attention is concentrated on inversion phenomena in Alberta, urban temperature fields in Calgary, and previous data trends and anomalies from air monitoring systems in Calgary. Ozone, A.I.S.I. and COH monitor operating characteristics are presented. Positive and negative aspects of these monitors and their relationship to the visual recording of pollutants is evaluated. Historical records of the Calgary air monitoring program are used to present relationships between air pollutants and inversion intensity. The effect of pre-chinook and chinook wind occurrences on pollution values and inversion phenomena is presented. Pre-chinook or upslope conditions are seen to be responsible for high pollution levels in the City of Calgary. Supplementary data show that high nocturnal ozone values are related to thunderstorm (lightning), cold fronts or mountain winds. During the day, high values are either due to photochemical "smog" or as a result of vertical mixing of naturally occurring ozone. COH values maximize at 0°C and during calm winds, this occurs both in Edmonton and

Calgary. This occurrence is probably related to large quantities of ice nuclei emitted during rush hour in cold weather. (Author's Abstract)

1154. Melo, O.T. and Phillips, C.R. - 1974.

"Ambient Oxidant Measurements at Toronto, Canada". *Atmos. Environ.*, Vol. 8, No. 11, pp. 1195-1201.

Ambient oxidant concentrations have been monitored at Toronto, Canada, since 1970. During the first 2 years of the survey, more than 100 hourly concentrations in excess of 10 ppm were observed. In the summer months, high oxidant concentration levels appeared to result from photochemical reactions since they were accompanied by the daily fluctuations of primary and secondary pollutants characteristic of photochemical activity. Simultaneous analysis of the oxidant monitoring data and continuous records of meteorological parameters showed that high oxidant concentrations occurred on days of high temperatures, long solar irradiation periods and southerly winds. The analysis indicated that the oxidant precursors may have originated from sources to the south of Toronto. (Authors' Abstract)

1155. Moss, M.R. - 1975.

"Ground Surface Concentrations of Atmospheric Sulphur in the Vicinity of Welland, Ontario; Some Ecological Implications". *Report to the Air Quality Branch, Ontario Ministry of the Environment, Toronto, 16 pages.*

Two surveys were undertaken to study the concentrations of atmospheric sulphur at the ground surface in the area of Welland, Ontario, the first in 1968 and the second in 1973. Welland provides an ideal site for this study since it is heavily industrialized and is isolated from other industrial centers. The results indicate a heavy concentration of sulphur immediately to the east of the major sources of industrial emissions. This concentration is downwind of the sources in terms of a dominant westerly air flow in this area. Two other concentration areas with values lower than the first are separated from the first area and are located to the east and west of it. While a significant causal relationship can be drawn between the distribution of atmospheric sulphur and the distribution of sulphur in the biotic component for the area of highest concentration, the two areas of lower concentration cannot be conclusively explained. It is suggested that further study of the heat island phenomenon, pollution domes and mesoscale air circulation patterns should answer this question.

1156. Moss, M.R. - 1975.

"Spatial Patterns of Precipitation Reaction". *Environ. Pollut.*, Vol. 8, pp. 301-315.

In many parts of the world precipitation reaction is becoming more acid. The spatial impact of this phenomenon is increasing, being attributed to the increasing output of gaseous pollutants from industrial areas. Analyses were conducted on samples of precipitation for two urban, industrial centres, Sheffield (Great Britain) and Welland (Ontario, Canada). In each, quite different results were found. Precipitation in Welland was considerably less acid than in Sheffield, but the results show both sites to be less acid than many rural areas. Precipitation is further analyzed to explain the results and the findings indicate that in urban areas the spatial patterns are to be explained by many factors, chemical and meteorological, often unique to each site. The impact of such urban centres on rural environments, in increasing acidity, appears in most cases, however, to be the previously-accepted process resulting from the slow drift of gaseous pollutants, many other substances having been removed within the urban areas. (Author's Abstract)

1157. Moss, M.R. - 1975.

"Spatial Patterns of Sulphur Accumulation by Vegetation and Soils Around Industrial Centres". *J. Biogeog.*, Vol. 2, No. 3, pp. 205-222.

The normal functioning of the global sulphur cycle is disrupted by sulphur released by anthropogenic factors from the lithosphere into the atmosphere. The pathways of this released sulphur follow the natural pathways of the sulphur cycle so that much of it enters the soil/plant system. The reactions at the interface between the atmosphere and the biosphere are examined, and the patterns of excess sulphur accumulation investigated around two industrial centres, namely Sheffield in the U.K. and Welland, Ontario. The patterns encountered do not show any simple linear relationship with respect to distance from the source. Patterns are explained by reference to many interrelated factors; for Sheffield, the general environmental deterioration over many decades is important and for Welland, they relate to the nature of the urban mesoscale atmospheric circulation patterns. Contrasts in sulphur accumulation between woodland and grassland ecosystems are discussed. 'Pollution' as such is not studied, but the accumulation of excess sulphur obviously has direct implications for environmental pollution. (Author's Abstract)

1158. Munn, R.E. - 1974.

"Study of Regional Particulate Pollution in the Detroit-Windsor, Sarnia-Port Huron Area". *Proceedings, Symposium on Turbulent Diffusion in Environmental Pollution, Charlottesville, Virginia, April 8-14, 1973*, pp. 111-126. (Published in part as "Suspended Particulate Concentrations: Spatial Correlations in the Detroit-Windsor Area", *Tellus*, Vol. 27, No. 4, pp. 397-405.)

This study of the regional dispersion of particulate matter in the Detroit-Windsor, Sarnia-Port Huron areas emphasizes the meteorology of air pollution and the pollution contribution from one urban area to another. A relatively simple diffusion equation is applied to the data collected. The results indicate that it might be possible to combine large scale numerical models of the atmosphere with trajectory-diffusion point-source models of pollution to predict regional air quality.

1159. Munn, R.E. - 1975.

"The Oxidant Climatology of Canada". In *Photochemical Air Pollution: Formation, Transport and Effects*. Associate Committee on Scientific Criteria for Environmental Quality, National Research Council of Canada, NRCC No. 14096, Ottawa, pp. 53-70.

This paper discusses the oxidant climatology of Canada in relation to photochemical air pollution. Attention is focussed on the probability of the occurrence of inversions and the distribution of solar radiation in Canada.

1160. National Research Council, Canada - 1975.

Photochemical Air Pollution: Formation, Transport and Effects. Associate Committee on Scientific Criteria for Environmental Quality, National Research Council of Canada, NRCC No. 14096, Ottawa, 224 pages.

This document synthesizes the available relevant information on the formation, transport and effects of photochemical air pollution. It was subsequently shown that in certain locations of Canada, under specified meteorological conditions, the potential for the formation of photochemical air pollution exists. Papers on the chemical composition of photochemical air pollution and the oxidant climatology of Canada are annotated elsewhere in this *Bibliography*.

1161. Naylor, A.G. - 1975.

"Report on Snow Sampling Studies 1974-75". *Report* to Air Resources Branch, Ontario Ministry of Environment, Toronto, 45 pages.

The purpose of this study was to determine if large concentrations of dissolved sulphur dioxide were present in snow that had fallen close to or through the plume from the Inco Coppercliff super stack. It was feared that large concentrations could have the same damaging effect on vegetation as a bad fumigation, which were regular in occurrence with the smaller stacks at Coppercliff. The study considers samples from three suitable events. (Author's Abstract)

1162. Nyborg, M. - 1974.

"Reclamation of Soils and Waters Made Acid by Windblown Sulphur Dust". In *Proceedings, Workshop on Reclamation of Disturbed Lands in Alberta, Northern Forest Research Centre, Edmonton, Alberta, March 27-28, 1974, Report, NOR-X-116*, pp. 55-70.

Approximately five million tons of elemental Sulphur are produced annually in Alberta from the processing of sour natural gas. The storage, handling and loading of Sulphur give off sulphur dust that may be carried onto adjacent land by wind. In soil, Sulphur may be oxidized to H_2SO_4 causing acidification. Such soils are barren, prone to wind and water erosion, and make runoff water extremely acid. Reclamation of such soils with $CaCO_3$ is discussed. Results of reclamation of Alberta soils are shown in table form. Alberta plant species tolerances to low pH are also shown in tables.

1163. Padmanabhamurty, B. - 1975.

"Eigenvectors of Sulphur Dioxide in Metropolitan Toronto and Their Association with Meteorological Parameters." *Atmos. Environ.* Vol. 9, No. 3, pp. 365-366.

The interrelationship between eigenvector coefficients and some commonly measured meteorological parameters was shown by computing the partial and multiple correlation coefficients. The study pointed out that of the many meteorological parameters, wind direction and wind speed are the dominant factors in the interrelationship. (PA Abstract)

1164. Padmanabhamurty, B. - 1975.

"The Role of Wind in Pollution Dispersion". *J. Air Pollut. Control Assoc.*, Vol. 25, No. 9, pp. 956-957.

To assess the relationship between wind and pollution dispersion, average concentrations of sulfur dioxide and particulates were measured for over two years along with regional winds at downtown locations in Sudbury, Sarnia and Toronto. Results of this study are illustrated in a figure and a table. Critical wind speeds are given for each test location. Data for each city are analyzed separately.

1165. Padmanabhamurty, B. and Hirt, M.S. - 1974.

"The Toronto Heat Island and Pollution Distribution. *Water Air Soil Pollut.*, Vol. 3, No. 1, pp. 81-90.

A study of the lapse rate or stability at the Meteorological Research Station at Woodbridge (rural) and its relation to heat island intensity in Toronto has been made. For clear and partly cloudy conditions with offland winds, it was found that the heat-island intensity increased linearly with the lapse rate-stability. Furthermore, it was found that the concentration of particulate pollutants increased as the heat island intensity increased.

1166. Powe, N.N. - 1969.

"The Climate of Montreal". Meteorological Branch, Canada Department of Transport, *Climatological Studies*, Number 15, 51 pages.

This booklet offers a complete description of the climate of Montreal, including a brief discussion of air pollution in the city. Soiling index cycles are discussed and illustrated in graph form. Types of weather conditions that allow air pollution to accumulate are also described.

1167. Reimer, A., Reichert, J.K. and Scott, A.G. - 1973.

"Effect of Meteorological Variables on Atmospheric Suspended Particulates and Associated Natural Radon and Thoron Daughters." *Proceedings, Symposium on the Physics and Behaviour of Radioactive Contaminants in the Atmosphere, International Atomic Energy Agency and World Meteorological Agency, Vienna, November 12-16, 1973*, pp. 189-210.

The effects of meteorological variables on suspended particulates and natural radon and thoron daughters in the lower atmosphere over Manitoba, Canada were examined. Radon and thoron daughter concentrations depended mainly on temperature and wind during the summer; no clear-cut association was observed during the winter. Monthly mean particulate concentrations varied from about 25 micrograms/cu m during the summer to about 8 micrograms/cu m during the winter except during periods of soil erosion. A particulate concentration cycle with a duration of 3-4 days was observed which agreed closely with the atmospheric pressure periodicity (3.5-3.9 days) for this latitude, illustrating the physical dependence of pollution cycles on synoptic scale meteorological features. (USEPA Abstract)

1168. Sereda, P.J. - 1973.

"Weather Factors Affecting Corrosion of Metals". *Proceedings, 76th Annual Meeting of the American Society for Testing Materials, Philadelphia, June 24-29, 1973*, pp. 7-22.

Various weather factors and air pollutants are assessed in relation to the corrosion of metals. Time of wetness (corresponding to the time during which humidity exceeds 86.5%) is a very important factor in metal corrosion. Reasonable values are obtained from analysis of meteorological records and are applicable to the prediction of long-range corrosion effects. Short-term corrosion data necessitate the collection of data for particular exposure conditions. Chemical agents identified with corrosion are; sulfur dioxide, hydrogen sulfide, ammonia, nitrite, nitrate, sodium chloride, and particulate matter. Multiple regression analysis of corrosion data and corresponding weather factors do not always indicate significant correlation with temperature, perhaps due to the close coupling between time of wetness and low temperature periods. Data are also summarized for SO_2 pollution in major Canadian cities. (USEPA Abstract)

1169. Shaw, R.W. and Whelpdale, D.M. - 1973.

"Sulphate Deposition by Precipitation into Lake Ontario". *Water, Air, Soil, Pollut.*, Vol. 2, pp. 125-128.

Measurements of sulphate concentration in precipitation from individual snow storms of several hours duration in the Western Lake Ontario region indicate that approximately $9-66 \text{ mg m}^{-2}$ of $SO_4^{=}$ is being deposited into the lake per storm. This amount is up to several times more than daily average values over long periods found by other workers. Using a mean sulphate concentration of 4 mg l^{-1} and an annual accumulation of precipitation of 760 mm, the yearly sulphate deposition by precipitation is about 0.1%

of the total mass of sulphate in the Lake; however, more significantly it is of the same order of magnitude as that discharged directly into the lake by industry. (Authors' Abstract)

1170. Sheih, C.M. and Moroz, W.J. - 1972.

"Lake Breeze Pollutant Transport Modelling". Center for Air Environment Studies, Pennsylvania State University, University Park, Report, 295-73, 37 pages.

A two dimensional lake breeze model covering both sides of the lake and allowing for various synoptic pressure gradients is described and applied to the Lake Ontario region to assess the relative pollution potential of the area. The model uses Estoque's techniques for the sea breeze and is essentially the extension of Moroz's lake breeze model with modifications in the treatment of the continuity equation eddy diffusivity, boundary conditions and numerical scheme. Application of the model to the cross section of Lake Ontario at Toronto (prevailing wind from north and perpendicular to the shore) reveals that the combination of the prevailing wind, onshore lake breeze, updraft over the land, and downdraft over the lake results in a closed circulation cell which is capable of trapping pollutants inside and accumulating the concentration to a hazardous level. The vertical velocity is downwind and the atmospheric stability is stable over the lake, making a plume drift downward and remaining concentrated in a line without dispersion until it reaches the land. The congestion of pollutant sources from the center of the lake to the lake breeze front is thus inadvisable. (USEPA Abstract)

1171. Shenfeld, L., Hirt, M.S., Whaley, H. and Lee, G.K. - 1973.

"Diffusion Studies of Plumes Influenced by an Urban Area and a Large Relatively Cold Lake". *Proceedings*, Third International Clean Air Congress, Dusseldorf, Germany, pp. B16-B19.

Two large thermal generating stations are located on the shore of Lake Ontario in the Metropolitan Toronto area. The shoreline portion is, in the main, industrial in character. Residential and commercial areas extend inland for about twenty kilometers. This paper described plume behaviour, first, on a day when it is trapped within an inversion advected inland over the city by geostrophic off-lake winds, and second, on a day when the plume penetrates the inversion layer developed by a cool lake breeze.

1172. Stengle, T.R., Lichtenberg, J.J. and Houston, C.S. - 1973.

"Sampling of Glacial Snow for Pesticide Analysis on the High Plateau Glacier of Mount Logan". *Arctic*, Vol. 26, No. 4, pp. 335-336.

Techniques were developed for taking snow samples at high altitudes in locations where adverse conditions dominated and simple equipment was necessary. Samples taken at an elevation of 5,364 m on Mount Logan, Yukon Territory, Canada, with a new SIPRE snow auger showed traces of an oily material. Sample containers are described and precautions taken to avoid sample contamination are reviewed. No DDT was detected in any of 19 samples analyzed by gas chromatography. Sampling of glacial snow for trace organic pollutants is feasible. All equipment should be carefully precleaned, since PCB traces from the oil contamination on the auger affected results. (P.A. Abstract)

1173. Stokes, P.M. and Hutchinson, T.C. - 1975.

"The Effects of Acid and Particulate Precipitation on Phytoplankton and Lake Chemistry in the Sudbury Region of Ontario, Canada". Paper Presented to First International Symposium on Acid Precipitation and the Forest Ecosystem, July 1975.

The Sudbury basin, Ontario, is the source of ⁸⁰% of the free world's Ni and is also a major producer of Cu, Fe, Co, and other metals. The sulfur dioxide and particulate discharge from the Sudbury smelters is described. A survey of some of the lakes in the Sudbury area (commencing 1958) revealed high sulfate concentration in lakes within 1.9 km of the smelters. Many of these lakes also had abnormally low pH values. A survey of the phytoplankton revealed severely depauperate populations and a low productivity. Bioassays on waters from lakes within 1.9 km of one of the smelters indicated pH limitations to growth and survival and severe but complicating metal problems, from metals occurring in rocks and from particulate fallout. Algal isolates from these contaminated lakes proved to be metal tolerant. The use of increasingly tall stacks has extended the area of occurrence of acid rain. Acidification of lakes at least 24.8 km from the smelter was revealed with changes in phytoplankton composition, even though overall phytoplankton biomass might not always be decreased. Acid precipitation into lakes, especially shield lakes of low buffering capacity, might not only lower the pH and increase the solubility and availability of toxic heavy metals, but might also result in wide and rapid fluctuation in pH. Shifts in species population composition of algae such as was observed would presumably also have effects on the primary consumers in the lakes. Possible consequences of acid rainfall on lake ecology in this and similar areas are discussed. (P.A. Abstract)

1174. Vekris, S.L. - 1971.

"Dispersion of Coal Particles from Storage Piles". *Ont. Hydro. Res. Q.*, Vol. 23, No. 2, pp. 11-16.

The dispersion of dust from a large coal pile at Lakeview Generating Station has been examined and a theory developed for calculating the deposition at distances of a few thousand metres. Three phases are involved in the process: generation of airborne dust; dispersion by eddy diffusion; and deposition by gravitational settling and precipitation washout. Results suggest that, on rare occasions, coal dust deposition could be a major source of dustfall if steps are not taken to reduce dust generation.

1175. Waddell, B.D. - 1975.

"Sulfur Dioxide Modelling in Toronto". Unpublished B.A. Thesis, Department of Geography, York University, Toronto, 79 pages.

One of the major atmospheric contaminants is sulfur dioxide. This thesis attempts to model the dispersion of sulfur dioxide from a single point source, Lakeview Generating Station. The models utilized are based on the Gaussian distribution of pollutants released from an elevated source and compare two different equations for determining plume rise above a stack. The results of the models are predicted ground-level sulfur dioxide concentrations in parts per hundred million. These calculated concentrations are given for each intersecting grid point, 1 kilometre apart in a 441 square kilometre grid based on Lakeview at its centre. The thesis also attempts to determine how accurate the predicted results from each model are compared to the real world concentrations. (Author's Abstract)

1176. Wallace, R.R. and Hynes, H.B.N. - 1975.

"The Catastrophic Drift of Stream-Insects After Treatments with Methoxychlor (1,1,1-trichloro-2,2-bis (*p*-methoxyphenyl) ethane)". *Environ. Pollut.* Vol. 8, No. 4, pp 255-268.

The pattern and duration of catastrophic drift of aquatic insects was studied after ground and aerial spray application of methoxychlor to 2 streams in Quebec, Canada. The insecticide was applied for the control of larval Simuliidae in the streams. The rate of aerial application of the 15% methoxychlor solution was 4.54 l/flight mi of a 0.14-kg/l solution, and ground application was

0.075 mg/l for 15 min. Drift samples were taken with nets. The impact of methoxychlor as a blackfly larvicide was not confined to simuliid larvae, as the simuliid larvae comprised <4% by wt of the drift of insects after the treatments. Most of the drift occurred within 150 min of the start of the treatments. The pattern of drifting insects after the treatments was similar for both streams; the number of insects caught increased rapidly to a maximum value and tapered off. Methoxychlor, used as a substitute for DDT, in spraying the length of a stream is not recommended for commercial control operations. (P.A. Abstract) 1177. Wallis, J.P.A., Donnelly, J.K. and Aziz, K. - 1975.

"Plume Dispersion: Another Problem in the Development of the Athabasca Oil Sands". Paper Presented at 26th Annual Technical Meeting of the Petroleum Society of Canadian Institute of Mines and Metallurgy: Banff, June 11-13, 1975, 10 pages.

The upgrading of the bitumen extracted from the Athabasca Oil Sands results in a substantial amount of sulfur by-product; part of which is emitted to the atmosphere as sulfur dioxide. Present regulations require that a plant be so designed that the maximum ground level concentration for SO₂ be 0.17 ppm or less in a Pasquill D atmosphere. Ignored or neglected are inversion layers and other atmospheric stability categories. Yet both occur with some regularity in the Fort McMurray area. This study shows that these factors have a strong bearing on ground level concentrations in the Oil Sands area, and that the problem is compounded when plume overlap occurs.

1178. Ware, D.M. and Addison, R.F. - 1973.

"PCB Residues in Plankton from the Gulf of St. Lawrence". *Nature*, Vol. 246, No. 5434, pp. 519-521.

The variation in PCB levels with particle size and time in Gulf of St. Lawrence plankton was examined. Nine samples were taken at approximately 10-d intervals from June to Aug. 1972 from a station about 16 km offshore from the northern coast of Prince Edward Island. The PCB concentrations were inversely related to particle size. This trend persisted in spite of a 34-fold difference in residue levels between composite samples. This finding is consistent with the known affinity of organochlorines for particulate matter and indicates that the acquisition of contaminants is directly proportional to particle surface area. The 73- to 202- μ m particles contain the highest PCB concentrations ever reported for natural plankton. Although the overall degree of contamination was variable, organochlorines did not seem to accumulate during the study period. For the southern Gulf of St. Lawrence, atmospheric input is the most likely source of organochlorines. (P.A. Abstract)

1179. Whaley, H. and Lee, G.K. - 1974.

"Plume Dispersion from a Thermal Power Station on the Shore of a Large Lake". *J. Inst. Fuel*, 1974, pp. 242-250.

The dispersion of multiple plumes from the four 150-meter stacks of a thermal generating station was measured by an aerial Probins technique. During the studies, the plant load varied between 1200 MW and 1500 MW, and the bituminous coal fuel contained 2.5% sulfur and 8% ash. The station is situated on the northwest shore of Lake Ontario. Spatial measurements of sulfur dioxide and temperature within the plume were obtained by means of fast-response helicopter - and automobile-mounted instruments. Additional meteorological information was obtained from radiosonde balloon releases. The variations in plume behavior which resulted from meteorological changes during 3 consecutive days in spring are described. The plume parameters derived from measured data are compared with those estimated from published information in the literature. Plume rise calculated from the Briggs equation and the Pasquill standard deviations of plume spread was compared with corresponding data derived from the three-dimensional measurements of buoyant plumes under neutral, inversion, and limited mixing conditions. Under neutral conditions, the derived plume axis elevations, although lower than those estimated by the Briggs equation, showed the same 2/3 Power law dependence with downwind distance. For inversion and limited mixing conditions, the derived plume axis elevations eventually leveled off and then approached zero with increasing dimensionless downwind distance from the source. Briggs equation, if applied at these distances, indicated that the plume would remain at a constant ceiling height. Derived standard deviations of plume spread when compared with Pasquill values showed good agreement for neutral conditions and fair agreement for stable conditions. For limited mixing conditions, the wide variation observed in ratios of the lateral to vertical standard plume spread indicated that both spread parameters cannot be assumed to have the same stability class; therefore, a realistic assessment of plume dispersion under a capping inversion can be obtained only from measured data. (USEPA Abstract)

1180. Whelpdale, D.M. and Shaw, R.W. - 1974.

"The Moderate - and Long-range Transport of Air Pollutants and their Removal from the Atmosphere". *Experient. Supple.*, No. 20, pp. 31-41.

Moderate and long range transport of air pollutants and the removal of these pollutants from the atmosphere are examined within the context of the cycling of contaminants through the ecosphere. Evidence exists for the transport of sulfur dioxide over Lake Ontario for distances up to 100 km, and studies of SO₂ concentrations and vertical gradients of temperature with respect to regional wind direction show that the mean daily concentration of SO₂ increases from 1.8 pphmv (parts per hundred million by volume) (when the regional wind is from the lake) to 3.0 pphmv (when it is from the land). The importance of vertical distribution of temperature for transport of pollutants over large distance is indicated. Measurements of 502 gradients over Lake Ontario are currently being made to allow for an estimate of turbulent fluxes and thus pollutant exchanges at the interface. Once fluxes have been measured under a variety of atmospheric and surface conditions, then the exchanges of pollutants at the interface will be able to be parameterized on a regional basis, making possible reliable estimates of pollutant sink strengths. (USEPA Abstract)

1181. Yan, N.D. - 1975.

"Acid Precipitation and its Effects on Phytoplankton Communities of Carlyle Lake, Ontario". MA Thesis, Department of Botany, University of Toronto, 129 pages.

The La Cloche Mountain Lakes and other soft-water Shield lakes in the vicinity of Sudbury, Ontario have, for the last decade, been the subject of research on lake acidification. One source of acid is sulphur dioxide. Typical pH values for such lakes are 6.0 to 6.5 but pH values over the range 3.8 to 5.0 are now not uncommon. Losses of fish populations and changes in crustacean zooplankton communities have accompanied depressions of lake pH. As yet, phytoplankton population changes have been scantily documented. Studies were carried out in Carlyle Lake in the spring, summer, fall and winter of 1974-75. The pH values of waters in floating cylinders was maintained at levels of 4.0, 5.0, 6.0 and 6.5 for a forty day period by additions of dilute sulphuric acid and sodium hydroxide. Phytoplankton biomass was estimated in weekly samplings by Utermöhl technique. All major taxonomic groupings had biomass maximum at pH 5.0, the pH closest to the lake pH, with the exception of the Pyrrophyta, including especially the taxa *Cryptomonas ovata* Ehrenberg, *Chroomonas caudata* Geitler and *Peridinium limbatum* (Stokes) Lemmermann, which had its biomass maximum at pH 4.0. Samples of open-water phytoplankton communities of Carlyle Lake revealed a domination by Dinophyceae, a pattern unlike other undisturbed circumneutral Precambrian Shield lakes, and unlike other naturally or unnaturally

acidified aquatic environments, with the exception of Scandinavian lakes acidified by atmospheric acid input. Samples of other La Cloche Mountain Lakes with pH levels of less than 5.1 also showed a remarkable similarity in community structure and diversity with Scandinavian acidified lakes. Comments are made on extrapolations from results of cylinder (water column enclosure) experiments to whole lake behaviour. Predictions of the future of phytoplankton populations of La Cloche Mountain Lakes given continual acid input are attempted. (Author's Abstract)

1182. Yan, N.D. and Stokes, P.M. - 1976.

"The Effects of pH on Lake Water Chemistry and Phytoplankton in a La Cloche Mountain Lake". Paper Presented at the Symposium on Water Pollution, Canada Centre for Inland Waters, February 1976, Burlington, 23 pages.

Some La Cloche Mountain Lakes and other soft water Shield lakes in the vicinity of Killarney Provincial Park (some 50-310 km south-west of Sudbury, Ontario) have for the last decade been the subject of research on lake acidification. Acid precipitation (mainly from sulphur oxides) and lake waters of low buffering capacity apparently compound the problem. Typical pH values for such lakes range from 6.0 to 6.5, but pH values over the range 5.0-3.5 are not now uncommon. Loss of fish populations especially as a result of reproductive failure, and changes in zooplankton species composition have accompanied the lowering of pH which has occurred rapidly over the last two decades. The effect of pH changes on phytoplankton in the lakes would be of interest. The present study was on Carlyle Lake (Killarney Provincial Park) during the spring, summer, fall and winter of 1974-75. pH values of water in cylinders floating in the lake were maintained at 4.0, 5.0, 6.0 and 6.5 respectively, for six week periods, by additions of sulphuric acid or sodium hydroxide. Phytoplankton biomass was estimated by Utermöhl technique, species identified and quantified at regular intervals during experiments. Maximum algal biomass in the cylinders occurred at pH 5.0 (close to the present pH of the lake). All major taxa had biomass maxima close to pH 5.0, with the exception of *Cryptomonas ovata* Ehrenberg, *Chroomonas caudata* Geit and *Peridinium limbatum* (Stokes) Lemm. which had maxima at pH 4.0. A preliminary comparison between the species composition and diversity of phytoplankton populations in La Cloche lakes and in recently acidified lakes in similar geological rock basins in Western Europe is made. (Authors' Abstract)

1183. Yap, D. - 1974.

"A Preliminary Investigation of Winter Air Pollution Potential at Fort Simpson, Northwest Territories". *Atmos.*, Vol. 12, No. 2, pp. 62-68.

Based on radio-sonde data collected during nine consecutive days in February 1974, an examination was made of the daytime variation of the winter mixing depth and air pollution potential in the Fort Simpson area of the Mackenzie Valley. Under anti-cyclonic weather conditions, mixing depths were generally low (<100 m) or non-existent. The generation of a mixed layer was found to be primarily associated with extensive low- to mid-level cloud cover and precipitation. During this period of investigation, ventilation coefficients were extremely low. This suggests that the area has a great risk of high pollution potential in winter. (Author's Abstract)

See Also Reference Numbers: 1030, 1031, 1033, 1044, 1045, 1047, 1059, 1063, 1068, 1076, 1079, 1087, 1090, 1110, 1112, 1203, 1204, 1205, 1207, 1210, 1228, 1236, 1244, 1260, 1261, 1263, 1287, 1290, 1301, 1308, 1317, 1331.

4. EFFECTS, A) HEALTH

1184. Anon. - 1973.

"Biology and Health Physics Division Progress Report January 1 to March 31, 1973". Atomic Energy of Canada, Ltd., *Progress Report*, PR-B-97, June 1973, 61 pages.

Research reports on biology, population, environment, and health physics are provided. Specific topics include radiation damage to living cells, computer methods for studying and linking health records, and thermoluminescence dosimetry for routine personnel monitoring. Sampling from streams and lakes on Chalk River (Ontario) Nuclear Laboratory property showed no increase in radionuclides or environmental contamination. Information on Co exchange in biota, the effects of heated condenser water on mollusks, estimation of evaporation rates from lakes, and analysis of dissolved matter in the Ottawa River is presented. (P.A. Abstract)

1185. Anon. - 1973.

"Biology and Health Physics Division Progress Report April 1 to June 30, 1973". Atomic Energy of Canada, Ltd., *Progress Report*, PR-B-98, August 1973, 68 pages.

Research projects by the Chalk River (Ontario) Nuclear Laboratories on biology, population, environment, and health physics are described. The assessment of radiation hazards to cells, the enzymes involved in radiation degradation and repair, multiplicity reactivation, and mutations were studied. The interaction of radiation with environmental carcinogens, diseases that are increased with radiation exposure, and cancer were investigated. The concentrations of radionuclides in effluent streams, land surveys, transfer of radionuclides in plants, radiation doses received by organisms, the effect of heat on plankton, and the movement of radioactive wastes in groundwater were examined. (P.A. Abstract)

1186. Bates, D.V. - 1973.

"The Fate of the Chronic Bronchitic: A Report of the Ten-year Follow-up in the Canadian Department of Veterans Affairs Coordinated Study of Chronic Bronchitis". *Amer. Rev. Respirat. Dis.*, Vol. 108, pp. 1043-1065.

The fate of the chronic bronchitic is discussed based on a report of the 10 year follow-up in the Canadian Dept. of Veterans Affairs coordinated study of chronic bronchitis. Fourteen of the 149 men followed in detail had symptoms indicating they developed at least two grades of emphysema over the 10 years. They did not differ from the average age of the study population, and the development of emphysema seemed to bear no relationship to the longevity of the chronic bronchitic process. The middle aged men who were cigarette smokers with slight ventilatory impairment were similar to the rest of the population as far as mean rate of function test change and the total death rate. The slower rate of decline of ventilatory function among men from Winnipeg is related to the low levels of pollution compared to Montreal, Toronto, and Halifax. Chest films do not appear to be useful in predicting function deterioration, but are important in the detection of vascular change. Changes in pulmonary function occur either as a regression change significantly greater than predicted with no sharp steps of decline or with a step decline as part of a regression change. (USEPA Abstract)

1187. Cecilioni, V.A. - 1974.

"Further Observations on Cancer in a Steel City". *Fluoride*, Vol. 7, No. 3, pp. 153-165.

The incidence of cancer in the steel city of Hamilton was investigated during 1969-1970. The death rate from cancer in Hamilton was higher than in the less industrialized city of Ottawa. The highest rate (65 per 100,000) occurred in the proximity of the steel mills, compared with the death rates (23 and 12 per 100,000) farther distant. Continuous monitoring in the industrial area disclosed that the levels of carbon monoxide, fluoride, lead, nitrogen oxides, sulfur dioxide, and suspended particulates increased to 15 times above the average of the province of Ontario. In 1971-1972 the atmospheric fluoride levels were up to 20 times higher than the average value for Ontario as a whole which is 40 mgm F/100 sq cm/30 days. Admission records at two large Hamilton hospitals showed a close correlation between respiratory disease and the daily pollution index. (USEPA Abstract)

1188. Clementi, K.J. - 1969.

"Health in the Dusty Trades". University of Toronto, Institute of Environmental Sciences and Engineering, Pub. No. ES-6, 27 pages.

This is a brief review of conditions and some investigations among workers in dusty trades in Alberta. The hazards of inhalation of silica and its products, wood dusts, and grain and other organic dusts are dealt with. This review demonstrates the need for the "Dusty Trades" legislation introduced in Alberta in 1966.

1189. Edwards, G. - 1976.

"Nuclear Power: A New Dimension in Politics". *Alternatives*, Vol. 5, No. 2, pp. 26-31.

This article discusses the introduction of the CANDU nuclear power system into Canada and the Canadian Coalition for Nuclear Responsibility (CCNR), which is calling for complete public accountability on the subject of nuclear energy. Safety, economics, energy requirements, social impact, health and pollution and decision making are the topics discussed.

1190. Environmental Hearing Board - 1976.

Lead Contamination in the Metropolitan Toronto Area, Ministry of the Environment, Ontario, Toronto, 265 pages.

This is a report of the Environmental Hearing Board regarding a public hearing convened on January 16, 1975, for the primary purpose of examining the findings of two government studies on lead pollution: the report of a study conducted by the Working Group on Lead entitled "Studies of the Relationship of Environmental Lead Levels and Human Lead Intake", (See Ref. 1111), and the Report of the Study by the Committee to inquire into and report upon "The Effect on Human Health of Lead from the Environment", which was submitted to the Minister of Health on October 29, 1974. The report contains health, environmental, administrative and legal aspects of lead pollution with conclusions and recommendations in relation to five lead processing plants in Toronto.

1191. Fehr, F. and Dennis, C.A.R. - 1975.

"The Use and Health Hazard of Mercury in Saskatchewan". Prairie Institute of Environmental Health. *Report*, PIEH No. 4, June 1975, 98 pages.

The extent and degree of health hazard to the population from Hg is examined by documentation of its known use, consumption, and health effects. Topics include uses of Hg and losses to the environment, health effects and tissue levels, and a summary of the Hg problem. (P.A. Abstract)

1192. Hamilton, T.R. - 1975.

"Social Effects of Air Pollution Emissions from Fossil-Fired Thermal Stations". Task C-1, Health Effects of Community Air Pollution. *Final Report to Ontario Hydro*, Toronto, 69 pages.

This report examines the health effects of community air pollution with special reference to Southern Ontario and to the influence of emissions from thermal power generation. It is concluded in the report that the actual pollution levels in Southern Ontario are at or below the thresholds for any measurable causation of: subtle decreases in childhood ventilatory function, increase in acute lower respiratory tract infections in children, increase in frequency or severity of acute respiratory illness in families or increase in the prevalence of chronic bronchitis in adults. It is reported however that on some days of the year with cold outdoor temperatures and local air stagnation, community air pollution in Southern Ontario can cause aggravation of cough and wheeze in asthmatic children and in the aged and emphysematous. Thermal power generation contributes to the background pollution, particulates in the respirable size range, sulphur dioxide and nitric oxide.

1193. Kasowski, M.A. and Kasowski, W.J. - 1976.

"The Burden of Lead: How Much is Safe?". *Can. Med. Assoc. J.*, Vol. 114, No. 6, pp. 573-574.

This short article summarizes the findings reported in October 1975 at an international conference on heavy metals in the environment held in Toronto. The effects in humans of high levels of lead are described in four categories: behavioral, effects on cells, variable sensitivity and effects on pregnancy. One study describes results from data collected in Toronto. It shows that calcium concentrations associated with lead in soil can increase uptake of lead into the human body.

1194. Knight, G., Newkirk, T.E. and Yourt, G.R. - 1974.

"Full-Shift Assessment of Respirable Dust Exposure". *Can. Min. Met. Bull.*, Vol. 67, No. 744, pp. 61-72.

The need for the historical development of and the research studies on instrumentation for full-shift sampling of respirable dust in metal mines are described. Extensive recent research and field testing resulted in the development of instruments and methods that more accurately assessed the health hazard from exposure to respirable dust than do current practices. The gravimetric respirable dust sampler worn by a worker or operated in a fixed position nearby was effective and convenient for collecting a single sample over an entire shift. From this sample, the total mass, the quantity of quartz, and other particulates such as diesel smoke were determined. For high-quartz mines where the weight of samples was necessarily small, direct measurement of quartz on filters by x-ray diffraction was more accurate and suitable than weighing. Konimeter samples in the range of 200-300 ppcc, taken simultaneously with a gravimetric sampler in high-quartz mines, corresponded with 0.1 mg/cu m of quartz in the ACGIH mass formula (TLV equals 10/% respirable quartz + 2 (in mg/cu m). Filters from samplers worn by workmen yielded higher readings of respirable dust than those from samplers in fixed positions nearby. When two gravimetric samplers were worn by the same miner, with one cyclone and one filter attached to the lapel and the other to the cap-lamp battery, readings were sufficiently similar to warrant adopting the latter arrangement. The cooperation of miners in wearing samplers was very good; very few samplers were spoiled. Problems encountered in the operation of samplers were minor. Some were eliminated in the new units incorporated with the cap-lamp battery. (USEPA Abstract)

1195. McCarthy, D.S. and Craig, D.P. - 1972.

"Why the Difference in Closing Volume?". *Lancet*, Vol. 2, No. 7790, page 1321.

The use of closing volume measurements for the early detection of lung disease is discussed, with particular reference to regional differences observed among asymptomatic smokers. About 15% of 91 asymptomatic female smokers living in Winnipeg, Manitoba, showed abnormalities in closing volume traces in contrast to previous studies which showed closing volume abnormalities in 72% of 46 male asymptomatic smokers living in London, England. The regression line for non-smoking females in Winnipeg was similar to that observed for non-smoking males in London. The regional difference is hypothesized as being due to atmospheric pollution which is high in London and very low in Winnipeg and probably acts synergistically to accentuate the detrimental effect of tobacco smoke on the lungs.

1196. Musial, C.J., Hutzinger, O., Zitko, V. and Crocker, J. - 1974.

"Presence of PCB, DDE, and DDT in Human Milk in the Provinces of New Brunswick and Nova Scotia, Canada". *Bull. Environ. Contam. Toxicol.*, Vol. 12, No. 3, pp 258-267.

Six lactating mothers from New Brunswick and 9 from Nova Scotia were the subjects of the study. The residue levels were determined by biochemical and chromatographic separation followed by mass spectroscopic and computer analysis. Although the data are not statistically significant, it appears that the levels of p,p'-DDT and p,p'-DDE are higher in the New Brunswick area, possibly because of the wider use of insecticide sprays in the past. Comparison is also made to data collected in several other countries. (P.A. Abstract)

1197. Neri, L.C., Mandel, J.S., Hewitt, D. and Jurkowski, D. - 1975.

"Chronic Obstructive Pulmonary Disease in Two Cities of Contrasting Air Quality". *Can. Med. Assoc. J.*, Vol. 113, No. 11/12, pp. 1043-1046.

Spirometric tests of 3280 Ottawa residents in 1969-71 and 2208 Sudbury residents in 1972-73 showed that the mean ratio of forced vital capacity to forced expiratory volume in 1 second was lower in Sudbury, where sulfur dioxide concentrations in the air tend to be appreciably higher than in Ottawa. This difference was significant for both males and females considered separately, and held true when age and smoking habits were taken into account. The prevalence of symptomatic chronic bronchitis was significantly higher in Sudbury males than in Ottawa males, but no such difference could be detected in females. (Authors' Abstract)

1198. Warren, P., Cherniack, R.M. and Tse, K.S. - 1974.

"Hypersensitivity Reactions to Grain Dust". *J. Allergy Clin. Immunol.*, Vol. 53, No. 3, pp. 139-149.

Allergic and respiratory investigations were performed on 17 subjects in the Winnipeg region with respiratory symptoms and occupational exposure to grain dust. Common symptoms included chronic cough and sputum production, grain fever, wheezing and dyspnea on exposure to grain dust. Results of pulmonary function tests demonstrated a pattern of obstructive airway disease. Immediate hypersensitivity to grain dust was common. Both immediate and late reactions were observed on inhalation challenge studies. There was a good correlation between the hypersensitivity reactions on skin testing and on bronchial provocation. Inhalation of crude grain dust extract may produce systemic symptoms of malaise, myalgia, headache, and leukocytosis even in normal subjects. There was no evidence of precipitin-mediated hypersensitivity.

1199. White, F.M.M., Swift, J. and Becklake, M.R. - 1974.

"Rheumatic Complaints and Pulmonary Response to Chrysotile Dust Inhalation in the Mines and Mills of Quebec". *Can. Med. Assoc. J.*, Vol. III, No. 6, pp. 533-535.

In 1967-68 an age-stratified random sample of 1069 current workers in Quebec asbestos mines and mills was surveyed. Questions concerning rheumatic complaints were included in a modified MRC questionnaire used at that time, and on this basis a rheumatic severity gradient was devised. No relationship could be detected between rheumatic complaints and pulmonary radiologic response to chrysotile dust exposure, despite implications in the literature that such a relationship might exist. (Authors' Abstract)

See Also Reference Numbers: 1038, 1039, 1084, 1088, 1105, 1108, 1109, 1111, 1113.

4. EFFECTS, B) VEGETATION AND ANIMALS

1200. Balsillie, D. and McGovern, P.C. - 1974.

Effects of Sulphur Dioxide and Heavy Metals on Vegetation in the Sudbury Area (1973). Ontario Ministry of the Environment, Sudbury, Ontario, 47 pages.

Eleven stations in the Sudbury area monitor ground level concentrations and durations of sulphur dioxide from smelters. The results are illustrated with tables and graphs. Analysis includes comparison of data with previous years and discussion of damage to vegetation. Chemical analysis of vegetation and soil by the Phytotoxicology Section from 1972 is included.

1201. Balsillie, D. and McGovern, P.C. - 1975.

Effects of Sulphur Dioxide and Heavy Metals on Vegetation in the Sudbury Area (1974). Ontario Ministry of the Environment, Northeast Region, Sudbury, Ontario, 33 pages.

Twelve stations in the Sudbury, Ontario, area monitor ground level concentrations and durations of sulphur dioxide from smelters. The results are illustrated with tables and graphs. Analysis includes discussion of vegetation damage and chemical analysis of vegetation and soil samples for 1970-1974 inclusive.

1202. Balsillie, D., McGovern, P.C. and McIlveen, W.D. - 1975.

Environmental Studies in the Timmins Area (1970-1975). Ontario Ministry of the Environment, Northeast Region, Sudbury, 59 pages.

In 1970, the Ontario Ministry of the Environment initiated a preoperational background survey of the environmental situation in the Timmins area where Ecstall Mining Company was expected to construct an electrolytic zinc refinery near Hoyle (20 km NE of Timmins). The refinery was erected adjacent to the ore concentrator which had been operative since 1966. This new zinc plant became operational in April, 1972. From 1970 to 1974, Ministry personnel have conducted an extensive program of environmental analysis and evaluation in the area. Based on information gathered from the original 10 surveillance plots and two control plots, the

condition of the vegetation with regard to the number of species, number of plants, growth rate and crown condition has not been altered over the past 4 years. Also, the lead peroxide candle survey showed that (except for one reading at one plot in 1974) only background levels of SO₂ were present in the ambient air both before and after the initiation of operations at the new refinery. As a result of a fumigation of sulphur dioxide, severe vegetation injury occurred to the east of the zinc plant in late July, 1974. As well, other vegetation injuries were noted in the immediate vicinity of the zinc plant in 1973 and 1974. Chemical analysis of vegetation has shown that elevated levels of sulphur and several metals are present in the immediate vicinity of the zinc plant and up to 3 km to the northeast of the plant. For the 1974 season, several of the more distant plots were removed from the survey and replaced with plots located closer to the zinc plant. This realignment should ensure that any environmental deterioration will be properly monitored. In 1975, a close surveillance in the Timmins area will be maintained to assess any environmental changes in the coming months ahead.

1203. Beamish, R.J. - 1974.

"Growth and Survival of White Suckers (*Catostomus commersoni*) in an Acidified Lake". *J. Fish. Res. Board*, Vol. 31, pp. 49-54.

White suckers (*Catostomus commersoni*) in the acidic Lumsden Lake in 1967 and 1968 exhibited reduced annual growth followed by death. The reduced growth and death appeared directly related to the low pH and not to a shortage of food caused by the decreasing pH. Examination of heavy metals, in the lake from precipitation fallout showed that only zinc levels (24-33 micrograms/l) were sufficiently high to be potentially hazardous to fish. The heavy metal, although not of sufficient magnitude to be considered the principle stressing agent, may have acted synergistically with the acid, influencing its concentration. (USEPA Abstract)

1204. Beamish, R.J. - 1974.

"Loss of Fish Populations from Unexploited Remote Lakes in Ontario, Canada as a Consequence of Atmospheric Fallout of Acid". *Water Res.*, Vol. 8, pp. 89-95.

In a previous study of 150 lakes, 70 had a pH of 5.5 or lower. In some lakes, acid levels increased more than 100-fold from 1961 to 1971. Therefore, the Ontario Society of Artist and Muriel lakes were studied to determine the effects of increased pH on fish populations. Fish disappeared as the lakes became acidic due to long-term lethal effects and an absence of young coming into the population due to failure of reproduction. Emissions from the nickel smelters near Sudbury were the most probable source of contamination. This was shown by the anomalous concentrations of nickel in the lakes and precipitation, the high concentrations of nickel emitted into the atmosphere in Sudbury, the ability of sulfur dioxide to form acid in the atmosphere and fallout in precipitation over considerable distances from the emission source, the tremendous amounts of SO₂ emitted by industry in Sudbury, and the abnormally high concentrations of hydrogen and sulfate ions in the lakes. (USEPA Abstract)

1205. Beamish, R.J. - 1975.

"Effects of Precipitation on Canadian Lakes," Paper Presented to First International Symposium on Acid Precipitation and the Forest Ecosystem, July, 1975, Columbus, Ohio.

In the Sudbury region of Ontario, Canada, fallout of sulfur oxides (SO_x) is responsible for damage to vegetation, lakes, and fish. The acidic fallout effects a rate of acidification in many lakes that over several decades has resulted in the extinction of many species of fish. Fish exhibit profound differences in response to levels within the range of their individual susceptibilities. Prior to extinction most females of a particular species did not release their ova to be fertilized. The failure of females to spawn was coincident with an inability to maintain normal serum Ca levels. In some species growth was reduced despite an adequate supply of preferred food items. The damage to trees, lakes, and fish by fallout of SO_x caused the Canadian Government to initiate court proceedings against the International Nickel Company of Canada and Falconbridge Nickel Mines. After several years of study, followed by discovery hearings and trial delays, the suit was settled out of court several days before the trial was scheduled to commence. (P.A. Abstract)

1206. Blauel, R.A. and Hocking, D. - 1973.

"Sulfur Gas Impact Surveys and Research at the Northern Forest Research Centre". *Proceedings, Workshop on Sulphur Gas Research in Alberta, Information Report, NOR-X-72*, Northern Forest Research Centre, Edmonton, Alberta, pp. 111-114.

This is a general description of the research on the effects of sulphur gases and other air pollutants on forest vegetation carried out by the Northern Forest Research Centre in Alberta. Objectives of research, cooperating agencies and focuses of study are listed and discussed.

1207. Blauel, R.A. and Hocking, D. - 1974.

"Air Pollution and Forest Decline near a Nickel Smelter: The Thompson, Manitoba Smoke Easement Survey 1972-74". Northern Forest Research Centre, Environment Canada, Edmonton, *Report, NOR-X-115*, 46 pages.

Forest decline near a nickel smelter releasing large quantities of sulfur dioxide and particulate emissions was assessed. Aerial and ground examinations revealed varying degrees of patchy forest decline within an area of about 50 sq. mi. near the smelter. Up to 80% of the trees were dead in the more severely affected patches. Similar proportions of higher plant ground cover were dead, and nearly all lichens and mosses were dead. The observed gradient in the frequency and severity of injury matched that of sulfur and nickel in foliage and surface organic matter. The distribution pattern around the smelter smoke stack reflected the dominant wind directions. (USEPA Abstract)

1208. Chametski, W.A. and Stevens, W.E. - 1974.

"Organochlorine Insecticide Residues in Preen Glands of Ducks: Possibility of Residue Excretion". *Bull. Environ. Contam. Toxicol.*, Vol. 12, No. 6, pp. 672-676.

Pesticide loads in 21 ducklings (7 gadwalls, 8 pintails, 2 blue-winged teal, 1 lesser scaup, and 3 baldpates) were obtained at the natal site or through contaminant transfer to the egg. Insecticide levels, analyzed by gas chromatography, varied from 0.09 ppm (wet wt) to 2.29 ppm for dieldrin, 0.13 to 0.88 ppm for DDE, and 0.25 to 3.77 ppm for DDT. The ratio of total DDT: total DDE in a species for baldpate, gadwall, and pintail ducks was 0.83, 0.94, and 0.92 respectively. Higher ratios for the blue-winged teal (6.34) and scaup (4.30) were due to food intake with a higher DDT contamination or a greater affinity for DDT storage or egg transferral. The organochlorine insecticide residues may be ingested by ducks following excretion through the preen gland and subsequent degradation on the feathers by sunlight. The residue tests were made to determine possible contamination of the ducks from aerial insecticide spray operations in the western prairies of Canada. (P.A. Abstract)

1209. Chiba, M., Fisher, R.W. and Herne, D.C. - 1971.

"Pesticide Pollution in Relation to Orchard Spray Application". *Proceedings*, International Symposium on the Identification and Measurement of Environmental Pollutants, National Research Council of Canada, Ottawa, pp. 25-54.

Environmental contamination and biological efficacy were analyzed for airblast and gun applications of pesticides in an Ontario apple orchard. Neither spray volume, rate of chemical, nor application method had a significant effect on efficacy or persistence as determined by mortality studies with the European red mite. Concentrate sprays produced smaller droplets and resulted in more drift than dilute sprays applied by an airblast sprayer; a gun sprayer produced the largest droplets and least drift. The highest concentration in air during spraying was 0.03 mg/cubic metres at 40 m downwind from the site of application, and 0.01 mg/cubic metres at 130 m. In all treatments about 50 percent of the applied pesticides was deposited on the target trees and from 9 to 13 percent on the ground. (WATDOC)

1210. Cole, A.F.W., Macdowall, F.D.H. and Mukammal, E.I. - 1966.

"Ozone Dose and Plant Injury". *Science*, Vol. 153, No. 3743, p. 1552.

In this rebuttal to criticism of their "empirical exposure factor", (see Ref. 629), the authors illustrate that the relation of ozone dosage to injury of tobacco plants is neither linear nor non-linear, but random in response to varying environmental conditions. A correction factor such as one derived from prevailing micrometeorological conditions must be applied to the ozone dose to arrive at an expression of effective ozone dose.

1211. Dreisinger, B.R. and McGovern, P.C. - 1971.

Sulphur Dioxide Levels and Vegetation Injury in the Sudbury Area During the 1970 Season. Air Management Branch, Department of Energy and Resources Management, Sudbury, Ontario, 39 pages.

Eleven stations in the Sudbury area monitor ground level concentrations and durations of sulphur dioxide from smelters. The results are illustrated with tables and graphs. Analysis includes a discussion of vegetation damage in the area. These results can be used as background information to assess the effectiveness of new abatement measures at the smelters.

1212. Gayed, S.K. and Watson, M.C. - 1975.

"Diseases of Flue-Cured Tobacco in Ontario and Estimates of Disease Losses, 1972-73". *Can. Plant Dis. Surv.*, Vol. 55, No. 1, pp. 31-35.

In Ontario the major diseases of flue-cured tobacco (*Nicotiana tabacum*) are brown root rot caused by the root lesion nematodes *Pratylenchus* spp; pole rot caused by *Rhizopus arrhizus*; weather fleck induced by air pollution; and sore-shin caused by *Rhizoctonia solani*. In 1972 and 1973 the average annual yield loss from these and other tobacco diseases was estimated at 3.5%, representing a farm value of \$5.5 million. Annual losses from pole rot and weather fleck were estimated at 1.3% and 0.73%, respectively. Brown root rot is controlled on most farms by soil fumigation at a cost of approximately \$2.2 million per annum; despite these control measures losses averaged 0.5%. Blue mold caused by *Peronospora tabacina* has not been noticed in Ontario since 1966. Stalk rot (rattle box) caused by *Sclerotinia sclerotiorum* was recorded for the first time in Canada in 1970 but has not become a problem; and *Nyctothecium verrucaria* is reported for the first time from tobacco seedlings. A comparison between the tobacco disease patterns in Canada and North Carolina is also discussed. (Authors' Abstract)

1213. Green, G.J. - 1974.

"Air-Borne Rust Inoculum Over Western Canada". *Can. Plant Dis. Surv.*, Vol. 54, No. 1, pp. 6-7.

An estimate of the amount of air-borne cereal rust inoculum over western Canada in 1973 was obtained by exposing vaseline-coated microscope slides, held at 45° from the vertical, in spore traps, as reported in previous issues of the Canadian Plant Disease Survey. Slides were exposed at Winnipeg, Morden, and Brandon, Manitoba, and at Indian Head, Regina, and Saskatoon, Saskatchewan. The spore counts are shown in a table. The number of leaf rust spores counted was similar to 1972 and generally much above the 10 year average.

1214. Green, G.J. - 1975.

"Air-Borne Rust Inoculum Over Western Canada in 1974". *Can. Plant Dis. Surv.*, Vol. 55, No. 2, pp. 48-50.

In 1974 urediospores of *Puccinia graminis* and *P. recondita* were trapped from May 28 to August 5. Spores were carried into western Canada in early June, but their numbers increased slowly because dry weather limited rust development. Rapid rust development in early August did not affect the spore counts. During 1960-1974, when spore trapping began about mid-May and ended August 31, the numbers of urediospores caught varied widely, even in years when field observations indicated about equal prevalence. The number of spores caught are an inexact measure of rust prevalence and damage, but together with field observations they are usually good indicators of the amount and distribution of infection. (Author's Abstract)

1215. Heck, W.W., Linzon, S.N. and Macdowall, F.D.H. - 1975.

"Effects of Photochemical Oxidants on Vegetation". In *Photochemical Air Pollution: Formation, Transport and Effects*, Associate Committee on Scientific Criteria for Environmental Quality, National Research Council of Canada, NRCC No. 14096, Ottawa, pp. 89-142.

This paper presents criteria on the effects of photochemical oxidants on vegetation from which air quality standards can be developed. Pertinent criteria include descriptions of injury, injury symptoms as inclusive documentation of dose-response relationships, sensitivities and tolerances of plant species, factors affecting plant response, and the mechanisms of toxicant action. The references reviewed include directly related scientific literature with special emphasis on information specific to Canadian air quality problems.

1216. Hutchinson, T.C. - 1973.

"The Impact of Pollution on the Canadian Flora". Institute of Environmental Sciences and Engineering, University of Toronto, Pub. No. EL-1, 9 pages.

The effects of various types of pollution on plant species in locations across Canada are considered. Attention is focussed on the problem of sulphur dioxide emission and heavy metal pollution caused by the mining and smelting industries. Particular attention is given to effects in the Sudbury area. The phytotoxic effects of automobile emissions in cities and in areas bounding highways are also underlined.

1217. Hutchinson, T.C., Krauter, K. and Stokes, P.M. - 1973.

"Heavy-Metal Tolerance in Algae Isolated from Contaminated Lakes near Sudbury, Ontario". *Can. J. Bot.*, Vol. 51, pp. 2155-2168.

Chemical analyses of lake waters in the Sudbury smelting area indicated abnormally high levels of metals, especially copper and nickel. Two of the algal isolates from these contaminated lakes, a *Scenedesmus* species and a *Chlorella* species, were chosen for study. Their growth, as determined by cell number, was tested under controlled conditions in defined media. Nutrient conditions, pH, and concentration in solution of copper and nickel were used as variables in bioassays. In comparison with laboratory strains of similar algae in medium with no chelate (ethylenediaminetetraacetic acid), the isolated lake strains were found to be tolerant of the heavy metals nickel (*Scenedesmus*) and copper (*Scenedesmus* and *Chlorella*). The patterns of response to metals in solution differed markedly between laboratory and lake strains. The ecological implications are considered. (Authors' Abstract)

1218. Lee, T. and Vitt, D.H. - 1973.

"A Preliminary Study of the Effects of Air Pollution on Lichen and Bryophyte Vegetation near Edmonton, Alberta". *Proceedings, Workshop on Sulphur Gas Research in Alberta, Information Report, NOR-X-72*, Northern Forest Research Centre, Edmonton, Alberta, pp. 129-141.

The frequency of lichens was measured at thirteen sites in the Edmonton, Alberta, area. The results indicated that species differed in their tolerance to sulphur dioxide. Some species, therefore, may be used as approximate indicators of industrial air pollution.

1219. Legge, A.H. - 1973.

"Design of a Gas-Exchange System for the Study of the Effects of Sulphur Dioxide on Vegetation". Environment Canada, Edmonton, Canadian Forestry Service and Northern Forest Research Centre and Alberta Environment, Research Secretariat, *Proceedings, Workshop on Sulphur Gas Research in Alberta, November 1-2, 1973*, Edmonton, pp. 115-120.

A gas-exchange system was developed for the intimate analysis of the effects of sulfur dioxide on vegetation in the Whitecourt area of the sour-gas corridor in the Province of Alberta. Research is underway on 1-year-old seedlings of white spruce, and lodgepole pine to determine quantitatively the effects of varying concentrations of sulfur dioxide under differing environmental conditions. Plant physiology is being correlated with the onset of visible plant symptom development with air quality. The gas-exchange system was designed to continuously record processes of photosynthesis, respiration, and transportation in plants. The rate of carbon dioxide uptake determines primary production in green plants. The heart of the system is double-linked growth chambers in which the plants are exposed to SO₂ and gas-exchange is measured. The exposure chamber and measurement instrumentation are described. (USEPA Abstract)

1220. Legge, A.H., Walker, R.B. and Amundson, R.G. - 1975.

"Quantitative Assessment of the Impact of Sulfur Gas Emissions on a Forest Ecosystem". Paper Presented to First International Symposium on Acid Precipitation and the Forest Ecosystem, July, 1975, Columbus, Ohio.

Field studies of photosynthesis in *Pinus contorta* and *P. banksiana* hybrids, *Picea glauca* and *Populus tremuloides* subjected to sulfur dioxide (SO₂) and hydrogen sulfide (H₂S) from a nearby natural gas processing plant were initiated near Whitecourt, Alberta, Canada, in summer 1974. A 15-m-high scaffold was used as access to midcrown foliage in the pines while the spruce and aspen were accessible from the ground. Net assimilation rates, transpiration rates, and leaf resistances were calculated, and water deficits were monitored. Chemical analyses for sulfate-S using the methylene blue colorimetric method of Johnson and Nishita showed levels of 300-700 ppm, with the older foliage showing slightly higher values. Ambient SO₂, H₂S, and total S were measured using a Tracor 270HA Atmospheric Sulfur Analyzer (chromatographic method); trends in ambient SO₂ concentrations were measured using an Environmetrics SO₂ Analyzer (polarographic method). Concentration was variable for SO₂ and generally 0.05 ppm. Analytical problems and gas-exchange design are discussed. (P.A. Abstract)

1221. Linzon, S.N. - 1973.

"Some Effects of Particulate Matter on Vegetation in Ontario". *Proceedings, 3rd International Clean Air Congress*, Dusseldorf, Germany, pp. A118-A120.

In Ontario, particulate matter discharged into the atmosphere has been found to contaminate soils, crops, fruits, and vegetables, and in some cases to produce visible symptoms of injury on vegetation. In the vicinity of a cement company, apple trees suffered from coatings of cement - kiln dust on foliage and fruit and from the inhibition of hormonal sprays applied to the trees for the purposes of fruit retention and color development. Emissions of magnesium-lime dust from a magnesium refinery accumulated in the soil of neighbouring farms and raised the pH to levels which restricted the growth of the crops. Soot emissions from the combustion of carbonaceous fuels resulted in unmarketable chrysanthemum flowers in a greenhouse, suppressed growth of jack pine trees near a railroad round house, and necrotic spotting of foliage on shrubs, ornamentals and vegetables growing on residential properties. One particularly heavy discharge of soot from a power plant affected an area of approximately 500 square kilometers. Deicing compounds applied to highways in winter have resulted in terminal shoot dieback injury to roadside peach, apple, and eastern white pine trees from the splashing of salt by passing vehicles. Lead particles emitted from automobiles and from lead recovery companies have contaminated the soil and vegetation in the immediate vicinity. Lettuce had a greater than usual ability to accumulate lead. Relationships are presented between the degree of chemical contamination of soils and vegetation and air quality particulate data. (Author's Abstract)

1222. Linzon, S.N. - 1975.

"How Air Pollution Affects Vegetation". Phytotoxicology Section, Air Resources Branch, Ontario Ministry of the Environment, Toronto, Ontario, 8 pages.

This fact sheet describes the operations and objectives of the Phytotoxicology Section of the Air Resources Branch, Ontario Ministry of the Environment. Included are discussions of the various air pollutants and their effects on plants. Some examples of investigations by the Phytotoxicology Section of plant damage in various areas of Ontario are given. Special appeal is made to any resident who suspects plant damage due to air pollution to request an investigation. (Replaces Ref. No. 615).

1223. Loman, A.A. - 1972.

"Atmospheric Sulfur Dioxide and Foliar Sulfur". Northern Forest Research Centre, *File Report, NOR-Y-48*, Environment Canada, Edmonton, 10 pages.

This is a general report which discusses the role of sulfur in vegetation, foliar sulfur content as a measure of damage by sulfur dioxide, and the practicality of exact determinations of admissible sulfur dioxide levels in the air to prevent damage to trees. Results of forest research in Alberta are also presented.

1224. Loman, A.A. - 1973.

"Sulphur Dioxide and Forest Vegetation". *Proceedings, Workshop on Sulphur Gas Research in Alberta, Information Report, NOR-X-72*, Northern Forest Research Centre, Edmonton, Alberta, pp. 106-110.

Three categories of pollution symptoms in Alberta forest vegetation, chronic, acute and transient, are described in relation to operations of sour gas plants. A table of species of forest vegetation in Alberta, in order of decreasing susceptibility to sulphur dioxide emissions, is also given.

1225. McGovern, P.C. - 1975.

Effects of Sulphur Dioxide and Heavy Metals in the Wawa Area Soils and Vegetation (1974). Ontario Ministry of the environment, Northeast Region, Sudbury, 35 pages.

Emissions of sulphur dioxide from the Algoma Ore Division sinter plant at Wawa were monitored by the Ontario Ministry of the Environment during the 1974 growing season. Concentrations of SO₂ recorded on continuous SO₂ monitors and sulphation candles were such as to cause acute vegetation injury over an approximate area of 200 square kilometres. Vegetation and soil samples collected in 1973 northeast of Wawa contained elevated levels of sulphur, iron and arsenic. In general, the levels decreased with increased distance from the source. Data collected during the past several seasons in the Wawa area have been of value in assessing the effects of the sinter plant emissions on the vegetation and soils in the "Wawa Fume Damage Area".

1226. McKeen, C.D., Fulton, J.M. and Findlay, W.I. - 1973.

"Fleck and Acidosis of Potatoes in Southwestern Ontario". *Can. Plant Dis. Surv.*, Vol. 53, No. 3, pp. 150-152.

The occurrence of a black necrotic flecking on the foliage of Irish Cobbler potatoes in southwestern Ontario during late June of 1966 and 1968 as well as the appearance of chlorotic leaves on similar plants during May of 1970 is reported. The potato fleck symptoms observed in 1966 and 1968 (interveinal speckles which enlarged rapidly to produce irregularly shaped black necrotic areas) appeared similar to the speckle leaf disorder attributed to air pollution. However, observations during 1970 of leaves that were interveinally chlorotic and purplish-red appeared to be due to high soil acidity. Potatoes grown in highly acid soil are susceptible to manganese toxicity. (USEPA Abstract)

1227. Macdowall, F.D.H. - 1965.

"Air Pollution Damage to Plants in Canada". *Greenhouse-Garden-Grass*, Vol. 5, No. 3, pp. 13-19.

This is a general discussion of the effects of sulphur dioxide, fluorine, chlorine and ozone, as air pollutants, upon plants. The sources and formation processes of these pollutants are indicated. Relevant literature is cited in an historical context. Visible damage to plants from these substances is described along with relative tolerances of particular species. It is concluded that visible damage to plants should not be the only criterion of air pollution effects since plants may be affected before damage is apparent. Other parameters such as characteristic plant species sensitivity, proximity to industry and cities and the presence in the air of an identified pollutant should also be taken into account.

1228. Macdowall, F.D.H. - 1966.

"The Relation Between Dew and Tobacco Weather Fleck". *Can. J. Plant Sci.*, Vol. 46, pp. 349-353.

Tobacco weather fleck is now known to be caused by air-polluting ozone. The coincidence of dew and fleck in tobacco leaves has suggested a causal relationship. However, water condensed on the leaf surface or temporarily infiltrated into areas of lamina did not cause any visible damage to the tissues and did not contribute to the amount of fleck caused by a preceding dose of ozone. In fact, infiltrated water delayed the development of fleck symptoms caused by ozone, by suppressing damaging rates of oxygen uptake.

1229. Macdowall, F.D.H. - 1973.

"Protection from Ozone by Nitric Oxide". *Lighter*, Vol. 43, pp. 14-17.

It might be possible to protect a tobacco crop from air-polluting ozone by reacting a less toxic air pollutant with it. Nitric oxide is relatively non-toxic to tobacco plants. At concentrations of 1 ppm and less, nitric oxide does not react with oxygen but it still reacts with ozone. Consequently the concentration of ozone in the air is inversely proportional to that of nitric oxide. Tobacco plants were fumigated with ozone, oxides of nitrogen and with ozone and oxides of nitrogen together. Damage to plants by oxides of nitrogen alone was greater than by ozone alone, while damage was less with the combined application of ozone and oxides of nitrogen. The presence of nitric oxide effectively removes ozone and leaves an inconsequential amount of nitrogen dioxide.

1230. Macdowall, F.D.H. - 1974.

"Importance of Soil in the Absorption of Ozone by a Crop". *Can. J. Soil Sci.*, Vol. 54, pp. 239-240.

Experiments at Port Burwell, Ontario, have demonstrated that the absorption of ozone by the soil under a tobacco crop is of major importance in protecting the crop from weather fleck.

1231. Macdowall, F.D.H. and Cole, A.F.W. - 1971.

"Threshold and Synergistic Damage to Tobacco by Ozone and Sulphur Dioxide". *Atmos. Environ.*, Vol. 5, pp. 553-559.

Fumigation of greenhouse grown tobacco with ozone corroborated the approximate threshold dose of 20 ppm which has been observed in the field. Synergism between ozone and sulphur dioxide was confirmed but it was not obtained with sulphur dioxide at a dose an order of magnitude less than the ozone threshold dose as they occurred in the field. Synergism did not lower the threshold dose of ozone. The synergism mixtures were twice as potent as the added effects of the components. (Authors' Abstract)

1232. Murtha, P.A. - 1973.

"ERTS Record SO₂ Fume Damage to Forest, Wawa, Ontario". *For. Chron.*, Vol. 49, No. 6, p. 2.

Earth Resources Technology Satellite (ERTS) imagery is discussed in terms of mapping and monitoring large forest areas affected by severe sulfur dioxide fume damage, and records are presented for forests in Wawa, Ontario. Band 5 of the ERTS image (red spectral region: 600-700 nm) shows three damage zones (total kill, heavy kill, and medium damage zones) by interpretation of the gray tones (image-density variations) on the black and white positive image. The interpretation is augmented by electronic color enhancement of the density variations, although the light injury zone, recognizable by photo interpretation, cannot be delineated on the ERTS image. It is possible with ERTS to draw a line around the perimeter of the medium kill zone. Delineation of damage

zones air photo and ERTS imagery interpretation are compared with airborne sketch mapping. Some shifts in areas between adjoining zones are evident among the methods, but since the actual areas of damage are not known exactly, it is impossible to conclude that any method is more accurate than another. This satellite appears to be the quickest method of mapping and monitoring forest areas affected by SO₂ damage. (USEPA Abstract)

1233. Murtha, P.A. - 1973.

"SO₂ Damage to Forests Recorded by ERTS-1". Earth Resources Technology Satellite, *Proceedings*, 3rd Symposium, December 10-14, 1973, pp. 137-143.

Satellite imaging (ERTS-1) was used during four successive passes to detect sulfur dioxide-induced forest damage around Wawa, Ontario. Image interpretation supported by electron color enhancement was used to delineate three damage zones (total-kill, heavy-kill, and medium-damage). The results from the satellite mapping technique were similar to results obtained from aerial sketching and air photo interpretation. Band 5 provided the greatest detail for assessing forest damage, followed in order by bands 4, 6 and 7. Although total-kill was separated from heavy-kill damage zones, total-kill was not consistently separated from clear-cut logging, burned areas, and frozen lakes and bogs. Nevertheless, the imagery technique appears to provide a simple means of mapping and monitoring large forest areas affected by severe SO₂ fume damage, provided sufficient time elapses for the damaged forest region to take on the characteristics of air pollution damage. The mapping of light injury areas from satellite imagery does not appear possible. (USEPA Abstract)

1234. National Research Council, Canada - 1975.

Fenitrothion: The Effects of its Use on Environmental Quality and its Chemistry. Associate Committee on Scientific Criteria for Environmental Quality, NRCC No. 14104, Ottawa, 162 pages.

Fenitrothion has been used since the late sixties to moderate economic losses resulting from continuing outbreaks of spruce budworm in eastern Canadian forests. The effects of this insecticide on the forest fauna are analyzed and compared with Canadian applications of Fenitrothion.

1235. National Research Council, Canada - 1976.

Effects of Chromium in the Canadian Environment. Associate Committee on Scientific Criteria for Environmental Quality, NRCC No. 15017, Ottawa, 168 pages.

This report discusses the effects of emissions of chromium chemicals on the various living organisms in the Canadian environment. Naturally occurring levels and forms of chromium are compared with those resulting from industrial and domestic activities. Levels of chromium air pollution at several places in Canada are compared with those of other places throughout the world.

1236. Pearson, R.G., Drummond, D.B., McIlveen, W.D. and Linzon, S.N. - 1974.

"PAN-Type Injury to Tomato Crops in Southwestern Ontario". *Plant Dis. Rep.*, Vol. 58, No. 12, pp. 1105-1108.

Investigation into reports of unusual foliar injury development on tomato crops in Southwestern Ontario during 1972 and 1973 resulted in the discovery of widespread peroxyacetyl nitrate (PAN)-type injury on the rapidly growing, succulent, middle-aged foliage of recently transplanted field tomatoes. The injury symptoms ranged from undersurface silverying, glazing and bronzing to bifacial necrosis accompanied by leaf rolling. The 1972 injury was detected throughout the major tomato production areas near Chatham, Dresden and Leamington. Two distinct zones of injury were detected in 1973; one similar to the area affected during 1972 and another to the east, near Simcoe and throughout the Niagara Peninsula. A review of weather records for locations in Ontario and to the south of Lake Erie in Ohio showed that weather conditions favourable to the formation and transport of oxidants existed prior to the development of the injury symptoms each year. So far as the authors are aware, this is the first time that PAN-type symptoms have been reported on vegetation in Canada. (Authors' Abstract)

1237. Slaney, F.F. and Company Limited - 1974.

"Social Effects of Air Pollution Emissions from Fossil-Fired Thermal Stations. C-5. Vegetation and Animals". *Final Report* to Ontario Hydro, Toronto, 50 pages.

This report examines the effects on vegetation and animals of atmospheric emissions from the Lakeview and Nanticoke thermal generating stations. The results of an extensive literature search as well as of the surveys carried out by the consultants are given. Damage to tobacco and other crops from prevailing atmospheric ozone concentrations were found in the study area and particular attention is paid to this problem in the paper. No damage to vegetation from sulphur oxides was reported. No evidence was found of any adverse effect on the health of animals from existing levels of air pollution. Although concern is expressed for the future about the combined effects of Ontario Hydro, Texaco and Stelco plants at Nanticoke, the authors believe that if remedial measures are taken to maintain the air quality in conformity with Ontario standards there should be no injurious effects on vegetation or animals.

1238. Temple, P.J. and Linzon, S.N. - 1976.

"Boron as a Phytotoxic Air Pollutant". *J. Air Pollut. Control Assoc.*, Vol. 26, No. 5, pp. 498-499.

Damage to vegetation in Ontario due to boron and fluoride in the atmosphere is analyzed. This report is the result of the investigation of two types of boron emitting industries by the Phytotoxicology Section, Air Resources Branch, Ontario Ministry of the Environment. One is a manufacturer of stoves and refrigerators and the other is a producer of fiberglass materials. Results of the investigation are analyzed and illustrated in tabular form.

1239. Ullman, P.M. - 1967.

"Alberta Vegetation Summary". *Report Prepared for the Alberta Department of Health, Environmental Health Services Division*, Edmonton, 36 pages.

Results of a cooperative study of the Alberta Forest Service and the Provincial Air Pollution Control Division showed that pine and spruce foliar sulfur contents fluctuated upwards in the vicinity of sour gas plants for 3 to 5 years. Later they fluctuated down again to levels found at the time the gas plants went into production, whereas foliar sulfur contents of aspen and poplar continued to fluctuate upwards.

1240. Vasiloff, G.N. and Smith, M.L. - 1974.

"A Photocopy Technique to Evaluate Fluoride Injury on Gladiolus in Ontario". *Plant Dis. Rep.*, Vol. 58, No. 12, pp. 1091-1094.

A photocopy method was used for evaluating and reproducing fluoride-induced leaf injury during a gladiolus indicator plant program. Measurements of leaf injury and fluoride content were made on 5000 leaves from potted gladioli plants grown at 31 indicator plot locations in seven surveillance areas located in the Province of Ontario. Harvested plants were transported to a laboratory where a standard office photocopier was used to make reproductions of four middle-aged leaves from each plant. All leaves collected from each plot were divided into terminal and basal portions for chemical analysis of fluoride and other phytotoxic components. Comparisons of fluoride content and leaf injury for three collections of gladioli in a surveillance area near a fertilizer plant showed reductions in leaf injury which paralleled reductions in fluoride content for increasing distances downwind of the source. As the plot distance increased from 3.4 km to 5.5 km from the source, fluoride content decreased from 5.0 ppm to 3.0 ppm and leaf injury decreased from 4.6% to 0.2%. (USEPA Abstract)

See Also Reference Numbers: 1046, 1068, 1069, 1097, 1099, 1113, 1114, 1127, 1133, 1157, 1161, 1176, 1251.

4. EFFECTS, C) SOIL

1241. Cox, G.L. - 1975.

"The Effects of Smelter Emissions on the Soils of the Sudbury Area", Unpublished M.Sc. Thesis, University of Guelph, 228 pages.

The soils of the Sudbury area have been exposed to emissions from the smelting of sulfide ore for over 80 years. These emissions consist mainly of SO₂, and some 25 other pollutants, 16 of which are metals. The effect of these emissions on the soil has been associated with increasing acidity and heavy metal contamination. A three phase research program was developed to determine (1) the chemical changes which have taken place in the soils around Sudbury exposed to smelter emissions; (2) the effect of emissions on the acidity and heavy metal concentration in unaffected soils at different moisture contents; (3) the effects of SO₂ on acidity and sulphate-sulphur content of soils differing in texture, moisture and calcium-carbonate content. This thesis reviews the results of this research program.

1242. John, M.K., Van Laerhoven, C.J. and Cross, C.H. - 1975.

"Cadmium, Lead and Zinc Accumulation in Soils Near a Smelter Complex". *Environ. Letters*, Vol. 10, No. 1, pp. 25-35.

Soil samples from the surface 5 cm and underlying 5-10 cm were collected in the vicinity of a Pb-Zn smelter complex at Trail, British Columbia, Canada. Samples were air-dried, crushed, extracted with nitric acid, and analyzed for Cd, Pb, and Zn by atomic absorption spectrophotometry. Mean concentrations in the surface layer averaged 17.8, 2,607, and 571 ppm, respectively. Although underlying mineral soils contained smaller concentrations of all 3 metals, the relative immobility of Pb and the mobility of Zn were observed. A close association between Cd and Zn concentrations was reflected by significant correlations; variations of Pb concentrations in surface soils, however, were independent of concentrations of the other metals. (P.A. Abstract)

1243. Levesque, M. - 1974.

"Selenium Distribution in Canadian Soil Profiles". *Can. J. Soil Sci.*, Vol. 54, No. 1, pp. 63-68.

The distribution of Selenium (Se) in 54 Canadian soil profiles was examined according to horizon in the profile, and to soil properties. Apart from the organic surface layers, the Podzolic B horizons had the highest Se values (0.52 ppm), and so displayed a marked accumulation. The Luvisolic and Gleysolic B horizons also showed some accumulation. The Se content of parent materials was generally low (0.10 ppm). Simple correlation analyses of the combined data (irrespective of horizon) indicated that Se distribution was closely associated with both organic carbon and NH₄-oxalate extractable Fe and Al. When the data were arranged according to genetic groupings, this association remained true only for Podzolic B horizons. Multiple regression analyses revealed that the predominant factors involved in the Se distribution were the Se content of parent materials, and the organic carbon content of the upper horizons, in that order, except for Podzolic soils. Clay had little or no influence on the Se distribution. In spite of the relationship of Se to parent materials, the contribution by atmospheric contaminants to the Se enrichment of soils could remain important. (Author's Abstract)

1244. Mains, G. - 1972.

"Fluoride Pollution in Hamilton? An Investigation Conducted in Terms of the Soluble Fluoride Content of Hamilton Soils". University of Toronto, Institute of Environmental Sciences and Engineering", Pub. No. ES-3, 22 pages.

The fluoride content of soils may be a result of geographical input and in some cases industrial pollution. Whereas methods for determining the total fluoride content of soils and plants is tedious, the soluble fluoride in soils can be determined with relative ease, the magnitude of this may be indicative of industrial pollution. Soils from 9 sites across the city of Hamilton, a steel-producing centre in southern Ontario, (21 samples per site) were analyzed for dissolved fluoride using a colourimetric assay method and a lanthanum-alizarin reagent. Results showed a gradient of fluoride in the solutions of Hamilton soils ranging from 8.0 ppm in a control site on the southwestern edge of the city to 38.5 ppm beside the steel plants. The gradation of values in between these two sites correlated well with wind movements in the Hamilton area. The results are compatible with the aerial deposition of fluoride pollutants from the steel mills in Hamilton. (Author's Abstract)

1245. Mills, J.G. and Zwarich, M.A. - 1975.

"Heavy Metal Content of Agricultural Soils in Manitoba". *Can. J. Soil Sci.*, Vol. 55, No. 3, pp. 295-300.

The content of Hg, Cd, Pb, Cu, Zn, Cr, and Ni in the agricultural soils of southern and western Manitoba was investigated. The background levels of these metals in uncontaminated soils and the extent of contamination from agricultural, automotive, and urban sources was determined. Heavy metal concentrations in the surface soils were closely related to concentration in the soil parent materials. Agricultural practices had no detectable effect on the heavy metal content of the soil. Some accumulation of Pb was found in soils adjacent to highways and in the Winnipeg urban area. In general, there was little or no contamination of agricultural soils with Hg, Cd, Cu, Zn, Cr or Ni. (P.A. Abstract)

See Also Reference Numbers: 1063, 1097, 1098, 1099, 1127, 1157, 1162, 1167, 1201, 1202, 1225, 1230.

4. EFFECTS, D) MATERIALS

1246. Acres Consulting Services Limited - 1974.

"Social Effects of Air Pollution. C-2: Effects on Buildings". *Final Report* to Ontario Hydro, Toronto, 35 pages.

This report, compiled on the basis of the results of a literature survey, examines the effect of generating station emissions on exposed building materials in the areas surrounding Lakeview and Nanticoke stations. The effects on zinc, paint, copper, nickel, concrete, aluminum, brick, stone and glass were considered. Effects were evaluated in terms of ambient concentrations of sulphur dioxide and particulates calculated by a Gaussian dispersion model from predicted 1978 station emissions. The potential air pollution costs due to damage and soiling based on the proposed 10 per cent increase in generation applied to the ambient sulphur dioxide and particulate levels are reported to be \$41,000 - \$204,000 p.a. at Lakeview and \$3,000 - \$16,000 p.a. at Nanticoke. The translation of these potential costs into actual expenditures may vary anywhere from 0 to 100 per cent depending on a variety of factors external to air pollution such as personal value judgements, habits and levels of financial prosperity.

1247. Laughlin, R.G.W. and Williams, M.J. - 1974.

"Social Costs of Pollutants on Textile Consumer Productions. C-3: Textile Products". *Final Report* to Ontario Hydro, Toronto, 132 pages.

This report examines the costs of air pollution effects on textile materials for specific geographic locations. It includes a thorough presentation of available literature on the subject. It is concluded in the report that there is insufficient evidence to make an accurate assessment of the costs of textile degradation but an indication of the likely range of costs is given. In 1972 and 1973, soiling costs of textiles in Metropolitan Toronto were estimated to be up to \$7.4 million per year. Although this economic effect attributable to soiling by particulates was found, it is reported that the concentrations of sulphur dioxide and nitrogen dioxide encountered in Toronto would not cause any significant effect on the useful life of textiles. No significant costs could be assigned to air pollution damage to textiles in the Nanticoke area for 1972 and 1973.

1248. Peat, Marwick and Partners - 1974.

"Social Effects of Air Pollution: The Impact of Air Pollution on Property Values. Task C-6 Economic Appraisal". *Final Report* to Ontario Hydro, Toronto, 52 pages.

This report examines the impact of air pollution upon residential property values in Metropolitan Toronto. A literature review is included giving examples of studies where multiple regression analysis was used to measure the effect of air pollution on property values. It was determined in the report that this technique was not applicable to Toronto because prevailing concentration levels there are much less than those referred to in the literature. As an alternative, an analysis was made of changes in property values for three areas of Toronto having similar socio-economic characteristics but which had experienced in the period 1968-1973 different changes in pollution levels. The findings of the analysis suggest that, at present levels of sulphation in Toronto, incremental air pollution has no measurable impact upon residential property values.

1249. Sandor, P.E., Barrows, D.S., Allingham, R.M., and Jacob, A.L. - 1975.

"Air Pollution and Residential Property Values in Toronto, Ontario". Paper No. 75-11.7, 68th Annual Meeting of the Air Pollution Control Association, Boston, June, 13 pages.

This study was undertaken to assess the impact of air pollution on residential property values in Metropolitan Toronto. The paper briefly reviews the literature with respect to air pollution and property values. The advantages and disadvantages of regression analysis as a methodology to measure the impact of air pollution on residential property values are also assessed. The quantitative findings of the analysis suggest that at present levels of sulphation in Toronto, incremental air pollution has no measurable impact upon residential property values.

See Also Reference Numbers: 1168, 1315, 1336.

4. EFFECTS, E) ECONOMY

1250. Brown, T.D. - 1973.

"Air Pollution and Energy Reserves". *Civ. Serv. Rev.*, Vol. 46, No. 1, pp. 6, 8, 10, 12.

Air pollution is discussed in relation to conserving energy, with particular reference to Canadian energy usage. A personal inventory of air pollution for a family unit of four people is compiled to illustrate the effects of daily activities on the Canadian air pollution problem. Activities relating to automobile usage, space heating, domestic electricity consumption, and services requiring various fuels are specified in terms of annual average use and the amount of various pollutants produced. The amount of pollution produced from all sources for a family of four is 155,521 lb/yr for carbon dioxide, 1821 lb/yr for carbon monoxide, 564.3 lb/yr for nitrogen oxides, 6986 lb/yr for gaseous sulfur compounds, and 351 lb/yr for particulates and hydrocarbons. Comparisons of the pollution produced from alternative residential heating modes (oil, gas, electric) are presented along with comparisons of pollution resulting from gasoline versus electric powered transportation. Fuel consumption by use category and resulting air pollution is illustrated for the residential/commercial sector, general industry, thermal power, automobiles, and other transportation over the period 1965-1980. Automobiles account for the highest percentage of total air pollution (74.0% in 1970) and are projected to result in an annual increase of 18.2% over the period 1965-1980. Fuel consumption in relation to Canadian fuel reserves and total world reserves is also tabulated. (USEPA Abstract)

1251. Sano, I. - 1972.

"Economics of Sulfur Dioxide Air Pollution, with Special Reference to Forest Growth". (Shinrin ni oyobosu ariyusan gasu no keizaiteki no eikyo.) *Kuki Seijo* (Clean Air Journal of the Japan Air Cleaning Association, Tokyo) Vol. 9, No. 6, pp. 80-83.

A study conducted in the Sudbury district of Ontario over a 10-year period to assess the effects of sulfur dioxide on plant life, primarily forest growth, and the economics of plant damage is discussed. Large smelters in the district discharge about two million tons of SO₂ gas annually into the surrounding atmosphere. Eastern white pine was chosen as the indicator tree, and the damage in terms of foliage, bark, and biological injuries, tree mortality, and volume growth loss was measured on approximately 6000 trees. Based on the volume growth loss data, the economic cost of SO₂ damage was estimated at \$117,000/year. (USEPA Abstract)

See Also Reference Numbers: 1021, 1052, 1212.

4. EFFECTS, F) OTHER (e.g. visibility)

1252. Acres Consulting Services Limited - 1974.

"Social Effects of Air Pollution. C-4: Effects on Water Quality". *Final Report* to Ontario Hydro, Toronto, 25 pages.

This report examines the possible effect of atmospheric emissions on the water quality of Lakes Erie and Ontario, resulting from the operation of the Nanticoke and Lakeview coal-fired generating stations. It refers to a mathematical model previously developed by Acres Consulting Services to estimate the "long distance" transport of pollutants that leads to the calculation of atmospheric loading on the two lakes from all significant sources in and around the Great Lakes Basin. A Gaussian dispersion model, using expected emissions in 1978, was used to calculate "near field" contributions of the Nanticoke and Lakeview stations. It is concluded that because of the strong buffering action of both Lake Erie and Lake Ontario, the SO₂ loadings have no significant effect on pH or general water quality. No toxic effects on ambient water quality values are predicted from the output of the Nanticoke or Lakeview stations.

1253. Caranci, A. and Wrubleski, E.M. - 1974.

"Farm Certification and Approach to Farm Odour Problems in Ontario". In Air Pollution Control Association Southern Section and Technical Council, *Control Technology and Agricultural Air Pollution*, Memphis, Tenn., March 18-19, 1974, pp. 117-132.

Farm odour problems in Ontario are reviewed in terms of environmental legislation, procedures related to the certification of farms, and abatement activities. The Environmental Protection Act of 1971 defines an acceptable level of odour intensity consistent with normal farm practice. Main sources of farm odours are the storage and spreading of manure and barn odours. In almost every case such problems are resolved by the following two steps: physical changes such as the addition of covered storage tanks and the minimization of moisture in manure and modifications in management practice. A Certificate of Compliance, jointly issued by the Ontario Ministries of the Environment and Agriculture and Food, is given to farm operators in compliance with the intent of the Environmental Protection Act. (USEPA Abstract)

1254. Demers, D., Fermier, J., Hamilton, T., Murray, R., et al. - 1974.

"Preliminary Investigations of Odour Control at a Typical Industrial Source". A SWEEP Project, Department of Chemical Engineering, University of Windsor, Windsor, Ontario, 99 pages.

A preliminary study by four undergraduate chemical engineering students has developed a solid basis for a comprehensive approach to the control of odours from food processing industries. Gas chromatographic analysis of extracts of syrup fed to the Hiram Walker and Sons Limited flash dryer system indicates the presence of approximately 14 components, some or all of which may be odorous. On the basis of several on-site inspections, a number of modifications potentially capable of lowering odour levels in one stack effluent have been suggested.

1255. Jacobs, J.D. - 1971.

"Aircraft Contrail Effects on the Surface Radiation Budget in an Arctic Region". *Bull. Amer. Meteorol. Soc.*, Vol. 52, No. 11, pp. 1101-1102.

Aircraft contrails are viewed as artificial clouds that can have direct influence on local climate. In this study the effects of contrails in the Arctic are described. A reduction in net radiation at the surface was noted as a result of aircraft contrails in the Baffin Island region.

1256. Penman, A. and Borlase, W.J. - 1975.

"Chemicals Reduce System Odours". *Water Pollut. Control.*, Vol. 113, No. 1, pp. 29, 33.

Sewer odours from the Winnipeg, Canada, lift station are causing a major problem. The use of Cl as an odour control chemical is proving infeasible because of increased costs, future difficulty in getting the chemical, and the danger in storing and using it. Micro-Aid, a product of the Yucca plant, is noncorrosive and biodegradable. Testing was done for 7 wk, during the hottest part of summer, at 5 sites. Chlorine provides a better immediate reduction in atmospheric and dissolved S levels. Micro-Aid produces better overall reduction in odours. Unlike Cl, Micro-Aid produces only a slight odour of its own. A minimum amount of comminutor maintenance is required and no special safety equipment is necessary. A 1-yr trial with the new product has been proposed for 1975. (P.A. Abstract)

1257. Schroeder, W.H. - 1975.

"Air Pollution Aspects of Odorous Substances. A Literature Survey". Air Pollution Control Directorate, Environment Canada, Ottawa. *Report, EPS 3-AP-75-1*. 53 pages.

A state-of-the-art literature survey relative to air pollution aspects of odorous substances is presented. Background information is provided on the nature and characteristics of odorous substances, odour perception and odour classification. Major sources, and the odours emitted from each source, are identified. The effects of odours are discussed and the legislative aspects of odour control have also received consideration. Methods for qualitative and quantitative measurement of odours and odorants have been discussed in some detail. Finally, odour abatement methods and best practicable control technology are reviewed. (Author's Abstract)

1258. Stanley Associates Engineering Ltd., - 1973.

"Survey and Assessment of Atmospheric Odour in the Edmonton Area". Edmonton, Feb. 1973, 100 pages.

During 1972, a public opinion survey of Edmonton residents was made, odours were measured daily by odour panels, two surveys were conducted among metropolitan Edmonton residents in which individuals selected at random made observations concerning the occurrence of odours at their residences, and a telephone answering service was established to receive and compile odour complaints. Automotive exhaust was the most common and widespread odour source. Exhaust odour strength was not intense, nor considered extremely offensive to most residents. Chemical, meat processing, and sewage odours ranked next in order of frequency. These odours were usually stronger and more offensive. The southeast section of Edmonton had the worst overall odour problem, northeast Edmonton was second. Both areas had frequent odour occurrences, and were particularly affected by chemical and meat processing odours. Sherwood Park had a slightly lower incidence of odour occurrence, most of it due to the nearby petroleum and chemical industry. West Edmonton and St. Albert were much less affected by odours, with most residents feeling they did not have a serious odour problem. The major odour sources identified by Edmonton residents (excluding motor vehicles) were the meat packing and rendering plants, the east-end chemical plants, refineries, and sewage treatment facilities.

1259. Wilson, C.V. - 1975.

"The Climate of Quebec: Energy Considerations". Atmospheric Environment Service, Environment Canada, *Climatological Studies*, Number 23, 120 pages.

This is a comprehensive analysis of the climate of the province of Quebec which centers on the receipt of solar radiation and the energy balance. It includes a brief discussion of the effects of air pollution on the amount of incoming solar radiation received at the surface. This discussion focusses on Montreal and Quebec City.

1260. Yamashita, S. - 1973.

"Air Pollution Study from Measurements of Solar Radiation". *Arch. Meteorol. Geophys. Bioklimatol.*, Ser. B, Vol. 21, No. 2-3, pp. 243-253.

The reduction of solar radiation at Toronto was investigated on both cloudless and clear days. This reduction was related to sulfur dioxide concentration multiplied by the cosine of the solar altitude because solar radiation is influenced by the concentration of pollution and the path length of the solar beam through the urban atmosphere. The relationship between the reduction of solar radiation and the wind direction was obtained, indicating the effect of the shift of the urban pollution dome on solar radiation. Three stations measured the solar radiation in and around Toronto. Definite differences in solar radiation between the three stations on both cloudless and clear days were found. No seasonal variation of the SO₂ concentration was found, but the reduction index had a pronounced seasonal variation because it is influenced by air pollution concentrations and by the solar altitude. The reduction index was higher for a northerly wind and lower for a southerly wind. (USEPA Abstract)

1261. Yamashita, S. - 1974.

"A Comparative Study of Turbidity in an Urban and a Rural Environment at Toronto". *Atmos. Environ.*, Vol. 8, No. 5, pp. 507-518.

Values of Linke's turbidity factor in Toronto and at nearby rural locations were computed from the measurements of global and diffuse sky solar radiation on cloudless days. The turbidity factor was larger in the city than in the rural area through the year, except for some time in the summer. A comparison of the turbidity factor for the same optical air masses and wind directions was also made. Annual mean values of about 3.0, 2.71, 2.54, and 2.74 turbidity were obtained for Toronto city, two locations in Scarborough, and at the Toronto Meteorological Research Station, respectively, the last two stations being rural. Mean monthly values for all stations showed higher turbidity during the summer than in the winter. The difference in the turbidity factor between the urban and the rural environment was larger in spring and autumn than in winter and summer. The turbidity factor was slightly larger in the afternoon than in the morning. The statistics on wind direction showed the effect of the urban atmosphere on turbidity. (USEPA Abstract)

See Also Reference Numbers: 1031, 1063, 1113, 1136, 1173, 1178, 1181, 1182, 1184, 1185, 1289, 1300, 1331.

4. EFFECTS, G) GENERAL

1262. Breesee, P. and Tyler, S. - 1975.

"Alberta's Athabasca Oil Sands: A Canadian Perspective". *Alternatives*, Vol. 4, No. 2, pp. 21-33.

In this comprehensive article on the Athabasca Oil Sands in Alberta, air pollution is described as part of the environmental impact of oil extraction. This discussion centers on emissions of SO₂ and pollution from constantly running diesel engines.

1263. Eedy, W. - 1974.

Environmental Cause/Effect Phenomena Relating to Technological Development in the Canadian Arctic. National Research Council of Canada, Ottawa, Environmental Secretariat, Publication NRCC 13688, 136 pages.

The environmental cause/effect interrelationships observed as a consequence of man-mediated disruptions in Canadian Arctic regions are summarized. Sulfur dioxide pollution has destroyed vegetation in Southern Canada. Lichens are particularly vulnerable and have no defence mechanism against pollutants. In Fairbanks, ice fogs and stagnant air collect very high concentrations of pollutants, with the worst conditions arising from fossil fuel combustion and vehicle exhaust. In Yellowknife thermal inversions cause high local deposition of arsenic arising from smelter fumes. Concentrations are reported as high as 3 ppm. Fogs cause problems in the Edmonton air. Stable smoke clouds drifted north from a southern forest fire and reduced the solar radiation by 25%. Similar problems can occur with the plumes of industrial or thermoelectric stacks. (USEPA Abstract)

1264. National Research Council, Canada - 1973.

Lead in the Canadian Environment. Associate Committee on Scientific Criteria for Environmental Quality, National Research Council, Ottawa, 116 pages.

This report on lead as a pollutant establishes criteria for environmental quality with respect to lead in Canada. The release of lead into the Canadian environment, current lead levels in the Canadian environment and the toxic effects of lead, are discussed. Although the text is general in content, there are many charts and tables with specifically Canadian data.

1265. National Research Council, Canada - 1974.

Chlordane: Its Effects on Canadian Ecosystems and Its Chemistry. Associate Committee on Scientific Criteria for Environmental Quality, NRCC No. 14994, Ottawa, 189 pages.

Inadvertent atmospheric contamination from the pesticide Chlordane may take place because of drift from aerial applications and granular formations. Dust can arise from the manufacture, transit, and application of Chlordane. Wind erosion may also cause the transport of the pesticide. Soil-incorporated residues of Chlordane volatilize faster than those of Dieldrin. Photo-isomerization by ultra-violet light of residues within the atmosphere is also a possibility. Some studies have indicated that Chlordane may move from natural waters into the atmosphere. The height of the water column can also influence the process. The extensive use of Chlordane for structural and household pest control raised the question of aerial transport within exposures. Several experiments in buildings are described. Some Chlordane residues have been found in air samples at various localities, but the possible daily respiratory intake of Chlordane and other pesticide residues is only a fraction of that ingested from food. (USEPA Abstract)

1266. Pond, S.G. - 1974.

"Discussion of Potential Sites for a Nanaimo Area Lumber Transshipment Port, with Particular Reference to Potential Effluents and Emissions". *Environmental Assessment of Nanaimo Port Alternatives*, Land Use Branch, Environment Canada, Ottawa, pp. 1-6.

This section of a report on the environmental effects of development of a lumber transshipment facility at Nanaimo assesses the potential pollution problems at each of the five proposed sites. Water pollution, sewage disposal, air pollution, human annoyance and sources of contaminants are briefly discussed. Bilge water, storm runoff, and collisions in the port are assessed as potential pollution problems. Harmac South is selected as the site that would minimize pollution of the estuary during construction but adequate waste treatment facilities would have to be built there because connection with the Nanaimo regional system would not be possible.

1267. Sub-Committee on Energy and the Environment - 1973.

"Impact of Energy Use on the Environment in Ontario". *Report*, Prepared by the Members of the Sub-Committee on Energy and the Environment for the Ontario Advisory Committee on Energy, March, Toronto, 318 pages.

This report discusses the environment implications of energy use in Ontario together with conclusions and recommendations. It analyzes the impact of electric power generation, industry, recreation and transportation on air, land and water. Present air quality is compared with that of the future. Current legislation, both federal and provincial (Ontario), is also discussed.

1268. Warren, H.V. - 1974.

"Environmental Lead: A Survey of its Possible Physiological Significance". *J. Biosoc. Sci.*, Vol. 6, No. 2, pp. 223-238.

Sources of environmental lead are discussed in a survey of diseases of the nervous system. Only 5-10% of the Pb ingested in food and water is absorbed, while 40-50% of the Pb present in inhaled air is absorbed. Air, dust, and leaded gasoline are among the sources of Pb. Normal rural air in the United States may contain 0.05 micrograms of Pb/cu m, while 0.3-2.5 may be representative of general urban areas. An urban dweller can inhale daily 60-120 micrograms of Pb, but it is not known whether 25 or 50% of this Pb is absorbed. Urban dusts in Vancouver seldom run less than 200 ppm with many downtown samples carrying more than 1%. Values from 0.5 to 6% Pb in dust are common in many large cities in Great Britain, Canada, and the United States. Evidence exists in the United States and Great Britain to show the significance of atmosphere and vegetative pollution by tetraethyl Pb discharged in the exhaust fumes of motor vehicles. The Pb from leaded gasoline not only is a major contribution to the Pb occurring in urban air and dust but also adds indirectly, and significantly, to the Pb content of the food grown in some localities. Many diseases of the nervous system such as multiple sclerosis, swayback, kuru, motor neurone disease, and amyotrophic lateral sclerosis frequently have an unexplained association with Pb or mercury. (USEPA Abstract)

See Also Reference Numbers: 1044, 1049, 1066, 1072, 1128, 1145, 1160, 1202, 1336.

5. ADJUSTMENTS AND CONTROL, A) LEGAL ASPECTS

1269. Anon. - 1972.

"Federal Guidelines are Aimed at Helping Firms Meet Rules". *Can. Pulp Pap. Ind.*, Vol. 25, No. 5, pp. 27, 29.

Environment Canada is bringing out a set of guidelines that will assist pulp and paper companies and regulatory agencies with the implementation of the federal government's new effluent regulations. The Environmental Protection Service of the Department is taking on the job of carrying promising new pollution control technology beyond the research stage to practical demonstration. The intent is to encourage recovery at the source by treating to practicable levels. The guidelines will go into somewhat more detail than was possible in the regulations themselves with respect to how the standards should be calculated for each mill and how they are intended to be implemented. One aspect of the regulations is that they specify limits not just for the plant as a whole but for each step or processing unit within it.

1270. Anon. - 1972.

"Pollution: Environmental Law Reference Material". Department of Continuing Education, Law Society of Upper Canada, Osgoode Hall, Toronto, May 11 and 12, 1972, 176 pages.

This book contains twenty-three Canadian federal and Ontario provincial legislative acts that pertain to air, water and noise pollution. Several papers are included that deal with such subjects as air and noise pollution, environmental law and the federal government in relation to pollution. Also included is a selected bibliography on air and water pollution. Relevant papers are abstracted separately elsewhere in this *Bibliography*.

1271. Anon. - 1973.

The Clean Air Act Annual Report 1972-1973. (et seq.) Environmental Protection Service, Air Pollution Control Directorate, Environment Canada, May, 73 pages.

The Clean Air Act of Canada provides the basis for the federal government's air pollution control activities. The act has 3 main objectives: to promote a uniform approach across Canada, to make provisions for the mechanisms and institutions needed to ensure that all measures to control air pollution can be taken, and to delineate a leadership role for the federal government. The regulations of the act, regulatory bodies, and air pollution control programs operated under the act are discussed. (Replaces Ref. 853) (P.A. Abstract)

1272. Brun, M.J. and Jarrault, P. - 1974.

"Maximum Allowable Concentrations and Emissions Limited for Individual Pollutants, Industries, and Countries According to Standards and Recommendations". (Teneurs Limites Dans l'Air Ambient et a l'Emission. Valeurs par Polluant, par Industrie, par Pays d'Apres les Normes et Recommendations.) C.I.T.E.P.A. Technical Interprofessional Study Center for Air Pollution, *Etudes Documentaires*, 42, CI 805, CI 809, Feb. 1, 53 pages.

Maximum allowable concentrations and emissions from different sources of dust, sulfur dioxide, carbon monoxide, hydrogen sulfide, nitrogen oxides, chlorine, hydrochloric acid, fluorine, hydrocarbons, and heavy metals, as recommended or imposed by acts or standards in various countries, such as Bulgaria, Belgium, Canada, U.S.A., Finland, France, the Netherlands, Israel, Italy, Japan, West Germany, East Germany, Rumania, Sweden, Czechoslovakia, Turkey and the USSR are listed. Percentages of the times during which the maximum allowable concentrations may be exceeded are given. Detailed listings are presented of the maximum allowable emissions from various sources, such as the metallurgical, chemical, and pulp and paper industries, waste incineration, domestic heating, cement works, petroleum refining, power generation, and sewage treatment. (USEPA Abstract)

1273. Environment Canada - 1974.

"Canada's Motor Vehicle Pollution Control Program". Air Pollution Control Directorate, *Report*, EPS 2-AP-74-1, Environment Canada, Ottawa, 35 pages.

The Federal Government, recognizing the need to improve the quality of our air, has launched a program to eliminate the motor vehicle as a significant source of air pollution in Canada. This report presents a general discussion of current government steps taken towards accomplishing this goal. Data and methodology now available for assessing and monitoring the Canadian automotive emission problem are summarized and evaluated, areas for further research are designated, and arguments are presented for the immediate need for stringent government action. (Author's Abstract)

1274. Environment Canada - 1975.

"Canada's Air Pollution Control Program". Air Pollution Control Directorate, *Report*, EPS 2-AP-75-1, Environment Canada, Ottawa, 46 pages.

This report outlines the federal government's approach to the control of air pollution in Canada. The federal role under the authority of the Clean Air Act is described including the establishment of goals, air quality objectives, regulatory programs and cooperation with provincial governments and advisory services. The federal approach of containment at source using best practicable technology is discussed and the National Air Pollution Surveillance Network is described. Selected speeches and news releases complement the formal statement of policy.

1275. Estrin, D. - 1976.

"The Legal and Administrative Management of Ontario's Air Resources 1967-74". In Elder, P.S., (ed), *Environmental Management and Public Participation*, Canadian Environmental Law Research Foundation and the Canadian Environmental Law Association, Toronto, pp. 182-212.

This paper deals with the management of air resources in Ontario. It outlines the legislative goals and techniques given to the province's air administrators. The effectiveness of these goals and techniques is discussed. Public participation in the program is analyzed and recommendations are given.

1276. Grant, W.J. - 1973.

"Canadian Pollution Authorities and Requirements". Paper Presented at 4th National Meeting, American Institute of Chemical Engineers, New Orleans, March 15, 20 pages.

Pollution legislation and enforcement authorities in Canada are outlined along with activities of the Petroleum Association for Conservation of the Environment. The Environmental Protection Act of 1971 is the most general piece of Canadian pollution legislation, and the Environmental Protection Service is the action arm of government policy. The Clean Air Act permits the federal government to set national air quality objectives and to cooperate with the provinces in several key areas such as monitoring and research. Federal intervention in air pollution control is permitted when there is a significant danger to public health or when international agreements are involved. National air quality objectives have been established for sulfur dioxide, particulates, carbon monoxide, and total oxidants. Nitrogen oxides and hydrocarbons are currently under consideration. The Petroleum Association for Conservation of the Environment represents all phases of the petroleum industry in Canada and maintains standing sub-committees on air and water pollution, liquid wastes, oil spills, legislation, public relations, and research. (USEPA Abstract)

1277. Jefferies, J.G. - 1974.

"Possible Provincial Strategies for Controlling Automobile Emissions". Preprint, American Public Works Association, 15 pages. (Presented at the American Public Works Association, International Public Works Congress, Toronto, Ontario, September 14-19, 1974.)

The province of Ontario has passed legislation to control air pollution from motor vehicles. Federal standards which were identical to those of the province were established. A number of control strategies to meet these standards are being considered. One method would require all vehicles to undergo an exhaust emission check prior to annual registration. Proposed standards were derived from an on-going inspection vehicle. In general, standards of this type would reject the worst 10% of the vehicles being tested; but initially the rejection rate could be as high as 25-30%, so it may be necessary to have more lenient standards during the first year and then enforce the full standards. New cars might be forced to be tested under warranty to ensure that they comply with the standards. The standards would be slightly more stringent under warranty to permit some deterioration in control performance later in the vehicle's life. When these intermediate strategies have been brought into effect, it will then be possible to determine the necessity to introduce legislation to require all automobiles in the province to undergo a regular, probably annual, emission check. Regular emission testing will probably be required for automobiles having catalytic systems. When inspections are analyzed in terms of costs and benefits, it seems that an annual emission inspection would not be justified only on a province-wide basis. Alternatives could be undertaken, such as introducing the standards only in the southern part of the province which contains greater vehicle pollution. There should be some provincial inspection strategy to back up the federal legislation. (USEPA Abstract)

1278. Klemm, R.E. - 1972.

"Regulatory Agencies Governing the Operations Associated with Processing Plants". *Environmental Effects of the Operation of Sulfur Extraction Gas Plants in Alberta: Report*, Environment Conservation Authority of Alberta, Edmonton, pp. 34-43.

This chapter examines the regulatory agencies governing the operation of sulfur extraction gas plants in Alberta. A chart is presented outlining the current division of responsibilities for those matters of direct concern to the Gas Conservation Board, Departments of Environment, Lands and Forests, Mines and Minerals, and Agriculture. The coordination of all activities is the responsibility of the Department of the Environment. Many of the field inspections are carried out by the Energy Resources Conservation Board. Regulations by contaminant and by operation are also mentioned. Finally the regulatory conditions surrounding gas processing and sulfur recovery plants is discussed. (WATDOC)

1279. Lack, J.C. and Schnitzer, W.J. - 1973.

"Review of Monitoring Data Available from the Alberta Department of the Environment: with Specific Tabulations for Sour Gas Processing Plants". *Proceedings, Workshop on Sulphur Gas Research in Alberta, Information Report*, NOR-X-72, Northern Forest Research Centre, Edmonton, Alberta, pp. 146-188.

This paper summarizes the current air quality monitoring being conducted by the Department of the Environment and by the Sour Gas Industry. Included is a summary of the minimum requirement guidelines which have been established for all air licences

issued to sour gas plants. These requirements apply to all new plants and also existing plants when the existing approval is amended. Also included is a consolidation of the Air Monitoring Directives (AMD) which have been issued during 1972 and 1973. This AMD summarizes the reporting requirements for sour gas plants. (Authors' Abstract)

1280. Lundquist, L.J. - 1972.

"Do Political Structures Matter in Environmental Politics? The Case of Air Pollution Control in Canada, Sweden, and the United States". *Can. J. Public Admin.*, Vol. 15, pp. 119-141.

The point of departure of this study is the question whether differences in political structures also lead to differences in the policy alternatives selected for practical use. The study examines the influence of federal/unitary, parliamentary/balance-of-power, and administrative/judicial structural aspects on the selection of policy alternatives for air pollution control in Canada, Sweden, and the United States. The examination indicates that these structural differences have had an influence on the choices of such policy elements as (a) the basic approach to pollution control, (b) the distribution of authority among different levels of government, (c) the methods of enforcement, and (d) public participation. As a result of these influences, considerable differences exist between the three countries with regard to air pollution control policy. This is all the more remarkable in view of the similarity of the problem of air pollution and the availability of similar techniques for pollution control in all industrialized countries. The paper ends with an outline of an 'ideal' policy of air pollution control, and discusses the structural problems of all three countries with regard to the adoption of such an 'ideal' policy. (Author's Abstract)

1281. Morley, C.G. - 1972.

"Pollution as a Crime: the Federal Response". In *Pollution: Environmental Law Reference Material*, Department of Continuing Education, Law Society of Upper Canada, Osgoode Hall, Toronto, May 11, 12, pp. 159-167.

This discussion focusses on three Canadian federal legislative acts aimed at controlling pollution: the Fisheries Act, the Canada Water Act and the Clean Air Act. The need for the standards set and objectives of these laws are described.

1282. Royal Commission on Metropolitan Toronto - 1975.

"Physical Services, Environmental Protection and Energy Supply in Metropolitan Toronto". *Background Report*, James F. MacLaren Limited, Toronto, 163 pages.

This report contains a background analysis of the state of servicing in Metropolitan Toronto of water supply, sewerage and sewage works, storm water management, solid waste management and energy supply together with observations on the environmental control of air quality and noise. The section dealing with air quality control reviews the ways in which the provincial and federal governments carry out their mandates in the air management field and assesses the implications of government decisions in this field for Metropolitan Toronto.

1283. Slater, R.W. - 1975.

"Development and Implementation of Federal Environmental Protection Requirements in Ontario". *Proceedings*, 22nd Ontario Industrial Waste Conference, Ontario Ministry of the Environment, June 15-18, pp. 198-214.

The government-industry task force technique for defining "best practicable technology" for pollution control from various industrial sectors is described. The differences between regulations, standards, guidelines and codes of good practice are discussed. Programmes for implementing these requirements are developed to ensure minimal duplication and conflict with other levels of government. Environment Canada's responsibilities for environment protection with respect to the activities and facilities of the Federal Government are described. The relationship between the well established clean-up programme for the Federal Government's own facilities and the more recent environmental assessment process is given. (Author's Abstract)

1284. Warner, P. - 1971.

"Manitoba Clean Environment Commission and its Functions". *Proceedings*, Waste Management Seminar, Agassiz Centre for Water Studies, University of Manitoba, Winnipeg, pp. 27-34.

The Clean Environment Act proclaimed on 15th June, 1968, provided for the appointment of a commission of not less than three members appointed by the Lieutenant Governor in Council, with one to be designated as chairman and one as vice-chairman. The Commission is empowered under the Act to issue licences with such terms and conditions as it deems fit and for such periods as it may think necessary, except where otherwise provided for in the Act. It is by setting these terms and conditions that the Clean Environment Commission can exert its main influence in controlling polluters or potential polluters. (WATDOC)

1285. Winthrop, S.O. - 1975.

"Canada's Air Pollution Control Program". *Proceedings*, 1975 Clean Air Conference, Vol. 1, Ann Arbor Science Publishers, 1975. pp. 1-12.

The constitutional basis for Canada's air pollution legislation is presented. The federal government's role as described by the Clean Air Act includes the establishment of goals, air quality objectives, regulatory programs, and cooperation with provincial governments and advisory services. Air pollution control at the source is based on the best practicable technology. The development of national emission guidelines for major industrial sectors and national emission standards for contaminants is discussed. Motor vehicle emissions are regulated at the point of manufacture under the Motor Vehicle Safety Act. Operation of the National Air Pollution Surveillance Network is described. (P.A. Abstract)

See Also Reference Numbers: 1086, 1188, 1205, 1253, 1267, 1291, 1298, 1314, 1315, 1323, 1325, 1335.

5. ADJUSTMENTS AND CONTROL, B) TECHNOLOGICAL

1286. Anon - 1966.

"Industry Fights Pollution With 14 Million Dollar Tab". *Water Pollut. Control*, Vol. 104, No. 7, pp. 28-29.

Canada's first hydrochloric acid regeneration plant was installed at the Hilton works of the Steel Company of Canada Ltd., at a cost of 2 million dollars. A history of pollution abatement processes in this steel company is given, beginning in 1928 with the utilization of waste gas from the blast furnaces as a fuel in other areas of the Hilton works, and continuing to the present regeneration plant. Both air and water treatment processes are discussed. Oil recovery systems, electrostatic precipitators, a phenol extraction plant, clarifiers, and a scale pit are among the treatment facilities employed by the company. (WATDOC)

1287. Anon - 1972.

"Kamloops Pollution Curbs Are B.C.'s Most Extensive". *Can. Pulp Pap. Ind.*, Vol. 25, No. 7, pp. 21-25.

Weyerhaeuser Canada Ltd.'s new 1250 tons/day bleached kraft pulp mill at Kamloops, British Columbia, brings into effect close use of the forest resource, as well as an extensive pollution abatement program. Beehive burners have in the past burned constantly, but now sawdust and shavings will be used for the production of sawdust market pulp, while hog fuel will also be shipped to the Weyerhaeuser pulp mill for use in hog fuel burning boilers where the mill will generate most of its own power. The mill was designed to burn off a high percentage of odorous bases and waste products, so that as little odour and effluent as possible are vented to the environment. Depending on the nature of the waste, it is burned in the lime kiln or power boilers. A gas containment system will collect blow gases from the digester so that noncondensable organic sulfur compounds can be separated out and then delivered to the lime kiln where they are burned. Burning of the sulfur compounds produces heat and reduces the amount of fuel required for the kiln. Sulfur dioxide is removed from the kiln flue gas by two wet scrubbers in series. Fly ash removal systems, water effluent treatment, a high stack, and other pollution abatement techniques are indicated. (USEPA Abstract)

1288. Anon - 1972.

"MP and E's Survey of Steam Power Systems". *Mod. Power Eng.*, Vol. 66, No. 7, pp. 51-58.

The importance of steam power systems in industries and in institutions is dramatically reflected in a survey of plants across Canada. A total of 77% of the plants surveyed use steam. Analysis of survey returns by industry shows clothing and textile manufacturers all reporting the use of steam; 94.7% of institutions; 93.8% of food and beverage manufacturers; 93.3% of the paper and allied industries; and 86.4% of the petroleum, coal, and chemical industries. Differences in steam using practices are indicated, with regard to pressures, uses, number of boilers, boiler makeup, boiler blowdown, feedwater controls, economizers, superheaters, standby fuels, pollution control, water supply and treatment, corrosion inhibitors, personnel, equipment, purchasing considerations, and periods of demand. Many oil-using plants use fuel additives to control pollution; paper industries use collectors, scrubbers, and electrostatic precipitators to eliminate pollutants in stack gas. (USEPA Abstract)

1289. Anon - 1972.

"Odor Control: A Spicy Story". *Water Pollut. Control*, Vol. 110, No. 5, p. 60.

Stange Canada Ltd., one of Canada's largest companies involved in the packaging of exotic spices of all types and varieties, installed an air control system in its plant in Malton, Ontario. The company's management agreed in the early stages of design that the main task of any system to be installed should not only be the collection of dust, but also control of the total atmosphere in the plant's processing and packaging rooms. Air in the production and packaging area is controlled by two independent high velocity air handling systems. At each of the three grinders, two nozzles are placed at points where dust might escape. These nozzles are closely adapted in their shape to the vessels used in spice handling, and are of a design developed originally for the collection of vapors, as the submicron aromatic spice components behave in many ways like a vapor or gas. Air collected at these spots is led through stainless steel risers to a galvanized horizontal duct, suspended from the ceiling at an incline to allow the frequent flushing of the system with water. The horizontal ducts lead to a bag dust collector. (USEPA Abstract)

1290. Anon. - 1973.

"Huge Scrubber Cools 1.6 Million cfm of Paper Mill Off-Gas". *Chem. Process*, Vol. 36, No. 4, p. 51.

One of the largest gas scrubber/coolers in the world, located at Weyerhaeuser's pulp and paper mill in British Columbia, cools 1.6 cfm of gases from power boilers, recovery furnaces, and kilns to <200°F. The venturi-type scrubber is >130 ft long with a 23-ft-diameter inlet. The cool gases can be passed safely into a 3,000-ft-long wood duct that terminates in a stack about 800 ft above the mill, which is located in a deep valley. By ducting the cooled gases and discharging them high above the valley, the inversion layer will be pierced and the plume, quickly dispersed. The operation and special qualities of the scrubber are briefly described. (P.A. Abstract)

1291. British Columbia, Department of Land, Forests and Water Resources. - 1974.

"Report on Pollution Control Objectives for the Chemical and Petroleum Industries". Pollution Control Board, British Columbia Department of Land, Forests and Water Resources, Victoria, 63 pages.

An inquiry was held to resolve the technical considerations and measures required of the chemical and petroleum industries of British Columbia to meet the requirements of the Pollution Control Act of 1967. Sampling and monitoring of waste discharges, waste management planning, in-plant control, and emergency and abnormal operating conditions are described. Air pollution control objectives are classified as Levels A, B, and C. Emissions and control from petroleum industries are described including general emissions from refineries, gaseous streams from petroleum industries, catalytic cracking regenerator and heater and power boiler stack emissions, storage tank hydrocarbon vapors, HC from air blowing of asphalts, flare stack emissions, and miscellaneous emissions. Emissions and control from natural gas plants discussed include general, main stack, flare, inlet separator, storage tank, and sulfur storage emissions. Emissions and control from oil and gas production discussed include general, battery site flaring, storage, and miscellaneous emissions. Emissions and control from the petrochemical industry discussed include general and gaseous emissions. Emissions and control in resin and paint industries discussed include general, formaldehyde, phenolic resin, urea-formaldehyde resin, polyester resin, alkyd resin, polyvinyl acetate emulsion, bodied oil production, and treated fiber product production emissions. Paint manufacture, chlor-alkali, and sodium chlorate industry emissions are discussed. Emissions from chlor-alkali processes utilizing mercury cells include mercury, chlorine, hydrogen chloride, particulates, and hydrogen sulfide. Gaseous emissions from chlor-alkali processes using diaphragm cells include lead. Gaseous emissions from sodium chlorate plants include chlorine, particulates, and hydrogen chloride. Emissions from sulfuric acid plants, alum plants, explosive plants, and fertilizer manufacturers are also discussed. Ambient air quality guidelines and monitoring programs are reviewed. Solid waste disposal and water pollution control guidelines and objectives are also discussed. (USEPA Abstract)

1292. Delbridge, W.A. - 1975.

"Financing New Pollution Control Technology". *Eng. Dig.*, Vol. 21, No. 7, pp. 29-31.

The development and demonstration of pollution abatement technology (DPAT) program is a shared cost venture with industry. The Federal Government's share of the capital and operating costs could reach 30 million dollars over the next five years. This article explains all aspects of DPAT, including priorities, selection procedures and how to apply for assistance. Under the DPAT program the Federal Government can alleviate the costs industry faces in finding and proving out ways to reduce pollution. Contracts are entered into with individual enterprises to explore new technology, and the knowledge gained in this way is made available to other firms in Canada on a non-profit basis. (WATDOC)

1293. Environment Canada - 1975.

"Combustion Technology for the Disposal and Utilization of Wood Residue". Air Pollution Control Directorate, *Report*, EPS 3-AP-75-4, Environment Canada, Ottawa, 92 pages.

This report provides a state-of-the-art review of new and emerging technology for the utilization and disposal of wood residues with emphasis on air pollution potential and cost. Disposal of thermal decomposition is emphasized and utilization is limited to useful energy aspects. (Author's Abstract)

1294. Flewelling, F.J. - 1971

"Loss of Mercury From Chloralkali Plants". *Chem. Can.*, Vol. 23, No. 5, p. 14.

A discussion of the mercury cell process for the manufacture of chlorine and caustic soda in Canada is given. Attention is focussed upon the attempts since 1970 to reduce the loss of mercury into the atmosphere and water. Tables illustrate the effectiveness of abatement measures.

1295. Haas, L. - 1972.

"Latest Canadian Market Pulp Mill". *Pulp Pap. Int.*, Vol. 14, No. 9, pp. 31-34.

A 500-ton/day market pulp mill was started up in interior British Columbia. The mill is very closely integrated with a large sawmill and studmill so that a minimum of roundwood is pulped. The operation and technology of the mills are reviewed. Of the \$65 million spent on building the pulp mill, 7% or \$4.5 million was for effluent treatment and air pollution abatement. Pollution controls include a modified design storage tank for concentrated black liquor to prevent odors; precipitators with a collection efficiency of 99.5%; steam stripping of foul condensates; and odorous gas recovery and destruction to sulfur dioxide in the lime kiln. (USEPA Abstract)

1296. Hunter, W.D., Jr. and Michener, A.W. - 1973.

"New Elemental Sulphur Recovery System Establishes Ability to Handle Roaster Gases". *Eng. Min. J.*, Vol. 174, No. 6, pp. 117-120.

Large-scale conversion of sulphur dioxide (SO₂) from sulphide roaster gases to elemental S was successfully demonstrated at an Allied Chemical Corporation plant near Sudbury, Ontario. The recovery process exhibited the required capability of removing at least 90% of the SO₂ in the gases generated by the Ni-Fe reduction plant's fluid bed roasting system. The process consists of 3 principal stages: cooling and purification of the gases, reaction of SO₂ with methane, and formation and recovery of S. The SO₂ reduction phase involves a new nonsteady state reaction system. The process engineering and operating experience is discussed with key reaction system chemistry and cost analysis information. (P.A. Abstract)

1297. Kerr, R.K., Paskall, H.G. and Rankine, R.P. - 1973.

"Potential Efficiencies of the Conventional Claus Sulphur Recovery Process". *Proceedings*, Workshop on Sulphur Gas Research in Alberta, *Information Report*, NOR-X-72, Northern Forest Research Centre, Edmonton, Alberta, pp. 17-24.

The latest advances in Claus process technology are discussed in the light of recent theoretical prediction, together with supporting evidence obtained in the field. Unprecedented efficiency levels can be achieved by conventional Claus sulphur recovery plants employing as few as two catalytic stages. However, to sustain high level efficiencies for extended periods of time, persistent catalyst deactivation problems must be solved. (Authors' Abstract)

1298. Klemm, R.F. - 1972.

"Tail Gas Clean-Up". *Environmental Effects of the Operation of Sulfur Extraction Gas Plants in Alberta: Report*, Environment Conservation Authority of Alberta, Edmonton, pp. 72-79.

A discussion is presented on tail gas clean-up in relation to the environmental effects of sulfur extraction gas plants in Alberta. New guidelines for sulfur concentrations allowable in the air have been set. Thus 21 out of 40 sulfur recovery plants will require updating. The costs and technology of this operation is outlined in this chapter. Tail gas clean-up methods are also discussed particularly in view of various limitations to clean-up procedures. (WATDOC)

1299. Lim, W.G. and Hann, G.K. - 1974.

"Spot Sampling of Stack Gases - a New Approach". *Pulp Pap. Mag.*, Vol. 75, No. 7, pp. T255-T258. (Also Presented at the 8th Canadian Pulp and Paper Association, Air and Stream Improvement Conference, 8th, St. Andrews, New Brunswick, September 1-13, 1973.)

The stack gas sampling program at the Northwood Kraft Pulping Plant is described. It has progressed from the accepted method involving insulated, heated glass containers, a vacuum pump, and conditioning times of up to an hour or more, to a simple 5-minute affair requiring not much more than a 500-milliliter teflon bottle and a pocket big enough to hold it. Measurements of sulfur dioxide, hydrogen sulfide, and other reduced sulfur compounds are no longer complicated by considerations of sample loss through adsorption or of poor reproducibility of results. The sampling method described, now in full-time use, is rapid and simple, yielding results which are felt to be at least as reliable as those obtained by any other method in popular use. The time required per sample is short enough that there seems to be no real problem in achieving the eventual goal of sampling and measuring all 17 stacks routinely on a daily basis. (USEPA Abstract)

1300. McLeish, G. - 1972.

"Cariboo Pleases Ecologists and Economists". *Pulp Pap. Mag.*, Vol. 73, No. 10, pp. 42-44, 46, 51-52.

A new bleached kraft mill in British Columbia has assumed responsibility for disposal of wastes from 16 area sawmills, which annually burn nearly 275,000 bd units of bark and other waste in smoke-emitting beehive furnaces. Up to 250,000 bd units of waste will be burned at the kraft mill in a low-particulate emission hog-fuel fired boiler with a travelling grate. The remaining hog will be trucked to a special landfill area. As a first step in odor control, the evaporator train at the pulp mill features a concentrator instead of a cascade evaporator. In addition, the recovery boiler eliminates direct contact between furnace gases and black liquor, all but preventing the escape of malodorous compounds to the atmosphere. The residual malodorous gases from the turpentine recovery and odor abatement unit are incinerated in gas-fired lime kilns. Bleach and recausticizing plant effluents will be retained for 2 days in a primary aerated lagoon; the remaining mill effluent will be treated in a clarifier, then combined with treated primary basin effluent and passed to a secondary lagoon that is also equipped with aerators. After 3-4 days retention, the combined effluent will be discharged to a river. Sludge from the clarifier underflow will be filtered and dewatered before removal to a landfill. (USEPA Abstract)

1301. Overend, M. - 1972.

"Hill Stack Dispersal to Beat Inversions". *Water Pollut. Control*, Vol. 110, No. 4, pp. 76, 78.

Weyerhaeuser Canada Ltd. is building a new pulp mill on the banks of the Thompson River in Kamloops, British Columbia, at a cost of about \$110 million, of which more than \$22 million will be spent on direct and indirect pollution control measures. Incorporated in the far-reaching environmental protection plan will be a new super stack up the side of a mountain, costing \$6,465,000, which is expected to lead flue emissions above the inversion level. The biggest item in the water protection department will be the new 75-acre effluent lagoon, which will provide a five-day retention period for mill effluent before it is discharged. Included in the water treatment facilities will be two settling ponds, a clarifier, and a large emergency dump pond, where spills can be released. Other water protection devices are mentioned, and provision for the high level stack discharge is described. (USEPA Abstract)

1302. Robertson, D.J. - 1960.

"Filtration of Copper Smelter Gases at Hudson Bay Mining and Smelting Company, Limited". *Can. Min. Met. Bull.*, Vol. 53, No. 577, pp. 326-335.

The copper smelting operation of the Hudson Bay Mining and Smelting Company Limited, at Flin Flon, Manitoba, generates a gas flow of 350,000 c.f.m. at n.t.p. This gas stream passes to the atmosphere through a 20 foot diameter by 250 foot brick stack, carrying with it an appreciable dust burden in the form of metallic oxide fumes. The flow constituents during the period 1952 and 1953 and before gas filtration was included in the treatment scheme are shown in comparison to data taken after treatment began. This paper describes the gas filtration treatment and the results it obtained.

1303. Romaine, E. - 1973.

"Ram River Plant Canada's Largest Sulfur Producer". *Can. Petrol.*, Vol. 14, No. 3, pp. 27-30.

A gas processing plant at Ram River, Alberta, Canada, operated by the Aquitaine Co. of Canada Ltd. includes four 1000 long ton/day two-stage Claus sulfur recovery plants which are achieving 96% sulfur recovery with a new Kaiser S-201 catalyst. Tail gas from the first two plants completed is treated in a Sulfreen unit with a carbon catalyst, while tail gas from the other two units will be treated in a Sulfreen unit to be completed in mid-1973 which will use an alumina catalyst. Overall recovery of the two Claus units plus the Sulfreen unit is greater than 98%. The sulfur units generate 1.6 million lbs/hr of steam at 360 Psig which is supplemented by steam from two 175,000 lbs/hr gas-fired power boilers. The operators have complete control of the wells and the plant through the supervisory control system located in the control room. A map, plant layout, and flow diagram are included. (USEPA Abstract)

1304. Ross, W.K. - 1972.

"Designing a Canadian Refinery's Expansion to Comply with Present and Immediately Foreseeable Environmental Requirements". Paper 21, Presented at the International Pollution Engineering Congress, Cleveland, December 4-6, 1972, 11 pages.

Plans for new pollution control measures at a refinery which will be expanded are discussed. Air pollutant emission standards for sulfur dioxide, hydrogen sulfide, carbon monoxide, particulate matter, hydrogen fluoride, and smoke are listed. Planned control measures include scrubbing raw fuel gas with amine to remove H₂S and converting 92% of the H₂S to elemental sulfur for sale. The rest, as sulfur dioxide, plus the flue gas from oil burning will go to a 300-foot stack. Crude oil storage tanks will be fitted with roofs to prevent the loss of hydrocarbon and H₂S vapors. All H₂S bearing waters will be stored in a closed system and disposed of in a disposal well. Hydrofluoric acid transfer lines will be purged to clear them of HF vapors. The purged gas will flow to the flare through a gas scrubber to remove remaining HF vapors. After use as a catalyst, the HF will be recovered by distillation. The catalytic cracking unit is the major source of carbon monoxide and particulates. The CO will be directed to a boiler, where it will be burned to carbon dioxide. The regenerator will also be equipped with primary and secondary cyclones to remove 99.99% of the circulated catalyst particulates. Three possibilities were considered to reduce smoke when burning flared gases and oil sludges, including the installation of spare steam-driven river water and circulating water pumps, the provision of duplicate incoming electrical power lines, and the provision of a compressor on crude gas. The flares will be equipped with automatic steam injection to minimize smoke. Oily sludges will be centrifuged to remove the bulk of oil and water; and the centrifuge cake will go to a multi-hearth furnace, where it will be reduced to dry ash. The gases will pass through a chamber in which burners actuated by a smoke detector will burn the carbon in the smoke. Processes to minimize the loss of hydrocarbons are also described. Continuous monitoring is discussed, and environmental monitors of air pollutants are listed. (USEPA Abstract)

1305. Rowland, L. - 1972.

"Sulphur Guidelines will be Costly". *Oilweek*, Vol. 22, No. 49, pp. 54-55.

Alberta gas plants with sulfur recovery facilities must meet new provincial guidelines by the end of 1974. Of the 38 plants with recovery facilities, 17 appear capable of meeting the guidelines with existing processes and equipment that will require no modifications. The other 21 plants may require remedial work ranging in value to upwards of \$3 million. The guidelines are based on inlet volume to the sulfur recovery station of a plant. For plants with inlet rates of 1000-4000 long tons/day, stack cleanup facilities are mandatory and efficiency must be 98-99% under favorable acid gas quality conditions. In the 400-1000 ton range, minimal stack cleanup or equivalent is required, with 96-98% efficiency. Plants handling 100-400 tons must have at least a three-stage Claus or equivalent process and an efficiency of 94-96%. Between 10-100 tons, there must be at least a two-stage Claus process with 93-94% efficiency. (USEPA Abstract)

1306. Roy, L.P. - 1963.

"Anti-Pollution Efforts are Successful". *Petro. Process. Eng.*, June 1963, pp. 36-44.

In 1960, a group of oil refineries and petro-chemical plants located together in east Montreal, formed the Laval Industrial Association to study the degree of air and water pollution in the area. This article describes the testing equipment and survey methods that were used. The results of the tests are shown. The equipment and methods for reducing pollution that were adopted by these processing plants are described.

1307. Saddington, R.R. - 1971.

"What Sudbury's Nickel Industry Does About Pollution at INCO". *Watersheds*, Vol. 5, No. 3, pp. 27-29.

This paper briefly examines the various types of pollution confronting Canada, the considerations brought into play while searching for solutions, and what one company, International Nickel, is doing to meet them. Both air and water pollution programs are discussed. Air pollution controls include tall stacks for dispersing sulphur dioxide bearing smelter gas and the installation of

additional electrostatic precipitators. Water pollution controls include the use of recycled water and the filtration of mine waters until clear water remains. A program is also being carried out which enables abandoned tailing areas to be reclaimed. (WATDOC)

1308. Segsworth, V.K. - 1974.

"INCO's SO₂ Emission Control Program". Paper Presented at the 21st Ontario Industrial Waste Conference, Toronto, June 25, 1974, 10 pages.

Control measures to reduce sulfur dioxide pollution from the pyro-metallurgical processing of iron, copper, and nickel sulfide concentrates are reviewed for two International Nickel Company smelting and recovery facilities. A fluid bed roaster/kiln process which produces a roaster gas containing about 8% SO₂ is used for iron ore recovery. The gas is directed to sulfuric acid plants for subsequent recovery as 100% H₂SO₄. Oxygen flash smelting is used for copper processing, and off gas containing 80% SO₂ is cooled and converted to liquid SO₂. Nickel concentrate is roasted in a fluid bed roaster or in a Nichols-Herroschoff roaster, and the calcine is fed to reverberatory furnaces. Control by dispersion is accomplished with a 1250-foot high stack. (USEPA Abstract)

1309. Van de Wouwer, R. - 1972.

"Clinker Cooler Dust Collector Recovers 60 TPD at Inland's Winnipeg Plant". *Pit Quarry*, Vol. 64, No. 7, pp. 104-105.

A wheelabrator ultra-jet pulse-type dust collector which operates on a 1000-tpd clinker cooler excess air stream was installed at the Winnipeg plant of Inland Cement Industries. The dust collector units were shipped preassembled to the job site allowing complete field erection in 10 days. In addition to reducing erection time and cost, the method guarantees installation of dust-tight units. Considering the high capital cost of the dust collector bags, much attention was given to control cooler excess air temperature to the dust collector. The problem was successfully solved by the addition of two sonic water nozzles in the inlet duct. Design of the equipment to prevent dust build-up is described. (USEPA Abstract)

See Also Reference Numbers: 1049, 1050, 1051, 1070, 1075, 1077, 1078, 1085, 1086, 1096, 1256, 1257, 1269, 1283, 1325, 1339, 1342.

5. ADJUSTMENTS AND CONTROL, C) TOWN PLANNING AND AIR RESOURCE MANAGEMENT

1310. Alberta Industry-Government Sour Gas Environmental Committee - 1974.

"Guidelines for Urban Development in Relation to the Sour Gas Industry". Calgary, various pages.

This report examines the encroachment of populated settlements in Alberta, especially in the area between Calgary and Edmonton, upon sour gas operations. It is pointed out that, at present, insufficient regulations or procedures exist to prevent this encroachment although uncontrolled gas release from these fields could pose a hazard to large numbers of the residents. Recommendations are given regarding the examination of the problem by urban planners and developers before residential districts are constructed near sour gas fields.

1311. Anon. - 1972.

"How Fight for Air is Being Won in Metro Toronto". *Toronto Board Trade J.*, Vol. 62, No. 5, pp. 1-4.

This article discusses the success of Toronto's Air Quality Monitoring Program which was begun in 1966. Five air monitoring stations and the development of the air pollution index have contributed to this success. The process by which pollution emitters are controlled is explained. The key to Toronto's control of air pollution is due to a computer model built upon the collected air quality data for two years. Eventually this model will be expanded to include all of Southern Ontario.

1312. Dworsky, L.B., Allee, D.J. and Gates, C.D. - 1971.

Management of Lake Ontario - A Preliminary Report Proposing an International Management Organization. Cornell University Water Resources and Marine Sciences Centre, Ithaca, N.Y., 362 pages.

This preliminary report summarizes the results of a comprehensive study of the physical, social, economic and political aspects of the Lake Ontario basin with a view to improving existing governmental organizations and proposing new institutional arrangements for better management of the lake and of the Great Lakes system as a whole. Problems identified and considered in the report include water quality control, pollution control, municipal and industrial water supply, agricultural water supply, lake levels, electric power, flood control, navigation, fish and wildlife protection, recreation, waste disposal, air pollution, economic development, transportation, governmental problems, social problems, and institutional arrangements. Agencies and organizations now exercising some control over the lake are examined and assessed for their effectiveness. (WATDOC)

1313. Inhaber, H. - 1975.

"Set of Suggested Air Quality Indices for Canada". *Atmos. Environ.*, Vol. 9, No. 3, pp. 353-364.

An approach to producing air quality indices over a wide area is discussed. The proposed indices cover aspects of pollution in cities, around cities, and in rural areas. Data are shown on a local and regional basis, and the production of national indices is attempted. Lack of comprehensive data makes detailed evaluation difficult. (M.G.A Abstract)

1314. Klemm, R.F. - 1972.

"Ambient Air Quality Standards: Province of Alberta. *Environmental Effects of the Operation of Sulfur Extraction Gas Plants in Alberta: Report*, Environment Conservation Authority of Alberta, Edmonton, pp. 105-112.

The purpose of this outline is to establish minimum acceptable standards of ambient air quality to protect the health and welfare of all citizens, maintain the quality of the province's air resource and prevent deleterious effects to animals, plants and property. In this chapter there follows a series of charts illustrating these standards. Table I, *Ambient Air Quality Standards*, describes the amount of concentration acceptable relative to a particular pollutant. Table II, *Maximum Calculated Ground-level Concentration Standards*, describes the acceptable concentrations of a particular pollutant relative to its rural or urban position. (WATDOC)

1315. Kupa, P.C. - 1975.

"Air Pollution Control in Ontario: the Philosophy and Mechanisms for Air Quality Management". *Proceedings*, 22nd Ontario Industrial Waste Conference, Ontario Ministry of the Environment, June 15-18, pp. 187-197.

A brief statement of the historical development of air quality management in Ontario is given. The underlying rationale for managing air quality is one of effects. This concept treats air as a natural resource and aims at achieving a desirable air quality which is judged on the basis of the effect of contaminants on man, animals, vegetation and property, in such a manner as to have no known adverse effects. This places constraints on the rate of contaminant emission from any source in the context of the geographical location

of that source. The regulations define a maximum time concentration for any contaminant at the point of impingement, that is, where the plume from the source intersects the ground, a building, or other significant object. (Author's Abstract)

1316. Ott, W.R. and Thom, G.C. - 1976.

"A Critical Review of Air Pollution Index Systems in the United States and Canada". *J. Air Pollut. Control Assoc.*, Vol. 26, No. 5, pp. 460-470.

An extensive survey was conducted of all air pollution indices that are presently utilized or are available. The data were obtained from a literature review; from telephone discussions with personnel in state, local and provincial air pollution control agencies; and from material received from these agencies. The findings of this review are that a great diversity and lack of consistency exist in the way air quality conditions are reported to the public by means of air pollution indices. States, provinces, and U.S. cities use daily informational indices which differ strikingly from each other and differ from the more complex long-term trend indices that appear in the scientific literature. This review identifies 14 basically different index types while no two indices are exactly the same. Alberta and Ontario are the provinces considered in this review.

1317. Shenfeld, L. and Boyer, A.E. - 1974.

"Utilization of an Urban Air Pollution Model in Air Management". In NATO Committee on the Challenges of Modern Society, *Proceedings*, Expert Panel on Air Pollution Modeling, 5th meeting, Roskilde, Denmark, June 4-6, 1974, U.S. Environmental Protection Agency, Research Triangle Park, N.C., Chapter 22, 35 pages.

The multiple source urban diffusion model, developed for metropolitan Toronto in 1971, is an adaptation of the regional model originally designed for Connecticut by G.R. Hilst. The emission inventory system, the meteorological input, and the verification of the model, including its reliability and scoring of the results, are discussed. Examples of application of the model in simulating air quality of 1975, and carbon monoxide concentrations resulting from automotive emissions, and in the Toronto district heating study; and its use in urban and air quality planning are described. (M.G.A. Abstract)

See Also Reference Numbers: 1024, 1035, 1042, 1054, 1055, 1060, 1081, 1090, 1100, 1135, 1139, 1140, 1141, 1151, 1152, 1158, 1215, 1218, 1222, 1254, 1273, 1274, 1280, 1282, 1284, 1325, 1332, 1335.

5. ADJUSTMENTS AND CONTROL, D) ORGANIZATIONS

1318. Anon. - 1972.

"Public Accepts Pollution as Major Problem Area". *Can. Pulp Pap. Ind.*, Vol. 25, No. 5, pp. 30-31.

Since Pollution Probe was founded four years ago, the organization has grown to incorporate 50 chapters across Canada, mostly in Ontario. The aim of the group is to reduce the discharge of effluent to a level society agrees is not harmful to competing users of the air and water resources. A recent conflict has been over commercial logging in Canada's provincial and national parks. Donald A. Chant, the chairman of the Board of Advisors to Pollution Probe and one of the group's founding members, thinks that the pulp and paper industry does not do a very good public relations job, and that the industry has been slow in developing economic ways of recycling its products. (USEPA Abstract)

1319. Chant, D.A. - 1970.

"Pollution Probe: Fighting the Polluters with Their Own Weapons". *Sci. Forum.*, Vol. 3, No. 2, pp. 19-22.

Action by citizens groups is needed to encourage and guide progressive government and industries in environmental quality control including air pollution control; to pressure inert governments and industries into awareness and progress; and to counter lobbying and other counter-pressures from polluters who have selfish, short-term economic interests without environmental conscience. One such citizen group is Pollution Probe, and in this article, the author outlines the formation, present structure, objectives and successes of Pollution Probe. (WATDOC)

See Also Reference Numbers: 1015, 1276, 1306, 1324, 1333.

5. ADJUSTMENTS AND CONTROL, E) ECONOMIC

1320. Auld, D.A.L. - 1974.

"Willingness to Pay for Pollution Abatement: A Case Study". *Alternatives*, Vol. 3, No. 2, pp. 34-36.

This paper is a report on research undertaken to answer questions about household attitudes towards the cost of pollution abatement. The basic method used to acquire information was through personal interviews conducted in both Hamilton and Guelph. Hamilton was chosen for its high degree of pollution, and Guelph, being an agricultural community, for its low degree of pollution. Other analytical procedures are also outlined and the results are summarized. A great similarity in response for both cities was noted. One reason for the lack of variation between the two cities, yet the wide range of response of willingness-to-pay, may have been that two people in the same metropolitan area may see air pollution as high or low, while arguing that it constitutes an impairment to the habitat. (WATDOC)

1321. Maniate, P., and Carter, D.C. - 1973.

"Pollution Control Costs for Canada in 1980". Policy Branch, Environment Canada, Ottawa, 10 pages.

This paper presents an estimate of the pollution abatement costs for Canada in 1980. This is the third estimate published and is based on wider and more reliable data. The methodology used in calculating the costs of various pollution control measures is briefly summarized and a figure of about \$6 billion annually is forecast. This amount is broken down into costs for municipal treatment plants, sewers, solid waste disposal, air pollution control, government activities, and industrial waste control. Brief explanations of what each of these categories involves are provided. (WATDOC)

See Also Reference Numbers: 1051, 1052, 1061, 1062, 1080, 1246, 1292, 1301, 1305, 1309.

5. ADJUSTMENTS AND CONTROL, F) GENERAL

1322. Anon. - 1973.

"Charting a Course for a Cleaner Environment". *Can. Petrol.*, Vol. 14, No. 4, pp. 48-49.

The summary reviews such new developments as the water effluent quality standards for oil refineries being proposed by Environment Canada; the stiffer guidelines imposed on the sour gas industry in Alberta to limit sulfur dioxide emissions to the atmosphere; the existing and impending legislation in the different provinces that relate to both stream and air pollution; and the technology evolving to achieve the generally accepted goal of continuing economic progress with a minimum adverse effect on the environment. (WATDOC)

1323. British Columbia Pollution Control Branch - 1974.

"Report on Pollution Control Objectives for the Chemical and Petroleum Industries of British Columbia as a Result of a Public Inquiry Held by the Director of the Pollution Control Branch", Department of Lands, Forests, and Water Resources, Water Resources Service, Victoria, 59 pages.

This report presents the results of the Public Inquiry carried out by the Director of the Pollution Control Branch in May, 1972. The Inquiry was held to resolve what technical considerations and measures would be required of the chemical and petroleum industries of British Columbia to meet the requirements of the Pollution Control Act, 1967. The criteria were formulated on the basis of ecological, health, technological and economic considerations.

1324. Council of the Forest Industries of British Columbia - 1970.

Brief to the Inquiry into Control of Discharges by the Forest Products Industry. Council of the Forest Industries of British Columbia, July, 1970, Vancouver, 190 pages.

This brief was prepared in response to the April 21, 1970, notice of public inquiry, issued by the British Columbia Director of Pollution Control. The stated purpose of the inquiry is to "resolve what technical considerations and measures must be provided by the forest products industry in B.C. for control of discharges to water and/or land and/or air to satisfactorily ensure pollution will not be caused, in accordance with the Pollution Control Act, 1967". The brief has been prepared to assist the Pollution Control Branch to achieve its purpose. Part 1, consists of a general introduction and summary of the forest industries' activities in relation to pollution and the environment. A policy statement on waste management and how the forest industry implements this policy is presented. Sources of waste are described. Water management methods in forestry and logging, and manufacturing sectors and recommendations for the control of such wastes are reported on. There is a discussion of B.C.'s present pollution control legislation and recommendations for its improvement. Part 2, presents information on that sector of the forest industry dealing with forestry and logging as it relates to environmental problems. Use of insecticides, herbicides and controlled burning of logging slash is covered in relation to forest protection. The effects of logging on rivers and streams and on aquatic life are described. Problem areas requiring research are pointed out. Part 3, reports on sawmills, plywood mills, shingle mills, dry particle board plants and wood preservation plants. Areas discussed include: disposal of waste wood residues, waste emission problems, present methods of control, effects of plant location, economics, available technology and research and development of new trends in pollution control. Part 4, deals with the pulp and paper industry. Consideration is given to identification of wastes, their effects on environment, and the means available to control them. Socio-economic factors are discussed and a review of new technology being developed to reduce pollution is presented. Water borne wastes from pulp mill effluents are discussed under the following headings: suspended solids, oxygen consuming wastes, toxic wastes, coloured wastes, and foam producing wastes. (WATDOC)

1325. Lemmon, W.A. - 1974.

"Air Pollution Control in Canada". *Chem. Econ. Eng. Rev.*, Vol. 6, No. 6, pp. 30-36.

The basic air pollution control philosophies in Canada are dilution and dispersal of pollution and containment at the source. The two methods of carrying out the philosophy of containment are the use of the air resource management approach and the best practicable technology approach. Federal legislative activities carried out under the Clean Air Act include promotion of a uniform approach across Canada, provision for the mechanisms and institutions needed to ensure that all measures to control air pollution can be taken, and provision of federal leadership. The organization of the air pollution control activities is centered in the Environmental Protection Service in Ottawa. The various national programs to control air pollution include the National Air Pollution Surveillance Program, development of ambient air quality objectives, the development of air pollution inventories, the development of national emission standards and of national emission guidelines, development of emission standards for federal facilities, development of mobile source and fuel and fuel additive regulations, and federal-provincial agreements and cooperation. Air pollution control today in Canada is generally reviewed, including estimated nationwide emissions, alert systems, and emissions and control in the following industries: asbestos mining and milling, iron ore beneficiating and indurating, aluminum smelting, nonferrous smelting, Portland cement, thermal power plant, iron and steel, ferroalloy, and petroleum. (USEPA Abstract)

1326. Taylor, W.L.W. - 1971.

"What Sudbury's Nickel Industry Does About Pollution at Falconbridge", *Watersheds*, Vol. 5, No. 3, pp. 27-29.

Falconbridge nickel mines, in the Sudbury area, has taken preventive and control measures against pollution which their mining industry may produce. Water pollution abatement has been achieved within current standards and is being economically applied. Land reclamation is also being successfully carried out in former tailings sites and is being achieved within economic limits. Air pollution, although great strides have been made to overcome this problem, has not been satisfactorily controlled yet. Air and water pollution control programs are explained.

See Also Reference Numbers: 1053, 1071, 1105, 1126, 1190, 1312.

6. SOCIAL ASPECTS

1327. Barker, M.L. - 1972.

"The Structure and Content of Environmental Cognitions: An Exploratory Study of Evaluations of Air Pollution Among Five Professional and Disciplinary Student Groups". Ph.D. Thesis, Department of Geography, University of Toronto, 201 pages.

Fundamental distinctions in modes of thought between the various professions and disciplines are thought to contribute to a lack of depth of understanding between specialized groups when evaluating a complex environmental issue (in this case, air pollution). A basic premise for this study is that an understanding of human behaviour may be approached via mediating psychological events.

These events are adaptive orientations which serve to combine information selectively perceived in the external world with internally-constructed information from past experience and individual predispositions. From this starting point, the study examines the psychological structures upon which potential environmental decision-makers base their constructions of the external world, recognizing that the kinds of information used by specialist groups and the ways in which it is used are crucial to the evaluative and choice phases in the environmental management process. The research focuses on the basic groundwork established by an individual's specialized training as it influences his ability to process information from the external environment. The primary elements of this information-processing phase are the ways in which a person recognizes and defines components identified and the complexity of links which he uses to organize these components. Two basic questions are posed: (1) How do individuals trained in different fields differ in their recognition of components and generation of linkages between components of an environmental issue? (2) To what extent do the individuals within these groups differ in the complexity of rules which they are able to generate in order to organize these linkages? Within the framework of the personal construct theory of Kelly and the conceptual systems theory of Harvey, Hunt and Schroder, the first question is discussed in terms of cognitive structure and the second in terms of integrative complexity. Given this theoretical framework, the study considers air pollution as the specific problem and five professions and disciplines were selected: Medicine, Law, Engineering, Economics, and Geography. (The degree of involvement of these five groups in academic and governmental evaluations of air pollution varies; however, they reflect certain traditional or recently-assumed interests and responsibilities). One hundred and twenty-five students formed the basis of the sample from the five professional and disciplinary groups and the selection was based upon the senior years of the respective programs at the University of Toronto. Measures of integrative complexity and flexibility on the air pollution domain were derived from semi-projective tests which reinforced the specialist stance in the first case, and then called for a multidisciplinary perspective. On this domain, measures of discrimination, differentiation, and level of information were obtained. A sentence completion test provided a measure of superordinating General Integrative Complexity, and a general questionnaire requested information about the subject's educational background, professional role in environmental decision-making, and level of concern for air pollution. Significant differences occurred between the five groups in terms of integrative complexity and level of information in the air pollution domain, and length of university experience. The lawyers and economists were professionally complex, and while the former group maintained a flexible approach in the multi-disciplinary task, the latter group was extremely inflexible. The remaining three groups possessed intermediate or low levels of integrative complexity and flexibility. Engineering students were the most well-rounded and obtained the highest scores on the information test, as opposed to the economists who obtained the lowest scores. No significant differences occurred between the groups on other structural variables, or in terms of definition and ranking of air pollution. The disciplinary and professional groups varied in their evaluations of potential specialist roles in decision-making, and in the phases of problem-solving discussed in the specialist and multi-disciplinary essay tests. The relationships among structural variables and content characteristics are described systematically in Chapters 4 and 5 respectively, and the cognitive characteristics of the five professional and disciplinary groups are reviewed in Chapter 6. Drawing upon the findings of this study, and upon the body of relevant theoretical and empirical literature, implications for environmental decision-making and educational trends are discussed in the concluding chapter. (Author's Abstract)

1328. Barker, M.L. - 1974.

"Information and Complexity, the Conceptualisation of Air Pollution by Specialist Groups". *Environ. Behav.*, Vol. 6, No. 3, pp. 346-377.

The study focused on the ability of specialists trained in different fields to select and organize information about air pollution. Five professional and disciplinary groups potentially concerned with air quality management were selected: law, medicine, engineering, economics, and geography. One hundred and twenty-five students completing specialist training in these groups were interviewed. They completed a sequence of questionnaire and semi-projective tests designed to measure differences in definition, knowledge, and concern for air pollution, perceived professional role in air quality management, and the complexity and flexibility with which environmental information is organized. Basic differences in modes of thought and information were revealed in the study. Although the five groups defined air pollution in similar ways and showed the same level of concern for the problem in Metropolitan Toronto, they differed significantly in the amount of knowledge about air pollution, the conceptual organization of environmental information, and perceived professional roles. (Author's Abstract)

1329. Boldt, E.D., Frideres, J.S. and Stephens, J.J. - 1973.

"Perception of Pollution - and Willingness to Act". *Alternatives*, Vol. 2, No. 4, pp. 31-36.

This report summarizes the results of an investigation on the scale of pollution awareness by two isolated communities in the northern part of Manitoba; The Pas and Flin Flon. The major form of environmental contamination in Flin Flon is air pollution from the smoke stacks of a nearby smelter. Water pollution from improper sewage installation is the major environmental contamination in The Pas. The populations in both communities answered a questionnaire which was designed to indicate their perception of the pollution problem. The procedures used to analyze the results are explained and the factors affecting pollution perception and the willingness to act are listed. More than 65% of the respondents (75% of Flin Flon residents) believed that pollution was a problem. However, more than 83% (89% in Flin Flon) were not prepared to do anything personally about pollution. Rather pollution control and prevention was the responsibility of individual companies, government, and to some extent a joint effort which was to include the community at large. (WATDOC)

1330. Elder, P.S. - 1976.

Environmental Management and Public Participation. Canadian Environmental Law Research Foundation and the Canadian Environmental Law Association, Toronto, 384 pages.

This book is comprised of eleven papers by different authors, each of which discusses the legal framework and decision-making processes for environmental quality that are utilized in the various provinces of Canada. The scope is wide and general and such subjects as land management, air and water quality, public participation and the laws attempting to control environmental quality are discussed. One paper dealing with air quality in Ontario by David Estrin is annotated elsewhere in this *Bibliography*. (Ref. 1275)

1331. Fritz, D.E. - 1974.

"Dispersal of a Malodour Pollutant as Related to Meteorological and Topographical Parameters in Rothsay, Ontario". Unpublished B.A. Thesis, Department of Geography, Wilfred Laurier University, Waterloo, 153 pages.

The purpose of this study was to investigate the dispersal of malodorous substances in the area of a large rendering plant at Rothsay, Ontario. The study was carried out by an interview survey of the residents of the area which was compared with

meteorological data and the topography of the area. The results indicate that wind direction and velocity, inversions in the atmosphere, relative humidity, fog and topographical features play a prominent role in the dispersal of malodorous air pollution.

1332. Hewings, J.M. - 1975.

''Environmental Indices and Public Attitudes: The Case of the Ontario Air Pollution Index''. Ph.D. Thesis, Department of Geography, University of Toronto, 403 pages.

Criteria, standards and indicators have in recent years become fundamental parts of government planning procedures in a number of jurisdictions in North America. They provide, through their interrelationships, concise, legally enforceable control procedures which link administrative actions to cause and effect relationships associated with man's activities as an agent of environmental change. Evaluation of their effectiveness has to date, however, been limited. This thesis, therefore, investigates through a case study approach, the impact of one such set of inter-relationships in the form of the Ontario Air Pollution Index, on public perceptions of, and attitudes towards air pollution, and the province's air management program. In addition it incidentally provides greater insight into the role of factors which have been suggested by other studies as being correlated with attitudes to air pollution or the environment. Three review chapters examine the development of air pollution indicators, the formation of attitudes towards the environment and the attitude change literature. The study employed the use of telephone questionnaire interviews, with a number of attitude measuring devices, including open and closed ended questions, a Guttman scale, and questions directed at finding out the level of public information on the Index, and on air pollution in general. These responses were analyzed using pretest-posttest, and posttest only study designs with controls. Interviews were accordingly undertaken in Windsor and Sudbury on a monthly basis, both prior and subsequent to the initial use of the Index in these cities, and in London and Ottawa (control cities) during the same period. Questionnaires were also administered in Toronto and Hamilton for periods after the Index was introduced into those cities. In the cases of Sudbury, Windsor, Ottawa and London, interviews were continued over a one year period. (June, 1970 to May/June, 1971). Data from Hamilton and Toronto were obtained for a six month period, (June, 1970 to November, 1970) and from Toronto alone for the two isolated months of April and June, 1971. A total of approximately 6,500 usable questionnaires were collected. The results of the main part of the analysis reveal that the information provided by the Air Pollution Index has a clearly measurable effect on attitudes only at times when ambient air quality reaches a defined ''First Alert'' level, which corresponds to the lowest point at which morbidity effects have been noted elsewhere, and marks the stage at which the province orders major contributors of air pollution to cut back production, or change to low sulfur fuels. Effects at other times, if present, were masked in the data by fluctuations in attitude levels attributable to seasonal or other effects. In the subsidiary analysis of the role of variables such as age, sex and place of residence in attitude formation no single item was observed to be related to response over a sufficient period of time, in a sufficient number of cities, to warrant any positive conclusions being made.

1333. Incullet, I.I. - 1970.

''Managers and Man's Environment''. *Optimum*, Vol. 1, No. 3, pp. 7, 34-41.

The air, man's natural environment, has no boundaries. Therefore, it is imperative that all the earth's inhabitants participate in concern as a group. The author reviews the attitude changes and public awareness in pollution of air and water, and outlines some international measures such as the International Joint Commission in the Great Lakes, and the hopes and opportunities of United Nations participation. He emphasizes Canada's role as a power in world resources, as a leader in calling for international legislation and suggests some approaches such as international conferences, the establishment of a Canadian centre or institute to study pollution and demands to the United Nations for international legislation. The survey ends with a discussion of the chemical components of air pollution: nitrogen oxides, carbon monoxide, sulphur dioxide, and hydrocarbons. There is a résumé in French. (WATDOC)

1334. Iona College - 1974.

Cognition of Urban Environmental Hazards in Windsor, Ontario. Department of Geography, University of Windsor, 106 pages.

It has often been implied that urban policy-makers are not always fully aware of the problems and aspirations of urban residents. In part, these ambivalences may be attributable to fundamental differences between the policy-makers and laymen in their awareness and evaluation of the urban environment. This proposition is examined in the context of cognitions of salient urban hazards (including air pollution) in Windsor, Ontario. The cognitions are elicited using direct interviewing procedures and selected projective field techniques. Hypotheses are formulated and tested to determine: (i) whether Windsor residents hold the same cognitions of urban environmental hazards as the city of Windsor Planning Department; and (ii) whether the residents' evaluations of the hazards are related to objective environmental data and social class. The analysis is currently at the completion stage and the findings are being interpreted. (Author's Abstract)

1335. Jordan, F.J.E. - 1972.

''Environmental Information and the Public Interest''. *Ask the People, Proceedings of a Multi-Disciplinary Workshop on Public Participation*, Agassiz Centre for Water Studies, Winnipeg, Manitoba, pp. 10-16.

This paper is concerned with the gathering by government of information on activities having a major impact on our environment and with the dissemination of this information to members of the public in a meaningful and intelligible fashion so that the average citizen may become involved in the process of decision-making on issues affecting his environment. Federal laws - the Government Organization Act, 1970, the Clean Air Act, Fisheries Act Amendment Act, Canada Water Act, Arctic Waters Pollution Prevention Act - are discussed and reveal the limited fashion in which environmental information is dealt with in our legislation. Recommendations for change within the federal government are listed. (WATDOC)

1336. Youston, D.J. - 1975.

''Review of Consultant Reports on the Social Effects of Atmospheric Emissions from Fossil-Fired Thermal Stations''. Ontario Hydro Research Division, *Report*, No. 75-75-CON, Toronto, 33 pages.

This report summarizes the findings of consultant reports on the social effects of atmospheric emissions from fossil-fired thermal stations. The areas covered by the reports include effects on health, buildings, textile products, water quality of the Great Lakes, vegetation and animals, and property value. Based on the reports, estimates are derived for the economic social effects attributable to exports of energy from Lakeview generating station and Nanticoke generating station. The individual reports are annotated separately.

See Also Reference Numbers: 1028, 1053, 1061, 1062, 1250, 1258, 1275, 1280, 1310, 1318, 1319, 1320.

7. RESEARCH, A) GOVERNMENT

1337. Anlauf, K.G., Lusic, M.A., Wiebe, H.A. and Sanderson, H.P. - 1975.

"Mobile Air Quality Monitoring". *Zephyr*, October, 1975, pp. 1-9. (Also *Internal Report ARQA-28-75*, Atmospheric Chemistry, Criteria and Standards Division, Air Quality Branch, Atmospheric Environment Service, Downsview, Ontario, 9 pages.)

A discussion of techniques employed in mobile air quality monitoring is given. A more detailed picture of ground level air pollutants can be obtained with mobile equipment than with traditional stationary equipment. Mobile equipment can be quickly moved throughout a large area taking numerous samples. Similarly, airborne instruments can study the detailed vertical and horizontal distribution of pollutants at stack levels and above. A description of aircraft instruments and ground level mobile equipment used by the Air Quality Branch in Ontario is also given.

1338. Anon. - 1975.

"Canada". In *Pollution Research Index: A Guide to World Research in Air, Land, Marine and Freshwater Pollution*, F.H. Books Ltd., Guernsey, pp. 53-63.

There are 42 governmental agencies in Canada that deal with pollution problems. This chapter lists these agencies along with their subdivisions. Addresses, managing personnel and the scope of interest and activities of these agencies are given.

1339. Canada, Department of Energy, Mines and Resources - 1973.

"Technology and Environmental Concerns (Final Report)". *Annual Report 1972-73*, Department of Energy, Mines and Resources, Ottawa, pp. 20-28.

A report is presented on technological and environmental research activities of the Canadian Department of Energy, Mines and Resources for the period 1972-1973. Topics covered include: fuel technology, automation in surveying and instrumentation, metallurgical technology, ore treatment, mining engineering, conversion of waste products into useful products, analytical standards, mine safety, remote sensing by aircraft and satellite, environmental concerns such as reduction of atmospheric pollution from automobile operation and industrial plants, geological studies of areas exploited for energy, safety and pollution abatement in mining and metallurgy, earthquake hazard studies, and ice dynamics studies involving the transfer of kinetic and thermal energy between the atmosphere and the ocean through a complete or partial ice cover. (USEPA Abstract)

1340. Norstrom, R.J., Quadling, C., Marier, J.R. and Wolters, P. - 1972.

"Pollution and Rapid Access to the Literature". *Can. Res. Develop.*, Vol. 5, No. 2, pp. 20-22.

Early in 1970, the National Research Council of Canada was authorized to establish a Pollution Information Storage and Retrieval Centre in the National Science Library. The task of gathering relevant references together and assembling the data-base was informally designated the Pollution Information Project (PIP). The NSL staff and NRC biology division scientists cooperated to set up procedures which allowed the already existing CAN/SDI (Canadian Selective Dissemination of Information) system to be used to assemble the component references of the PIP data-base on magnetic tape. The problem of defining the extent of interest in pollution to the retrieval system was approached by reading a large number of titles of pollution-relevant scientific papers and making a checklist containing the relevant single words or combinations of words which would have been needed to retrieve the title. A combination approach was employed in which paired word blocks were utilized in such a way as to allow sequential automatic pairing of names of individual sources and pollutants. Input to the new data-base and retrieval procedures are indicated. (USEPA Abstract)

See Also Reference Numbers: 1150, 1292.

7. RESEARCH, B) UNIVERSITY

1341. Brannen, E. - 1976.

"Detection of H₂S and SO₂ Using Laser Absorption Techniques". Physics Department, University of Western Ontario, London, Ontario, 14 April, 1976, *Report to Air Resources Branch*, 6 pages.

The methods and results of several monitoring experiments carried out at London, Ontario, are described. Hydrocarbon monitoring was accomplished in the field while other tests were carried out in the laboratory. The hydrocarbon monitoring test confirms the accuracy obtainable with, and the suitability of, the laser system designed for outdoor monitoring of gaseous pollutants.

1342. Gnyp, A.W., Price, S.J.W., St. Pierre, C.C. and Steiner, J. - 1972.

"Problems in Stack Sampling: Part 1 - Trained Personnel". *Water Pollut. Control*, Vol. 110, No. 4, pp. 72-74.

In 1969-70, efforts of the University of Windsor stack sampling team of the industrial Research Institute were devoted to the acquisition and evaluation of literature, primarily on stack testing procedures and factors affecting stack sampling. In 1971-72 the research team is concentrating on remaining knowledgeable on the current state of technology associated with stack sampling for particulate and gaseous pollutants. The work covers updating and evaluating literature on sampling and monitoring stack effluents, initiating a new literature search devoted to exotic pollutants such as heavy metals and chlorinated hydrocarbons, and initiating a non-experimental investigation of the parameters required for the development of practical particle size analysis technique that would be applicable to on-site stack testing procedures. The initial goal of the 1972-73 research program is to carry out laboratory investigations of the instruments and testing procedures indicated as worthy of further consideration. A pressing need was found for the organization of a comprehensive training program for industrial and control agency personnel concerned with air pollution problems. (USEPA Abstract)

7. RESEARCH, C) GENERAL

See Reference Numbers: 1028, 1206.

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