THE CLEAN AIR ACT
ANNUAL REPORT
1974–1975

Air Pollution Control Directorate
Environmental Protection Service
Department of the Environment

May 1975

Cat. No.: En41-1975

Minister
Environment Canada

Ministre
Environnement Canada

His Excellency,
The Right Honourable Jules Léger,
Governor General and Commander-in-Chief of Canada.

May it Please Your Excellency:

I have the honour herewith, for the information of Your Excellency and the Parliament of Canada, to present the Annual Report on the Clean Air Act for the fiscal year ended March 31, 1975.

Respectfully submitted,

Jeanne Sauvé

Deputy Minister
Environment Canada

Sous-ministre
Environnement Canada

The Honourable Jeanne Sauvé
Minister of the Environment
Ottawa, Canada

Dear Madame Sauvé:

I have the honour to submit the Annual Report on the Clean Air Act for the fiscal year ended March 31, 1975.

Respectfully submitted,

J.B. Seaborn

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INTRODUCTION

The Clean Air Act was officially proclaimed on November 1, 1971. This report, submitted in accordance with Section 41 of the Act, covers operations for the period ending March 31, 1975.

The Clean Air Act provides the basis for the federal government's air pollution control activities and has three main objectives. The first and foremost is to promote a uniform approach across Canada. To achieve this, the Act is designed to prevent the creation of so-called 'pollution havens', a matter that is of great concern to both federal and provincial authorities.

A second major objective of the Act is to make provisions for the mechanisms and institutions needed to ensure that all measures to control air pollution can be taken. Of major significance is the recognition that provinces have a direct responsibility in controlling air pollution and that joint cooperative efforts between provincial and federal authorities are required. To this end, the Act enables the federal government to enter into agreements with individual provinces and allows the delegation of administrative and enforcement authority where this is possible; the Act also provides for direct action by the federal government when this is necessary.

Finally, the Act attempts to delineate a leadership role for the federal government. It is recognized that certain tasks can and should be handled at the federal level either because of constitutional considerations or because the federal government is in the best position to manage the task.

RESPONSIBILITIES OF THE MINISTER

The responsibilities of the Minister under the Clean Air Act are to:

(a) establish, operate, and maintain a system of air pollution monitoring stations throughout Canada;

(b) collect, both through the operation of air pollution monitoring stations and from other appropriate sources, data on air pollution in Canada and process, correlate, and publish such data on a regular basis;

(c) conduct research and studies relating to the nature, transportation, dispersion, effects, control, and abatement of air pollution and provide consultative, advisory and technical services, and information related thereto;

(d) formulate comprehensive plans and designs for the control and abatement of air pollution and establish demonstration projects, and publicize, demonstrate, and make such projects available for demonstration; and

(e) publish or otherwise distribute or arrange for the publication or distribution of all pertinent information that would serve to inform the public of all aspects of ambient air quality and of the control and abatement of air pollution.

ENVIRONMENTAL PROTECTION SERVICE

Within the Department of the Environment the administration of the Clean Air Act is carried out by the Environmental Protection Service through its five regional offices across Canada and through the Federal Activities Environmental Branch and the Air Pollution Control Directorate located in Ottawa.

Air Pollution Control Directorate

The responsibilities of the Air Pollution Control Directorate are divided among three branches.

The Air Pollution Programs Branch carries out development and coordinates operation of Canada's National Air Pollution Surveillance (NAPS) Program; develops national emission inventories of major air pollutants and inventories of potentially hazardous air contaminants; is responsible for the nontechnical aspects of emission regulations and guidelines development including analyses of the socio-economic implications of air pollution control; coordinates the development and prescription of National Air Quality Objectives and conducts interservice, intergovernmental and international liaison.

The Abatement and Compliance Branch is responsible for carrying out engineering and technical assessment of pollution emissions and emission control and abatement methods to establish the technical basis for development of air pollution control guidelines, standards, and regulations. The Abatement and Compliance Branch is composed of five divisions: (a) chemical process sources, (b) mining, mineral, and metallurgical, and (c) combustion sources, which covers major stationary sources; (d) mobile sources, which is concerned with emissions from motor vehicles, railways, ships, and aircraft; and (e) fuels, which deals with fuel composition and additives.

The Technology Development Branch is responsible for fostering the development and demonstration of control technology and scientific and technical methods for the control and abatement of air pollution. The Branch provides chemical services, the development of

sampling, analysis, and measurement procedures for air pollutants, a motor vehicle testing facility, and a technology transfer service that incorporates both publications and training. The Technology Development Branch comprises three divisions: engineering, chemistry, and publications and training.

Major activities of the Directorate in the 1974-75 period included the compilation of inventories of air pollutant sources and emissions, the coordination of a National Air Pollution Surveillance Network, the establishment of National Air Quality Objectives, the prescription of National Emission Standards and Guidelines, the control of air pollution from works, undertakings, and businesses under federal legislative authority, and the control of the composition of fuels that may be produced in Canada or imported into the country. Specific tasks carried out in these and other programs are outlined in more detail in the following pages. An organization chart for the Directorate and a resource summary for the overall Air Pollution Control Program are shown in Figure 1 and Table 1 respectively.

Federal Activities Environmental Branch

The Federal Activities Environmental Branch was created as a focal point in dealing with environmental protection matters associated with all federal government departments, agencies, and crown corporations, including projects that receive financial assistance or permits under federal jurisdiction. Areas of environmental concern cover both land facilities and vessels, and include treatment and disposal of waste water, solid waste management, air pollution, noise, and toxic and hazardous substances.

Centres for facilitating exchanges between the many organizations who have needs and those who have expertise have been established in the Environmental Protection Service Regional Offices. Guidelines, technical advice, and assistance are arranged through these centres to ensure that all new federal projects are examined for possible environmental effects and that proper environmental protection measures are incorporated into the project designs and operations. The Federal Activities Environmental Branch is also charged with defining pollution problems at existing facilities, developing courses of remedial action, and, in consultation with other departments, recommending clean-up project priorities and allocating funds from a central Federal Activities Clean-Up Fund.

Environmental Protection Service Regional Offices

Primary points of contact with provincial environmental protection agencies are through the five Environmental Protection Service Regional Offices located in Halifax, Montreal, Toronto, Edmonton, and Vancouver. Regional Directors are responsible for

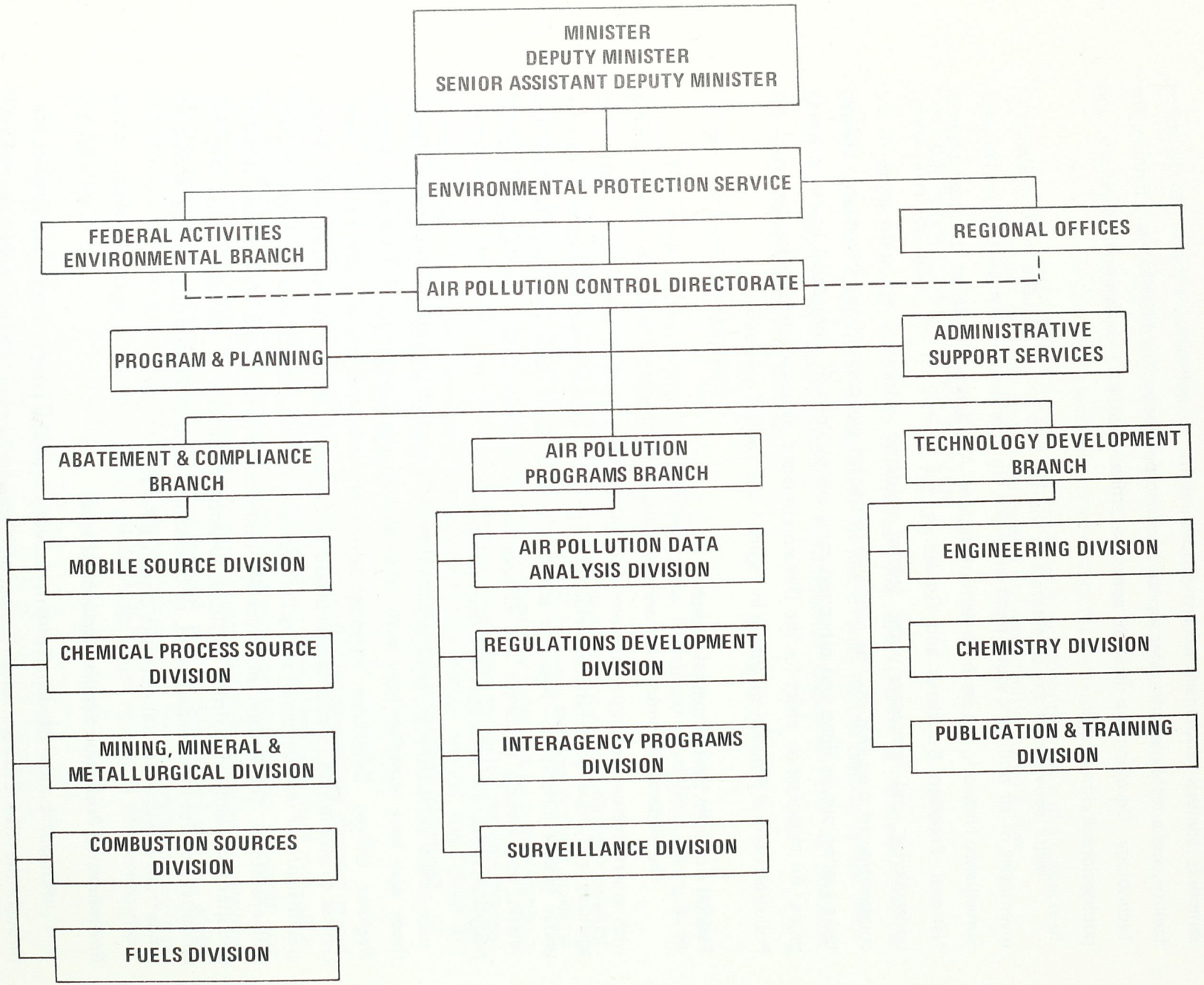

FIGURE 1 ORGANIZATION OF THE AIR POLLUTION CONTROL DIRECTORATE

TABLE 1 AIR POLLUTION CONTROL PROGRAM RESOURCE SUMMARY

Fiscal year	End of year strength	Salaries ($)	Goods and services ($)	Capital ($)	Total expenditure ($)
1970–1971	38	268 326	113 527	157 458	539 311
1971–1972	76	900 000	455 000	660 000	2 015 000
1972–1973	147	1 711 000	644 000	1 079 000	3 434 000
1973–1974	151	1 859 000	1 053 000	958 000	3 870 000
1974–1975	163	2 533 279	1 077 210	1 132 507	4 742 996

providing within their region direction and supervision of Environmental Protection Service programs arising from the Clean Air Act together with policies and commitments resulting from federal-provincial bilateral and international agreements. Regional Directors formulate and carry out enforcement and other operational programs in accordance with national policies and guidelines.

INTERAGENCY COOPERATION AND COLLABORATION

General

To assist in effectively utilizing available resources for air pollution control in Canada, the Environmental Protection Service maintains close contact with all provincial agencies as well as with foreign and international organizations responsible for air pollution control.

Cooperation and collaboration with provincial agencies are essential because the provinces have jurisdictional control over most air pollution sources. Control programs initiated by the Environmental Protection Service are in many instances carried out by provincial agencies. Close liaison is also maintained with the Office of Air Quality Planning and Standards of the United States Environmental Protection Agency to facilitate information exchange.

Together with other agencies in the federal government, the Air Pollution Control Directorate participates in a number of international environmental organizations. These include the Organization of Economic Cooperation and Development (OECD), the World Health Organization (WHO), the Economic Commission for Europe (ECE), and the North Atlantic Treaty Organization Committee on the Challenges of Modern Society (NATO/CCMS).

The Directorate also contributes to the activities of the International Joint Commission through membership on the International Air Pollution Advisory Board. Members of the Directorate continue to be involved in a joint study with United States officials in response to recommendations contained in the International Joint Commission report on transboundary air pollution in the Detroit-Windsor and Sarnia-Port Huron areas.

Federal-Provincial

The Federal-Provincial Committee on Air Pollution is the principal national mechanism for obtaining federal-provincial cooperation and ensuring participation of all provincial agencies that wish to be involved in specific projects.

This committee was established on an ad hoc basis in 1969 by the Department of National Health and Welfare, which at that time had responsibility for federal air pollution control programs. With the formation of the Department of the Environment in 1971, the committee was formally established under the aegis of the Minister of the Environment. The committee serves as an effective forum for examination of priorities for the development of national air pollution control programs, control technology, an expanded air pollution surveillance network, source inventories, and similar matters of common interest. During the period under review, a meeting of the committee was held in Ottawa, from April 30 to May 2, 1974, at which nine of the ten provinces were represented.

In 1970, the Federal-Provincial Committee on Air Pollution established a subcommittee of experts to recommend to the parent committee appropriate levels for National Air Quality Objectives.

The first recommendations of the subcommittee on National Air Quality Objectives led to air quality objectives for sulphur dioxide, suspended particulates, carbon monoxide, and oxidants, published in Part I of the Canada Gazette on December 16, 1972. Amendments and the final formulation of these objectives, were published in Part II of the Canada Gazette on June 12, 1974. Air quality objectives were also prescribed for nitrogen dioxide and published in Part II of the Canada Gazette on February 12, 1975.

Membership on the Subcommittee of National Air Quality Objectives varies depending on the expertise required. It now comprises seven members: five members from four provinces, one member from the Department of National Health and Welfare, and one member from the Department of the Environment.

A separate subcommittee of the Federal-Provincial Committee on Air Pollution has been established to recommend Maximum Tolerable Levels of Air Quality. These levels denote concentrations of air contaminants that lead to a substantial threat to public health and require action to prevent the development of such a threat. In the past fiscal year recommendations were made to the parent committee for levels of sulphur dioxide and suspended particulate matter.

Another subcommittee has been set up for the purpose of recommending criteria for air monitoring site selection. This subcommittee held its first meetings in the past year and is expected to make recommendations in the near future.

Secretariat services to all subcommittees are provided by the Air Pollution Control Directorate.

Another important activity of the Federal-Provincial Committee on Air Pollution is the National Air Pollution Surveillance (NAPS) Network. The NAPS Network is a joint project based on the cooperative efforts of the federal and provincial levels of government, designed to monitor all locally significant air pollution parameters in all significant centres of population. The network provides a ready means of auditing progress in air pollution control across the country. Its method of operation and other pertinent details are explained elsewhere.

Because the provinces have jurisdiction over most air pollution sources, the Department has adopted the basic strategy of promoting and supporting viable provincial control agencies through federal-provincial cooperative efforts. Projects aimed at assisting the provinces include a free exchange of data, training of air pollution technicians, providing monitoring equipment for the National Air Pollution Surveillance Network, and supplying technical services on request.

Present cooperative efforts may at some future date become formalized in bilateral agreements as authorized by Section 19 of the Clean Air Act. These agreements could specify the respective responsibilities of each jurisdiction in the abatement and control of air pollution. Essential to such agreements would be the adoption by the provinces of the National Air Quality Objectives and National Emission Guidelines as minimum control standards.

International

Environmental Protection Agency. Liaison with officials of the United States Environmental Protection Agency has continued and expanded over the past year. The relationship is of considerable benefit to Canada's Air Pollution Control Program and through the exchange of information is proving to be of mutual benefit to both countries.

The Environmental Protection Agency has made available to the Environmental Protection Service their emissions inventory subsystem. After some minor modifications are made, the system will be used for the development and maintenance of Canadian nationwide emission inventories. The United States government has asked to be informed of the results achieved with the modified program.

Through regular attendance at the United States National Air Quality Criteria Advisory Committee, which advises the Environmental Protection Agency, Environment Canada is kept informed on many areas pertaining to air quality research, priorities and programs. During the past year, the Environmental Protection Service cooperated with the Environmental Protection

Agency on a program of quality control for laboratory analysis of ambient air samples as part of the United States vinyl chloride monitoring program.

International Joint Commission. The Air Pollution Control Directorate provides the Canadian Chairman and a member, as well as technical assistance to the International Air Pollution Advisory Board, a standing board of the International Joint Commission. Any air pollution problems that arise along the Canada-United States border are investigated by the Board and reported to the International Joint Commission.

A report of the study of transboundary air pollution problems in the Detroit-Windsor and Sarnia-Port Huron areas was issued by the International Joint Commission in 1972 and it contained recommendations for abatement and control of transboundary air pollution. One of the results of this activity has been that the Premier of Ontario and the Governor of Michigan have signed a Memorandum of Agreement to implement an integral cooperative program for the abatement of transboundary air pollution in the southeastern Michigan-southwestern Ontario area. This Memorandum of Agreement specifically asks the respective federal governments to request the International Joint Commission to assume responsibility for monitoring progress of the programs implemented to control air pollution in the transboundary area.

The International Advisory Board has been involved in resolving several instances of transboundary pollution and, in addition, has been active in examining the potential for transboundary pollution from a number of projects on both sides of the border.

Other International Organizations. To ensure that Canada remains well informed with respect to developing air pollution technology in various parts of the world, and to assist in fulfilling Canada's international obligations in the field of air pollution control, the Air Pollution Control Directorate has continued to participate in a number of international programs. This participation is coordinated through the Department of External Affairs. It involves programs of the World Health Organization (WHO), the Organization for Economic Cooperation and Development (OECD), the Economic Commission for Europe (ECE), and the NATO Committee on the Challenges of Modern Society (NATO/CCMS). The Air Pollution Control Directorate provides Canada's delegate to the OECD Air Management Sector Group and participates through the Interdepartmental Committee of International Environment Affairs in activities of the Environment Committee and other sector groups. Canada is participating in such studies as oxidants and their precursors in the atmosphere, use of surveillance and control techniques for air pollution alert systems, use of techniques to provide air quality information for land use planning, and pollution control costs at power stations.

The Air Pollution Control Directorate provided Canada's representative to the January 1975 meeting of the Economic Commission for Europe Working Party on Air Pollution Problems. In this forum, Canada is participating in the preparation of a seminar on desulphurization of fuels and combustion gases and is also participating on a task force of rapporteurs for the development of guidelines for control of emissions from nonferrous metallurgical industries.

SURVEILLANCE ACTIVITIES

General

Section 3 of the Clean Air Act makes provisions for the collection and publication of data on air pollution. This includes a responsibility to maintain a continuing record of ambient air pollution levels in urban areas on a national basis, to define problem areas through field investigations, to ensure compliance with regulations, to form a basis for legal proceedings, and to provide consultative services to federal or provincial agencies in matters of air monitoring and surveillance.

Nationwide Emission Inventories

One of the first actions taken with the passage of the Clean Air Act was to contract with an outside consultant for the compilation of a National Emission Inventory for Canada. This inventory provided an across-the-board view for the year 1970 of pollution problems in relation to the five major contaminants: sulphur dioxide, particulate matter, carbon monoxide, hydrocarbons, and nitrogen oxides. A revision of the inventory based on data for the year 1972 is now underway. It is also planned to have all inventory information stored in a computer for quick access and retrieval.

Inventories are also compiled on pollutants that may prove to be of significant danger to health. The major sources of emissions to the atmosphere of the pollutants asbestos, beryllium, mercury, and lead in Canada for the year 1970 have been compiled and the data published. Inventories for zinc, cadmium, arsenic, manganese, and fluorides for 1972 are now being compiled through a contract with an outside consultant. An inventory completed in house, on the sources and emissions of vinyl chloride in Canada for 1973 is summarized in Table 2. Still in progress is a national inventory of vanadium based on 1972 data. It is intended to update these inventories periodically as new data become available.

TABLE 2 SUMMARY OF VINYL CHLORIDE EMISSIONS IN CANADA, 1973

Emission Source	Estimated emissions	
	Tons	Percent
VINYL CHLORIDE MANUFACTURING		
Ontario	350	5.3
Quebec	300	4.6
	650	9.9
POLYVINYL CHLORIDE MANUFACTURING		
Ontario	3600	54.8
Quebec	2250	34.3
	5850	89.1
PROCESSING OF POLYVINYL CHLORIDE		
Various locations	68	1.0
	68	1.0
TOTAL	6568	100.0

National Air Pollution Surveillance Network

This Network consists of air monitoring instruments located in significant centres of population across Canada. A knowledge of the nature and extent of air pollution across Canada is fundamental to the sound planning of control and abatement programs. The chief purpose of the National Air Pollution Surveillance program is to provide this information on a continuing basis; however, the program also serves a number of other needs and will become increasingly useful as data accumulate. For example, it will be possible to detect trends in the levels of pollution with changing industrial activity, population density, and air pollution abatement progress. Information collected by the program can be used in epidemiological studies and in the development of air quality objectives. Moreover, since the National Air Pollution Surveillance Network is a cooperative effort of federal, provincial and municipal governments, its usefulness in fostering federal-provincial cooperation cannot be overemphasized.

Data from these stations are compiled by the Directorate on a monthly basis. An annual summary is also produced. Measurements include soiling index, suspended particulates, lead, dustfall, sulfation rate, sulphur dioxide, carbon monoxide, ozone, nitrogen oxides and hydrocarbons. Values obtained in various locations across Canada for suspended particulates,

sulphur dioxide, carbon monoxide and ozone are presented in Tables 3, 4, 5 and 6 respectively.

During 1974-75 the National Air Pollution Surveillance Network was expanded and improved. As of March 31, 1975, the Network comprised 432 instruments, located at 147 stations in 45 cities. This includes 172 continuous gaseous pollutant monitors. A map showing the location of the sampling stations in all the provinces, the Yukon and Northwest Territories is presented in Figure 2. Expansion of the Network during the past year included the installation across the country of fifteen suspended particulate samplers, ten sulphur dioxide monitors, eight carbon monoxide monitors, eighteen nitrogen oxide monitors, eight ozone monitors and eleven hydrocarbon monitors. These installations brought to twenty-three, the number of stations in the network having continuous monitors for all pollutants of current major concern.

Source Testing

Stack tests were conducted at several plants to evaluate or develop stack sampling reference methods, to gather source data to guide the development of emission guidelines and regulations, and in response to specific requests. Plants at which sampling tests were performed included asbestos mining and milling plants, chlor-alkali plants, municipal waste incinerators, sewage sludge incinerators, and a pulp and paper mill.

Ambient Air Surveys

The Strait of Canso air monitoring network is in its fourth year of operation. An extensive carbon monoxide survey was conducted in Whitehorse during the cold weather months as a follow-up to a preliminary study carried out the previous winter. The Saint John-Lorneville, New Brunswick air sampling network, a cooperative study involving the province of New Brunswick, the city of Saint John, the Atmospheric Environment Service and the Environmental Protection Service, Atlantic Regional Office, completed its first year of operation. Data generated by this study will be used in planning control strategies for the Lorneville industrial complex.

Special Studies

Evaluation of Air Monitoring Instruments. Work is continuing on the evaluation (laboratory and field) of new and improved commercially available instruments to measure carbon monoxide, hydrocarbons, particulates, ozone, nitrogen oxides and sulphur compounds in the atmosphere. Twenty-five commercially available continuous air pollution monitors, data

TABLE 3 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK FOR SUSPENDED PARTICULATES - COMMERCIAL DOWNTOWN CORE AREAS

Location	Annual Geometric Mean[1] (micrograms per cubic metre)				
	1970	1971	1972	1973	1974
St. John's, Duckworth & Ordinance			54	55	51
Charlottetown, Kent & Queen				50	49
Halifax N.S., Tech. College			42	49	47
Sydney, County Jail			46	66	68
Fredericton, Woodstock	33	36		19	23
Saint John, 110 Charlotte	61	54	46	55	60
Moncton, Post Office	77	54	54	54	
Montreal, 1212 Drummond		111	132	101	128
Hull, Rue Principale	77	73	69	72	79
Quebec, Parc-Autos Paquet-Laliberte			83	101	101
Chicoutimi, City Hall			75	57	54
Ottawa, Slater & Elgin	109	92	75	87	91
Toronto, 67 College	111	99	92	101	81
Hamilton, Barton & Wentworth	140	144	133	128	105
Peterborough, 139 George			72	80	
London, King-Rectory		125	95	94	92
Sudbury, Lisgar St.				63	55
Sarnia, 156 Victoria		105	98	104	89
Windsor, City Hall	142	122	91	121	122
Sault Ste. Marie, Prov. Ont. Bldg.	44	55	66	58	50
Thunder Bay, 14 Algoma	84	69	60	76	60
Winnipeg, Kennedy & York	79	73	75	78	77
Brandon, 11th & Princess				68	69
Regina, 1955 Smith	66	57	49	58	66
Saskatoon, City Library		72	68	65	71
Moose Jaw, Telephone Bldg.			48	65	69
Prince Albert, 49-12th St. E			51	69	77
Edmonton, 100 & 102 Ave.				65	71
Calgary, 7th Ave. & 2nd St. SE	117	105	85	147	122
Red Deer, 4720 49th St.	74	59	58	61	62
Medicine Hat, 770 1st St. SE	67	57	57	74	88
Lethbridge, 13th St. & 9th Ave. S	38	41	38	57	45
Yellowknife, 50th Ave. & 51st St.				79	60
Vancouver, 739 W Hastings	104	89	77	61	56
Victoria, Police Station	51	59	44	47	44
Whitehorse, Federal Bldg.					85

[1] Figures are estimated when data not available for a complete year.

TABLE 4 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK FOR SULPHUR DIOXIDE - COMMERCIAL DOWNTOWN CORE AREAS

Location	Annual Arithmetic Mean[1] (Parts per hundred million)				
	1970	1971	1972	1973	1974
Halifax N.S., Tech. College			3.3	3.2	3.1
Saint John, 110 Charlotte			4.4	3.2	
Saint John, Post Office					2.5
Montreal, 1125 Ontario	5.4	4.1	3.7	2.0	2.6
Montreal, 1212 Drummond	9.9	8.0	6.6	4.7	5.2
Hull, Rue Principale	2.4	1.7	1.3	1.2	0.9
Ottawa, Slater & Elgin	4.5	2.2	3.0	2.5	2.4
Toronto, 67 College	7.1	5.2	3.0	1.4	1.2
Hamilton, Barton & Wentworth	3.7	2.9	1.7	1.8	2.1
London, King-Rectory		1.4	0.6	0.4	0.8
Sarnia, 156 Victoria		2.7	1.9	1.7	2.2
Windsor, 471 University	3.6	4.3	3.6	3.2	3.3
Winnipeg, Kennedy & York			1.0	0.4	0.7
Saskatoon, City Library				0.4	0.0
Regina, 12th & Smith			0.0	0.1	0.0
Moose Jaw, Telephone Bldg.				0.1	0.0
Edmonton, 109th St. & 98th Ave.			0.1	0.0	0.0
Calgary, 620-7th Ave. SW			0.3	0.2	0.2
Vancouver, 739 W Hastings			1.4	0.7	0.7
Victoria, Police Station			1.1	0.6	0.5

[1] Figures are estimated when data not available for a complete year.

handling instruments and calibration systems were evaluated. In addition, evaluations are being conducted on sample interface systems, calibration, data acquisition and associated peripheral equipment. The purpose of the program is to find the most reliable equipment, methods and procedures for monitoring air pollution levels.

Instrument specifications have been prepared for all of the pollutants for which air quality objectives exist. Standard instrument evaluation methods and procedures have been prepared and incorporated into the program.

TABLE 5 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK FOR CARBON MONOXIDE - COMMERCIAL DOWNTOWN CORE AREAS

	Annual Arithmetic Mean[1] (Parts per million)	
Location	1973	1974
Ottawa, Slater & Elgin	3.1	3.2
Windsor, 471 University	4.7	5.1
Hamilton, Barton & Wentworth	2.1	2.0
Winnipeg, Kennedy & York	2.4	2.3
Edmonton, 109th St. & 98th Ave.	2.1	2.0
Calgary, 620-7th Ave. SW	4.3	3.1

TABLE 6 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK FOR OZONE

	Annual Arithmetic Mean[1] (Parts per hundred million)	
Location	1973	1974
Montreal, Botanical Gardens	1.7	2.4
Windsor, 471 University	1.9	1.4
Hamilton, Barton, & Wentworth	3.0	2.2
Sarnia, 156 Victoria	2.6	1.8
Edmonton, 109th St. & 98th Ave.	0.8	1.3
Calgary, 620-7th Ave. SW	0.9	1.3
Vancouver, 2294 West 10th Ave.	0.9	1.5

[1] Figures are estimated when data not available for a complete year.

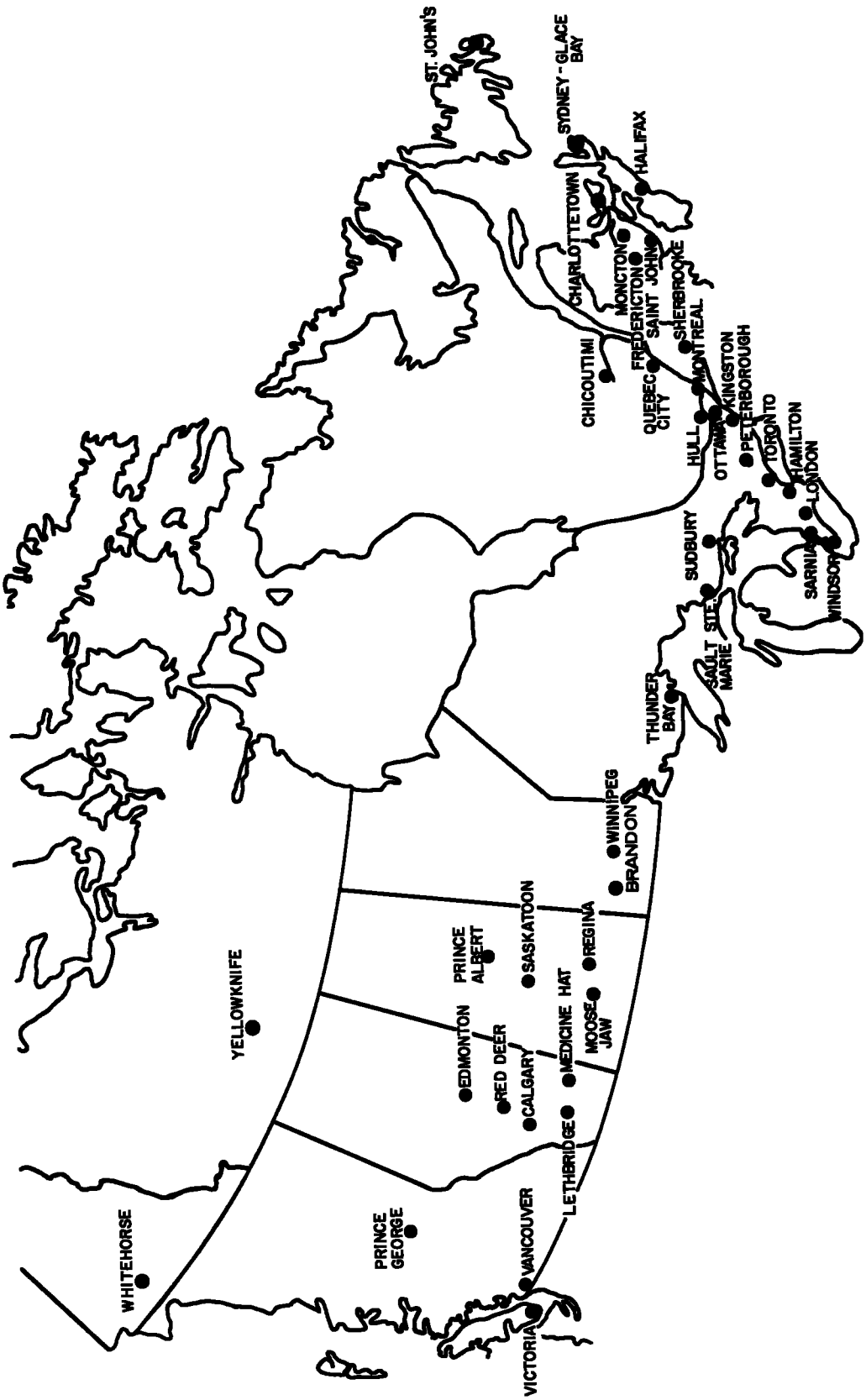

FIGURE 2 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK (SEPTEMBER 1974)

A major study to determine the effect of sample flow rate, particle size and loading on total suspended particulate measurements is being carried out in five cities (Windsor, Sydney, Fredericton, Toronto and Montreal). The stations are equipped with a number of different instruments to measure particle size distribution. The data from the various instruments are being compared to assess the accuracy and precision of each. The most accurate and useful instrument will be recommended for inclusion in the National Air Pollution Surveillance Network.

Effects Studies. An air pollution study in Sydney, Nova Scotia, is being conducted in cooperation with the Department of National Health and Welfare, and is expected to run for several years. When completed, it will provide information on air contaminant levels near the steel mill and their effects on human health and welfare. Information is being obtained on total suspended particulates, particle size distribution, sulphur dioxide concentrations, sulfation rate, dustfall, various meteorological parameters and the effects of air pollution on various types of metals.

TECHNOLOGY DEVELOPMENT

Development and Demonstration of Pollution Abatement Technology Program (DPAT)

Section 3 of the Clean Air Act provides a broad mandate for technology development and demonstration. The Environmental Protection Service has developed a program that provides for contractual cost-sharing arrangements with industry in which the federal government provides a share of capital and operating costs required to develop and demonstrate new technology for pollution abatement and control.

The Environmental Protection Service is responsible for setting priorities for dealing with specific pollution sources and pollutants. These priorities will determine the areas in which the DPAT program will operate. Major factors in the assessment of DPAT proposals will be the severity of the pollution problem addressed and the extent to which the developed control technology could be applied in Canada.

For air, the initial emphasis will be on the containment of sulphur dioxide from fuel and mineral combustion and the capture of fine particulate matter. Technology development and demonstration projects will be sought in the following air pollution areas:

- containment and capture of sulphur dioxide from fuel combustion in stationary sources;
- containment and capture of sulphur dioxide from metallurgical processing;

- desulphurization of fuel oil;
- containment and capture of fine particulates;
- containment and capture of nitrogen oxides from fuel combustion in stationary sources.

To qualify for the program, a contractor must be able to develop and demonstrate either a process that significantly reduces pollution, or a new technology for containing or capturing pollution from a current process. The contractor must make information on any process or control technology developed with DPAT assistance freely available in Canada.

Standard Reference Methods

A reference method for the measurement of nitrogen dioxide was developed and published. Copies of this reference method and others previously published are being disseminated by the Department. Reference methods for mercury, arsenic, polycyclic particulates and vinyl chloride are in preparation.

Air Sampling Technology

Fundamental research is continuing into the vapour pressures of arsenic trioxide, arsenic pentoxide, polycyclic aromatic hydrocarbons and polychlorinated biphenyls. Isotope ratio studies on sulphur, cadmium, mercury and lead are continuing to make possible the identification of actual chemical species found as well as their sources. A large-scale study on arsenic sampling and measurement is being carried out in the Yellowknife area.

Method Development

Development of the analytical methodology for arsenic is continuing. In addition to the Vasak and Sedivec method, those methods which employ anodic stripping voltammetry and X-ray fluorescence have been exhaustively investigated. The development of gas chromatography-mass spectrometry (MS) is continuing with practical application to ambient air samples, samples of coal tar, coal tar volatiles, samples of wood preservative sludge and samples of coke oven emissions. Data for these samples and reference materials are being stored in a computerized data file and arrangements have been made on a cooperative basis to supply these data to the United States Environmental Protection Agency master file.

Collaboration continues with the United States National Bureau of Standards on the testing of calibration mixtures of vinyl chloride in pressure cylinders. Reference analyses are being provided to the National Bureau of Standards on these mixtures and on actual air samples containing vinyl chloride.

Instrument Development and Evaluation

Several generations of continuous-reading, mercury-in-air monitors have been developed, and these have been field tested successfully at several chlor-alkali plants in the United States and Canada. Data are being accumulated as part of the program to determine and control mercury emissions from chlor-alkali plants.

Commercial instrumentation now being evaluated includes ambient air monitors for carbon monoxide, sulphur dioxide, ozone, nitrogen dioxide, total gaseous hydrocarbons and methane. Instrumentation and methodology has been developed for the measurement of reactive hydrocarbons, particularly olefins. The gas phase titration system continues to prove valuable for the calibration of ozone or nitrogen dioxide monitors. A gravimetric calibration system using a recording microbalance has been developed for use with this system.

Emission Control Technology

New concepts in motor vehicle emission control systems, alternate power plants such as turbine, diesel, and electric, and alternate fuels such as propane, natural gas, and hydrogen are being evaluated continuously through literature research and laboratory testing. Current laboratory support includes the evaluation of two vehicles modified for propane as an alternative to gasoline for limited use in fleet vehicles.

TECHNOLOGY TRANSFER

Publications

Thirty-seven technical and scientific reports were published during the year, including the following:

Regulations, Codes, and Protocol Series

EPS 1-AP-74-2	Standard Reference Method for the Measurement of Nitrogen Dioxide in the Atmosphere (Chemiluminescence Method)

Policy and Planning Series

EPS 3-AP-74-3	Air Pollution Emissions and Control Technology. Cement Industry
EPS 3-AP-74-4	Canadian Taxi Survey
EPS 3-AP-74-5	Automotive Exhaust Gas Analyzers

EPS 3-AP-74-7	Canadian Urban Trucking Study

Technology Development Series

EPS 4-AP-74-1	Effect of Cold Weather on Motor Vehicle Emissions

Surveillance Series

EPS 5-AP-74-5 to EPS 5-AP-74-12	National Air Pollution Surveillance Monthly Summaries for April 1973 to December 1973 inclusive
EPS 5-AP-74-13	National Air Pollution Surveillance Annual Summary – 1973

Air Pollution Information System

The Air Pollution Technical Information System was expanded by the addition of 15 000 microfiched documents and the collection now contains more than 70 000 documents on air pollution. These were obtained primarily from the United States Environmental Protection Agency's Air Pollution Technical Information Centre (APTIC). By exchange agreement, APTIC provides the Department with copies of all their new acquisitions selected from a systematic screening of over 7000 worldwide publications. In return for this information service, the Department acts as the agent for all Canadian air pollution information requests to the United States Environmental Protection Agency.

Training

As the air pollution control agencies across Canada develop and promulgate regulations governing pollutant emissions, the requirement to have trained enforcement officers is intensified. In support of these regulatory activities, air pollution control training courses are being presented for enforcement officers of the federal, provincial and municipal governments. Five such courses were offered this year; they related to air sampling, source testing, legal aspects of control and the cleaning of industrial gases.

The courses were attended by 150 students representing three levels of government enforcement agencies.

A training course in Stationary Source Testing was prepared and presented under contract by the Industrial Research Institute of the University of Windsor. The remaining courses were developed in house and presented at headquarters with lecturers from the

Environmental Protection Service, universities, Canadian and United States industry, and consulting firms.

With the exception of the course on Stationary Source Testing, all lectures were recorded on videotape. The tapes are available to enforcement agencies across Canada for training purposes. Other audiovisual material on air pollution control has been added to the library which now includes about one hundred and fifty videotaped lectures and thirty audio cassettes.

Plume opacity is a rapid and convenient method to determine whether a given industry is in compliance with regulations. It is frequently written into regulations. To ensure the presence of trained enforcement officers, two smoke generators were purchased during the year. They will be held in the Quebec and Northwest regions and will be used to certify enforcement officers at six-month intervals.

NATIONAL AIR QUALITY OBJECTIVES

General

National Air Quality Objectives are designed to protect health and welfare by setting limits on levels of pollution in the air. The Clean Air Act calls for three levels of air quality objectives - 'desirable', 'acceptable', and 'tolerable' - for each major air pollutant. The objectives promulgated or proposed to date concern only the first two of these levels.

The maximum acceptable level is intended to provide adequate protection against effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and well-being. It represents the realistic objective today for all parts of Canada. When this level is exceeded, control action by a regulatory agency is indicated.

The maximum desirable level defines the ultimate goal for air quality and provides a basis for an antidegradation policy for the unpolluted parts of the country and for the continuing development of control technology.

Maximum tolerable levels are intended to denote concentrations of air contaminants that lead to a substantial threat to public health. Proposed maximum tolerable levels for suspended particulate matter and sulphur dioxide are nearing completion.

National Air Quality Objectives prescribed by the Governor in Council and published in the Canada Gazette are given in Table 7.

TABLE 7 NATIONAL AIR QUALITY OBJECTIVES

Air contaminant	Maximum acceptable level	Maximum desirable level
Sulphur dioxide	60 $\mu g/m^3$ (0.02 ppm) Annual arithmetic mean	30 $\mu g/m^3$ (0.01 ppm) Annual arithmetic mean
	300 $\mu g/m^3$ (0.11 ppm) Average concentration over a 24 h period	150 $\mu g/m^3$ (0.06 ppm) Average concentration over a 24 h period
	900 $\mu g/m^3$ (0.34 ppm) Average concentration over a 1 h period	450 $\mu g/m^3$ (0.17 ppm) Average concentration over a 1 h period
Suspended particulate matter	70 $\mu g/m^3$ Annual geometric mean	60 $\mu g/m^3$ Annual geometric mean
	120 $\mu g/m^3$ Average concentration over a 24 h period	
Carbon monoxide	15 mg/m^3 (13 ppm) Average concentration over an 8 h period	6 mg/m^3 (5 ppm) Average concentration over an 8 h period
	35 mg/m^3 (30 ppm) Average concentration over a 1 h period	15 mg/m^3 (13 ppm) Average concentration over a 1 h period
Oxidants (ozone)	30 $\mu g/m^3$ (0.015 ppm) Annual arithmetic mean	30 $\mu g/m^3$ (0.015 ppm) Average concentration over a 24 h period
	50 $\mu g/m^3$ (0.025 ppm) Average concentration over a 24 h period	100 $\mu g/m^3$ (0.05 ppm) Average concentration over a 1 h period
	160 $\mu g/m^3$ (0.08 ppm) Average concentration over a 1 h period	
Nitrogen dioxide	100 $\mu g/m^3$ (0.055 ppm) Annual arithmetic mean	60 $\mu g/m^3$ (0.033 ppm) Annual arithmetic mean
	200 $\mu g/m^3$ (0.11 ppm) Average concentration over a 24 h period	
	400 $\mu g/m^3$ (0.22 ppm) Average concentration over a 1 h period	

It is acknowledged that the effects of sulphur dioxide, carbon monoxide, suspended particulate matter and oxidants on the public health and welfare are not necessarily understood to the extent considered desirable. As more information on the effects of these and other air pollutants becomes available, the National Air Quality Objectives will be revised appropriately.

NATIONAL EMISSION GUIDELINES

General

Under Section 8 of the Clean Air Act provision is made for the promulgation of National Emission Guidelines. These are now being developed for various industry sectors. The purpose of these guidelines is to specify levels of emissions of air contaminants that reflect the application to the industrial processes involved of best operating practices and best practicable technology in air pollution control. The adoption of these guidelines by appropriate regulatory agencies will result in significant reduction in emissions of air contaminants and thus prevent deterioration of air quality on a national basis.

The guidelines will be published in a form that will allow for their ready adoption by regulatory agencies, in particular provincial air pollution control agencies, as minimum standards for industry located within their jurisdiction. It is recognized that local conditions, such as the density of industrial development or local topography in some geographical areas, will necessitate the adoption of more stringent environmental requirements. They will, of course, also establish the minimum environmental requirement for all works, business, and undertakings involving the federal government.

Cement Industry

The first of a series of National Emission Guidelines developed under the Clean Air Act was promulgated in the Canada Gazette on October 12, 1974. It covers the cement industry and was developed with the full cooperation of provincial and industry representatives.

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.

Actual atmospheric emissions of particulate matter from the production of cement in Canada during 1970 were 170 544 tons (Table 8) and estimated emissions for 1975 are 89 927 tons (Table 9).

The national emission guideline for the cement industry will limit the emission of particulate matter to 1.7 pounds per ton of cement clinker produced in existing plants effective December 1, 1979. If these guideline limits were met Canada-wide for the year 1975, it is estimated that particulate emissions from the cement industry would be reduced by 85% from 90 000 tons to 15 000 tons.

Asphalt Industry

National emission guidelines have been completed for the asphalt paving industry and will be promulgated early in the new fiscal year.

Other Industry Sectors

National emission guidelines now under development for the various industry sectors are listed below in the approximate order in which their completion is expected:

Coke oven industry
Incineration
Natural gas processing industry
Arctic mining industry
Meat products industry
Thermal power generating industry
Petroleum refining industry
Ferrous foundries industry
Iron and steel industry
Pulp and paper industry
Chlor-alkali industry
Nonferrous smelting industry
Ferro-alloy industry
Chemical fertilizer and related industries

TABLE 8 REPORTED PARTICULATE EMISSIONS FROM THE CANADIAN CEMENT INDUSTRY, 1970*

Region	No. of plants	Production (tons)		No. of kilns	No. of coolers	Emissions (tons)				
		Cement	Clinker			Raw material	Kiln	Cooler	Finish grinding	Total
Ontario	7	3 329 000	3 391 000	16	13	46	39 314	15 375	165	54 900
Quebec	7	2 018 000	2 065 000	11	10	34	40 431	34 867	94	75 426
Balance of Canada	13	2 739 000	2 623 000	20	18	772	25 047	14 320	79	40 218
TOTAL	27	8 086 000	8 079 000	47	41	852	104 792	64 562	338	170 544

*Based on normal operations, fugitive dust not included, from data reported in Air Pollution Control Directorate questionnaires, 1973, from 24 plants and estimated data from 3 plants.

TABLE 9 ESTIMATED PARTICULATE EMISSIONS FROM THE CANADIAN CEMENT INDUSTRY, 1975*

Region	No. of plants	Production (tons)		No. of kilns	No. of coolers	Emissions (tons)				
		Cement	Clinker			Raw Material	Kiln	Cooler	Finish grinding	Total
Ontario	7	5 440 000	5 965 000	17	13	168	1 651	827	198	2 844
Quebec	6	3 391 000	3 237 000	10	9	74	30 154	38 681	66	68 975
Balance of Canada	13	4 005 000	3 806 000	20	18	358	10 186	7 483	82	18 109
TOTAL	26	12 836 000	13 008 000	47	40	600	41 990	46 991	346	89 927

*Based on normal operations, fugitive dust not included, from data reported in Air Pollution Control Directorate questionnaires, 1973, from 23 plants and estimated data from 3 plants.

NATIONAL EMISSION STANDARDS

General

Section 7 of the Clean Air Act empowers the Governor in Council to prescribe national Emission Standards for air contaminants which constitute a significant danger to health. National emission inventories of contaminants which may prove to be of significant danger are essential to this activity and are reported under Surveillance Activities. The Air Pollution Control Directorate consults with the Health Protection Branch of the Department of National Health and Welfare to obtain their recommendations on the health hazards of such contaminants.

Secondary Lead Smelters

Secondary lead smelters, in the course of normal operations, are known to produce airborne particulate matter containing high levels of lead (Table 10).

Control technology is available to provide a high degree of containment for emissions from this industry. Accordingly, a proposed National Emission Standard Regulation for this industry was developed and promulgated in the Canada Gazette on December 7, 1974.

The proposal limits the quantity of particulate matter emitted into the ambient air operation of a secondary lead smelter to

(a) 0.046 grams per normal cubic metre (or 0.020 grains per standard cubic foot) in operations involving the use of blast furnaces, cupolas or reverberatory furnaces, or

(b) 0.023 grams per normal cubic metre (or 0.010 grains per standard cubic foot) in operations involving the use of holding furnaces, kettle furnaces or lead oxide production units and in operations involving scrap and material handling, crushing, furnace tapping, furnace slagging, furnace cleaning or casting.

The concentration of lead in the particulate matter emitted into the ambient air during these operations shall not exceed 63 percent by weight. The proposed standard further stipulates that no particulate matter shall be emitted into the ambient air from lead-bearing scrap or lead-bearing material stored in or about a secondary lead smelter.

It is expected that these regulations, when implemented, will reduce lead emissions from the Canadian secondary lead smelting and melting industry by approximately 92 percent.

TABLE 10 LEAD EMISSIONS FROM SECONDARY LEAD PRODUCTION, 1970

Location	Secondary lead production (tons)	Process*	Lead emissions (tons)
Montreal, Que.	4 120	BF, MK	4.35
Toronto, Ont.			
Plant 1	5 785	BF, MK	6.10
Plant 2	15 000	RF, MK	14.25
Plant 3	12 000	RF, BF, MK	12.00
Winnipeg, Man.	2 191	RF, MK	2.08
Calgary, Alta.	1 804	RF, MK	1.71
Vancouver, B.C.	124	MK	0.02
TOTAL	41 024		40.51

*Abbreviations: BF, blast furnace; RF, reverberatory furnace; MK, melting kettle.

INSPECTORS AND ANALYSTS

Under Section 27 of the Clean Air Act the Minister may appoint any person to act as inspector or analyst for the purpose of enforcing regulations promulgated under the Act. In 1975, the following inspectors were appointed:

AIR POLLUTION CONTROL DIRECTORATE

OTTAWA

M.E. Rivers
D.B.W. Robinson
W.A. Warfe
A. Miszkiel
D. Poon
A.C. Gullon
W.A. Lemmon
J. Labuda
F. Landheer
K. Quickert

ATLANTIC REGION

C.J. Edmonds
P. Banning
J.H. Kozak
H. Monteith
C.J. Wiseman
R.W. Shaw
D.A. Doucette
R.A. Row
D. Boffa

QUEBEC REGION

Y. Ainsley
T. Wypruk
G. Fortier

ONTARIO REGION

R.W. Slater
K. Shikaze
L. Killoran
C. Morden
R.J. Fry
G. Rosenblatt
M. De Bellefeuille
R. Nobes

NORTHWEST REGION

R. Connelly
R.G. Clough
A.K. Hazra
V.T. Chacko

PACIFIC REGION

R.E. McLaren
M. Ito
T.H. Carscadden
G. Trasolini
K. Wile
S. Sidhu
B.A. Heskin
J.V. Watkins
R.H. Olson
G. Thompson
T. Cook
E.P. Wituschek

FEDERAL ACTIVITIES PROTECTION

General

The federal government's conduct of its own in-house activities, as perceived by the public, has a powerful potential to work either for or against the endeavours of the government as a leader in environmental protection. Environment Canada has direct responsibility for ensuring that the federal government minimizes adverse environmental effects from its existing and future works, undertakings, and business. Accordingly, policies concerning operations within this area of responsibility have been developed and include:

- setting exemplary and comprehensive standards, guidelines, and codes of good practice based on the best practicable technology for pollution control and protection of the environment;
- compiling an inventory of pollution problems associated with existing federal sources and activities;
- defining through engineering investigations all factors and circumstances pertinent to existing pollution problems and developing courses of remedial action and design concepts in consultation with operator departments and other departments with jurisdiction for environmental protection and with the provinces;
- recommending, in consultation with other government departments, government-wide project priorities and allocations on an annual basis for cleaning up existing pollution;

- arranging for or providing advice, assistance, and review of plans during detailed design and construction;
- screening all new government facilities and activities for potential adverse effects upon the environment;
- reviewing and assessing new projects to ensure that proper and adequate environmental control measures are provided;
- carrying out surveillance and monitoring to ensure compliance with established environmental standards, guidelines, and codes of good practice;
- assessing crown corporations to ensure that they meet industrial standards promulgated under the Clean Air Act;
- consulting with those departments and agencies responsible for environmental legislation to ensure the development of consistent federal regulations and requirements for pollution control and environmental protection; and
- assisting in the instruction of other government departments in the methods of implementing the Codes and Guidelines for Federal Facilities.

A screening system, using criteria established interdepartmentally, is being implemented, whereby all new federal projects or activities will be evaluated by the initiating departments to indicate potential adverse environmental effects. All new projects will be registered to indicate screening decisions. If adverse effects could result from a project, it will be referred to the Department of the Environment for further assessment to identify and ensure the adequacy of the required environmental protection measures.

In its program the federal government emphasizes leadership through a positive approach to the prevention, control, and abatement of environmental pollution from federal activities. This exerts considerable leverage on other public and private sectors to look at their own responsibilities in establishing measures for pollution control.

The onus has been placed on the Department of the Environment to coordinate and ensure consistency and effectiveness in the planning and implementation of the programs needed. This includes identifying environmental problems, remedies, priorities, and monitoring. Examples of the type of projects managed under this program are given below.

Natural Gas Processing Plant at Fort Nelson, British Columbia

This facility comes under federal jurisdiction because it is part of a gas pipeline subject to the Federal National Energy Board Act. The plant is being expanded to a production capacity of 950 million cubic feet per day in 1975 which will increase sulphur dioxide

emissions to a level of 700 long tons per day. The federal government, in cooperation with the British Columbia Pollution Control Branch, proposed steps to ensure that compliance in reducing sulphur dioxide emissions would be achieved in a reasonable time period. Pollution control facilities are being installed which should be operational by mid-1975 and which should reduce emissions by 90 percent.

Smelter at Flin Flon, Manitoba

This facility, operated by the Hudson Bay Mining and Smelting Company, comes under federal jurisdiction as a result of having been declared a works for the general benefit of Canada by an Act of Parliament. During the year, meetings were held between representatives of the Company, the Province of Manitoba, and the Department of the Environment to develop a program of pollution containment for the facility.

Other projects

Other projects underway or conducted during the year included:

- an air pollution study at Vancouver International Airport in which the environmental impact from the expansion of the activity of the airport to the year 2000 was assessed;
- studies conducted on various types of high efficiency burners for boilers and incineration systems for use at federal facilities to set an exemplary standard;
- the Boiler and Incinerator Guidelines for Federal Facilities were accepted in draft form and sent to various government departments for their input. In addition, the Canadian Transport Commissions' Air Pollution Code 0-26 was revised to reflect the above guidelines and is presently being considered by the Commission;
- the impact of federally owned western grain elevators on their immediate environment was studied, and recommendations were made to control dust emissions from this source;
- guidelines for the construction of the proposed Pickering Airport were completed and reflected the control of air pollutants during and after the construction period.

TECHNICAL AND ADVISORY SERVICES

The Environmental Protection Service continued to provide advice and assistance to other federal departments, provincial and municipal agencies, universities, and industry in those areas of air pollution where scientific and technical staff have developed unique

specialized skills and knowledge. For example, assistance was provided to the Prince Edward Island Environmental Commission on the assessment of the air pollution aspects of asphalt plant operations; assistance was given to the Manitoba Clean Environment Commission in hearings regarding emissions from secondary lead smelters; and information and advice was provided to the Province of Nova Scotia on odour control for meat rendering plants and fish processing plants. Other advisory or technical services provided included:

- assessment of particulate and sulphur dioxide emissions from a proposed steel complex for the Province of British Columbia;
- assistance to the Province of Manitoba in a series of Clean Environment Commission hearings regarding a nonferrous smelter in Thompson, Manitoba;
- assessment of the air pollution potential of a proposed base metal mine and concentrator on Baffin Island, Northwest Territories;
- preparation of a manual on dispersion calculations for use by pollution control agencies and consultants;
- assessment of the air pollution control requirements for the proposed Ottawa municipal waste heat recovery incinerator;
- provision of advice to consultants on incineration requirements for burning of wood waste in British Columbia, and municipal garbage in Prince Edward Island;
- provision of comments on Canadian Electrical Association environmental guidelines;
- provision of comments to the Province of Manitoba on proposed provincial asphalt industry guidelines;
- coordination and participation in the stack monitoring of the Montreal Urban Community incinerator;
- intervention in a National Energy Board hearing into the export of power by the Fraser Companies Limited, Fredericton, New Brunswick;
- provision of technical advice and assistance on an international problem involving the Poplar River Power Project in Saskatchewan;
- under the Accelerated Capital Cost Allowance Program approximately 785 new applications were received; 245 assessments were completed covering air pollution property, 455 assessments were completed covering air implications of water pollution property, and 3 assessments were completed on joint air and water pollution control property; and
- technical assessments were made of industrial projects carried out under grants from the Department of Regional Economic Expansion.

REGULATION OF FUELS AND FUEL ADDITIVES

Sections 22 through 26 of the Clean Air Act provide for the regulation of fuel and fuel additives. A significant source of air pollution results from the combustion of fuel and fuel additives. Measures must be taken to reduce those combustion product pollutants which may affect the environment.

The Department has examined the question of lead in the ambient air arising from motor vehicle emissions as a potential health hazard. The Department of National Health and Welfare has been consulted and although available evidence does not indicate that a health hazard exists in Canada today, there appears to be sufficient cause for concern to warrant control as being prudent in the long term.

Lead-Free Gasoline Regulations became effective on July 1, 1974. These regulations restrict the maximum permissible concentrations of lead and phosphorus to 0.06 grams per imperial gallon and 0.006 grams per imperial gallon respectively in gasoline represented as lead-free. These limits are necessary to protect certain emission control devices introduced on some 1975 model year cars which require the use of lead-free gasoline.

A national monitoring program became operational in September 1974 to ensure that lead-free gasoline quality was within the regulations. Lead-free gasoline samples are collected from all refineries on a monthly basis and from about 10 percent of the retail stations annually. Twenty out of 1000 samples exceeded the allowable concentration of 0.06 grams lead per imperial gallon. Procedures for enforcing the regulations are being developed and will be implemented by the Environmental Protection Service Regional Offices in Vancouver, Edmonton, Toronto, Montreal and Halifax.

Steps are also being taken to protect motorists who buy lead-free gasoline from mistakenly purchasing leaded grades. Federal regulations now in effect under the Motor Vehicle Safety Act limit the size of the gasoline tank filler outlet on 1975 cars equipped with catalytic converters. These inlets are too small for the standard 15/16 inch diameter nozzles that are used to dispense leaded gasoline. However, an intermediate nozzle (14/16 inch) is being used which permits leaded gasoline to be added to catalyst-equipped automobiles thus circumventing the intent of regulations.

A survey in the Montreal area indicated that about 25 percent of the gasoline pumps had been fitted with the nonstandard intermediate nozzle. This situation was brought to the attention of the provincial authorities who immediately requested the petroleum companies to

take the necessary action. Several provinces are now considering legislation which would regulate pump nozzle size.

As part of the program to reduce lead emissions to the atmosphere, Leaded Gasoline Regulations were prescribed on July 30, 1974, by the Governor in Council. These regulations become effective January 1, 1976, and will limit the lead concentration to a maximum of 3.5 grams per imperial gallon of leaded gasoline. The regulations also require the petroleum refiners and importers to submit quaterly reports on the quantities of lead that are added to or imported in leaded grades.

MOBILE SOURCES

General

The control of air pollution from mobile sources is not dealt with directly by any section of the Clean Air Act. Other federal acts presently exist that provide the powers to regulate these sources. The Clean Air Act does, however, address itself to this subject under its general provisions for air quality objectives, air quality monitoring and surveillance, fuel composition regulations, and federal-provincial cooperative programs.

With the passage of the Motor Vehicle Safety Act the federal government initiated a program to combat air pollution from all new motor vehicles manufactured in or imported into Canada starting with the 1971 model year. The Ministry of Transport was made responsible for the administration of the Motor Vehicle Emissions Regulations; the Department of the Environment was designated to carry out the required compliance testing and to provide technical advisory services in support of the regulations. Within the Department of the Environment, these activities are carried out by the Mobile Sources Division and by the Emission Testing Laboratory of the Air Pollution Control Directorate.

Current activities of the Directorate in this area include monitoring new motor vehicles for compliance with current standards, assessing the contribution of the motor vehicle to the total air pollution burden, and recommending legislation for the control and abatement of air pollution from this source.

Compliance Monitoring Program

The compliance monitoring program is designed to ensure that new motor vehicles offered for sale in Canada conform to current emission standards as certified by the manufacturers. At the beginning of a model year the Ministry of Transport selects a

representative sample of all the makes and models of motor vehicles imported into or made in Canada. This sample is then tested by the Department of the Environment for compliance with emission standards.

The Emissions Testing Laboratory was established in its permanent location in March 1972, and began emission testing of the 1972 model year vehicles in June 1972. The testing capacity was doubled early in 1973 by the addition of a second chassis dynamometer.

In this fiscal year over 300 000 miles were accumulated on 43 vehicles as part of the compliance monitoring program.

Assessing the Contribution of Motor Vehicles to the Air Pollution Burden in Canada

General. Until recently, this assessment was based almost entirely on United States and European studies because of the lack of Canadian data. The situation is now being corrected through a number of programs involving in-depth studies supported by actual Canadian emission results.

Cold Weather Programs. This continuing program was initiated in November 1972 to determine the effects of our Canadian climate on emissions in the temperature range -10 °F to 60 °F. The program consists of the daily conditioning and emission testing (CVS-CH test procedure) at ambient temperatures of a fleet of twelve vehicles, with 15 percent of the tests conducted at baseline conditions (68 - 86 °F) on a rotational basis for comparison. Data from about 250 tests indicated that emission levels increase substantially as temperature decreases. For example at -10 °F the levels can be as much as 150 percent higher, and at 20 °F, 100 percent higher than baseline results.

Motor Vehicle Air Pollutant Inventory. Results from a survey of truck and taxi activities in urban areas were compiled and published in two volumes. This information added to a general understanding of the operational characteristics of motor vehicles in our major cities. The data was used as input in a computer model for road transportation emissions. This model was brought on stream in the fall of 1974 and enables Mobile Sources personnel to evaluate emission control strategies in major Canadian cities. In order to improve and update private motor vehicle statistics, a questionnaire was developed and sent to a small sample of vehicle owners in Toronto, Montreal, Vancouver, Edmonton, Calgary, Quebec City, and Ottawa-Hull. The results of this survey will be analyzed and published in the 1975-76 fiscal year. The data gathered in these studies and outputs from the model have been extensively used to evaluate the impact of motor vehicles in urban areas.

Control and Abatement of Air Pollution from Motor Vehicles

Emission Standards. To achieve significant emission reduction at low cost the federal government has in the past followed the policy of paralleling United States motor vehicle emission regulations. As a result, by meeting standards of 3.4, 39, and 3.0 grams per mile (CVS-CH test procedure) for hydrocarbons, carbon monoxide, and oxides of nitrogen, respectively, 1973-74 model year cars were emitting only about one-third as much as uncontrolled vehicles. However, the Ministers of Transport and Environment announced on July 19, 1973 that, for 1975, the Canadian Standards would be 2.0, 25, and 3.1 grams per mile (CVS-CH test procedure) for hydrocarbons, carbon monoxide, and oxides of nitrogen, which represent a reduction in emissions of about 72 percent from uncontrolled values. These standards will remain the same for the 1976 and 1977 model years. Corresponding United States standards for these years require about 82 percent control.

Annual Vehicle Inspections. Although the control of emissions from in-use motor vehicles is outside federal jurisdiction, the dramatic increase in emissions from badly maintained vehicles is of great concern. A continuing review and evaluation of all compulsory emission inspection systems used in Canada, the United States, and several European countries, is now in progress. The Air Pollution Control Directorate has proposed tentative guidelines for provincial and municipal motor vehicle inspection programs. These programs will be coordinated with the Ministry of Transport's feasibility study on annual safety inspections. In particular, extensive advisory work was done for the Quebec government to assist their development of an inspection program. Emission Testing Laboratory support consisted of emission testing to determine effects of maintenance and evaluation of test equipment that could be used in these inspections. In addition, a program was designed in cooperation with taxi companies in the Ottawa-Hull area to follow the emissions from a fleet of vehicles over their lifetime.

ATMOSPHERIC ENVIRONMENT SERVICE

General

The Atmospheric Environment Service (AES) supports air pollution control agencies by conducting research on the atmospheric processes influencing the transport, dispersion, transformation, disposition and effects on receptors of air pollutants, and by providing a wide range of meteorological information and professional consultation. During the reporting period AES expended resources on its air quality program totalling 65 man-years and $3.0 millions.

Atmospheric Chemistry Studies

During the summer of 1974 a mobile laboratory and a fixed station were operated to gather data on the 'brown haze' phenomenon frequently observed in Toronto and other cities. Emphasis in this study was on the production of oxidants, but analytical gas chromatographic techniques were also developed for the measurements of carbon monoxide and the freons so that in subsequent studies the observational program may cover a wider range of the chemical constituents, active and inert, found in Canadian urban atmospheres.

Research on stratospheric chemistry was carried out in response to widespread concern regarding the destruction of ozone by chemical agents introduced by supersonic aircraft, high flying jets, and, most recently, the freons used in refrigeration and aerosol sprays. Two successful high level balloon flights carried out from Churchill, Manitoba, in July 1974, obtained measurements on the photochemistry of the stratosphere. Techniques were developed so that stratospheric flights in 1975 will also obtain measurements of chlorine compounds (including the freons).

Dispersion Studies

Work on the development of predictive techniques useful to decision-makers at federal and provincial levels continued on several fronts. A review of the extent of acid rain in Canada was near completion. Sulphur dioxide to sulphate oxidation rates were studied using a fixed-wing aircraft from the National Aeronautics Establishment to gather data in the plume from the Sudbury super-stack. Analysis of data collected in 1973-74 was carried out in an investigation of the dispersion and deposition characteristics of the plume from this unique stack. The Saint John Regional Study continued with a two-week field survey in July and subsequent selection of an appropriate meteorological model for a real-time supplementary control system. A long-term project to model the dispersion in urban atmospheres got under way with a three-week field study in Edmonton and further analysis of the extensive meteorological and pollution data that are already available for Montreal. The use of such models requires inputs from the analysis and prediction systems of AES, and the development of these fundamental systems has kept pace through research leading to computer forecasts of meteorological parameters on space-time scales appropriate to air quality modelling projects.

Planning was completed for AES participation in the Oil Sands Environmental Research Program. This major multi-disciplinary project will provide an opportunity to develop and test dispersion and deposition models on both local and regional scales.

Cause-Effect Criteria

A two year study (by contract) of the effects of sulphur dioxide on Arctic lichens was concluded. It was determined that the following growing-season concentrations of sulphur dioxide should not be exceeded for the indicated time periods: 0.6 parts per million (ppm) over 1 hour, 0.24 ppm over 3 hours, 0.05 ppm over 24 hours. Otherwise there is potential for damage to these components of the Arctic ecosystem. Other major findings which are outlined in a three-volume report include information about the meteorological conditions conducive to maximum sulphur dioxide damage and background concentrations of sulphur and heavy metals in these plants.

An investigation of the ecological distribution and chemical composition of lichens was initiated as part of the Saint John Regional Study. This two-year investigation will assist in determining the past and present effects of air pollution on the ecology of such a region.

A literature survey was completed of the probable effects of airborne lead on humans.

A research program was begun in collaboration with the University of Guelph to develop a generalized model for crop injury by ozone. Quantitative predictions of damage for a wide range of atmospheric and plant conditions will aid in developing field criteria for desirable ambient air quality for vegetation.

Information and Consultation

A wide variety of services were provided during the year. A study of forecast capabilities led to arrangements for the provision of real-time meteorological predictions, on a one-year trial basis, for the supplementary control system in the new thermal generating station at Lorneville, New Brunswick. Assessments of dispersion characteristics were supplied to the Environmental Protection Service and other agencies in connection with a number of proposed or existing pollution sources (Trail, British Columbia; Thompson, Manitoba; Poplar River and Regina, Saskatchewan; Canso Strait, Nova Scotia; Come-by-Chance, Newfoundland; etc.). Tenders were called to produce, through further development, operational minisondes meeting AES standards (the minisonde system uses balloon-borne sensors to obtain frequent measurement of wind and temperature in the lowest layers of the atmosphere). The review of environmental impact assessments, occasionally followed by the provision of advice on the meteorological factors requiring further investigation, constituted a growing workload within AES.

Monitoring

Two remote AES stations, Mould Bay in the Arctic and Sable Island off the coast of Nova Scotia, were added to the global air pollution monitoring network of the World Meteorological Organization (WMO), bringing the number of Canadian stations in the network to eight (Figure 3). A program to test 'regional background' levels of sulphur dioxide was begun at the AES upper air station at Shelburne, Nova Scotia.

International

AES scientists continued to be active in various intergovernmental bodies and international scientific organizations working in areas such as the long-range transport of pollutants (OECD Working Group), multiple-source modelling of urban pollution (NATO/CCMS Working Group), environmental monitoring and assessment (Scientific Committee on Problems of the Environment, WMO Working Groups), climatic change and the assessment of human activities as a change-forcing mechanism (WMO Working Groups, Phase II of the Global Atmospheric Research Program), and the input of airborne material to receptor surfaces (IJC study of the Upper Great Lakes, symposia on acid rains, WMO Commission for Agricultural Meteorology Rapporteur on Plant Injury by Air Pollution). Such international contacts provided an exchange of information on a wide variety of actual or potential air pollution problems requiring a strong leadership role at the federal level of government.

The book "Environmental Impact Assessment: Principles and Procedures" was published to complete the work of a 1973-74 UNEP/UNESCO/SCOPE workshop for which AES provided the leadership.

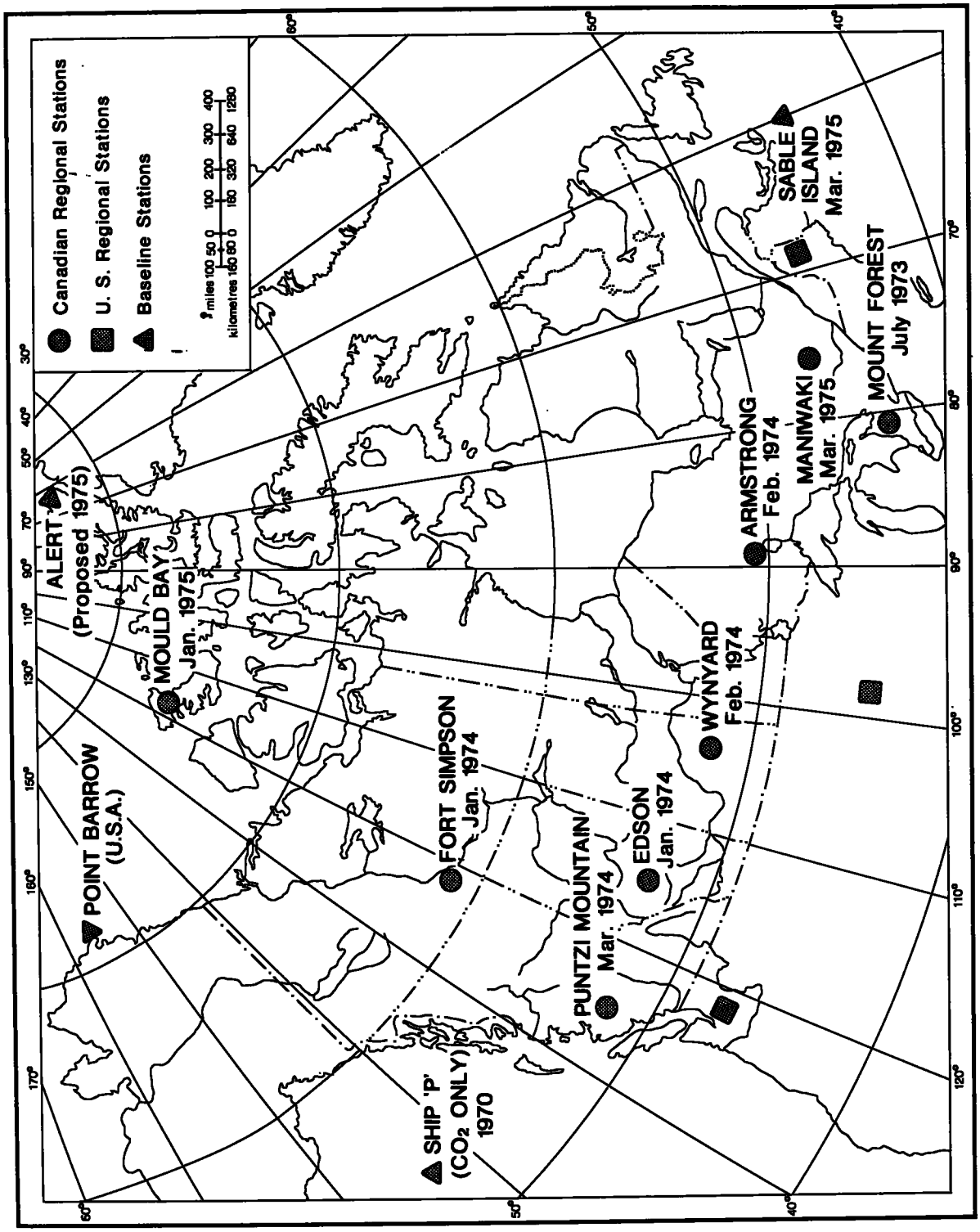

FIGURE 3 WMO BACKGROUND AIR POLLUTION STATIONS

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