THE CLEAN AIR ACT
ANNUAL REPORT
1973–1974

Air Pollution Control Directorate
Environmental Protection Service
Department of the Environment

May 1974

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Minister
Environment Canada

Ministre
Environnement Canada

His Excellency,
The Right Honourable Jules Léger, C.C., C.M.M., C.D.,
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, 1974.

Respectfully submitted,

Jeanne Sauvé

Deputy Minister
Environment Canada

Sous-ministre
Environnement Canada

The Honourable Jeanne Sauvé, P.C., M.P.,
Minister of the Environment,
Ottawa, Canada.

Madame:

I have the honour to submit the Annual Report on the Clean Air Act for the fiscal year ended March 31, 1974.

Respectfully submitted,

R.F. Shaw
Deputy Minister

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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, 1974.

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 impromptu 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 Protection 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 coordinates the surveillance of ambient air pollution in Canada, collects and evaluates information regarding air pollution sources in Canada, conducts source and area surveys and studies, assesses social and economic effects of air pollution control regulations and programs, and develops interagency cooperative programs. The Air Pollution Programs Branch consists of four divisions: data analysis, regulations development, interagency programs, and surveillance.

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 cover major stationary sources; (d) mobile sources, which is concerned with emissions from motor vehicles, railways, ships, and aircraft; and (e) fuels, which is concerned 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 1973-1974 period included such things as 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 on these and other programs are outlined in more detail in the following pages. An organization chart for the Directorate and a resources summary for the overall Air Pollution Control Program are shown in Figure 1 and Table 1, respectively.

Federal Activities Protection Branch

The Federal Activities Protection 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 Protection 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

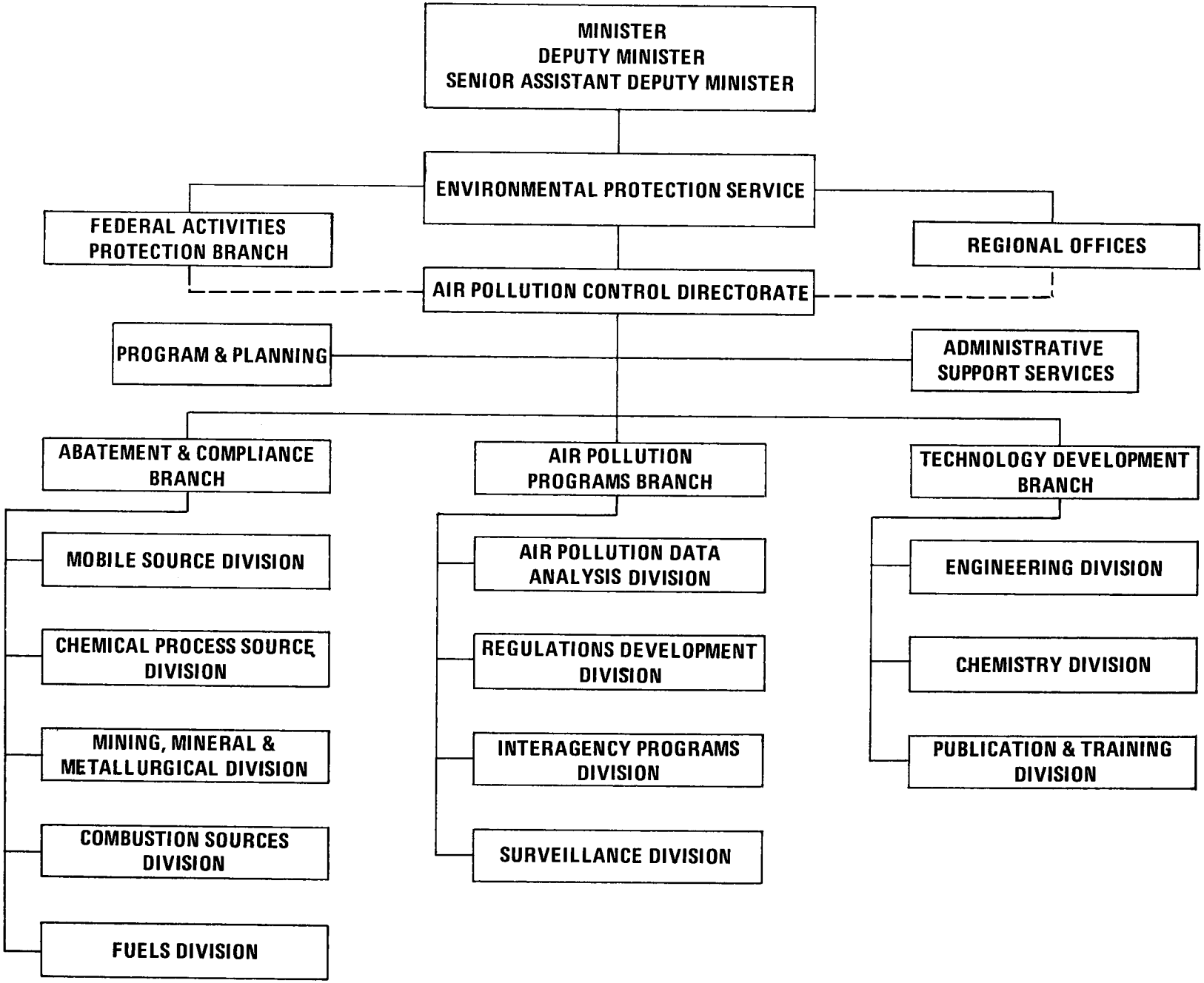

FIGURE 1 ORGANIZATION OF THE AIR POLLUTION CONTROL DIRECTORATE

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

providing within their region direction and supervision of Environmental Protection Service programs arising from the Clean Air Act, 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 formal 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 establishment 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, May 1-2, 1973, 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 the announced air quality objectives for sulphur dioxide, suspended particulates, carbon monoxide, and oxidants, which were published in Part 1 of the Canada Gazette on December 16, 1972. Amendments and the final formulation of these objectives were published in Part 1 of the Canada Gazette on March 30, 1974.

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. Secretariat services to the subcommittee 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 standards.

International

Environmental Protection Agency. Increasing liaison with officials of the United States Environmental Protection Agency has provided considerable value to Canada's air pollution control program.

Environmental Protection Agency officials have significantly assisted the Environmental Protection Service in developing new Canadian programs. In the field of motor vehicle emission control a number of exchange visits have taken place from which Canada has profited. The exchange of benefits is mutual as Canada is now providing United States officials with data on motor vehicle emissions in cold weather. Canada has also provided data on Canadian vehicle emission factors and operational statistics.

United States Environmental Protection Agency officials continue to provide access to their very considerable resources by making available published and unpublished reports and data in the problem areas of particular interest to Canada. Information in the area of ambient air quality research, priorities, and programs has assisted the Environmental Protection Service in keeping abreast of current needs for protection of the Canadian people. Such background data help Canadian officials to avoid duplicating ineffective control programs.

International Joint Commission. Several air pollution references have been investigated by the International Joint Commission over the years. The most recent reference in 1966 resulted in a detailed analysis of the transboundary air pollution problems in the Detroit-Windsor and Sarnia-Port Huron areas. The report on the study was issued by the International Joint Commission in 1972, and it contained recommendations for abatement and control of the transboundary air pollution.

At a bilateral meeting of American and Canadian officials in Washington in October 1972, a joint working task force was established to consider aspects of the recommendations contained in the International Joint Commission report and to report back to the parent group. Members of the Air Pollution Control Directorate participated in the October meeting and comprise the lead agency for the Canadian sector of the task force. The report of the task force is now being considered by American and Canadian officials in the State Department and

the Department of External Affairs prior to a further bilateral meeting from which it is expected that a positive program will emerge.

The Air Pollution Control Directorate also provides the Canadian chairman 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 and reported to the International Joint Commission. In the past year the board has been called upon to investigate four transboundary air pollution incidents, three in Ontario and one in British Columbia.

Other International Organizations. To project an accurate image of Canada's capability in air pollution control, to assist in fulfilling Canada's international obligations, and to obtain maximum benefit for Canada from developing air pollution technology in various parts of the world, the Air Pollution Control Directorate is participating in a number of international programs. This participation is coordinated through the Department of External Affairs. It involves, for example, a contribution to the World Health Organization's program of urban air pollution surveillance. This program provides an international monitoring network for worldwide comparisons of air pollution levels in urban centres in commercial, industrial, and residential settings. The Directorate's Chemistry Division is also participating as a part of a WHO working group for the provision of standard reference material for polycyclic aromatic hydrocarbons. This laboratory has also been designated by the World Health Organization as the National Reference Centre for Canada with regard to the analysis of air pollutants. Personnel have, at various times, been invited to participate in symposia sponsored by WHO. The most recent was an inter-regional symposium in December 1973 on the use of air quality criteria in national air pollution control programs.

The Air Pollution Control Directorate provides Canada's delegate to the OECD Air Management Sector Group and participates through the Interdepartmental Committee of International Environmental Affairs in activities of the Environment Committee and other sector groups. Canada is participating in several new studies being planned by the Air Management Sector Group. These include a determination of the magnitude and control strategies available for control of oxidants and their precursors in the atmosphere, a study on emission measurement techniques for particulate matter from selected sources, the development of case histories on the use of surveillance and control techniques for particulate matter from selected sources, the development of case histories on the use of surveillance and control techniques for air pollution alert systems, and the preparation of case histories in the use of techniques in relation to air pollution control and land use planning.

Following Canada's membership in the Economic Commission for Europe in July 1973, the Directorate participated in the fourth meeting of the Commission's Working Party on Air Pollution Problems in January, 1974. Among the activities of the Working Party, Canada is participating with other member countries in preparation for a second seminar on the desulphurization of fuels and combustion gases to be held in 1975. Canada also plans to participate on a task force of rapporteurs for the development of guidelines for control of emissions from non-ferrous metallurgical industries.

SURVEILLANCE ACTIVITIES

General

A section of the Act makes provisions for the collection and publishing 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.

For the year 1970 inventories were also compiled on several pollutants that may prove to be of significant danger to health. With the cooperation of the provinces and industry, inventories were completed on the sources and emissions of asbestos, lead, mercury, and beryllium. A summary of the results of these studies are presented in Tables 2, 3, 4, and 5. Still in progress are national inventories of arsenic, cadmium, fluorides, manganese, zinc, and vanadium.

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

TABLE 2 1970 ASBESTOS EMISSIONS IN CANADA

Source	Emissions	
	Tons	Percent
PRODUCTION		
Asbestos mining	6 620	40.4
Asbestos milling	9 673	59.0
Production total	16 293	99.4
MANUFACTURING		
Asbestos-cement products	1.88	0.01
Floor tile industry	0.75	*
Paving	0.44	*
Coating, caulks, sealants	0.42	*
Insulation	0.57	*
Friction materials	0.99	*
Plastics	0.09	*
Textiles	0.11	*
Paper	0.05	*
Miscellaneous	0.13	*
Manufacturing total	5.43	0.03
CONSUMPTION		
Construction industry	0.90	*
Sprayed insulation	2.18	0.02
Brake linings		
Installation	18.00	0.11
Wear	72.00	0.44
Consumption total	93.08	0.57
TOTAL	16 391.51	100.00

* Negligible (less than 0.01%).

Canada is fundamental to the sound planning of control and abatement programs. The chief purpose of the National Air Pollution Surveillance program, therefore, is to provide this information on a continuing basis. However, the program also serves a number of other needs and will become increasingly more 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

TABLE 3 1970 LEAD EMISSIONS IN CANADA

Source	Emissions Tons	Emissions Percent
CONSUMPTION		
Gasoline		
Automobile	14 083	65.8
Aviation	151.9	0.7
Handling	9.2	*
Solder		
Soldering	0.7	*
Joint buffing	3.8	*
Printing industry	27.3	0.1
Insecticide application	6.0	*
Paint	0.04	*
Consumption total	14 281.9	66.7
MISCELLANEOUS		
Coal combustion		0.1
Power plants	9.4	
Coke production	0.13	
Other	3.76	
Oil combustion	105.4	0.5
Wood combustion	46.4	0.2
Sewage sludge incineration	2.17	*
Refuse incineration	58.3	0.3
Waste oil incineration	134.0	0.6
Zinc production	37.3	0.2
Copper, nickel production	2 437.0	11.4
Iron production		10.8
Sintering	1 528.0	
Blast furnace	705.7	
Electric furnace	85.0	
Steel production		0.7
Basic oxygen furnace	8.13	
Open hearth furnace	105.7	
Electric furnace	29.0	
Ferroalloys		0.3
Ferrosilicon	42.1	
Others	28.6	
Iron foundries	23.3	0.1
Cement manufacture	115.5	0.5
Miscellaneous total	5 500.9	25.7

Source	Emissions Tons	Emissions Percent
PRODUCTION		
Lead mining		1.9
Underground	206.0	
Open pit	195.0	
Lead milling	565.0	2.6
Lead smelting		2.1
Blast furnace	141.0	
Imperial furnace	316.8	
Lead refining		0.3
Betts process	19.3	
Softening, desilvering	43.2	
Secondary lead		0.2
Blast furnace	20.5	
Reverberatory furnace	14.7	
Melting kettles	5.3	
Production total	1 526.8	7.1
MANUFACTURING		
Storage batteries		*
Oxide made	2.0	
Oxide bought	1.4	
Gasoline additives	64.5	0.3
Litharge	0.6	*
Other compounds	0.01	*
Metal fabrication	38.0	0.2
Manufacturing total	106.5	0.5
TOTAL	21 416.1	100.0

* Negligible (less than 0.1%).

TABLE 4 1970 MERCURY EMISSIONS IN CANADA

Source	Emissions	
	Tons	Percent
PRODUCTION		
Mercury mining	1.05	1.3
Mercury beneficiation	0.76	0.9
Secondary production	0.004	*
Distillation	0.002	*
Production total	1.82	2.2
METALLIC MERCURY USE		
Chlor-alkali industry	26.4	32.1
Dental amalgams	0.17	0.2
Electrical equipment	0.003	*
Gold recovery	0.28	0.3
Pharmaceutical manufacture	0.0001	*
Instrumentation	0.03	*
Mercury use total	26.88	32.7
MERCURY COMPOUND USE		
Agriculture	1.5	1.8
Paint manufacture	0.036	*
Battery cathodes	0.008	*
Pharmaceutical use	0.65	0.8
Mercury compound use total	2.20	2.7
MISCELLANEOUS		
Paint use		
Interior	0.99	1.2
Exterior	5.04	6.1
Coal combustion	6.99	8.5
Petroleum combustion	20.0	24.3
Natural gas combustion	0.002	*
Wood combustion	2.87	3.5
Refuse incineration	4.44	5.4
Sewage sludge incineration	0.54	0.7
Fluorescent tubes	0.94	1.1
Thermometer breakage	0.4	0.5
Zinc recovery	5.26	6.4
Copper recovery	3.42	4.2
Lead recovery	0.40	0.5
Miscellaneous total	51.29	62.4
TOTAL	82.19	100.0

* Negligible (less than 0.1%).

TABLE 5 1970 BERYLLIUM EMISSIONS ACROSS CANADA

Source	Emissions lb	Emissions %
PRODUCTION		
Mining	–	–
Beneficiation	–	–
MANUFACTURING		
Machining of Be metal Machining of Be alloys Use of Be ceramics	<1	*
COMBUSTION		
Coal		
Power plants	8 666.0	55.33
Coke production	137.7	0.88
Others	3 581.0	22.86
Coke		
Iron foundries	118.8	0.76
Blast furnaces	257.7	1.64
Others	11.9	0.07
Heavy Oil	2 891.0	18.46
TOTAL	15 660.1	100.00

* Negligible

National Air Pollution Surveillance Network is a cooperative effort between the federal, provincial, and municipal levels of government, its usefulness in fostering federal-provincial cooperation cannot be overemphasized.

The 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, sulphation rate, and sulphur dioxide. Tables 6 and 7 present values obtained in commercial downtown core areas across Canada for sulphur dioxide and suspended particulates, respectively.

During the past year the National Air Pollution Surveillance Network was expanded and improved. As of March 31, 1974, the network consisted of 365 air sampling instruments in 42 cities across 10 provinces and the Northwest Territories. A map showing the location of the sampling stations is presented in Figure 2. Expansion of the network included the installation

across the country of 12 tape samplers, 12 high volume samplers, 12 sulphur dioxide monitors, 8 carbon monoxide monitors, 10 oxide of nitrogen monitors, 8 ozone monitors, 2 hydrogen sulfide instruments, and 6 hydrocarbon analyzers. Sampling site documentation was completed for all network stations and a start made on the development of standard calibration procedures and schedules. A remote automatic air pollution monitoring station was established in downtown Ottawa to evaluate the feasibility of operating a fully instrumented station from a central computer and to assess real time data handling systems.

Source Testing and Surveys

Source isolation surveys were conducted in the vicinity of a fertilizer plant in Newfoundland for airborne fluorides and in the area of a chlor-alkali plant in Saskatoon for airborne mercury. The operation of the air monitoring network in the Strait of Canso area by

TABLE 6 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK FOR SULPHUR DIOXIDE - COMMERCIAL DOWNTOWN CORE AREAS

	Annual arithmetic mean[1] (Parts per hundred million)			
Location	1970	1971	1972	1973
Halifax N.S., Tech College			3.25	3.16
Saint John, 110 Charlotte			4.40	3.27
Montreal, 1125 Ontario	5.43	4.06	3.70	2.07
Montreal, 1212 Drummond	9.94	8.01	6.61	4.89
Hull, Rue Principale	2.38	1.65	1.33	1.16
Ottawa, Slater & Elgin	4.46	2.15	3.03	2.66
Toronto, 67 College	7.10	5.17	2.97	1.46
Hamilton, Barton & Wentworth	3.72	2.91	1.65	1.83
London, King-Rectory		1.42	0.58	0.35
Sarnia, 156 Victoria		2.65	1.93	1.67
Windsor, 471 University	3.64	4.25	3.62	3.26
Winnipeg, Kennedy & York			0.97	0.40
Edmonton, 109 St. & 98 Ave.			0.10	0.01
Calgary, 620-7 Ave. SW			0.45	0.21
Vancouver, 739W Hastings			1.89	0.72
Victoria, Police Stations			1.53	0.63
Regina, 12th & Smith			0.03	0.06
Moose Jaw, Sask.				0.16
Quebec City, Loisirs Limoilou				3.31

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

TABLE 7 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK FOR SUSPENDED PARTICULATES - COMMERCIAL DOWNTOWN CORE AREAS

Location	Annual geometric mean[1] (micrograms per cubic meter)			
	1970	1971	1972	1973
St. John's, Duckworth & Ordinance			54	55
Fredericton, Woodstock	33	36		21
St. John, 110 Charlotte	61	54	46	55
Moncton, Post Office	77	54	54	54
Montreal, 1212 Drummond		111	132	98
Hull, Rue Principale	77	73	69	72
Quebec, Parc-Autos Paquet-Laliberte			83	101
Chicoutimi, City Hall			75	57
Ottawa, Slater & Elgin	109	92	75	87
Toronto, 67 College	110	99	92	101
Hamilton, Barton & Wentworth	140	142	133	128
Peterborough, Fire Station		61		80
London, King-Rectory		125	95	94
Sarnia, 156 Victoria		105	98	104
Windsor, City Hall	142	122	91	118
Sault Ste. Marie, Prov. Ont. Bldg		55	66	58
Thunder Bay, 14 Algoma		69	60	76
Winnipeg, Kennedy & York	76	73	75	78
Regina, 1955 Smith	66	57	49	61
Saskatoon, City Library		72	68	65
Moose Jaw, Telephone Bldg.			48	65
Prince Albert, 49-12th St. E.			51	70
Edmonton, 98th & Jasper	80	60	66	
Edmonton, 100 & 102 Ave				66
Calgary, 7th Ave. & 2nd St. SE	117	105	85	149
Red Deer, 4720 49th St.	71	64	58	61
Medicine Hat, 770 1st St. SE	67	57	57	74
Lethbridge, 13th St. & 9th Ave S	34	41	37	57
Vancouver, 739 W. Hastings			77	61
Victoria, Police Station	52	59	44	47
Sudbury, Lisgar St.				65

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

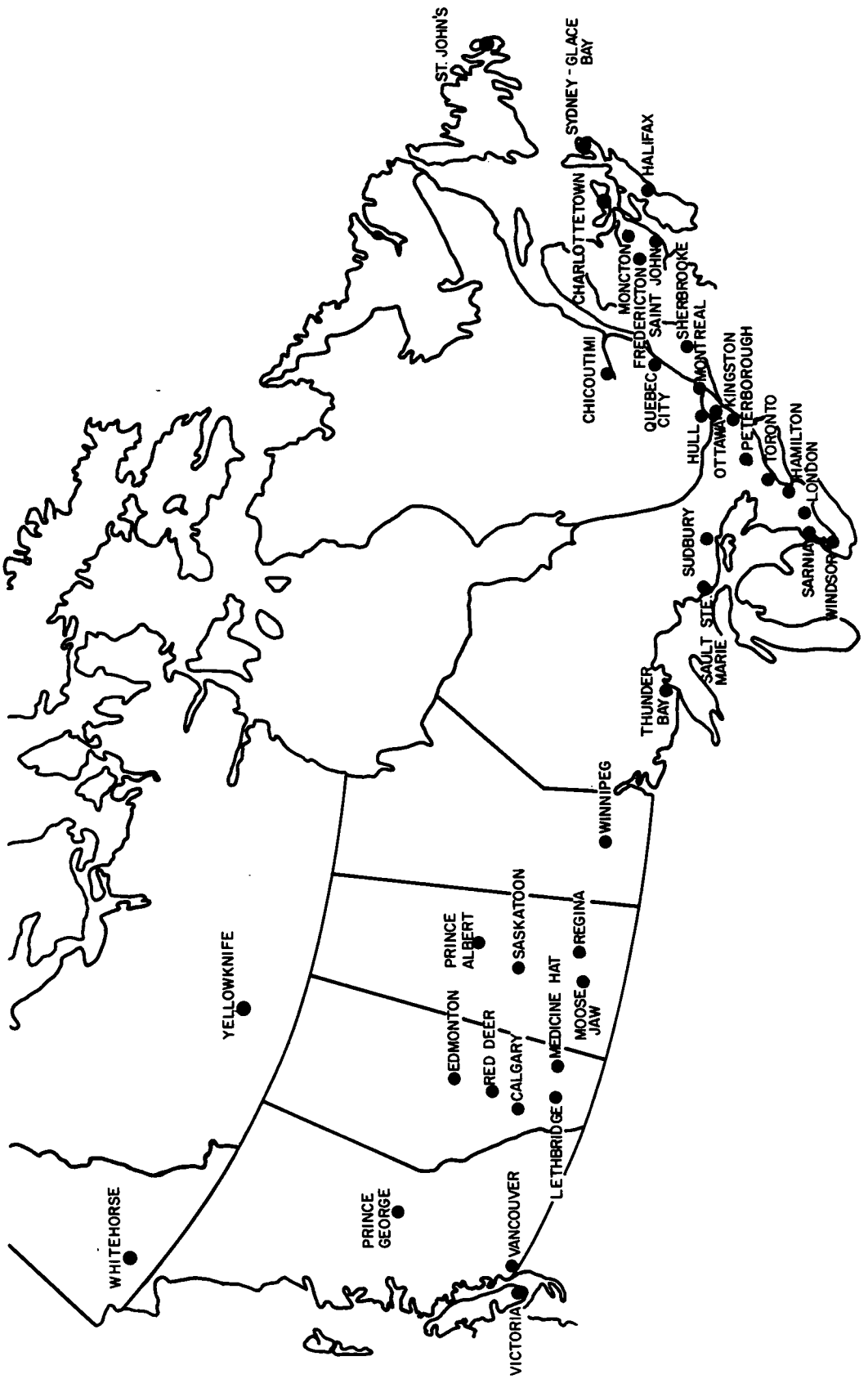

FIGURE 2 NATIONAL AIR POLLUTION SURVEILLANCE NETWORK (SEPTEMBER 1973)

the Atlantic Regional Office is continuing. A carbon monoxide survey was conducted in downtown Whitehorse to determine the extent to which carbon monoxide concentrations build up under the influence of weather conditions which reduce the diluting capability of the atmosphere. Emission inventories were completed for several cities in Canada to assess the need for surveillance monitoring and to aid in the siting of air sampling instruments.

A stack sampling workshop was held in Ottawa to review the Federal Source Testing Code prior to its publication. Stack tests were conducted at several plants to evaluate stack sampling procedures and to provide source data to guide the development of emission guidelines and regulations.

Special Studies

Field Testing of Air Monitoring Instruments and Associated Equipment. Work is continuing on the purchase and evaluation (under actual conditions of use) of new and improved instruments to measure carbon monoxide, reactive and nonreactive hydrocarbons, particulates, ozone, nitrogen oxide, nitrogen dioxide, and total nitrogen oxides in the atmosphere. In addition, evaluations are being conducted on associated testing, calibration, and data acquisition equipment.

Evaluation tests on 28 continuous air pollution monitors, data handling instrumentation, and calibration systems were completed. The purpose of the program is to find more reliable equipment, methods, and procedures for monitoring air pollution levels.

Effects studies. An air pollution study of 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 health and welfare of residents. Information will also be obtained on total particulate mass and particulate size distribution, sulphur dioxide levels, sulphation rate, various meteorological parameters, and the effects of air pollution on various types of metals and plant material. During the past year particle sizing instrumentation was added to the air pollution effects network.

Windsor Study. Air monitoring continues at the Windsor Ontario station in an area with high dustfall characteristics. The station is equipped with a number of different instruments to measure particulate size distribution. The data from the various instruments will be compared in an attempt to assess the accuracy and performance of each one. The most accurate and useful instrument indicated from this work will be recommended for inclusion in the National Air Pollution Surveillance Network.

Special Assignments. A study to determine the effect of sample flow rate on total suspended particulate measurements is being carried out in four cities (Windsor, Sydney, Fredericton, and Toronto).

Packages to determine the effect of ambient air pollution on certain materials (e.g. paints, clothing, plastics, metals) will be placed at locations across Canada to obtain data for studies on the economic cost of air pollution.

TECHNOLOGY DEVELOPMENT

General

Section 3 of the Clean Air Act provides a broad mandate for technology development and demonstration. A program has been developed that will provide funding on a contract basis for government-approved projects for demonstrating the applicability of new technology in controlling air pollution. Proposals received under this program are being evaluated for cost-sharing with industry. Final approval of funds for this program is expected in the new year.

Standard Reference Methods

Standard reference methods to be used for the determination of lead and phosphorus in motor fuel have been developed and published. A reference method for the measurement of oxidants (ozone) in the atmosphere has also been developed and published. Copies of these reference methods are being disseminated by the Department.

Air Sampling Technology

Fundamental research is continuing into the vapor pressures of arsenic trioxide, selenium dioxide, benzo(a) pyrene, and other polycyclic and heterocyclic compounds. Laboratory equipment and experiments have been designed to assess the collection efficiency and vapor pressures in a sampling situation. From the work already done on vapor pressures and collection efficiency, the need for a controlled-temperature sampling device has been demonstrated. Thermodynamic studies on various compounds of sulphur, cadmium, mercury, lead, arsenic, and selenium were initiated in order to identify actual chemical species found as air pollutants and possibly also their sources.

Reference spectra were prepared for the polycyclic hydrocarbons benzo(a) anthracene and coronene, two of the polycyclics designated of special interest by the International Agency for Research on Cancer.

Air samples containing polycyclic hydrocarbons and polychlorinated biphenyls have been analyzed by methods employing gas chromatography, ultraviolet spectrophotometry, fluorimetry, and mass spectrometry. To enable comparisons of pollution levels measured by these different techniques, the methods have been calibrated so that each produces similar results.

Measurement Methods Development

A reference method for determining the concentration of mercury in ambient air has been prepared, and instrumentation for monitoring the emission of mercury from stacks has been developed.

Commercial instrumentation now being evaluated includes new and improved ambient air monitors for carbon monoxide, sulphur dioxide, ozone, nitrogen dioxide, total gaseous hydrocarbons, methane, and fluoride. A gas phase titration system and assembly has been designed and built so that a more accurate calibration of both ozone and nitrogen dioxide instruments is possible. A temperature-corrected high volume sampler is being evaluated and the evaluation of a particle-sizing accessory for the conventional high volume sampler has been completed. This is being done in anticipation of regulations on particulate size distribution as they relate to the respirable fraction of a particulate emission.

The comparative evaluation of the instrumental techniques employing X-ray fluorescence and atomic absorption is continuing for the elements lead and arsenic. Fundamental studies have demonstrated that high volume sampling for arsenic is probably in error on the low side and, for this reason, further studies on collection efficiency of filter media are in progress. These studies are being conducted in conjunction with a survey of arsenic in air levels at Yellowknife. The collection efficiency of airborne lead on glass fibre or membrane filters is also being assessed comparatively.

Collaboration continues with the United States National Bureau of Standards on the testing of reference gas mixtures and permeation tubes. Consultative and analytical services have also been provided to the United States Environmental Protection Agency.

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 extended testing of two Wankel-engined vehicles and the

evaluation of two vehicles modified for propane as an alternative to gasoline for limited use in fleet vehicles. The energy crises has caused renewed interest in gas-saving and pollution-preventing devices. Six inventions were evaluated but none demonstrated a significant improvement in economy or efficiency.

TECHNOLOGY TRANSFER

Publications

Publications produced during the period covered by this report are listed below.

Regulations, Codes, and Protocol Series

EPS 1-AP-73-3	Standard Reference Method for the Determination of Lead in Motor Fuel (Atomic Absorption)
EPS 1-AP-73-4	Standard Reference Method for the Determination of Phosphorus in Motor Fuel (Spectrophotometric Method)
EPS 1-AP-73-7	Standard Reference Method for the Measurement of Oxidants (Ozone) in the Atmosphere (Chemiluminescence Method)
EPS 1-AP-74-1	Standard Reference Method for Source Testing: Measurement of Emissions of Particulates from Stationary Sources

Economic and Technical Review Series

EPS 3-AP-73-6	Air Pollution in the Urban Environment
EPS 3-AP-73-10	Canadian Automobile Driver Survey
EPS 3-AP-74-1	National Inventory of Asbestos, Beryllium, Mercury, and Lead. Summary of Emissions for 1970

Surveillance Series

EPS 5-AP-73-12	Ambient Air Levels of Mercury in the Vicinity of Selected Chlor-Alkali Plants
EPS 5-AP-73-14	Winter Testing of Automobile Idle Exhaust Emissions in Edmonton, Alberta
EPS 5-AP-73-15	National Air Pollution Surveillance Annual Summary - 1972
EPS 5-AP-73-1	National Air Pollution Surveillance Monthly Summary - April 1972

EPS 5-AP-73-4 to EPS 5-AP-73-11	National Air Pollution Surveillance Monthly Summaries for May 1972 to December 1972 inclusive
EPS 5-AP-74-1 to EPS 5-AP-74-3	National Air Pollution Surveillance Monthly Summaries for January 1973 to March 1973 inclusive

Impact and Assessment

EPS 8-AP-73-1	Automobile Emission Trends in Canada, 1960 - 1985

Air Pollution Information System

An air pollution information system has been developed to support Departmental scientific and technical staff engaged in air pollution studies. This system utilizes established files of air pollution information such as are available through the National Science Library, as well as information obtained from a variety of sources and maintained within the Air Pollution Control Directorate.

One part of this information system that has been particularly useful is a microfiche collection of more than 55 000 documents obtained 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 which are now being added to the air pollution data bank at the rate of 500 to 1000 new items each month. These acquisitions are selected by APTIC from a systematic screening of over 7000 worldwide publications. In addition, government reports, patents, technical papers, preprints, translations, and articles from books and proceedings are scanned for pertinent information.

Comprehensive retrospective literature searches on the entire APTIC data bank are available to the Department through APTIC's computer-based information retrieval system. Access has also been arranged through an on-line interactive cathode ray tube terminal to the Pollution Information Project (PIP) data base. This is a computerized environment-oriented data base developed as a joint project of the Canada Institute for Scientific and Technical Information, the National Research Council (NRC) Associate Committee on Scientific Criteria for Environmental Quality, and the NRC Division of Biology.

A joint United States Environmental Protection Agency and Environment Canada Workshop was held in Washington, D.C. in December 1973 to explore the possibility of strengthening environmental information resources in each country by exchanging reports and by sharing specialized information services such as abstracting, translation, and automated

search systems. Procedures were established for the timely exchange of information and it was decided that a further meeting to review the exchange system would be held in Ottawa in 1974.

Training

Three training courses were presented during the year covering the following topics: Air Pollution and its Control, Air Pollution Meteorology, and Control of Particulates. These courses were attended by a total of approximately 100 technical personnel from the air pollution control agencies of the federal, provincial, and municipal levels of government.

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 anti-degradation policy for the unpolluted parts of the country and for the continuing development of control technology.

Maximum tolerable levels, to be announced at a later date, are intended to indicate the onset of an 'imminent danger' requiring immediate abatement action.

A complete formulation of the National Air Quality Objectives as revised appeared in the March 30, 1974, edition of the Canada Gazette. This latest formulation, which the Governor General in Council will prescribe early in the new fiscal year, is given in Table 8.

The development of proposed Air Quality Objectives for the desirable and acceptable levels for nitrogen dioxide has been completed. These proposed objectives were published in the Canada Gazette in April 1974, and comments from all interested parties were invited.

TABLE 8 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 $\mu g/m^3$ 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 a 8 h period	6 mg/m^3 (5 ppm) Average concentration over a 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	

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

Under Section 8 of the 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 reductions 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 and provide for a national baseline. They will, of course, also establish the minimum environmental requirement for all works, businesses, and undertakings involving the federal government.

National emission guidelines are being developed with the cooperation of the provinces and industry. Those now under development for the various industry sectors are listed below, in the approximate order in which their completion is expected:

Cement Industry
Asphalt Industry
Incineration
Coke Oven Industry
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 Plants
Non-Ferrous Smelting Industry
Petro-Chemical and Resins Industry
Ferro-Alloy Industries

NATIONAL EMISSION STANDARDS

Section 7 of the 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. In addition 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. During 1973-74 action was initiated towards development of a National Emission Standard for the secondary lead smelting industry which is intended to restrict the amount of lead-bearing particulate matter these smelters emit to the ambient air. Preliminary work has also commenced with respect to mercury emissions from chlor-alkali plants and asbestos emissions from mining and milling operations.

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 businesses. 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 problems;

- arranging for or providing advice, assistance, and review of plan 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; and
- 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.

A screening system, using criteria established interdepartmentally, has been developed, against which all new federal projects or activities are evaluated by the initiating departments to indicate potential adverse environmental effects. All new projects are registered to indicate screening decision. If adverse effects could result from a project, it is 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.

Plant at Fort Nelson, British Columbia

This facility comes under federal jurisdiction as a result of being 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 by 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 Board, proposed steps to ensure that compliance in reducing sulphur dioxide emissions would be achieved in a reasonable time period.

Emissions from a 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.

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 the staff have developed unique specialized skills and knowledge. For example, two emergency surveys for mercury in air were performed where there had been accidental spills of metallic mercury. Advisory services were provided on the measurement of environmental contamination from candles having lead wicks, on the quality control of a mine atmosphere, on the development of various air sampling instrumentation, and to the state of New York during a court case involving the measurement of polycyclic hydrocarbons. Other advisory or technical services provided included the following:

- assessment of thermal power station emissions for the provinces of Prince Edward Island and Quebec;
- preparation of a brief and participation in a British Columbia Pollution Control Branch hearing on municipal waste discharges;
- provision of technical information on various types of incineration units to the Department of National Defence, to the Department of Public Works, and to outside consultants;
- provision of assistance to the Department of Indian and Northern Affairs on a pollution bylaw for Indian bands; and
- assessment of particulate and sulphur dioxide emissions from a steel complex for the province of Nova Scotia.

REGULATION OF FUELS AND FUEL ADDITIVES

Sections 22 through 26 of the Clean Air Act provide for the regulation of fuel and fuel additives. An important source of air pollution results from the combustion of gasoline and gasoline additives. The problem is twofold: the first is the direct emission of an additive such

as lead, a toxic material; and the second is the effect of fuel additives on motor vehicle emission control devices designed to reduce carbon monoxide and hydrocarbon emissions.

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 was consulted and has submitted views on this subject. 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.

The economics of lead in gasoline were examined during 1972-1973 through an extensive survey of the oil industry by questionnaire and through consultation with the provincial governments.

On October 31, 1973, Lead-Free Gasoline Regulations were prescribed by the Governor in Council. These regulations restrict the maximum permissable 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 to be introduced on some 1975 model year cars which require the use of lead-free gasoline.

The promulgation of final regulations controlling the amount of lead additive permitted in leaded grades of gasoline were expected this year but were delayed. The Department plans to have these regulations prescribed during fiscal year 1974-1975.

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 regulation, 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 were 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 are orientated towards programs designed to reduce pollution caused by motor vehicles. These include monitoring new motor vehicles for compliance with current standards, assessing the contribution of the motor vehicle to the total air pollution burden, and, finally, recommending legislation and developing new technology for the control and abatement of air pollution from this source.

Compliance Monitoring Program

The compliance monitoring program ensures that all 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 thoroughly tested for compliance with the emission standards by the Department of the Environment.

Test procedures permit an estimation of the deterioration of the emission control systems during the lifetime of the motor vehicle. With these known deterioration factors the emission level determined at 4000 miles after engine break-in may be related to that at 50 000 miles.

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 250 000 miles were accumulated as part of the control system's durability on a total of 44 motor vehicles.

Assessing the Contribution of Motor Vehicle 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 initiation of 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 23 min emission testing at ambient

temperatures of a fleet of nine vehicles, with 25% of the tests conducted at baseline conditions (65 - 80 °F) on a rotational basis for comparisons. Data from about 1000 tests indicated that emission levels increase substantially as temperature decreases. For example, at -10 °F the levels can be as much as 150% higher, and at 20 °F, 100% higher than are baseline results.

Motor Vehicle Air Pollutant Inventory. Estimates of the effects of control measures on national emission levels were published based on data analyzed in the 1972-1973 fiscal year. Data were compiled, evaluated, and published from results of a contracted questionnaire survey of Canadian driver habits. Contracted studies on Canadian urban trucking and urban taxi operations were completed. These studies added substantially to the pool of data on the use characteristics of Canadian motor vehicles, and will be used for assessment of future control strategies. This information supplemented data from statistics-gathering agencies and from technical studies in several Canadian provinces and in other countries, as well as from the cold weather and compliance testing programs at the Emission Testing Laboratory. The development of a computer program to calculate total motor vehicle emissions in a given area and year was started. When completed it will facilitate the regionalized assessment of motor vehicle emissions.

Control and Abatement of Air Pollution from Motor Vehicles

Emission Standards. To achieve significant emission reduction at low cost the Federal Government has 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-C Test Procedure) for hydrocarbons, carbon monoxide, and oxides of nitrogen, respectively, 1973-1974 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 slightly less stringent that those in the United States. The Canadian standards will 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% from uncontrolled values.

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 comprehensive review and evaluation of all compulsory emission inspection systems used in Canada, the United States, and several European countries is now in progress, and will be published shortly. 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. 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 the Department of National Defence to follow the emissions from a well maintained fleet of vehicles over their lifetime. A total of 80 vehicles is involved.

ATMOSPHERIC ENVIRONMENT SERVICE

General

The Atmospheric Environment Service (AES) is carrying on an active research program in support of air pollution control agencies and provides a wide range of meteorological information and consultation to federal and provincial agencies. In addition, AES participation in international activities dealing with air quality is becoming increasingly significant in establishing a leadership role for the federal government. During the reporting period AES expended resources on its air quality program totaling 65 man years and $2.7 million.

Atmospheric Chemistry Studies

The atmospheric chemistry program, initiated in 1971, made significant progress during the year. Emphasis is being given to the study of chemical reactions in urban atmospheres, in particular the distinctive orange-brown haze which develops over large Canadian cities during sunny days. Preparations were completed for field studies beginning in the summer of 1974. Progress was also made on the construction of an instrument for the measurement of solar radiation in several discrete wavebands as the basis for photochemical smog evaluation, and on aerosol studies in a wind tunnel as a means for simulating the decay and dispersion of chemical species. Findings from these studies will be of considerable interest to control agencies.

Dispersion Studies

Dispersion and transport modelling studies are aimed at gaining a better understanding of how meteorological conditions affect air quality on local, regional, and global scales. The objective is to develop predictive models useful to decision-makers at federal and provincial levels. A review of all existing models has begun, special attention being devoted to their advantages and disadvantages under Canadian conditions. Field studies were continued at Sudbury, where the tallest stack in the world and an isolated sulphur dioxide source were used to investigate plume characteristics on one hand and the atmospheric oxidation and removal

processes for sulphur on the other. Plans were also developed for two major field studies: the first, in cooperation with the Alberta Department of the Environment, for development of an urban air quality model; the second, a regional model, based on data that may become available from the Alberta Tar Sands region. Both of these are long-range projects that will serve to test and develop methodologies for general application in land-use planning, evaluation of control alternatives, and real time emission control.

Science Subvention Program

A substantial amount of research at universities was sponsored through the Science Subvention Program. Activities fall into two broad categories: studies directly related to in-house research objectives, and studies relating the effects of meteorological conditions to plant damage caused by air pollution. Studies in the latter category are used in assessing the applicability of cause/effect criteria to Canadian conditions, with subsequent input through the Federal-Provincial Committee on Air Pollution to the development of National Air Quality Objectives.

Information and Consultation

A wide variety of services were provided during the year. Activities included the provision of climatological data, assessments of the dispersive capacity of the atmosphere at specific locations, the review of environmental assessment statements, and field studies at the request of control agencies. A partial list of the localities concerned indicates the breadth of application for such services: Trail, Edmonton, Calgary, Regina, Winnipeg, Shilo (Manitoba), Windsor-Quebec City corridor, Saint John, Canso Straits, Come-by-Chance, Alberta Tar Sands area, and, in the high Arctic, Strathcona Sound, Melville Island, Beaufort Sea.

The Saint John Regional Study is an example of the support being provided to air pollution control agencies. As an outcome of the Lorneville Impact Study, AES has the responsibility for developing the meteorological input to the supplementary control system (fuel switching) for the new power plant. A pilot field study was conducted to measure mixing depths and the dispersion characteristics of the area. A preliminary precipitation scavenging study was carried out, and exploratory continuous air sampling was made to provide a base for a more comprehensive study planned for July when mixing depths are at their seasonal low. Regional meteorological models are being developed to assist the province in their long-range planning for the area.

International

AES scientists were active in intergovernmental bodies during the year as elected officers, consultants, members of committees and working groups, and rapporteurs. These contacts with scientists in other countries help in the identification of problems that do, or may require, control measures, and in the exchange of information on scientific problems of mutual interest, such as multiple-source modelling of urban pollution (NATO Working Group) and long-range transport of atmospheric sulphur compounds (OECD Working Group).

Intergovernmental monitoring of environmental quality is being increasingly emphasized. At the planning level, AES scientists contributed to the work of the United Nations Environmental Program (UNEP) in designing the Global Environmental Monitoring System and also organized an international workshop on environmental impact assessment jointly sponsored by DOE, UNESCO, and SCOPE (Scientific Committee on Problems of the Environment, of the International Council of Scientific Unions). At the operational level, rural stations in the global air pollution monitoring network of the World Meteorological Organization were established at Puntzi Mountain B.C., Edson Alberta, Fort Simpson N.W.T., Wynyard Saskatchewan, Armstrong Ontario, and Mount Forest Ontario. Following site suitability tests begun in 1973-1974, four additional stations will be established in Eastern Canada.

Date Due
