Environment Canada
Environmental Protection Service

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Department of the Environment Environmental Contaminants Contract Fund

1978-79 Annual Status Report

Economic and Technical Review
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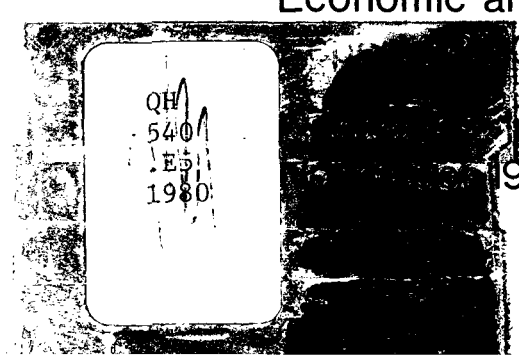
al Impact Control Directorate
1980



ENVIRONMENTAL PROTECTION SERVICE REPORT SERIES

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DEPARTMENT OF THE ENVIRONMENT
ENVIRONMENTAL CONTAMINANTS CONTRACT FUND

1978-79 Annual Status Report

prepared
by the

Environmental Contaminants Contract Fund Subcommittee

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Environment Canada Environnement Canada

Ottawa, Ontario

January 10, 1980.

Your file Votre référence

Our file Notre référence

Dr. S.O. Winthrop
Chairman
Department of the Environment
Environmental Contaminants Program
  Steering Committee
Environmental Impact Control Directorate
Environmental Protection Service

Dear Dr. Winthrop:

In accordance with the terms of reference of the Environmental Contaminants Contract Fund Subcommittee, I am pleased, on behalf of the Subcommittee, to submit the attached ECCF Annual Status Report for fiscal year 1978-79.

Yours truly

Robert Bisson.

Robert Bisson
Chairman
Environmental Contaminants
  Contract Fund Subcommittee

Attach.

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1 INTRODUCTION

Following the promulgation of the Environmental Contaminants Act in April 1976, the Department of the Environment (DOE) Environmental Contaminants Program Steering Committee was created and went into operation in January 1977. The Environmental Contaminants Contract Fund (ECCF) was established in the 1977-78 fiscal year with an annual allotment of $750,000 for the support of contracts pertaining to the implementation of the DOE Environmental Contaminants Program; the allocation of these resources was made a responsibility of the Steering Committee.

Initially, the Steering Committee took care of the evaluation of the proposals submitted for ECCF funding. At the beginning of the 1978-79 fiscal year, the ECCF Subcommittee was established and given the mandate to review ECCF proposals and to forward recommendations on their funding to the parent committee. The current membership of the ECCF Subcommittee is given below and it has remained unchanged from the beginning in terms of the agencies represented:

K. Anlauf:	AES, Air Quality Inter-Environmental Research Branch
R. Bisson:	EPS, Environmental Impact Control Directorate (chairmanship)
M. Riddle:	EPS, Water Pollution Control Directorate
R. Thomas:	EPS, Air Pollution Control Directorate
A. Davis:	EMS, Inland Waters Directorate
A. Gilman:	EMS, Canadian Wildlife Service
K. Marshall:	Fisheries and Oceans Canada, Fish Habitat Management Branch
R. Stoddart:	Fisheries and Oceans Canada, Oceans and Aquatic Sciences Affairs Branch

A general picture of the operations of the Fund from its beginning is provided by the following statistics:

	F.Y. 1977-78	F.Y. 1978-79	F.Y. 1979-80
Number of projects funded	33	39	est. 32
Total amount ECCF funds spent	$543,548	$667,886	est. $650,000

The present report provides an account of the activities of the Fund associated with the first year of existence of the ECCF Subcommittee. Chapter 2 gives an overview of the ECCF projects completed during the 1978-79 fiscal year. Chapter 3 deals with the financial aspects of the Fund for the same period, and Chapter 4 provides an assessment of the performance of the Fund.

2 PROJECTS FUNDED IN 1978-79

In this Chapter, each project funded under the Environmental Contaminants Contract Fund in the 1978-79 fiscal year is listed and, to allow cross-reference with Chapter 3, the project code number is indicated in the left margin.

For each project funded and completed in the 1978-79 fiscal year, the following information is provided:

- title of the project or of the Contractor's final report deriving from the project;
- identification of the Contractor and the Scientific Authority(ies);
- summary giving the highlights of the work carried out.

At the end of this Chapter are listed the projects funded in 1978-79, but slated for completion in 1979-80.

Anyone wishing to obtain more information regarding a particular project mentioned in this chapter is invited to contact the appropriate Scientific Authority.

2.1 Projects Completed

(77-200) "Analysis of Organic Environmental Contaminants in Fish from the Lower Fraser River"

Contractor: Can Test Ltd., Vancouver, B.C.

Scientific Authorities: O.E. Langer and D.M. Wilson
Environmental Protection Service - Pacific Region
West Vancouver, B.C. (604) 666-6711

Most of the available information on organic contaminant levels in Fraser River fish species was obtained in a Westwater Research Centre fish sampling program conducted in 1972 and 1973. The majority of the samples, analyzed in 1973, determined muscle tissue levels of chlorinated pesticides and PCBs. In 1978, funding obtained from the Environmental Contaminants Contract Fund permitted the balance of the samples collected in 1973 to be analyzed for a wide range of industrial and agricultural organic contaminants.

PBBs, PCTs, and mirex were not detected in any samples. PCBs were detected with greater frequency and at higher concentrations than were any other contaminants. Residue levels were highest in coarse fish species such as Largescale suckers (up to 3695 ppb) and Northern squawfish (up to 1894 ppb). Most species from the

Fraser River contained PCB tissue concentrations between 100 and 900 ppb. Residue levels and incidence of occurrence in several species were higher in the more industrially developed estuarine portions of the river than further upstream, indicating that past and current industrial activity in this vicinity has contributed to significant PCB contamination in the Fraser River.

The results of this study are presented and discussed as part of an EPS Pacific Region report prepared for the Canada-British Columbia Fraser River Estuary Study.

(77-202) "Study to Evaluate and Monitor the Use of Polychlorinated Biphenyls (PCBs) in Electrical Equipment"

Contractor: Stothert Engineering Ltd., Vancouver, B.C.

Scientific Authority: D.M. Wilson
Environmental Protection Service -
Pacific Region
West Vancouver, B.C. (604) 666-6711

This study evaluated the conditions of PCB-filled electrical equipment and potential for accidental release of PCBs in large British Columbia industries. Equipment maintenance, spill control, storage and disposal procedures, and potential escape routes of PBCs from the plants to the environment were determined, and inspection reports prepared.

A handbook for PCB users covering uses, storage, handling, shipping and disposal procedures for PCB wastes and equipment was also developed. Personnel safety, equipment maintenance methods, spill prevention and containment plans, and substitute chemicals for PCBs were among the many topics covered.

(77-202) "EPS-Pacific Region Mercury Overview"

Contractor: multi-contracts

Scientific Authority: O.E. Langer
Environmental Protection Service -
Pacific Region
West Vancouver, B.C. (604) 666-6711

The report provides an overview of mercury contamination in British Columbia and the Yukon Territory, based on the compilation and interpretation of data supplied by various sources. In many instances, the reported data are plotted on regional maps to give a geographical representation.

Elevated mercury levels occur most frequently in aquatic organisms, fish-eating birds, and sediments from the more heavily urbanized areas around Vancouver and Victoria, and from regions of extensive natural mineralization, such as Pinchi Lake. Localized incidents of mercury contamination have also been demonstrated in the

receiving environments of industrial operations such as mines, smelters, pulp mills, and a mercury cell chlor-alkali plant. In most instances, the occurrence of high levels of environmental contamination has been attributed to industrial mercury releases prior to recently implemented government regulations and pollution control measures; however, some industrial facilities in B.C. continue to discharge significant amounts of mercury to the atmosphere and receiving waters.

No major areas of mercury contamination have been identified in the Yukon Territory. Preliminary sampling programs, however, have indicated the presence of elevated concentrations in surface waters, sediments, and fish from various Yukon water systems. While contamination in the Yukon has not been attributed to industrial mercury releases, it is likely that the past widespread activity of placer mines combined with natural releases have contributed to the contamination of some aquatic systems.

(77-300) "Research on the Determination of Polynuclear Aromatic Hydrocarbons and Trace Pollutants in Natural Waters"

Contractor: University of Manitoba (Dr. H.D. Gesser, Princ. Inv.), Winnipeg, Man.

Scientific Authority: B.K. Afghan
National Water Research Institute - CCIW
Burlington, Ont. (416) 637-4661

Open cell polyurethane foams have been evaluated for the concentration of polycyclic aromatic hydrocarbons from spiked water samples. At concentrations of 0.1 to 10 µg/L, pyrene is absorbed. The distribution coefficient for pyrene between foam and water was estimated at about 10^6. Evidence of absorption from water at room temperature was obtained also for fluoranthene, 1, 2-benzofluorene, triphenylene, benz(a)anthracene, chrysene, benzo(e)pyrene and benzo(a)pyrene. Recovery of the lower molecular weight PAHs (pyrene through chrysene) and B(e)P and B(a)P was obtained by tetrahydrofuran extraction of the foams.

Losses of the less soluble PAHs B(a)P, perylene, indenopyrene and dibenz (a,h)anthracene were experienced from solutions at 100 µg/L concentrations, possibly by absorption on the walls of the glass vessel.

Fluorescence of several of the PAHs was used to monitor absorption from aqueous solutions and, in some instances, recovery from the foams by solvent. Gas chromatography on liquid crystal columns was used to detect recoveries of all the PAHs tested as well as to measure purity of the reference samples. Baseline separations of a mixture of C_{16}, C_{18}, C_{20} and C_{22} PAHs - 100 ng of each one - were obtained with one column operated isothermally.

(77-301) "Toxic Substances in Winter Snowpack in the Great Lakes Region"

Contractor: International Environmental Consultants Ltd., Toronto, Ontario

Scientific Authority: W.M.J. Strachan
National Water Research Institute - CCIW
Burlington, Ont. (416) 637-4222

Samples representing the "integrated" accumulation of snow between early December, 1977, to mid-March, 1978, were collected at 28 sites around Ontario. Samples of individual events were collected over the same period in Thunder Bay, Sudbury, Ottawa, Peterborough, London and Sault Ste. Marie. Event sub-sampling was also undertaken at Thunder Bay and Peterborough. The samples were analysed for selected trace metals and organochlorine compounds.

Measurable quantities of PCBs, hexachlorobenzene, DDT residues, heptachlor epoxide, dieldrin, endrin, methoxychlor, lindane, endosulphan, and pentachlorophenol were found in both the integrated snow samples and the event samples. Concentrations of organochlorines (O/Cs) in the event and integrated snow samples were similar. Neither mirex nor chlordane were detected. PCB concentrations were substantially lower than previously reported. Long range transport and transport of the O/C compounds occur during the winter, although the concentrations of the O/Cs in snow were lower than values reported in the literature for rainfall. The most significant concentrations were found in southwestern Ontario which is the most industrially and agriculturally developed region of the province. No definite time/concentration relationship for O/Cs could be discerned in the sub-event sampling program.

Trace metal concentrations in integrated snow samples were significantly lower than those in event samples. The difference is probably attributable to urban anthropogenic sources near the event sampling stations as compared to the remote integrated stations. In general, lead concentrations at the integrated stations were near or below detection limit except for stations located within a few miles of heavily travelled highways. In comparison, all event samples contained significant quantities of lead. Similarly, measurable concentrations of cadmium were found only in urban areas (event sampling stations). Mercury concentrations in event samples were found to be slightly above those in integrated samples. Measurable concentrations of arsenic were found in more event snow samples than in integrated snow samples. The data indicate short range transport and deposition of these trace metals, but no conclusions can be drawn about long range transport.

(77-302) "Study of Toxic Substances in the Great Lakes"

Contractor: Beak Consultants Limited, Mississauga, Ont.

Scientific Authority: W.M.J. Strachan
National Water Research Institute - CCIW
Burlington, Ont. (416) 637-4222

Information on toxic substances in Lake Superior is reported on the basis of analysis results of samples collected from lightly polluted and unpolluted areas of Thunder Bay, Marathon and Michipicoten. Sediment and fish samples were subjected to a determination of moisture and lipid content respectively, and analysed for trace metals (arsenic, cadmium, lead, mercury) and trace organics (chlorinated pesticides, PCBs, hexachlorobenzene, pentachlorophenol). A limited number of water samples were collected for trace organic analysis of the water itself and of the suspended material. Atomic absorption spectroscopy was the method used for trace metal analysis while gas-liquid chromatography was used for trace organic analysis.

(77-330) "Feasibility Study on the Measurement of Atmospheric Mercury Deposition"

Contractor: International Environmental Consultants Ltd., Islington, Ont.

Scientific Authority: D.P. Sturtevant
Water Quality Branch - CCIW
Burlington, Ont. (416) 637-4639

Within a program aimed at evaluating the precipitation sampling and preservation methodologies in the measurement of mercury in atmospheric deposition, the following factors have been studied: container material, type of container used as collector, and preservation of samples. When compared with polypropylene, linear polyethylene and teflon coated containers, borosilicate glass containers were found superior and produced the most reproducible results. Funnel/bottle samplers were preferred over large diameter containers for precipitation event sampling. Among the preservatives evaluated, HNO_3, $HNO_3/K_2Cr_2O_7$, $H_2SO_4/K_2Cr_2O_7$, $HAuCl_4/HNO_3$, the most adequate performance was obtained with $HNO_3/K_2Cr_2O_7$.

(77-350) "Analysis of Cadmium, Arsenic and Selenium in Gulf of St. Lawrence Sediment Samples"

Contractors: Saint Mary's University, Halifax, N.S. (C.M. Elson, Princ. Inv.)
Bondar - Clegg & Company Ltd., Ottawa, Ontario

Scientific Authority: D.H. Loring
Marine Ecology Laboratory
Dartmouth, Nova Scotia (902) 426-3565

Sediment samples collected from the Bay of Fundy and the Gulf of St. Lawrence were analysed for arsenic via a colorimetric technique and for cadmium and selenium via atomic absorption spectroscopy.

In an article submitted for publication, the Scientific Authority reports that total concentrations of heavy and transition metals in the Bay of Fundy sediment samples vary regionally, and with the sediment texture.

(77-351) "Analysis of PCB and DDT Related Compounds in Fish and Plankton from the Gulf of St. Lawrence"

Contractor: R.J. LeBlanc, Halifax, Nova Scotia

Scientific Authority: G.C.H. Harding
Marine Ecology Laboratory
Dartmouth, Nova Scotia (902) 426-2692

Plankton collected in St. Georges Bay, southern Gulf of St. Lawrence, was sorted into seven size fractions to enable tropic analogies and then individually analysed for organochlorine content after a sulphuric acid cleanup method. Pelagic fish (herring, mackerel, gaspareaux, smelts, capelin and silversides) of various ages were analysed. Under the conditions used, the study had to be limited to PCB analysis as the PCB components caused massive interference in the determination of the DDT - related compounds. There is no evidence of food chain magnification of PCBs in a planktonic food chain, although pelagic fish contain more PCBs per unit dry weight or lipid weight as they mature.

(77-390) "Study of the Behaviour, Pathways, Residence Time, and Toxicity of PCBs in the Marine Environment"

Contractor: Seakem Oceanography Ltd., Sidney, B.C.

Scientific Authority: C.S. Wong
Institute of Ocean Sciences
Sidney, B.C. (604) 656-8407

An experiment to determine the fate and effects of PCBs in an enclosed ecosystem was carried out utilizing the CEPEX (Controlled Ecosystem Pollution Experiment) technique. Arochlor 1254, a commercial mixture of PCBs, was mixed with ethanol and a dispersant, then added to two enclosures at levels of 5 and 50 ppb respectively; a third enclosure was used as a control. Nutrients were added to stimulate the phytoplankton bloom. The sampling schedule carried out covered numerous chemical and biological parameters in the ecosystem.

Results indicated that there was a general, noticeable decrease in chlorophyll-a and C-14 productivity in the PCB spiked enclosures. For the phytoplankton, there appeared to be a delay in the timing of the blooms in both spiked enclosures by a few days for the diatoms and, in the 50 ppb PCB level enclosure, a shift in the species composition from domination by diatoms to that by the micro-flagellates after 12 days.

For zooplankton, the growth was suppressed temporarily by PCBs at the 5 ppb level but was inhibited severly at the 50 ppb level with low recovery later. PCBs were removed quickly from seawater with concentrations dropping to about 10% of the added amounts in 2-3 weeks. It appeared that PCBs were absorbed quickly into phytoplankton

with an accumulation factor of at least 10^5 from seawater and removed into the detritus reservoir through sinking of the dead diatoms. There was also evidence that PCBs could be released back to the seawater column during the remineralization phase. A partitioning phenomenon was observed with the detritus samples containing relatively more of the higher chlorine-containing components of the PCBs, and the seawater samples containing relatively less of these PCB components. Evaporative loss to the atmosphere and absorption onto the enclosure wall material did not constitute major processes in PCB removal.

(77-391) "Study of the Behaviour, Pathways, Residence Time and Toxicity of Tetraethyllead in the Marine Environment"

Contractor: Seakem Oceanography Ltd., Sidney, B.C.

Scientific Authority: C.S. Wong
Institute of Ocean Sciences
Sidney, B.C. (604) 656-8407

A CEPEX (Controlled Ecosystem Pollution Experiment) experiment was conducted to examine various chemical and biological parameters of an ecosytem subjected to the presence of tetraethyllead. The experiment used three 60,000 litre enclosures, one as the control and the other two spiked with approximately 5 and 50 ppb of tetraethyllead in methanol, respectively. Nutrients were added to the enclosures to stimulate the phytoplankton bloom.

Results indicated that tetraethyllead at the 50 ppb level destroyed most of the phytoplankton and zooplankton activities within 48 hours and the compound at the 5 ppb level reduced the populations and growth rates considerably. The compound was rapidly removed from seawater, a decrease of about 80% in seawater concentrations occurring in 5 days. Particulate tetraethyllead also increased rapidly after 2-3 days, indicating removal via the detritus route after absorption onto surfaces of living and/or dead cells. Other possible routes for the removal of tetraethyllead from seawater are evaporative loss to the atmosphere transformation into other forms of organic and inorganic lead compounds in seawater.

(78-001) "Contaminants in the Bay of Chaleur - Phase I"

Contractor: MacLaren Marex Inc., Dartmouth, Nova Scotia

Scientific Authority: P.B. Eaton
Environmental Protection Service - Atlantic Region
Halifax, Nova Scotia (902) 426-6141

As part of a program designed to study the situation of contaminants (chlorobenzenes, PCBs, PAHs, mercury, lead, cadmium, arsenic) in the Chaleur Bay, the

Phase I project was to constitute a background document for setting up the terms of reference of a Phase II project: sampling and analysis. The report provides a review of existing relevant information in the areas of chemical oceanography, sediment dynamics and biological oceanography, and it concludes by suggesting a sampling design and analytical methodologies.

(78-002) "An Environmental Survey for Chlorobenzenes at Four Coastal Sites in Nova Scotia"

Contractor: MacLaren Marex Inc., Dartmouth, Nova Scotia

Scientific Authority: P.B. Eaton
Environmental Protection Service - Atlantic Region
Halifax, Nova Scotia (902) 426-6141

Chlorobenzenes have been detected in the effluents from textile plants, chlor-alkali plants and certain chemical plants in the Atlantic Region of Eastern Canada. The question of dispersion and accumulation of chlorobenzenes in sediments and biota near the effluents of some of these plants has been examined in this study. Two identified chlorobenzene sources (a chlor-alkali plant and a textile plant) and one suspected source (a coking oven) were examined and compared with a control area remote from known sources. A total of 46 sediment samples and four biota samples were analyzed using gas chromatography. The results indicate a widespread presence of chlorobenzenes at all locations; however, levels are low except in the case of para-and meta-dichlorobenzene which reached a high of 5 ppm at the coking oven site.

(78-052) "Inventaire des usages du mercure au Québec"

Contractor: Les Conseillers Beak Limitée, Montréal, Québec

Scientific Authority: H. Alves
Service de la protection de l'environnement - région du Québec
Montréal, Québec (514) 283-7307

In a study aimed at identifying the uses and users of mercury in the Province of Quebec, a questionnaire was sent to more than 650 companies, branches and divisions in various industrial categories operating in that province. Among the 231 responses received, 189 of these reported no use of either mercury or mercury compounds; the remaining 42 revealed a variety of uses and levels of mercury consumed by them. The chlor-alkali industry is by far the largest user of mercury in Quebec, followed by manufacturers of paint, mercury vapour lamps and industrial control instruments.

(78-101a) "Survey of Point Sources and Environmental Levels of HCB and Other Selected Chlorobenzenes in Ontario Region and in the Vicinity of Montreal"

Contractor: Sciex Inc., Thornhill, Ont.

Scientific Authority: D.J. Pascoe
Environmental Protection Service - Ontario Region
Toronto, Ont. (416) 966-5840

The study included the methodology development for the determination of ambient gas phase concentrations of hexachlorobenzene (HCB) and chlorobenzenes (CBs), using the TAGA™ (Trace Atmospheric Gas Analyzer) system. The detection limits of the method under the conditions used were determined to be 0.020 ppb for HCB and 0.1 to 1.0 ppb for the various CBs.

An extensive field sampling program was conducted in the Provinces of Ontario and Quebec at or near industrial sites where HCB and CBs were suspected to be present in the air as fugitive emissions. Monitoring for HCB was carried out at 21 sites and for CBs at 13 of these sites. The results demonstrated that the gaseous concentrations of these substances were, with only a few exceptions, below the detectability limits of the TAGA™ system. The significance of these results is limited, as the sampling was conducted during the winter months with ambient temperatures at or below 0°C.

(78-101b) "Organochlorine Residue Analyses of Herring Gull Egg and Mollusc Samples"

Contractor: Ontario Research Foundation, Mississauga, Ont.

Scientific Authorities: T.D. Leah
Contaminants Control Branch
Hull, Quebec (819) 997-3450

D.J. Hallett
Canadian Wildlife Service - Ontario Region
Ottawa, Ont. (613) 997-1410

Mollusc and Herring Gull egg (hexane extract) samples, both collected in the Great Lakes region, were analyzed for organochlorine residues. Generally, in mollusc samples, the level has been found not to exceed 0.001 ppm for organochlorine pesticides, and 0.1 ppm for PCBs. The results of analyses for chlorobenzenes (tri- to hexachloro-) in mollusc and Herring Gull egg samples indicate that these compounds are prevalent at the top of the aquatic food chain of the Great Lakes. The study demonstrates the capillary column GC/EC is superior to conventional packed column GC/EC for the analysis of chlorobenzenes and enhances the separation of compounds when analysing for a variety of organochlorine residues.

(78-102) "Chlorinated Dibenzofurans and Dibenzo-p-dioxins: Detection and Quantitation in Electrical Equipment and their Formation during the Incineration of PCBs"

Contractor: Wellington Science Associates Inc., Rockwood, Ont.

Scientific Authority: D.J. Pascoe
Environmental Protection Service - Ontario Region
Toronto, Ont. (416) 966-5840

The report contains background information to the study through a review of the literature pertaining to the polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) in the following areas: chemical and physical properties (including spectral properties), biological and toxicological properties, and occurrence in PCB-based electrical fluids and other commercial compounds.

The research carried out during the study investigated the formation of PCDDs and PCDFs associated with the use of electrical equipment filled with PCB-based fluids and with the incineration of these fluids. In either case, no significant amount of PCDDs were detected. The amount of PCDFs in transformer askarels was found to depend upon the length of time the transformer (and askarel) had been in service. PCDFs were also found to form when PCB-based fluids were exposed to high temperature (ca. 500°C) with oxygen present.

(78-150) "A Survey of the Sources, Uses and Environmental Distribution of Hexachlorobenzene in Alberta, Saskatchewan, Manitoba and the Northwest Territories"

Contractor: J.R. Tuttle, Edmonton, Alberta

Scientific Authority: P. Fee
Environmental Protection Service - Western & Northern Region
Edmonton, Alberta (403) 425-4569

The report of this study provides an inventory of the industries/operations in the Northwest Region whose activities involve hexachlorobenzene, based on a survey conducted in 1978. The results of the survey indicate that the predominant uses of hexachlorobenzene are related to the pesticide (production, formulation, distribution) and wood preservation industries. Under the heading "Environmental Distribution of Hexachlorobenzene", the report presents the available data on levels of HCB residues in foods.

(78-202) "Monitoring Environmental Contamination from Chlorophenol Contaminated Wastes Generated in the Wood Preservation Industries"

Contractors: Can Test Ltd., Vancouver, B.C.
E.V.S. Consultants Ltd.,
North Vancouver, B.C.

Scientific Authorities: O.E. Langer and D.M. Wilson
Environmental Protection Service - Pacific Region
West Vancouver, B.C. (604) 666-6711

A field and analytical program was undertaken to investigate the present levels of chlorophenol and chlorobenzene contaminants in coastal receiving environments of the lower mainland of British Columbia and the lower east coast of Vancouver Island. Samples of sediments, surface water, effluent, and biota were obtained from freshwater, estuarine, and marine locations adjacent to wood protection facilities.

Both tetra- and pentachlorophenol were present in the aquatic environment at all sites where PCP formulations were used. Other PCP homologues and chlorobenzenes were detected at some sites at much lower concentrations.

It was concluded that both tetra- and pentachlorophenol represent a significant environmental contamination problem in the areas investigated.

(78-252) "Proceedings of Joint Industry/Government Chlorofluorocarbon Regulation Workshop"

Contractor: V. Prendergast Associates, Brantford, Ont.

Scientific Authority: J.R. Monteith
Contaminants Control Branch
Hull, Quebec (819) 997-1640

The report of the proceedings of the CFC workshop summarizes the discussion which took place during the review of various regulatory scenarios. Industry representatives felt that no regulation was necessary based on the scientific evidence available; however, it was generally accepted that the only viable regulatory approach was to ban the use of CFC's 11 and 12 as propellants in hairsprays, deodorants and antiperspirants. Aspects discussed included industrial safety, product reformulation, socio-economic factors, and international impacts. The report contains, as appendices, a list of the companies involved in the Canadian aerosol industry and a list of the organizations that had submitted written briefs prior to the workshop.

(78-254) "Identification and Assessment of Commercial Information on Suspected Toxic Substances"

Contractor: N.S. Wei & Associates Limited, Toronto, Ont.

Scientific Authorities: T.D. Leah
Contaminants Control Branch
Hull, Quebec (819) 997-3450

D.J. Pascoe
Environmental Protection Service - Ontario Region
Toronto, Ont. (416) 996-5840

One of the main objectives of the study was to identify the sources and availability of commercial information on suspected toxic chemicals present in the Canadian environment, excluding any contact with the Canadian chemical industry. The study focussed on 24 selected chemicals that are prevalent in the Canadian chemical industry and suspected to be toxic. The collected information is presented in a matrix format for each individual chemical, showing the type of information (commercial, chemical processing technology, releases) and the sources of such information.

(78-255) "Validation Testing of Bioaccumulation Protocols"

Scientific Authority: V. Zitko
Fisheries Environmental Research
St. Andrews, N.B. (506) 529-8854

The uptake and excretion of mirex, Dechlorane Plus 25, and Dechloranes 602, 603 and 604, administered in water and, separately, in food to juvenile Atlantic Salmon was studied. Only mirex and a small amount of Dechlorane 602 were accumulated from water, but all compounds were accumulated from food by fish. The presence of the compounds in the fish was confirmed by GC/MS. Accumulated compounds were excreted very slowly.

(78-257) "Study of Various Industrial Uses of Polychlorinated Biphenyls"

Contractor: M.M. Dillon Limited, London, Ontario

Scientific Authority: C.J. MacDonald
Contaminants Control Branch
Hull, Quebec (819) 997-1640

The report focusses on the non-electrical applications for which PCBs were used. A questionnaire was designed and sent to companies and agencies likely to provide information relevant to the study. The only responses retained were those from respondents operating a system in one of the following categories: heat transfer systems, hydraulic systems, vapour diffusion pump applications and special lubricant applications, as well as responses from respondents who had converted their system from PCB fluids to non-PCB fluids.

For each system examined in the study, a general description is given, possible problems associated with fluid losses, drainage and replacement are discussed, and aspects of the fluid changeover are presented. From the study, some of the main conclusions are that: virtually every industrial system that employed PCB-based fluids in non-electrical uses has been either converted to use a non-PCB based fluid or has been retired from service; some of the converted systems use fluids contaminated with PCBs at levels above 100 ppm; and, the reduction of PCB contamination in fluids via draining, combined in some cases with flushing, is extremely costly.

Charcoal adsorption has proven ineffective in removing residual PCBs from synthetic oils, as demonstrated in laboratory bench scale experiments carried out under the terms of reference of the study.

(78-340) "Analyses of the Levels of Toxic Substances in Woodcocks of the Atlantic Region"

Contractor: Ontario Research Foundation, Mississauga, Ont.

Scientific Authority: P.A. Pearce
Canadian Wildlife Service
Fredericton, N.B. (506) 452-3086

Apparent eye abnormalities detected in New Brunswick woodcocks and the concern of a possible relationship with exposure to certain environmental contaminants prompted this study. Woodcock specimens with and without ocular anomalies were obtained and analysed by GLC for whole body (less head and highly keratinized parts) residue burdens of organochlorine compounds (organochlorine pesticides, HCB, PCBs, mirex/photomirex) and fenitrothion and fenitrothion breakdown products.

The study has generated data allowing the assessment of the current level of contamination in New Brunswick woodcocks and indicates the unlikely relationship between the level of contamination and eye condition. Total DDT in birds from areas of known high past use of that insecticide still remains relatively high (22-60 ppm lipid weight). Mirex levels (high of 0.8 ppm lipid weight) were much higher in spring birds than in fall ones. PCB concentrations were as high (range 1 to 5 ppm lipid weight) as in samples analysed in earlier years. No residues of fenitrothion and two of its metabolites (fenitro-oxon, S-methyl fenitrothion) were detected under the conditions of analysis, while low levels (range 0.1 to 0.5 ppm "wet" weight) of nitrocresol occurred commonly in the birds sampled.

(78-353) "Literature Review on Halogenated Additives to Plastics"

Contractor: Atlantic Analytical Services, Saint John, N.B.

Scientific Authority: V. Zitko
Fisheries Environmental Research
St. Andrews, N.B. (506) 529-8854

As the first phase of study on the toxicity of fire retardant additives to polymers, approximately 1000 references from the scientific and patent literature have been reviewed and classified as to their content of toxicity data and the chemical composition of the additives reported.

(78-354) "Effects of Cadmium in the Marine Environment"

Contractor: D.S. Pezzack, St. Andrews, N.B.

Scientific Authority: D.W. McLeese
Fisheries Environmental Research
St. Andrews, B.C. (506) 529-8854

The project has provided information on the dynamics of accumulation of cadmium by bottom-feeding marine organisms and on the effects of EDTA (simulating natural organic ligands) and of zinc in their accumulation of cadmium.

The patterns of Cd uptake and excretion by Nereis virens and Pandalus montagui are similar, with minor differences in uptake rate, and in body burden and concentration factor at a specific time, when these organisms are exposed to sea water and to $CdCl_2$-spiked sediments. Equilibrium was not reached by 14 or 30 days, indicating the potential for a considerable accumulation of Cd from water with low Cd levels, given sufficient time.

EDTA reduced the rates of Cd uptake in whole animals of both species as did the presence of Zn. With both materials, the depression of the uptake rate was greater for Nereis virens. The presence of zinc, although causing a depression in the uptake rate for whole Pandalus montagui, caused a doubling of the uptake rate by hepatopancreas tissue.

(78-372) "Determination of Tetraalkyllead, Extractable Lead and Total Lead in Environmental Samples"

Contractor: University of Toronto (Dr. J.C. VanLoon, Princ. Inv.)
Toronto, Ont.

Scientific Authorities: P.T.S. Wong
Great Lakes Biolimnology Laboratory - CCIW
Burlington, Ont. (416) 637-4559

Y.K. Chau
National Water Research Institute - CCIW
Burlington, Ont. (416) 637-4707

Procedures for the determination of total Pb, hexane extractable Pb, volatile Pb and tetraalkyllead in fish, vegetation, sediments and water were developed. Detection limits of the atomic absorption spectroscopy method for fish, vegetation, sediment and water were: 10, 10, 50 and 1 ppb respectively for total Pb and 2, 2, 2 and 0.001 ppb respectively for hexane extractable Pb. The detection limits for volatile Pb and tetraalkyllead were about 1 ppb for all samples. One hundred and fourteen fish, 50 sediment, 44 vegetation and 32 water samples collected in Ontario were analysed for the above parameters. Tetraalkyllead and volatile Pb were found in some fish samples. Hexane extractable Pb was present in fish, waters and sediments. Vegetation showed no hexane extractable or volatile Pb.

(78-373) "Measurements of Sublethal and Lethal Effects of Contaminants on an Aquatic Ecosystem"

Contractor: University of Waterloo (Drs. C.I. Mayfield, J.E. Thompson and W.E. Innis, Princ. Inv.)
Waterloo, Ont.

Scientific Authority: P.T.S. Wong
Great Lakes Biolimnology Laboratory - CCIW
Burlington, Ont. (416) 637-4559

Wide-angle X-ray diffraction of chloroplast and microsomal membranes isolated from Bay Quinte algae has revealed that the membrane lipid phase transition temperature (defined as the highest temperature at which gel phase lipid can be detected) rises as the algal bloom in the Bay ages. Thus, for young algae, the membranes are exclusively liquid-crystalline (fluid) at physiological temperature, but as the cells age, increasing proportions of the membrane lipid become crystalline. Treatment of young Quinte algal samples with pollutants (pentachlorophenol, 1 and 10 ppm; hexachlorobenzene, 1 and 10 ppm, and a mixture of heavy metals, 1 and 10 x IJC recommended levels) also raised the transition temperature of microsomal membranes. This indicates that pollutant-induced damage is tantamount to premature aging, and that change in membrane transition temperature can be used as an index by which to score the toxicity of contaminants. In addition, two of the pollutants tested in this study -- hexachlorobenzene and the mixture of heavy metals -- induced an unusually complex array of crystallinity in chloroplasts of the treated cells which was not seen during natural aging of

the algae. This crystallinity can be readily detected by X-ray diffraction of crude chloroplast fractions and, inasmuch as it does not become manifest during normal algal aging, appears to have considerable potential as a sensitive and highly specific biossay for detecting pollutant-induced damage in field samples.

(78-374) "Literature Review of Carcinogenesis in Canadian Fishes"

Contractor: R.A. Sonstegard, Elora, Ont.

Scientific Authority: P.V. Hodson
Great Lakes Biolimnology Laboratory - CCIW
Burlington, Ont. (416) 637-4559

A review of the status of specific carcinogenicity problems in specific fish species in Canada is presented. For each fish species reviewed, where known, a description of the etiology of the tumor, the spatial and temporal variability of tumor incidence and possible biological and/or environmental causes are included. For those tumors where an environmental cause such as chemical contamination is suspected, the practicality of monitoring the spatial and temporal variability of incidence as an indicator of pollution is discussed.

(78-380) "A Simple Rapid Protocol for the Detection of Environmental Mutagens, Carcinogens and Teratogens"

Contractor: University of Manitoba (Dr. M.R. Samoiloff, Princ. Inv.)
Winnipeg, Man.

Scientific Authority: J.F. Klaverkamp
Freshwater Institute
Winnipeg, Man. (204) 269-7379

The report describes the initial phase of a two phase project designed to utilize the free-living nematodes Panagrellus redivivus and Caenorhabditis elegans as a system for the detection of environmental mutagens, carcinogens and teratogens. The first phase of the project has demonstrated the most sensitive developmental indicators in response to known toxic agents, and the conditions for maximal detection of the response to toxic agents.

Three criteria for the assay have been established: 1) the exposure to the toxicant must be chronic, lasting for the 96 hour postembryonic developmental period, 2) the exposure to the toxicant cannot completely block maturation since functional adults are required for an assay of mutagenesis, 3) as the most general manifestation of mutagenesis, carcinogenesis or teratogenesis is abnormal development, the assay must give some probabilistic measure of developmental success. A precise, highly reproducible sensitive assay has been developed using these criteria. Detection of three known toxicants, cadmium, hexachlorobenzene and benzene, and two mutagens, the acridine proflavine and 5-bromouracil has been successful at concentrations of 10^{-8} molar.

Fecundity, used as an indicator of induced abnormalities during gonad formation, gametogenesis or embryogenesis, is affected by proflavine, 5-bromouracil and hexachlorobenzene at 10^{-8} molar, by cadmium at 10^{-7} molar and by benzene at 10^{-4} molar.

Methods for detection of lethal mutations on the Panagrellus redivivus X-chromosome demonstrate a spontaneous mutation frequency of 7.8×10^{-6} lethal mutations per locus. Mutagenesis was detected after growth in the mutagens proflavine and 5-bromouracil at 10^{-8} molar, and after growth in 10^{-7} molar hexachlorobenzene. Mutagenesis was not detected following growth in cadmium or benzene.

(78-392) "Identification by GC-MS Analyses of Halogenated Organics and PCBs in Tissues of Selected Aquatic Organisms"

Contractor: Radian Corporation, Austin, Texas

Scientific Authority: I.H. Rogers
Pacific Environment Institute
West Vancouver, B.C. (604) 926-6949

Pacific salmon, crabs, flounders, clams (Macoma sp.) and sediments were sampled at two stations near the municipal sewage outfall at Iona Island, and a control station in August and October, 1978. Analyses for organohalogens and EPA Priority Pollutants were conducted using GC with a Hall detector, followed by GC-MS. Three main groups of compounds found were PCBs, phthalate esters and condensed ring hydrocarbons. 1, 2-Dichlorobenzene occurred in sediment near the outfall. Phenol and pentachlorophenol were present in one flounder sample. The overall level of organic pollutants was relatively low but improvements in sample cleanup are necessary.

(78-393) "Methylation of Arsenic in Marine Sediments and Interstitial Waters in Rupert Inlet, B.C."

Contractor: Beak Consultants Limited, Vancouver, B.C.

Scientific Authority: J.A.J. Thompson
Institute of Ocean Sciences
Sidney, B.C. (604) 656-8408

The incidence and production of organoarsenic compounds in sediments and overlying waters of a Vancouver Island inlet, which has been perturbed by mine tailing discharges, were studied in a two-phase study. In Phase I, two sediment samples from Rupert Inlet, one sample from adjoining Holberg Inlet and one from Quatsino Sound were obtained for pore water sampling and analysis for total carbon and arsenic concentrations. Overlying waters were obtained at each station. Pore waters and overlying waters were analysed for As(III), As(V), $CH_3AsO(OH)_2$ (monomethylarsenic acid) and $(CH_3)_2AsO(OH)$ (dimethylarsenic acid) using vapor phase chromatography and flameless atomic absorption techniques. No As was detectable in overlying waters at concentrations below 1.0 µg/L.

In pore waters, As(III), As(V) and the two methylarsenic compounds were found in concentrations up to approximately 5 µg/L in two samples only, where both dissolved As and organic carbon were in higher concentrations than at the other two stations.

In phase II, the capability of sediment microorganisms to methylate added As(III), as arsenite, and $(CH_3)_2As$, as $(CH_3)_2AsO(OH)$, under anaerobic conditions was examined. When As (III) was added, amounts of $(CH_3)AsO(OH)_2$ ranging from 599 to 1167 µg/L were produced. Concentrations of $(CH_3)_2$ AsO(OH) produced ranged from 22 to 50 µg/L after four weeks incubation at 15°C. Variations in production for the four sediment samples used were not great. Dimethylarsenic acid added to each of the four sediment samples was rapidly reduced regardless of nutrient levels. Amounts remaining after 4 weeks incubation ranged from 1 to 2 percent of the amount added. The study indicated that organoarsenic derivatives exist in pore waters at concentrations considerably above those in sea water. From the limited data, a relationship among the arsenic, organic carbon and the methylarsenic concentrations exists. The importance of release of arsenic from tailings to pore waters requires further investigations.

(78-394) "Identification of Heavy Metals in Organisms within an Area of the Fraser River Estuary Receiving a Major Municipal, Industrial and Stormwater Discharge"

Contractor: E.V.S. Consultants Ltd., North Vancouver, B.C.

Scientific Authority: I.K. Birtwell
Fisheries Management - Pacific Region
Vancouver, B.C. (604) 666-1209

Concentrations of heavy metals were measured in sediments and marine organisms from two mudflat areas in the Fraser River estuary, British Columbia. The Sturgeon Bank mudflat was influenced by the combined municipal, industrial and storm-water discharge from the Iona Island sewage treatment plant. The second mudflat, Roberts Bank, was used as a control area.

Metal levels in sediments reached their highest levels at sites closest to the Iona Island sewage treatment plant outfall. Of the metals analyzed, only mercury and arsenic showed levels indicating contamination in animal tissues. However, elevated levels of these metals were also found in samples from the control site, indicating other sources of metal contamination to the estuary. Concentrations of mercury in sediments and biota, and concentrations of arsenic in biota showed seasonal fluctuations of over one order of magnitude. High detection limits precluded assessment of cadmium and lead as heavy metal contaminants.

Mercury levels were significantly ($p<0.05$) higher in clams (Macoma balthica) and flounder (Platichthys stellatus) collected from sites on Sturgeon Bank, than in specimens taken from the control area. However, the mercury content of crabs (Cancer magister) in the two areas was not always significantly different, although values approached 0.5 µg/g wet weight. These findings indicated the potential for an environmental contaminant problem in both study areas. Metal levels in chinook salmon (Oncorhynchus tshawytscha) were generally low. Concentrations of mercury in tissues did

not reach 0.5 µg/g wet weight in any of the samples. Arsenic did exceed the recommended level of 5.0 µg/g wet weight for commercial seafood organisms in some samples of both crabs and flatfish.

Results were discussed with respect to a literature review on the effects of heavy metals with emphasis on mercury and arsenic. Recommendations for the direction of future studies included studies of temporal fluxes in heavy metal levels, physio-chemical and biological factors affecting the availability and uptake of metals by marine organisms, and improved analytical practices.

2.2 Projects Being Completed

(77-250) "Canada/US Liaison on Toxic Substances Control Act (TSCA)"

Contractor: C.T. Charlebois, Ottawa, Ont.

Scientific Authority: J.E. Brydon
Contaminants Control Branch
Hull, Quebec (819) 997-1499

(77-352) "Effects of Chlorinated Hydrocarbons on the Hepatic Mixed Function Oxidase Enzymes of Brook Trout"

Contractor: Dalhousie University, Halifax, N.S. (Dr. F.C.P. Law, Princ. Inv.)

Scientific Authority: R.F. Addison
Marine Ecology Laboratory
Dartmouth, N.S. (902) 426-3279

(78-050) "L'hexachlorobenzène dans l'environnement Québécois"

Contractor: multi-contracts

Scientific Authority: H. Alves
Service de la protection de l'environnement - région du Québec
Montréal, Québec (514) 283-7307

(78-051) "Etiquetage d'équipements contenant du BPC"
Contractor: multi-contracts
Scientific Authority: H. Alves
Service de la protection de l'environnement - région du Québec
Montréal, Québec (514) 283-7307

(78-151) "Enforcement of PCB Regulations at Active and Abandoned Mines in the Northwest Territories"
Scientific Authority: P. Fee
Environmental Protection Service - Western & Northern Region
Edmonton, Alberta (403) 425-4569

(78-251) "Category III Contaminants Use Patterns Survey"
Contractor: Martec Limited, Halifax, N.S.
Scientific Authority: T.D. Leah
Contaminants Control Branch
Hull, Quebec (819) 997-3450

(78-253) "Development of a Field Test Kit for the Determination of PCBs in Liquids"
Contractor: Beak Consultants Limited, Vancouver, B.C.
Scientific Authority: C.J. MacDonald
Contaminants Control Branch
Hull, Quebec (819) 997-1640

3 FINANCIAL REPORT

This chapter contains a financial report covering the operations of the Environmental Contaminants Contract Fund during the 1978-79 fiscal year. A total of $667,886 out of an annual allotment of $750,000 was spent on 39 projects.

Project Number	Responsibility Centre	Status of Project	1977/78 Expenditures Authorized $	1977/78 Expenditures Incurred $	1978/79 Expenditures Authorized $	1978/79 Expenditures Incurred $	Total Charged to Fund (77/78 & 78/79) $	Current 1979/80 Commitment $
77-200	EPS-PAC	Completed	25,000		19,270	19,270	19,270	
77-201	EPS-PAC	Completed	45,000	4,619	21,224	21,604	26,223	
77-202	EPS-PAC	Completed	22,000	17,877	3,000	3,000	20,877	
77-250	EPS-CCB	In progress	47,009	14,817	31,192	29,395	44,212	12,228
77-300	EMS-CCIW	Completed	13,000	4,441	22,410	22,450	26,891	
77-301	EMS-CCIW	Completed	70,000	34,552	35,288	28,547	63,099	7,178
77-302	EMS-CCIW	Completed			52,869	50,921	50,921	
77-330	EMS-CCIW	Completed			35,000	37,319	37,319	
77-350	F&O-ATL	Completed	5,000	4,602	5,000	4,947	9,549	
77-351	F&O-ATL	Completed			19,200	17,960	17,960	
77-352	F&O-ATL	In progress	6,125	2,528	18,900	19,561	22,089	600
77-390	F&O-PAC	Completed			27,745	27,745	27,745	
77-391	F&O-PAC	Completed			26,000	26,259	26,259	
78-001	EPS-ATL	Completed			6,963	6,963	6,963	
78-002	EPS-ATL	Completed			14,127	9,543	9,543	2,507
78-050	EPS-QUE	In progress			25,000	23,300	23,300	5,000
78-051	EPS-QUE	In progress			23,000	22,542	22,542	3,723
78-052	EPS-QUE	Completed			5,655	5,591	5,591	
78-101	EPS-ONT	Completed			59,300	59,136	59,136	
78-102	EPS-ONT	Completed			22,633	22,627	22,627	
78-150	EPS-NW	Completed			5,000	5,000	5,000	
78-151	EPS-NW	In progress			3,000	3,000	3,000	
78-202	EPS-PAC	Completed			25,579	27,579	27,579	
78-251	EPS-CCB	In progress			20,000	16,455	16,455	11,591
78-252	EPS-CCB	Completed			9,127	9,127	9,127	
78-253	EPS-CCB	In progress			10,000	10,000	10,000	
78-254	EPS-CCB	Completed			10,000	9,917	9,917	
78-255	EPS-CCB	Completed			4,000	4,000	4,000	
78-257	EPS-CCB	Completed			6,000	3,890	3,890	
78-340	EMS-ATL	Completed			9,950	9,950	9,950	
78-353	F&O-ATL	Completed			5,000	4,998	4,998	
78-354	F&O-ATL	Completed			7,000	7,000	7,000	
78-372	F&O-ONT	Completed			19,472	18,881	18,881	
78-378	F&O-ONT	Completed			20,741	20,741	20,741	
78-374	F&O-ONT	Completed			5,250	5,250	5,250	2,600
78-380	F&O-NW	Completed			15,417	15,399	15,399	
78-382	F&O-PAC	In progress			25,000	26,283	26,283	7,000
78-393	F&O-PAC	Completed			11,839	11,736	11,736	
78-394	F&O-PAC	Completed			21,000	20,675		

4 PERFORMANCE ASSESSMENT

This chapter reviews the operations of the Environmental Contaminants Contract Fund during 1978-79, its first complete fiscal year, in an attempt to assess the performance of the Fund in terms of financial and scientific management.

4.1 Financial

The comments expressed in this part reflect the views of the present Head of the ECCF to whom is attributed the responsibility for the general financial management of the Fund. It should be remembered that during the period covered in this discussion, the position of Head of the ECCF had not yet been staffed, the headship duties having been assumed on a part-time basis.

In order that the comments to follow be put in proper perspective, the administrative procedure governing the funding of ECCF projects during 1978-79 and still in effect in 1979-80 should be summarized. Once a project has received approval for funding from the DOE Environmental Contaminants Program Steering Committee at the recommendation of the ECCF Subcommittee, the EPS Finance and Administration Branch is requested to issue an expenditure authorization to the Responsibility Centre of the project's Scientific Authority. Such an authorization does not entail a transfer of funds, but it allows the Responsibility Centre to raise a contract requisition and subsequently obtain reimbursement of contract expenditures via a journal vouchering procedure. In theory, this administrative procedure should work well, provided that the journal vouchering of contract expenditures is done promptly, especially close to the end of the fiscal year, and that the Head of the ECCF is kept informed at all time of contract modifications likely to affect the financial aspect of the Fund.

By the end of June 1979 when all the financial information had been compiled and finalized for the 1978-79 operations of the Fund, it was established that a total of $667,886 was spent on ECCF projects against a $750,000 allotment, thus leaving approximately $82,000 unspent. It should be pointed out that for some of the projects mentioned in this document, the ECCF contributed only a portion of the funding. The following table provides a breakdown of the ECCF expenditures in 1978-79:

	HQ	ATL	QUE	ONT	NW	PAC	TOTAL
EPS	$ 82,784	$16,506	$51,433	$ 81,763	$ 8,000	$ 71,453	$311,939
EMS	101,918	9,950		37,319			149,187
F&O		54,466		44,872	15,399	92,023	206,760
	$184,702	$80,922	$51,433	$163,954	$23,399	$163,476	$667,886

In trying to explain the shortfall in expenditures experienced in 1978-79, it is worth noting that such a situation could not have been forecasted on the basis of the information gathered periodically by the Head of the ECCF from the Scientific Authorities of the various projects funded. At the end of October 1978, all the ECCF resources had been fully committed and, at the end of February 1979, it was forecasted that the 1978-79 ECCF expenditures would total $732,000, the $18,000 difference being linked to the fact that a few contracts had to be rescheduled for completion in 1979-80. Therefore, the unexpected shortfall amounts to approximately $64,000. The main factors responsible for its occurrence have been identified: funding commitments were discovered unused by the end of the fiscal year, and 1978-79 contract expenditures were left unpaid by the Responsibility Centre beyond the deadline set for their payment within the 1978-79 budget. Considering the financial management procedure governing the Fund, a $64,000 shortfall, which corresponds to about 8.5% of the total allotment, constitutes a performance which is not bad and one that changes in the procedure would likely improve.

The lapsing of ECCF resources experienced in 1978-79 has prompted the review of the current administrative procedure for the purpose of identifying possible modifications that could prevent the recurrence of this situation. Because the 1978-79 case became understood at a time when the 1979-80 fiscal year was well under way, it was felt that any significant changes to the existing procedure could not be implemented before 1980-81. In the meantime, steps are being taken to monitor as closely as possible the financial status of ECCF projects.

Given that for any ECCF contract, the Scientific Authority is the primary source of information to the Head of the Fund and given that the Scientific Authority is only indirectly involved in the financial management of the contract, it follows that within the current administrative procedure, the Head of the Fund cannot have first hand information on the financial status of individual ECCF contracts. Therefore, it seems that a tighter financial control of the Fund would require some involvement of the Head of the Fund in the procedure surrounding the payment of ECCF contract expenditures.

4.1.1 Recommendation. The ECCF Subcommittee recommends that the Steering Committee endorse the setting up of a new procedure aimed at improving the financial management of the Fund, with the details of this new procedure to be defined through consultation between the Contaminants Control Branch and the EPS Finance and Administration Branch.

4.2 Scientific

The 1978-79 fiscal year marked the beginning of the activities of the Environmental Contaminants Contract Fund Subcommittee which was established by the DFE Environmental Contaminants Program Steering Committee for the main purpose of making recommendations on the allocation of the ECCF resources to research projects. The subcommittee's first meeting was held on April 24, 1978, and since then meetings have been held on a more or less regular basis.

One of the first tasks tackled by the subcommittee was the allocation of 1978-79 ECCF resources, approximately 50% of those having to be committed toward the continuation of projects initiated in 1977-78 and the remainder to new projects. The main criteria retained in the evaluation of the new projects were their scientific merit and the subcommittee's consensus on the subjects or areas of research perceived as needing to have some work carried out on a priority basis.

Very early in its existence, the subcommittee identified the importance of establishing a procedure that would govern the allocation of ECCF resources in the future, and of defining mechanisms to ensure that the expenditures would yield scientifically sound information. Guidelines were drawn for the following aspects: proposal submission form, criteria for proposal evaluation, duties of Scientific Authorities of ECCF projects and a Guidance Statement to cover the solicitation of 1979-80 proposals. It is worth pointing out that following the preparation of a Guidance Statement for 1979-80, and for 1980-81, on both occasions the subcommittee conveyed to its parent committee the frustration and difficulties encountered in trying to prepare a document precisely spelling out the priorities that would govern the allocation of ECCF resources in the next fiscal year. The subcommittee has been consistently unsuccessful in its attempts to obtain from the various Services or Directorates involved in environmental contaminants matters the feedback that would be essential for the proper identification of priority areas for funding under the ECCF.

4.2.1 Recommendation. In order to optimize the allocation of ECCF resources and facilitate the preparation of the annual ECCF Guidance Statement, it is recommended that each year the Steering Committee provide the ECCF Subcommittee with a document outlining for the next fiscal year the plans of the various Services or Directorates in relation with the Department's Environmental Contaminants Program.

The projects funded in 1978-79 covered a variety of activities focussing on a limited number of contaminants and they have contributed an impressive amount of data and results. In order to give an overview of how the ECCF resources were spent in 1978-79, the various projects have been regrouped in Table 1 on the basis of the substance and the type of activity covered. The category "Media Survey" covers the projects dealing with the measurement of contaminants levels in a given medium and, in some instances, the associated analytical methodology development work. The category "Industrial Survey" covers the projects in which industrial inventory or use-pattern survey for a given substance was carried out. For the categories "Basic Research" and "Miscellaneous", the project code number is indicated for cross-reference with Chapter 2 of this document. The table clearly shows that surveys of environmental levels of contaminants and industrial surveys have consumed a large part of the Fund and that more effort was directed at organic contaminants rather than trace metals.

In order to evaluate the performance of the Fund in 1978-79, each completed project was subjected to a review within the subcommittee, based on the content of the final report and on the comments of the project's Scientific Authority. In general, it can be said that the Fund has supported good scientific work, the projects were carried out in accordance with the objectives stated in the proposals and, where applicable, efforts were made to subject the results of analytical work to a quality control procedure to ensure their reliability. Some projects will result in articles to be published in scientific journals. As for the usefulness of the information resulting from the 1978-79 expenditures, indications are that the projects have mostly supported the information needs of the services or regions from where the proposals originated; only to a limited extent has this information helped the Contaminants Control Branch in the preparation of hazard assessment documents on contaminants.

TABLE I: DISTRIBUTION OF ECCF EXPENDITURES IN 1978-79

Substance	Activity				Total
	Media Survey	Industrial Survey	Basic Research*	Miscellaneous*	
Various organochlorine contaminants	$ 84,900 (biota) 20,000 (water) 37,921 (biota, water, sed.)		$40,140 (78-255; 78-373; 78-380)	$27,128 (78-001; 78-254; 78-353; 78-374)	$210,089
PCBs	$ 17,960 (biota) 3,600 (sed. & soil)	$22,542	$60,372 (77-390; 78-102; 78-253)	$25,494 (77-201; 78-257)	$129,368
Chlorofluorocarbons				$ 9,127 (78-252)	$ 9,127
Hexachlorobenzene		$ 28,300			$ 28,300
Chlorobenzenes	$ 9,543 (sediments) 49,300 (air)				$ 58,843
Chlorophenols	$ 27,579 (sed., water, biota)				$ 27,579
PAHs			$22,450 (77-300)		$ 22,450
Cat. III contaminants		$ 16,455			$ 16,455
Various trace metals	$ 8,547 (water) 4,947 (sediments) 13,000 (sed., water, biota)				$ 26,494
Arsenic	$ 11,736 (biota, water)				$ 11,736
Cadmium			$ 7,000 (78-354)		$ 7,000
Lead	$ 18,881 (sed., water, biota)		$26,259 (77-391)		$ 45,140
Mercury		$ 5,591	$37,319 (77-330)	$ 3,000 (78-151)	$ 45,910
General				$29,935 (77-250)	$ 29,395

* The numbers in parentheses refer to project numbers used in Chapters 2 and 3.